

An abstract painting with vibrant colors: a large red section on the left, a yellow section on the right, a blue section at the bottom right, and a purple section at the bottom. The background is a light pinkish-red. Small, colorful dots are scattered across the red, yellow, and purple areas.

# **Evidence-based strategies to improve and monitor healthcare professionals' well-being and their work environment**

**Amber Boskma**



**EVIDENCE-BASED STRATEGIES TO IMPROVE AND  
MONITOR HEALTHCARE PROFESSIONALS' WELL-BEING  
AND THEIR WORK ENVIRONMENT**

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# **EVIDENCE-BASED STRATEGIES TO IMPROVE AND MONITOR HEALTHCARE PROFESSIONALS' WELL-BEING AND THEIR WORK ENVIRONMENT**

**Evidence-based strategieën om het welzijn van zorgprofessionals en hun  
werkomgeving te verbeteren en te monitoren**  
(met een samenvatting in het Nederlands)

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# 1

## **General introduction**

Healthcare systems worldwide are under pressure due to an aging population, rising chronic diseases, and modern lifestyle challenges. At the same time shortages of healthcare professionals threaten the quality and safety of care delivery. The increased demand for healthcare is causing a crucial mismatch between demand and supply. One reason for the need for care increases is the aging of populations. Consequently increased care is required from improved treatment options, innovations, and technology<sup>1</sup>. The proportion of the population aged 60 years and older will increase from 12.4% in 2010 to 28% in 2040<sup>2</sup>. Alongside aging, the prevalence of chronic diseases increases<sup>1</sup>. Additionally, modern lifestyles contribute to health issues such as obesity and stress-related conditions<sup>1</sup> with nearly 60% of adults and one in three children affected by overweight and obesity<sup>3</sup>. Moreover, social expectations are rising since today's citizens and patients want participation and co-creation in the healthcare system. They also expect high quality personalized care placing additional strain on the healthcare system<sup>4</sup>. Additionally, the growing demand is compounded by a declining influx of healthcare professionals, driven by fewer students pursuing the field<sup>5</sup> and high attritions rates caused by sick leave, employee turnover or leaving the profession<sup>6,7</sup>. Nurses are generally motivated by intrinsic factors<sup>8</sup>. Public perceptions of nursing are a low-paying and low-status jobs having significantly hindered the participants' choice to pursue nursing as a career<sup>9</sup>. A recent study from Asia described the lack of autonomous decision making, having to attend to patients' hygiene needs, engendered stigma, and lack of parental support as deterring factors to choosing nursing as a career<sup>10</sup>. Considering a career in healthcare seems influenced by personal interest, family pressure and financial reward<sup>11</sup>. Students not opting for a career in healthcare mention that medical training is difficult and prolonged, that there is too much competition, and that doctors have excessive working hours<sup>11</sup>. Fewer students are pursuing a career in healthcare and increasing numbers of students drop out of the education program<sup>12</sup>. Therefore, increasing the number of new healthcare professionals is a major challenge. In addition to that, we have to account for the graduated professionals who get sick and leave the profession. The rate of sick leave in the healthcare sector is relatively high compared to other sectors<sup>13</sup>. According to Statistics Netherlands the sick leave rates within the healthcare sector keeps increasing<sup>13</sup>. Apart from the COVID-19 pandemic in which the sick leave was around 8-9%, the rate in 2024 reaches 7-8% as compared to the sick leave rates of a stable 5-6% in the pre-COVID era<sup>13</sup>. The Dutch national average sick leave rate of 2024 was 5.5%<sup>13</sup>. According to one in five employees who took sick leave, their complaints during their absence were entirely or partially due to work<sup>13</sup>. High work pressure was the most cited cause of complaints<sup>13</sup>. Lastly, we have a considerable number of professionals who prematurely leave the profession which also contributes to the shortages of healthcare professionals. Retention and turnover are complex processes and vary according to healthcare professional type<sup>14</sup>. Generally, there is no single reason for staying or leaving<sup>14</sup>. Examples of recognized influencing factors include: organizational factors such as working hours, adequate staffing, and disputes; work-related factors such as responsibility, a humanistic work approach, and shared values; relationship factors such as team climate

and supportive colleagues; and recognition factors, including salary<sup>14,15</sup>. Considering the challenges surrounding healthcare demand, reduced influx of healthcare professionals, and high professional turnover, it is crucial to prioritize healthcare professionals' well-being and their work environment<sup>15</sup>. This ensures their capacity to manage pressure and maintain the attractiveness of their work. The well-being of healthcare professionals and their work environment has become an essential issue.

Healthy healthcare professionals and a healthy work environment are not only a prerequisite for *capacity* of healthcare, but also for *quality and safety* of care<sup>16,17</sup>. Although, the quintuple aim is a common guidance today in healthcare improvements, encompassing the added achievement of health equity<sup>18</sup> as early as 2014, the triple aim for healthcare was expanded to the quadruple aim adding the goal of improving work life of healthcare professionals<sup>4</sup>.

Even though causality is unclear, suboptimal quality and errors were mentioned in healthcare professionals with higher burnout<sup>19</sup>. A more recent study including a wider range of outcomes, described more medical errors, mortality, and patient dissatisfaction, in situations where the well-being of healthcare professionals was lower<sup>17</sup>. Another study showed engaged employees' performance better<sup>20</sup>. In addition, quantitative data shows that errors and mortality improve. Evidence suggest that perceived safety is also related to well-being outcomes of healthcare workers<sup>21</sup>.

Having established healthcare professionals' well-being is critical, it is essential to define this concept, understand its influencing factors, and explore strategies for monitoring and improving it. Well-being refers to feeling satisfied, being fulfilled, experience meaning in life or feeling quality of life<sup>22</sup>. A more holistic approach would be to describe well-being in multiple dimensions<sup>22</sup>. Well-being contains psychological, physical, and social health<sup>23</sup>. Well-being at work can be defined as 'the creation of an environment that fosters contentment and allows employees to flourish and achieve their full potential, benefiting both themselves and their organization'<sup>24</sup>. Various models exist explaining and visualizing well-being at work. One of the most frequently used is the PERMA-model which is a comprehensive model acknowledging the multi-dimensional character of well-being<sup>25</sup>. The model contains positive emotions, engagement, relationships, meaning, and accomplishment<sup>25</sup> including both personal and professional elements<sup>25</sup>. The PERMA-model supports understanding the proportionate share of elements that focus on general well-being instead of especially on well-being at work<sup>25</sup>. The Coping Reserve Tank is especially developed for students<sup>26</sup> showing a reservoir that can be replenished or drained by various aspects (e.g., stress and support) resulting in potential outcomes of resilience versus burnout<sup>26</sup>. Another example is the Self-Determination Theory suggesting motivation as an additional mediator for the dependent variables work performance and well-being<sup>27</sup>. The model contains autonomy, competence, and engagement<sup>27</sup>. The theory is

applied across various fields including parenting, education, healthcare, and sports<sup>27</sup>. However, it focuses on several types of motivation as influencing factors instead of approaching well-being at work as a more multi-dimensional concept<sup>27</sup>. Maslow's hierarchy of needs<sup>28</sup>, adapted for the workplace environment<sup>29</sup>, outlines levels contributing to well-being: physiological needs, safety, social needs, recognition, and self-actualization. The model emphasizes motivation and individual qualities but relies on subjective interpretations and qualitative data<sup>29</sup>. Lastly, the Job Demands-resources model offers a dynamic framework that highlights the balance between stressors and (personal/job) resources<sup>30</sup>. This model integrates two processes: the stress process which is sparked by excessive job demands and lack of resources and the motivational process which is triggered by abundant job resources. This may lead to positive outcomes such as commitment, intention to stay, and work performance<sup>30</sup>. The different model components contribute to a more positive well-being (e.g., Job satisfaction) or to a more negative well-being (e.g., Burnout)<sup>30</sup>. The JD-R model components are Demands (e.g., stress, workload, conflicts), Resources (e.g., support, development opportunities, team atmosphere), Leadership (e.g., inspiring, connecting), and Personal resources (e.g., motivation, resilience)<sup>30</sup>. In this thesis, the JD-R model was used due to its clear, comprehensive, and thoroughly researched framework for analyzing the various components and processes that influence well-being at work. The JD-R model provides a dynamic framework to understand how stressors and resources influence work outcomes and was therefore selected.

The increasing healthcare demand in the face of growing shortages of healthcare professionals, should be the top priority of research for health systems and healthcare institutions. The first step of this research is to understand the multi-dimensional concept, including the influencing factors on positive and negative well-being. The second step is to monitor healthcare professionals' well-being and timely screening, ensuring the well-being of individuals, to prevent and act on negative health in the workplaces. Therefore, gaining insight into their challenges and needs. Moreover, monitoring well-being enables the evaluation of interventions' effectiveness. Currently a clear understanding of the well-being of healthcare professionals is lacking. Additionally, how to measure and monitor well-being at work remains uncertain<sup>31,32</sup>. It is unknown which instruments are available and which are suitable for assessing this multi-dimensional concept<sup>33</sup>. The development of robust, reliable instruments remains a challenge. Most importantly, identifying the right set of indicators that provide a holistic view is still an open question<sup>31</sup>. Partly because of this, the gap between frontline professionals and employees in policy and management positions persists. It is ambiguous how healthcare professionals' well-being can be efficiently improved and a supportive work environment can be created. It is recognized a one-size-fits-all approach usually does not work and there is still much to learn about how interventions can be tailored to specific needs. Additionally, evaluations are typically focused on short-term effects leaving long-term effects unclear.

Giving insight into the current state of well-being among healthcare professionals, along with the tools for monitoring and interventions aimed at improving healthcare professionals' well-being, will contribute to a sustainable, futureproof and supportive work environment. Addressing well-being at work for healthcare professionals is crucial for: (1) ensuring the well-being of individuals, (2) preventing and acting on negative health outcomes in the workplaces, (3) bridging the gap between employees and employers, (4) gaining insight into the unique challenges and needs of healthcare professionals, (5) evaluating the effectiveness of well-being interventions, (6) and ensuring the quality and safety of patient care. This thesis offers foundational insights and guidance to help hospitals embark on a transformative journey toward fostering well-being in the healthcare workforce.

This thesis investigates the growing mismatch between healthcare demand and professional supply, focusing on well-being as a cornerstone for addressing these challenges. The overarching question driving this thesis is: "How can we transition from arbitrariness and fragmentation to evidence-based strategies to improve and monitor healthcare professionals' well-being and their work environment?" To address this, the studies included in this thesis aim to address the following research questions.

#### **Current state of well-being**

- How do registered nurses and nursing students in learning departments experience their career development opportunities (**Chapter 2**)?
- How do physicians and nurses in a Dutch university medical center perceive healthcare complexity and quality of care delivered in relation to their individual well-being (**Chapter 3**)?
- How do healthcare workers in the Dutch university medical centers describe their work experiences (**Chapter 4**)?

#### **Measuring well-being**

- What instruments have been developed and validated for measuring well-being among healthcare professionals in hospital settings (**Chapter 5 and 6**)?

#### **Improving healthcare professionals' well-being**

- What well-being initiatives are available for healthcare workers in Dutch university medical centers (**Chapter 7**)?
- What are the effects of organization-directed interventions on healthcare professionals' well-being, work environment, retention and quality of care? (**Chapter 8**)?

Finally, **Chapter 9** provides a summary of the findings, while **Chapter 10** includes a general discussion with recommendations for policy, research, and practice.

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# 2

## **Experienced career perspectives of nursing students and their supervisors in learning departments: a qualitative study**

Boskma A, Wolthuis F, Roelofs P, Wijlen van A, Schie van J, Man-van Rinkel de J, Finnema E (2023). BMC Nursing

## ABSTRACT

**Background:** Due to the nursing shortage, positive work environments are needed to retain (student) nurses. More and attractive internships for students need to be ensured. In order to provide more internship places learning departments were developed, which are characterized by a buddy system and supervisors who coaches at least two students during a shift. Gaining knowledge about career perspectives and job satisfaction is essential within the context of learning departments, as both will contribute to quality and safety of care and will support lifelong learning. The current study aimed to investigate how nurses and nursing students working and learning in learning departments experience preconditions for career opportunities. **Methods:** Using a generic qualitative approach, semi-structured interviews were conducted through videocalls between March and April 2021 in the Netherlands. Inductive qualitative analysis based on ‘The Data Analysis Spiral’ was used. **Results:** Career perspective is explored among six students and seven nurses. Five main themes were generated for both nurses and students; (1) personal goals; (2) skills and self-efficacy; (3) mentoring; (4) job satisfaction; and (5) career perspectives. Within the five main themes, subcategories were developed from 198 codes related to career opportunities. Results show career perspective is experienced differently. For students, the requirements to experience career perspective seem largely existing, as learning departments fits with personal goals, increases self-efficacy and provide coaching mentoring. Students felt learning departments contributed positively to becoming more skilled in working independently and collaborating with fellow students. This resulted in students feeling well prepared for the future. Nurses’ career perspectives varied from wanting more personal development to experiencing opportunities due to having great colleagues, a challenging patient category, satisfaction from sharing knowledge and a decreasing physical workload. Nurses who had affinity with coaching students experience more career perspective on learning departments. **Conclusion:** Interviews provided in-depth insights. Interviews gave in-depth insight into the elements of learning departments that contribute to career perspectives of (student)nurses. The results can be used by nursing supervisors, teachers and policymakers to optimize nurses’ work environment, to eliminate leave intentions and improve quality of patient care. The results should be taken into consideration when coaching students, developing manuals and implementing or optimizing learning departments. Future research is recommended to investigate which tools/interventions are effective for nurses and other healthcare professionals to support career guidance.

Keywords: Learning department, Career perspective, Nurses, Nursing students

## INTRODUCTION

A worldwide shortage of qualified nurses<sup>1,2</sup> endangers healthcare<sup>3</sup>. Prolonged nurse shortages and high turnover increase nurse workload and place undue pressure on existing staff<sup>4</sup>. In 2025 125.000 extra nurses will be needed within Dutch healthcare<sup>5</sup>. Causes of nurses leaving are increasing complexity of healthcare due to the ageing population, insufficient numbers of nursing students, poor work environments and the physical and mental stress of the job<sup>1</sup>. In a situation where more nurses leave, rather than enter the profession, a nursing shortage arises<sup>6</sup>.

Intention to leave is significantly associated with job satisfaction, work environment, quality, safety, staffing and tasks<sup>1</sup>. Another influencing aspect is the opportunity for career advancement (professional development and learning potential) for nurses<sup>1</sup>, since experiencing career opportunities was shown to be a significant predictor of job satisfaction in various studies<sup>7</sup>. First, a cross-sectional study among 1538 registered nurses (RN's) in New York showed that promotional opportunities and career orientation proved significant determining factors for job satisfaction<sup>8</sup>. Likewise, a cross-sectional study among 87 nurses from Washington showed the intent to leave and lack of job satisfaction appeared to be driven mainly by lack of opportunities for career growth and development, lack of extra remuneration for nurses who acquire additional degrees and certification, and lack of extra help during periods of high acuity<sup>3</sup>.

Above, the career opportunities are described as an element focusing and influencing nurses' retentions. Within the context of this study, the Netherlands, the Dutch government developed an action plan focusing on nursing students too<sup>9,10</sup>. Sufficient internships and inspiring education should increase the number of students to address the nursing shortage in the end<sup>9,10</sup>. Learning departments were developed based on factors for successful internship and best practice examples<sup>11</sup>. Calibris stated that learning departments are successful<sup>10</sup>. Pupils, supervisors and patients were enthusiastic and optimistic about the quality of these internships<sup>10</sup>. A University Medical Center (UMC) in the Netherlands designed their 'best practice example' learning department<sup>11</sup>. This learning department is mainly characterized by their manner of guidance, as one nursing supervisor who coaches at least two students during a shift<sup>11</sup>.

Learning departments have a variety of nurses (e.g. senior nurses, in Dutch *regieverpleegkundige*), nursing students (e.g. with various education levels and years of experience)<sup>11</sup> and practical trainers. Practical trainers have a nursing background and are a contact point for students, they organize, coordinate and watch over the learning path of students.

Currently, a research project investigating work environment and job satisfaction is ongoing. One topic in this project is the development and evaluation of a format description for this specific set-up to anticipate on future-proof nursing care in a healthy learning and working environment with the specific aim to provide transferability of a best practice example<sup>12</sup>.

Overall, improving career perspective is essential because high job satisfaction is associated with high-quality patient care<sup>1</sup>. It potentially improves patients' perceptions of care quality and ensures an adequate nursing workforce<sup>7</sup>. Moreover, lifelong learning is increasingly seen as a precondition for sustainable employability<sup>13,14</sup>. Focusing on students is just as important because 40% of recently graduated nurses leave the profession within two years and 27,5% leaves within one year<sup>15</sup>. Therefore it is essential to ensure sufficient attractive internships and focus on retention of recent graduates.

The current study aimed to investigate how RN's and nursing students working in learning departments experience the requirements for career opportunities. In particular, we focus on career opportunities, because this is associated with quality and safety of patient care and intention to leave<sup>1,7,16</sup>. The relationships and predictors of career opportunities contribute to a more comprehensive understanding, which in turn may support the development of effective strategies to address the nursing shortage and increase patient care quality<sup>17</sup>.

## METHODS

### Design

The study was generic qualitative in approach and descriptive in design to understand experiences from RN's and student nurses' point of view. Due to the explorative nature of the study aim, the choice for qualitative was appropriate<sup>18</sup>. A generic qualitative design is well-suited to explore participants' experiences and offers the opportunity for participants to describe career perspectives and express their views in their own words<sup>18</sup>. The consolidated criteria for reporting qualitative studies (COREQ) is used to facilitate reporting of the results<sup>19</sup>.

### Population

The study population consisted of nursing students and RN's in three learning departments of one UMC in the Netherlands. The specialisms of the wards were cardiothoracic surgery, lung disease and rehabilitation. Participants were eligible when they were: (a) a RN working as supervisor in a learning department; (b) a student with experience in a learning department; (c) spoke Dutch. To encounter rich information the sampling strategy was purposive<sup>20</sup>. Participants were selected with a maximum variation on (a) years of work experience; (b) age<sup>21-25</sup>; (c) gender<sup>21,23</sup> (d) hours work per week<sup>22,23</sup>; (e) wards with different healthcare specialism<sup>21</sup>; (f)

school institutes<sup>23</sup>; and (g) educational levels<sup>21-25</sup> because these factors are associated with career opportunities<sup>21-25</sup>. Maximum variation was applied to get access to perspectives from different nursing students and RN's<sup>20</sup>, and enhance the credibility of the data<sup>26</sup>.

Current study focused on valuable and high-quality data to achieve data saturation. The aim was to recruit a minimum of twelve participants, since reaching saturation with this sample size seemed feasible<sup>27</sup>. Students had to have completed their internship in a learning department in order to provide rich data. Additionally, students who interned more than two years ago and RN's who worked in learning departments more than two years ago were not approached to avoid recall bias. Ten intermediate vocational education students, eighteen bachelor students and three nursing teams (approximately 120 nurses) were approached. Reasons for declining participation are unknown.

### **Procedures**

Students' were contacted via the internship office. Information, informed consent and an invitation to participate were sent by email. For ethical considerations see section 'Ethics approval and consent to participate'. Two reminders were sent.

RN's were recruited via the project leader of the learning departments and practical trainers. Additionally, the researcher visited two wards to introduce herself, provide study information and distribute posters. Due to a COVID-19 breakout on one ward introductory appointments were cancelled.

Recruitment took place from December 2020 till March 2021. Interviews were scheduled at the time most convenient for participants. The researcher was accessible by email for questions and comments. A pilot interview was conducted to practice and test the interview guide, hereafter the sequence of questions was adjusted. This interview was included in the analysis, as no substantive adaptations were made. Piloting the interview guide resulted in getting more used to the data and becoming more confident<sup>20</sup>.

### **Data collection**

Semi-structured interviews were conducted between March and April 2021 by the first and second author. Due to COVID-19, interviews took place through videocalls (Microsoft Teams<sup>®</sup>), which are considered to be a proper alternative since differences in quality are sufficiently modest compared to face-to face interviews<sup>27-31</sup>. Of the videocalls, only audio tapes were used for analysis. Participants called in from home or work. An interview guide was used to ensure similar types of data from all informants was collected<sup>20</sup>. Themes covered the following areas: self-efficacy<sup>32-35</sup>, skills and competences<sup>21,36</sup>, match personal goals<sup>37,39</sup>,

job satisfaction<sup>1,39</sup>, work environment<sup>1,38</sup>, intention to leave the hospital and the profession<sup>35</sup>, mentoring<sup>34,36,39,38</sup>, and funding and release time<sup>33</sup>.

### **Data analysis**

Inductive qualitative analysis based on ‘The Data Analysis Spiral’<sup>18,40</sup> was used. Using Atlas.ti 8.4.25.0 (Scientific Software Development GmbH, Germany) transcripts were separated in meaningful segments related to the eight themes and labeled with codes. No transcript standards were used. Transcripts were coded independently by the first author (AB) and an external researcher, thereafter labels were discussed to reach consensus. Provisional outcomes were discussed within the research group, assumptions were formulated and the interview guide was amended. After open coding, fragments and codes were merged into sub categories and five main categories.

A back-and-forth movement between interviewing and analyzing was conducted to compare new insights and test insights in new rounds of data collection<sup>20,41</sup>. Expectations and interim hypothesis were checked during interviews and the attainment of saturation could be made unadulterated<sup>20,41</sup>. Additionally, theoretical sensitivity was reached by having knowledge about the subject and being aware of important concepts or issues that arose from the data<sup>20</sup>.

An audit trail and memos were used to write down and link thoughts and methodological choices<sup>18</sup>. After analyzes member checking was performed. Results were sent to students and RN’s by e-mail. Written feedback was asked from participants to confirm assumptions, two participants provided feedback.

Additionally, the first author is a nurse with intrinsic motivations in the topic of the current study due to her own experiences and career choices. Being recognizable to participants can offers rapport and familiarity, but can also lead to colored perspectives. The first author was aware of this and she deliberately aimed to interview with an open, curious view. Furthermore, during interviews the second author was present. She was a good sparring partner to discuss interpretations since she specializes in educational science.

## **RESULTS**

### **Participants**

Participants are shown in Table 1. Six nursing students and seven RN’s were interviewed. For unknown reasons, one student recruited dropped out before the interview and seven students did not respond when approached with the request for an interview. Students’ mean age was 22,2 years (20-24), and RN’s mean age was 39,7 years (23-62). All the participants are female,

which reflects the wider nursing population in the Netherlands which is primarily female. Within the sample, variation was achieved on education levels, ward specialism and years of work experiences. Interviews lasted between 47 and 61 minutes (mean 54 minutes) and were recorded and transcribed verbatim. Five main themes were generated for both nurses and students; (1) personal goals; (2) skills and self-efficacy; (3) mentoring; (4) job satisfaction; and (5) career perspectives. Within the five main themes, subcategories were developed from 198 codes related to career opportunities (Figs. 1 & 2). Saturation was achieved after 13 interviews, since new codes were no longer needed and formulated assumptions were confirmed. Although this study did not aim to investigate differences between students and nurses, they emerged from analysis. Therefore, main themes will be further explored first for students and secondly for nurses in the following sections.

Table 1 Baseline characteristics

Baseline characteristics	Number of participants (%)
Total number of participants	13 (100)
<i>Students</i>	6 (46)
<i>Registered nurses</i>	7 (54)
Gender students	
<i>Male</i>	0 (0)
<i>Female</i>	6 (100)
Gender nurses	
<i>Male</i>	1 (14)
<i>Female</i>	6 (86)
Age in years students	
<40	6 (100)
>40	0 (0)
<i>Mean</i>	22,2
Age in years nurses	
<40	(4) (57)
>40	(3) (43)
<i>Mean</i>	39,7
Educational level students	
<i>Vocational education</i>	1 (17)
<i>Bachelor</i>	3 (50)
<i>Vocational education + bachelor</i>	2 (33)
Educational level nurses	
<i>Inservice</i>	3 (43)
<i>Vocational education</i>	2 (29)
<i>Bachelor</i>	1 (14)
<i>Vocational education + bachelor</i>	1 (14)

Table 1 Baseline characteristics (Continued)

Baseline characteristics	Number of participants (%)
Ward specialism students	
Thorax	1 (17)
Lung	2 (33)
Revalidation	2 (33)
Thorax + revalidation	1 (17)
Ward specialism nurses	
Thorax	2 (29)
Lung	2 (29)
Revalidation	3 (43)
Years of work experiences nurses	
In total	
<30	3 (43)
>30	4 (57)
Mean	19,4
On the learning department	
<15	4 (57)
≥15	3 (43)
Mean	11,6
Hours work per week nurses	
24	1 (14)
28	3 (43)
32	3 (43)

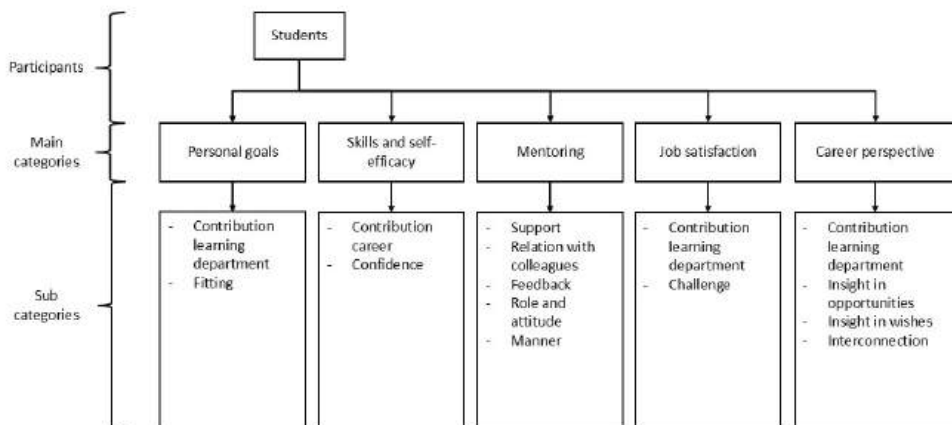


Figure 1 Coding scheme students

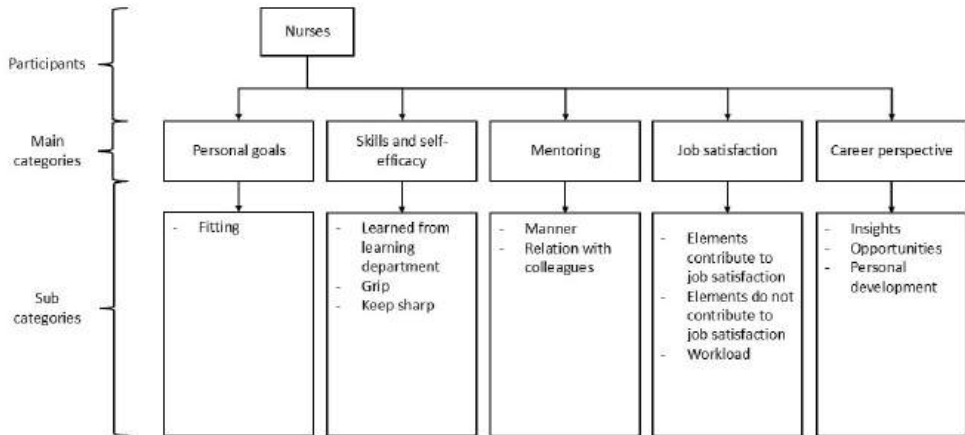


Figure 2 Coding scheme nurses

## Students

### *Personal goals*

All students mentioned a learning goal-oriented environment when describing learning departments, since personal goals were considered and ample space was given. At the start of each shift, students make their learning goals for the shift known to their supervisors and fellow students. Reflection on learning goals generally takes place at the end of the shift. All students indicated this structure gave them insight into their own progress.

*‘You’re very consciously working every day, you think about what will become my learning goal today, because you’ve to indicate what you want to learn that day. I think on a regular department you don’t do that so much, you think today I’ll just take care of patients and see what happens’ – Bachelor student*

### *Skills and self-efficacy*

Many students indicated learning departments contributed to becoming more skilled in working independently and collaborating with fellow students. Being more competent in arguing care, assertiveness and leadership were also skills that students perceived as contributing to the career. All students felt learning departments contributed to gaining confidence in their competence.

*‘I feel that I learned a lot, this gives you more self-confidence’ – Bachelor student*

*'I found the buddy system, where you work with a fellow student, a very positive part of the learning department. You learn how to work with your colleagues, similar to how you'll do it later, discussing together and getting responsibility before going to your supervisor. You try to solve the problem instead of asking for help right away' – Vocational education student*

### *Mentoring*

Several students experienced support of fellow students, supervisors and practical trainers. Coaching was experienced as involved, safe, trusted, open and honest. Coaching is characterized by guiding and supporting students. The students are in the lead, which gives them more self-confidence and a realistic perspective on the authentic work environment. Some students described their mentoring as encouraging and stimulating which was stressful on the one hand, but provides a high learning return on the other hand. Mentoring was directed at becoming proficient in professional aspects, by observing, discussing the work, practicing, getting explanations and having actions checked/tested. A fixed training structure on the learning departments exists, which is similar for every student and was therefore perceived as not very personal but also as offering convenience and handles. According to students, career guidance was minimal. A few students indicated nurse supervisors were a role model or source of information. However, students also reported barely any conversations about career opportunities occurred. For example, some students said they were asked about future steps by supervisors but this was not a major subject within their interactions. Various students spoke of learning from fellow students by sharing knowledge and experiences. Students talking about career opportunities occasionally happened. As such, mentoring was mainly targeted on becoming competent in professional aspects, rather than focused on career counseling. Most students experienced mentoring positively which could influence the willingness to stay in the profession and hospital.

*'I don't feel we worked on my career options in the way of talking about you can do that or what do you want after this' – Bachelor student*

### *Job satisfaction*

Most of the students experienced a welcoming environment. Collaboration in the learning department meant students challenge each other with questions and kept each other sharp. A reported downside of the high number of students on learning departments was that when patients arrived with interesting or complex care needs students had to share or 'fight for' the learning opportunities. Central to much of the students' interviews was job satisfaction, resulting in them wanting to do this work later. They were happy with the internship placement.

*Career perspective*

Students felt learning departments provided insight in future intentions. All students stated working on learning departments resulted in a realistic idea of working as a nurse. Additionally, seeing different wards and specialisms could be helpful. Career opportunities are broad, but not always clear for students. Taking new career steps is especially relevant for students as for many, applying for jobs would be a logical next step after their (upcoming) graduation.

**Nurses***Personal goals*

Nurses experienced learning departments as fitting their personal goals for the moment. Some nurses reported to expect to reach the developmental ceiling on learning departments after some time and were thinking about future-goals on other wards. Overall, learning departments are mostly set-up for educating student nurses. As such, students' developmental goals play a bigger role on learning departments.

*Skills and self-efficacy*

Nurses described learning to coach and learning to give and receive feedback as contributing elements to their further career. Various nurses reported mentoring students contributed to their competence in arguing care. A few nurses experienced having less grip on patient care because students provided this care. However, a majority of the nurses indicates that student questions ensures critical attitudes, a sharp eye and awareness of their actions.

*'They really just ask you why are you doing it like that and then you think, well, why? Then, you start thinking because, if you've been working for a long time you sometimes just act automatically, but they prevent you from that, because they keep you sharp' –  
Inservice educated nurse*

*Mentoring*

Nurses explained career counseling was mainly organized during annual appraisals with senior nurses and/or head nurses. Counseling was experienced differently per ward. Some nurses experienced commitment and initiative from both sides (nurses and senior nurses/head nurses), others experienced the initiative had to come from themselves. Likewise, trust, safety and involvement within the team was experienced differently. Several nurses reported being satisfied, others described missing appreciation and support. Future plans and purposes are a part of their evaluation. When more or other opportunities were desirable, there was room for nurses to indicate this themselves.

*'The head nurse plans the annual appraisal, so you don't have to think about that yourself. But if you want to have another conversation about your own development, that you've certain ideas about what I'd like to do that or that training, you can always discuss that with her. She's always open to that' – Inservice educated nurse*

### *Job satisfaction*

For many nurses the challenging nature of the work and their colleagues were reasons to stay. Patient category was central for experiencing challenge in work and career perspective on the ward. Sharing knowledge and experiences with students resulted in satisfaction. Likewise, for some nurses, affinity with mentoring students was influential on their job satisfaction and staying in learning departments. Most nurses said they liked students' fresh perspective. The ability to alternate between coaching students and direct patient care appears relevant. Otherwise, less pleasure in work was indicated due to less patient contact. For nurses with physical complaints career perspectives can increase. The further the students' internships progressed, the lower the physical workload seemed for nurses. Some nurses do not experience a reduction in workload, partly due to psychological burden of coordinating care and assessing school assignments.

*I'd like to keep alternating between shifts per week on the learning department and not, so that you also continue to develop yourself – Vocational educated nurse*

### *Career perspective*

Nurses' insight in opportunities varied. Insight is obtained by seeing other wards and specialisms, due to own efforts, conversations with colleagues and the hospital website. Career opportunities are felt in courses and training, which the organization facilitated on the one hand, but were expressed as nurses own responsibility on the other hand. Specific career opportunities related to learning departments are supervisor and practical trainer courses/positions. Other career opportunities are mostly associated with patient care, e.g. transplant nurse courses or nurse practitioner masters.

*'There're many opportunities, on the ward patient care is complex and dynamic, so you can grow a lot there. Every year in your annual appraisal you are asked if you want to do something else, or go to a different department, which is very positive. If you're assertive and you indicate that you need more challenge or are looking for something else, then you can get quite far with that' – Vocational educated nurse*

## DISCUSSION

In our study investigating how RN's and nursing students working in learning departments experience the requirements for career opportunities, the thirteen interviews provided in-depth insights within various themes: personal goals, skills and self-efficacy, mentoring, job satisfaction and career perspectives.

Within the theme 'personal goals' interviews showed students' developmental goals play a bigger role on learning departments. Students and nurses both experienced learning departments as fitting their personal goals, but some nurses reported to expect to reach the developmental ceiling after some time. For 'skills and self-efficacy' applies that students felt becoming more skilled in working independently and collaborating with fellow students. Nurses described learning to coach and learning to give and receive feedback as contributing elements to their further career. With regard to 'mentoring', the nurses guide the students. The students are in the lead, which gives them more self-confidence and a realistic perspective on the authentic work environment. For nurses their counseling was mainly organized during annual appraisals with senior nurses and/or head nurse. Central to much of the students' interviews was job satisfaction, resulting in them wanting to do this work later. For many nurses the challenging nature of the work and their colleagues were reasons to stay. Taking new career steps is especially relevant for students as for many, applying for jobs would be a logical next step after their (upcoming) graduation. For nurses specific career opportunities related to learning departments are supervisor and practical trainer courses/positions.

Comparing results with existing literature, many similarities are found. First, students mentioned feeling well prepared for the future. Feeling confident about the future was reported and explained by previous literature<sup>42-47</sup>. For example, a dissonance between expectations and reality was described by students as resulting in a desire to leave the profession<sup>42,44,45</sup>. Further studies showed preparedness as satisfying<sup>43,46</sup>. A possible explanation of these comparable outcomes might be the supervision which is part of all the context in which these studies took place(collaborative learning)<sup>43,46</sup>. Every nurse coaches two students, as the buddy-system within current study. Some studies described the preparedness phenomenon as positive and a reason to stay in the profession<sup>43,46</sup>, other studies described the lack of the preparedness as a reason to leave the profession<sup>42,44,45</sup>. As such, our findings align with the literature.

Secondly, a lack of clear career opportunities was another result. While students mentioned realistic future representations and broad career opportunities, it was not always clear for students what next steps needed to be taken. Missing clear information about career prospects were reported earlier<sup>42</sup>, which reinforces the current results.

Moreover, for nurses in learning departments, experiencing career opportunities seems not directly dependent on working on learning departments. Namely, the present study suggest nice colleagues were reasons for nurses to not leave the ward. The importance of supportive and empathetic relationships with colleagues appeared in various studies<sup>45,47,48</sup>, and therefore the need of relatedness aligns with current study.

Finally, findings of the current study also support the significant positive correlation between willingness to stay and clinical stress<sup>49</sup>, because the challenging demanding nature of the work and patient category were experienced by nurses as leading for experiencing challenge in work and career perspective on the ward. Additionally, the need for dynamics of nursing was previously stated as a factor affecting the career development of nurses<sup>50</sup>.

### **Strengths and limitations**

The included heterogeneous group provided rich data from different perspectives which had strengthened the study. The achieved maximum variation will contribute to transferability<sup>51</sup>. Because a heterogeneous group was included there was room for various perspectives, improving intersubjectivity<sup>51</sup>. Intersubjectivity agreement was also improved by the independently coded transcripts by the first author, the second author and an external author<sup>51</sup>. Consensus was reached after discussion within the research team. Lastly, constant comparison was used, assumptions were formulated and member checking was conducted to optimize confirmability<sup>51</sup>.

Some limitations need to be considered. Career perspective and opportunities are broad notions which have multiple interpretations. This can mean different participants referred to different notions when answering the interview questions. However, care was paid to this potential limitation by asking participants about their definition of career perspective during interviews. To strengthen interpretation triangulating in research design can be helpful. For example, combining observation research or action research can be conducted to give the results more rigor and quality. Second, career opportunities for students seem more logical after graduating, moreover the worldwide shortage of nursing could influence the experiences of opportunities. This can lead to students experiencing more career opportunities and focusing more on their next career steps. However, during interviews the researcher focused on contributions of learning departments to find relevant data to answer the research question. Further, most of the students were part of special hospital learning pathways aiming at interconnection, whereby a job was virtually guaranteed. Finally, including more men could have strengthened the study, although our sample represents the daily practice as nursing is a female-dominated occupation. Bachelor students were overrepresented, so possible education variation is minimal. However it is known that bachelor students are increasingly attending advanced education<sup>24</sup>. However, a number of the responded bachelor students completed vocational education too.

**Implications for clinical practice and future research.**

The results can be used by nursing supervisors, teachers and policy makers to optimize work/learning department environments, deploy strategies to eliminate leave intentions and improve quality of patient care. The results should be taken into consideration when coaching students, develop manuals and implement or optimize learning departments. For example, career perspectives should be discussed with students from the perspective of the school program and the internship location. Topics to discuss could be: what attracts students in work, what are the career options and what steps need to be taken to achieve these options. Moreover, it is advisable to make an inventory of the wishes and needs of nurses by creating learning departments. Personnel who are interested in the educational side of nursing can be deliberately deployed. Future research is recommended to investigate which tools/interventions are effective for nurses and other healthcare professionals to support career guidance.

**CONCLUSION**

The current study showed that career perspective was experienced differently by student nurses and registered nurses. Students mostly focus on questions such as ‘do I want to work in healthcare and this setting?’ and ‘am I competent enough?’, while nurses focus on the aspects of job satisfaction (colleagues, challenge, workload). This suggest that requirements to experience career perspective seems partially existing for students and RN’s in learning departments. Interviews gave in-depth insight into the elements of learning departments that contribute to career perspectives of (student)nurses. These insights can be used by nursing supervisors, teachers and policymakers to optimize nurses’ work environment, to eliminate leave intentions and improve quality of patient care. The results should be taken into consideration when coaching students, developing manuals and implementing or optimizing learning departments. Future research is recommended to investigate which tools/interventions are effective for nurses and other healthcare professionals to support career guidance.

**ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

Participation was voluntary and participants could decide to withdraw at any time. Informed consent was obtained digital (two copies) from all respondents.

The study was conducted according to the principles of the Declaration of Helsinki (latest version WMA General Assembly 2013) and in accordance with the Medical Research Involving Human Subject Act (WMO)<sup>52</sup>. Ethical approval had been granted to the authors prior to the study by the authorized Medical Ethics Research Committee of the University Medical

Center Groningen for the entire project (File number: 202000768). Additionally, the study was conducted according to the principles of General Data Protection Regulation (AVG)<sup>53</sup>. Participation was confidential and voluntary and participants could withdraw from the study at any time without explanation. Oral and written information were provided to the participants, and they provided their informed consent.

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# 3

## **How physicians and nurses experience complexity and quality of care in connection to their own well-being: a focus group study**

Boskma A, Bontjer S, Franx A, Dongelmans D, Hooft L, Laan van der M. Paper under review, International Journal of Qualitative Studies on Health and Well-being, submitted July 2025

## ABSTRACT

**Background:** Well-being of healthcare professionals is a fundamental prerequisite for delivering high-quality care. However, the current healthcare system is overloaded, and working conditions are becoming increasingly complex. Currently, there are unanswered questions regarding professionals' perspectives, focusing on the perceived dynamic between the complexity and quality of care and the experienced well-being of healthcare professionals. Regularly, perspectives of healthcare professionals are lacking, and there appears to be mismatches between the system and employees. This study aims to address how physicians and nurses in an academic medical center in the Netherlands perceive healthcare complexity and quality of care delivered in connection to their individual well-being. **Design:** In this qualitative research, a purposive sample of physicians and nurses from one academic medical center was utilized. Recruitment for focus group discussions took place from July 2023 to August 2023, via managers, project leaders, emails, and flyers. Approximately 65 nurses and 25 physicians were approached for participation. Informed consent was obtained before the start of data collection. Data were analyzed by two researchers using the thematic analysis methodology in the software program Atlas Ti. **Results:** 17 participants participated, including 10 nurses and 7 physicians. From the nursing data, 81 quotations were labeled, using 67 unique codes a total of 242 times. From the physician data, 80 quotations were labeled, using 78 unique codes a total of 237 times. Results are described on the themes of complexity, quality, stressors & facilitators, and well-being. **Conclusion:** Nurses and physicians navigate varying levels of care complexity and quality, impacting their work satisfaction. Balancing between care coordination, patient needs, and service quality is crucial for well-being. Challenges as staff turnover, teams (switch in colleagues), and resource limitations can lead to frustration. However, coping strategies, experience, teamwork, and effective routines helps in managing complexity and ensuring quality care, promoting professional fulfillment. Healthcare professionals stress the importance of addressing these challenges to enhance patient outcomes and maintain job satisfaction in the evolving healthcare landscape. Physicians rely on personal competencies as facilitators, while nurses tend to seek support from a broader range of facilitators, external to their individual capacities and more team oriented. **Implications for practice:** Experiences of nurses and physicians offer insights into factors influencing both care quality and well-being. These findings can serve as crucial foundations for developing targeted interventions and policies aimed at enhancing healthcare delivery and supporting professional satisfaction and personal well-being of healthcare providers. **Study registration:** Not registered.

Keywords: Complexity of care, Quality of care, Well-being of healthcare professionals, Healthcare quality, Workforce

## INTRODUCTION

Healthcare systems are experiencing increased pressure due to an aging population in Europe<sup>1,2</sup>, the rising prevalence of chronic diseases among patients<sup>1</sup>, and challenges associated with modern lifestyles<sup>3</sup>. Additionally, social expectations are evolving as patients demand greater participation, co-creation, and personalized, high-quality care, further intensifying demands on the system<sup>4</sup>. At the same time, there is decline in the healthcare workforce, attributable to fewer students pursuing the field<sup>5</sup> and high attrition rates driven by sick leave, turnover and professionals leaving the field<sup>6,7</sup>. This study focuses on concepts impacting the well-being of healthcare professionals, a topic which has received growing attention the last couple of decades. The study was conducted in a Dutch university medical center. Recent national data indicate high sickness absence rates among Dutch healthcare professionals, reaching 7.8% in 2024, with particularly concerning trends among physicians and nurses<sup>8</sup>. Relevant concepts and their connection to well-being at work are highlighted below, followed by the aim of this study.

### **Conceptual framework for well-being at work**

Well-being encompasses psychological, physical, and social dimensions<sup>9</sup>. Well-being at work can be defined as: ‘creating an environment to promote a state of satisfaction in which an employee can thrive and realize their full potential for themselves and their organization’<sup>10</sup>.

### **Job demands-resources model**

The Job Demands-Resources model (JD-R model) framework provides insight into the interaction between work and well-being, integrating two processes of stress and motivation (see Figure 1). It identifies key influencing factors, including job demands, job resources, personal resources, and leadership. Job demands are stressors like workload and bureaucracy, while job resources include support, learning opportunities, and teamwork. Leadership refers to inspiring leaders and a sense of connection. Personal resources include resilience and goal-directedness. A balanced interaction between these factors enhances job satisfaction, promotes retention and improves performance. Conversely, imbalance may lead to sleep problems, stress, burnout, and ultimately higher absenteeism and turnover<sup>11</sup>.

### **Care complexity as job demand**

Another potential stress related factor within the job demand domain is the increasing complexity of care, particularly in university medical centers. As care shifts towards primary care and decentralized services, complicated and highly specialized treatments are increasingly concentrated in university medical centers to safeguard quality and accessibility amid the growing demand<sup>12,13</sup>. Consequently, care delivery within these centers has become more complex, emerging from dynamic interactions among patients, informal caregivers, healthcare

management, and multidisciplinary professionals<sup>14</sup>. While this type of care in university medical centers attracts healthcare professionals who are motivated by challenging and specialized work<sup>15</sup>, excessive complexity combined with insufficient time and resources to properly engage with these challenges may negatively affect their well-being<sup>16</sup>. An example of how a complicated healthcare environment affects professionals is moral stress: the distress experienced when organizational constraints or system complexity prevent them from acting according to their professional values<sup>17,18</sup>. Moreover, healthcare professionals operating in critical care environments, such as the intensive care unit, are at a higher risk of experiencing ethical conflicts due to intense working environments, frequent exposure to death, and significant technological advancements<sup>17,19</sup>. This phenomenon was amplified during the Covid-19 pandemic<sup>20</sup>. How healthcare professionals themselves perceive and experience these dynamics in relation to their own well-being remains insufficiently understood.

### **Quality of care conceptualized**

Furthermore, well-being and vitality of healthcare professionals are fundamental prerequisites for safe and high-quality care<sup>21-23</sup>. Quality of care entails delivering healthcare safely, effectively, and patient-centered, while being timely, efficient, and equitable<sup>24</sup>. This means avoiding harm, using scientific knowledge, respecting patient preferences, reducing waiting times, limiting unnecessary waste, and providing consistent care regardless of personal characteristics<sup>25</sup>. In the context of the JD-R model, quality of care can be conceptualized as both a job resource and an organizational performance outcome<sup>11</sup>. As an outcome, it reflects professional flourishing and performance, arising from job satisfaction and well-being. When the well-being of healthcare professionals is balanced, the quality of care improves. An example demonstrating that the health of healthcare professionals is a crucial factor for quality of care is the observed association between emotional exhaustion among healthcare professionals and the incidence of pneumonia and pressure ulcers<sup>26</sup>. Conversely, quality of care may also function as a job resource. The ability to provide high-quality care may contribute to professionals' sense of satisfaction and thereby supports their well-being. Therefore, it is valuable to include healthcare professionals' perspectives on quality of care in relation to their own well-being.

In summary, the quantitative association between well-being outcomes (e.g., stress), manifestations of complexity (e.g., workload), and quality of care (e.g., infections and mortality) is well-known<sup>27-29</sup>. However, there are unanswered questions regarding healthcare professionals' perspectives, focusing on the perceived dynamic between the complexity and quality of care and their experienced well-being<sup>26</sup>. Moreover, in previous qualitative studies, these topics were often investigated separately<sup>30-32</sup>. Therefore, the aim of this study was to explore how the complexity of care perceived by healthcare professionals and the quality of care they provide impact their well-being. It focuses on physicians and nurses, as these two groups are particularly dealing with the demands of complex care and directly responsible for care delivery and

patient outcomes. This study seeks to identify input for developing tailored interventions to improve healthcare professionals well-being by understanding the perspectives of physicians and nurses and decrease the gap in literature and mismatch in daily practice.



Figure 1 Illustration of theoretical concepts based on the Job Demands-Resource model.

## METHOD

### Design

In this study a descriptive qualitative design was applied. We conducted focus group interviews to map and understand the experiences of both physicians and nurses. This type of research has an exploratory nature and is suitable for eliciting knowledge, opinions, experiences, and perceptions from respondents<sup>33</sup>. The COREQ checklist with criteria for reporting qualitative research was utilized for reporting the results<sup>34</sup>.

### Study participants

The participants comprised physicians and nurses from the university medical center Groningen in the Netherlands. The medical center is located in the North of the Netherlands and contains more than 12 000 employees and a bed capacity of 1300. Eligible study participants had an employment contract with the relevant medical center at the time of data collection, excluding

students. A purposive sampling strategy was chosen based on professional background. Variation in age, gender, medical specialty, and work experience among respondents is crucial for capturing diverse perspectives and experiences related to the research question. This diversity is related to the reliability and validity of our findings. The aim was to recruit a minimum of six nurses and six physicians.

### **Procedures**

The recruitment of participants took place from July 2023 to August 2023. To recruit nurse participants, managers from various nursing departments were approached and informational flyers were distributed at the departments. Nurses who were on day shift on the day of data collection were also personally invited via email. In total, approximately 65 nurses from different wards were approached to participate in the study. Physicians were individually approached through the researchers network or via email invitations. Moreover, medical departments were informed with a request to promote participation among medical colleagues. In total, approximately 25 physicians from different specialties were approached to participate in the study. The imprecision of approached participants arises from the fact that we contacted teams and do not know exactly how many colleagues work in each team. Informed consent was to be obtained from the participants before the start of data collection.

### **Sample description**

In total, 17 participants took part in the focus group interviews, comprising 10 nurses and 7 physicians (Table 1). Focus group one consisted of nurses and focus group 2 consisted of physicians. All participants provided consent for their involvement in the research, as well as for the processing and utilization of the collected data, by signing an informed consent form. Among the nurse participants, the majority were female (80%), while among the physician group, the majority were male (71%). Both groups exhibited heterogeneity in terms of average age. Most participating physicians had been working at the medical center for 1-10 years or 20-30 years. Among the nurses, a significant majority had been working at the medical center for 1-10 years. Both groups demonstrated variability in the representation of medical specialties. Among the physicians, five specialties were represented, with a focus on anaesthesiology and ophthalmology. Among the nurses, four specialties were represented, with an emphasis on major specialties such as surgery, internal medicine, and oncology. For member checking, three participants responded, agreed with the results, and confirmed interpretations.

Tabel 1 Sample characteristics

	Total	Physicians	Nurses
<b>Participants</b>	17 (100%)	7 (41%)	10 (59%)
<b>Gender participants</b>			
Female	10 (59%)	2 (29%)	8 (80%)
Male	7 (41%)	5 (71%)	2 (20%)
<b>Age in years</b>			
18-25	3 (18%)	0 (0%)	3 (30%)
26-35	4 (23%)	2 (29%)	1 (10%)
36-45	3 (18%)	1 (14%)	3 (30%)
46-55	5 (29%)	2 (29%)	3 (30%)
56-65	2 (12%)	2 (29%)	0 (0%)
<b>Work experience in years</b>			
1-10	10 (59%)	3 (43%)	7 (70%)
11-20	3 (18%)	1 (14%)	2 (20%)
20-30	4 (23%)	3 (43%)	1 (10%)
<b>Specialisms/ward</b>			
Intensive care	1 (6%)	1 (14%)	0 (0%)
Psychiatry	1 (6%)	1 (14%)	0 (0%)
Anesthesiology	2 (12%)	2 (29%)	0 (0%)
Ophthalmology	2 (12%)	2 (29%)	0 (0%)
Oncology	4 (23%)	1 (14%)	3 (30%)
Surgery	3 (18%)	0 (0%)	3 (30%)
Internal medicine	3 (18%)	0 (0%)	3 (30%)
Pediatrics	1 (6%)	0 (0%)	1 (10%)

### Data collection

Two focus group interviews were conducted in August 2023 by researchers AB and SB. Focus groups are considered appropriate for collecting diverse perspectives, and stimulated interactions, variety in opinions and uncovered ideas. Moreover, focus group sessions are more feasible and efficient since more professionals could be approached simultaneously. The first session targeted nurses, and the second session physicians. In addition, attention was paid to building rapport within the group to encourage a safe interview climate (which was discussed at the beginning of the session), the fact that physicians participated in a group of physicians and nurses in a group of nurses created homogeneous groups and helped to minimize power dynamics. These similar backgrounds likely facilitated open discussions. The discussions took place in the education center of the respective medical center and were supported by a brief presentation providing context and background information. The duration of the sessions ranged from 55 to 65 minutes. One topic list was used for both groups to ensure all relevant topics were covered in a structural manner during the interviews. Based on the research question, the following themes were explored: perceived complexity of care, perceived quality

of care delivery, and the impact of these themes on the well-being of physicians and nurses (physical well-being, emotional well-being, and social well-being). At the conclusion of the sessions, participants received a gift voucher for appreciation.

### **Research team and reflexivity**

Both researchers played an active role during the interviews, serving either as the facilitator or as the note-taker. The first author is a nurse scientist and the second author a biomedical scientist. Being identifiable to participants can foster a sense of rapport and familiarity, yet it may also introduce biases or subjective viewpoints. The authors acknowledged this potential influence and consciously conducted interviews with an open-mind and inquisitive approach.

### **Data Analysis**

The two focus group interviews were recorded and transcribed resulting in textual qualitative data. Subsequently, two researchers analysed the data using the thematic analysis methodology in the software program Atlas Ti (v5.20.0-2023-11-28, © 2002–2023 – Aplasia Scientific Software Development GmbH). Thematic analysis is a flexible and effective method for systematically generating qualitative research findings by identifying, analysing, and reporting patterns (themes) within the data<sup>35</sup>. This methodology involves three phases: familiarization, coding, and thematizing. During the familiarization phase, researchers repeatedly reviewed the transcriptions to become familiar with the content of the data. During reading, the researchers independently reflected on the data by making brief notes to identify relevant concepts for answering the research question. These notes were then compared and discussed. In the coding phase (open coding), the researchers independently analysed the data to identify apparent patterns and themes, assigning codes to specific text fragments. Through axial coding, codes were clustered and linked to broader code-groups to identify the main underlying themes. The individual codebooks were discussed and compared to reach consensus for the common codebook to ensure consistency. Both researchers then recoded the entire dataset, any discrepancies were resolved through discussion. In the final thematization phase, themes were identified based on the coded data and discussed during a joint analysis session.

Multiple strategies were used to validate the findings. First, the focus group discussions were conducted based on a predefined topic list, providing a uniform structure during conversations and enhancing the transferability of the study<sup>36,37</sup>. Furthermore, notes were taken, and discussions were recorded using a voice recorder, followed by transcription, thereby increasing the internal validity and credibility of the collected data<sup>36,37</sup>. Two researchers independently analyzed the collected data. The data were coded independently, and multiple interpretative discussions were held to achieve consensus on the findings. After the analysis, member checking was performed. The results were sent to nurses and physicians via e-mails. Written feedback was obtained from participants to confirm the assumptions and enhance the

intersubjectivity of the current research<sup>36,37</sup>. Moreover, some insights from the session with nurses were noted and checked during the session with physicians. The participants' statements are quoted in the results. All participants were Dutch-speaking employees. Statements were translated using Google Translate and checked by AB and SB.

### **Ethical approval and informed consent**

Participation was voluntary, and participants could decide to withdraw at any time. Informed consent was obtained digitally (two copies) from all respondents. Participants were informed that participation was voluntary, that they could withdraw at any time without accountability, that data would be stored, that participants would not be identifiable in the article, the advantages (contributing to research) and disadvantages (time investment) of participation, that a small compensation in the form of a voucher would be provided after participation, and that the information collected would be processed and published in an article<sup>38</sup>. Ethical approval was obtained via the Medical Ethics Review Board of the University Medical Center of Groningen (reference number: M25.356630).

## **RESULTS**

In total, 81 quotations were coded from the nursing data. A total of 67 unique codes were used, with a cumulative frequency of 242 occurrences. In total, 80 quotations have been coded from physicians' data. Seventy-eight unique codes were used, amounting to a total of 237 instances. Based on the code-group and short- and long codes, main themes were generated (complexity (coordination and patient complexity), quality of care, stressors & facilitators, well-being (personal and patient well-being)).

For nurses we created the following code-groups and short-codes for (1) complexity ((a) *patient complexity* (treatment & tasks, medical conditions); (b) *coordination of care* (patient plan, chain care, organize, collaboration, prioritize, switching, development)); (2) quality of care ((a) *definition of quality* (patient satisfaction, attention, basic care)); (3) stressors & facilitators ((a) *collaboration* (division of tasks, lack of clarity, communication, personnel changes); (b) *system* (administration, system, patient flow, availability of time and resources, roster scheduling); (c) *function/role* (contact person); (d) *individual* (autonomy, challenge, trust, work experience, routine); (e) *support* (education, protocols, support)); (4) well-being ((a) *work performance/ patient well-being* (health & recovery patient, duration of stay patients, job satisfaction, dissatisfaction, well-being, employability)).

For physicians, the code groups and short codes for (1) complexity and (2) quality of care were the same. For (4) well-being, only the short code "discomfort" was added. The formulation for

(3) stressors and facilitators was as follows: ((a) *collaboration* (division of tasks, lack of clarity, communication, trust); (b) *system* (administration, system, regulations, innovation, patient flow, availability of time and resources, timing, roster scheduling, expectations); (c) *function/role* (contact person, responsibility, professional development); (d) *individual* (coping, autonomy, challenge, trust, work experience, routine); (e) *support* (education, protocols, support)).

The final codebook for nurses can be found in appendix 1 and the final codebook for physicians can be found in appendix 2. Themes will be further described first for nurses and secondly for physicians in the following sections.

### **Complexity experienced in coordinating care**

Nurses experience complexity in the logistical organization of patient care and departmental management, in the implementation of policies and policy changes, and in multi-disciplinary collaboration with multiple specialties. These aspects were often mentioned in conjunction with the complexity of the patient's medical conditions. The administrative burden, the feeling of having to juggle multiple tasks, and the need to streamline and navigate care were perceived as complex. Nurses explained that order changes often arise because different specialties engage in the care of a single patient. Finding the policy and priorities in this context is perceived as complex. Furthermore, it is common for orders to be communicated later in the day due to patients being admitted on 'wrong' departments, requiring further coordination among physicians and supervisors. Finally, it is noted that changes in orders are not always communicated and are not clearly communicated.

*'Yes, for example, in our case, psychiatry often comes back into the consultation, or dietetics, physiotherapy, occupational therapy. Try structuring care around that. Or when people have more traumatic injuries, things from cardiology, neurology. All these specialties together, one says this, the other says that.'* – Nurse FG1

Physicians mainly experienced complexity in multi-disciplinary collaboration with multiple specialties, in the ongoing developments in the patient population and care trajectories, in the logistic organization of care around the patient and departmental management. These aspects are repeatedly noticed in conjunction with the complexity of medical conditions in patients. The extensive coordination between colleagues and patients plays a significant role in the perceived complexity. Additionally, physicians express that healthcare has changed significantly and increased in complexity over the past 15 years due to the availability of new innovative technologies, the need for information to go through more channels, the introduction of more regulations, and increased collaboration within the healthcare chain. There is a frequent experience of a lack of overview and control, which used to be more associated with a general practitioner.

*'There are many captains on the ship.'* – Medical specialist FG2

*'That clashes occasionally. Cases are becoming increasingly complex because, for example, there are different technologies. Then you have another multidisciplinary meeting about something. Progress is not quick; everything is much more complicated.'*  
– Medical specialist FG2

### **Complexity experienced in patient needs**

Nurses often experience complexity in the nature and quantity of the patient's medical conditions. For example they mentioned the care for an elderly patient population with frequently occurring co-morbidities. The frequent switching between patients and interacting with different colleagues adds an extra layer of complexity. In addition, nurses experience complexity in performing nursing procedures both in terms of the nature and quantity.

*'One complexity is, I think, when people have an IV, and then a catheter, a PICC line, a drain, a nasogastric tube, oxygen, and they are also confused. That does make it overly complex, indeed.'* - Coordinating Nurse FG1

Physicians frequently expressed that the nature and quantity of medical conditions are perceived as complex. An explanation given for this is the provision of tertiary care in the hospital, an increase in comorbidities and more vulnerable patients. One-third of the physicians also highlight the complexity arising from the variety of medical treatments. Someone points out that from the patient's perspective, complexity cannot be considered a static concept, as conditions can now be treated more effectively.

*'I experience complexity in care, at least in the sense that you no longer have a patient with just one thing wrong or where you perform just one treatment. A simple gallbladder in this hospital, you can be sure it has various comorbidities that you need to consider.'*  
- Resident physician FG2

### **Quality of care experienced in time, attention, and patient satisfaction**

According to nurses, the primary pillar of quality is the time and attention one can provide to a patient. Several participants frequently mentioned this. Additionally, patient satisfaction and the ability to perform necessary care actions are important aspects that nurses consider indicators of quality. Examples of care actions include assisting with patient mobilization, changing intravenous lines, providing oral care, and repositioning the patient in bed. Expressing appreciation from patients is cited as an example of patient satisfaction, along with considering the patient's preferences (shared decision-making) and, for instance, combining and scheduling

various clinic appointments on the same day. Patient satisfaction is often mentioned in conjunction with time and attention provided by nurses.

*'Yes, because if you can give that bit of attention to the patient or special care, you also bring a sense of calm to the department.'* – Nurse FG1

*'Yes, I really think there's a shortage there, having a good conversation with the patient.'*  
- Coordinating Nurse FG1

According to physicians, the primary pillar for quality of care is the level of patient satisfaction, as mentioned by multiple participants. They indicate that when a patient is satisfied, and they have been able to make a difference, it is perceived as good quality of care. Apart from providing excellent quality of care for the individual patient, several physicians wonder about the consequences of this for the quality of care at the societal level. Furthermore, the ability to perform necessary treatments and attention to the patient are also considered important pillars for quality by the physicians. For example, it was mentioned that there are issues with delivering certain drugs, causing the patient to switch medication every six months, which significantly affects the quality of care.

*'I do agree with your opinion. An overly complex patient, you think about that with more people and that way, you can provide better care with more experience. But then the question is, is that also the best care for that patient? And how is that for the larger group?'* - Resident physician FG2

### **Negative influencing factors**

Nurses indicated that several factors have a negative impact on the perceived complexity, quality, workload, and or personal well-being. The so-called stressors frequently mentioned in connection to perceived workload include limited availability of time and staffing capacity, turnover of colleagues and changes in teams, limited patient flow in the chain, and the shifting of care (responsibility). The fact that patient admissions are becoming shorter and procedures more intensive, with the nurse as the crucial point of contact for the patient and/or family, also contributes to this perceived workload. There is often uncertainty about patient plans/orders and treatment, causing nurses to perceive the delivery of appropriate care, multi-disciplinary collaboration, and organization of care as complex. The limited availability of time not only leads to higher perceived workload among nurses but also to reduced perceived quality of care concerning attention to the patient and the ability to provide the right basic care. This stressor is also often mentioned in combination with its impact on nurse employability and dissatisfaction. Other stressors mentioned by nurses include inefficient communication with

(multi-disciplinary) colleagues, rotating shifts and limited recovery time, administrative tasks, and the amount of work experience.

In summary, categorizing the stressors for nurses at the individual, team, and organizational levels it would appear as follows: individual work (uncertainty about patient plans/orders and treatment, rotating shifts and limited recovery time, administrative tasks, and work experience); team work (turnover of colleagues, changes in teams, and communication issues); organizational level (limited available time and staffing capacity, limited patient flow, and shifting of care responsibility)

*'No fresh staff has been hired. So, the tasks are there, and we take them on, which actually shouldn't be the case. As a result, I get less patient care and more administrative tasks, which I really don't like as a nurse.'* - Nurse Case Manager FG1

*'Yes, but that causes a drain on the nursing units; you notice it very strongly. There are always new people coming in that you must coach, and the people who have been there longer are constantly burdened with that, while they already have enough with their own work.'* - Coordinating Nurse FG1

*'Sometimes you have a few patients who are very ill, or they are delirious. Sometimes there are no sitting students available, yes, then you just keep going and hope, fingers crossed, that your patient doesn't fall, for example. That's not always fun.'* - Senior Nurse FG1

Physicians indicated that several factors could have a negative impact on the perceived complexity, quality, workload, or personal well-being. Stressors that were most prominently expressed during the group discussion included the responsibility felt by the physician, patient expectations and behavior, staff turnover, and laws and regulations. Physicians feel that they sometimes must make significant decisions in a relatively short time and juggle many tasks simultaneously. At the same time, the physicians describe the conspicuous change in this increasingly individualistic society. Turnover in colleagues and changes in teams create a sense of discomfort and uncertainty. These three stressors were most frequently mentioned together in the sessions in combination with perceived workload and reduced well-being. Likewise, laws and regulations were most frequently highlighted in the session as an inhibiting factor for complexity and quality. Other examples of mentioned stressors included limited staff capacity, restricted patient flow, and the amount of work experience someone has. Finally, it was stated that changes and innovations sometimes make healthcare more complex and sometimes help make healthcare less complex. Approximately one-third of the physicians described a negative impact of changes and organizational factors on quality.

In summary, categorizing the stressors for physicians at the individual, team, and organizational levels it would appear as follows: individual work (responsibility felt by the physician, patient expectations and behavior, less work experience); team work (turnover of colleagues, changes in teams); organizational level (laws and regulations, patient flow)

*'You're almost every day with a different team in the operating room. And in emergency care, you also have different colleagues around you every time. That is complex because you must look at the dynamics each time and find your place again. I sometimes find that uncomfortable.'* - Resident physician FG2

### **Positive influencing factors**

In addition to stressors, there are also factors that can have a positive impact on the perceived complexity, quality, workload, or personal well-being. However, these were less frequently mentioned in the session. The facilitator most often mentioned is teamwork and support in the team, which promotes both the quality of care and the well-being of nurses. The presence of protocols and instructions not only improve quality but also have a positive impact on the well-being of nurses because they provide them with guidance and confidence. Other facilitators include training, learning opportunities, and staff changes. Working routines ensure that nurses perceive care as less complex because they must think less consciously about the tasks to be performed.

In summary, categorizing the facilitators for nurses at the individual, team, and organizational levels it would appear as follows: individual work (no facilitator mentioned); team work (teamwork, support, perspectives and new ideas that incoming colleagues bring to the team); organizational level (presence of protocols and instructions, trainings and learning opportunities, working routines)

*'Yes, it (protocols) just gives you a sense of security. I like to look things up to see if I'm doing it right. I find it very pleasant that I can look it up and not have to ask a colleague all the time. Or that you do it together with a colleague and support each other in that.'*  
- Coordinating Nurse FG1

To a lesser extent, physicians described facilitating factors. Coping mechanisms and setting boundaries were the most prominent mentioned during the session. Coping and setting boundaries appear to be perceived the most crucial factors for promoting personal well-being for physicians, as these are often mentioned together. About half of the physicians' state that having more work experience is the key facilitator for coping with the experienced complexity. Furthermore, physicians mentioned that having challenges contributes to their well-being.

Finally, collaboration in teams and experiencing support through teamwork were described as facilitators contributing to the experience of well-being and quality.

In summary, categorizing the facilitators for physicians at the individual, team, and organizational levels it would appear as follows: individual work (coping mechanisms and setting boundaries, more work experience, having challenges); team work (collaboration in teams, experiencing support and teamwork); organizational level (no facilitator was mentioned).

*'Something that I found complex in the early stages of my career doesn't feel complex at all now because I have more experience.'* - Medical specialist FG2

### **Well-being experienced on personal level**

Nurses often experience the influence of the work context on their own health and well-being. A substantial proportion of nurses indicated experiencing feelings of dissatisfaction in the form of frustration and demotivation. This outcome is often described in combination with factors that nurses consider important for the quality of care, namely, having attention and time for the patient and being able to provide basic care. Additionally, health can be influenced through an imbalanced work-life ratio, insufficient recovery time, and heavy physical exertion. These aspects, often arising from stressors, can indeed lead to reduced personal employability and commitment. However, the work context can also positively influence the well-being of nurses by increasing job satisfaction through receiving appreciation and experiencing a sense of fulfillment, often in interaction with the patient.

*'Yes, if you have enough staff, then it's not a problem, then it's a fun challenge. We all really want to learn and are willing to do a lot and take care of others, but you need time for that, otherwise, it only frustrates.'* - Coordinating Nurse FG1

*'I do think that on a day when you can deliver good quality, you go home much happier, like yes, I got it all done, or I did it well.'* - Coordinating Nurse FG1

*'He and his mother were so grateful; they had no stress. You need time for that. Yes, then you go home happily because during your shift, you've already been able to process everything, so you don't sit in the car on the way home or at home thinking, oh, what did I actually do today.'* - Nurse FG1

A frequently arising question in the group discussion with physicians was the perception of influence on their own health and well-being. This influence was more often expressed in a negative sense (discontent, discomfort) than in a positive sense (job satisfaction). Examples of discontent include the constant need to be on, the desire for rest, frustration due to limited

availability of resources, and the continuous encounter with resistance draining one's energy. Discomfort mainly revolves around changing teams. It is mentioned that 'you don't know what to expect from each other' with unfamiliar colleagues, requiring a constant search for a specific workflow. Two physicians indicate experiencing an impact on the level of personal employability.

*'There are occasional things that don't go smoothly. That has everything to do with a shortage of personnel and who knows what else. It does influence how much time and energy you have to invest to get something done. People who hide behind rules. Then I think, darn it, come on. It throws me off balance, frustrated.'* - Medical specialist FG2

### **Well-being influence on patient level**

A third of the participants in the session with nurses indicated that the available care affects the physical health and recovery of the patient. This was often stated in conjunction with the amount of time and attention nurses can dedicate to the patient and the experience of dissatisfaction within the team. Furthermore, it is equally often mentioned that the available care can also negatively influence the duration and intensity of a patient's hospital stay, as well in combination with a sense of dissatisfaction among nurses.

*'Well, no, I don't think you can always provide the care that the patient deserves. You're just too busy. For example, you're supposed to mobilize the patient — sometimes you manage to do it, but sometimes you just don't get around to it. Or for example, turning the patient regularly. And that has consequences: people end up lying in bed longer, they aspirate, develop complications. That really frustrates me.'* - Senior Nurse FG1

More than half of the respondents in the focus group session with physicians indicated that the available care influences the physical health and recovery of the patient. This is mentioned, for example, in the context of attention and timing of care. Physicians feel that attention to the patient and the right timing of care can contribute to good patient care and their own well-being. Additionally, physicians state that the increase in complexity in organizing care and compliance with laws and regulations can have a negative impact on the health and recovery of the patient. For instance, it is sometimes challenging to arrange a specific drug or a bed for a patient. Influences on the health and recovery of the patient are often mentioned in conjunction with personal discontent.

*'Sometimes, you know that choice A is actually the best for the patient, but it takes too much time and energy to achieve, which I don't have, so I opt for B. That does affect my job satisfaction.'* - Medical Resident FG2

## DISCUSSION

### Summary of findings

We explored the perceptions of physicians and nurses in an academic centre on healthcare complexity, quality of care and patient experience in relation to their personal well-being. Although the main study objective was to explore instead of compare both groups, nurses and physicians perceive the complexity and delivered quality of care in diverse ways. Care complexity, influenced by care coordination and patient-related factors, are often considered as a challenge affecting their individual well-being. Nurses tend to focus more on personal and departmental perspectives, while physicians provide broader societal explanations. At the same time, patient health and the ability to provide high-quality care seem to be crucial pillars for the well-being of healthcare professionals and vice versa. Key quality factors for both physicians and nurses include time and attention for the patient, the ability to perform necessary basic care, and patient satisfaction. Concluding, a balance in the coherence between complexity and quality of care appears to be essential for the degree of well-being at work but can be influenced by different factors. Perceived barriers are excessive turnover of colleagues, changing teams and the lack of time and resources for organizing care logistically. Additionally, healthcare professionals emphasize the positive influence of their own coping mechanisms, having work experience, receiving support within the team, and having routine and workflow when dealing with care complexity and maintaining a high level of care quality. The findings of this study should be taken into consideration within the current healthcare landscape, especially in policy changes, implementation of interventions, and restructuring of care. This could involve strengthening facilitators (e.g., time and attention for patients (space for patient-centered care) and colleagues) and eliminating barriers (e.g., frequent patient plan changes or team changes).

### Findings in context

#### *Different sources of professional support and well-being*

Experiencing support is important for healthcare professionals<sup>39,40</sup>. Our study found that physicians and nurses perceive complexity of care differently. Physicians primarily derive support from their personal competencies, such as clinical experience, coping strategies, and the ability to set boundaries. In contrast, nurses draw especially support from external resources, including clinical guidelines, protocols, and team-based support systems. The JD-R model also posits that both personal and work-related resources can contribute to professional well-being<sup>41</sup>. Organizational embedding might play a significant role in shaping the differences between physicians and nurses. Physicians frequently rotate between different clinical settings (e.g., operating theatre, intensive care units, outpatient clinics), which limits their ability to build sustained support within fixed teams. Nurses, on the other hand, often work for extended periods within stable teams, making team cohesion and shared routines more

central to their support structures. Moreover, these differences may be attributed to professional roles, socialization processes, and the organizational context in which each group operates. Namely, medical training emphasizes independent thinking, clinical decision-making, and personal accountability from an early stage in physicians' professional development. Nursing education and professionalization, by contrast, focus on functioning within care teams, with an emphasis on collaboration, structure, and adherence to protocols.

Hence, tailored strategies for these specific issues would be valuable in serving both stakeholders, especially when approached from a multidisciplinary perspective. For example, focusing on improving interdisciplinary communication, strengthening team cohesion, and efficiency in prioritizing. These factors align with the work environment of an academic center that delivers overly complex tertiary care<sup>13</sup>.

#### *Quality of care: patient satisfaction as a catalyst for professional well-being*

This study revealed the dynamic between quality of care and professional well-being. The capacity to deliver high-quality care appeared to serve as a catalyst for professional fulfilment. At the same time, participants highlighted that care performance was correlated with their level of personal well-being. This finding is in line with the study of De Vries et al. (2023), which also found that quality of care is known to improve when healthcare professionals experience a sense of well-being<sup>42</sup>. In light of ongoing efforts to monitor and enhance the well-being of healthcare professionals, it warrants critical consideration, by researchers, policymakers, and organizational leaders, whether the ability to provide good care should be integrated into employee surveys, incorporated into core outcome sets for measuring well-being, and reflected in theoretical frameworks such as the JD-R model<sup>43</sup>.

#### *Balancing guidance and constraint in protocols.*

Current study reveals nurses and physicians hold differing views on guidelines and protocols in healthcare practice. Nurses often see them as valuable tools that help deliver quality care, whereas physicians frequently experience guidelines as obstacles, mainly due to increasing regulatory pressure and concerns about risk management. This contrast has also been observed in previous studies<sup>44</sup>.

Currently, discussions in healthcare largely focus on balancing necessary administrative burden and regulations with practical feasibility<sup>13</sup>. A lack of coherence and coordination among rules can cause healthcare professionals to lose oversight, leading to uncertainty about the extent to which they can honour individual patient preferences<sup>45</sup>. On one hand, healthcare professionals tend to organize care through more protocols and checklists<sup>46</sup>, viewing them as valuable for delivering quality care<sup>47</sup>. On the other hand, a multitude of standards and varying opinions on what constitutes quality of care and how to measure it create tensions in practice<sup>47</sup>.

The differences in perspective can logically be explained by the nature of the work, professional identity, degree of autonomy, and the way healthcare professionals are positioned within the broader healthcare system. However, these tensions call for better alignment and clearer guidelines that both ensure quality and allow sufficient space for professional autonomy and individual patient needs.

### **Limitations of the study**

This study has some inherent limitations. Firstly, the results of this study are based on qualitative findings from two focus group discussions conducted within a single university medical center, and therefore might not be valid for physicians and nurses from other hospitals. Secondly, the existing cultural differences between physicians and nurses may have influenced the study results. Although they share the common goal of providing high-quality care to patients, there are clear differences in professional identity, collaboration culture, values, and skills between nurses and physicians<sup>48</sup>. These differences are shaped by their unique roles, responsibilities, generations, specialization directions, education, and training<sup>49,50</sup>. Notably, during the conversations, physicians found it more challenging to articulate or share the impact of complexity and quality of care on their individually experienced well-being. This could be related to the high-performance and hierarchical culture in the medical profession, where little space seems to exist for emotions and vulnerability<sup>51</sup>. Physicians are often expected to adhere more strongly to medical ideals of objectivity, neutrality, and omnipotence. The emphasis lies on taking the lead and assuming responsibility for decisions. Nurses operate from a care perspective in which emotion and intuition play a greater role<sup>52,53</sup>. Additionally, these professionals are more trained to work in teams and collectively solve problems<sup>52,53</sup>. Furthermore, the sampling of participants has a reasonable level of diversity despite working in the same hospital. Gender wise the nurse sample was slightly skewed, however understandable. Including more men could have strengthened the study, although our sample represents the daily practice as nursing is a female-dominated occupation. Finally, it should be noted that the focus group methodology itself has limitations, such as potential bias, influence, the Hawthorne effect<sup>54,55</sup> and the role of the facilitator during the sessions.

### **Implications for practice**

The insights gained from this study are crucial for establishing a healthy work environment that is conducive to the well-being of both physicians and nurses, ultimately contributing to the enhancement of current healthcare practices. This could involve strengthening facilitators (e.g., time and attention for patients (space for patient-centered care) and colleagues/collaborations) and eliminating barriers (e.g., frequent patient plan changes or team changes). When developing policies or conducting further research, it is essential to consider the described facilitating factors and barriers, as well as the key pillars for the well-being of healthcare professionals. The turnover of colleagues and changes in teams were identified by

both groups of healthcare professionals as significant stressors. Additionally, collaboration and support were highlighted by both groups as crucial facilitators. Further research should focus on testing appropriate interventions aimed at preventing team turnover or supporting teams in adapting to a changing work environment for effective collaboration. In this regard, it is important to develop interventions in co-creation with the end users or target population to ensure that cultural differences, work practices, and varying responsibilities are adequately taken into account. Finally, it was notable that physicians and nurses perceive regulations and protocols differently. To gain a more comprehensive understanding, future research could specifically investigate this aspect. Insight into the delineation of when and which regulations are supportive and when and which regulations are hindering in light of regulatory pressure and risk management. Through a quantitative study, the extent of perception differences can be explored. Additionally, it would be interesting to compare various contexts to determine whether these perspectives are context dependent.

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## ADDITIONAL FILES

### Content Table

Additional file	Content
Additional file 1	Codebook nurses
Additional file 2	Codebook physicians

**Additional file 1**

Tabel A Codebook nurses

<b>Theme</b>	<b>Code-group</b>	<b>Short code</b>	<b>Long code</b>
Complexity	Patient complexity	Treatment & tasks	Nurses experience complexity in the quantity/ nature of nursing procedures
	Coordination of care	Patient plan	Nurses experience complexity in patient plan (changes)
	Coordination of care	Chain care	Nurses experience complexity in the flow within the chain
	Coordination of care	Organize	Nurses experience complexity in the logistical organization of care around/for the patient and department management
	Patient complexity	Medical conditions	Nurses experience complexity in the nature and quantity of medical conditions in patients
	Coordination of care	Collaboration	Nurses experience complexity in collaborating with multiple specialties in a multidisciplinary setting
	Coordination of care	Prioritize	Nurses experience complexity in establishing priorities
	Coordination of care	Switching	Nurses experience complexity in frequent switching with patients/colleagues
	Coordination of care	Development	Nurses experience complexity due to developments in patient populations and care pathways
	Quality of care	Definition of quality	Patient satisfaction
Definition of quality		Attention	For nurses, time and attention for the patient are essential pillars for quality
Definition of quality		basic care	For nurses, performing the necessary care interventions is a fundamental pillar for quality
Stressors & facilitators	Collaboration	Division of tasks	Performing non-function-related tasks has a +/- impact on the perceived complexity/quality/ workload/well-being
	System	Administration	Conducting administrative tasks has a +/- impact on the perceived complexity/quality/workload/ well-being
	System	System	Brief and action-intensive patient admissions have a +/- impact on the perceived complexity/quality/ workload/well-being



Table A Codebook nurses (*Continued*)

<b>Theme</b>	<b>Code-group</b>	<b>Short code</b>	<b>Long code</b>
	System	Patient flow	Limited patient flow in the chain and the transfer of care (responsibility) have a +/- impact on the perceived complexity/quality/workload/well-being
	System	Availability of time and resources	Limited availability of time, resources, and staffing has a +/- impact on the perceived complexity/quality/workload/well-being
	Collaboration	Lack of clarity	(Lack of) clarity regarding patient plans and treatment has a +/- impact on the perceived complexity/quality/workload/well-being
	Collaboration	Communication	(In)efficient communication with colleagues and parents/family has a +/- impact on the perceived complexity/quality/workload/well-being
	System	Roster scheduling	Rotating shifts and limited recovery time have a +/- impact on the perceived complexity/quality/workload/well-being
	Collaboration	Personnel changes	Turnover of colleagues and changes in teams (e.g., onboarding) have a +/- impact on the perceived complexity/quality/workload/well-being
	Function/role	Contact person	Serving as the central point of contact for patients and/or family has a +/- impact on the perceived complexity/quality/workload/well-being
	Individual	Autonomy	(Lack of) control/grip and independence has a +/- impact on the perceived complexity/quality/workload/well-being
	Individual	Challenge	(Lack of) challenge has a +/- impact on the perceived complexity/quality/workload/well-being
	Individual	Trust	Nurses experience a +/- influence on levels of self-confidence or trust in the team/colleagues
	Individual	Work experience	The amount of nursing experience has a +/- influence on the perceived complexity/quality/work pressure/well-being
	Individual	Routine	Working routinely has a +/- influence on the perceived complexity/quality/work pressure/well-being
	Support	Education	Education and learning opportunities have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Support	Protocols	Protocols and instructions have a +/- impact on the perceived complexity/quality/work pressure/well-being

Table A Codebook nurses (*Continued*)

Theme	Code-group	Short code	Long code
	Support	Support	Team collaboration has a +/- impact on the perceived complexity/quality/work pressure/ well-being
Well-being	Work performance/ Patient well-being	Health & recovery patient	The available care influences the physical health and recovery of the patient
	Work performance/ Patient well-being	Duration of stay of patients	The available care influences the duration and intensity of the hospital stay
	Work performance/ Patient well-being	Job satisfaction	Nurses experience a sense of satisfaction (e.g., fulfillment, appreciation, joy, relaxation)
	Work performance/ Patient well-being	Dissatisfaction	Nurses experience a sense of dissatisfaction (e.g., frustration, discontent)
	Work performance/ Patient well-being	Well-being	Nurses experience an impact on their health (e.g., energy levels/fatigue, physical strain, stress, recovery, work-life balance)
	Work performance/ Patient well-being	Employability	Nurses experience an impact on their personal employability (e.g., commitment, development, and professional choices)

**Additional file 2**

Tabel B Codebook physicians

<b>Theme</b>	<b>Code-group</b>	<b>Short code</b>	<b>Long code</b>
Complexity	Patient complexity	Treatment & tasks	Physicians experience complexity in the quantity/ nature of care procedures
	Coordination of care	Patient plan	Physicians experience complexity in patient care plan (changes)
	Coordination of care	Chain care	Physicians experience complexity in patient flow (and collaboration) in the healthcare chain
	Coordination of care	Organize	Physicians experience complexity in (logistically) organizing care around/for the patient and departmental management
	Patient complexity	Medical conditions	Physicians experience complexity in the nature and quantity of medical conditions in patients
	Coordination of care	Collaboration	Physicians experience complexity in multidisciplinary collaboration with multiple specialties
	Coordination of care	Prioritize	Physicians experience complexity in setting priorities
	Coordination of care	Switching	Physicians experience complexity in frequent switching with patients/colleagues
	Coordination of care	Development	Physicians experience complexity in developments in patient population and care trajectories
	Quality of care	Definition of quality	Patient satisfaction
Definition of quality		Attention	For physicians, time and attention to the patient are essential pillars for quality.
Definition of quality		Basic care	For physicians, performing the necessary care procedures/treatments is a pillar for quality
Stressors & facilitators	Collaboration	Division of tasks	Performing non-function-related tasks has a +/- impact on the perceived complexity/quality/work pressure/well-being
	System	Administration	Conducting administrative tasks has a +/- impact on the perceived complexity/quality/workload/ well-being
	System	System	Brief and action-intensive patient admissions have a +/- impact on the perceived complexity/quality/ workload/well-being

Table B Codebook physicians (Continued)

Theme	Code-group	Short code	Long code
	System	Regulations	Laws and regulations, as well as quality requirements, have a +/- impact on the perceived complexity/quality/work pressure/well-being
	System	Innovation	Change and innovation in the field have a +/- impact on the perceived complexity/quality/work pressure/well-being
	System	Patient flow	Limited patient flow in the chain and the transfer of care (responsibility) have a +/- impact on the perceived complexity/quality/workload/well-being
	System	Availability of time and resources	Limited availability of time, resources, and staffing has a +/- impact on the perceived complexity/quality/workload/well-being
	System	Timing	Acute situations and timing have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Collaboration	Lack of clarity	(Lack of) clarity regarding patient policy and treatment has a +/- impact on the perceived complexity/quality/workload/well-being
	Collaboration	Communication	(In)efficient communication with colleagues and parents/family has a +/- impact on the perceived complexity/quality/workload/well-being
	System	Roster scheduling	Rotating shifts and limited recovery time have a +/- impact on the perceived complexity/quality/workload/well-being
	System	Expectations	(Changes in) patient or system requirements and expectations have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Team	Personnel changes	Turnover of colleagues and changes in teams (e.g., onboarding) have a +/- impact on the perceived complexity/quality/workload/well-being
	Function/role	Contact person	Serving as the central point of contact for patients and/or family has a +/- impact on the perceived complexity/quality/workload/well-being
	Function/role	Responsibility	Sense of responsibility and/or expertise has a +/- impact on the perceived complexity/quality/work pressure/well-being
	Function/role	Professional development	Ambition and competition have a +/- impact on the perceived complexity/quality/work pressure/well-being



Table B Codebook physicians (Continued)

Theme	Code-group	Short code	Long code
	Individual	Coping	A coping mechanism and/or setting boundaries have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Individual	Autonomy	(Lack of) control/grip and independence has a +/- impact on the perceived complexity/quality/workload/well-being
	Individual	Challenge	(Lack of) challenge has a +/- impact on the perceived complexity/quality/workload/well-being
	Individual/ Collaboration	Trust	Physicians experience a +/- influence on levels of self-confidence or trust in the team/colleagues
	Individual	Work experience	The amount of work experience has a +/- influence on the perceived complexity/quality/work pressure/well-being
	Individual	Routine	Working routinely has a +/- influence on the perceived complexity/quality/work pressure/well-being
	Support	Education	Education and learning opportunities have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Support	Protocols	Protocols and instructions have a +/- impact on the perceived complexity/quality/work pressure/well-being
	Support	Support	Team collaboration has a +/- impact on the perceived complexity/quality/work pressure/well-being
Well-being	Work performance/ Patient well-being	Health & Recovery patient	The available care influences the physical health and recovery of the patient
	Work performance/ Patient well-being	Duration of stay of patients	The available care influences the duration and intensity of the hospital stay
	Work performance/ Patient well-being	Job satisfaction	Physicians experience a sense of satisfaction (e.g., fulfillment, appreciation, joy, relaxation)
	Work performance/ Patient well-being	Dissatisfaction	Physicians experience a sense of dissatisfaction (e.g., frustration, discontent)
	Work performance/ Patient well-being	discomfort	Physicians experience a sense of discomfort and unfamiliarity (e.g., uncertainty, discomfort)
	Work performance/ Patient well-being	Well-being	Physicians experience an impact on their health (e.g., energy levels/fatigue, physical strain, stress, recovery, work-life balance)

Table B Codebook physicians (Continued)

<b>Theme</b>	<b>Code-group</b>	<b>Short code</b>	<b>Long code</b>
	Work performance/ Patient well-being	Employability	Physicians experience an impact on their personal employability (e.g., commitment, development, and professional choices)



# 4

**Uncovering gaps in workforce well-being: a national look at survey practice in Dutch university medical centres – an exploratory quantitative study**

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## ABSTRACT

**Introduction:** Maintaining a healthy workforce is crucial for safe, high-quality care. To enhance well-being and engagement in Dutch university medical centers (UMCs), an overview of staff well-being and job perceptions is needed first. Surveys are widely used to improve working conditions, but varying questionnaires hinder a comprehensive view. This study aimed to evaluate the content of employee surveys currently used in UMCs in the Netherlands from a well-being perspective and to analyse the survey results at a national level. **Methods:** All seven UMCs were approached to participate in the study and share employee survey data. The primary outcome of interest is work experience; a secondary analysis was conducted. Items were categorized following the Job Demands-Resources model. Descriptive statistics were presented as percentages, means, and medians with IQRs. **Results:** Two UMCs participated and 31 862 completed surveys were included. Variation in survey items (eg, 15-18 subcategories, 21-33 question items), response options (eg, 1-5, 1-10), frequency (1-3 times per year), and timing were found. Scores on the following outcomes are presented: work overload, coworker support, job control, organisational justice, participation in decision-making, performance feedback, possibilities for learning and development, recognition, task variety, team atmosphere, team effectiveness, trust in leadership, other job resources, connecting/inspiring leadership, self-efficacy, goal-directiveness, boredom, burnout, job satisfaction, work engagement, other employee well-being, commitment organisation/team, and work ability. Results should be interpreted with caution, and solely found for Hospital A, for certain job control items, median scores of 2 or 3 were observed, whereas the majority of other question items revealed a median score of 4. **Conclusion:** There is a significant lack of cohesion across employee surveys. As it stands, employee surveys in Dutch UMCs are not effective tools for monitoring the work experience or well-being of the healthcare workforce. While these surveys may support management decisions, this support is not reflected in interventions related to work and the work environment.

Key words: Healthcare professionals' well-being, Work experience, Employee surveys

## INTRODUCTION

### Pressure on healthcare systems

Healthcare systems worldwide are under pressure due to an aging population<sup>1,2</sup>, rising chronic diseases<sup>1</sup>, and modern lifestyle challenges<sup>3</sup>. Moreover, social expectations are rising since today's patients demand participation and co-creation and expect high quality personalised care, further straining the system<sup>4</sup>. At the same time, the number of healthcare professionals (HCPs) is declining. This is due to fewer students pursuing the field<sup>5</sup> and high attrition rates caused by sick leave, turnover and professionals leaving the field<sup>6,7</sup>. The healthcare sector shows a relatively high rate of sick leave compared with other sectors, 7.8% in 2024<sup>8</sup>. One in five employees report that their sick leave was wholly or partly work-related, with high work pressure being the most cited cause<sup>8</sup>. Retention and turnover are complex processes and vary per HCP type.<sup>9</sup> Generally, there is no single reason for staying or leaving<sup>9</sup>. Examples of recognised influencing factors include organisational factors (eg, working hours and adequate staffing), work-related factors (eg, responsibility and shared values), relationship factors (eg, team climate and supportiveness), and recognition factors (eg, salary)<sup>9,10</sup>. Considering the challenges surrounding healthcare demand, reduced influx of HCP and high professional turnover, it is crucial to prioritise HCPs' well-being and their work environment<sup>10</sup>.

### Well-being at work

The Job Demands-resources model (JD-R model) offers a dynamic framework that highlights well-being at work processes<sup>11</sup>. The JD-R model components are 'job demands' (eg, stress, workload, conflicts), 'job resources' (eg, support, development opportunities, team atmosphere), 'leadership' (eg, inspiring, connecting), and 'personal resources' (eg, motivation, resilience)<sup>11</sup>. A balance in these components influences well-being, both positively (eg, job satisfaction) and negatively (eg, burnout), and is reflected in outcomes such as commitment, intention to stay, and performance<sup>11</sup>.

### The role of interventions

Research and clinical practice often emphasise individually targeted interventions (eg, coaching, education, behavioral change) to improve HCPs' well-being<sup>12</sup>. However, organisational change may offer more proactive and preventive solutions<sup>13</sup>. Systemic changes can address underlying root causes, benefit larger groups, act as a preventive measure, and prove more sustainable<sup>12,14-16</sup>. For such changes to be effective, they should be accessible, effective, confidential, and tailored to the specific needs of HCPs.<sup>17</sup> Hospitals often use employee well-being surveys to identify and act on such needs. In Europe, organisations are legally obligated to assess and address psychological safety risks under occupational health and safety laws.

### **Surveying HCPs**

Systematically surveying employees is widespread practice in most medical centres in The Netherlands. In Europe, it is mandatory according to occupational health and safety laws to address psychological safety risks and act on them. Over the last few decades, such surveys have evolved<sup>18,19</sup>. Initially, these surveys focused on job satisfaction, where emphasis later shifted to benchmarking (comparing organisations performance). However, benchmarking diverts the attention from the organisation's own context<sup>18,19</sup>, and simply having satisfied employees is no longer sufficient<sup>18</sup>. Instead, it is more important to engage employees, acknowledging their contributions to the hospital's success, that they feel respected and appreciated, and that they have development and career opportunities<sup>18</sup>. Nowadays, employee surveys are intended to create insight, and these should be used to improve the working environment, well-being, and engagement of employees<sup>18,19</sup>. Although many employee surveys exists<sup>20</sup>, previous research has primarily focused on their content and implementation<sup>21</sup>. Contexts and perceptions of HCP changes over time<sup>22</sup>. Rather than developing new tools, it is advised to analyse and optimize existing ones<sup>20,22-24</sup>. Besides, approaches are focused on work environment experiences, and with this, the well-being of HCPs is less centered. The questionnaires are intended as a tool to initiate dialogue with teams and employees about these aspects<sup>19</sup>. This is particularly relevant in academic medical centres, where professionals face complex tasks due to the complex patient population. Their role in treating the most complex cases and training future HCPs increases the organisational demands and highlights the importance of maintaining a healthy, sustainable workforce. This makes structured evaluation of well-being through employee surveys especially valuable. Though not mandatory, employee surveys are cyclically administered in Dutch hospitals, ranging from once every 2 years to four times per year.

### **Evaluating Dutch surveys and analysing results at a national level**

To support the sustainable employability of HCPs in Dutch academic hospitals, an overview of their well-being and job perceptions is necessary. Although there are uniform legal obligations, different questionnaires are used at various moments across institutions, limiting straight-forward syntheses and obstructing a bigger picture. This study, therefore, focuses on two comprehensive and reasonably comparable hospitals, selecting data from direct care providers (eg, nurses, doctors), supportive roles (eg, assistants, administrative staff), and education/research/management staff. The aim of this study is to evaluate the content of employee surveys currently used in university medical centers (UMCs) in the Netherlands from a well-being perspective and to analyse the survey results at a national level.

## METHODS

### Study design

This study is multi-centered and used existing longitudinal data from employee surveys. The Strengthening the Reporting of Observational Studies in Epidemiology Statement<sup>25</sup> was used to facilitate reporting the results. The study consisted of two parts: in the preparation phase 1, the content of employee surveys was assessed, and in the execution phase 2, the survey results were explored of two UMCs. In this study, it was decided to avoid benchmarking, comparisons between hospitals, and not to formulate definitive conclusions due to the heterogeneity of the data. Additionally, we wanted to avoid competition and instead emphasise learning from other centres and focusing on elements related to the work context.

### Setting and respondents

All seven UMCs were approached to participate in the study and share employee survey items and employee survey results. The population consisted of all hospital employees up to 65 years of age from all seven Dutch UMCs.

### Data collection

This study aimed to re-use existing data. The advantage of this approach was the ability to evaluate existing (non-validated) surveys without placing an additional burden on employees to obtain a national-level overview. It was assumed in advance that well-being would be assessed, at least in part, in the available surveys. This would allow for a comparable analysis using data that was already collected.

Two UMCs were willing and in the opportunity to participate. Data from 2020 to 2023 were requested through human resource advisors to identify patterns over time and to account for possible fluctuations due to COVID-19 and seasonal variation. Hospital A used three different surveys over the 3 years and hospital B one survey (Additional file 1). Hospital A conducted the survey once per year and hospital B three times per year (January, May and September). In total, four different surveys and seven measurement moments were included in the analysis (data during COVID-19 pandemic and data after COVID-19 pandemic). This signifies for hospital A: September 2020, December 2021, and July 2022. For hospital B, the measurement moments best aligning to hospital A were chosen. This signifies: September 2020, January 2022, May 2022, and May 2023. For a schematic representation of included measurement moments see Figure 1. For phase 1, survey items were qualitatively constructed by AB and MO following the JD-R model<sup>11</sup> to explore if questions were included addressing: job demands (eg, workload, work-life balance), job resources (eg, sustainable employability, recognition/appreciation, job content, development opportunities, psychological safety, support, team), personal resources (e.g. resilience, goal directiveness) leadership (eg, autonomy, leadership), employee well-being

(eg, job satisfaction), and outcomes (eg, health, engagement, eNPS (employee Net Promotor Score), intention to leave (the profession), patient safety, improvement). Furthermore, basic characteristics are linked to the survey by administrative data. For phase two, the following employee characteristics were included: the specific hospital where employees work, age, gender, years of service, and positions/roles.

Anonymised data at the respondent-level was collected through the hospitals' Human Resource advisors of the hospitals. To prevent employees from being identifiable, it was important that age was categorised into ranges of ten years (15-25, 25-35, 35-45, 45-55, 55-65), years of service into ranges of 5 years, and positions/roles were identified according to the following classification: (1) resident physicians (residents and specialist trainees); (2) nursing and care (nurses, caregivers, ward assistants); (3) medical specialists; (4) clinical (co)treating (laboratory technicians, physiotherapists, dietitians, psychologists); (5) clinical support (surgical assistants, anesthesia technicians, medical assistants); (6) facility (eg, technology roles, area management staff, logistics staff); (7) staff, administration, and secretariat (eg, staff advisors, secretaries, teachers, research and education staff); (8) scientific research and education (professors, researchers, PhD candidates, MD-PhD); (9) analytical (analysts); (10) management (managers, team leaders, head nurses); (11) trainees/students and (12) others.

Data were managed using Excel and SPSS statistics V.28 (IBM). Survey questions were initially translated through Google Translate and Deepl.com, and all original questions with their translations were assessed by AB and MO to check whether the translated content sufficiently reflected the Dutch questions and to determine their final English wording.

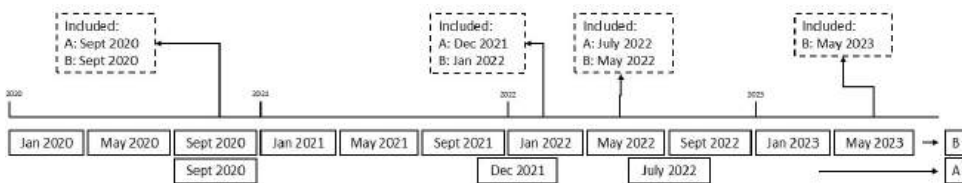


Figure 1 Schematic representation of included measurement moments

### Data handling

The first step of structuring the data consisted of determining overlapping themes within the four instruments to gain insight into which categories are appropriate for illustrating the big picture. Two researchers independently categorised survey questions into categories and subcategories reported in the 'energy compass' (derived from the JD-R<sup>11</sup>) and resolved discrepancies through discussion. Scores of question items were presented per category in a

table. Only data from completed surveys at any given measurement moment were included in the analyses. In this study, complete surveys are referred to since individual respondents were probably included multiple times because they completed several surveys at measurement moments. Only subcategories and survey questions measured, at least on two different measurement moments, were included to ensure more robustness and to enable exploration of data over time. With this data from the following categories, were excluded from the analysis: communication, emotional demand, physical demand, mental demand, harassment, sleep problems, use of skills, work-home conflict.

### **Data analysis**

Within hospitals and across measurement moments, data from the same individuals may be present. Repeated measures were included in the analysis. However, due to the anonymous nature of the data, it was not possible to link individual responses over time. Therefore, the data were treated as repeated cross-sectional observations. Descriptive analyses were used to explore trends and patterns across years. Descriptive statistics were presented as means for continue variables and medians with IQRs for categorical variables. Additionally, the full distribution of responses per item was provided in percentages to offer insight into response spread and agreement levels.

A stratification by age and positions/roles was conducted for work overload and opportunities for learning and development, as these categories were included by both hospitals in all seven measurement moments. Individual participant characteristics were summarised using descriptive statistics. Areas for improvement are determined relatively and inductively, based on lower median scores and broader variability (IQR) in comparison to other items. No formal hypothesis testing was conducted since such testing was not feasible due to the heterogeneity of the data across hospitals and time points.

## **RESULTS**

### **Participant characteristics**

Hospital A contains more than 12 000 employees and 1300 beds. Hospital B contains more than 11 000 employees and 1000 beds. Reasons for the other five UMCs to decline were staff shortage on the Information Technology department, doubts about obtaining proper results (eg, due to heterogeneity in methods, content, time frame and purpose of the surveys) and insufficient trust in the added value of transparency between centres.

A total of 31 862 completed surveys were included, encompassing 11 862 for hospital A and 19 687 for hospital B. This corresponds to 3603–5056 fully completed surveys at each

measurement moment. Table 1 illustrates the distribution of complete surveys per hospital per measurement moment. Hospital A has a consistently lower response rate (around 30%-35%) compared with Hospital B (around 44%). Descriptive characteristics are shown for gender, age, years of service, and positions/roles. In Hospital A, most complete surveys are filled in by males, while in Hospital B, there is a large amount of missing gender data. Missing values for participant characteristics have not been imputed, due to huge numbers and this data were not provided by respondents. The data were linked through an HR system and, therefore, is independent of any potential selection bias. Age is similar across both hospitals, with the largest groups being aged 30-59. Most respondents have 0-5 years of service experience, particularly in Hospital B. The most common positions/roles are staff, administration, secretarial, and nursing and care across both hospitals.

Table 1 Basic characteristics of the sample

	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B	Hospital B
	Sept 2020	Dec 2021	July 2022	Sept 2020	Jan 2022	May 2022	May 2023	
Total	11.757	11.958	11.875	11.316	11.183	11.121	11.059	
Complete cases	4157	4102	3603	5056	4842	4894	4895	
Response percentage	35.36%	34.30%	30.34%	44.68%	43.30%	44.01%	44.26%	
	Gender							
Male	2993 (72.00%)	3013 (73.45%)	2630 (72.99%)	149 (2.95%)	138 (2.85%)	169 (3.45%)	178 (3.64%)	
Female	1164 (28.00%)	1089 (26.55%)	973 (27.01%)	442 (8.74%)	464 (9.58%)	505 (10.32%)	486 (9.93%)	
Missing values for gender	0 (0.00%)	0 (0.00%)	0 (0.00%)	4465 (88.31%)	4240 (87.57%)	4220 (86.23%)	4231 (86.44%)	
	Age in years							
< 30	569 (13.69%)	556 (13.55%)	473 (13.13%)	1039 (20.55%)	928 (19.17%)	907 (18.53%)	919 (18.77%)	
30-39	941 (22.64%)	919 (22.40%)	781 (21.68%)	1157 (22.88%)	1116 (23.05%)	1146 (23.42%)	1166 (23.82%)	
40-49	970 (23.33%)	1067 (26.01%)	932 (25.87%)	985 (19.48%)	976 (20.16%)	1030 (21.05%)	1023 (20.90%)	
50-59	1173 (28.22%)	1100 (26.82%)	1004 (27.87%)	1107 (21.89%)	1074 (22.18%)	1066 (21.78%)	1085 (22.17%)	
60 +	504 (12.12%)	460 (11.21%)	413 (11.46%)	481 (9.51%)	446 (9.21%)	435 (8.89%)	412 (8.42%)	
Missing values for age	0 (0.00%)	0 (0.00%)	0 (0.00%)	287 (5.68%)	302 (6.24%)	310 (6.33%)	290 (5.92%)	
	Years of service							
0-5	1369 (32.93%)	1406 (34.28%)	1211 (33.61%)	2305 (45.59%)	2200 (45.44%)	2275 (46.49%)	2241 (45.78%)	



Table 1 Basic characteristics of the sample (*Continued*)

	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B	Hospital B
6-10	Complete cases	599 (14.07%)	564 (13.75%)	521 (14.46%)	712 (14.08%)	682 (14.09%)	654 (13.36%)	693 (14.16%)
11-15	Complete cases	616 (14.47%)	644 (15.70%)	539 (14.96%)	664 (13.13%)	595 (12.29%)	648 (13.24%)	605 (12.36%)
16-20	Complete cases	593 (13.93%)	537 (13.09%)	467 (12.96%)	465 (9.20%)	477 (9.85%)	484 (9.89%)	493 (10.07%)
21-25	Complete cases	311 (7.31%)	342 (8.34%)	355 (9.85%)	455 (9.00%)	486 (10.04%)	436 (8.91%)	459 (9.38%)
26-30	Complete cases	244 (5.73%)	197 (4.80%)	155 (4.30%)	189 (3.74%)	161 (3.33%)	164 (3.35%)	166 (3.39%)
31-35	Complete cases	256 (6.01%)	245 (5.97%)	196 (5.44%)	130 (2.57%)	128 (2.64%)	111 (2.27%)	117 (2.39%)
36-40	Complete cases	100 (2.35%)	100 (2.44%)	98 (2.72%)	60 (1.19%)	62 (1.28%)	65 (1.33%)	62 (1.27%)
41-45	Complete cases	64 (1.50%)	62 (1.51%)	55 (1.53%)	25 (0.49%)	21 (0.43%)	24 (0.49%)	20 (0.41%)
46>	Complete cases	5 (0.12%)	5 (0.12%)	6 (0.17%)	1 (0.02%)	0 (0.00%)	3 (0.06%)	3 (0.06%)
	Missing values for years of service	0 (0.00%)	0 (0.00%)	0 (0.00%)	50 (0.99%)	30 (0.62%)	30 (0.61%)	36 (0.74%)
Function								
Nursing & Care	Complete cases	892 (20.95%)	871 (21.23%)	764 (21.20%)	821 (16.24%)	726 (14.99%)	803 (16.41%)	804 (16.42%)
Clinical support	Complete cases	365 (8.57%)	336 (8.19%)	307 (8.52%)	418 (8.27%)	385 (7.95%)	416 (8.50%)	412 (8.42%)
Clinical (co) treating	Complete cases	278 (6.53%)	250 (6.09%)	215 (5.97%)	309 (6.11%)	331 (6.84%)	335 (6.85%)	348 (7.11%)
Analytics	Complete cases	223 (5.24%)	277 (6.75%)	229 (6.36%)	424 (8.39%)	375 (7.74%)	393 (8.03%)	418 (8.54%)

Table 1 Basic characteristics of the sample (Continued)

	Hospital A	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B	Hospital B
Scientific research & education	289 (6.79%)	307 (7.48%)	243 (6.74%)	373 (7.38%)	387 (7.99%)	358 (7.32%)	402 (8.21%)		
Management	225 (5.29%)	218 (5.31%)	219 (6.08%)	205 (4.05%)	197 (4.07%)	199 (4.07%)	173 (9.66%)		
Staff, administration, secretariat	1130 (26.54%)	1104 (26.91%)	991 (27.50%)	1111 (21.97%)	1116 (23.05%)	1126 (23.01%)	1136 (23.21%)		
Facility	376 (8.83%)	370 (9.02%)	300 (8.33%)	656 (12.97%)	598 (12.35%)	595 (12.16%)	570 (11.64%)		
Resident physicians	73 (1.71%)	75 (1.83%)	62 (1.72%)	180 (3.56%)	156 (3.22%)	133 (2.72%)	149 (3.04%)		
Medical specialists	261 (6.13%)	254 (6.19%)	242 (6.72%)	323 (6.39%)	340 (7.02%)	318 (6.50%)	266 (5.43%)		
Students & others	45 (1.06%)	40 (9.98%)	31 (0.86%)	236 (4.67%)	231 (4.77%)	218 (4.45%)	217 (4.43%)		
Missing values for function	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)		

### Phase 1: content and constructs of employee surveys

Variation in survey items, response options, frequency, and timing were found. Following the JD-R categories, in total we included 18 subcategories for Hospital A and 15 for Hospital B (see Table 2). The constructs most frequently addressed in employee surveys predominantly pertain to the subcategory of job resources. Some themes are assessed in both hospitals, which may indicate a key set of shared priorities or standards across the two hospitals. Categories such as personal resources are underrepresented, which may suggest a potential blind spot in capturing broader aspects of employee well-being. Categories were often explored through multiple questions and analysed by means of statistical methods, despite the fact that answer options were ordinally distributed within categories. Hospital A used multiple questions in one survey for the following subcategories: coworker support (four items), job control (five items), recognition (three items), team atmosphere (two items), and team effectiveness (two items). Hospital B used multiple questions for subcategories: performance feedback (two items), possibilities for learning and development (three items), team effectiveness (five items), trust in leadership (two items), other job resources (three items), and commitment organisation (two items). For an overview of overlapping and differences in subcategories between hospitals, see Table 2, but this did not mean that within each sub-category the questions agreed between hospitals.

Table 2 Overview of overlapping and differences in sub-categories between hospitals

	Hospital A	Hospital B
Job demands		
Workload	X	X
Job resources		
Co-worker support	X	
Job control	X	
Organizational justice		X
Participation in decision making		X
Performance feedback	X	X
Possibilities for learning and development	X	X
Recognition	X	
Task variety	X	
Team atmosphere	X	
Team effectiveness	X	X
Trust in leadership		X
Other job resources	X	X

Table 2 Overview of overlapping and differences in sub-categories between hospitals (*Continued*)

	Hospital A	Hospital B
Engaged leadership		
Connecting	X	
Inspiring	X	X
Personal resources		
Self-efficacy		X
Goal directedness		X
Employee well-being		
Boredom	X	
Burnout	X	
Job satisfaction	X	X
Work engagement	X	
Other employee well-being		X
Outcomes		
Commitment organisation	X	X
Commitment team		X
Work ability	X	

Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model

Sub-category	Question-item	Scale	Hospital A		Hospital B		Hospital A		Hospital B	
			Sept 2020 (4157)	Dec 2021 (4102)	July 2022 (3603)	Sept 2020 (5056)	Jan 2022 (4842)	May 2022 (4894)	May 2023 (4895)	
<b>Job demands</b>										
Work overload	There is an acceptable workload	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)
	I have too much work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)
	I think my workload is on an average base.	(1) way too much, (2) too much, (3) too less, (4) way too less, (5) appropriate; (6) no opinion	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)
<b>Job resources</b>										
Co-worker support	As colleagues we help each other (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	As colleagues we help each other (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	I receive help with my work when needed	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)

Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital A	Hospital B	Hospital A	Hospital B				
Job control	If I am having a hard time at work I can turn to someone I don't know	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-5)										
	I can decide how and when to do my work within reasonable limits	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)									
	I can decide how i do my work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)	4 (IQR: 3-4)									
I can decide when i do my work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	2 (IQR: 2-4)	2 (IQR: 2-4)										
I can set my own work pace	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 2-4)	3 (IQR: 2-4)										
Organizational justice	I can take breaks whenever I need it	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 2-4)										
Participation in decision making	I can address mistakes and unsafe situations without fear of negative consequences	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)				
Participation in decision making	I feel free to question decisions or actions of persons with greater authority	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)				



Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital A	Hospital B	Hospital A	Hospital B
Performance feedback	I receive sufficient feedback on how I do my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	Within our team it is common to give feedback	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	The feedback of my direct supervisor helps me to improve my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	I am given the opportunity to develop	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	I get opportunity to learn and develop knowledge and skills	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) I don't know	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)
Possibilities for learning and development	I can develop in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	I can continuously improve in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	Within our team we learn from mistakes	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)

Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital B	Hospital A	Hospital A	Hospital B	Hospital B
Recognition	With my work I am of added value	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)						
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)						
		(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)	4 (IQR: 3-4)						
Task variety	My work is sufficiently varied	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)						
Team atmosphere	The relationship with my colleagues is good (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)						
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-4)	4 (IQR: 4-4)						
Team effectiveness	As colleagues we work together in a smart way (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)						
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	3 (IQR: 3-4)	3 (IQR: 3-4)						



Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital B	Hospital A	Hospital A	Hospital B	Hospital B											
	Within our team we adhere to the agreements we make with each other	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)											
											Within our team we openly share knowledge and information	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)					
																	I know the goals of our team	4 (IQR: 4-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Trust in leadership	We cooperate well in our team	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)											
											My direct supervisor provides good leadership	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)						
																My manager provides good leadership	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)		
																				My work environment is pleasant	4 (IQR: 3-4)
Other	My work environment is pleasant	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)											

Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital B	Hospital A	Hospital A	Hospital B	Hospital B
	We cooperate well in our division	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	We cooperate well in our hospital	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)
	We cooperate well with organizations outside of our hospital	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
<b>Engaged leadership</b>										
Connecting	The relationship with my direct supervisor is good	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
Inspiring	My direct supervisor know how to motivate me	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	My direct supervisor shows exemplary behavior	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
<b>Personal resources</b>										
Self-efficacy	I can effectively solve problems in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)



Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
Goal directedness	I know what I need to do to achieve our team's goals	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
<b>Employee well-being</b>									
Boredom	My work is challenging in a good way	2020+2022: totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable 2021: (1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 4-4)	3 (IQR: 3-4)	4 (IQR: 4-4)				
Burnout	Indicate where you are on the range of fatigue to vitality	1-10 ((1) fatigue; (10) vital)		MEAN 6,50	MEAN 6,4				
Job satisfaction	I enjoy my work	Hospital A 2020+2022: totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable Hospital B: (1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable; (6) no opinion	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
Work engagement	Indicate where you are on the balance of disengaged to engaged	1-10 ((1) disengagement; (10) engagement)		MEAN 7,14	MEAN 6,94				

Table 3 median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
Other	I feel safe at work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
Outcomes									
Commitment organization	Working for this hospital makes me proud	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable		4 (IQR: 3-4)					
	I like to do something extra for my work	((1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	The success of my hospital means much to me	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	I rate working in this hospital as	1-10 ((1) bad; (2) good)			MEAN 7.31	MEAN 7.29	MEAN 7.32	MEAN 7.31	MEAN 7.31
Commitment team	I put my team's results above my personal ambitions	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Work ability	I can do my job without negative effects on my health	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable		4 (IQR: 3-4)					



**Phase 2: survey results at a national level**

Overall, the surveys use 5-point Likert-type scales, where response options typically range from (1) totally disagree to (5) totally agree. A sixth option (6) is included and varies by item as either no opinion or not applicable. A median score of 4 indicates agreement or a positive experience. A median of 3 reflects neutral or mixed perceptions. A median of 2 indicates disagreement or a negative experience. In Additional file 2, an overview of survey results are presented per survey item and measurement. A more comprehensive overview of results is addressed in Additional file 3, including a distribution for all answer options per surveyed question. The insights are concisely described in the results for clarity. A complete description of results per JD-R category is reported in Additional file 4.

*Work environment*

Across both hospitals, workload was generally perceived as acceptable to appropriate. However, in Hospital B, responses were more varied (median 5, IQR 2–5), suggesting a broader range of experiences with workload appropriateness. In Hospital A, coworker support was consistently rated positively, particularly within teams (median 4, IQR 4–5). In contrast, support across the care chain (median 4, IQR 3–4) and during difficult situations (median 4, IQR 3–5) was perceived less uniformly, pointing to more mixed experiences in these areas. Job control showed the most variability in perceptions, especially in Hospital A. Respondents reported limited autonomy over work timing (median 2, IQR 2–4), tempo (median 3, IQR 2–4), and breaks (median 3, IQR 2–4), reflecting low to neutral agreement and suggesting that this is an area requiring attention. The inconsistency was also evident from discrepancies between the median and most frequently selected answers. Perceptions of organisational justice (median 4, IQR 4–4) and participation in decision-making (median 4, IQR 3–4) in Hospital B were stable and indicated general agreement. Similarly, both hospitals showed consistent access to performance feedback (median 4, IQR 3–4) and learning and development opportunities (median 4, IQR 3–4). A notable exception was found in Hospital A, where the item ‘chance to learn and develop my knowledge and skills’ received more varied responses (median 3, IQR 2–4), although the most common answer remained positive (4, or ‘agree’, in 31.89% of cases). Recognition (median 4, IQRs 3–4 and 4–5), task variety (median 4, IQR 4–5), and team atmosphere (median 4, IQRs 4–4 and 4–5) were rated positively and consistently over time in Hospital A, showing strong agreement. However, slightly greater variation in ratings for relationships across the care chain compared with within teams suggests differences in perceived collaboration. Team effectiveness received overall positive ratings in both hospitals (median 4, IQRs 3–4 and 4–4), though in Hospital A, perceived effectiveness across the care chain was lower (median 3, IQR 3–4), indicating weaker collaboration in that area. Trust in leadership was generally present in Hospital B (median 4, IQR 3–4), though perceptions of individual managers varied more widely (median 4, IQR 3–6), possibly influenced by frequent selection of ‘no opinion’. Finally, both hospitals consistently reported a positive

work environment and effective collaboration across departments (median 4, IQR 3–4), underscoring a generally favorable organisational climate.

#### *Individual HCP*

Connecting leadership in Hospital A was consistently perceived as present over time, reflected in stable agreement levels (median 4, IQR 4–5). Inspiring leadership showed more neutral perceptions in both hospitals (median 4, IQR 3–4), with some variation in motivation by supervisors; the item ‘my supervisor motivates me’ received slightly lower ratings (median 3, IQR 3–4), indicating moderate to neutral agreement. Self-efficacy and goal-directedness in Hospital B were found to be generally present, with a median score of 4 (IQR 3–4). Perceptions of boredom in Hospital A fluctuated across years. Ratings were more favorable in 2020 and 2022 (median 4, IQR 4–4), while a dip was observed in 2021 (median 3, IQR 3–4), indicating a temporary increase in experienced boredom. Nevertheless, the most frequently chosen response remained ‘often’ (score 4), selected by 39.54% of respondents, pointing to a generally recurring experience of boredom. Burnout levels in Hospital A remained stable over time, with nearly identical mean scores (6.5 in 2021; 6.4 in 2022), suggesting no notable change in burnout symptoms. Job satisfaction was consistently rated positively across both hospitals (median 4, IQR 4–5), indicating general agreement with satisfaction statements. Notably, answer option 6 (‘no opinion or not applicable’) was rarely selected, further supporting the strength of the agreement. Work engagement in Hospital A showed a slight downward trend over time, with mean scores decreasing from 7.14 in 2021 to 6.94 in 2022, suggesting a minor decline in energy and involvement. Perceived safety at work in Hospital B was found to be generally affirmed, with a median score of 4 (IQR 4–5). Organisational commitment was rated with a median score of 4 (IQR 3–4), with stable mean values in Hospital B (range 7.29–7.31), reflecting generally agreement regarding organisational commitment. Commitment to the team in Hospital B was also found to be generally present, with a median score of 4 (IQR 3–4), showing stable agreement across timepoints. Finally, workability in Hospital A was found to be consistently moderate to positive throughout the measurement period, with a median score of 4 (IQR 3–4), indicating a generally stable perceived capacity to perform job tasks.

#### **Stratification by age and positions/roles**

Detailed stratification by age and positions/roles is illustrated in Additional file 5.

#### *Work overload*

In hospital A, multiple groups showed lower ratings for workload, with a median score of 3 (neutral, IQR 2–4), indicating greater variability within these groups and that a substantial number of employees rated the workload as less than acceptable. This was observed among employees aged 60+, as well as those working in nursing and care, clinical support, scientific

research and education, and medical specialists. In addition, for the second item about workload, nearly every group indicated there is too much work.

In hospital B, lower agreement with appropriate workload was seen among employees aged 40–49, and those in clinical support, clinical (co)treating roles, scientific research and education and medical specialists.

#### *Possibilities for learning and development*

In hospital A, most groups reported agreement regarding learning and development opportunities (median 4, IQR 3–4). Deviations from this pattern were found in the analytics group (median 3, IQR 3–4), indicating that at least half of this group expressed lower levels of agreement. Groups such as employees under 30, those in management roles, and resident physicians showed a more uniform pattern (median 4, IQR 4–4), suggesting general agreement with limited variability. Higher levels of agreement were observed in groups involved in scientific research and education, management and among medical specialists (median 4, IQR 4–5). The groups most frequently expressing disagreement with the statement (>3%) included those aged 50–59, and those working in clinical support, facilities, clinical (co) treating roles and analytics.

A similar pattern was found in Hospital B. Most groups reported agreement (median 4, IQR 3–4), although in January 2022, employees under 30 showed a lower rating (median 3). Groups such as those aged <30, 30–39, 40–49, and 60+, and those in clinical (co) treating roles, scientific research and education, management, staff/administration/secretariat, resident physicians, and medical specialists showed limited variability (median 4, IQR 4–4). A higher level of agreement was again observed among those in scientific research and education and resident physicians (median 4, IQR 4–5). The groups most frequently disagreeing with the statement (>3%) included those aged 40–49 and 60+, as well as those working in clinical support, analytics, management, and facilities.

## **DISCUSSION**

This study aimed to assess the content and methodological consistency of employee well-being surveys currently used in UMCs, and to explore national-level survey results from two participating hospitals as a secondary step. Phase 1 focused on evaluating the design, scope, and theoretical alignment of surveys from a well-being-at-work perspective. Phase 2 involved a descriptive analysis of aggregated survey results, offering initial insights into reported employee experiences.

### **Survey design and methodological variation**

Substantial variation was found across UMCs in terms of survey content, item phrasing, response options, timing, and frequency. While surveys covered a wide array of topics, the focus of the questions often reflected strategic priorities of hospital boards rather than the focus of implemented interventions. These findings align with existing literature describing the trade-offs between comprehensive validated instruments and shorter, pragmatic tools that are easier to administer but less robust psychometrically.<sup>24,26</sup> The diversity of survey designs may be influenced by local leadership styles, cultural norms, and shifting organisational priorities. While this flexibility can help capture emerging topics, such as inclusivity and psychological safety<sup>22</sup>, it limits comparability across organisations and over time, undermining the potential for data-informed decision-making.

### **Challenges in interpreting results**

The exploratory analysis of survey results from Hospital A highlighted several domains (particularly job control, learning and development, team effectiveness, and inspiring leadership) as potential areas for improvement. Items in these domains scored a median of 2 or 3, compared with 4 on most other topics. While this provides a starting point for discussion, the interpretation must be cautious due to limitations in survey design, measurement reliability, and external validity. Moreover, these data only represent a subset of UMC employees and likely suffer from response bias and overlap in respondents. Nevertheless, despite the limitations in interpreting the current study's results, previous research has consistently emphasized the importance of, for example, job control and autonomy, which supports the relevance and credibility of the observed patterns<sup>27-29</sup>.

Notably, we found minimal differences in outcomes over time, including during and after the COVID-19 period. This is inconsistent with literature showing significant declines in well-being among HCPs during the pandemic.<sup>27,30,31</sup> Several explanations are possible: survey items may lack sensitivity to change<sup>24</sup>, the surveys may not capture key stressors, or a relatively short timeframe and socially desirable responding may have masked real variation. These issues point to the need for clinimetric research into the validity, reliability, and responsiveness of existing tools<sup>32</sup>.

### **Misalignment between measurement and action**

A key finding is the disconnect between what is measured and what is targeted by interventions. Most survey items focus on job resources, such as supervisory support and team climate, while organisational interventions tend to target personal resources like resilience or stress management. This misalignment may partly explain why organisations struggle to measure intervention impact or drive meaningful change through survey data. One possible explanation is that survey design is often human resources or board-driven, while interventions are mostly

shaped by project leaders, consultants or by HCP themselves, resulting in a disconnect between assessment and response.

### **Strengths and limitations**

This study offers early insights into both the content of well-being surveys and the patterns they reveal. A strength of our approach is the descriptive use of distributions and medians instead of means, which are often inappropriately applied to ordinal data. However, significant limitations remain. Firstly, internal validity decreased since data was used from unvalidated heterogeneous surveys. This influences reliability of the results and requires caution with interpreting the results<sup>32</sup>. Second, the inductive categorisation process, although conducted independently by the authors, introduces the risk of inconsistency and subjectivity. Furthermore, only two of the seven Dutch UMCs participated, greatly reducing generalisability. Overlapping respondents and selection bias may have further skewed results.<sup>32</sup> Combined, these limitations constrain our ability to draw robust conclusions and diminish the utility of findings for policy or practice.

### **Practical implications**

Several practical implications emerge:

- Survey frequency should be re-evaluated, as repeated measurements showed little variation. Oversurveying may burden staff without producing actionable insights<sup>18</sup>.
- Job control emerged as a key area for improvement. However, it is important to ensure that this and other areas identified through surveys are within employees' sphere of influence and reflect their lived experiences.
- Current surveys are broad and suited for organisational reflection, but they may miss critical indicators like performance, turnover intention, and resource adequacy. A more targeted, theory-driven approach is needed for intervention planning.
- Using validated instruments that can detect changes over time and adopting a shared conceptual framework (eg, the JD-R model) can support more meaningful benchmarking and evidence-informed strategies.

Collaborative efforts between hospitals could support the development of a core outcome set, enabling collective learning and longitudinal monitoring. Without such alignment, surveys may continue to serve primarily symbolic or communicative functions rather than actionable tools for change.<sup>26</sup>

## **CONCLUSION**

Currently, employee well-being surveys in Dutch UMCs show significant methodological variation, limiting their usefulness for monitoring work experience and informing policy.

While they may support internal reflection, their capacity to guide targeted intervention is undermined by weak measurement validity, lack of alignment with organisational actions, and limited comparability across centres.

Job control appears to be an area warranting further attention, though interpretation is constrained by methodological issues. The lack of meaningful variation in survey outcomes over time raises important questions about the appropriateness of current instruments and the assumptions guiding their use.

Future research should focus on developing a consensus-based core outcome set (eg, via a Delphi study), and explore why validated tools are underutilized and collaboration is minimal. Rather than developing new instruments, efforts should centre on improving use and integration of existing tools. To support evidence-based people management, the rigour of patient care research must be mirrored in the way we evaluate and support the healthcare workforce.

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## ADDITIONAL FILES

### Content table

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Additional file	Content
Additional file 1	Surveys question
Additional file 2	Median and means per question item
Additional file 3	Median, means and percentages per question item
Additional file 4	A complete description of results per JD-R category
Additional file 5	Stratification by age and function for 'work overload' and 'possibilities for learning and development'

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**Additional file 1**

Table A Surveys question items hospital A 2020

Sub-category	Question item	Answer options
Work ability	How likely are you to recommend the hospital as an employer to friends, acquaintances, or business contacts?	(0) unlikely; (10) likely
Task variety	My work is sufficiently varied	(1) totally disagree;
Job control	I can decide how and when to do my work within reasonable limits	(2) disagree; (3)
Boredom	My work is challenging in a good way	neutral; (4) agree; (5)
Job satisfaction	I enjoy my work	totally agree; (6) not applicable
Recognition	With my work I am of added value	
Work ability	I can do my job without negative effects on my health	
Co-worker support	As colleagues we help each other (team)	
Team atmosphere	The relationship with my colleagues is good (team)	
Team effectiveness	As colleagues we work together in a smart way (team)	
Co-worker support	As colleagues we help each other (chain)	
Team atmosphere	The relationship with my colleagues is good (chain)	
Team effectiveness	As colleagues we work together in a smart way (chain)	
Connecting	The relationship with my direct supervisor is good	
Performance feedback	I receive sufficient feedback on how i do my work	
Recognition	I receive sufficient appreciation for my work	
Inspiring	My direct supervisor knows how to motivate me	

Table A Surveys question items hospital A 2020 (Continued)

Sub-category	Question item	Answer options
Possibilities for learning & development	I am given the opportunity to develop	
Other	My work environment is pleasant	
Work overload	There is an acceptable workload	
Organization	Working for this hospital makes me proud	

Table B Surveys question items hospital A 2021

Sub-category	Question item	Answer options
Recognition	I am appreciated at work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion
Co-worker support	I receive help with my work when needed	
Communication	I receive the information I need at work.	
Co-worker support	If I am having a hard time at work I can turn to someone	
Job control	I can decide how i do my work	
Job control	I can decide when i do my work	
Job control	I can set my own work pace	
Participation in decision making	I have influence over decisions in my work.	
Emotional demands	My work is emotionally demanding	
Mental demands	I struggle with my work because it is complicated	

Table B Surveys question items hospital A 2021 (Continued)

Sub-category	Question item	Answer options
Physical demands	My work is physically demanding	
Work overload	I have too much work	
Job demand	The time pressure in my work is high.	
Work-home conflict	My work has no negative effect on my private life.	
Job control	I can take breaks whenever I need it	
Sleep problems	I wake up feeling refreshed	
Use of skills	I have the opportunity to use my knowledge and skills.	
Possibilities for learning & development	I get opportunity to learn and develop knowledge and skills	
Boredom	My work is challenging in a good way	
Burnout	Indicate where you are on the range of fatigue to vitality	1-10 ((1) fatigue; (10) vital)
Work engagement	Indicate where you are on the balance of disengaged to engaged	1-10 ((1) disengagement; (10) engagement)
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Threats or intimidation?	(1) never; (2) sometimes; (3) regularly; (4) often;
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Discrimination?	(5) always; (6) I don't know
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Bullying?	
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Sexual harassment?	

Table B Surveys question items hospital A 2021 (Continued)

Sub-category	Question item	Answer options
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Physical aggression?	
Harassment	In your interactions with colleagues or supervisors over the past year, have you personally experienced: Verbal aggression?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Threats or intimidation?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Discrimination?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Bullying?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Sexual harassment?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Physical aggression?	
Harassment	In your interactions with patients, their families, or visitors over the past year, have you personally experienced: Verbal aggression?	

Table C Surveys question items hospital A 2022

Sub-category	Question item	Answer options
Burnout	Indicate where you are on the range of fatigue to vitality	1-10 ((1) fatigue; (10) vital)
Work engagement	Indicate where you are on the balance of disengaged to engaged	1-10 ((1) disengagement; (10) engagement)

Table C Surveys question items hospital A 2022 (Continued)

Sub-category	Question item	Answer options
Task variety	My work is sufficiently varied	(1) totally disagree;
Job control	I can decide how and when to do my work within reasonable limits	(2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable
Boredom	My work is challenging in a good way	
Job satisfaction	I enjoy my work	
Recognition	With my work I am of added value	
Work ability	I can do my job without negative effects on my health	
Co-worker support	As colleagues we help each other (team)	
Team atmosphere	The relationship with my colleagues is good (team)	
Team effectiveness	As colleagues we work together in a smart way (team)	
Co-worker support	As colleagues we help each other (chain)	
Team atmosphere	The relationship with my colleagues is good (chain)	
Team effectiveness	As colleagues we work together in a smart way (chain)	
Connecting	The relationship with my direct supervisor is good	
Performance feedback	I receive sufficient feedback on how i do my work	
Recognition	I receive sufficient appreciation for my work	
Inspiring	My direct supervisor knows how to motivate me	
Possibilities for learning & development	I am given the opportunity to develop	
Other	My work environment is pleasant	
Work overload	There is an acceptable workload	
Organization	Working for this hospital makes me proud	

Table D Surveys question items hospital B

Sub-category	Question item	Answer options
Job satisfaction	I enjoy my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion
Other	I feel safe at work	
Organizational justice	I can address mistakes and unsafe situations without fear of negative consequences	
Participation in decision making	I feel free to question decisions or actions of persons with greater authority	
Work overload	I think my workload is on an average base..	(1) way too much, (2) too much, (3) too less, (4) way too less, (5) appropriate; (6) no opinion
Possibilities for learning & development	I can develop in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion
Possibilities for learning & development	I can continuously improve in my work	
Self-efficacy	I can effectively solve problems in my work	
Possibilities for learning & development	Within our team we learn from mistakes	
Team effectiveness	Within our team we adhere to the agreements we make with each other	
Team effectiveness	Within our team we openly share knowledge and information	
Performance feedback	Within our team it is common to give feedback	
Performance feedback	The feedback of my direct supervisor helps me to improve my work	
Trust in leadership	My direct supervisor provides good leadership	
Inspiring	My direct supervisor shows exemplary behavior	
Trust in leadership	My manager provides good leadership	
Team effectiveness	I know the goals of our team	
Goal directedness	I know what I need to do to achieve our team's goals	
Team effectiveness	Within our team we use the results of the employee survey to make improvements	

Table D Surveys question items hospital B (*Continued*)

Sub-category	Question item	Answer options
Organization	I like to do something extra for my work	
Team	I put my team's results above my personal ambitions	
Organization	The success of my hospital means much to me	1-10 ((1) bad; (2) good)

**Additional file 2**

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model

Sub-category	Question-item	Scale	Hospital A		Hospital B		Hospital A		Hospital B		
			Sept 2020 (4157)	Dec 2021 (4102)	July 2022 (3603)	Sept 2020 (5056)	Jan 2022 (4842)	May 2022 (4894)	May 2023 (4895)		
			<b>Job demands</b>								
Work overload	There is an acceptable workload	(1) totally disagree; (2) disagree;	4 (IQR: 3-4)		4 (IQR: 3-4)		5 (IQR: 2-5)		5 (IQR: 2-5)		
		(3) neutral; (4) agree; (5) totally agree; (6) not applicable									
		(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)		4 (IQR: 3-4)		5 (IQR: 2-5)		5 (IQR: 2-5)		
	I think my workload is on an average base..	(1) way too much, (2) too much, (3) too less, (4) way too less, (5) appropriate; (6) no opinion					5 (IQR: 2-5)		5 (IQR: 2-5)		
			<b>Job resources</b>								
Co-worker support	As colleagues we help each other (team)	(1) totally disagree; (2) disagree;	4 (IQR: 4-5)		4 (IQR: 4-5)		4 (IQR: 4-5)		4 (IQR: 3-4)		
		(3) neutral; (4) agree; (5) totally agree; (6) not applicable									
	As colleagues we help each other (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)		4 (IQR: 3-4)		4 (IQR: 3-4)		4 (IQR: 3-4)		

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B
Job control	I receive help with my work when needed	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)					
		(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-5)					
	I can decide how and when to do my work within reasonable limits	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)				
		(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)					
	I can decide when i do my work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	2 (IQR: 2-4)					
		(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 2-4)					
I can take breaks whenever I need it	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 2-4)						
	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)					
Organizational justice	I can address mistakes and unsafe situations without fear of negative consequences	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	



Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B
Participation in decision making	I feel free to question decisions or actions of persons with greater authority	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)				
Performance feedback	I receive sufficient feedback on how I do my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	Within our team it is common to give feedback	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	The feedback of my direct supervisor helps me to improve my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)				
Possibilities for learning and development	I am given the opportunity to develop	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) I don't know	3 (IQR: 2-4)	3 (IQR: 2-4)				
Possibilities for learning and development	I get opportunity to learn and develop knowledge and skills	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) I don't know			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	I can develop in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Possibilities for learning and development	I can continuously improve in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B
	Within our team we learn from mistakes	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Recognition	With my work I am of added value	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)		4 (IQR: 4-5)			
	I receive sufficient appreciation for my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)		4 (IQR: 3-4)			
	I am appreciated at work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)					
Task variety	My work is sufficiently varied	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)		4 (IQR: 4-5)			
Team atmosphere	The relationship with my colleagues is good (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)		4 (IQR: 4-5)			
	The relationship with my colleagues is good (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-4)		4 (IQR: 4-4)			
Team effectiveness	As colleagues we work together in a smart way (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)		4 (IQR: 3-4)			

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital B	Hospital A	Hospital B	Hospital A	Hospital B
	As colleagues we work together in a smart way (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	3 (IQR: 3-4)	3 (IQR: 3-4)					
	Within our team we adhere to the agreements we make with each other	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)			4 (IQR: 3-4)	4 (IQR: 3-4)
	Within our team we openly share knowledge and information	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 4-4)			4 (IQR: 4-4)	4 (IQR: 4-4)
	I know the goals of our team	((1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 3-4)			4 (IQR: 4-4)	4 (IQR: 3-4)
	Within our team we use the results of the employee survey to make improvements	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 4-4)			4 (IQR: 4-4)	4 (IQR: 4-4)
	We cooperate well in our team	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 4-4)			4 (IQR: 4-4)	4 (IQR: 4-4)
Trust in leadership	My direct supervisor provides good leadership	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)			4 (IQR: 3-4)	4 (IQR: 3-4)
	My manager provides good leadership	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-6)	4 (IQR: 3-6)			4 (IQR: 3-6)	4 (IQR: 3-6)

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
Other	My work environment is pleasant	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	
	We cooperate well in our division	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
We cooperate well with organizations outside of our hospital	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	
<b>Engaged leadership</b>									
Connecting	The relationship with my direct supervisor is good	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable			3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)
Inspiring	My direct supervisor knows how to motivate me	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)



Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (*Continued*)

Sub-category	Question-item	Scale	Hospital A		Hospital B	
			A	B	A	B
Personal resources						
Self-efficacy	I can effectively solve problems in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Goal directedness	I know what I need to do to achieve our team's goals	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Employee well-being						
Boredom	My work is challenging in a good way	2020+2022: totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable 2021: (1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 3-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
Burnout	Indicate where you are on the range of fatigue to vitality	1-10 ((1) fatigue; (10) vital)	MEAN 6,50	MEAN 6,4	4 (IQR: 4-4)	4 (IQR: 4-5)
Job satisfaction	I enjoy my work	Hospital A 2020+2022: totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable Hospital B: (1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable; (6) no opinion	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)

Table E: median and means per question item for diverse measurement moments within hospital A and B, categorized following the JD-R model (Continued)

Sub-category	Question-item	Scale	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
				MEAN	MEAN				
Work engagement	Indicate where you are on the balance of disengaged to engaged	1-10 ((1) disengagement; (10) engagement)		7.14	6.94				
Other	I feel safe at work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion				4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
<b>Outcomes</b>									
Commitment organization	Working for this hospital makes me proud	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	I like to do something extra for my work	((1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	The success of my hospital means much to me	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
	I rate working in this hospital as	1-10 ((1) bad; (2) good)				MEAN 7.31	MEAN 7.29	MEAN 7.32	MEAN 7.31
Commitment team	I put my team's results above my personal ambitions	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
Work ability	I can do my job without negative effects on my health	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)



Additional file 3

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question.

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Job demands									
Work overload	There is an acceptable workload	(1) totally disagree; (2) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)			
			1: 2,36	1: 4,44	1: 4,44				
			2: 15,25	2: 19,15	2: 19,15				
			3: 22,40	3: 23,70	3: 23,70				
			<b>4: 52,51</b>	<b>4: 45,38</b>	<b>4: 45,38</b>				
			5: 7,43 6: 0,05	5: 7,27 6: 0,06	5: 7,27 6: 0,06				
I have too much work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know		4 (IQR: 3-4)	4 (IQR: 3-4)					
			1: 7,17	1: 7,17					
			2: 15,19	2: 15,19					
			3: 23,28	3: 23,28					
			<b>4: 45,83</b>	<b>4: 45,83</b>					
			5: 8,09 6: 0,44	5: 8,09 6: 0,44	5: 8,09 6: 0,44				

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	I think my workload is on an average base..	(1) way too much, (2) too much, (3) too less, (4) way too less, (5) appropriate; (6) no opinion	5 (IQR: 2-5)	5 (IQR: 2-5)	5 (IQR: 2-5)	1: 5,91 2: 29,98 3: 3,38 4: 0,44 <b>5: 58,15</b> 6: 2,14	5 (IQR: 2-5) 2-5) 1: 5,68 2: 29,74 3: 3,10 4: 0,29 <b>5: 58,72</b> 6: 2,48	5 (IQR: 2-5) 1: 5,44 2: 30,49 3: 2,62 4: 0,39 <b>5: 59,11</b> 6: 1,96	5 (IQR: 2-5) 1: 5,54 2: 29,52 3: 2,80 4: 0,37 <b>5: 59,57</b> 6: 2,21
Job resources									
Co-worker support	As colleagues we help each other (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	1: 0,22 2: 1,97 3: 9,65 <b>4: 54,44</b> 5: 33,41 6: 0,31	1: 0,33 2: 3,08 3: 9,24 <b>4: 53,96</b> 5: 33,08 6: 0,31		

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	As colleagues we help each other (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4) 1: 0,55 2: 5,22 3: 23,91 4: <b>56,03</b> 5: 10,39 6: 3,90	4 (IQR: 3-4) 1: 0,78 2: 8,16 3: 27,42 4: <b>53,87</b> 5: 8,16 6: 1,61	4 (IQR: 3-4)				
	I receive help with my work when needed	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4) 1: 1,27 2: 19,82 3: 26,04 4: <b>36,13</b> 5: 16,38 6: 0,37						



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	I can decide how i do my work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4)	1: 4,10 2: 17,21 3: 22,60 4: <b>44,61</b> 5: 11,14 6: 0,34					
	I can decide when i do my work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	2 (IQR: 2-4)	1: 18,70 2: 24,79 3: 19,97 4: <b>29,62</b> 5: 6,46 6: 0,46					
	I can set my own work pace	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	3 (IQR: 2-4)	1: 10,56 2: 29,64 3: 21,60 4: <b>28,64</b> 5: 9,17 6: 0,39					

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	I can take breaks whenever I need it	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know		3 (IQR: 2-4)					
				1: 10,53 2: <b>32,91</b> 3: 24,01 4: 23,26 5: 9,04 6: 0,24					
Organizational justice	I can address mistakes and unsafe situations without fear of negative consequences	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion				4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
						1: 1,44 2: 5,66 3: 11,35 4: <b>58,86</b> 5: 21,91 6: 0,77	4-4 1: 1,38 2: 6,61 3: 12,06 4: <b>57,58</b> 5: 21,66 6: 0,70	1: 1,29 2: 5,72 3: 12,44 4: <b>57,81</b> 5: 22,03 6: 0,72	1: 1,47 2: 6,13 3: 11,44 4: <b>58,16</b> 5: 22,33 6: 0,47



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Participation in decision making	I feel free to question decisions or actions of persons with greater authority	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 2,27 2: 8,72 3: 18,47 <b>4: 54,29</b> 5: 15,35 6: 0,89	1: 2,27 2: 8,72 3: 18,47 <b>4: 54,29</b> 5: 15,35 6: 0,89	1: 2,27 2: 8,72 3: 18,47 <b>4: 54,29</b> 5: 15,35 6: 0,89	1: 2,13 2: 8,91 3: 18,66 <b>4: 54,56</b> 5: 14,92 6: 0,84	1: 2,10 2: 9,05 3: 17,53 <b>4: 54,95</b> 5: 15,53 6: 0,84		
Performance feedback	I receive sufficient feedback on how I do my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 2,74 2: 14,82 3: 28,48 <b>4: 41,78</b> 5: 11,28 6: 0,89	1: 2,58 2: 16,49 3: 27,92 <b>4: 41,16</b> 5: 10,88 6: 0,97	1: 2,58 2: 16,49 3: 27,92 <b>4: 41,16</b> 5: 10,88 6: 0,97	1: 2,58 2: 16,49 3: 27,92 <b>4: 41,16</b> 5: 10,88 6: 0,97	1: 2,58 2: 16,49 3: 27,92 <b>4: 41,16</b> 5: 10,88 6: 0,97		

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Within our team it is common to give feedback	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	3-4	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		1: 2,06	1: 2,02	1: 1,82	1: 2,02	1: 1,82			
		2: 13,15	2: 12,77	2: 12,50	2: 12,77	2: 12,50			
		3: 23,95	3: 25,26	3: 24,37	3: 25,26	3: 24,37			
		4: 49,47	4: 49,47	4: 50,93	4: 49,47	4: 50,93			
		5: 10,01	5: 9,58	5: 9,66	5: 9,58	5: 9,66			
6: 1,36	6: 0,90	6: 0,72	6: 0,90	6: 0,72					
The feedback of my direct supervisor helps me to improve my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	3-4	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		1: 2,00	1: 1,84	1: 1,96	1: 1,84	1: 1,96			
		2: 6,65	2: 5,76	2: 5,76	2: 5,76	2: 5,76			
		3: 20,47	3: 21,03	3: 18,86	3: 21,03	3: 18,86			
		4: 51,05	4: 51,66	4: 51,77	4: 51,66	4: 51,77			
		5: 14,62	5: 14,67	5: 16,14	5: 14,67	5: 16,14			
6: 5,22	6: 5,05	6: 5,52	6: 5,05	6: 5,52					
			6: 5,49						



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital A Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Possibilities for learning and development	I am given the opportunity to develop	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 2-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,61 2: 8,18 3: 21,43 4: 49,60 5: 18,98 6: 0,19	1: 3,90 2: 24,26 3: 29,55 4: 31,89 5: 9,53 6: 0,88	1: 2,28 2: 10,46 3: 22,04 4: 47,68 5: 17,24 6: 0,31	1: 2,28 2: 10,46 3: 22,04 4: 47,68 5: 17,24 6: 0,31	1: 2,28 2: 10,46 3: 22,04 4: 47,68 5: 17,24 6: 0,31	1: 2,28 2: 10,46 3: 22,04 4: 47,68 5: 17,24 6: 0,31	1: 2,28 2: 10,46 3: 22,04 4: 47,68 5: 17,24 6: 0,31
	I get opportunity to learn and develop knowledge and skills	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) I don't know	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)	3 (IQR: 2-4)

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
I can develop in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 2,22	1: 1,59	1: 2,35	1: 1,90	1: 2,35	1: 1,59	1: 2,35
			2: 9,30	2: 9,62	2: 8,72	2: 10,12	2: 8,72	2: 9,62	2: 8,72
			3: 17,84	3: 17,90	3: 17,92	3: 18,11	3: 17,90	3: 17,90	3: 17,92
			<b>4: 53,22</b>	<b>4: 53,72</b>	<b>4: 54,03</b>	<b>4: 52,38</b>	<b>4: 53,72</b>	<b>4: 53,72</b>	<b>4: 54,03</b>
			5: 16,53	5: 16,51	5: 16,04	5: 16,67	5: 16,51	5: 16,51	5: 16,04
I can continuously improve in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,15	1: 0,76	1: 1,21	1: 0,85	1: 0,76	1: 0,76	1: 1,21
			2: 6,49	2: 6,50	2: 5,97	2: 6,98	2: 6,50	2: 6,50	2: 5,97
			3: 20,53	3: 19,76	3: 20,98	3: 20,53	3: 19,76	3: 19,76	3: 20,98
			<b>4: 56,65</b>	<b>4: 58,36</b>	<b>4: 57,14</b>	<b>4: 56,65</b>	<b>4: 58,36</b>	<b>4: 58,36</b>	<b>4: 57,14</b>
			5: 14,38	5: 14,00	5: 13,97	5: 14,38	5: 14,00	5: 14,00	5: 13,97
	6: 0,81	6: 0,63	6: 0,74	6: 0,81	6: 0,63	6: 0,63	6: 0,74		
				6: 1,03					

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	Within our team we learn from mistakes	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,31	1: 1,31	1: 1,31	1: 0,92	1: 1,39		
			2: 7,38	2: 7,38	2: 7,38	2: 7,81	2: 7,09		
			3: 17,84	3: 17,84	3: 17,84	3: 17,12	3: 17,73		
			4: <b>62,36</b>	3: 18,01	4: <b>62,34</b>	4: <b>62,34</b>	4: <b>63,49</b>		
			5: 9,75	5: 10,63	5: 10,63	5: 9,38	5: 9,38		
Recognition	With my work I am of added value	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
			1: 0,12	1: 0,31	1: 0,31	1: 0,31	1: 0,31		
			2: 1,37	2: 1,55	2: 1,55	2: 1,55	2: 1,55		
			3: 9,26	3: 11,43	3: 11,43	3: 11,43	3: 11,43		
			4: <b>59,97</b>	4: <b>60,78</b>	4: <b>60,78</b>	4: <b>60,78</b>	4: <b>60,78</b>		
			5: 29,20	5: 25,92	5: 25,92	5: 25,92	5: 25,92		
	6: 0,07	6: 0,00	6: 0,00	6: 0,00	6: 0,00				

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	I receive sufficient appreciation for my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4) 1: 3,01 2: 12,00 3: 27,93 <b>4: 42,80</b> 5: 13,69 6: 0,58	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 4,30 2: 14,68 3: 27,03 <b>4: 40,36</b> 5: 13,18 6: 0,44	4 (IQR: 3-4) 1: 4,30 2: 14,68 3: 27,03 <b>4: 40,36</b> 5: 13,18 6: 0,44	4 (IQR: 3-4) 1: 4,30 2: 14,68 3: 27,03 <b>4: 40,36</b> 5: 13,18 6: 0,44	4 (IQR: 3-4) 1: 4,30 2: 14,68 3: 27,03 <b>4: 40,36</b> 5: 13,18 6: 0,44	4 (IQR: 3-4) 1: 4,30 2: 14,68 3: 27,03 <b>4: 40,36</b> 5: 13,18 6: 0,44
	I am appreciated at work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02	4 (IQR: 3-4) 1: 0,93 2: 18,82 3: 29,47 <b>4: 37,06</b> 5: 11,70 6: 2,02

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital A Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Task variety	My work is sufficiently varied	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
		1: 0,34	1: 0,67	1: 0,67	1: 0,67	1: 0,67	1: 0,67	1: 0,67	1: 0,67
		2: 3,51	2: 3,05	2: 3,05	2: 3,05	2: 3,05	2: 3,05	2: 3,05	2: 3,05
		3: 10,03	3: 10,10	3: 10,10	3: 10,10	3: 10,10	3: 10,10	3: 10,10	3: 10,10
		4: 50,28	4: 54,82	4: 54,82	4: 54,82	4: 54,82	4: 54,82	4: 54,82	4: 54,82
		5: 35,75	5: 31,28	5: 31,28	5: 31,28	5: 31,28	5: 31,28	5: 31,28	5: 31,28
6: 0,10	6: 0,08	6: 0,08	6: 0,08	6: 0,08	6: 0,08	6: 0,08	6: 0,08	6: 0,08	
Team atmosphere	The relation with my colleagues is good (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
		1: 0,07	1: 0,08	1: 0,08	1: 0,08	1: 0,08	1: 0,08	1: 0,08	1: 0,08
		2: 0,91	2: 1,61	2: 1,61	2: 1,61	2: 1,61	2: 1,61	2: 1,61	2: 1,61
		3: 7,67	3: 8,66	3: 8,66	3: 8,66	3: 8,66	3: 8,66	3: 8,66	3: 8,66
		4: 57,73	4: 57,09	4: 57,09	4: 57,09	4: 57,09	4: 57,09	4: 57,09	4: 57,09
		5: 33,41	5: 32,33	5: 32,33	5: 32,33	5: 32,33	5: 32,33	5: 32,33	5: 32,33
6: 0,19	6: 0,22	6: 0,22	6: 0,22	6: 0,22	6: 0,22	6: 0,22	6: 0,22	6: 0,22	

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Team effectiveness	The relation with my colleagues is good (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
			1: 0,17	1: 0,17	1: 0,25	1: 0,25	1: 0,25	1: 0,25	1: 0,25
			2: 1,61	2: 1,61	2: 1,94	2: 1,94	2: 1,94	2: 1,94	2: 1,94
			3: 19,34	3: 19,34	3: 21,18	3: 21,18	3: 21,18	3: 21,18	3: 21,18
			4: <b>62,69</b>	4: <b>62,69</b>	4: <b>64,61</b>	4: <b>64,61</b>	4: <b>64,61</b>	4: <b>64,61</b>	4: <b>64,61</b>
			5: 12,44	5: 12,44	5: 10,46	5: 10,46	5: 10,46	5: 10,46	5: 10,46
Team effectiveness	As colleagues we work together in a smart way (team)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 0,63	1: 0,63	1: 1,14	1: 1,14	1: 1,14	1: 1,14	
			2: 10,44	2: 10,44	2: 10,91	2: 10,91	2: 10,91	2: 10,91	
			3: 28,27	3: 28,27	3: 28,86	3: 28,86	3: 28,86	3: 28,86	
			4: <b>47,58</b>	4: <b>47,58</b>	4: <b>47,54</b>	4: <b>47,54</b>	4: <b>47,54</b>	4: <b>47,54</b>	
			5: 12,51	5: 12,51	5: 11,05	5: 11,05	5: 11,05	5: 11,05	
	6: 0,58	6: 0,58	6: 0,50	6: 0,50	6: 0,50	6: 0,50	6: 0,50		



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
	As colleagues we work together in a smart way (care chain)	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	3 (IQR: 3-4) 1: 1,61 2: 14,31 <b>3: 39,93</b> 4: 35,05 5: 5,03 6: 4,07	(3603) 3 (IQR: 3-4) 1: 2,78 2: 17,85 <b>3: 43,05</b> 4: 30,92 5: 3,61 6: 1,80 (3538)	(5056) 4 (IQR: 3-4) 1: 1,36 2: 10,19 3: 22,41 <b>4: 57,16</b> 5: 7,83 6: 1,05	(4842) 4 (IQR: 3-4) 3-4 1: 1,49 2: 9,00 3: 21,87 <b>4: 57,83</b> 5: 8,49 6: 1,32	(4894) 4 (IQR: 3-4) 1: 1,25 2: 9,91 3: 22,91 <b>4: 57,05</b> 5: 7,85 6: 1,04	(4895) 4 (IQR: 3-4) 1: 1,55 2: 9,48 3: 22,90 <b>4: 57,77</b> 5: 7,44 6: 0,86	
	Within our team we adhere to the agreements we make with each other	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion							

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Within our team we openly share knowledge and information		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
			1: 1,19	1: 0,86	1: 1,04	1: 0,86	1: 1,04		
			2: 5,18	2: 5,66	2: 4,96	2: 5,66	2: 4,96		
			3: 13,67	3: 13,79	3: 13,22	3: 13,79	3: 13,22		
			<b>4: 60,36</b>	<b>4: 60,05</b>	<b>4: 61,29</b>	<b>4: 60,05</b>	<b>4: 61,29</b>		
			5: 18,79	5: 19,17	5: 18,96	5: 19,17	5: 18,96		
I know the goals of our team		((1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,27	1: 1,27	1: 1,27	1: 1,10	1: 1,27		
			2: 6,96	2: 6,96	2: 6,97	2: 7,52	2: 6,97		
			3: 16,36	3: 16,36	3: 16,81	3: 17,14	3: 16,81		
			<b>4: 62,32</b>	<b>4: 62,32</b>	<b>4: 62,80</b>	<b>4: 62,06</b>	<b>4: 62,80</b>		
			5: 11,43	5: 11,43	5: 10,38	5: 10,58	5: 10,38		
6: 1,66	6: 1,66	6: 1,78	6: 1,59	6: 1,78					
			6: 1,88						

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Within our team we use the results of the employee survey to make improvements	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
			1: 0,59	1: 0,57	1: 0,57	1: 0,57	1: 1,00	1: 1,00	1: 1,00
			2: 3,20	2: 3,04	2: 3,04	2: 3,04	2: 2,74	2: 2,74	2: 2,74
			3: 14,79	3: 15,04	3: 15,04	3: 15,04	3: 16,10	3: 16,10	3: 16,10
			<b>4: 59,24</b>	<b>4: 58,52</b>	<b>4: 58,52</b>	<b>4: 58,52</b>	<b>4: 57,81</b>	<b>4: 57,81</b>	<b>4: 57,81</b>
			5: 21,12	5: 21,84	5: 21,84	5: 21,84	5: 21,49	5: 21,49	5: 21,49
We cooperate well in our team	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)	4 (IQR: 4-4)
			1: 1,01	1: 1,00	1: 1,00	1: 1,00	1: 0,88	1: 0,88	1: 0,88
			2: 5,60	2: 5,58	2: 5,58	2: 5,58	2: 5,37	2: 5,37	2: 5,37
			3: 13,41	3: 13,22	3: 13,22	3: 13,22	3: 13,63	3: 13,63	3: 13,63
			<b>4: 61,79</b>	<b>4: 62,38</b>	<b>4: 62,38</b>	<b>4: 62,38</b>	<b>4: 61,96</b>	<b>4: 61,96</b>	<b>4: 61,96</b>
			5: 17,42	5: 17,02	5: 17,02	5: 17,02	5: 17,43	5: 17,43	5: 17,43
	6: 0,77	6: 0,80	6: 0,80	6: 0,80	6: 0,74	6: 0,74	6: 0,74		
		6: 0,95	6: 0,95	6: 0,95	6: 0,95	6: 0,95	6: 0,95	6: 0,95	

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Trust in leadership	My direct supervisor provides good leadership	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
					3-4			1: 2,15 2: 6,74 3: 19,49 4: <b>48,98</b> 5: 18,76 6: 3,88	1: 2,29 2: 6,29 3: 17,63 4: <b>50,07</b> 5: 20,06 6: 3,66
Trust in leadership	My manager provides good leadership	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)	4 (IQR: 3-6)
					3-6			1: 2,31 2: 6,01 3: 24,42 4: <b>29,79</b> 5: 7,27 6: 30,20	1: 2,53 2: 5,64 3: 24,27 4: <b>30,17</b> 5: 7,74 6: 29,64



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Other	My work environment is pleasant	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,03 2: 6,47 3: 19,36 <b>4: 57,18</b> 5: 15,83 6: 0,12	(4102)	1: 1,64 2: 8,66 3: 19,65 <b>4: 55,68</b> 5: 14,35 6: 0,03	4 (IQR: 3-4)	1: 2,35 2: 12,08 3: 31,61 <b>4: 42,92</b> 5: 4,19 6: 6,84	1: 2,40 2: 12,80 3: 31,52 <b>4: 41,14</b> 5: 4,75 6: 7,39	1: 2,23 2: 12,54 3: 32,52 <b>4: 42,25</b> 5: 3,74 6: 6,72
Other	We cooperate well in our division	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,03 2: 6,47 3: 19,36 <b>4: 57,18</b> 5: 15,83 6: 0,12	(4102)	1: 1,64 2: 8,66 3: 19,65 <b>4: 55,68</b> 5: 14,35 6: 0,03	4 (IQR: 3-4)	1: 2,35 2: 12,08 3: 31,61 <b>4: 42,92</b> 5: 4,19 6: 6,84	1: 2,40 2: 12,80 3: 31,52 <b>4: 41,14</b> 5: 4,75 6: 7,39	1: 2,23 2: 12,54 3: 32,52 <b>4: 42,25</b> 5: 3,74 6: 6,72

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
We cooperate well in our hospital	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)
			1: 2,79	1: 2,27	1: 2,75	1: 2,27	1: 2,27	1: 2,49	
			2: 12,62	2: 13,02	2: 12,99	2: 13,02	2: 13,14	2: 13,14	
			<b>3: 37,01</b>	<b>3: 39,01</b>	<b>3: 37,01</b>	<b>3: 39,01</b>	<b>3: 38,57</b>	<b>3: 38,57</b>	
			4: 34,77	4: 34,43	4: 34,77	4: 34,43	4: 34,18	4: 34,18	
			5: 3,03	5: 2,31	5: 3,03	5: 2,31	5: 2,70	5: 2,70	
We cooperate well with organizations outside of our hospital	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,21	1: 1,02	1: 1,32	1: 1,02	1: 1,37	1: 1,37	
			2: 6,45	2: 5,93	2: 6,45	2: 5,93	2: 5,92	2: 5,92	
			3: 30,95	3: 32,49	3: 30,95	3: 32,49	3: 31,64	3: 31,64	
			<b>4: 39,32</b>	<b>4: 37,45</b>	<b>4: 39,32</b>	<b>4: 37,45</b>	<b>4: 38,63</b>	<b>4: 38,63</b>	
			5: 4,15	5: 3,78	5: 4,15	5: 3,78	5: 4,49	5: 4,49	
	6: 17,92	6: 19,33	6: 17,92	6: 19,33	6: 17,94	6: 17,94			
				6: 19,37					

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Engaged leadership									
Connecting	The relationship with my direct supervisor is good	(1) totally disagree; (2) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
			1: 0,82 2: 3,44 3: 14,10 4: <b>52,92</b> 5: 27,93 6: 0,79	1: 1,36 2: 3,47 3: 15,29 4: <b>51,18</b> 5: 27,89 6: 0,80					
Inspiring	My direct supervisor know how to motivate me	(1) totally disagree; (2) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)	3 (IQR: 3-4)
			1: 2,74 2: 12,29 3: 33,97 4: <b>38,37</b> 5: 11,21 6: 1,42	1: 3,91 2: 13,18 3: 33,08 4: <b>36,77</b> 5: 11,63 6: 1,42					



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Goal directedness	I know what to do to achieve the aims within our team	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	1: 1,42 2: 6,98 3: 19,13 4: <b>60,15</b> 5: 9,91 6: 2,41	1: 1,00 2: 7,32 3: 19,51 4: <b>59,93</b> 5: 9,91 6: 2,33	1: 1,27 2: 6,72 3: 19,51 4: <b>60,67</b> 5: 9,44 6: 2,39	4 (IQR: 3-4)
Employee well-being									
Boredom	My work is challenging in a good way	2021+2023: totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 4-4)	3 (IQR: 3-4)	4 (IQR: 4-4)	1: 0,41 2: 4,86 3: 15,28 4: <b>58,50</b> 5: 20,95 6: 0,00	1: 1,71 2: 18,26 3: 31,23 4: <b>39,54</b> 5: 9,07 6: 0,20	1: 0,86 2: 5,91 3: 17,21 4: <b>57,48</b> 5: 18,54 6: 0,00	MEAN 6,50 MEAN 6,4
Burnout	Rate yourself on a scale of exhausted and vital	1-10 ((1) exhausted; (2) vital)							

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Job satisfaction	I experience joy I my work	Hospital A	4 (IQR: 4-5)	4 (IQR: 4-4)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
		2020+2022:	1: 0,22 2: 2,77 3: 14,07 <b>4: 56,75</b> 5: 26,20 6: 0,00	1: 0,56 2: 4,02 3: 16,99 <b>4: 57,59</b> 5: 20,84 6: 0,00	1: 0,69 2: 4,67 3: 11,10 <b>4: 55,52</b> 5: 27,79 6: 0,24	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)
Work engagement	Indicate where you are on the range of fatigue to vitality	Hospital B:	1: 0,22 2: 2,77 3: 14,07 <b>4: 56,75</b> 5: 26,20 6: 0,00	1: 0,56 2: 4,02 3: 16,99 <b>4: 57,59</b> 5: 20,84 6: 0,00	1: 0,69 2: 4,67 3: 11,10 <b>4: 55,52</b> 5: 27,79 6: 0,24	1: 0,55 2: 3,66 3: 11,69 <b>4: 55,88</b> 5: 28,03 6: 0,18	1: 0,95 2: 4,73 3: 10,80 <b>4: 55,76</b> 5: 27,49 6: 0,27	1: 0,55 2: 3,66 3: 11,69 <b>4: 55,88</b> 5: 28,03 6: 0,18	1: 0,78 2: 4,31 3: 11,15 <b>4: 57,24</b> 5: 26,35 6: 0,16
		totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable Hospital B: (1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable; (6) no opinion	MEAN 7.14	MEAN 6.94					



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Other	I feel safe at work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 4-5)	4 (IQR: 4-5)	4 (IQR: 4-5)	1: 1,50 2: 5,70 3: 10,48 4: 51,17 5: 30,83 6: 0,32	4 (IQR: 4-5) 4-5) 1: 1,88 2: 5,60 3: 11,09 4: 50,23 5: 30,94 6: 0,27	1: 1,12 2: 5,62 3: 11,14 4: 51,76 5: 30,14 6: 0,22	1: 1,59 2: 5,62 3: 10,09 4: 50,87 5: 31,54 6: 0,29
Outcomes									
Commitment - organization	Working for this hospital makes me proud	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	4 (IQR: 3-4)	4 (IQR: 3-4)	1: 1,11 2: 7,02 3: 33,28 4: 47,07 5: 11,07 6: 0,44				

Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
I like to do something extra for my work		((1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 0,91			1: 0,57	1: 0,57	1: 1,25	
			2: 7,63			2: 7,72	2: 7,72	2: 6,93	
			3: 27,83			3: 29,44	3: 29,44	3: 29,42	
			<b>4: 50,63</b>			<b>4: 49,57</b>	<b>4: 49,57</b>	<b>4: 50,13</b>	
			5: 9,38			5: 9,42	5: 9,42	5: 9,15	
The success of my hospital means much to me		(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	4 (IQR: 3-4)			4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
			1: 1,62			1: 1,55	1: 1,55	1: 1,86	
			2: 6,86			2: 6,97	2: 6,97	2: 6,62	
			3: 30,48			3: 30,85	3: 30,85	3: 31,09	
			<b>4: 48,44</b>			<b>4: 48,16</b>	<b>4: 48,16</b>	<b>4: 48,80</b>	
			5: 9,34			5: 9,30	5: 9,30	5: 8,93	
I rate working in this hospital as..		1-10 ((1) bad; (2) good)	MEAN 7,31			MEAN 7,31	MEAN	MEAN 7,32	MEAN 7,31
						6: 2,77	6: 3,17	6: 2,70	
						7,29			



Table F Comprehensive overview of results, including a distribution for all answer options per surveyed question. (Continued)

Sub-category	Question-item	Scale	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Commitment - team	I put my team's results above my personal ambitions	(1) totally disagree; (2)				4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)	4 (IQR: 3-4)
		disagree; (3)				1: 7,38	1: 6,64	1: 6,64	1: 7,40
		neutral; (4) agree;				2: 14,10	1: 7,25	2: 14,04	2: 15,55
		(5) totally agree;				3: 23,81	2: 14,25	3: 24,91	3: 22,59
		(6) no opinion				4: 36,97	3: 23,67	4: 36,78	4: 36,85
						5: 6,37	4: 36,16	5: 6,74	5: 7,05
					6: 11,37	6: 10,89	6: 10,56		
Work-ability	I can do my job without negative effects on my health	(1) totally disagree; (2)	4 (IQR: 3-4)	4 (IQR: 3-4)					
		disagree; (3)				1: 3,08			
		neutral; (4) agree;				2: 19,40			
		(5) totally agree;				3: 25,40			
		(6) not applicable				4: 39,99			
						5: 12,10			
				6: 0,03					

## **Additional file 4**

### *Job demands*

#### *Work overload*

Workload was measured by both hospitals with three different questions. Within the hospitals, workload barely differed over time. Hospital A shows a median of 4 (IQR: 3-4), indicating on one hand an acceptable workload and on the other hand often too much work. Hospital B shows a median of 5 (IQR: 2-5), indicating an appropriate workload with a range of 3. However, answer options were as follows: (1) way too much, (2) too much, (3) too less, (4) way too less, (5) appropriate; (6) no opinion.

### *Job resources*

#### *Co-worker support*

Co-worker support was measured by Hospital A with four questions and experiences barely seem to differ over time. Hospital A shows a median of 4 for all questions, indicating agreement with the questions about helping each other as colleagues. The item about helping each other within teams shows an IQR of 4-5 and helping each other within the care chain shows an IQR of 3-4, indicating better co-worker support within teams compared to co-worker support within the care chain. The fourth question about going to someone when its hard shows an IQR of 3-5, indicating a more spread experience about this item. Additionally, in 2021, respondents from hospital A most frequently answered this question with 'I don't know'.

#### *Job-control*

Aspects of job control were measured by Hospital A using five questions. Experiences barely differed over time. Hospital A shows variation in median and IQR. Questions about determining own timing of work, work tempo and taking breaks show the greatest variation in responses with a range of 2, indicating that opinions and experiences on this topic differ. One item, "I can determine myself when I do my work," measured in December 2021, had a median score of 2, suggesting room for improvement. The IQR was 2-4, indicating varying responses. Interestingly, the most frequently selected answer was 'often', chosen by 29.62% of respondents. Two related items, "I can set my own work pace" and "I can take breaks whenever I need it," both had a median score of 3 (IQR: 2-4). For the work tempo item, 28.64% chose 4 (often), while for the breaks item, 32.91% chose 2 (sometimes), indicating more variability and potential for improvement.

#### *Organizational justice*

Organizational justice was measured by hospital B with one question and experiences barely differed over time. Hospital B shows a median of 4 (IQR: 4-4) at all measurement moments, indicating small ranges and agreement about this item.

*Participation in decision making*

Participation in decision making was measured by hospital B with one question and experiences barely differed over time. Hospital B shows a median of 4 (IQR: 3-4) at all measurement moments.

*Performance feedback*

Performance feedback was measured by both hospitals with three different questions and experiences barely differed over time. At all measurements moments of both hospitals a median of 4 (IQR: 3-4) was discovered.

*Possibilities for learning and development*

Possibilities for learning and development was measured by both hospitals with five different questions and experiences barely differed over time. Except for one question, at all measurements moments of both hospitals a median of 4 (IQR: 3-4) was discovered. The question 'I get the chance to learn and develop my knowledge and skills' of Hospital A in 2021 shows a median of 3 (IQR: 2-4), indicating greater variation in response and thus in opinions and experiences with a range of 2. The most common response was 4 (agree), chosen by 31.89% of respondents, suggesting a relatively high frequency of agreement but also indicating variability and room for growth.

*Recognition*

Recognition was measured by hospital A with three questions and experiences barely differed over time. Medians for all questions and measurement moments was 4. The IQR varied from 3-4 to 4-5, indicating more agreement about adding value through one's own perspectives compared to receiving recognition and feeling recognized by others.

*Task variety*

Task variety was measured by hospital A with one question and experiences barely differed over time. Both measurement moments show a median of 4 (IQR: 4-5), indicating mainly agreement with a sufficient task variety.

*Team atmosphere*

Team atmosphere was measured by hospital A with two question and experiences barely differed over time. Both measurement moments and questions show a median of 4, but vary in IQR from 4-4 to 4-5, indicating more unanimity regarding the agreement on having a good relationship with colleagues within the chain. There is greater variability concerning the relationship within the team, with more respondents choosing "totally agree" compared to the question about the relationship within the chain.

*Team effectiveness*

Team effectiveness was measured by both hospitals with seven questions and experiences barely differed over time. Except for one question measured by hospital A, for all questions and measurement moments a median of 4 discovered. That question ‘as colleagues we work together in a smart way (care chain)’ shows a median of 3, indicating more experienced work effectiveness within own teams than within the care chain. Moreover, respondents from hospital A in 2020 and 2022 most frequently answered this question with ‘not applicable’. Furthermore, two questions measured by hospital B about ‘we use the results of the employee survey’ and ‘we work effectively together’ show IQRs of 4-4, indicating less variability and more unanimity regarding agreement about this statements.

*Trust in leadership*

Trust in leadership was measured by hospital B with two questions and experiences barely differed over time. The majority of respondents experienced good leadership of the supervisor and the manager with a median of 4. However, spreading regarding leadership of the manager was larger (IQR 3-6 compared to an IQR of 3-4 for supervisors), indicating more variability in answers. This can be explained by respondents from hospital B most frequently answered this question with ‘no opinion’ for all measurement moments.

*Other job resources*

Other job resources was measured by both hospitals with four questions and experiences barely differed over time. Medians of all questions and measurement moments was 4 (IQR: 3-4), indicating more than half of the respondents are neutral towards or agreed with the statements about a nice work environment and effectively collaboration with division/hospital/external parties.

*Engaged leadership**Connecting*

Experiencing connecting leaders was measured by hospital A with one question and barely differed over time, indicating (totally) agreement towards a good relationship with the supervisor with a median of 4 (IQR: 4-5).

*Inspiring*

Experiences of inspiring leaders were measured by both hospitals with two questions, and these experiences barely differed over time, indicating a neutral opinion/agreement towards statements about a motivating supervisor and role model behaviors, with a median of 4 (IQR: 3-4). The item ‘my supervisor motivates me’ demonstrates a change in median over time (3 IQR: 3-4), indicating some fluctuations in the perceived leadership.

*Personal resources**Self-efficacy*

Self-efficacy was measured by hospital B with one question and barely differed over time, indicating a neutral opinion/agreement towards the statement 'I can effectively solve problems in my work', with a median of 4 (IQR: 3-4).

*Goal-directiveness*

Goal-directiveness was measured by hospital B with one question and barely differed over time, indicating a neutral opinion/agreement towards the statement 'I know what to do to achieve the aims within our teamwork', with a median of 4 (IQR: 3-4).

*Employee well-being**Boredom*

Boredom was measured by hospital A with one question and differ slightly over time. However, this can be explained by various answer options used. Measurements in 2020 and 2022 shows a median of 4 (IQR: 4-4), revealing unanimity and thus overall agreement that work is challenging in a good way. However, in 2021, the median dropped to 3 (IQR: 3-4), indicating more variability and suggesting that work was only regularly/often challenging. Still the most frequently given answer was 4, in 39.54% of the cases 'often' was answered.

*Burnout*

Burnout was measured by hospital A with one question on a 10-point rating scale (1: exhausted – 10: vital). Experiences barely differed over time from a mean of 6.5 in 2021 to a mean of 6.4 in 2022.

*Job satisfaction*

Job satisfaction was measured by hospital A and B with the same question. Experiences barely differed over time with a median of 4 (IQR: 4-5). Strikingly, answer 6 (no opinion or not applicable) was given least often for this question.

*Work engagement*

Work engagement was measured by hospital A with one question on a 10-point rating scale (1: disengaged – 10: engaged). Experiences slightly decreased over time from a mean of 7.14 in 2021 to a mean of 6.94 in 2022.

*Other employee well-being*

Hospital B measured one other question on employee well-being: 'I feel safe at work'. A median of 4 (IQR: 4-5) discovered for all questions and measurement moments, indicating (totally) agreement with this statement.

## *Outcomes*

### *Commitment-organization*

Commitment to the organization was measured by both hospitals with in total four questions, experiences barely differed over time. For all categorical questions a median of 4 (IQR: 3-4) revealed, indicating a neutral opinion/agreement towards the questions about 'working for this hospital makes me proud', 'like to do something extra for work' and 'the success of my hospital is important to me'.

The fourth item was a 10-point rating scale (1: bad – 10: good), asking to rate overall experience for working at hospital B. Means over time vary from 7.29-7.31.

### *Commitment-teams*

Commitment to the team was measured by hospital B with one question and experienced barely differ over time. A median of 4 (IQR: 3-4) discovered, indicating a neutral opinion/agreement towards the statement: 'I prioritize the team results above my own ambitions'.

### *Workability*

Work ability was measured by hospital A with one question and experiences barely differed over time. A median of 4 (IQR: 3-4) discovered, indicating a neutral opinion/agreement towards the statement: 'I can do my work without negative consequences'.

**Additional File 5**

Table G Stratification for age and function on possibilities for workload items

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
There is an acceptable workload	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	Age <30	4 (IQR 3-4) 1: 10 (1.76%) 2: 72 (12.65%) 3: 137 (24.08%) <b>4: 313 (55.01%)</b> 5: 36 (6.33%) 6: 1 (0.18%) Total 569		4 (IQR 3-4) 1: 21 (4.44%) 2: 87 (18.39%) 3: 121 (25.58%) <b>4: 208 (43.97%)</b> 5: 36 (7.61%) 6: 0 (0%) Total: 473				
		Age 30-39	4 (IQR 3-4) 1: 25 (2.66%) 2: 144 (15.30%) 3: 190 (20.19%) <b>4: 510 (54.20%)</b> 5: 72 (7.65%) 6: 0 (0%) Total: 941		4 (IQR 3-4) 1: 32 (4.10%) 2: 157 (20.10%) 3: 173 (22.15%) <b>4: 364 (46.61%)</b> 5: 55 (7.04%) 6: 0 (0%) Total 781				

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Age 40-49	4 (IQR 3-4) 1: 24 (2.47%) 2: 152 (15.67%) 3: 220 (22.68%) 4: <b>504 (51.96%)</b> 5: 70 (7.22%) 6: 0 (0%) Total: 970		4 (IQR 3-4) 1: 40 (4.29%) 2: 190 (20.39%) 3: 217 (23.29%) 4: <b>428</b> (45.92%) 5: 56 (6.01%) 6: 1 (0.11%) Total: 932				
		Age 50-59	4 (IQR 3-4) 1: 28 (2.39%) 2: 194 (16.54%) 3: 260 (22.17%) 4: <b>613 (52.26%)</b> 5: 77 (6.56%) 6: 1 (0.09%) Total: 1173		4 (IQR 3-4) 1: 46 (4.58%) 2: 170 (16.93%) 3: 243 (24.20%) 4: <b>465</b> (46.31%) 5: 80 (7.97%) 6: 0 (0%) Total: 1004				

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 60+			4 (IQR 3-4)		3 (IQR 2-4)				
			1: 11 (2.18%)		1: 21 (5.08%)				
			2: 72 (14.29%)		2: 86 (20.82%)				
			3: 124 (24.60%)		3: 100 (24.21%)				
			4: <b>243 (48.21%)</b>		4: <b>170 (41.16%)</b>				
			5: 54 (10.70%)		5: 35 (8.47%)				
			6: 0 (0%) Total: 504		6: 1 0.24% Total: 413				
Nursing & Care			4 (IQR 3-4)		3 (IQR 2-4)				
			1: 28 (3.14%)		1: 46 (6.02%)				
			2: 139 (15.58%)		2: 170 (22.25%)				
			3: 219 (24.55%)		3: 188 (24.61%)				
			4: <b>456 (51.12%)</b>		4: <b>315 (41.23%)</b>				
			5: 50 (5.60%)		5: 44 (5.76%)				
			6: 0 (0%) Total: 892		6: 1 (0.13%) Total: 764				

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)	
Clinical support			4 (IQR 3-4)	3 (IQR 2-4)	3 (IQR 2-4)					
			1: 6 (1.64%)	1: 16 (5.21%)	1: 16 (5.21%)					
			2: 41 (11.23%)	2: 91 (29.64%)	2: 91 (29.64%)					
			3: 82 (22.47%)	3: 70 (22.80%)	3: 70 (22.80%)					
			4: <b>208 (56.99%)</b>	4: <b>117 (38.11%)</b>	4: <b>117 (38.11%)</b>					
			5: 28 (7.67%)	5: 12 (3.91%)	5: 12 (3.91%)					
			6: 0 (0%)	6: 1 (0.32%)	6: 1 (0.32%)					
			Total: 365	Total: 307	Total: 307					
			4 (IQR 3-4)	4 (IQR 2-4)	4 (IQR 2-4)					
			1: 2 (0.72%)	1: 7 (3.26%)	1: 7 (3.26%)					
2: 29 (10.43%)	2: 48 (22.33%)	2: 48 (22.33%)								
3: 60 (21.58%)	3: 50 (23.26%)	3: 50 (23.26%)								
4: <b>171 (61.51%)</b>	4: <b>106 (49.30%)</b>	4: <b>106 (49.30%)</b>								
5: 16 (5.76%)	5: 4 (1.86%)	5: 4 (1.86%)								
6: 0 (0%)	6: 0 (0%)	6: 0 (0%)								
Total: 278	Total: 215	Total: 215								
Analytics			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)					
			1: 3 (1.34%)	1: 12 (5.24%)	1: 12 (5.24%)					
			2: 25 (11.21%)	2: 27 (11.79%)	2: 27 (11.79%)					
			3: 28 (12.56%)	3: 48 (20.96%)	3: 48 (20.96%)					
			4: <b>155 (69.51%)</b>	4: <b>124 (54.15%)</b>	4: <b>124 (54.15%)</b>					
			5: 10 (4.48%)	5: 18 (7.86%)	5: 18 (7.86%)					
			6: 0 (0%)	6: 0 (0%)	6: 0 (0%)					
Total: 223	Total: 229	Total: 229								

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Scientific research & education			4 (IQR 2-4)		3 (IQR 2-4)				
			1: 13 (4.50%)		1: 14 (5,76%)				
			2: 62 (21.45%)		2: 51 (20,99%)				
			3: 62 (21.45%)		3: 65 (26,75%)				
			<b>4: 120 (41.52%)</b>		<b>4: 85 (34,98%)</b>				
			5: 31 (10.72%)		5: 28 (11,52%)				
			6: 0 (0%)		6: 0 (0%)				
		Total: 289		Total: 243					
Management			4 (IQR 3-4)		4 (IQR 3-4)				
			1: 6 (2.67%)		1: 7 (3,20%)				
			2: 40 (17,78%)		2: 37 (16,89%)				
			3: 58 (25,78%)		3: 48 (21,92%)				
			<b>4: 92 (40,89%)</b>		<b>4: 104 47,49%)</b>				
			5: 27 (12%)		5: 23 (10,50%)				
			6: 0 (0%)		6: 0 (0%)				
		Total: 225		Total: 219					
Staff, administration, secretariat			4 (IQR 3-4)		4 (IQR 3-4)				
			1: 27 (2.39%)		1: 27 (2,72%)				
			2: 174 (15,40%)		2: 138				
			3: 258 (22,83%)		(13,93%)				
			<b>4: 586 (51,86%)</b>		3: 228				
			5: 85 (7,52%)		(23,01%)				
			6: 0 (0%)		<b>4: 517</b>				
		Total: 1130		<b>(52,17%)</b>					
				5: 81 (8,17%)					
				6: 0 (0%)					
				Total: 991					

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Facility			4 (IQR 3-4)		4 (IQR 3-4)				
			1: 3 (0.80%)		1: 11 (3.67%)				
			2: 44 (11.70%)		2: 37 (12.33%)				
			3: 75 (19.95%)		3: 64 (21.33%)				
			<b>4: 215 (57.18%)</b>		<b>4: 163 (54.33%)</b>				
			5: 39 (10.37%)		5: 25 (8.33%)				
			6: 0 (0%) Total: 376		6: 0 (0%) Total: 300				
Resident physicians			4 (IQR 3-4)		3 (IQR 2-4)				
			1: 0 (0%)		1: 4 (6.45%)				
			2: 8 (10.96%)		2: 16 (25.81%)				
			3: 19 (26.03%)		3: 14 (22.58%)				
			<b>4: 43 (58.90%)</b>		<b>4: 26 (41.94%)</b>				
			5: 3 (4.11%)		5: 2 (3.23%)				
			6: 0 (0%) Total: 73		6: 0 (0%) Total: 62				
Medical specialists			3 (IQR 2-4)		3 (IQR 2-4)				
			1: 9 (3.45%)		1: 16 (6.61%)				
			2: 68 (26.05%)		2: 66 (27.27%)				
			3: 63 (24.14%)		<b>3: 73 (30.17%)</b>				
			<b>4: 106 (40.61%)</b>		4: 68 (28.10%)				
			5: 15 (5.75%)		5: 19 (7.85%)				
			6: 0 (0%) Total: 261		6: 0 (0%) Total: 242				

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)		
I have too much work	(1) never; (2) sometimes; (3) regularly; (4) often; (5) always; (6) I don't know	Age <30	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)		
			1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	1: 25 (4,50%)	
			2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	2: 68 (12,23%)	
			3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	3: 119 (21,40%)	
			<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>	<b>4: 265 (47,66%)</b>
			5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)	5: 77 (13,85%)
			6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)	6: 2 (0,36%)
			Total: 556	Total: 556	Total: 556	Total: 556	Total: 556	Total: 556	Total: 556	Total: 556	Total: 556
			Age 30-39	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)	1: 50 (5,44%)
2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)	2: 149 (16,21%)			
3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)	3: 215 (23,39%)			
<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>	<b>4: 425 (46,25%)</b>			
5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)	5: 74 (8,05%)			
6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)	6: 6 (0,65%)			
Total: 919	Total: 919	Total: 919	Total: 919	Total: 919	Total: 919	Total: 919	Total: 919	Total: 919			
Age 40-49	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)	4 (IQR 2-4)		
1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)	1: 95 (8,90%)		
2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)	2: 180 (16,87%)		
3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)	3: 241 (22,59%)		
<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>	<b>4: 471 (44,14%)</b>		
5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)	5: 78 (7,31%)		
6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)	6: 2 (0,19%)		
Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067	Total: 1067		

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Age 50-59		4 (IQR 3-4)					
				1: 96 (8,73%)					
				2: 160 (14,55%)					
				3: 272 (24,73%)					
				<b>4: 501 (45,55%)</b>					
				5: 67 (6,09%)					
				6: 4 (0,36%)					
				Total: 1100					
		Age 60+		4 (IQR 3-4)					
				1: 28 (6,09%)					
				2: 66 (14,35%)					
				3: 108 (23,48%)					
				<b>4: 218 (47,39%)</b>					
				5: 36 (7,83%)					
				6: 4 (0,87%)					
				Total: 460					
		Nursing & Care		4 (IQR 3-4)					
				1: 26 (2,99%)					
				2: 146 (16,76%)					
				3: 249 (28,59%)					
				<b>4: 402 (46,15%)</b>					
				5: 45 (5,17%)					
				6: 3 (0,34%)					
				Total: 871					

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Clinical support				4 (IQR 3-4)					
				1: 9 (2,68%)					
				2: 26 (7,74%)					
				3: 70 (20,83%)					
				<b>4: 185 (55,06%)</b>					
				5: 44 (13,10%)					
			6: 2 (0,60%)						
			Total: 336						
Clinical (co) treating				4 (IQR 3-4)					
				1: 18 (7,20%)					
				2: 33 (13,20%)					
				3: 63 (25,20%)					
				<b>4: 115 (46,00%)</b>					
				5: 21 (8,40%)					
			6: 0 (0%)						
			Total: 250						
Analytics				4 (IQR 3-4)					
				1: 11 (3,97%)					
				2: 23 (8,30%)					
				3: 37 (13,36%)					
				<b>4: 173 (62,45%)</b>					
				5: 29 (10,47%)					
			6: 4 (1,44%)						
			Total: 277						

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Scientific research & education				3 (IQR 2-4)					
				1: 61 (19,87%)					
				2: 60 (19,54%)					
				3: 63 (20,52%)					
				<b>4: 101 (32,90%)</b>					
				5: 20 (6,51%)					
			6: 2 (0,65%)						
			Total: 307						
Management				4 (IQR 3-4)					
				1: 24 (0,11%)					
				2: 42 (19,27%)					
				3: 54 (24,77%)					
				<b>4: 84 (38,53%)</b>					
				5: 13 (5,96%)					
			6: 1 (0,46%)						
			Total: 218						
Staff, administration, secretariat				4 (IQR 3-4)					
				1: 74 (6,70%)					
				2: 165 (14,95%)					
				3: 253 (22,92%)					
				<b>4: 508 (46,01%)</b>					
				5: 99 (8,97%)					
			6: 5 (0,45%)						
			Total: 1104						

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Facility									
			4(IQR 3-4)						
			1: 22 (5,95%)						
			2: 41 (11,08%)						
			3: 80 (21,62%)						
			<b>4: 187 (50,54%)</b>						
			5: 39 (10,54%)						
			6: 1 (0,27%)						
			Total: 370						
Resident physicians									
			3 (IQR 2-4)						
			1: 5 (6,67%)						
			2: 17 (22,67%)						
			3: 17 (22,67%)						
			<b>4: 32 (42,67%)</b>						
			5: 4 (5,33%)						
			6: 0 (0%)						
			Total: 75						
Medical specialists									
			3 (IQR 2-4)						
			1: 41 (16,14%)						
			2: 63 (24,80%)						
			3: 66 (25,98%)						
			<b>4: 79 (31,10%)</b>						
			5: 5 (1,97%)						
			6: 0 (0%)						
			Total: 254						

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
I think my workload is on an average base much, (3) too much, (4) way less, (5) too less, (6) appropriate; (6) no opinion		Age <30	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 41 (3,95%)	1: 39 (4,30%)	1: 36 (3,88%)	1: 36 (3,88%)	1: 39 (4,30%)	1: 27 (2,94%)	
			2: 257 (24,74%)	2: 223 (24,03%)	2: 257 (24,74%)	2: 223 (24,03%)	2: 235 (25,91%)	2: 227 (24,70%)	
			3: 61 (5,87%)	3: 41 (4,42%)	3: 61 (5,87%)	3: 41 (4,42%)	3: 45 (4,96%)	3: 51 (5,55%)	
			4: 5 (0,48%)	4: 4 (0,43%)	4: 5 (0,48%)	4: 4 (0,43%)	4: 4 (0,44%)	4: 4 (0,44%)	
			<b>5: 656 (63,14%)</b>	<b>5: 604 (65,09%)</b>	<b>5: 656 (63,14%)</b>	<b>5: 604 (65,09%)</b>	<b>5: 572 (63,07%)</b>	<b>5: 592 (64,42%)</b>	
			6: 19 (1,83%)	6: 12 (1,32%)	6: 19 (1,83%)	6: 12 (1,32%)	6: 18 (1,96%)	6: 18 (1,96%)	
			Total: 1039	Total: 907	Total: 1039	Total: 907	Total: 919	Total: 919	
			6: 20 (2,16%)	6: 20 (2,16%)	6: 20 (2,16%)	6: 20 (2,16%)	6: 20 (2,16%)	6: 20 (2,16%)	
			Total: 928	Total: 928	Total: 928	Total: 928	Total: 928	Total: 928	
Age 30-39			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 65 (5,62%)	1: 64 (5,73%)	1: 65 (5,62%)	1: 64 (5,73%)	1: 52 (4,54%)	1: 62 (5,32%)	
			2: 368 (31,81%)	2: 366 (32,80%)	2: 368 (31,81%)	2: 366 (32,80%)	2: 339 (29,07%)	2: 339 (29,07%)	
			3: 50 (4,32%)	3: 45 (4,03%)	3: 50 (4,32%)	3: 45 (4,03%)	3: 357 (31,15%)	3: 40 (3,43%)	
			4: 3 (0,26%)	4: 3 (0,26%)	4: 3 (0,26%)	4: 3 (0,26%)	4: 5 (0,44%)	4: 7 (0,60%)	
			<b>5: 654 (56,53%)</b>	<b>5: 608 (54,48%)</b>	<b>5: 654 (56,53%)</b>	<b>5: 608 (54,48%)</b>	<b>5: 670 (58,46%)</b>	<b>5: 697 (59,78%)</b>	
			6: 17 (1,47%)	6: 19 (1,66%)	6: 17 (1,47%)	6: 19 (1,66%)	6: 21 (1,80%)	6: 21 (1,80%)	
			Total: 1157	Total: 1146	Total: 1157	Total: 1146	Total: 1166	Total: 1166	
			6: 27 (2,42%)	6: 27 (2,42%)	6: 27 (2,42%)	6: 27 (2,42%)	6: 27 (2,42%)	6: 27 (2,42%)	
			Total: 1116	Total: 1116	Total: 1116	Total: 1116	Total: 1116	Total: 1116	



Table G Stratification for age and function on possibilities for workload items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 40-49								
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 63 (6,40%)	1: 68 (6,97%)	1: 67 (6,50%)	1: 74 (7,23%)	1: 74 (7,23%)	1: 74 (7,23%)
			2: 316 (32,08%)	2: 309 (31,66%)	2: 365 (35,44%)	2: 365 (35,44%)	2: 348 (34,02%)	2: 348 (34,02%)
			3: 19 (1,93%)	3: 19 (1,93%)	3: 16 (1,55%)	3: 17 (1,66%)	3: 17 (1,66%)	3: 17 (1,66%)
			4: 7 (0,71%)	4: 7 (0,71%)	4: 5 (0,49%)	4: 2 (0,20%)	4: 2 (0,20%)	4: 2 (0,20%)
			<b>5: 552 (56,04%)</b>	<b>5: 552 (2,46%)</b>	<b>5: 555 (53,88%)</b>	<b>5: 557 (54,45%)</b>	<b>5: 557 (54,45%)</b>	<b>5: 557 (54,45%)</b>
			6: 28 (2,84%)	6: 28 (2,84%)	6: 22 (2,14%)	6: 22 (2,14%)	6: 22 (2,14%)	6: 22 (2,14%)
			Total: 985	Total: 985	Total: 1030	Total: 1030	Total: 1023	Total: 1023
			6: 27 (2,77%)	6: 27 (2,77%)	6: 27 (2,77%)	6: 27 (2,77%)	6: 27 (2,77%)	6: 27 (2,77%)
			Total: 976	Total: 976	Total: 976	Total: 976	Total: 976	Total: 976
Age 50-59								
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 96 (8,67%)	1: 76 (7,08%)	1: 58 (5,44%)	1: 58 (5,35%)	1: 58 (5,35%)	1: 58 (5,35%)
			2: 331 (29,90%)	2: 332 (30,91%)	2: 317 (29,74%)	2: 353 (32,53%)	2: 353 (32,53%)	2: 353 (32,53%)
			3: 22 (1,99%)	3: 22 (1,99%)	3: 11 (1,03%)	3: 14 (1,29%)	3: 14 (1,29%)	3: 14 (1,29%)
			4: 6 (0,54%)	4: 6 (0,54%)	4: 3 (0,28%)	4: 2 (0,18%)	4: 2 (0,18%)	4: 2 (0,18%)
			<b>5: 632 (57,09%)</b>	<b>5: 632 (2,51%)</b>	<b>5: 655 (61,44%)</b>	<b>5: 625 (57,60%)</b>	<b>5: 625 (57,60%)</b>	<b>5: 625 (57,60%)</b>
			6: 20 (1,81%)	6: 20 (1,81%)	6: 22 (2,06%)	6: 22 (2,06%)	6: 22 (2,06%)	6: 22 (2,06%)
			Total: 1107	Total: 1107	Total: 1066	Total: 1085	Total: 1085	Total: 1085
			6: 23 (2,14%)	6: 23 (2,14%)	6: 23 (2,14%)	6: 23 (2,14%)	6: 23 (2,14%)	6: 23 (2,14%)
			Total: 1074	Total: 1074	Total: 1066	Total: 1085	Total: 1085	Total: 1085

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 60+									
			5 (IQR 2-5) 1: 24 (4,99%) 2: 139 (28,90%) 3: 12 (2,49%) 4: 1 (0,21%) <b>5: 286</b> (59,46%) 6: 19 (3,95%) Total: 481	5 (IQR 2-5) 1: 18 (4,03%) 2: 114 (25,56%) 3: 8 (1,79%) 4: 0 (0%) <b>5: 288</b> (64,57%) 6: 14 (3,22%) Total: 435	5 (IQR 2-5) 1: 25 (7,13%) 2: 107 (24,60%) 3: 6 (1,38%) 4: 0 (0%) <b>5: 277</b> (63,68%) 6: 14 (3,22%) Total: 412	5 (IQR 2-5) 1: 25 (3,11%) 2: 214 (26,65%) 3: 29 (3,61%) 4: 3 (0,37%) <b>5: 528</b> (65,75%) 6: 4 (0,50%) Total: 803	5 (IQR 2-5) 1: 28 (3,48%) 2: 211 (26,24%) 3: 29 (3,61%) 4: 1 (0,12%) <b>5: 525 (65,30%)</b> 6: 10 (1,24%) Total: 804	Total: 446	Total: 446
Nursing & Care									
			5 (IQR 2-5) 1: 33 (4,02%) 2: 253 (30,82%) 3: 33 (4,02%) 4: 1 (0,12%) <b>5: 493</b> (60,04%) 6: 8 (0,97%) Total: 821	5 (IQR 2-5) 1: 28 (3,86%) 2: 197 (27,13%) 3: 26 (3,58%) 4: 0 (0%) <b>5: 469</b> (64,60%) 6: 6 (0,83%) Total: 726	5 (IQR 2-5) 1: 28 (3,11%) 2: 214 (26,65%) 3: 29 (3,61%) 4: 3 (0,37%) <b>5: 528</b> (65,75%) 6: 10 (1,24%) Total: 804	5 (IQR 2-5) 1: 28 (3,48%) 2: 211 (26,24%) 3: 29 (3,61%) 4: 1 (0,12%) <b>5: 525 (65,30%)</b> 6: 10 (1,24%) Total: 804	Total: 821	Total: 821	

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Clinical support									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 26 (6,22%)	1: 20	1: 20	1: 24 (5,77%)	1: 24 (5,77%)	1: 26 (6,31%)	1: 26 (6,31%)
			2: 142	2: 142	2: 142	2: 130	2: 130	2: 125 (30,34%)	2: 125 (30,34%)
			(33,97%)	(33,97%)	(33,97%)	(31,25%)	(31,25%)	3: 13 (3,16%)	3: 13 (3,16%)
			3: 17 (4,07%)	3: 17 (4,07%)	3: 17 (4,07%)	3: 16 (3,85%)	3: 16 (3,85%)	4: 2 (0,49%)	4: 2 (0,49%)
			4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 2 (0,48%)	4: 2 (0,48%)	5: 237 (57,52%)	5: 237 (57,52%)
			5: 226	5: 226	5: 226	5: 239	5: 239	6: 9 (2,18%)	6: 9 (2,18%)
			(54,07%)	(54,07%)	(54,07%)	(57,45%)	(57,45%)	Total: 412	Total: 412
			6: 7 (1,67%)	6: 7 (1,67%)	6: 7 (1,67%)	6: 5 (1,20%)	6: 5 (1,20%)	Total: 416	Total: 416
			Total: 418	Total: 418	Total: 418	(56,88%)	(56,88%)	6: 13	6: 13
								(3,38%)	(3,38%)
								Total: 385	Total: 385
Clinical (co) treating									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 19 (6,15%)	1: 32	1: 32	1: 15 (4,48%)	1: 15 (4,48%)	1: 19 (5,46%)	1: 19 (5,46%)
			2: 107	2: 107	2: 107	2: 108	2: 108	2: 117 (33,62%)	2: 117 (33,62%)
			(34,63%)	(34,63%)	(34,63%)	(32,24%)	(32,24%)	3: 12 (3,45%)	3: 12 (3,45%)
			3: 13 (4,21%)	3: 13 (4,21%)	3: 13 (4,21%)	3: 12 (3,58%)	3: 12 (3,58%)	4: 2 (0,57%)	4: 2 (0,57%)
			4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 1 (0,30%)	4: 1 (0,30%)	5: 190 (54,60%)	5: 190 (54,60%)
			5: 167	5: 167	5: 167	5: 192	5: 192	6: 8 (2,30%)	6: 8 (2,30%)
			(54,05%)	(54,05%)	(54,05%)	(57,31%)	(57,31%)	Total: 348	Total: 348
			6: 3 (0,97%)	6: 3 (0,97%)	6: 3 (0,97%)	6: 7 (2,09%)	6: 7 (2,09%)	Total: 335	Total: 335
			Total: 309	Total: 309	Total: 309	(54,08%)	(54,08%)	6: 8 (2,42%)	6: 8 (2,42%)
								Total: 331	Total: 331

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
			Sept 2020 (4157)	Dec 2021 (4102)	July 2022 (3603)	Sept 2020 (5056)	Jan 2022 (4842)	May 2022 (4894)	May 2023 (4895)
Analytics									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 29 (6,84%)	1: 13 (3,47%)	1: 15 (3,59%)	1: 11 (2,80%)	1: 15 (3,59%)	1: 15 (3,59%)	1: 15 (3,59%)
			2: 107 (25,24%)	2: 115 (30,67%)	2: 101 (25,70%)	2: 101 (25,70%)	2: 105 (25,12%)	2: 101 (25,70%)	2: 105 (25,12%)
			3: 21 (4,95%)	3: 16 (4,27%)	3: 9 (2,29%)	3: 9 (2,29%)	3: 16 (3,83%)	3: 9 (2,29%)	3: 16 (3,83%)
			4: 5 (1,18%)	4: 1 (0,27%)	4: 4 (1,02%)	4: 4 (1,02%)	4: 5 (1,20%)	4: 4 (1,02%)	4: 5 (1,20%)
			5: 248 (58,49%)	5: 218 (58,13%)	5: 268 (64,11%)	5: 256 (65,14%)	5: 268 (64,11%)	5: 256 (65,14%)	5: 268 (64,11%)
			6: 14 (3,30%)	6: 12 (3,05%)	6: 9 (2,15%)	6: 12 (3,05%)	6: 9 (2,15%)	6: 12 (3,05%)	6: 9 (2,15%)
			Total: 424	Total: 393	Total: 418	Total: 393	Total: 418	Total: 393	Total: 418
			6: 12 (3,20%)	6: 12 (3,20%)	6: 12 (3,20%)	6: 12 (3,20%)	6: 12 (3,20%)	6: 12 (3,20%)	6: 12 (3,20%)
			Total: 375	Total: 375	Total: 375	Total: 375	Total: 375	Total: 375	Total: 375
Scientific research & education									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 27 (7,24%)	1: 31 (8,01%)	1: 32 (7,96%)	1: 20 (5,59%)	1: 32 (7,96%)	1: 20 (5,59%)	1: 32 (7,96%)
			2: 133 (35,66%)	2: 150 (38,76%)	2: 134 (33,33%)	2: 155 (43,30%)	2: 134 (33,33%)	2: 155 (43,30%)	2: 134 (33,33%)
			3: 3 (0,80%)	3: 2 (0,52%)	3: 3 (0,75%)	3: 8 (2,23%)	3: 3 (0,75%)	3: 8 (2,23%)	3: 3 (0,75%)
			4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)
			5: 204 (54,69%)	5: 200 (51,68%)	5: 224 (55,72%)	5: 169 (47,21%)	5: 224 (55,72%)	5: 169 (47,21%)	5: 224 (55,72%)
			6: 6 (1,61%)	6: 6 (1,68%)	6: 6 (1,68%)	6: 6 (1,68%)	6: 6 (1,68%)	6: 6 (1,68%)	6: 6 (1,68%)
			Total: 373	Total: 358	Total: 387	Total: 358	Total: 387	Total: 358	Total: 387



Table G Stratification for age and function on possibilities for workload items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Management								
			5 (IQR 2-5) 1: 10 (4,88%) 2: 66 (32,20%) 3: 3 (1,46%) 4: 0 (0%) <b>5: 125</b> <b>(60,98%)</b> 6: 1 (0,49%) Total: 205		5 (IQR 2-5) 1: 12 (6,09%) 2: 67 (34,01%) 3: 3 (1,52%) 4: 1 (0,50%) <b>5: 109</b> <b>(53,33%)</b> 6: 6 (3,05%) Total: 197	5 (IQR 2-5) 1: 20 (10,05%) 2: 66 (33,17%) 3: 1 (0,50%) 4: 1 (0,50%) <b>5: 107</b> <b>(53,77%)</b> 6: 4 (2,01%) Total: 199	5 (IQR 2-5) 1: 14 (8,09%) 2: 59 (34,10%) 3: 3 (1,73%) 4: 0 (0%) <b>5: 96 (55,49%)</b> 6: 1 (0,58%) Total: 173	
Staff, administration, secretariat								
			5 (IQR 2-5) 1: 67 (6,03%) 2: 295 (26,55%) 3: 37 (3,33%) 4: 9 (0,81%) <b>5: 677</b> <b>(60,94%)</b> 6: 26 (2,34%) Total: 1111		5 (IQR 2-5) 1: 59 (5,29%) 2: 294 (26,34%) 3: 36 (3,23%) <b>5: 696</b> <b>(61,81%)</b> 6: 23 (2,04%) Total: 1116	5 (IQR 2-5) 1: 68 (6,04%) 2: 306 (27,18%) 3: 27 (2,40%) 4: 6 (0,53%) <b>5: 696</b> <b>(61,81%)</b> 6: 23 (2,04%) Total: 1126	5 (IQR 2-5) 1: 64 (5,63%) 2: 320 (28,17%) 3: 31 (2,73%) 4: 3 (0,26%) <b>5: 679 (59,77%)</b> 6: 39 (3,43%) Total: 1136	

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B
			Sept 2020 (4157)	Dec 2021 (4102)	July 2022 (3603)	Sept 2020 (5056)	Jan 2022 (4842)	May 2022 (4894)	May 2023 (4895)
Facility									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 42 (6,40%)	1: 42 (7,06%)	1: 47 (7,86%)	1: 42 (6,40%)	1: 42 (7,06%)	1: 34 (5,96%)	1: 34 (5,96%)
			2: 165 (25,15%)	2: 141 (23,58%)	2: 165 (25,15%)	2: 165 (25,15%)	2: 164 (27,56%)	2: 169 (29,65%)	2: 169 (29,65%)
			3: 21 (3,20%)	3: 18 (3,01%)	3: 21 (3,20%)	3: 21 (3,20%)	3: 17 (2,86%)	3: 12 (2,11%)	3: 12 (2,11%)
			4: 5 (0,76%)	4: 5 (0,84%)	4: 5 (0,76%)	4: 5 (0,76%)	4: 2 (0,34%)	4: 5 (0,88%)	4: 5 (0,88%)
			<b>5: 394 (60,06%)</b>	<b>5: 361 (60,37%)</b>	<b>5: 394 (60,06%)</b>	<b>5: 394 (60,06%)</b>	<b>5: 343 (57,65%)</b>	<b>5: 334 (58,60%)</b>	<b>5: 334 (58,60%)</b>
			6: 29 (4,42%)	6: 27 (4,54%)	6: 29 (4,42%)	6: 29 (4,42%)	6: 27 (4,54%)	Total: 570	Total: 570
			Total: 656	Total: 595	Total: 656	Total: 656	Total: 595	Total: 595	Total: 595
			6: 26 (4,35%)	6: 26 (4,35%)	6: 26 (4,35%)	6: 26 (4,35%)	6: 26 (4,35%)	Total: 598	Total: 598
Resident physicians									
			5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)	5 (IQR 2-5)
			1: 10 (5,56%)	1: 4 (2,56%)	1: 10 (5,56%)	1: 10 (5,56%)	1: 1 (0,75%)	1: 7 (4,70%)	1: 7 (4,70%)
			2: 52 (28,89%)	2: 55 (35,26%)	2: 52 (28,89%)	2: 52 (28,89%)	2: 50 (37,59%)	2: 39 (26,17%)	2: 39 (26,17%)
			3: 9 (5,00%)	3: 4 (2,56%)	3: 9 (5,00%)	3: 9 (5,00%)	3: 1 (0,75%)	3: 4 (2,68%)	3: 4 (2,68%)
			4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)
			<b>5: 107 (59,44%)</b>	<b>5: 93 (60,06%)</b>	<b>5: 107 (59,44%)</b>	<b>5: 107 (59,44%)</b>	<b>5: 81 (60,90%)</b>	<b>5: 98 (65,77%)</b>	<b>5: 98 (65,77%)</b>
			6: 2 (1,11%)	6: 0 (0%)	6: 2 (1,11%)	6: 2 (1,11%)	6: 0 (0%)	6: 1 (0,67%)	6: 1 (0,67%)
			Total: 180	Total: 156	Total: 180	Total: 180	Total: 156	Total: 149	Total: 149
			Total: 180	Total: 133	Total: 180	Total: 180	Total: 133	Total: 133	Total: 133

Table G Stratification for age and function on possibilities for workload items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Medical specialists									
			3 (IQR 2-5)	2 (IQR 2-5)	2 (IQR 2-5)	3 (IQR 2-5)	2 (IQR 2-5)	2 (IQR 2-5)	2 (IQR 2-5)
			1: 30 (9,29%)	1: 26 (7,65%)	1: 26 (7,65%)	1: 31 (9,75%)	1: 31 (9,75%)	1: 27 (10,15%)	1: 27 (10,15%)
			2: 131 (40,56%)	2: 145 (42,65%)	2: 145 (42,65%)	2: 137 (43,08%)	2: 137 (43,08%)	2: 107 (40,23%)	2: 107 (40,23%)
			3: 6 (1,86%)	3: 9 (2,65%)	3: 6 (1,86%)	3: 4 (1,26%)	3: 4 (1,26%)	3: 5 (1,88%)	3: 5 (1,88%)
			4: 2 (0,62%)	4: 0 (0%)	4: 2 (0,62%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)	4: 0 (0%)
			<b>5: 152 (47,06%)</b>	<b>5: 155 (45,59%)</b>	<b>5: 152 (47,06%)</b>	<b>5: 144 (45,28%)</b>	<b>5: 144 (45,28%)</b>	<b>5: 125 (46,99%)</b>	<b>5: 125 (46,99%)</b>
			6: 2 (0,62%)	6: 2 (0,63%)	6: 2 (0,63%)	6: 2 (0,63%)	6: 2 (0,63%)	6: 2 (0,63%)	6: 2 (0,63%)
			Total: 323	Total: 323	Total: 318	Total: 318	Total: 318	Total: 266	Total: 266
									Total: 340

Table H Stratification for age and function on possibilities for learning and development items

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
I am given the opportunity to develop	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) not applicable	Age <30	4 (IQR 3-4)	4 (IQR 4-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 5 (0,88%)	1: 4 (0,85%)	1: 4 (0,88%)	1: 21 (2,69%)	1: 4 (0,85%)	1: 21 (2,69%)	1: 4 (0,85%)
			2: 44 (7,73%)	2: 37 (7,82%)	2: 44 (7,73%)	2: 86	2: 37 (7,82%)	2: 86	2: 44 (7,73%)
			3: 104 (18,28%)	3: 73	3: 104 (18,28%)	(11,01%)	3: 73	(11,01%)	3: 104 (18,28%)
			4: 278	(15,43%)	4: 278	3: 176	(15,43%)	3: 176	4: 278
			<b>48,86%</b>	<b>4: 256</b>	<b>48,86%</b>	(22,54%)	<b>4: 256</b>	(22,54%)	<b>48,86%</b>
			5: 136 (23,90%)	<b>(54,12%)</b>	5: 136 (23,90%)	<b>4: 357</b>	<b>(54,12%)</b>	<b>4: 357</b>	5: 136 (23,90%)
			6: 2 (0,35%)	5: 103	6: 2 (0,35%)	<b>(45,71%)</b>	5: 103	<b>(45,71%)</b>	6: 2 (0,35%)
			Total: 569	(21,78%)	Total: 569	5: 141	(21,78%)	5: 141	Total: 569
			Total: 473	6: 0 (0%)	Total: 473	(18,05%)	6: 0 (0%)	(18,05%)	Total: 473
			Total: 781						
		Age 30-39	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	
			1: 17 (1,81%)	1: 21 (2,69%)	1: 17 (1,81%)	1: 21 (2,69%)	1: 17 (1,81%)	1: 21 (2,69%)	
			2: 72 (7,65%)	2: 86	2: 72 (7,65%)	2: 86	2: 72 (7,65%)	2: 86	
			3: 176 (18,70%)	(11,01%)	3: 176 (18,70%)	(11,01%)	3: 176 (18,70%)	3: 176 (18,70%)	
			4: 483	3: 176	4: 483	3: 176	4: 483	4: 483	
			<b>(51,32%)</b>	(22,54%)	<b>(51,32%)</b>	(22,54%)	<b>(51,32%)</b>	<b>(51,32%)</b>	
			5: 192 (20,40%)	<b>4: 357</b>	5: 192 (20,40%)	<b>4: 357</b>	5: 192 (20,40%)	5: 192 (20,40%)	
			6: 1 (0,11%)	<b>(45,71%)</b>	6: 1 (0,11%)	<b>(45,71%)</b>	6: 1 (0,11%)	6: 1 (0,11%)	
			Total: 941	5: 141	Total: 941	5: 141	Total: 941	Total: 941	
				(18,05%)		(18,05%)		(18,05%)	
				6: 0 (0%)		6: 0 (0%)		6: 0 (0%)	
				Total: 781		Total: 781		Total: 781	

Table H Stratification for age and function on possibilities for learning and development items (*Continued*)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Age 40-49	4 (IQR 3-4) 1: 21 (2,16%) 2: 92 (9,48%) 3: 197 (20,31%) 4: 473 (48,76%) 5: 186 (19,18%) 6: 1 (0,10%) Total: 970		4 (IQR 3-4) 1: 18 (1,93%) 2: 114 (12,23%) 3: 194 (20,82%) 4: 440 (47,21%) 5: 163 (17,49%) 6: 3 (0,32%) Total: 932				
		Age 50-59	4 (IQR 3-4) 1: 18 (1,53%) 2: 102 (8,70%) 3: 270 (23,02%) 4: 583 (49,70%) 5: 199 (16,97%) 6: 1 (0,09%) Total: 1173		4 (IQR 3-4) 1: 32 (3,19%) 2: 105 (10,46%) 3: 240 (23,90%) 4: 477 (47,51%) 5: 147 (14,64%) 6: 3 (0,30%) Total: 1004				

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 60+		4 (IQR 3-4)			4 (IQR 3-4)				
		1: 6 (1,19%)			1: 7 (1,69%)				
		2: 30 (5,95%)			2: 35 (8,47%)				
		3: 144 (28,57%)			3: 111 (26,88%)				
		<b>4: 245</b>			<b>4: 188</b>				
		5: 76 (15,08%)			<b>(45,52%)</b>				
		6: 3 (0,60%)			5: 67 (16,22%)				
		Total: 504			6: 4 (0,97%)				
					Total: 413				
	Nursing & Care		x (IQR x-x)			4 (IQR 3-4)			
		1: 14 (1,57%)			1: 9 (1,18%)				
		2: 69 (7,74%)			2: 67 (8,77%)				
		3: 184 (20,63%)			3: 164 (21,47%)				
		<b>4: 450</b>			<b>4: 413</b>				
		5: 174 (19,51%)			<b>(54,06%)</b>				
		6: 1 (0,11%)			5: 109 (14,27%)				
		Total: 892			6: 2 (0,26%)				
				Total: 764					

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Clinical support			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)				
			1: 10 (2,74%)	1: 20 (6,51%)	1: 20 (6,51%)				
			2: 43 (11,78%)	2: 47	2: 47				
			3: 111 (30,41%)	3: 111 (30,41%)	3: 83 (15,31%)				
			4: 163 (44,66%)	4: 163 (44,66%)	3: 83 (27,04%)				
			5: 37 (10,14%)	5: 37 (10,14%)	4: 131 (42,67%)				
			6: 1 (0,27%)	6: 1 (0,27%)	5: 21 (6,84%)				
		Total: 365	Total: 365	6: 5 (1,63%)					
				Total: 307					
Clinical (co) treating			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)				
			1: 2 (0,72%)	1: 2 (0,72%)	1: 7 (3,26%)				
			2: 20 (7,19%)	2: 20 (7,19%)	2: 39 (18,14%)				
			3: 60 (21,58%)	3: 60 (21,58%)	3: 61 (28,37%)				
			4: 151 (54,32%)	4: 151 (54,32%)	4: 86 (40,00%)				
			5: 45 (16,19%)	5: 45 (16,19%)	5: 22 (10,23%)				
			6: 0 (0%)	6: 0 (0%)	6: 0 (0%)				
		Total: 278	Total: 278	Total: 215					

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Analytics			4 (IQR 3-4)	3 (IQR 3-4)					
			1: 8 (3,59%)	1: 10 (4,37%)					
			2: 36 (16,14%)	2: 40					
			3: 67 (30,04%)	(17,47%)					
			<b>4: 95 (42,60%)</b>	3: 74					
			5: 16 (7,17%)	(32,31%)					
			6: 1 (0,45%) Total: 223	<b>4: 87</b> <b>(37,99%)</b>					
Scientific research & education			4 (IQR 3-4)	4 (IQR 4-5)					
			1: 4 (1,38%)	1: 5 (2,06%)					
			2: 15 (5,19%)	2: 19 (7,82%)					
			3: 41 (14,19%)	3: 33					
			<b>4: 133</b> <b>(46,02%)</b>	(13,58%)					
			5: 94 (32,52%)	<b>4: 112</b> <b>(46,09%)</b>					
			6: 2 (0,69%) Total: 289	5: 73 (30,04%)					
			6: 1 (0,41%) Total: 243						

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Management			4 (IQR 4-5)		4 (IQR 4-5)				
			1: 0 (0%)		1: 1 (0,46%)				
			2: 5 (2,22%)		2: 12 (5,48%)				
			3: 30 (13,33%)		3: 22				
			4: 120		(10,05%)				
			(53,33%)		4: 113				
			5: 70 (31,11%)		(51,60%)				
			6: 0 (0%)		5: 71				
			Total: 225		(32,42%)				
					6: 0 (0%)				
				Total: 219					
Staff, administration, secretariat			4 (IQR 3-4)		4 (IQR 3-4)				
			1: 16 (1,42%)		1: 14 (1,41%)				
			2: 93 (8,23%)		2: 94 (9,49%)				
			3: 259 (22,92%)		3: 235				
			4: 567		(23,71%)				
			(50,18%)		4: 478				
			5: 195 (17,26%)		(48,23%)				
			6: 0 (0%)		5: 168				
			Total: 1130		(16,95%)				
					6: 2 (0,20%)				
				Total: 991					

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Facility			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)				
			1: 10 (2,66%)	1: 8 (2,67%)	1: 8 (2,67%)				
			2: 35 (9,31%)	2: 31	2: 31				
			3: 79 (21,01%)	3: 79 (21,01%)	(10,33%)				
			4: 180	4: 180	3: 54				
			(47,87%)	(47,87%)	(18,00%)				
			5: 72 (19,15%)	5: 72 (19,15%)	4: 147				
		6: 0 (0%)	6: 0 (0%)	(49,00%)					
		Total: 376	Total: 376	(19,67%)					
				6: 1 (0,33%)					
				Total: 300					
Resident physicians			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)				
			1: 0 (0%)	1: 0 (0%)	1: 0 (0%)				
			2: 0 (0%)	2: 0 (0%)	2: 5 (8,06%)				
			3: 8 (10,95%)	3: 8 (10,95%)	3: 13				
			4: 49 (67,12%)	4: 49 (67,12%)	(20,97%)				
			5: 15 (20,55%)	5: 15 (20,55%)	4: 32				
			6: 1 (1,37%)	6: 1 (1,37%)	(51,61%)				
		Total: 73	Total: 73	5: 12					
				(19,35%)					
				6: 0 (0%)					
				Total: 62					

Tabel H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Medical specialists	4 (IQR: 3-4) 1: 3 (1,15%) 2: 23 (8,81%) 3: 43 (16,48%) <b>4: 132</b> (50,57%) 5: 60 (22,99%) 6: 0 (0%) Total: 261		4 (IQR 3-4) 1: 6 (2,48%) 2: 20 (8,26%) 3: 48 (19,83%) <b>4: 105</b> (43,39%) 5: 63 (26,03%) 6: 0 (0%) Total: 242				
I get opportunity to learn and develop knowledge and skills	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) I don't know	Age <30		4 (IQR: 3-4) 1: 6 (1,08%) 2: 68 (12,23%) 3: 149 (26,80%) <b>4: 262 (47,12%)</b> 5: 69 (12,41%) 6: 2 (0,36%) Total: 556					
		Age 30-39		4 (IQR: 3-4) 1: 11 (1,20%) 2: 144 (15,67%) 3: 244 (26,55%) <b>4: 421 (45,81%)</b> 5: 96 (10,45%) 6: 3 (0,33%) Total: 919					

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Age 40-49		4 (IQR 3-4) 1: 18 (1,69%) 2: 140 (13,12%) 3: 299 (28,02%) <b>4: 451 (42,27%)</b> 5: 151 (14,15%) 6: 8 (0,75%) Total: 1067					
		Age 50-59		4 (IQR 3-4) 1: 20 (1,82%) 2: 164 (14,91%) 3: 300 (27,27%) <b>4: 466 (42,36%)</b> 5: 146 (13,27%) 6: 4 (0,36%) Total: 1100					
		Age 60+		4 (IQR 3-4) 1: 6 (1,30%) 2: 47 (10,22%) 3: 139 (30,22%) <b>4: 177 (38,48%)</b> 5: 86 (18,70%) 6: 5 (1,09%) Total: 460					

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Nursing & Care				4 (IQR 3-4)					
				1: 11 (1,26%)					
				2: 111 (12,74%)					
				3: 269 (30,88%)					
				<b>4: 396 (45,46%)</b>					
				5: 81 (9,30%)					
				6: 3 (0,34%)					
			Total: 871						
Clinical support				4 (IQR 3-4)					
				1: 6 (1,79%)					
				2: 77 (22,92%)					
				3: 104 (30,95%)					
				<b>4: 126 (37,5%)</b>					
				5: 19 (5,65%)					
				6: 4 (1,19%)					
			Total: 336						
Clinical (co) treating				4 (IQR 3-4)					
				1: 0 (0%)					
				2: 23 (9,20%)					
				3: 81 (32,40%)					
				<b>4: 110 (44,00%)</b>					
				5: 36 (14,40%)					
				6: 0 (0%)					
			Total: 250						
Analytics				4 (IQR 3-4)					
				1: 3 (1,08%)					
				2: 54 (19,49%)					
				3: 77 (27,80%)					
				<b>4: 122 (44,04%)</b>					
				5: 18 (6,50%)					
				6: 3 (1,08%)					
			Total: 277						

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Scientific research & education				4 (IQR 4-5)					
				1: 2 (0,65%)					
				2: 21 (6,84%)					
				3: 49 (15,96%)					
				<b>4: 151 (49,19%)</b>					
				5: 83 (27,04%)					
				6: 1 (0,33%)					
			Total: 307						
Management				4 (IQR 4-4)					
				1: 2 (0,92%)					
				2: 14 (6,42%)					
				3: 36 (16,51%)					
				<b>4: 115 (52,75%)</b>					
				5: 51 (23,39%)					
			6: 0 (0%)						
			Total: 218						
Staff, administration, secretariat				4 (IQR 3-4)					
				1: 19 (1,72%)					
				2: 175 (15,85%)					
				3: 325 (29,44%)					
				<b>4: 434 (39,31%)</b>					
				5: 144 (13,04%)					
			6: 7 (0,63%)						
			Total: 1104						
Facility				4 (IQR 3-4)					
				1: 16 (4,32%)					
				2: 71 (19,19%)					
				3: 114 (30,81%)					
				<b>4: 127 (34,32%)</b>					
				5: 38 (10,27%)					
			6: 4 (1,08%)						
			Total: 370						



Tabel H Stratification for age and function on possibilities for learning and development items (*Continued*)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Resident physicians		4 (IQR 3-4) 1: 0 (0%) 2: 4 (5,33%) 3: 19 (25,33%) 4: <b>45 (60,00%)</b> 5: 7 (9,33%) 6: 0 (0%) Total: 75					
		Medical specialists		4 (IQR 4-5) 1: 1 (0,39%) 2: 6 (2,36%) 3: 49 (19,29%) 4: <b>133 (52,36%)</b> 5: 65 (25,59%) 6: 0 (0%) Total: 254					
I can develop in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion	Age <30		4 (IQR 4-4) 1: 18 (1,73%) 2: 92 (8,85%) 3: 148 (14,24%) 4: <b>553 (53,22%)</b> 5: 223 (21,46%) 6: 5 (0,48%) Total: 1039	4 (IQR 3-5) 1: 13 (1,40%) 2: 108 (11,64%) 3: 139 (14,98%) 4: <b>433 (46,66%)</b> 5: 231 (23,48%) 6: 4 (0,43%) Total: 928	4 (IQR 4-4) 1: 16 (1,76%) 2: 87 (9,59%) 3: 121 (13,34%) 4: <b>465 (51,27%)</b> 5: 213 (23,48%) 6: 5 (0,55%) Total: 907	4 (IQR 4-4) 1: 12 (1,31%) 2: 71 (7,73%) 3: 111 (12,08%) 4: <b>504 (54,84%)</b> 5: 216 (23,50%) 6: 5 (0,54%) Total: 919		

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 30-39			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 24 (2,07%)	1: 21 (1,88%)	1: 14 (1,22%)	1: 21 (1,88%)	1: 14 (1,22%)	1: 14 (1,22%)	1: 26 (2,33%)
			2: 121	2: 111	2: 104	2: 121	2: 111	2: 104	2: 116
			(10,46%)	(9,95%)	(9,08%)	(10,46%)	(9,95%)	(9,08%)	(10,39%)
			3: 167	3: 172	3: 155	3: 167	3: 172	3: 155	3: 172
			(14,43%)	(15,41%)	(13,53%)	(14,43%)	(15,41%)	(13,53%)	(15,41%)
			<b>4: 596</b>	<b>4: 591</b>	<b>4: 643</b>	<b>4: 596</b>	<b>4: 591</b>	<b>4: 643</b>	<b>4: 630</b>
			<b>(51,51%)</b>	<b>(52,96%)</b>	<b>(56,11%)</b>	<b>(51,51%)</b>	<b>(52,96%)</b>	<b>(56,11%)</b>	<b>(56,45%)</b>
			5: 245	5: 216	5: 227	5: 245	5: 216	5: 227	5: 214
			(21,18%)	(19,35%)	(19,81%)	(21,18%)	(19,35%)	(19,81%)	(19,18%)
		6: 4 (0,35%)	6: 5 (0,45%)	6: 3 (0,26%)	6: 4 (0,35%)	6: 5 (0,45%)	6: 3 (0,26%)	6: 9 (0,81%)	
		Total: 1157	Total: 1116	Total: 1146	Total: 1157	Total: 1116	Total: 1146	Total: 1116	
Age 40-49			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 23 (2,34%)	1: 20 (2,05%)	1: 17 (1,65%)	1: 23 (2,34%)	1: 20 (2,05%)	1: 17 (1,65%)	1: 35 (3,42%)
			2: 95 (9,64%)	2: 98	2: 115	2: 95 (9,64%)	2: 98	2: 115	2: 87 (8,50%)
			3: 163	3: 163	3: 175	3: 163	3: 163	3: 175	3: 178
			(16,55%)	(16,55%)	(16,99%)	(16,55%)	(16,55%)	(16,99%)	(17,40%)
			<b>4: 525</b>	<b>4: 519</b>	<b>4: 550</b>	<b>4: 525</b>	<b>4: 519</b>	<b>4: 550</b>	<b>4: 553</b>
			<b>(54,40%)</b>	<b>(53,18%)</b>	<b>(53,40%)</b>	<b>(54,40%)</b>	<b>(53,18%)</b>	<b>(53,40%)</b>	<b>(54,06%)</b>
			5: 170	5: 146	5: 169	5: 170	5: 146	5: 169	5: 164
			(17,26%)	(14,96%)	(16,41%)	(17,26%)	(14,96%)	(16,41%)	(16,03%)
			6: 9 (0,91%)	6: 8 (0,82%)	6: 4 (0,39%)	6: 9 (0,91%)	6: 8 (0,82%)	6: 4 (0,39%)	6: 6 (0,59%)
		Total: 985	Total: 976	Total: 1030	Total: 985	Total: 976	Total: 1030	Total: 1023	

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 50-59									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 26 (2,35%)	1: 21 (1,96%)	1: 21 (1,96%)	1: 21 (2,35%)	1: 21 (1,96%)	1: 17 (1,59%)	1: 25 (2,30%)
			2: 100 (9,03%)	2: 108	2: 108	2: 100 (9,03%)	2: 108	2: 103	2: 96 (8,85%)
			3: 260	3: 260	3: 260	3: 260	3: 260	3: 249	3: 249
			(23,49%)	(23,49%)	(23,49%)	(23,49%)	(23,49%)	(22,95%)	(22,95%)
			<b>4: 602</b>	<b>4: 582</b>	<b>4: 582</b>	<b>4: 602</b>	<b>4: 582</b>	<b>4: 566</b>	<b>4: 582</b>
			(54,38%)	(54,19%)	(54,19%)	(54,38%)	(54,19%)	(53,64%)	(53,64%)
			5: 109 (9,85%)	5: 109 (9,85%)	5: 109 (9,85%)	5: 109 (9,85%)	5: 109 (9,85%)	5: 120	5: 120
			6: 10 (0,90%)	6: 10 (0,90%)	6: 10 (0,90%)	6: 10 (0,90%)	6: 10 (0,90%)	5: 112	6: 13 (1,20%)
			Total: 1107	Total: 1107	Total: 1107	Total: 1107	Total: 1107	6: 9 (0,84%)	Total: 1085
								Total: 1066	
Age 60+									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 15 (3,12%)	1: 12 (2,69%)	1: 12 (2,69%)	1: 15 (3,12%)	1: 12 (2,69%)	1: 10 (2,30%)	1: 11 (2,67%)
			2: 36 (7,48%)	2: 33 (7,40%)	2: 33 (7,40%)	2: 36 (7,48%)	2: 33 (7,40%)	2: 24 (5,52%)	2: 29 (7,04%)
			3: 115	3: 99	3: 99	3: 115	3: 99	3: 108	3: 102
			(23,91%)	(22,20%)	(22,20%)	(23,91%)	(22,20%)	(24,83%)	(24,76%)
			<b>4: 259</b>	<b>4: 248</b>	<b>4: 248</b>	<b>4: 259</b>	<b>4: 248</b>	<b>4: 245</b>	<b>4: 223</b>
			(53,85%)	(55,61%)	(55,61%)	(53,85%)	(55,61%)	(56,32%)	(54,13%)
			5: 43 (8,94%)	5: 41 (9,19%)	5: 41 (9,19%)	5: 43 (8,94%)	5: 41 (9,19%)	5: 39 (8,97%)	5: 36 (8,74%)
			6: 13 (2,70%)	6: 13 (2,91%)	6: 13 (2,91%)	6: 13 (2,70%)	6: 13 (2,91%)	6: 9 (2,07%)	6: 11 (2,67%)
			Total: 481	Total: 446	Total: 446	Total: 481	Total: 446	Total: 435	Total: 412
Nursing & Care									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 11 (1,34%)	1: 12 (1,65%)	1: 12 (1,65%)	1: 11 (1,34%)	1: 12 (1,65%)	1: 7 (0,87%)	1: 11 (1,37%)
			2: 84 (10,23%)	2: 84	2: 84	2: 84 (10,23%)	2: 84	2: 66 (8,22%)	2: 80 (9,95%)
			3: 137	3: 137	3: 137	3: 137	3: 139	3: 145	3: 145
			(16,69%)	(11,57%)	(11,57%)	(16,69%)	(11,57%)	(18,03%)	(18,03%)
			<b>4: 468</b>	<b>4: 468</b>	<b>4: 468</b>	<b>4: 468</b>	<b>4: 480</b>	<b>4: 480</b>	<b>4: 441</b>
			(57,00%)	(19,42%)	(19,42%)	(57,00%)	(19,42%)	(50,78%)	(54,85%)
			5: 117	5: 117	5: 117	5: 117	5: 108	5: 108	5: 124
			(14,25%)	(55,79%)	(55,79%)	(14,25%)	(13,45%)	(15,42%)	(15,42%)
			6: 4 (0,49%)	6: 3 (0,37%)	6: 3 (0,37%)	6: 4 (0,49%)	6: 3 (0,37%)	6: 3 (0,37%)	6: 3 (0,37%)
			Total: 821	Total: 803	Total: 803	Total: 821	Total: 803	Total: 803	Total: 804
								Total: 726	

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Clinical support									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 15 (3,59%)	1: 16 (4,16%)	1: 16 (4,37%)	1: 16 (4,16%)	1: 6 (1,44%)	1: 6 (1,44%)	1: 18 (4,37%)
			2: 61 (14,59%)	2: 58	2: 58	2: 58	2: 70	2: 70	2: 40 (9,71%)
			3: 80 (19,14%)	3: 80 (19,14%)	3: 80 (19,14%)	3: 80 (19,14%)	3: 94	3: 94	3: 95 (23,06%)
			<b>4: 222</b>	<b>4: 222</b>	<b>4: 222</b>	<b>4: 222</b>	<b>3: 94</b>	<b>3: 94</b>	<b>4: 218</b>
			<b>(53,11%)</b>	<b>(24,42%)</b>	<b>(24,42%)</b>	<b>(53,11%)</b>	<b>(22,60%)</b>	<b>(22,60%)</b>	<b>(52,91%)</b>
			5: 33 (7,89%)	<b>4: 187</b>	<b>4: 187</b>	5: 33 (7,89%)	<b>4: 211</b>	<b>4: 211</b>	5: 35 (8,50%)
			6: 7 (1,67%)	<b>(48,57%)</b>	<b>(48,57%)</b>	6: 7 (1,67%)	<b>(50,72%)</b>	<b>(50,72%)</b>	6: 6 (1,46%)
			Total: 418	5: 28 (7,27%)	5: 28 (7,27%)	Total: 418	5: 32 (7,69%)	5: 32 (7,69%)	Total: 412
				6: 2 (0,52%)	6: 2 (0,52%)		6: 3 (0,72%)	6: 3 (0,72%)	
				Total: 385	Total: 385		Total: 416	Total: 416	
Clinical (co) treating									
			4 (IQR 4-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 4-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 4 (1,29%)	1: 6 (1,81%)	1: 6 (1,81%)	1: 4 (1,29%)	1: 5 (1,49%)	1: 5 (1,49%)	1: 7 (2,01%)
			2: 23 (7,44%)	2: 39	2: 39	2: 23 (7,44%)	2: 30 (8,96%)	2: 30 (8,96%)	2: 32 (9,20%)
			3: 44 (14,24%)	3: 44 (14,24%)	3: 44 (14,24%)	3: 44 (14,24%)	3: 51	3: 51	3: 63 (18,10%)
			<b>4: 199</b>	<b>4: 199</b>	<b>4: 199</b>	<b>4: 199</b>	<b>(15,22%)</b>	<b>(15,22%)</b>	<b>4: 196</b>
			<b>(64,40%)</b>	<b>(18,73%)</b>	<b>(18,73%)</b>	<b>(64,40%)</b>	<b>4: 202</b>	<b>4: 202</b>	<b>(56,32%)</b>
			5: 38 (12,30%)	<b>4: 182</b>	<b>4: 182</b>	5: 38 (12,30%)	<b>(60,30%)</b>	<b>(60,30%)</b>	5: 47 (13,51%)
			6: 1 (0,32%)	<b>(54,98%)</b>	<b>(54,98%)</b>	6: 1 (0,32%)	5: 46	5: 46	6: 3 (0,86%)
			Total: 309	5: 40	5: 40	Total: 309	(13,73%)	(13,73%)	Total: 348
				(12,08%)	(12,08%)		6: 1 (0,30%)	6: 1 (0,30%)	
				6: 2 (0,60%)	6: 2 (0,60%)		Total: 335	Total: 335	
				Total: 331	Total: 331				



Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-Item	Scale	Stratification level	Hospital A	Hospital A	Hospital A	Hospital A	Hospital B	Hospital B	Hospital B	Hospital B	Hospital B
			Sept 2020 (4157)	Dec 2021 (4102)	July 2022 (3603)	Sept 2020 (5056)	Jan 2022 (4842)	May 2022 (4894)	May 2022 (4894)	May 2023 (4895)	Hospital B
<b>Analytics</b>											
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 29 (6,84%)	1: 7 (1,87%)	1: 7 (1,87%)	1: 29 (6,84%)	1: 7 (1,87%)	1: 15 (3,82%)	1: 15 (3,82%)	1: 14 (3,35%)	1: 14 (3,35%)
			2: 58 (13,68%)	2: 60	2: 60	2: 58 (13,68%)	2: 60	2: 54	2: 54	2: 62 (14,83%)	2: 62 (14,83%)
			3: 99 (23,35%)	3: 90	3: 90	3: 99 (23,35%)	3: 90	3: 86	3: 86	3: 113	3: 113
			4: 195	4: 189	4: 189	4: 195	4: 189	4: 202	4: 202	4: 201	4: 201
			(45,99%)	(50,40%)	(50,40%)	(45,99%)	(50,40%)	(51,40%)	(51,40%)	(48,09%)	(48,09%)
			5: 39 (9,20%)	5: 29 (7,33%)	5: 29 (7,33%)	5: 39 (9,20%)	5: 29 (7,33%)	5: 33 (8,40%)	5: 33 (8,40%)	5: 23 (5,50%)	5: 23 (5,50%)
			6: 4 (0,94%)	6: 0 (0%)	6: 0 (0%)	6: 4 (0,94%)	6: 0 (0%)	6: 3 (0,76%)	6: 3 (0,76%)	6: 5 (1,20%)	6: 5 (1,20%)
			Total: 424	Total: 375	Total: 375	Total: 424	Total: 375	Total: 393	Total: 393	Total: 418	Total: 418
<b>Scientific research &amp; education</b>											
			4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)
			1: 1 (0,27%)	1: 2 (0,52%)	1: 1 (0,27%)	1: 1 (0,27%)	1: 2 (0,52%)	1: 1 (0,28%)	1: 1 (0,28%)	1: 3 (0,75%)	1: 3 (0,75%)
			2: 21 (5,63%)	2: 15 (3,88%)	2: 15 (3,88%)	2: 21 (5,63%)	2: 15 (3,88%)	2: 18 (5,03%)	2: 18 (5,03%)	2: 12 (2,99%)	2: 12 (2,99%)
			3: 50 (13,40%)	3: 45	3: 45	3: 50 (13,40%)	3: 45	3: 50	3: 50	3: 46 (11,44%)	3: 46 (11,44%)
			4: 196	4: 196	4: 196	4: 196	4: 196	4: 189	4: 189	4: 232	4: 232
			(52,55%)	(52,97%)	(52,97%)	(52,55%)	(52,97%)	(52,79%)	(52,79%)	(57,71%)	(57,71%)
			5: 102	5: 117	5: 117	5: 102	5: 117	5: 99	5: 99	5: 106	5: 106
			(27,35%)	(30,23%)	(30,23%)	(27,35%)	(30,23%)	(27,65%)	(27,65%)	(26,37%)	(26,37%)
			6: 3 (0,80%)	6: 3 (0,78%)	6: 3 (0,78%)	6: 3 (0,80%)	6: 3 (0,78%)	6: 1 (0,28%)	6: 1 (0,28%)	6: 3 (0,75%)	6: 3 (0,75%)
			Total: 373	Total: 387	Total: 387	Total: 373	Total: 387	Total: 358	Total: 358	Total: 402	Total: 402
<b>Management</b>											
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 1 (0,49%)	1: 6 (3,05%)	1: 6 (3,05%)	1: 1 (0,49%)	1: 6 (3,05%)	1: 3 (1,51%)	1: 3 (1,51%)	1: 3 (1,73%)	1: 3 (1,73%)
			2: 11 (5,37%)	2: 14 (7,11%)	2: 14 (7,11%)	2: 11 (5,37%)	2: 14 (7,11%)	2: 8 (4,02%)	2: 8 (4,02%)	2: 9 (5,20%)	2: 9 (5,20%)
			3: 26 (12,68%)	3: 25	3: 25	3: 26 (12,68%)	3: 25	3: 25	3: 25	3: 15 (8,67%)	3: 15 (8,67%)
			4: 119	4: 111	4: 111	4: 119	4: 111	4: 117	4: 117	4: 106	4: 106
			(58,05%)	(56,35%)	(56,35%)	(58,05%)	(56,35%)	(58,79%)	(58,79%)	(61,27%)	(61,27%)
			5: 47 (22,93%)	5: 41	5: 41	5: 47 (22,93%)	5: 41	5: 45	5: 45	5: 39 (22,54%)	5: 39 (22,54%)
			6: 1 (0,49%)	6: 0 (0%)	6: 0 (0%)	6: 1 (0,49%)	6: 0 (0%)	6: 1 (0,50%)	6: 1 (0,50%)	6: 1 (0,58%)	6: 1 (0,58%)
			Total: 205	Total: 197	Total: 197	Total: 205	Total: 197	Total: 173	Total: 173	Total: 173	Total: 173
			Total: 199	Total: 197	Total: 197	Total: 199	Total: 197	Total: 199	Total: 199	Total: 199	Total: 199

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Staff, administration, secretariat			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 21 (1,89%)	1: 19 (1,70%)	1: 22 (1,95%)	1: 22 (1,95%)	1: 22 (1,95%)	1: 27 (2,38%)	1: 27 (2,38%)
			2: 102 (9,18%)	2: 110	2: 110	2: 110	2: 120	2: 106 (9,33%)	2: 106 (9,33%)
			3: 245 (22,05%)	3: 221	3: 221	3: 221	3: 240	3: 217	3: 217
			<b>4: 601</b>	<b>4: 595</b>	<b>4: 595</b>	<b>4: 595</b>	<b>4: 585</b>	<b>4: 631</b>	<b>4: 631</b>
			5: 132 (11,88%)	5: 157	5: 157	5: 157	5: 146	5: 142	5: 142
			6: 10 (0,90%)	6: 10 (1,07%)	6: 10 (1,07%)	6: 10 (1,07%)	6: 13 (1,14%)	6: 13 (1,14%)	6: 13 (1,14%)
			Total: 1111	6: 14 (1,25%)	6: 14 (1,25%)	6: 14 (1,25%)	6: 13 (1,15%)	6: 13 (1,15%)	Total: 1136
				Total: 1116	Total: 1116	Total: 1116	Total: 1126	Total: 1126	Total: 1136
	Facility			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 28 (4,27%)	1: 20 (3,34%)	1: 20 (3,34%)	1: 20 (3,34%)	1: 17 (2,86%)	1: 24 (4,21%)	1: 24 (4,21%)
			2: 69 (10,52%)	2: 67	2: 67	2: 67	2: 74	2: 63 (11,05%)	2: 63 (11,05%)
			3: 151 (23,02%)	3: 151	3: 151	3: 151	3: 126	3: 117	3: 117
			<b>4: 314</b>	<b>4: 301</b>	<b>4: 301</b>	<b>4: 301</b>	<b>4: 294</b>	<b>4: 289</b>	<b>4: 289</b>
			5: 80 (12,20%)	5: 80 (12,20%)	5: 80 (12,20%)	5: 80 (12,20%)	5: 67	5: 65 (11,40%)	5: 65 (11,40%)
			6: 14 (2,13%)	6: 14 (2,13%)	6: 14 (2,13%)	6: 14 (2,13%)	5: 77	6: 12 (2,11%)	6: 12 (2,11%)
			Total: 656	Total: 656	Total: 656	Total: 656	Total: 570	Total: 570	Total: 570
				6: 11 (1,84%)	6: 11 (1,84%)	6: 11 (1,84%)	6: 7 (1,18%)	6: 7 (1,18%)	Total: 570
				Total: 598	Total: 598	Total: 598	Total: 595	Total: 595	Total: 595

Table H Stratification for age and function on possibilities for learning and development items (*Continued*)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
<b>Resident physicians</b>									
			4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)	4 (IQR 4-5)
			1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 2 (1,34%)
			2: 5 (2,78%)	2: 6 (3,85%)	2: 6 (3,85%)	2: 4 (3,01%)	2: 4 (3,01%)	2: 3 (2,01%)	2: 3 (2,01%)
			3: 15 (8,33%)	3: 5 (3,21%)	3: 5 (3,21%)	3: 9 (6,77%)	3: 9 (6,77%)	3: 16 (10,74%)	3: 16 (10,74%)
			<b>4: 96 (53,33%)</b>	<b>4: 78 (50%)</b>	<b>4: 78 (50%)</b>	<b>4: 62 (46,62%)</b>	<b>4: 62 (46,62%)</b>	<b>4: 89 (59,73%)</b>	<b>4: 89 (59,73%)</b>
			5: 64 (35,56%)	5: 67 (42,95%)	5: 67 (42,95%)	5: 58 (43,61%)	5: 58 (43,61%)	5: 39 (26,17%)	5: 39 (26,17%)
			6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)
			Total: 180	Total: 156	Total: 156	Total: 149	Total: 149	Total: 149	Total: 149
			Total: 133						
<b>Medical specialists</b>									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 1 (0,31%)	1: 3 (0,88%)	1: 1 (0,31%)	1: 1 (0,31%)	1: 1 (0,31%)	1: 5 (1,88%)	1: 5 (1,88%)
			2: 28 (8,67%)	2: 31 (9,12%)	2: 24 (7,55%)	2: 24 (7,55%)	2: 17 (6,39%)	2: 17 (6,39%)	2: 17 (6,39%)
			3: 42 (13,00%)	3: 50 (14,71%)	3: 50 (14,71%)	3: 47 (14,29%)	3: 47 (14,29%)	3: 38 (14,29%)	3: 38 (14,29%)
			<b>4: 172 (53,25%)</b>	<b>4: 172 (53,25%)</b>	<b>4: 172 (53,25%)</b>	<b>4: 169 (53,14%)</b>	<b>4: 169 (53,14%)</b>	<b>4: 143 (44,38%)</b>	<b>4: 143 (44,38%)</b>
			5: 79 (24,46%)	5: 80 (24,53%)	5: 80 (24,53%)	5: 77 (24,21%)	5: 77 (24,21%)	5: 63 (23,68%)	5: 63 (23,68%)
			6: 1 (0,31%)	6: 4 (1,18%)	6: 4 (1,18%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)
			Total: 323	Total: 340	Total: 340	Total: 266	Total: 266	Total: 266	Total: 266
			Total: 318						
<b>Age &lt;30</b>									
I can continuously improve in my work	(1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 4-4)
			1: 7 (0,67%)	1: 5 (0,54%)	1: 6 (0,66%)	1: 6 (0,66%)	1: 5 (0,54%)	1: 5 (0,54%)	1: 5 (0,54%)
			2: 62 (5,97%)	2: 82 (8,84%)	2: 60 (6,62%)	2: 60 (6,62%)	2: 48 (5,22%)	2: 48 (5,22%)	2: 48 (5,22%)
			3: 192 (18,48%)	3: 157 (16,92%)	3: 157 (16,92%)	3: 157 (16,92%)	3: 153 (16,65%)	3: 153 (16,65%)	3: 153 (16,65%)
			<b>4: 588 (56,59%)</b>	<b>4: 500 (53,88%)</b>	<b>4: 500 (53,88%)</b>	<b>4: 514 (56,67%)</b>	<b>4: 514 (56,67%)</b>	<b>4: 532 (57,89%)</b>	<b>4: 532 (57,89%)</b>
			5: 183 (17,61%)	5: 179 (19,29%)	5: 179 (19,29%)	5: 168 (18,52%)	5: 168 (18,52%)	5: 178 (19,37%)	5: 178 (19,37%)
			6: 7 (0,67%)	6: 5 (0,54%)	6: 5 (0,54%)	6: 3 (0,33%)	6: 3 (0,33%)	6: 3 (0,33%)	6: 3 (0,33%)
			Total: 1039	Total: 928	Total: 928	Total: 907	Total: 907	Total: 919	Total: 919

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 30-39									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 15 (1,30%)	1: 7 (0,63%)	1: 6 (0,52%)	1: 6 (0,63%)	1: 6 (0,52%)	1: 10 (0,86%)	1: 10 (0,86%)
			2: 84 (7,26%)	2: 72 (6,45%)	2: 72 (6,45%)	2: 72 (6,45%)	2: 67 (5,85%)	2: 88 (7,55%)	2: 88 (7,55%)
			3: 208	3: 221	3: 221	3: 208	3: 209	3: 209	3: 220
			(17,98%)	(19,80%)	(19,80%)	(17,98%)	(18,24%)	(18,87%)	(18,87%)
			<b>4: 654</b>	<b>4: 633</b>	<b>4: 633</b>	<b>4: 654</b>	<b>4: 672</b>	<b>4: 662</b>	<b>4: 662</b>
			<b>(56,53%)</b>	<b>(56,72%)</b>	<b>(56,72%)</b>	<b>(56,53%)</b>	<b>(58,64%)</b>	<b>(58,64%)</b>	<b>(56,78%)</b>
			5: 191	5: 176	5: 176	5: 191	5: 185	5: 185	5: 178
			(16,51%)	(15,77%)	(15,77%)	(16,51%)	(16,14%)	(15,27%)	(15,27%)
			6: 5 (0,43%)	6: 7 (0,63%)	6: 7 (0,63%)	6: 5 (0,43%)	6: 7 (0,61%)	6: 8 (0,69%)	6: 8 (0,69%)
			Total: 1157	Total: 1116	Total: 1116	Total: 1157	Total: 1146	Total: 1146	Total: 1166
Age 40-49									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 15 (1,52%)	1: 11 (1,13%)	1: 11 (1,13%)	1: 15 (1,52%)	1: 11 (1,13%)	1: 8 (0,78%)	1: 19 (1,86%)
			2: 69 (7,01%)	2: 77 (7,89%)	2: 77 (7,89%)	2: 69 (7,01%)	2: 82 (7,96%)	2: 52 (5,08%)	2: 52 (5,08%)
			3: 181	3: 192	3: 192	3: 181	3: 182	3: 209	3: 209
			(18,38%)	(19,67%)	(19,67%)	(18,38%)	(17,67%)	(20,43%)	(20,43%)
			<b>4: 566</b>	<b>4: 565</b>	<b>4: 565</b>	<b>4: 566</b>	<b>4: 603</b>	<b>4: 599</b>	<b>4: 599</b>
			<b>(57,46%)</b>	<b>(57,89%)</b>	<b>(57,89%)</b>	<b>(57,46%)</b>	<b>(58,54%)</b>	<b>(58,54%)</b>	<b>(58,55%)</b>
			5: 149	5: 120	5: 120	5: 149	5: 152	5: 138	5: 138
			(15,13%)	(12,30%)	(12,30%)	(15,13%)	(14,76%)	(13,49%)	(13,49%)
			6: 5 (0,51%)	6: 11 (1,13%)	6: 11 (1,13%)	6: 5 (0,51%)	6: 3 (0,29%)	6: 6 (0,59%)	6: 6 (0,59%)
			Total: 985	Total: 976	Total: 976	Total: 985	Total: 1030	Total: 1030	Total: 1023

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
<b>Age 50-59</b>									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 9 (0,81%)	1: 10 (0,93%)	1: 10 (0,93%)	1: 6 (0,56%)	1: 6 (0,56%)	1: 6 (0,56%)	1: 16 (1,47%)
			2: 84 (7,59%)	2: 68 (6,33%)	2: 72 (6,75%)	2: 68 (6,33%)	2: 72 (6,75%)	2: 72 (6,75%)	2: 63 (5,81%)
			3: 270	3: 254	3: 254	3: 254	3: 249	3: 249	3: 264
			(24,39%)	(23,65%)	(23,65%)	(23,65%)	(23,65%)	(23,65%)	(24,33%)
			<b>4: 618</b>	<b>4: 614</b>	<b>4: 614</b>	<b>4: 614</b>	<b>4: 627</b>	<b>4: 609</b>	<b>4: 609</b>
			<b>(55,83%)</b>	<b>(57,17%)</b>	<b>(57,17%)</b>	<b>(58,82%)</b>	<b>(58,82%)</b>	<b>(56,13%)</b>	<b>(56,13%)</b>
			5: 118	5: 118	5: 118	5: 104	5: 104	5: 122	5: 122
			(10,66%)	(10,99%)	(10,99%)	(9,75%)	(9,75%)	(11,24%)	(11,24%)
			6: 8 (0,72%)	6: 10 (0,93%)	6: 10 (0,93%)	6: 8 (0,75%)	6: 8 (0,75%)	6: 11 (1,01%)	6: 11 (1,01%)
			Total: 1107	Total: 1074	Total: 1074	Total: 1066	Total: 1066	Total: 1085	Total: 1085
<b>Age 60+</b>									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 8 (1,66%)	1: 6 (1,35%)	1: 6 (1,35%)	1: 8 (1,84%)	1: 8 (1,84%)	1: 8 (1,84%)	1: 8 (1,94%)
			2: 14 (2,91%)	2: 18 (4,04%)	2: 17 (3,91%)	2: 17 (3,91%)	2: 17 (3,91%)	2: 19 (4,61%)	2: 19 (4,61%)
			3: 130	3: 105	3: 105	3: 106	3: 106	3: 109	3: 109
			(27,03%)	(23,54%)	(23,54%)	(24,37%)	(24,37%)	(26,46%)	(26,46%)
			<b>4: 273</b>	<b>4: 259</b>	<b>4: 259</b>	<b>4: 253</b>	<b>4: 253</b>	<b>4: 230</b>	<b>4: 230</b>
			<b>(56,76%)</b>	<b>(58,07%)</b>	<b>(58,07%)</b>	<b>(58,16%)</b>	<b>(58,16%)</b>	<b>(55,83%)</b>	<b>(55,83%)</b>
			5: 44 (9,15%)	5: 44 (9,87%)	5: 44 (9,87%)	5: 43 (9,89%)	5: 43 (9,89%)	5: 40 (9,71%)	5: 40 (9,71%)
			6: 12 (2,49%)	6: 14 (3,14%)	6: 14 (3,14%)	6: 8 (1,84%)	6: 8 (1,84%)	6: 6 (1,46%)	6: 6 (1,46%)
			Total: 481	Total: 446	Total: 446	Total: 435	Total: 435	Total: 412	Total: 412
<b>Nursing &amp; Care</b>									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 7 (0,85%)	1: 4 (0,55%)	1: 4 (0,55%)	1: 3 (0,37%)	1: 3 (0,37%)	1: 5 (0,62%)	1: 5 (0,62%)
			2: 58 (7,06%)	2: 65 (8,95%)	2: 65 (8,95%)	2: 47 (5,85%)	2: 47 (5,85%)	2: 59 (7,34%)	2: 59 (7,34%)
			3: 163	3: 157	3: 157	3: 153	3: 153	3: 177	3: 177
			(19,85%)	(21,63%)	(21,63%)	(19,05%)	(19,05%)	(22,01%)	(22,01%)
			<b>4: 492</b>	<b>4: 426</b>	<b>4: 426</b>	<b>4: 517</b>	<b>4: 517</b>	<b>4: 458</b>	<b>4: 458</b>
			<b>(59,92%)</b>	<b>(58,68%)</b>	<b>(58,68%)</b>	<b>(64,38%)</b>	<b>(64,38%)</b>	<b>(56,97%)</b>	<b>(56,97%)</b>
			5: 97 (11,81%)	5: 71 (9,78%)	5: 71 (9,78%)	5: 79 (9,84%)	5: 79 (9,84%)	5: 104	5: 104
			6: 4 (0,49%)	6: 3 (0,41%)	6: 3 (0,41%)	6: 4 (0,50%)	6: 4 (0,50%)	6: 1 (0,12%)	6: 1 (0,12%)
			Total: 821	Total: 726	Total: 726	Total: 803	Total: 803	Total: 804	Total: 804

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Clinical support									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 9 (2,15%)	1: 5 (1,30%)	1: 2 (0,48%)	1: 2 (0,48%)	1: 2 (0,48%)	1: 11 (2,67%)	1: 11 (2,67%)
			2: 41 (9,81%)	2: 44	2: 44	2: 44	2: 55	2: 31 (7,52%)	2: 31 (7,52%)
			3: 106	(11,43%)	(13,22%)	(13,22%)	3: 98	3: 109	3: 109
			(25,36%)	3: 96	3: 98	3: 98	(26,46%)	(26,46%)	(26,46%)
			<b>4: 224</b>	(24,94%)	(23,56%)	(23,56%)	<b>4: 228</b>	<b>4: 228</b>	<b>4: 228</b>
			<b>(53,59%)</b>	<b>4: 211</b>	<b>4: 211</b>	<b>4: 232</b>	<b>(55,34%)</b>	<b>(55,34%)</b>	<b>(55,34%)</b>
			5: 33 (7,89%)	<b>(54,81%)</b>	<b>(55,77%)</b>	<b>(55,77%)</b>	5: 31 (7,52%)	5: 31 (7,52%)	5: 31 (7,52%)
			6: 5 (1,20%)	5: 24 (6,23%)	5: 28 (6,73%)	5: 28 (6,73%)	6: 2 (0,49%)	6: 2 (0,49%)	6: 2 (0,49%)
			Total: 418	6: 5 (1,30%)	6: 1 (0,24%)	6: 1 (0,24%)	Total: 412	Total: 412	Total: 412
				Total: 385	Total: 416	Total: 416			
Clinical (co) treating									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 2 (0,65%)	1: 1 (0,30%)	1: 1 (0,30%)	1: 1 (0,30%)	1: 1 (0,30%)	1: 1 (0,29%)	1: 1 (0,29%)
			2: 15 (4,85%)	2: 27 (8,16%)	2: 23 (6,87%)	2: 23 (6,87%)	2: 23 (6,87%)	2: 23 (6,61%)	2: 23 (6,61%)
			3: 62 (20,06%)	3: 77	3: 59	3: 59	3: 89 (25,57%)	3: 89 (25,57%)	3: 89 (25,57%)
			<b>4: 188</b>	(23,26%)	(17,61%)	(17,61%)	<b>4: 194</b>	<b>4: 194</b>	<b>4: 194</b>
			<b>(60,84%)</b>	<b>4: 198</b>	<b>4: 205</b>	<b>4: 205</b>	<b>(55,75%)</b>	<b>(55,75%)</b>	<b>(55,75%)</b>
			5: 40 (12,94%)	<b>(59,82%)</b>	<b>(61,19%)</b>	<b>(61,19%)</b>	5: 36 (10,34%)	5: 36 (10,34%)	5: 36 (10,34%)
			6: 2 (0,65%)	5: 24 (7,25%)	5: 44	5: 44	6: 5 (1,44%)	6: 5 (1,44%)	6: 5 (1,44%)
			Total: 309	6: 4 (1,21%)	(13,13%)	(13,13%)	Total: 348	Total: 348	Total: 348
				Total: 331	Total: 335	Total: 335			

Table H Stratification for age and function on possibilities for learning and development items (*Continued*)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
<b>Analytics</b>									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 14 (3,30%)	1: 3 (0,80%)	1: 3 (0,80%)	1: 3 (0,80%)	1: 5 (1,27%)	1: 8 (1,91%)	1: 8 (1,91%)
			2: 39 (9,20%)	2: 37 (9,87%)	2: 37 (9,87%)	2: 38 (9,67%)	2: 38 (9,67%)	2: 38 (9,09%)	2: 38 (9,09%)
			3: 108 (25,74%)	3: 101 (26,93%)	3: 101 (26,93%)	3: 95 (24,17%)	3: 95 (28,71%)	3: 120 (28,71%)	3: 120 (28,71%)
			<b>4: 214</b> <b>(50,47%)</b>	<b>4: 216</b> <b>(54,71%)</b>	<b>4: 216</b> <b>(57,60%)</b>	<b>4: 215</b> <b>(54,71%)</b>	<b>4: 215</b> <b>(53,11%)</b>	<b>4: 222</b> <b>(53,11%)</b>	<b>4: 222</b> <b>(53,11%)</b>
			5: 45 (10,61%)	5: 17 (4,53%)	5: 17 (4,53%)	5: 35 (8,91%)	5: 27 (6,46%)	5: 27 (6,46%)	5: 27 (6,46%)
			6: 4 (0,94%)	6: 1 (0,27%)	6: 1 (0,27%)	6: 5 (1,27%)	6: 3 (0,72%)	6: 3 (0,72%)	6: 3 (0,72%)
			Total: 424	Total: 375	Total: 375	Total: 393	Total: 393	Total: 418	Total: 418
<b>Scientific research &amp; education</b>									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 1 (3,07%)	1: 2 (0,50%)	1: 2 (0,50%)
			2: 18 (4,83%)	2: 10 (2,58%)	2: 10 (2,58%)	2: 11 (3,07%)	2: 11 (2,74%)	2: 11 (2,74%)	2: 11 (2,74%)
			3: 57 (15,28%)	3: 56 (14,47%)	3: 56 (14,47%)	3: 49 (13,69%)	3: 49 (13,69%)	3: 70 (17,41%)	3: 70 (17,41%)
			<b>4: 213</b> <b>(57,10%)</b>	<b>4: 224</b> <b>(57,88%)</b>	<b>4: 224</b> <b>(57,88%)</b>	<b>4: 210</b> <b>(58,66%)</b>	<b>4: 210</b> <b>(58,66%)</b>	<b>4: 226</b> <b>(56,22%)</b>	<b>4: 226</b> <b>(56,22%)</b>
			5: 80 (21,44%)	5: 93 (24,03%)	5: 93 (24,03%)	5: 87 (24,30%)	5: 87 (24,30%)	5: 88 (21,89%)	5: 88 (21,89%)
			6: 5 (1,34%)	6: 4 (1,03%)	6: 4 (1,03%)	6: 1 (0,28%)	6: 1 (0,28%)	6: 5 (1,24%)	6: 5 (1,24%)
			Total: 373	Total: 387	Total: 387	Total: 402	Total: 402	Total: 402	Total: 402
<b>Management</b>									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 1 (0,49%)	1: 3 (1,52%)	1: 3 (1,52%)	1: 1 (0,50%)	1: 2 (1,16%)	1: 2 (1,16%)	1: 2 (1,16%)
			2: 7 (3,41%)	2: 8 (4,06%)	2: 8 (4,06%)	2: 6 (3,01%)	2: 7 (4,05%)	2: 7 (4,05%)	2: 7 (4,05%)
			3: 33 (16,10%)	3: 29 (14,72%)	3: 29 (14,72%)	3: 28 (14,07%)	3: 28 (14,07%)	3: 15 (8,67%)	3: 15 (8,67%)
			<b>4: 126</b> <b>(61,46%)</b>	<b>4: 111</b> <b>(56,35%)</b>	<b>4: 111</b> <b>(56,35%)</b>	<b>4: 122</b> <b>(61,31%)</b>	<b>4: 122</b> <b>(61,31%)</b>	<b>4: 115</b> <b>(66,47%)</b>	<b>4: 115</b> <b>(66,47%)</b>
			5: 37 (18,05%)	5: 44 (22,34%)	5: 44 (22,34%)	5: 41 (20,60%)	5: 41 (20,60%)	5: 34 (19,65%)	5: 34 (19,65%)
			6: 1 (0,49%)	6: 2 (1,02%)	6: 2 (1,02%)	6: 1 (0,50%)	6: 1 (0,50%)	6: 0 (0%)	6: 0 (0%)
			Total: 205	Total: 197	Total: 197	Total: 173	Total: 173	Total: 173	Total: 173
			Total: 205	Total: 197	Total: 197	Total: 173	Total: 173	Total: 173	Total: 173

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Staff, administration, secretariat			4 (IQR 3-4) 1: 10 (0,90%) 2: 72 (6,48%) 3: 258 (23,22%) <b>4: 644</b> (57,97%) 5: 118 (10,62%) 6: 9 (0,81%) Total: 1111	4 (IQR 3-4) 1: 12 (1,08%) 2: 69 (6,18%) 3: 235 (21,06%) <b>4: 640</b> (57,35%) 5: 150 (13,44%) 6: 10 (0,90%) Total: 1116	4 (IQR 3-4) 1: 13 (1,15%) 2: 72 (6,39%) 3: 248 (22,02%) <b>4: 657</b> (58,35%) 5: 131 (11,63%) 6: 5 (0,44%) Total: 1126	4 (IQR 3-4) 1: 16 (1,41%) 2: 61 (5,37%) 3: 227 (19,98%) <b>4: 697</b> (61,36%) 5: 124 (10,92%) 6: 11 (0,97%) Total: 1136			
			4 (IQR 3-4) 1: 12 (1,83%) 2: 48 (7,32%) 3: 159 (24,24%) <b>4: 357</b> (54,42%) 5: 72 (10,98%) 6: 8 (1,22%) Total: 656	4 (IQR 3-4) 1: 10 (1,67%) 2: 42 (7,02%) 3: 132 (22,07%) <b>4: 334</b> (55,85%) 5: 58 (9,70%) 6: 15 (2,51%) Total: 598	4 (IQR 3-4) 1: 11 (1,85%) 2: 47 (7,90%) 3: 136 (22,86%) <b>4: 326</b> (54,79%) 5: 66 (11,09%) 6: 9 (1,51%) Total: 570	4 (IQR 3-4) 1: 10 (1,75%) 2: 45 (7,89%) 3: 131 (22,98%) <b>4: 313</b> (54,91%) 5: 62 (10,88%) 6: 9 (1,58%) Total: 570			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			
			4 (IQR 4-5) 1: 0 (0%) 2: 5 (2,78%) 3: 21 (11,67%) <b>4: 103</b> (57,22%) 5: 50 (27,78%) 6: 1 (0,56%) Total: 180	4 (IQR 4-5) 1: 0 (0%) 2: 5 (3,21%) 3: 10 (6,41%) <b>4: 94</b> (60,26%) 5: 47 (30,13%) 6: 0 (0%) Total: 156	4 (IQR 4-5) 1: 0 (0%) 2: 2 (1,50%) 3: 13 (9,77%) <b>4: 72</b> (54,14%) 5: 46 (34,59%) 6: 0 (0%) Total: 149	4 (IQR 4-5) 1: 1 (0,67%) 2: 4 (2,68%) 3: 16 (10,74%) <b>4: 94 (63,09%)</b> 5: 34 (22,82%) 6: 0 (0%) Total: 149			



Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Medical specialists									
Within our team we learn from mistakes  (1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		Age < 30	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 12 (1,15%)	1: 11 (1,19%)	1: 11 (0,99%)	1: 3 (0,88%)	1: 1 (0,31%)	1: 1 (0,31%)	1: 2 (0,75%)
			2: 74 (7,12%)	2: 71 (7,65%)	2: 71 (7,65%)	2: 20 (6,19%)	2: 26 (7,65%)	2: 15 (4,72%)	2: 10 (3,76%)
			3: 197	3: 180	3: 180	3: 50 (15,48%)	3: 68	3: 71	3: 55 (20,68%)
			(18,96%)	(19,40%)	(16,65%)	<b>4: 183</b>	(20,00%)	(22,33%)	<b>4: 138</b>
			<b>4: 626</b>	<b>4: 529</b>	<b>4: 532</b>	<b>(56,66%)</b>	<b>4: 168</b>	<b>4: 167</b>	<b>(51,88%)</b>
			<b>(60,25%)</b>	<b>(57,00%)</b>	<b>(60,61%)</b>	5: 66 (20,43%)	<b>(49,41%)</b>	<b>(52,52%)</b>	5: 61 (22,93%)
			5: 117	5: 124	5: 111	6: 2 (0,62%)	5: 70	5: 64	6: 0 (0%)
			(11,26%)	(13,36%)	(12,08%)	Total: 323	(20,59%)	(20,13%)	Total: 266
			6: 13 (1,25%)	6: 13 (1,40%)	6: 9 (0,98%)	6: 5 (1,47%)	6: 0 (0%)	6: 0 (0%)	Total: 266
		Total: 1039	Total: 928	Total: 919	Total: 340	Total: 318	Total: 318	Total: 907	
Age 30-39									
Within our team we learn from mistakes  (1) totally disagree; (2) disagree; (3) neutral; (4) agree; (5) totally agree; (6) no opinion		Age 30-39	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 15 (1,30%)	1: 9 (0,81%)	1: 6 (0,52%)	1: 15 (1,30%)	1: 9 (0,81%)	1: 6 (0,52%)	1: 19 (1,63%)
			2: 99 (8,56%)	2: 97 (8,69%)	2: 94 (8,20%)	2: 99 (8,56%)	2: 97 (8,69%)	2: 94 (8,20%)	2: 79 (6,78%)
			3: 198	3: 194	3: 181	3: 198	3: 194	3: 181	3: 219
			(17,11%)	(17,38%)	(15,79%)	(17,11%)	(17,38%)	(15,79%)	(18,78%)
			<b>4: 712</b>	<b>4: 663</b>	<b>4: 718</b>	<b>(61,54%)</b>	<b>(59,41%)</b>	<b>(62,65%)</b>	<b>(62,61%)</b>
			5: 117	5: 139	5: 137	5: 117	5: 139	5: 137	5: 104 (8,92%)
			(10,11%)	(12,46%)	(11,95%)	6: 16 (1,38%)	6: 14 (1,25%)	6: 10 (0,87%)	6: 15 (1,29%)
			6: 16 (1,38%)	6: 14 (1,25%)	6: 10 (0,87%)	Total: 1157	Total: 1116	Total: 1146	Total: 1166
			Total: 1157	Total: 1116	Total: 1146	Total: 1157	Total: 1116	Total: 1146	Total: 1166

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Age 40-49			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 4-4)
			1: 20 (2,03%)	1: 19 (1,95%)	1: 19 (1,95%)	1: 19 (1,95%)	1: 15 (1,46%)	1: 16 (1,56%)	1: 16 (1,56%)
			2: 68 (6,90%)	2: 68 (6,97%)	2: 68 (6,97%)	2: 68 (6,97%)	2: 78 (7,57%)	2: 64 (6,26%)	2: 64 (6,26%)
			3: 142	3: 155	3: 155	3: 142	3: 166	3: 157	3: 157
			(14,42%)	(15,88%)	(15,88%)	(14,42%)	(16,12%)	(15,35%)	(15,35%)
			<b>4: 640</b>	<b>4: 630</b>	<b>4: 630</b>	<b>4: 640</b>	<b>4: 650</b>	<b>4: 684</b>	<b>4: 684</b>
			<b>(64,97%)</b>	<b>(64,55%)</b>	<b>(64,55%)</b>	<b>(64,97%)</b>	<b>(63,11%)</b>	<b>(66,86%)</b>	<b>(66,86%)</b>
			5: 107	5: 95 (9,73%)	5: 107	5: 107	5: 109	5: 98 (9,58%)	5: 98 (9,58%)
			(10,86%)	6: 9 (0,92%)	(10,86%)	(10,86%)	(10,58%)	6: 4 (0,39%)	6: 4 (0,39%)
			6: 8 (0,81%)	Total: 976	6: 8 (0,81%)	Total: 976	6: 12 (1,17%)	Total: 1023	Total: 1023
		Total: 985	Total: 985	Total: 985	Total: 985	Total: 1030	Total: 1030	Total: 1030	
Age 50-59			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 12 (1,08%)	1: 12 (1,12%)	1: 12 (1,12%)	1: 12 (1,08%)	1: 9 (0,84%)	1: 12 (1,11%)	1: 12 (1,11%)
			2: 84 (7,59%)	2: 64 (5,96%)	2: 64 (5,96%)	2: 84 (7,59%)	2: 75 (7,04%)	2: 80 (7,37%)	2: 80 (7,37%)
			3: 209	3: 194	3: 194	3: 209	3: 202	3: 201	3: 201
			(18,88%)	(18,06%)	(18,06%)	(18,88%)	(18,95%)	(18,53%)	(18,53%)
			<b>4: 700</b>	<b>4: 688</b>	<b>4: 688</b>	<b>4: 700</b>	<b>4: 677</b>	<b>4: 698</b>	<b>4: 698</b>
			<b>(63,23%)</b>	<b>(64,06%)</b>	<b>(63,51%)</b>	<b>(63,23%)</b>	<b>(63,51%)</b>	<b>(64,33%)</b>	<b>(64,33%)</b>
			5: 86 (7,77%)	5: 96 (8,94%)	5: 86 (7,77%)	5: 86 (7,77%)	5: 95 (8,91%)	5: 84 (7,74%)	5: 84 (7,74%)
			6: 16 (1,45%)	6: 20 (1,86%)	6: 20 (1,86%)	6: 16 (1,45%)	6: 8 (0,75%)	6: 10 (0,92%)	6: 10 (0,92%)
			Total: 1107	Total: 1074	Total: 1074	Total: 1107	Total: 1066	Total: 1085	Total: 1085
Age 60+			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 3 (0,62%)	1: 6 (1,35%)	1: 6 (1,35%)	1: 3 (0,62%)	1: 1 (0,23%)	1: 4 (0,97%)	1: 4 (0,97%)
			2: 30 (6,24%)	2: 29 (6,50%)	2: 29 (6,50%)	2: 30 (6,24%)	2: 18 (4,14%)	2: 26 (6,31%)	2: 26 (6,31%)
			3: 105	3: 91	3: 91	3: 105	3: 74	3: 81 (19,66%)	3: 81 (19,66%)
			(21,83%)	(20,40%)	(20,40%)	(21,83%)	(17,01%)	<b>4: 260</b>	<b>4: 260</b>
			<b>4: 290</b>	<b>4: 272</b>	<b>4: 272</b>	<b>4: 290</b>	<b>4: 294</b>	<b>(63,11%)</b>	<b>(63,11%)</b>
			<b>(60,29%)</b>	<b>(60,99%)</b>	<b>(60,99%)</b>	<b>(60,29%)</b>	<b>(67,59%)</b>	<b>5: 36 (8,74%)</b>	<b>5: 36 (8,74%)</b>
			5: 40 (8,32%)	5: 37 (8,30%)	5: 40 (8,32%)	5: 40 (8,32%)	5: 38 (8,74%)	6: 5 (1,21%)	6: 5 (1,21%)
			6: 13 (2,70%)	6: 11 (2,47%)	6: 11 (2,47%)	6: 13 (2,70%)	6: 10 (2,30%)	Total: 412	Total: 412
			Total: 481	Total: 446	Total: 446	Total: 481	Total: 435	Total: 435	Total: 435

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Nursing & Care									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 7 (0,85%)	1: 10 (1,38%)	1: 10 (1,38%)	1: 7 (0,85%)	1: 10 (1,38%)	1: 2 (0,25%)	1: 8 (1,00%)
			2: 70 (8,53%)	2: 62 (8,54%)	2: 62 (8,54%)	2: 70 (8,53%)	2: 62 (8,54%)	2: 69 (8,59%)	2: 76 (9,45%)
			3: 155	3: 139	3: 139	3: 155	3: 139	3: 147	3: 150
			(18,88%)	(19,15%)	(19,15%)	(18,88%)	(19,15%)	(18,31%)	(18,66%)
			<b>4: 523</b>	<b>4: 466</b>	<b>4: 466</b>	<b>4: 523</b>	<b>4: 466</b>	<b>4: 520</b>	<b>4: 514</b>
			<b>(63,70%)</b>	<b>(64,19%)</b>	<b>(64,19%)</b>	<b>(63,70%)</b>	<b>(64,76%)</b>	<b>(64,76%)</b>	<b>(63,93%)</b>
			5: 62 (7,55%)	5: 45 (6,20%)	5: 45 (6,20%)	5: 62 (7,55%)	5: 60 (7,47%)	5: 60 (7,47%)	5: 53 (6,59%)
			6: 4 (0,49%)	6: 4 (0,55%)	6: 4 (0,55%)	6: 4 (0,49%)	6: 5 (0,62%)	6: 5 (0,62%)	6: 3 (0,37%)
			Total: 821	Total: 726	Total: 726	Total: 821	Total: 803	Total: 803	Total: 804
Clinical support									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 8 (1,91%)	1: 10 (2,60%)	1: 10 (2,60%)	1: 8 (1,91%)	1: 10 (2,60%)	1: 7 (1,68%)	1: 5 (1,21%)
			2: 47 (11,24%)	2: 48	2: 48	2: 47 (11,24%)	2: 48	2: 56	2: 46 (11,17%)
			3: 90 (21,53%)	(12,47%)	(12,47%)	3: 90 (21,53%)	(12,47%)	(13,46%)	3: 91 (22,09%)
			<b>4: 246</b>	3: 81	3: 81	<b>4: 246</b>	3: 81	3: 72	<b>4: 240</b>
			<b>(58,85%)</b>	(21,04%)	(17,31%)	<b>(58,85%)</b>	(21,04%)	(17,31%)	<b>(58,25%)</b>
			5: 22 (5,26%)	<b>4: 218</b>	<b>4: 218</b>	5: 22 (5,26%)	<b>4: 218</b>	<b>4: 243</b>	5: 25 (6,07%)
			6: 5 (1,20%)	<b>(56,62%)</b>	<b>(56,62%)</b>	6: 5 (1,20%)	<b>(56,62%)</b>	<b>(58,41%)</b>	6: 5 (1,21%)
			Total: 418	5: 24 (6,23%)	5: 24 (6,23%)	Total: 418	5: 24 (6,23%)	5: 36 (8,65%)	Total: 412
				6: 4 (1,04%)	6: 4 (1,04%)		6: 4 (1,04%)	6: 2 (0,48%)	
			Total: 385	Total: 416	Total: 416	Total: 385	Total: 416	Total: 416	Total: 412
Clinical (co) treating									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 3-4)
			1: 2 (0,65%)	1: 2 (0,60%)	1: 1 (0,30%)	1: 2 (0,65%)	1: 2 (0,60%)	1: 1 (0,30%)	1: 3 (0,86%)
			2: 22 (7,12%)	2: 17 (5,14%)	2: 17 (5,14%)	2: 22 (7,12%)	2: 17 (5,14%)	2: 28 (8,36%)	2: 20 (5,75%)
			3: 52 (16,83%)	3: 60	3: 60	3: 52 (16,83%)	3: 60	3: 50	3: 80 (22,99%)
			<b>4: 204</b>	(18,13%)	(14,93%)	<b>4: 204</b>	(18,13%)	(14,93%)	<b>4: 216</b>
			<b>(66,02%)</b>	<b>4: 217</b>	<b>4: 217</b>	<b>(66,02%)</b>	<b>4: 217</b>	<b>4: 227</b>	<b>(62,07%)</b>
			5: 27 (8,74%)	<b>(65,56%)</b>	<b>(67,76%)</b>	5: 27 (8,74%)	<b>(65,56%)</b>	<b>(67,76%)</b>	5: 27 (7,76%)
			6: 2 (0,65%)	5: 30 (9,06%)	5: 26 (7,76%)	6: 2 (0,65%)	5: 30 (9,06%)	5: 26 (7,76%)	6: 2 (0,57%)
			Total: 309	6: 5 (1,51%)	6: 3 (0,90%)	Total: 309	6: 5 (1,51%)	6: 3 (0,90%)	Total: 348
			Total: 331	Total: 335	Total: 335	Total: 331	Total: 335	Total: 335	Total: 348

Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
<b>Analytics</b>									
			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 7 (1,65%)	1: 4 (1,07%)	1: 4 (1,07%)	1: 4 (1,07%)	1: 4 (1,07%)	1: 7 (1,78%)	1: 9 (2,15%)
			2: 49 (11,56%)	2: 31 (8,27%)	2: 31 (8,27%)	2: 49 (11,56%)	2: 31 (8,27%)	2: 30 (7,63%)	2: 25 (5,98%)
			3: 82 (19,34%)	3: 80	3: 80	3: 82 (19,34%)	3: 80	3: 70	3: 86 (20,57%)
			<b>4: 247</b>	(21,33%)	(17,81%)	<b>4: 247</b>	(17,81%)	<b>4: 270</b>	<b>4: 270</b>
			<b>(58,25%)</b>	<b>4: 228</b>	<b>4: 245</b>	<b>(60,80%)</b>	<b>4: 245</b>	<b>(64,59%)</b>	<b>(64,59%)</b>
			5: 34 (8,02%)	5: 26 (6,93%)	5: 26 (6,93%)	5: 34 (8,02%)	5: 26 (6,93%)	5: 39 (9,92%)	5: 28 (6,70%)
			6: 5 (1,18%)	6: 6 (1,60%)	6: 6 (1,60%)	6: 5 (1,18%)	6: 6 (1,60%)	6: 2 (0,51%)	6: 0 (0%)
			Total: 424	Total: 424	Total: 424	Total: 424	Total: 418	Total: 418	Total: 418
			Total: 375	Total: 375	Total: 375	Total: 375	Total: 393	Total: 393	Total: 393
<b>Scientific research &amp; education</b>									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 5 (1,34%)	1: 2 (0,52%)	1: 2 (0,52%)	1: 5 (1,34%)	1: 2 (0,52%)	1: 1 (0,28%)	1: 8 (1,99%)
			2: 26 (6,97%)	2: 12 (3,10%)	2: 12 (3,10%)	2: 26 (6,97%)	2: 12 (3,10%)	2: 17 (4,75%)	2: 22 (5,47%)
			3: 48 (12,87%)	3: 67	3: 67	3: 48 (12,87%)	3: 67	3: 41	3: 52 (12,94%)
			<b>4: 217</b>	(17,31%)	(11,45%)	<b>4: 217</b>	(17,31%)	<b>4: 255</b>	<b>4: 255</b>
			<b>(58,18%)</b>	<b>4: 241</b>	<b>4: 235</b>	<b>(58,18%)</b>	<b>4: 241</b>	<b>4: 235</b>	<b>(63,43%)</b>
			5: 63 (16,89%)	5: 60	5: 60	5: 63 (16,89%)	5: 60	5: 57	5: 57 (14,18%)
			6: 14 (3,75%)	6: 5 (1,29%)	6: 5 (1,29%)	6: 14 (3,75%)	6: 5 (1,29%)	6: 8 (1,99%)	6: 8 (1,99%)
			Total: 373	Total: 373	Total: 373	Total: 373	Total: 402	Total: 402	Total: 402
			Total: 387	Total: 387	Total: 387	Total: 387	Total: 358	Total: 358	Total: 358
<b>Management</b>									
			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 1 (0,49%)	1: 3 (1,52%)	1: 3 (1,52%)	1: 1 (0,49%)	1: 3 (1,52%)	1: 0 (0%)	1: 2 (1,16%)
			2: 12 (5,85%)	2: 5 (2,54%)	2: 5 (2,54%)	2: 12 (5,85%)	2: 5 (2,54%)	2: 5 (2,51%)	2: 7 (4,05%)
			3: 27 (13,17%)	3: 21	3: 21	3: 27 (13,17%)	3: 21	3: 33	3: 12 (6,94%)
			<b>4: 142</b>	(10,66%)	(16,58%)	<b>4: 142</b>	(10,66%)	<b>4: 133</b>	<b>4: 136</b>
			<b>(69,27%)</b>	<b>4: 152</b>	<b>4: 133</b>	<b>(69,27%)</b>	<b>4: 152</b>	<b>(66,83%)</b>	<b>(78,61%)</b>
			5: 23 (11,22%)	5: 16 (8,12%)	5: 16 (8,12%)	5: 23 (11,22%)	5: 16 (8,12%)	5: 27	5: 16 (9,25%)
			6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 0 (0%)	6: 1 (0,50%)	6: 0 (0%)
			Total: 205	Total: 197	Total: 197	Total: 205	Total: 173	Total: 173	Total: 173
			Total: 199	Total: 199	Total: 199	Total: 199	Total: 199	Total: 199	Total: 199



Table H Stratification for age and function on possibilities for learning and development items (Continued)

Question-Item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
Staff, administration, secretariat			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 12 (1,08%)	1: 7 (0,63%)	1: 7 (0,63%)	1: 11 (0,98%)	1: 11 (0,98%)	1: 11 (0,98%)	1: 14 (1,23%)
			2: 57 (5,13%)	2: 59 (5,29%)	2: 59 (5,29%)	2: 83 (7,37%)	2: 83 (7,37%)	2: 72 (6,34%)	2: 72 (6,34%)
			3: 192	3: 198	3: 198	3: 183	3: 183	3: 189	3: 189
			(17,28%)	(17,74%)	(17,74%)	(16,25%)	(16,25%)	(16,64%)	(16,64%)
			<b>4: 737</b>	<b>4: 705</b>	<b>4: 705</b>	<b>4: 697</b>	<b>4: 697</b>	<b>4: 744</b>	<b>4: 744</b>
			<b>(66,34%)</b>	<b>(63,17%)</b>	<b>(63,17%)</b>	<b>(61,90%)</b>	<b>(61,90%)</b>	<b>(65,49%)</b>	<b>(65,49%)</b>
			5: 95 (8,55%)	5: 121	5: 121	5: 132	5: 132	5: 107 (9,42%)	5: 107 (9,42%)
			6: 18 (1,62%)	(10,84%)	(10,84%)	(11,72%)	(11,72%)	6: 10 (0,88%)	6: 10 (0,88%)
			Total: 1111	6: 26 (2,33%)	6: 26 (2,33%)	6: 20 (1,78%)	6: 20 (1,78%)	Total: 1136	Total: 1136
		Total: 1116	Total: 1116	Total: 1116	Total: 1126	Total: 1126	Total: 1126	Total: 1126	
Facility			4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)	4 (IQR 3-4)
			1: 20 (3,05%)	1: 17 (2,84%)	1: 17 (2,84%)	1: 15 (2,52%)	1: 15 (2,52%)	1: 12 (2,11%)	1: 12 (2,11%)
			2: 56 (8,54%)	2: 57 (9,53%)	2: 57 (9,53%)	2: 60	2: 60	2: 53 (9,30%)	2: 53 (9,30%)
			3: 151	3: 125	3: 125	3: 138	3: 138	3: 120	3: 120
			(23,02%)	(20,90%)	(20,90%)	(21,05%)	(21,05%)	(21,05%)	(21,05%)
			<b>4: 355</b>	<b>4: 323</b>	<b>4: 323</b>	<b>4: 317</b>	<b>4: 317</b>	<b>4: 309</b>	<b>4: 309</b>
			<b>(54,12%)</b>	<b>(54,01%)</b>	<b>(54,12%)</b>	<b>(53,28%)</b>	<b>(53,28%)</b>	<b>(54,21%)</b>	<b>(54,21%)</b>
			5: 57 (8,69%)	5: 63	5: 63	5: 55 (9,24%)	5: 55 (9,24%)	5: 63 (11,05%)	5: 63 (11,05%)
			6: 17 (2,59%)	(10,54%)	(10,54%)	6: 13 (2,28%)	6: 13 (2,28%)	6: 13 (2,28%)	6: 13 (2,28%)
			Total: 656	6: 13 (2,17%)	6: 13 (2,17%)	6: 10 (1,68%)	6: 10 (1,68%)	Total: 570	Total: 570
		Total: 598	Total: 598	Total: 598	Total: 595	Total: 595	Total: 595	Total: 595	
Resident physicians			4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)	4 (IQR 4-4)
			1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)	1: 0 (0%)
			2: 7 (3,89%)	2: 5 (3,21%)	2: 5 (3,21%)	2: 3 (2,26%)	2: 3 (2,26%)	2: 8 (5,37%)	2: 8 (5,37%)
			3: 31 (17,22%)	3: 19	3: 19	3: 21	3: 21	3: 19 (12,75%)	3: 19 (12,75%)
			<b>4: 119</b>	(12,18%)	(12,18%)	(15,79%)	(15,79%)	<b>4: 102</b>	<b>4: 102</b>
			<b>(66,11%)</b>	<b>4: 103</b>	<b>4: 103</b>	<b>4: 86</b>	<b>4: 86</b>	<b>(68,46%)</b>	<b>(68,46%)</b>
			5: 22 (12,22%)	<b>(66,03%)</b>	<b>(66,03%)</b>	<b>(64,66%)</b>	<b>(64,66%)</b>	5: 18 (12,08%)	5: 18 (12,08%)
			6: 1 (0,56%)	5: 28	5: 28	5: 21	5: 21	6: 2 (1,34%)	6: 2 (1,34%)
			Total: 180	(17,95%)	(17,95%)	(15,79%)	(15,79%)	Total: 149	Total: 149
			Total: 156	6: 1 (0,64%)	6: 2 (1,50%)	6: 2 (1,50%)	6: 2 (1,50%)	Total: 133	Total: 133
		Total: 156	Total: 156	Total: 156	Total: 156	Total: 156	Total: 156	Total: 156	

Tabel H Stratification for age and function on possibilities for learning and development items (*Continued*)

Question-item	Scale	Stratification level	Hospital A Sept 2020 (4157)	Hospital A Dec 2021 (4102)	Hospital A July 2022 (3603)	Hospital B Sept 2020 (5056)	Hospital B Jan 2022 (4842)	Hospital B May 2022 (4894)	Hospital B May 2023 (4895)
		Medical specialists							
			4 (1QR 4-4)	4 (1QR 4-4)	4 (1QR 4-4)	4 (1QR 4-4)	4 (1QR 4-4)	4 (1QR 4-4)	4 (1QR 4-4)
			1: 4 (1,24%)	1: 3 (0,88%)	1: 4 (1,11%)	1: 3 (0,88%)	1: 1 (0,31%)	1: 1 (0,31%)	1: 4 (1,50%)
			2: 15 (4,64%)	2: 24 (7,06%)	2: 24 (7,06%)	2: 24 (7,06%)	2: 20 (6,29%)	2: 20 (6,29%)	2: 12 (4,51%)
			3: 37 (11,46%)	3: 41	3: 41	3: 41	3: 50	3: 50	3: 29 (10,90%)
			<b>4: 215</b>	(12,06%)	(12,06%)	(12,06%)	(15,72%)	(15,72%)	<b>4: 186</b>
			<b>(66,56%)</b>	<b>4: 202</b>	<b>4: 202</b>	<b>4: 202</b>	<b>4: 198</b>	<b>4: 198</b>	<b>(69,92%)</b>
			5: 51 (15,79%)	<b>(59,41%)</b>	<b>(59,41%)</b>	<b>(59,41%)</b>	<b>(62,26%)</b>	<b>(62,26%)</b>	5: 34 (12,78%)
			6: 1 (0,31%)	5: 68	5: 68	5: 68	5: 49	5: 49	6: 0 (0%)
			Total: 323	(20,00%)	(20,00%)	(20,00%)	(15,41%)	(15,41%)	Total: 266
				6: 2 (0,59%)	6: 2 (0,59%)	6: 2 (0,59%)	6: 0 (0%)	6: 0 (0%)	
				Total: 340	Total: 340	Total: 340	Total: 318	Total: 318	





# 5

## **Assessing the Well-Being at Work of Nurses and Doctors in Hospitals: protocol for a Scoping Review of Monitoring Instruments**

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## ABSTRACT

**Background:** Well-being at work can be defined as ‘creating an environment to promote a state of contentment which allows an employee to flourish and achieve their full potential for the benefit of themselves and their organization.’ In the health care context, well-being at work of nurses and doctors is important for good patient care. Moreover, it is strongly associated with individual- and organization-level consequences. Relevant literature presents models and concepts of physical, mental, and social well-being. This study uses the 6 elements of the job demands-resources (JD-R) model to interpret well-being at work (job demands, job resources, personal resources, leadership, well-being, and outcomes) as part of a Netherlands Federation of University Medical Hospitals program to find ways to improve and monitor health care professionals’ well-being in Dutch hospitals. Many instruments exist to measure well-being at work in terms of population, setting, and other aspects. An overview of available and eligible instruments assessing and monitoring the well-being of nurses and doctors is currently missing. **Objective:** We will perform a scoping review aiming to provide an overview of validated instruments assessing and monitoring the well-being of nurses and doctors at work. **Methods:** We will perform a search of published literature in the following databases: Medline, Embase, and CINAHL. Studies will be eligible if they (1) assess well-being at work of nurses and doctors employed in hospitals; (2) describe an evaluation of an instrument or review an instrument; (3) measure well-being at work or aspects of well-being at work according to the elements of the JD-R model, and (4) were published in English from 2011 onwards. Title/abstract screening according to the eligibility criteria will be followed by full-text screening. Data extraction of included studies will be conducted by 3 reviewers independently. Reviewers will use standardized data extraction forms that include study characteristics, sample characteristics, measurement instrument details, and psychometric properties. The analysis will be descriptive. When synthesizing the data, a distinction will be made between comprehensive instruments and common instruments. **Results:** This scoping review identifies instruments that have been developed and validated for monitoring the well-being of nurses and doctors at work. Studies were searched between September and December 2021 and screened between December 2021 and May 2022. A total of 739 studies were included. **Conclusions:** Timely screening of well-being at work may be beneficial for individual health care workers, the organization, and patients. There is often a substantial gap and mismatch between employer perceptions of well-being and well-being interventions. It is important to develop and implement suitable interventions adapted to the needs of nurses and doctors and their health or other problems. Well-being screening should be timely to gain insight into these needs and problems. Moreover, to determine the effectiveness of well-being interventions, measurement is mandatory. The results will be critical for organizations to select a monitoring instrument that best fits the needs of employees and organizations.

Keywords: Well-being at work, Well-being, Well being, Health care professionals, Doctors, Nurses, Monitoring, Assessment, Measure, Scale, Instruments, Scoping literature review, Occupational health

## INTRODUCTION

Well-being at work for nurses and doctors employed in hospitals is an important condition for achieving effective, safe and good patient care<sup>1-3</sup>. Moreover, well-being at work is strongly associated with serious consequences at an individual level, such as poor work life balance<sup>3,4</sup>, obesity<sup>3</sup>, reduced quality of life of the health care worker<sup>3,5</sup>, substance abuse, and suicide<sup>3,6</sup>. At an organizational level it is related to high staff turnover<sup>3,6</sup>, absenteeism<sup>3,7</sup> and high health care costs<sup>3</sup>.

The Chartered Institute of Personnel and Development defines well-being at work as ‘creating an environment to promote a state of contentment which allows an employee to flourish and achieve their full potential for the benefit of themselves and their organisation’<sup>8</sup>. Well-being contains psychological well-being, physical well-being and social well-being<sup>9</sup>. Also, a variety of published literature presents models and concepts of well-being. Deci et al<sup>10</sup> reported the Self-Determination theory. The Self-Determination theory suggests that both employees’ performance and their well-being are affected by the type of motivation they have experienced<sup>10</sup>. For medical students, the ‘Coping Reserve Tank’ was illustrated<sup>11</sup>. This is a coping reservoir that can be replenished or drained by various factors, such as stress, mentorship, time demands and support<sup>11</sup>. Potential outcomes were described as resilience versus burnout<sup>11</sup>. Schaufeli<sup>12</sup> developed the job demands resources model (JD-R model) facilitating communication about ‘work and well-being’. In essence, the JD-R model integrates 2 processes: the stress process, which is sparked by excessive job demand and lack of resources, and a motivational process, which is triggered by abundant job resources and may lead to positive outcomes, such as organizational commitment, intention to stay and work performance<sup>12</sup>. Thus, different components, including resources (eg, support, development opportunities, team atmosphere), demands (eg, stress, workload, conflicts), and personal resources (eg, leadership, intrinsic motivation, resilience), contribute to positive wellbeing (eg, job satisfaction) or negative well-being (eg, burnout). Abundant resources and reasonable demands will result in positive outcomes (eg, performance, commitment); the reverse will lead to negative outcomes (sickness, absenteeism)<sup>12</sup>.

Measuring well-being at work among doctors and nurses is not easy, since this multidimensional concept encompasses diverse elements<sup>8,13</sup>. Instruments to measure well-being at work vary in specific professions<sup>14</sup>, and specific settings<sup>15</sup> or include only one or two aspects of well-being at work<sup>12,16</sup>. This study is part of a program of the Netherlands Federation of University medical hospitals (NFU) about finding ways to improve and monitor healthcare professionals’ wellbeing in Dutch hospitals. Strikingly, there is often a substantial gap and mismatch between employer perceptions of well-being and well-being interventions<sup>8</sup>. It is important to develop and implement suitable interventions adapted to the needs of nurses and doctors and their

health and other problems<sup>8,17</sup>. Well-being screening should be timely to gain insight into these needs and problems. Moreover, measurement to determine effectiveness of well-being interventions is mandatory<sup>8,17</sup>.

To summarize, when hospitals assess and monitor the well-being of nurses and doctors with validated instruments, they can, in a timely manner, design and start tailored interventions to prevent negative well-being in the workplace, thereby contributing to sustainable employability and quality of care<sup>18,19</sup>. An overview of available and eligible instruments assessing and monitoring the well-being of nurses and doctors is currently missing. Scoping reviews are helpful to explore broad, complex and heterogeneous literature<sup>20</sup>. For this study, a scoping review is planned to obtain an overview of the field of well-being instruments and identify its breadth.

## METHODS

### Aim

This scoping review aims to identify instruments monitoring well-being at work of nurses and doctors working in hospitals. The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)<sup>21</sup> and the 6-stage framework of Arskey and O'Mally<sup>22</sup> for conducting scoping reviews will be used.

### Information sources

A priori, possible previous reviews of this topic were checked. Published articles will be searched in the electronic databases: Medline, Embase and CINAHL. To avoid including outdated literature, we will include only articles published after 2011<sup>23</sup>. To identify instruments that are applied in present clinical practice, preference is given to more-frequent, lower-volume searches to fit the exponentially changing field of health care<sup>24,25</sup>. Grey literature will not be used as an information source.

### Search strategy

The search strategy was created by AB with assistance by an information specialist and the research team. Several terms derived from the research aim were identified to develop search strings to find relevant literature. Keywords and Medical Subject Heading (MeSH) terms related to the domain (nurses and doctors working in hospitals), the determinants (instruments for monitoring), and the outcome (well-being at work) will be used. The first draft of the search string was based on 5 relevant, previously published "golden bullets," sample articles that had to be found in the data set. Afterwards, a test data set was screened by the first author to optimize the search string. After this screening, the data set turned out to be too large (more

than 17,000 studies), so to ensure the feasibility of the study it was decided to make the search more specific. For the search strategy see Tables 1, 2, and 3.

Table 1 Search strategy for Medline

ID	Query	Results
#1	("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff").ti. or exp *"physicians"/ or exp *"Medical staff"/ or *"Residents"/ or exp *"Nurses"/ or exp *"Nursing Staff"/	461194
#2	(instrumentation or methods).fs. or exp "psychometrics"/ or psychometr*.ti,ab. or clinimetr*.tw. or clinometr*.tw. or exp "Health Status Indicators"/ or survey?.ti,ab. or score.ti,ab. or scale.ti,ab. or subscale.ti,ab. or (measurement adj 3 instrument).ti,ab. or subscale*.ti,ab. or item-discriminant.ti,ab. or interscale correlation*.ti,ab. or "ceiling effect".ti,ab. or "floor effect".ti,ab. or "Item response model".ti,ab. or Rasch.ti,ab. or "Differential item functioning".ti,ab. or "item bank".ti,ab. or (item adj3 (correlation* or selection* or reduction* or bank)).ti,ab.	6142766
#3	Validation Studies.pt. or exp "observer variation"/ or observer variation.ti,ab. or exp "reproducibility of results"/ or exp "discriminant analysis"/ or valid*.ti,ab. or (cronbach adj3 (alpha or alphas)).ti,ab. or interrater.ti,ab. or inter-rater.ti,ab. or intrarater.ti,ab. or intra-rater.ti,ab. or intertester.ti,ab. or inter-tester.ti,ab. or intratester.ti,ab. or intra-tester.ti,ab. or interobserver.ti,ab. or inter-observer.ti,ab. or intraobserver.ti,ab. or intraobserver.ti,ab. or interexaminer.ti,ab. or inter-examiner.ti,ab. or intraexaminer.ti,ab. or intra-examiner.ti,ab. or interindividual.ti,ab. or inter-individual.ti,ab. or intraindividual.ti,ab. or intra-individual.ti,ab. or kappa.ti,ab. or kappa?.s.ti,ab. or kappas.ti,ab. or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)).ti,ab. or concordance.ti,ab. or (intraclass and correlation*).ti,ab. or (uncertainty and (measurement or measuring)).ti,ab. or "standard error of measurement".ti,ab. or sensitiv*.ti,ab.	2822376
#4	exp Burnout, Psychological/ or exp Personal Satisfaction/ or exp Mental Health/ or (satisfaction or well-being or fulfilment or burnout or ((psychological or mental) adj health) or thriving or environment or ethic*).ti,ab,kf.	1122990
#5	#1 and #2 and #3 and #4	3301

Table 2 Search strategy for Embase

ID	Query <sup>a</sup>	Results
#1	#2 AND [embase]/lim NOT ([embase]/lim AND [medline]/lim)	1146
#2	#6 AND #5 AND #4 AND #3	2667

Table 2 Search strategy for Embase (Continued)

ID	Query <sup>a</sup>	Results
#3	'burnout'/exp OR 'job satisfaction'/exp OR 'mental health'/exp OR satisfaction:ti,ab,kw OR 'well being':ti,ab,kw OR fulfilment:ti,ab,kw OR burnout:ti,ab,kw OR (((psychological OR mental) NEAR/1 health):ti,ab,kw) OR thriving:ti,ab,kw OR environment:ti,ab,kw OR ethic*:ti,ab,kw	1484181
#4	'validation study'/exp OR 'observer variation'/exp OR 'reproducibility'/exp OR 'discriminant analysis'/exp OR valid*:ti,ab OR ((cronbach* NEAR/3 (alpha OR alphas)):ti,ab) OR interrater:ti,ab OR 'inter rater':ti,ab OR intrarater:ti,ab OR 'intra rater':ti,ab OR intertester:ti,ab OR 'inter tester':ti,ab OR intratester:ti,ab OR 'intra tester':ti,ab OR interobserver:ti,ab OR 'inter observer':ti,ab OR intraobserver:ti,ab OR interexaminer:ti,ab OR 'inter examiner':ti,ab OR intraexaminer:ti,ab OR 'intra examiner':ti,ab OR interindividual:ti,ab OR 'inter individual':ti,ab OR intraindividual:ti,ab OR 'intra individual':ti,ab OR kappa:ti,ab OR kappa?:ti,ab OR kappas:ti,ab OR ((replicab*:ti,ab OR repeated:ti,ab) AND (measure:ti,ab OR measures:ti,ab OR findings:ti,ab OR result:ti,ab OR results:ti,ab OR test:ti,ab OR tests:ti,ab)) OR concordance:ti,ab OR (intraclass:ti,ab AND correlation*:ti,ab) OR (uncertainty:ti,ab AND (measurement:ti,ab OR measuring:ti,ab)) OR 'standard error of measurement':ti,ab OR sensitiv*:ti,ab	3530203
#5	'psychometry'/exp OR 'health status indicator'/exp OR psychometr*:ti,ab OR clinimetr*:ti,ab OR clinometr*:ti,ab OR survey?:ti,ab OR score:ti,ab OR scale:ti,ab OR subscale:ti,ab OR ((measurement NEAR/3 instrument):ti,ab) OR subscale*:ti,ab OR 'item discriminant':ti,ab OR 'interscale correlation*:ti,ab OR 'ceiling effect':ti,ab OR 'floor effect':ti,ab OR 'item response model':ti,ab OR rasch:ti,ab OR 'differential item functioning':ti,ab OR 'item bank':ti,ab OR ((item NEAR/3 (correlation* OR selection* OR reduction* OR bank)):ti,ab)	2215105
#6	#8 OR #7	484701
#7	'healthcare professionals':ti OR caregivers:ti OR 'healthcare providers':ti OR practitioners:ti OR doctor:ti OR nurse?:ti OR physician?:ti OR resident?:ti OR 'healthcare worker':ti OR 'health staff':ti	231352
#8	'physician'/exp/mj OR 'medical staff'/exp/mj OR 'resident'/exp/mj OR 'nurse'/exp/mj OR 'nursing staff'/exp/mj	328848

<sup>a</sup>The following abbreviations are applicable to the queries: T1: title; N1: adjacency of 1 word; AB: abstract; MH: mesh heading; MM: major mesh.

Table 3 Search strategy for Cinahl

ID	Query <sup>a</sup>	Results
S1	S17 AND S10 AND S4 AND S3	1329
S2	S17 AND S10 AND S4 AND S3	229
S3	S9 OR S8 OR S7 OR S6 OR S5	46447
S4	S25 OR S24 OR S23 OR S22	421434
S5	TI(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)	145799



Table 3 Search strategy for Cinahl (*Continued*)

ID	Query <sup>a</sup>	Results
S6	AB(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)	36566
S7	(MH "Mental Health")	44106
S8	(MH "Job Satisfaction") OR (MH "Personal Satisfaction")	35259
S9	(MH "Burnout, Professional")	12506
S10	S15 OR S14 OR S13 OR S12 OR S11	502496
S11	TI(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)	80499
S12	AB(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)	417988
S13	(MH "Kappa Statistic")	17505
S14	(MH "Reproducibility of Results")	67821
S15	(MH "Interrater Reliability")	27493
S16	S25 OR S24 OR S23 OR S22 OR S21	82033
S17	S20 OR S19 OR S18	753761
S18	TI(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))	12483
S19	AB(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))	694621
S20	(MH "Psychometrics") OR (MH "Measurement Issues and Assessments")	32107

Table 3 Search strategy for Cinahl (*Continued*)

ID	Query <sup>a</sup>	Results
S21	AB("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")	556739
S22	TI("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")	296467
S23	(MM "Nurses+")	141674
S24	(MM "Medical Staff, Hospital+")	3977
S25	(MM "Physicians+")	64766

<sup>a</sup>The following abbreviations are applicable to the queries: T1: title; N1: adjacency of 1 word; AB: abstract; MH: mesh heading; MM: major mesh.

### Inclusion criteria

Studies will be eligible if they (1) assess well-being of nurses and doctors working in hospitals; (2) describe an evaluation of an instrument or review an instrument; (3) measure well-being at work or aspects of well-being at work according the elements of the JD-R model and (4) were published in English in or after 2011.

### Exclusion criteria

Studies will be excluded if they (1) describe only the development of the instrument but not its evaluation or (2) have a sample that consists only of students, without employees.

### Data management

Records and data will be managed by using the software Endnote (version 20.1; Clarivate Analytics), Rayyan (Rayyan Systems), EPPI-Reviewer (EPPI-center) and Mendeley Reference Manager (version 2.590; Elsevier).

### Selection process

Study screening and selection will be conducted independently by AB, KvdB, and NA using Rayyan. After the removal of duplicate records identified by the search strategy, articles will be screened on titles and abstracts for the inclusion and exclusion criteria. To ensure consistent screening, the first 100 articles will be pilot-screened by all 3 researchers until consensus is reached. After validation, the hits will be allocated to 1 of the 3 researchers. Eligible articles will then be assessed on their full text. To ensure consistent full-text screening, the first 18 articles will be pilot-screened by all 3 researchers until consensus is reached. After validation, the full texts will be subdivided among the 3 researchers. Justification for study inclusion and exclusion will be reported. Inclusion reasons and exclusion reasons will be marked with a label. Uncertainty in selection and the data extraction process will be resolved by consensus<sup>12</sup>. The JD-R model will be used to assess if the reported instruments appropriately measured well-being or aspects of well-being at work (job demands, job resources, engaged leadership,

personal resources, employees' well-being, outcomes). The energy compass of the JD-R model includes all aspects of well-being at work and is applicable to different employees in different settings<sup>12</sup>. Included instruments will be categorized according to the 6 domains of the JD-R model. The domain "job demands" contains the categories "qualitative job demands," "quantitative job demands," and "organizational demands." The domain "job resources" contains the categories "social resources," "work resources," "organizational resources," and "developmental resources." The domain "engaged leadership" contains the categories "inspiring," "strengthening," and "connecting." The domain "personal resources" contains the categories "resilience," "self-efficacy," "optimism," flexibility," "setting one's own limits," "productivity," "goal direction," and "self-development." The domain "well-being" contains the positive and negative categories "burnout," "work engagement," "psychological distress," "boredom," "sleep problems," and "job satisfaction." The domain "outcomes" contains the categories "commitment," "employability," and "performance." Study search and selection will be illustrated using the PRISMA flow diagram.

### Data collection process

Data extraction and full-text screening will be conducted at the same time. AB, KvdB, and NA will independently use the standardized data extraction form, which will be developed a priori in Excel (Microsoft Corp). The elements that will be charted for each article are (1) study characteristics, including year, authors, country, study ID, and study aim (validation study, measuring variables, both, other); (2) sample characteristics, including type of health care professionals (nurses, doctors, other), setting (hospital, partly hospital), and sample size; (3) measurement instrument, including the name of the instrument, main construct measured, subconstructs measured, job demands, job resources, leadership, personal resources, well-being, and outcomes; and (4) psychometric properties, including validity, reliability, responsiveness, and quality references. The aim of this study is not to evaluate psychometric properties but include only the evaluated instruments. Therefore, information about psychometric properties (whether validity, reliability, and responsiveness are tested) will be extracted. When no psychometric properties are reported, the references mentioned for evaluation will be extracted. Table 4 shows further details.

Table 4 Defining variables

Item	Definition
1. Study characteristics	
Year	<u>Picklist</u> - Years from 2011 up to and including 2021.
Authors	Last name; initials.
Country	Country where participants are recruited.

Table 4 Defining variables (*Continued*)

Item	Definition
Study ID	Unique code to identify the study, found in Eppi reviewer.
Study aim	<u>Picklist</u> <ul style="list-style-type: none"> <li>- Validation study: the study tests or evaluates instruments.</li> <li>- Measuring variables: the study uses instruments to measure variables.</li> <li>- Both: studies which both validate instruments and measure variables.</li> <li>- Other: studies in which the above is not described, eg, study protocols.</li> </ul>
2. Sample characteristics	
Healthcare professionals	<u>Picklist</u> : <ul style="list-style-type: none"> <li>- (partly)Nurses: all kinds of nurses providing direct patient care in hospitals, eg, intensive care nurses and pediatric nurses.</li> <li>- (partly)Doctors: all kinds of doctors providing direct patient care in hospitals, eg, residents, medical assistants and medical specialists in various specialties.</li> <li>- Both: studies in which both nurses and doctors are described.</li> </ul>
Setting	<u>Picklist</u> : <ul style="list-style-type: none"> <li>- Hospital: full sample works in hospital.</li> <li>- Partly in hospital: a part of the sample works in hospital.</li> </ul> <p>All kinds of hospitals are possible, eg, psychiatric hospitals, general hospitals or academic hospitals.</p>
Sample size	The full sample size. If the sample works in hospital partly, the full sample needs to be reported.
3. Measurement instrument	
Name of instrument	Full name of the instrument, including any abbreviation, eg, Professional Quality of Life Scale, version 5 (ProQol-5).
Main construct measured	Main construct that is intended to measure, eg, Professional quality of life.
Sub-constructs measured	Sub-themes that are intended to measure, eg, Compassion Satisfaction (CS), Secondary traumatic stress (STS), burnout (BO).
JD-R <sup>a</sup> demands	<u>Picklist</u> : <ul style="list-style-type: none"> <li>- Job demands: the outcome fits with 'job demands' according to the JD-R<sup>a</sup> model.</li> <li>- N/A<sup>b</sup>: the outcome does not fit with 'job demands' according to the JD-R<sup>a</sup> model</li> </ul>
JD-R <sup>a</sup> resources	<u>Picklist</u> : <ul style="list-style-type: none"> <li>- Job resources: the outcome fits with 'job resources' according to the JD-R<sup>a</sup> model.</li> <li>- N/A<sup>b</sup>: the outcome does not fit with 'job resources' according to the JD-R<sup>a</sup> model.</li> </ul>
JD-R <sup>a</sup> leadership	<u>Picklist</u> : <ul style="list-style-type: none"> <li>- Engaged leadership: the outcome fits with 'engaged leadership' according to the JD-R<sup>a</sup> model.</li> <li>- N/A<sup>b</sup>: the outcome does not fit with 'engaged leadership' according to the JD-R<sup>a</sup> model.</li> </ul>

Table 4 Defining variables (*Continued*)

Item	Definition
JD-R <sup>a</sup> well-being	<u>Picklist:</u> - Employee well-being: the outcome fits with 'employee well-being' according to the JD-R <sup>a</sup> model. - N/A <sup>b</sup> : the outcome does not fit with 'employee well-being' according to the JD-R <sup>a</sup> model.
JD-R <sup>a</sup> outcomes	<u>Picklist:</u> - Outcomes: the outcome fits with 'outcome' according to the JD-R <sup>a</sup> model. - N/A <sup>b</sup> : the outcome does not fit with 'outcomes' according to the JD-R <sup>a</sup> model.
4. Psychometric properties	
Validity	<u>Picklist:</u> - Valid: the instrument is tested and proven valid in the study, eg, content validity, construct validity, criterion validity <sup>26</sup> . - N/A <sup>b</sup> : Validity is not tested in the study
Reliability	<u>Picklist:</u> - Reliable: the instrument is tested and proven reliable in the study, eg, internal consistency, reliability, measurement error <sup>26</sup>
Responsiveness	<u>Picklist:</u> - Responsiveness: the instrument is responsive (the ability of the instrument to detect relevant changes in health status when they exist) <sup>26</sup> . - N/A <sup>b</sup> : responsiveness is not tested in the study
Quality	Only if reference(s) to original evaluation study in the form of author; year reference1-6

<sup>a</sup>JD-R: job demands-resources.

<sup>b</sup>N/A: not applicable

All instruments meeting the inclusion criteria will be extracted from studies. If more than one instrument has been described, instrument details will be extracted separately for each instrument. The data extraction form will be tested by AB, KvdB, and NA on 18 studies to ensure adequacy of the extraction. Disagreements will be discussed, and the form will be refined, if necessary, after the pilot phase with the 18 studies.

### Risk of bias

Evaluating evidence quality is not applicable for scoping reviews<sup>22,27</sup>. AB, KvdB, and NA are junior researchers with relatively little experience in conducting scoping reviews on the topic of the well-being of nurses and doctors, but they are supervised by senior researchers with ample experience. The variety of backgrounds, opinions, experiences, and perspectives within the interdisciplinary research team supports self-reflectivity about the subjective values, biases, and inclinations of the researchers. In addition to the medical doctors, other health care professional types are also represented within the research team and have experience with the well-being topic. The first author is a nurse and KvdB has a physiotherapy background. Likewise, LH specializes in the methodology of reviews.

### **Data analysis**

This scoping review will determine the size and nature of the evidence base for instruments evaluating well-being at work. The analysis will be descriptive and findings will be assimilated, synthesized, and described. The plan is to summarize validated well-being instruments in tables and figures according to the elements of the JD-R model. Additionally, we will report how often instruments have been extracted, which aspects of well-being are measured, and which types of health care professional are targeted. Synthesizing the data, a distinction will be made between comprehensive instruments and common instruments. The more JD-R domains an instrument encompasses, the more comprehensive (measuring entire well-being) the instrument will be considered to be. Most common instruments are instruments occurring frequently. Results will help readers interpret and choose fitting instruments.

### **Ethical considerations**

This study does not require ethical approval since it is a literature review.

## **RESULTS**

Studies were searched between September 2021 and December 2021. Studies were screened between December 2021 and May 2022. A total of 739 studies were included. Thereafter, data extraction and full text screening were conducted at the same time. The protocol was submitted for publication in October 2022. Before submission, we carried out our search and started screening and extracting data from relevant articles but had no insight into the overall data and had not yet performed data analysis.

## **DISCUSSION**

This scoping review gives an overview of instruments that have been developed and validated for monitoring the well-being of nurses and doctors at work.

Published research shows a great variety in concepts and measures of well-being at work in terms of target population (professions), settings, and aspects of well-being at work. However, a critical, overarching analysis of these concepts and measures is missing in the scientific literature. There is often a substantial gap and mismatch between employer perceptions of well-being and well-being interventions<sup>8</sup>. It is important to develop and implement suitable interventions adapted to the needs of nurses and doctors and their health or other problems<sup>8,17</sup>. Timely screening of well-being is necessary to gain insight into these needs and problems. Moreover, it is necessary to determine the effectiveness of well-being interventions<sup>8,17</sup>.

Our study has some limitations that need to be considered. First, the articles will be divided among 3 researchers because of the amount of data. Consequently, data screening and extraction will be performed once. In order to avoid bias, pilot sets will be screened until consensus on eligibility criteria and JD-R classification is reached. Additionally, an audit trail is used to describe and link thoughts, doubts, and methodological choices.

This study is distinctive in that it does not focus specifically on one instrument but provides an overview of many instruments. By using the JD-R model, we are able to determine which instruments fit in the construct of well-being. By categorizing the instruments according to the elements of the JD-R model, the reader will be supported in selecting instruments appropriate to their context.

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# 6

## **Prioritising nurses' and doctors' health at work: a scoping review of monitoring instruments**

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Laan van der M (2024). *BMJ Open*

## ABSTRACT

**Objective:** Nurses' and doctors' health at work is crucial for their overall performance and the quality of care they provide. The Jobs Demands Resources (JD-R) model offers a framework for health at work, encompassing 'job demands', 'job resources', 'personal resources', 'leadership', 'well-being' and 'outcomes'. While various instruments exist to measure health, an overview of instruments specifically designed for assessing nurses and doctors health is currently missing. This study provides a comprehensive overview of available health instruments specifically developed and validated for healthcare professionals in hospital care. **Design:** Scoping review. **Data sources:** MEDLINE, Embase and CINAHL. **Eligibility criteria:** Studies assessing the health of nurses and/or doctors in hospitals using or evaluating instruments based on the JD-R model, published between January 2011 and January 2024, excluding student-exclusive samples. **Data extraction and synthesis:** We extracted data on study and sample characteristics, as well as details of the measurement instruments, including main and subconstructs. Instruments were categorised based on the JD-R model domains. Descriptive analysis and data visualisation were performed using Excel and Python. **Results:** We included 1204 studies, reporting 986 unique instruments. We identified 32 comprehensive instruments suitable for broad health screening, measuring four or more of the JD-R model domains. Additionally, we identified instruments focusing on specific domains for targeted screening needs. Furthermore, we present frequently reported instruments assumed to be extensively evaluated, user-friendly, accessible and available in multiple languages. **Conclusions:** Health at work cannot be determined by a single instrument alone, underscoring the multidimensional nature of workplace health. Alternatively, organisations should select instruments based on domains most relevant and applicable to their context. This approach ensures a more comprehensive assessment of health at work.

Keywords: Mental health, Risk management, Occupational stress, Burnout, Professional

## INTRODUCTION

Health at work can be defined as ‘the creation of an environment that fosters contentment and allows employees to flourish and achieve their full potential, benefiting both themselves and their organisation’<sup>1</sup>. Health at work for healthcare professionals (HCPs) is for achieving effective, safe, and good patient care<sup>2-4</sup>. Considering current rates of absenteeism/turnover among HCPs, it may be clear that health protection in the field has been insufficient<sup>5</sup>. Lack of health at work is associated with consequences for individual HCPs, such as poor work-life balance<sup>4,6</sup>, obesity<sup>4</sup>, reduced quality of life<sup>4,7</sup>, substance abuse and even suicide<sup>4,8</sup>. At an organisational level it is related to high staff turnover<sup>4,8</sup>, absenteeism<sup>4,9</sup> and costs<sup>4</sup>.

It is understood that health contains psychological, physical, and social health<sup>10</sup>. Different models and concepts of health exist. One of these is the Self-Determination theory<sup>11</sup>, suggesting that motivation is a mediator between work performance and well-being<sup>11</sup>. For students, the Coping Reserve Tank was illustrated<sup>12</sup>, showing a reservoir that can be replenished or drained by various aspects as stress, mentorship, demands and support<sup>12</sup>. Potential outcomes as resilience versus burnout were described<sup>12</sup>. Current study uses the Job Demands Resources model (JD-R model) since it facilitates communication about ‘work and health’<sup>13,14</sup>. The model is comprehensively tested, frequently used in literature, and fits within the context of hospitals. In essence, the JD-R model integrates two processes: the stress process, which is sparked by excessive ‘job demands’ and lack of resources and the motivational process, which is triggered by abundant ‘job resources’ and may lead to positive outcomes such as commitment, intention to stay, and work performance<sup>14</sup>. The different model components contribute to a more positive well-being (eg, Job satisfaction) or to a more negative well-being (eg, *Burnout*). The JD-R model components are ‘demands’ (eg, stress, workload, conflicts), ‘resources’ (eg, support, development opportunities, team atmosphere), ‘leadership’ (eg, inspiring, connecting), and ‘personal resources’ (eg., motivation, resilience), see Figure 1<sup>14</sup>. In summary, the JD-R model gives a clear structure to the various components and processes that influence health at work.

The majority of institutions remain focused on individual-level approaches when it comes to preserving and promoting personal health<sup>15,16</sup>. There is often a mismatch between employees’ perception and organisations’ understanding of health at work<sup>1</sup>. Moreover, working in healthcare is seen as a vocation encompassing compassion, relateness and competence. This ideal is high stake and failing or impairment leads to stigmatizing, shaming, blaming, and humiliation<sup>5</sup>. Uncertain effectiveness of interventions shifts responsibility onto individuals, posing potential harm<sup>5</sup>. To bridge this gap, organisations should monitor health among HCPs to design and implement effective, tailored interventions to specific needs of HCPs.

However, it is unclear how to effectively measure and monitor health at work for HCPs, given its multidimensional nature and diverse elements<sup>1,17</sup>. Health at work instruments vary for specific professions<sup>18</sup>, specific settings<sup>19</sup> or include only one or two aspects of health at work<sup>14,20</sup>. Currently, there is a lack of comprehensive overviews of instruments specifically designed to assess and monitor HCPs' health.

This study is part of a program of the Netherlands Federation of University Medical Centers about finding ways to improve and monitor HCPs' health in Dutch hospitals. This scoping review aims to provide a comprehensive overview of available health instruments specifically developed and validated for HCPs in hospital care. Addressing health at work for HCPs and give an overview of instruments for the purpose of timely health screenings is crucial for (1) ensuring the well-being of individuals, (2) prevent and act on negative health in workplaces<sup>21,22</sup>, (3) gaining insight into the unique challenges and needs of these HCPs, (4) evaluating interventions' effectiveness, (5) the sustainability of healthcare organisations and (6) the quality of patient care<sup>21,22</sup>. Our scoping review of health instruments for HCPs serves as an essential step for hospitals on this transformative journey<sup>23</sup>.

## **METHODS**

This scoping review was conducted using the six-stage framework of Arskey and O'Mally<sup>24</sup>, as well as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-Scr)<sup>25</sup>. Scoping reviews are helpful to explore a broader perspective, complex and heterogeneous literature<sup>23</sup>. This review focus on identifying suitable instruments, assessing their coverage of JD-R model components and measured constructs, and determining commonly used and comprehensive tools for monitoring HCP healths, leveraging its ability to uncover hidden gaps and inconsistencies. The protocol has been previously published<sup>26</sup>.

### **Eligibility criteria**

Studies were considered eligible for inclusion when published in English from January 2011, and using or evaluating an instrument that assessed health of nurses or doctors working in hospitals. Health at work, or its aspects, was defined according to the JD-R model<sup>14</sup>. Studies were excluded when they described instruments not evaluated or the sample consisted of students alone.

### **Information source**

Studies were retrieved from MEDLINE, Embase and CINAHL. The first search was conducted in December 2021 and updated in January 2024.

**Search**

The search strategy was developed in collaboration with an information specialist. Several terms derived from the research aim were identified to develop search strings to find relevant literature. The search strategy is reported in supplementary material 1. Keywords and MeSH terms related to the domain (HCPs working in hospitals), the determinants (instruments for monitoring), and the outcome (health at work) were used.

**Selection process**

Independent screening and selection of studies were performed by AB, KB or KD using Rayyan (Rayyan Systems Inc, USA). After removing duplicate records, articles were screened on title and abstract regarding inclusion and exclusion criteria. To ensure consistent screening, the first 100 articles were pilot-screened on title and abstract by all three researchers until consensus was reached. The researchers proceeded to full-text screening with selected articles, from which the first 18 articles were again piloted until consensus. The domains of the energy compass ('job demands', 'job resources', 'engaged leadership', 'personal resources', 'employees well-being', 'outcomes') of the JD-R model<sup>14</sup> were used to assess whether the reported instruments measured (aspects of) health at work. The JD-R model includes all aspects of health at work and is applicable to different employees in different settings<sup>14</sup>. See Figure 1 for the conceptual model used.

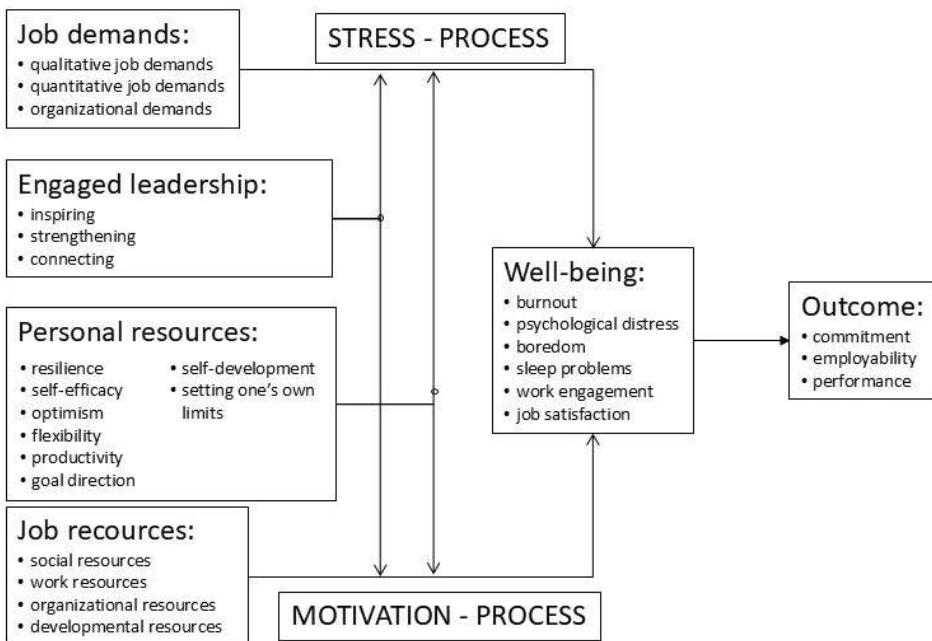


Figure 1 Conceptual model of health at work, based on the energy compass of the JD-R model.

**Data extraction**

AB, KB, DI and KD performed data extraction and full-text screening simultaneously using a predeveloped data extraction form in Excel. They extracted eligible instruments and recorded instrument details separately if multiple instruments were mentioned. The form's adequacy was tested on 18 studies, and refinements were made after discussing disagreements.

**Data items**

The data items charted were: (1) study characteristics (ie, year, authors, country and study aim); (2) sample characteristics (ie, type of HCP (nurses, doctors, other), setting and sample size); (3) details of measurement instrument (ie, instrument name as reported, main construct and subconstructs as reported by the article). If no constructs were reported, judgement was made by the researchers; and (4) reporting of psychometric properties (validity, reliability, responsiveness, quality references). Included instruments were categorised according to the six domains of the JD-R model ('job demands', 'job resources', 'engaged leadership', 'personal resources', 'employees well-being', 'outcomes'<sup>14</sup>). Uncertainty in the selection and data extraction processes was resolved by consensus within the research team. Extracted instruments were checked for discrepancies. Instrument names and main constructs were cleaned on terminology (eg, equalising punctuation marks, abbreviations and capital letters). Additionally, the classification of the domains of the JD-R model was checked, discussed, and cleaned for similar instruments.

**Critical appraisal of individual sources of evidence**

As this scoping review aims to overview instruments measuring health at work, evaluating risk of bias was not of our interest<sup>24,27</sup>.

**Synthesis of results**

Results were synthesised by identifying unique measuring instruments. According to the JD-R model, instruments that measured more domains were valued as more comprehensive. Trends over time were analysed for main constructs, JD-R domains and the number of domains. Characteristics were descriptively analysed and visualised using Excel and Python, including a Sankey diagram representing instrument connections between JD-R domains, main constructs and population (nurses, doctors, or both).

**Reflexivity**

The research team comprises junior researchers supervised by experienced senior researchers. The interdisciplinary team consists of professionals with diverse backgrounds, experiences and perspectives, promoting self-reflection on biases, including medical doctors, a nurse, physiotherapist, pharmacoepidemiologist, former residency programme director and a review methodology specialist.

## RESULTS

### Selection of sources of evidence

The electronic database search yielded 7029 citations. After removing duplicates, 5751 records were screened based on their title/abstract. Among this dataset, several studies were excluded from the review. Main reasons for exclusion were absence of full-texts, language, date of publication, wrong population or did not fulfil outcome requirements. Data extraction was performed on 1204 articles, see Figure 2.

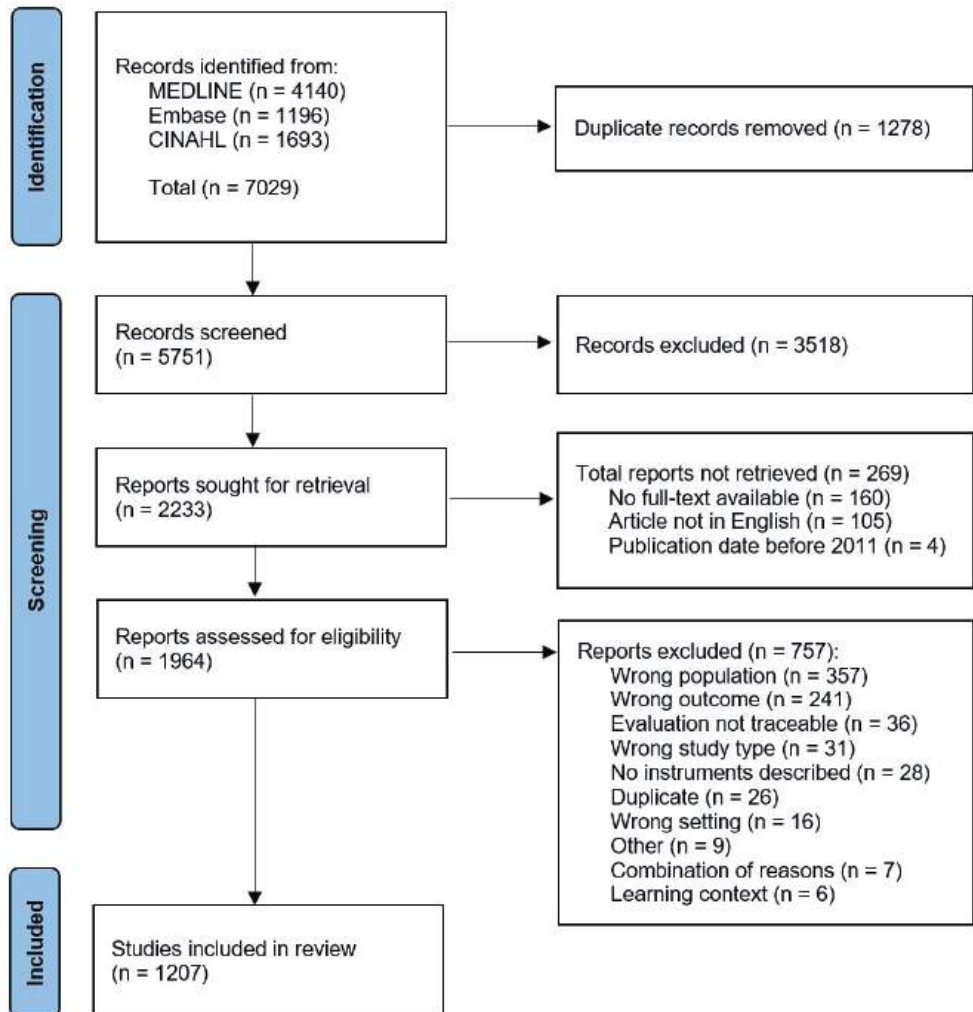


Figure 2 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of the study search and selection for instruments measuring well-being among nurses and doctors.

**Characteristics of sources of evidence**

Last decade, the number of publications has significantly increased (almost quadrupled), suggesting interest in measuring health at work has also increased. Current study included studies published between 2011 and 2024.

A total of 1204 studies included were reported using an instrument measuring health 2872 times. All instruments found were evaluated. Of the 2872 instruments, 75.4% (n=2166) were reported more than once, resulting in the identification of 986 unique instruments. Of the 986 instruments, in 569 instruments at least one study had reported that the instruments were valid. The reporting of the reliability was done for 678 instruments. An overview of all instruments is presented in supplementary material 2. Half of the instruments were used to measure health at work in nurses only (n=515, 52.2%), 23.9% were used (n=236) in doctors only and the remaining 235 instruments (23.8%) were used for both professions. Studies from across six continents were included, and instruments were categorised per country according to the World Bank Classification 2022 (low-income, lower middle-income, upper middle-income and high-income countries). Most studies using instruments to measure HCPs' health at work were conducted exclusively or partially in high-income countries (75.4%), see supplementary material 3.

**Synthesis of results***Main constructs and subconstructs*

In total, we included 1204 studies and extracted 986 unique instruments. A wide variety of instruments have been found in terms of instrument characteristics (eg, aspects of health, main constructs and amount of question items (eg, 30 questionnaires reported as single item instruments)) and usage characteristics (eg, among which HCP, number of times applied and usage in various countries). Sankey diagrams were made to highlight connections between most frequently identified main constructs (and their underlying unique instruments) and JD-R domains among three groups of HCPs (nurses, doctors and both); see Figure 3.

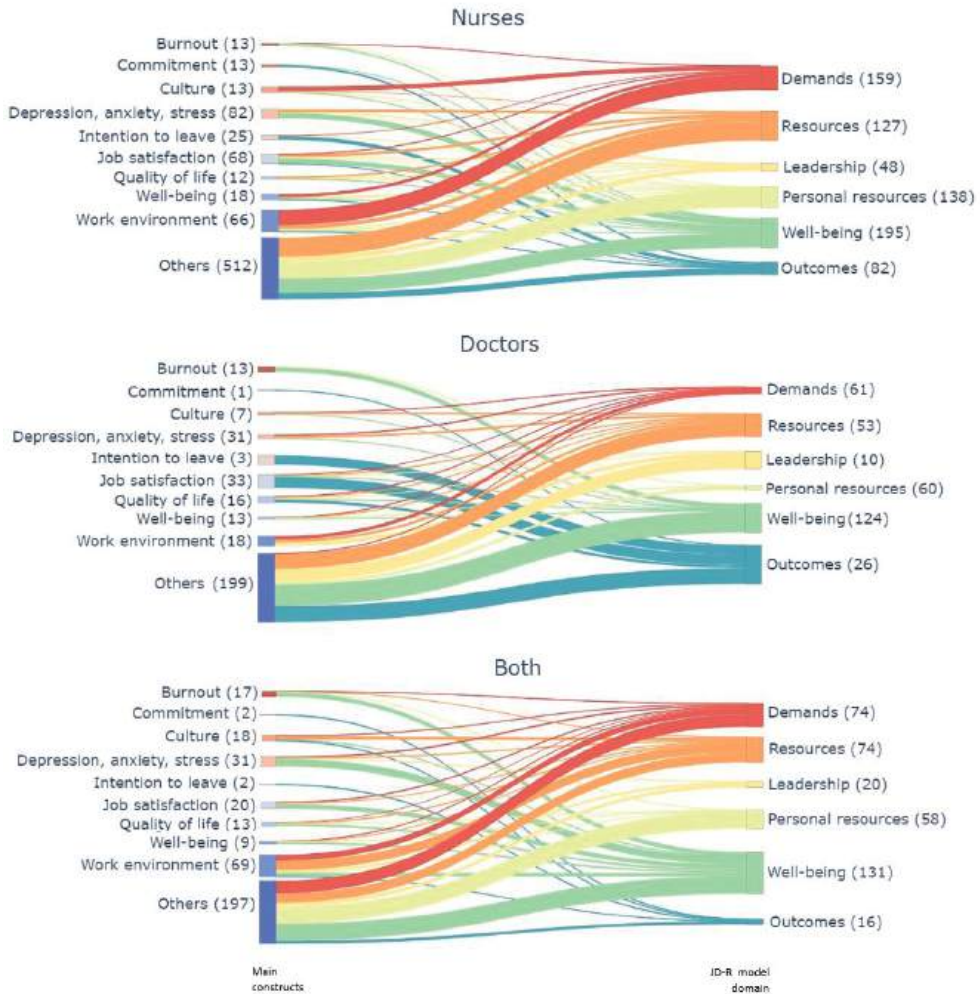


Figure 3 Sankey diagrams representing the number of unique instruments (752) and their connections between population, main constructs and Jobs Demands Resources domains.

The collected instruments represent a total of 251 different main constructs. Among these constructs, there were 9 that occurred 15 times or more, measured by a total of 379 instruments. The most commonly occurring main construct was *Depression/anxiety/stress*, which occurred in 90 instruments. *Job satisfaction* appeared in 77 instruments, *Work environment* in 69 instruments, *Burnout* in 37 instruments, *Intention to leave* in 29 instruments, *Well-being* in 24 instruments, *Culture* in 19 instruments, *Quality of life* in 19 instruments and *Commitment* in 15 instruments. Examples of other main constructs that occurred less frequently are *Leadership*, *Self-efficacy* and *Belongingness*.

Additionally, subconstructs were often described in the included papers. For each instrument, we categorised which domains of the JD-R model were measured based on these subconstructs. Figure 3 shows a visual representation of relationships between main constructs and the six domains of the JD-R model. Sankey plots give insight into the heterogeneity and overlap among the main constructs, and their connections to the JD-R domains. The thickness of the flows in the plots corresponds to the frequency of occurrence of the various main constructs. However, it is important to note that the relative sizes of the nodes in different diagrams are not comparable. Consequently, it is suitable to compare thickness of flows within each plot, but not between different plots. For example, when looking at instruments measuring the construct *Burnout*, these instruments include questions that can be related mostly to the ‘well-being’ domain of the JD-R model (the light green line between *Burnout* and ‘well-being’ is the thickest), then to equally to ‘resources’ and ‘job demands’ domains of the JD-R model (red and orange lines between *Burnout* and ‘well-being’ are equally thick). Of the 986 unique instruments, we identified 294 instruments that at least measure ‘job demands’, 332 instruments that at least measure ‘job resources’, 78 instruments that at least measure ‘engaged leadership’, 256 instruments that at least measure ‘personal resources’, 450 instruments that at least measure ‘employees’ well-being’ and 124 instruments that at least measure ‘outcomes’. We observed significant overlap among instruments, as many of them measured multiple domains of the JD-R model. None of the extracted instruments covered all six JD-R domains comprehensively. The specific occurrences of constructs, instruments and main constructs are reported in more detail in the supplementary material.

#### *Most comprehensive instruments*

The most comprehensive instruments were regarded as those which measure at least four out of six JD-R domains (based on what has been reported about the instrument in the included studies). We identified 32 comprehensive instruments, measuring 20 different main constructs. Five of them occurred more than 10 times and are shown in supplementary material 4: (1) The ‘Moral Sensitivity Questionnaire’ measures *Moral sensitivity*, consists of 35 items and contains 4 domains of the JD-R model. It was extracted 40 times, and was applied to both nurses and doctors in Europe and Asia; (2) The ‘Short Form Health Survey’ measures *General health*, consists of 36 items and contains 5 domains of the JD-R model. This instrument was extracted 23 times, and was applied to both nurses and doctors in Europe, Asia, Africa, North/South America and Oceania; (3) The ‘Professional Fulfillment Index’ measures *Professional fulfilment*, consists of 16 items and contains 4 domains of the JD-R model. This instrument was extracted 18 times, and was applied to both nurses and doctors in Asia and North America; (4) The ‘Professional Practice Environment Scale’ measures *Work environment*, consists of 38 items and contains 4 domains of the JD-R model. This instrument was extracted 13 times, and was applied to both nurses and doctors in Europe, Asia, North America and Oceania; (5) The ‘Copenhagen Psychological Questionnaire’ measures *Psychological health status*, consists

of 141 items and contains 4 domains of the JD-R model. This instrument was extracted 12 times, and was applied to both nurses and doctors in Asia and Europe.

#### *Most common instruments*

Supplementary material 5 provides examples of instruments corresponding to common main constructs, with the assumption that frequently used instruments are generally more extensively evaluated, user-friendly, accessible and available in multiple languages. The five most commonly used instruments were the ‘Maslach Burnout Inventory’ (314), the ‘Professional Quality of Life Scale’ (60), the ‘Perceived Stress Scale’ (58), the ‘Patient Health Questionnaire (57) and the ‘Practice Environment Scale of the Work Nursing Index’ (56). All the instruments were used to measure health of both nurses and doctors in five continents (America, Africa, Asia, Europe, Oceania) except for the ‘Professional Quality of Life Scale’. This instrument was used in America, Asia, Europe and Oceania. The most common instruments are aggregated into four main constructs: *Burnout*, *Depression/anxiety/stress*, *Quality of life* and *Work environment*, and cover 56.9% (215) of all instruments (378) of the common main constructs.

## DISCUSSION

This scoping review provides a comprehensive overview of evaluated instruments to assess and monitor nurses’ and doctors’ health at work. The review identified 986 unique instruments, covering 251 different main constructs, which highlights the great variety of available instruments measuring health at work and its various constructs. In the review, a distinction is made between comprehensive instruments and common instruments. Comprehensive instruments can be used for conducting initial health screening, providing a broader assessment of overall health at work. Subsequently, evaluation of more specific health domains can be conducted using common instruments that measure the domains of interest. This approach allows for a comprehensive understanding of health at work by combining the use of broader and more targeted instruments.

A one-size-fits-all approach to measuring health at work is challenging due to its complexity, resulting in a wide variety of instruments, each addressing specific aspects. Interestingly, our analysis revealed that none of the identified instruments covered all six domains of the JD-R model, suggesting a need for combining instruments to fully capture all potential aspects. Using multiple multi-item questionnaires can burden staff, as it requires time and effort, alternatively combining single-item questionnaires may offer a more feasible option. This approach can also shorten surveys, potentially improving response rates and reducing attrition in longitudinal studies<sup>28</sup>. Since we found 30 single-item questionnaires measuring the domains ‘job demands’, ‘personal resources’, ‘well-being’ and ‘outcomes’, by combining

these single-item questionnaires, it can only be possible to screen health on some aspects. Nonetheless, given the broadness and diversity of health at work, a combination of instruments, including single-item questionnaires, offers a pragmatic approach to comprehensive assessment while minimizing staff burden and maximizing data collection efficiency. On top of that, single-item questionnaires have been shown to effectively assess many relevant constructs<sup>28</sup>.

When selecting a tool to measure health in HCPs, it's important to note that some instruments are specific to doctors or nurses (likely to their distinct roles), while others can be used interchangeably. For example, *Assertiveness* and *Belongingness* are constructs measured exclusively among nurses, while *Job fit* and *Career calling* are specific to doctors. Considering the interdisciplinary nature of healthcare, a harmonized data collection system could facilitate in monitoring HCPs' health across disciplines<sup>29</sup>. Additionally, measurement properties and feasibility, alongside target groups and constructs, should be considered in instrument selection. Common instruments are presumed to be more accessible and user-friendly, that reflected in the visualised result presentation.

From all JD-R domains, well-being (eg, in terms of *Burnout*, *Sleep* and *Job satisfaction*) was the most represented domain with *Burnout* being the most measured main construct. The popularity of the Maslach burnout inventory, validated since 1981, may explain the prevalence of burnout as the most commonly measured construct<sup>30</sup>.

However, focusing solely on *Burnout* overlooks the broader concept of health at work. Most instruments in this study primarily emphasise negative outcomes (in contrast to the current trend in organisational psychology focusing on positive effects), while a more comprehensive approach should consider both positive and negative components of well-being. As Schaufeli reported, usually specific concepts of health are examined based on the organisations' needs<sup>14</sup>. Institutions planning to monitor HCPs health should understand the comprehensive nature of workplace health and the lack of a single instrument. A holistic approach helps in understanding dynamics and guides future actions (eg, prioritising and implementing actions)<sup>14</sup>. Combining instruments or selecting relevant domains is crucial. Previous research also highlights the need for a broader view of health in healthcare contexts<sup>14,17</sup>.

Lastly, the majority of included studies were conducted in high-income countries, which may limit generalisability. It is crucial to consider cultural nuances and stressors specific to health at work in diverse settings. Therewith, adapting instruments for broader use requires translation and validation for cultural sensitivity.

### Strengths and limitations

This review has multiple strengths. It provides a comprehensive overview of various instruments rather than focusing on a single one. The figures and tables highlight the complexity and diversity of measuring health at work, guiding further research directions. The review followed a systematic approach and benefited from the expertise of review methodology specialists. The use of the JD-R model allowed for a clear understanding of how instruments align with the health construct. Categorising instruments according to JD-R domains assists readers in selecting appropriate instruments for their specific context. Consensus was reached through pilot screenings to ensure unbiased selection and data extraction. An audit trail documented and linked methodological choices, thoughts and uncertainties. Lastly, the review's strength lies in its transparency, as it included a submitted protocol prior to data extraction.

Limitations should be acknowledged. First, data screening and extraction were conducted by different researchers, which may introduce variations in interpretation. Pilots were conducted to minimise discrepancies. Second, the 'well-being' domain of the JD-R model was not further divided into positive and negative concepts due to not consistently measuring the same concepts of health at work. However, positive and negative outcomes are inter-related, and the absence of one can be seen as negative. These determinants can influence each other bidirectionally. Third, among different articles, instruments were often reported slightly different, or instruments were adjusted by the authors, either by shortening them or by choosing and studying subdomains of an instrument. Instrument names and main constructs were cleaned manually on terminology and were subject to our interpretation due to unclear reporting in the included studies. Also, literature mentions the phenomena of under-reporting of important information with regards to measurement instruments<sup>31,32</sup>. Improving reporting increases transparency and decreases risk of bias<sup>31</sup>. This allows accurate assessment and better reliable application<sup>31</sup>. We therefore stress the importance of uniformity and completeness in reporting measurement instruments. Finally, for this review it was not feasible to assess validity and reliability outcomes for each instrument because of the vast numbers of studies and unique instruments. In this study, we extracted if studies reported or referred to other studies reporting measurement properties, which was a criterium for inclusion in this review. While validity and reliability were frequently reported, responsiveness was never mentioned. For screening and monitoring health at work, detecting (small) differences is essential. Therefore, insight in responsiveness is important since responsiveness refers to the ability to detect meaningful changes over time<sup>31</sup>. By ensuring that instruments are responsive, we can enhance the accuracy and effectiveness of health assessments, ultimately leading to better support and interventions for HCPs. Our comprehensive overview of health instruments for HCPs serves as an essential step for hospitals on this transformative journey.

**Practical implications**

This review may guide healthcare organisations in selecting monitoring instruments tailored to their needs. To begin, organisations must first determine the domain of interest, that is, which aspect of health needs further enquiry. For zooming in on more specific domains more common and specific instruments can be used, like the examples presented in the results. Another option is to screen with a broader purpose, measuring more concepts of health at work, for which the examples of comprehensive instruments can be used. Last, organisations can combine these two types of instruments by screening broadly first to determine red flags. Thereafter, red flags can be explored by using specific instruments. Summarising, when hospitals assess and monitor nurses' and doctors' health with validated instruments, they can timely design and start tailored interventions to prevent negative well-being in workplaces, thereby contributing to sustainable employability and quality of care.

**CONCLUSION**

This scoping review provides an comprehensive overview of validated instruments, which can be used to assess and monitor nurses' and doctors' health at work. It reveals the broad variety in available instruments and their corresponding constructs. These instruments can be categorised into two groups: comprehensive instruments and most common instruments. For a more focused evaluation of specific domains, more common and specific instruments can be used. Another option is to screen with a broader purpose, aiming to measure multiple concepts of health at work. It is important for institutions planning to monitor health at work of their HCPs to be aware of the holistic nature of health at work and acknowledge the absence of a single comprehensive instrument that covers all the six domains of the JD-R model. Therefore, a combination of different instruments or a selection based on the most relevant domains should be considered. By taking into account the diverse dimensions of health at work and selecting appropriate instruments, institutions can gain a more comprehensive understanding of the well-being of their HCPs.

Future research should prioritise investigating the generalisability of instruments for both nurses and doctors. Evaluating the feasibility and effectiveness of combining instruments to capture the concept of health at work according to the JD-R model comprehensively is crucial. Rather than developing new instruments, modifying, refining and shortening existing ones by incorporating subdomains is recommended to minimise confusion and inefficiency. Additionally, assessing psychometric properties, including responsiveness, of combined instruments is essential. These efforts will enhance the validity and applicability of health assessment tools in healthcare settings.

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## ADDITIONAL FILES

### Content table

Additional file	Content
Additional file 1	Search strategy
Additional file 2	Overview of all instruments
Additional file 3	Income classification
Additional file 4	Most comprehensive instruments occurring more than 10 times
Additional file 5	Examples of common instruments per common main construct

## Additional file 1

Table A Search strategy for Medline

ID	Query
#1	("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff").ti. or exp *"physicians"/ or exp *"Medical staff"/ or *"Residents"/ or exp *"Nurses"/ or exp *"Nursing Staff"/
#2	(instrumentation or methods).fs. or exp "psychometrics"/ or psychometr*.ti,ab. or clinimetr*.tw. or clinometr*.tw. or exp "Health Status Indicators"/ or survey?.ti,ab. or score.ti,ab. or scale.ti,ab. or subscale.ti,ab. or (measurement adj 3 instrument).ti,ab. or subscale*.ti,ab. or item-discriminant.ti,ab. or interscale correlation*.ti,ab. or "ceiling effect".ti,ab. or "floor effect".ti,ab. or "Item response model".ti,ab. or Rasch.ti,ab. or "Differential item functioning".ti,ab. or "item bank".ti,ab. or (item adj3 (correlation* or selection* or reduction* or bank)).ti,ab.
#3	Validation Studies.pt. or exp "observer variation"/ or observer variation.ti,ab. or exp "reproducibility of results"/ or exp "discriminant analysis"/ or valid*.ti,ab. or (cronbach* adj3 (alpha or alphas)).ti,ab. or interrater.ti,ab. or inter-rater.ti,ab. or intrarater.ti,ab. or intra-rater.ti,ab. or intertester.ti,ab. or inter-tester.ti,ab. or intratester.ti,ab. or intra-tester.ti,ab. or interobserver.ti,ab. or inter-observer.ti,ab. or intraobserver.ti,ab. or intraobserver.ti,ab. or interexaminer.ti,ab. or inter-examiner.ti,ab. or intraexaminer.ti,ab. or intra-examiner.ti,ab. or interindividual.ti,ab. or inter-individual.ti,ab. or intraindividual.ti,ab. or intra-individual.ti,ab. or kappa.ti,ab. or kappa?s.ti,ab. or kappas.ti,ab. or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)).ti,ab. or concordance.ti,ab. or (intraclass and correlation*).ti,ab. or (uncertainty and (measurement or measuring)).ti,ab. or "standard error of measurement".ti,ab. or sensitiv*.ti,ab.
#4	exp Burnout, Psychological/ or exp Personal Satisfaction/ or exp Mental Health/ or (satisfaction or well-being or fulfilment or burnout or ((psychological or mental) adj health) or thriving or environment or ethic*).ti,ab,kf.
#5	#1 and #2 and #3 and #4

Table B Search strategy for Embase

ID	Query
#1	#2 AND [embase]/lim NOT (([embase]/lim AND [medline]/lim)
#2	#6 AND #5 AND #4 AND #3
#3	'burnout'/exp OR 'job satisfaction'/exp OR 'mental health'/exp OR satisfaction:ti,ab,kw OR 'well being':ti,ab,kw OR fulfilment:ti,ab,kw OR burnout:ti,ab,kw OR (((psychological OR mental) NEAR/1 health):ti,ab,kw) OR thriving:ti,ab,kw OR environment:ti,ab,kw OR ethic*:ti,ab,kw

Table B Search strategy for Embase (Continued)

ID	Query
#4	'validation study'/exp OR 'observer variation'/exp OR 'reproducibility'/exp OR 'discriminant analysis'/exp OR valid*:ti,ab OR ((cronbach* NEAR/3 (alpha OR alphas)):ti,ab) OR interrater:ti,ab OR 'inter rater':ti,ab OR intrarater:ti,ab OR 'intra rater':ti,ab OR intertester:ti,ab OR 'inter tester':ti,ab OR intratester:ti,ab OR 'intra tester':ti,ab OR interobserver:ti,ab OR 'inter observer':ti,ab OR intraobserver:ti,ab OR interexaminer:ti,ab OR 'inter examiner':ti,ab OR intraexaminer:ti,ab OR 'intra examiner':ti,ab OR interindividual:ti,ab OR 'inter individual':ti,ab OR intraindividual:ti,ab OR 'intra individual':ti,ab OR kappa:ti,ab OR kappa?:ti,ab OR kappas:ti,ab OR ((replicab*:ti,ab OR repeated:ti,ab) AND (measure:ti,ab OR measures:ti,ab OR findings:ti,ab OR result:ti,ab OR results:ti,ab OR test:ti,ab OR tests:ti,ab)) OR concordance:ti,ab OR (intraclass:ti,ab AND correlation*:ti,ab) OR (uncertainty:ti,ab AND (measurement:ti,ab OR measuring:ti,ab)) OR 'standard error of measurement':ti,ab OR sensitiv*:ti,ab
#5	'psychometry'/exp OR 'health status indicator'/exp OR psychometr*:ti,ab OR clinimetr*:ti,ab OR clinometr*:ti,ab OR survey?:ti,ab OR score:ti,ab OR scale:ti,ab OR subscale:ti,ab OR ((measurement NEAR/3 instrument):ti,ab) OR subscale*:ti,ab OR 'item discriminant':ti,ab OR 'interscale correlation*':ti,ab OR 'ceiling effect':ti,ab OR 'floor effect':ti,ab OR 'item response model':ti,ab OR rasch:ti,ab OR 'differential item functioning':ti,ab OR 'item bank':ti,ab OR ((item NEAR/3 (correlation* OR selection* OR reduction* OR bank)):ti,ab)
#6	#8 OR #7
#7	'healthcare professionals':ti OR caregivers:ti OR 'healthcare providers':ti OR practitioners:ti OR doctor:ti OR nurse?:ti OR physician?:ti OR resident?:ti OR 'healthcare worker':ti OR 'health staff':ti
#8	'physician'/exp/mj OR 'medical staff'/exp/mj OR 'resident'/exp/mj OR 'nurse'/exp/mj OR 'nursing staff'/exp/mj

Table C Search strategy for CINAHL

ID	Query
S1	S17 AND S10 AND S4 AND S3
S2	S17 AND S10 AND S4 AND S3
S3	S9 OR S8 OR S7 OR S6 OR S5
S4	S25 OR S24 OR S23 OR S22
S5	TI(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)
S6	AB(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)
S7	(MH "Mental Health")
S8	(MH "Job Satisfaction") OR (MH "Personal Satisfaction")
S9	(MH "Burnout, Professional")
S10	S15 OR S14 OR S13 OR S12 OR S11



Table C Search strategy for CINAHL (*Continued*)

ID	Query
S11	TI(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)
S12	AB(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)
S13	(MH "Kappa Statistic")
S14	(MH "Reproducibility of Results")
S15	(MH "Interrater Reliability")
S16	S25 OR S24 OR S23 OR S22 OR S21
S17	S20 OR S19 OR S18
S18	TI(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))
S19	AB(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))
S20	(MH "Psychometrics") OR (MH "Measurement Issues and Assessments")
S21	AB("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")
S22	TI("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")
S23	(MM "Nurses+")
S24	(MM "Medical Staff, Hospital+")
S25	(MM "Physicians+")

**Additional file 2**

Table D Overview of all instruments

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Maslach burnout inventory	314	Burnout	Both					X		1
Professional quality of life scale	60	Quality of life	Both	X				X		2
Perceived stress scale	58	Depression, anxiety, stress	Both	X				X		2
Patient health questionnaire	57	Depression, anxiety, stress	Both					X		1
Practice environment scale of the nursing work index	56	Work environment	Both	X	X	X				3
Moral distress scale	50	Moral distress	Both	X				X		2
Moral sensitivity questionnaire	40	Moral sensitivity	Both	X	X	X		X		4
Depression anxiety stress scales	37	Depression, anxiety, stress	Both					X		1
Generalized anxiety disorder	36	Depression, anxiety, stress	Both					X		1
Connor davidson resilience scale	35	Resilience	Both				X			1
Utrecht work engagement scale	35	Engagement	Both					X		1
Copenhagen burnout inventory	31	Burnout	Both					X		1
Resilience scale	31	Resilience	Both				X			1
Insomnia severity index	23	Sleep	Both					X		1
Short form health survey	23	General health	Both	X	X		X	X	X	5
General health questionnaire	22	General health	Both					X		1
General self-efficacy scale	21	Self efficacy	Both				X			1
Job satisfaction scale	21	Job satisfaction	Both					X		1
Impact of event scale	20	Avoidance behaviours, intrusive memories	Both					X		1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Authors own questionnaire	19	Job satisfaction	Doctors					X		1
Professional fulfillment index	18	Professional fulfillment	Both	X		X	X	X		4
Revised nursing work index	18	Work environment	Both		X	X				2
Oldenburg burnout inventory	17	Burnout	Both					X		1
Self compassion scale	17	Self compassion	Both				X			1
Effort-reward scale	16	Effort reward	Both	X					X	3
Nurse stress scale	16	Depression, anxiety, stress	Nurses	X	X			X		3
Hospital anxiety and depression scale	15	Depression, anxiety, stress	Both					X		1
Single item burnout	15	Burnout	Both					X		1
Warwick–edinburgh mental well-being scale	15	Mental health	Both					X		1
Brief cope inventory	14	Coping	Both				X			1
Epworth sleep quality index	14	Sleep	Both					X		1
Mini-z survey	14	Burnout	Both	X	X			X		3
Negative acts questionnaire	14	Bullying	Both	X						1
Safety attitudes questionnaire	14	Work environment	Both	X	X			X		3
Jefferson scale of empathy	13	Empathy	Both				X			1
Job content questionnaire	13	Job characteristics	Both	X	X					2
Linear analogue self assessment items	13	Mental health, fatigue, QOL, job satisfaction,	Both					X		1
Measures of moral distress for healthcare professionals survey	13	Moral distress	Both	X	X			X		3
Professional practice environment scale	13	Work environment	Both	X	X	X	X			4
Copenhagen psychosocial questionnaire	12	Psychological health status	Both	X	X	X		X		4
Hospital ethical climate survey	12	Climate	Both	X	X					2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
State-trait anxiety inventory	12	Depression, anxiety, stress	Both					X		1
World health organization well being index	12	Well-being	Both					X		1
Ptcd checklist	11	PTSD	Both					X		1
Areas of work life scale	10	Work environment	Both	X				X		2
Empowerment at work scale	10	Empowerment	Both			X	X	X		3
Grit Scale	10	Grit	Both				X			1
Kessler psychological distress scale	10	Depression, anxiety, stress	Both					X		1
Organizational commitment scale	10	Commitment	Both						X	1
Task load index	10	Workload	Both	X						1
Well being index	10	Well-being	Both					X		1
Center for epidemiological studies depression scale	9	Depression, anxiety, stress	Both					X		1
Minnesota job satisfaction questionnaire	9	Job satisfaction	Both					X		1
Nurses' moral courage scale	9	Moral courage	Nurses				X		X	2
Pittsburgh sleep quality index	9	Sleep	Both					X		1
Satisfaction with life scale	9	Quality of life	Both					X		1
Survey of perceived organizational support	9	Organisational support	Both		X					1
Symptom checklist	9	Mental health	Both					X		1
Interpersonal reactivity index	8	Empathy	Both				X	X		2
Mc croskey-mueller satisfaction scale	8	Job satisfaction	Both	X				X		3
Mindful attention awareness scale	8	Mindfulness	Both					X		1
Neo five-factor inventory	8	Personality traits	Both				X			1
Alcohol use disorders identification test	7	Abuse	Both					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Cognitive and affective mindfulness scale	7	Mindfulness	Both				X			1
Index of work satisfaction	7	Job satisfaction	Nurses	X	X	X		X		4
Organizational commitment questionnaire	7	Commitment	Both						X	1
Posttraumatic growth inventory	7	Posttraumatic growth	Both		X		X	X		3
Primary care evaluation of mental disorders	7	Depression, anxiety, stress	Both					X		1
Sense of coherence score	7	Sense of coherence	Both				X			1
Trait emotional intelligence questionnaire short form	7	Emotional Intelligence	Doctors				X	X		2
Utrechts burnout schaal	7	Burnout	Both					X		1
Work family conflict scale	7	Conflict	Both	X						1
Work related quality of life scale	7	Quality of life	Both	X	X			X		3
Authentic leadership questionnaire	6	Leadership	Nurses			X				1
Beck depression inventory	6	Depression, anxiety, stress	Both					X		1
Big five inventory	6	Personality traits	Both				X			1
Intensity of labour scale	6	Workload	Nurses	X						1
Life orientation test	6	Optimism	Both				X			1
Patient reported outcomes measurement information system	6	Well-being	Both					X		1
Physician job satisfaction scale	6	Job satisfaction	Doctors					X		1
Psychological capital questionnaire	6	Psychological capital	Both				X			1
Brisbane practice environment measure	5	Work environment	Both	X	X					2
Compassion fatigue scale	5	Compassion fatigue	Both	X				X		2
Fear of COVID-19 Scale	5	Fear of covid-19	Both					X		1
Flourishing scale	5	Flourishing	Both					X		1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Global job satisfaction	5	Job satisfaction	Both					X		1
Hospital survey on patient safety culture	5	Work environment	Both		X					1
Job stress questionnaire	5	Depression, anxiety, stress	Both	X	X			X		3
Moral distress questionnaire	5	Moral distress	Both	X			X	X		3
Nurses professional values scale	5	Professional values	Nurses				X		X	2
Positive and negative affect schedule	5	Mood	Both				X			1
Questionnaire on the experience and evaluation of work	5	Work environment	Both	X	X	X		X		4
Secondary traumatic stress scale	5	Depression, anxiety, stress	Both	X				X		2
Simplified coping style questionnaire	5	Coping	Both				X			1
Turnover intention scale	5	Intention to leave	Nurses						X	1
Work ability index	5	Work ability	Nurses						X	1
Acceptance and action questionnaire	4	Psychological flexibility	Both				X			1
Anticipated turnover scale	4	Intention to leave	Nurses						X	1
Burnout assessment tool	4	Burnout	Both				X	X		2
Burnout measure	4	Burnout	Both					X		1
Caring behaviours inventory	4	Caring behaviours	Nurses				X		X	2
Chance impostor phenomenon scale	4	Imposter syndrome	Both	X				X		2
Conditions for work effectiveness questionnaire	4	Work effectiveness	Nurses		X					1
Coping with death scale	4	Coping	Nurses				X			1
Coronavirus anxiety scale	4	Depression, anxiety, stress	Both					X		1
Emotion regulation questionnaire	4	Emotion regulation	Both				X			1
Essentials of magnetism	4	Work environment	Both		X	X				2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Five facet mindfulness questionnaire	4	Mindfulness	Both				X			1
Mental health index	4	Mental health	Both					X		1
Moral distress thermometer	4	Moral distress	Both					X		1
Moral Injury Symptom Scale-Healthcare Professionals version	4	Moral injury	Both	X				X		2
Nordic musculoskeletal questionnaire	4	Functional status	Both						X	1
Nursing work index	4	Work environment	Both	X	X			X		3
Organizational justice scale	4	Organizational justice	Nurses	X	X					2
Perceived social support scale	4	Social support	Both		X					1
Postgraduate hospital educational environmental measure	4	Work environment	Doctors		X	X				2
Posttraumatic diagnostic scale	4	PTSD	Both					X		1
Quality of life-single item	4	Quality of life	Doctors					X		1
Rushon moral resilience scale	4	Moral resilience	Nurses				X			1
Social support rating scale	4	Social support	Both	X	X					2
Social support scale	4	Social support	Nurses		X					1
Spiritual Well-being Scale	4	Spirituality	Both	X	X		X	X		4
Ways of coping scale	4	Coping	Both				X			1
Workplace violence scale	4	Violence	Both	X						1
World health organization QOL assessment	4	Quality of life	Both					X		1
4cornersat questionnaire	3	Job satisfaction	Doctors	X				X		2
4-item scale adapted from tepper's scale	3	Abusive supervision	Nurses	X						1
7-item measurement instrument	3	Decision latitude	Nurses		X		X			2
American association of critical-care nurses healthy work environment assessment tool	3	Work environment	Both		X	X				2
Career success scale	3	Job satisfaction	Nurses		X			X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Chinese work environment scale	3	Work environment	Nurses	X	X	X				3
Collaboration and satisfaction about care decisions scale	3	Participation decision making	Both		X					1
Emotional labour scale	3	Emotional labour	Nurses	X			X			2
Eq-5d-5l	3	Quality of life	Both				X	X		2
Ethical Conflict in Nursing Questionnaire—Critical Care Version	3	Conflict	Nurses	X						1
Expanded nursing stress scale	3	Depression, anxiety, stress	Nurses	X				X		2
General work satisfaction scale from the michigan organizational assessment scale	3	Job satisfaction	Both					X		1
Index of professional governance	3	Nursing governance	Nurses		X	X				2
Intolerance of uncertainty scale	3	Reactions to uncertainty	Both				X			1
Japanese burnout scale	3	Burnout	Both					X		1
Job descriptive index	3	Job satisfaction	Nurses		X			X		2
Job diagnostic survey	3	Job characteristics	Both		X					1
Leadership practices inventory	3	Leadership	Both			X				1
Leiden quality of work questionnaire	3	Job satisfaction	Both	X	X			X		3
Life events checklist	3	Traumatic events	Nurses	X				X		2
Multidimensional measure of leader member exchange	3	Satisfaction with supervisor	Both		X					1
Multifactor leadership questionnaire	3	Leadership	Nurses			X				1
Nurse stress checklist	3	Depression, anxiety, stress	Nurses	X			X	X		3
Nurses' self-concept instrument	3	Self concept	Nurses		X	X	X			3
Nurses' job stressor scale	3	Depression, anxiety, stress	Nurses	X	X					2
Nursing activities score	3	Workload	Nurses	X						1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Organizational citizenship behaviors	3	Extra-role behavior	Nurses						X	1
Quality of nursing work life scale	3	Quality of life	Nurses	X	X	X		X		4
Quantitative workload	3	Workload	Both	X						1
Rosenberg's self-esteem scale	3	Self-esteem	Nurses				X			1
Ruminative response scale	3	Rumination	Both				X			1
Screening test for depression	3	Depression, anxiety, stress	Both					X		1
Self-rating anxiety scale	3	Depression, anxiety, stress	Nurses					X		1
Self-rating depression scale	3	Depression, anxiety, stress	Nurses					X		1
Shirom melamed burnout measure	3	Burnout	Nurses					X		1
Single item job satisfaction	3	Job satisfaction	Both					X		1
Single item over turnover intention	3	Intention to leave	Both						X	1
Social capital 6-items scale	3	Social capital	Nurses		X					1
Spanish burnout inventory	3	Burnout	Both					X		1
Spiritual climate scale	3	Climate	Nurses		X					1
Stanford presenteeism scale	3	Presenteeism	Nurses						X	1
Stress conscience questionnaire	3	Depression, anxiety, stress	Both	X				X		2
Toronto alexithymia scale	3	Alexithymia	Doctors				X			1
Work environment scale	3	Work environment	Both	X	X					2
Workplace social capital scale	3	Work environment	Both	X	X					2
1-item survey	2	Suicidal ideation	Both	X			X	X		3
2-question strategy	2	Depression, anxiety, stress	Doctors					X		1
A brief Nurses' Perceived Professional Benefit Questionnaire	2	Professional benefit	Nurses		X		X			2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
A nurses' occupational stressor scale	2	Depression, anxiety, stress	Nurses	X	X	X		X		4
Abbreviated workplace climate questionnaire	2	Climate	Doctors	X	X	X				3
Adult self-transcendent inventory	2	Wisdom	Nurses					X		1
Alarm fatigue questionnaire	2	Alarm fatigue	Nurses	X				X		2
Alberta context tool	2	Work environment	Both	X	X	X				3
Anxiety and depression scale	2	Depression, anxiety, stress	Nurses					X		1
Belongingness scale	2	Belongingness	Nurses		X			X		2
C - change resident survey	2	Culture	Doctors	X	X			X		3
Chalder fatigue questionnaire	2	Fatigue	Nurses					X		1
Communicatively restricted organizational stress	2	Depression, anxiety, stress	Nurses	X	X			X		3
Compassionate care questionnaire for nurses	2	Compassion	Nurses				X			1
Consultants' job stress and satisfaction questionnaire	2	Job satisfaction	Doctors					X		1
Context assessment index	2	Work environment	Nurses		X	X				2
Core self evaluation scale	2	Self-evaluation	Nurses				X			1
Death anxiety scale	2	Depression, anxiety, stress	Nurses	X			X	X		3
Decision fatigue scale	2	Decision fatigue	Nurses	X						1
Demand-control-support questionnaire	2	Demands, control support	Both	X	X					2
Doctors' job burnout questionnaire	2	Burnout	Both					X		1
Dupuy Psychological Well-being Index	2	Well-being	Doctors					X		1
Dutch sleep quality subscale of the VBBA	2	Sleep	Both					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Dutch VBBA worrying subscale	2	Worrying	Both				X	X		2
Dutch version of the job related affective well-being scale	2	Well-being	Both					X		1
Environmental complexity scale	2	Work environment	Nurses	X	X					2
Fatigue assessment scale	2	Fatigue	Nurses					X		1
Fatigue severity scale	2	Fatigue	Both					X		1
Freiburg mindfulness inventory	2	Mindfulness	Nurses				X			1
Functional assessment of chronic illness therapy spiritual well-being Scale	2	Quality of life	Nurses		X		X	X		3
General job satisfaction scale	2	Job satisfaction	Both					X		1
General nordic questionnaire for psychological and social factors at work short version	2	Work environment	Both		X	X				2
Grief traits and state scale	2	Grief	Nurses		X					1
Harvard national depression screening day scale	2	Depression, anxiety, stress	Doctors					X		1
Healthy lifestyle behaviors scale	2	Healthy lifestyle behaviours	Nurses				X			1
Hospital safety climate scale	2	Work environment	Nurses	X	X					2
Implicit theories of intelligence scale	2	Beliefs about mastery and performance mindsets.	Doctors				X			1
Indicators of quality nursing work environment	2	Work environment	Nurses	X	X					2
Innovation behavior scale	2	Innovativeness	Nurses				X			1
Instrument to measure stress in Korean nurses performing End-of-Life Care for children	2	Depression, anxiety, stress	Nurses	X				X		2
Intention to leave scale	2	Intention to leave	Nurses						X	1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Jefferson scale of physician lifelong learning	2	Lifelong learning	Doctors		X		X			2
Job autonomy scale	2	Autonomy	Nurses		X	X				2
Job satisfaction	2	Job satisfaction	Nurses					X		1
Job satisfaction survey	2	Job satisfaction	Both		X			X		2
Job stress scale	2	Depression, anxiety, stress	Nurses					X		1
Job turnover scale	2	Intention to leave	Both						X	1
Korean occupational stress scale	2	Depression, anxiety, stress	Both	X	X	X				3
Lateral violence in nursing survey	2	Violence	Nurses	X						1
Lifestyle profile	2	Healthy lifestyle behaviours	Nurses				X	X		2
Link burnout questionnaire	2	Burnout	Both					X		1
Local job opportunity	2	Intention to leave	Nurses						X	1
Major depression inventory	2	Depression, anxiety, stress	Doctors					X		1
Marlowe-crowne scale	2	Social desirability	Both				X			1
Midwifery practice climate scale	2	Work environment	Nurses		X	X				2
Moral distress risk scale	2	Moral distress	Both	X		X		X		3
Moral-distress appraisal scale	2	Moral distress	Nurses	X	X			X		3
Motivation factors questionnaire	2	Work motivation factors	Nurses	X	X	X				3
Multidimensional scale of perceived social support	2	Social support	Nurses		X					1
NZN work environment scale	2	Work environment	Both		X					1
Need for recovery scale	2	Need for recovery	Both					X		1
Novice nurse assertiveness scale	2	Assertiveness	Nurses				X			1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Nurse manager practice environment scale	2	Work environment	Nurses		X	X				2
Nurse station ergonomic assessment tool	2	Work environment	Nurses	X	X					2
Nursing career identity scale	2	Career identity	Nurses		X		X			2
Nursing health and job satisfaction scale	2	Job satisfaction	Nurses		X		X	X		3
Nursing profession self efficacy scale	2	Self efficacy	Nurses				X			1
Nursing workplace relational environment scale	2	Work environment	Both	X	X			X		3
Occupational coping self-efficacy	2	Coping	Nurses				X			1
Organizational climate scale	2	Work environment	Both	X	X			X		3
Oswestry Low back pain disability questionnaire	2	Functional status	Both				X	X	X	3
Pearlin mastery scale	2	Feeling of control	Nurses				X			1
Perceived barriers to treatment scale	2	Stigma	Nurses	X			X			2
Perception of Evidence-Based Practice	2	Professional skill at using better knowledge for decision making	Nurses				X			1
Perma profiler	2	Flourishing	Both		X		X	X	X	4
Personal-organizational values alignment	2	Work values	Doctors		X			X		2
Physician mental workload scale	2	Workload	Doctors	X				X	X	3
Physician-flow at work survey	2	Flow	Doctors		X				X	2
Physicians' reaction to uncertainty scale	2	Reactions to uncertainty	Doctors				X			1
Pickler employee questionnaire	2	Work environment	Both	X	X			X		3
Positive Health Behaviours Scale for adults	2	Healthy lifestyle behaviours	Nurses				X	X		2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Posttraumatic stress syndrome questions inventory	2	PTSD	Nurses					X		1
Professional Identity Scale for Nurses	2	Professional identity	Nurses	X	X		X			3
Professional moral courage scale	2	Moral courage	Both				X			1
Psychosocial safety climate	2	Climate	Nurses	X	X			X		3
Quality of Working Life for Female Medical and Healthcare Professionals	2	Quality of life	Both	X	X			X		3
Rapid Assessment of Physical Activity	2	Activity	Doctors						X	1
Regret coping scale of health care professionals	2	Coping	Both				X			1
Regret intensity scale	2	Regret	Both	X						1
Resilience at Work-Sinhala Scale	2	Resilience	Nurses				X			1
Satisfaction with Medicine Scale	2	Job satisfaction	Doctors					X		1
Schutte's self-report emotional intelligence test	2	Emotional Intelligence	Both				X			1
SCOFF tool	2	Eating disorders	Nurses					X		1
Second Victim Experience and Support Tool	2	Psychological impact	Both	X				X		2
Self reported health outcomes	2	General health	Doctors					X	X	2
Sevid questionnaire	2	Psychological impact	Doctors	X				X		2
Short questionnaire for workplace analysis	2	Work environment	Both	X	X					2
Social support instrument	2	Social support	Doctors				X			1
Stigma of occupational stress scale for doctors	2	Stigma	Doctors	X						1
Striving for Work Life Balance behavior scale	2	Work life balance	Nurses	X			X			2
Swedish occupational fatigue inventory	2	Fatigue	Doctors					X		1
Ten item personality inventory	2	Personality traits	Both				X			1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Toxic leadership behaviors of nurse managers scale	2	Management and leadership	Nurses		X					1
Turnover intention	2	Intention to leave	Nurses						X	1
Voice climate survey	2	Work environment	Doctors	X	X					2
Wells and Cartwright-Hatton meta-cognitive beliefs questionnaire	2	Emotional Intelligence	Both				X			1
Work design questionnaire	2	Autonomy	Doctors		X	X				2
Work extrinsic and intrinsic motivation scale	2	Motivation	Both	X	X	X				3
Workplace incivility scale	2	Incivility	Both	X	X					2
Workplace well-Being questionnaire	2		Doctors					X		1
1 item ("I have a high self-esteem")	1	Self-esteem	Both				X			1
1 item overall health	1	General health	Doctors					X		1
10-item scale	1	Burnout	Nurses					X		1
10-item job satisfaction scale	1	Job satisfaction	Doctors					X		1
10-item Resident Wellness Scale	1	Well-being	Doctors			X		X		2
12-item scale	1	Commitment	Nurses						X	1
14 items for wellbeing	1	Well-being	Nurses				X	X	X	3
14-item questionnaire	1	Job resources	Doctors		X	X				2
15-item scale	1	Job satisfaction	Nurses					X		1
16-item Leadership environment scale	1	Leadership	Nurses			X				1
17-item questionnaire	1	Job demands	Doctors	X						1
17-item scale	1	Job satisfaction/wellbeing	Doctors				X	X	X	3
18-item SAW survey questionnaire	1	Spirituality	Nurses		X		X			2
1-factor scale for overall job satisfaction	1	Job satisfaction	Nurses					X		1
1-item forgetting of intentions	1	Forgetting intentions	Nurses						X	1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
1-item scale	1	Work life balance	Doctors	X						1
2 intent to stay items	1	Intention to leave	Nurses						X	1
2 items Work satisfaction	1	Job satisfaction	Nurses					X		1
2 statements	1	Enthusiasm	Nurses				X			1
20-item survey	1	Unprofessional behavior	Nurses	X						1
21-question Web-based survey for nurses	1	Abuse	Nurses	X						1
26-item self-administered survey	1	Psychological impact	Nurses					X		1
2-item measure Emotional Exhaustion and Depersonalisation	1	Burnout	Both					X		1
2question approach measuring depression	1	Depression, anxiety, stress	Doctors					X		1
3-item scale	1	Colleague support	Both		X					1
3-item scale measuring use of intuition	1	Intuition	Both				X			1
3-item scale: Cynicism	1	Cynicism	Nurses				X			1
3-item scale: Professional efficacy	1	Self efficacy	Nurses				X			1
3-items from Meyer et al	1	Intention to leave	Nurses						X	1
3-items proposed by Adams	1	Intention to leave	Nurses						X	1
4 extra questions	1	PTSD	Nurses					X		1
4 items of Inventory of feelings of motivation and demotivation	1	Job control	Doctors	X	X					2
42 questions	1	Knowledge and practices of COVID-19	Doctors	X			X			3
44-question Sexist Microaggression Experiences and Stress Scale	1	Psychological impact	Doctors					X		1
4-item job satisfaction scale	1	Job satisfaction	Nurses					X		1
4-item scale	1	Job performance	Both						X	1
4-items for feeling as a victim	1	Feeling as a victim	Nurses	X				X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
50-item survey	1	Job satisfaction	Doctors					X		1
6-dimension nursing performance scale	1	Job performance	Nurses		X	X			X	3
6-item scale	1	Organisational support	Nurses		X					1
6-item scale developed by Hochwarter	1	Perceptions of organizational politics	Nurses	X						1
6-item scale for job uncertainty	1	Job insecurity	Both				X			1
7-item GAD scale	1	Depression, anxiety, stress	Nurses					X		1
7-item measure of team culture	1	Culture	Both			X				1
8-item scale based on Job Autonomy Questionnaire	1	Workload	Doctors	X						1
8-item scale comprising negative and positive efferece items	1	Emotional labour	Nurses	X			X			3
8-scales bt Zacharatos	1	High performance work systems (HPWS)	Nurses		X					1
9-item nurse satisfaction survey	1	Job satisfaction	Nurses		X			X		2
9-item Personal Health Questionnaire	1	Depression, anxiety, stress	Nurses					X		1
A 13-item SOC scale	1	Coherence	Nurses		X		X			2
A distraction observation sheet	1	Distractions	Both	X						1
A generic inventory of 91 medical specialist tasks	1	Feeling prepared	Doctors		X					1
A modified Wong Baker Faces Pain Rating Scale	1	Job satisfaction	Doctors					X		1
A non-burnout inventory	1	Mood	Both				X	X		2
A professional status scale	1	Professional state	Nurses					X		1
A quality of healthy work environment instrument	1	Work environment	Nurses		X		X			2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
A question about nurse staffing level	1	Patient-to-nurse ratio	Nurses	X						1
A scale developed by Rusault 1988	1	Neglect of work	Nurses				X	X	X	3
A single question on work satisfaction	1	Job satisfaction	Both					X		1
Academic work environment index	1	Work environment	Doctors	X	X					2
Acute care nurses job satisfaction scale	1	Job satisfaction	Nurses		X		X			2
Adult attachment types	1	Attachment type	Doctors				X			1
Affective occupational commitment	1	Commitment	Nurses						X	1
Affective organizational commitment scale	1	Commitment	Nurses						X	1
Affective ward commitment	1	Commitment	Nurses						X	1
Agency for healthcare research and quality's patient safety culture survey	1	Work environment	Both		X					1
Analyzing and developing adaptability and performance in teams to enhance resilience Scale	1	Team vitality	Nurses		X	X				2
Anxiety scale	1	Depression, anxiety, stress	Nurses					X		1
Assessment of Belief Conflict in Relationship- 14	1	Conflict	Nurses	X						1
Athens insomnia scale	1	Sleep	Nurses					X		1
Attitudes Toward Caring for Patients Feeling Meaninglessness Scale	1	Depression, anxiety, stress	Nurses					X		1
Autonomy	1	Autonomy	Nurses			X				1
Back ache disability index	1	Functional status	Nurses	X					X	2
Baptist health nurse retention questionnaire	1	Work environment	Nurses	X	X					2
Bar-on emotional quotient inventory	1	Emotional Intelligence	Nurses				X	X		2
Barriers to physician compassion scale	1	Self compassion	Nurses	X	X			X		3
Barton's job satisfaction scale	1	Job satisfaction	Nurses					X		1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Berkman-syme social network index	1	Social capital	Nurses		X					1
Brief burnout questionnaire	1	Burnout	Nurses					X		1
Brief engagement survey	1	Engagement	Doctors		X			X	X	3
Brief resident wellness profile	1	Well-being	Doctors					X		1
Brief scales for coping profile	1	Coping	Nurses				X			1
Brief self-control scale	1	Feeling of control	Nurses				X			1
Brief symptom inventory	1	Depression, anxiety, stress	Both					X		1
Brief symptom rating scale	1	Psychological health status	Nurses					X		1
Burden of documentation for nurses and midwives survey	1	Documentation burden	Nurses	X						1
Burnout battery	1	Burnout	Both					X		1
Burnout clinical subtypes questionnaire	1	Burnout	Nurses					X		1
Burnout index	1	Burnout	Doctors					X		1
Burnout instrument by Pines	1	Burnout	Nurses					X		1
Burnout inventory score	1	Burnout	Doctors					X		1
Burnout syndrome assessment scale for nurses	1	Burnout	Nurses					X		1
CAGE questionnaire	1	Abuse	Doctors					X		1
Care behaviors scale	1	Ability to work	Nurses		X				X	2
Career calling scale	1	Calling	Doctors		X		X			3
Career commitment scale	1	Commitment	Doctors						X	1
Caring efficacy scale	1	Caring Efficacy	Nurses		X					1
Caring inentions inventory	1	Caring behaviors	Nurses						X	1
Carroll's four-dimensional responsibility conceptual framework	1	Social responsibility of the hospital	Nurses		X					1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Casey-fink graduate nurse experience survey	1	Nurse experience	Nurses				X	X		2
Casey-fink nurse retention survey	1	Intention to leave	Nurses		X				X	2
CERES (Concern, Enthusiasm, Relevance, Efficacy, Satisfaction) scale	1	Meaning at work	Nurses				X	X		2
Certified registered nurse anesthetist organizational climate questionnaire	1	Climate	Nurses		X					1
Cesd-10	1	Depression, anxiety, stress	Both					X		1
Change fatigue scale	1	Fatigue	Nurses					X	X	2
Charge nurse stress questionnaire	1	Violence	Nurses	X	X					2
Chinese health questionnaire	1	Psychological health status	Nurses					X		1
Chinese nurse stressor scale	1	Depression, anxiety, stress	Nurses	X	X					2
Chinese nurses' stress scale	1	Depression, anxiety, stress	Nurses	X	X			X		3
Chinese physicians' job satisfaction questionnaire	1	Job satisfaction	Doctors					X		1
Chinese version occupational burnout inventory	1	Burnout	Nurses					X		1
Chinese version of difficult doctor-patient relationship questionnaire	1	Hcp-patient relationship	Doctors	X						1
Chinese version of the work control scale	1	Job control	Nurses		X					1
Clinical activities related to the environment scale	1	Activity	Nurses	X	X					2
Clinical leadership needs analysis	1	Leadership needs	Nurses		X	X			X	2
Clinical leadership survey	1	Leadership	Nurses			X			X	1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Clinical nurse leader staff satisfaction	1	Satisfaction with supervisor	Nurses		X					1
Clinical Nurse Specialist Outcomes and Barriers Analysis Survey	1	Work environment	Nurses	X	X					2
Clinical nursing practice environment scale	1	Work environment	Nurses	X	X					2
Clinical skills self-efficacy scale	1	Self efficacy	Nurses				X			1
Clinical stamina	1	Stamina	Doctors				X			1
Clinician communication tool	1	Confidence in communication	Both				X			1
Cnl self-efficacy scale	1	Self efficacy	Nurses			X	X			2
Coaching behavior scale	1	Leadership	Nurses			X				1
Cocb	1	Culture	Both	X	X					2
Cognitive appraisal scale	1	Cognitive appraisals	Nurses		X		X	X		3
Cognitive emotion regulation questionnaire	1	Coping	Nurses				X			1
Collaborative practice assessment tool	1	Teamwork	Both		X	X				2
Colleague Solidarity of Nurses Scale	1	Colleague support	Nurses	X	X					2
Collectivist orientation scale	1	Collectivist orientation	Nurses				X			1
Collegial RN-MD relations	1	Collegial nurse/doctor relations	Nurses	X	X					2
Commitment scale of the effort-reward imbalance questionnaire	1	Commitment	Nurses						X	1
Communication satisfaction questionnaire	1	Organizational communication satisfaction	Both		X					1
Compassion satisfaction scale	1	Compassion	Nurses					X		1
Compassion scales	1	Compassion	Doctors		X		X			2
Compassion to others scale	1	Self compassion	Nurses				X			1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Confidence in Coping With Patient Aggression Instrument	1	Coping	Nurses				X			1
Consultants' mental health questionnaire	1	Job satisfaction	Doctors					X		1
Contexte organisationnel etmanagérial en établissement de santé	1	Culture	Both	X	X			X	X	4
Continuing professional development reaction questionnaire	1	Intention to leave	Nurses				X			1
Control over schedule index	1	Job control	Doctors	X	X					2
Coping after workplace violence	1	Coping	Nurses				X			1
Coping and Adaptation Scale—Short Form	1	Coping	Nurses				X			1
Coping Inventory for Stressful Situations	1	Coping	Both				X			1
Counselor burnout inventory	1	Burnout	Doctors					X		1
Covid-19 nurse well-being at Work scale	1	Well-being	Nurses		X		X			2
CRISO Psychological climatequestionnaire	1	Climate	Both	X	X					2
Crown-crisp index	1	Depression, anxiety, stress	Nurses					X		1
Cultural and Psychosocial Influences on Disability - CUPID Questionnaire	1	Functional status	Nurses						X	1
Cultural health check	1	Culture	Both	X	X					2
Danish psychosocial workenvironment questionnaire	1	Psychological health status	Doctors	X				X	X	3
Death attitude profile	1	Attitude towards death	Nurses				X			1
Death depression scale	1	Depression, anxiety, stress	Nurses	X			X	X		3
Death distress scale-farsi	1	Death distress	Nurses				X	X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Death obsession scale	1	Death Obsession	Nurses				X			1
Death Self-efficacy Scale	1	Self efficacy	Nurses				X			1
Decisional involvement scale	1	Decisional involvement	Nurses		X	X	X			3
Demands and Support Questionnaire	1	Depression, anxiety, stress	Nurses					X		1
Dempster practice behavior scale	1	Autonomy	Nurses		X	X				2
Depression Scale-10-item version	1	Depression, anxiety, stress	Both					X		1
Dignity and Respect in Ageing Nurses' Work Scale	1	Well-being	Nurses		X		X	X		3
Disability questionnaire	1	Functional status	Doctors						X	1
Distributive justice	1	Organizational justice	Nurses	X	X					2
Drug abuse screening test	1	Abuse	Doctors					X		1
Duke university religion index	1	Religious involvement	Doctors				X			1
Dutch interpersonal behaviour scale	1	Interpersonal behaviour	Nurses				X			1
Edmondson's team psychological safety survey	1	Culture	Both		X					1
Educational clinical questionnaire: anxiety and depression	1	Depression, anxiety, stress	Nurses					X		1
Emotional competence inventory	1	Emotional Intelligence	Doctors				X			1
Emotional salary questionnaire	1	Gratitude	Nurses		X					1
Empathy assessment index	1	Empathy	Nurses				X			1
Empathy index	1	Empathy	Nurses				X			1
Empowering leadership questionnaire	1	Leadership	Nurses		X	X				2
Endicott work productivity scale	1	Job characteristics	Nurses						X	1
End-of-life decision-making and staff Stress questionnaire	1	Difficulties with end of life care	Both	X	X					2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Energy compass psychometric instrument	1	Job resources and job demands	Nurses	X	X	X				3
Energy leadership index	1	Leadership	Doctors	X	X		X	X	X	5
Engaged leadership scale	1	Leadership	Nurses			X				1
Ethic stress scale	1	Moral distress	Both					X		1
Ethical attitude questionnaire	1	Moral sensitivity	Both				X			1
Ethical attitude scale for nursing care	1	Moral sensitivity	Nurses				X			1
Ethical conflict scale covid-19	1	Conflict	Nurses	X	X					2
Ethical conflict scale for nurses in extraordinary circumstances	1	Conflict	Nurses	X						1
Ethical leadership scale	1	Leadership	Nurses		X	X				2
European social survey	1	Procedural Justice	Doctors		X					1
Everyday discrimination scale	1	Discrimination/harassment/abuse	Nurses	X						1
Evidence Based Practice Leadership Scale - Turkish version	1	Supervisory support	Nurses		X					1
Exchange relationships	1	Nature of the exchange relationship with the organization	Nurses		X					1
Experiences disruptive behaviors	1	Experiences disruptive behaviors	Nurses	X						1
Exposure to patient death and suffering scale	1	Exposed to patient death	Nurses	X						1
Expressions of Moral Injury Scale	1	Moral injury	Both					X		1
Eysenck personality inventory	1	Personality traits	Doctors				X			1
Facilitation listening survey	1	Listening	Nurses	X						1
Family supportive supervisor behaviors scale	1	Supervisory support	Nurses		X	X				2
Family-work relationship scale	1	Work life balance	Nurses	X						1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Fatigue scale	1	Fatigue	Nurses					X		1
Fear of compassion scale	1	Fear of compassion	Nurses				X			1
Fear Scale for Healthcare Professionals	1	Fear	Nurses					X		1
Fetzer Institute Multidimensional Measurement of Religiousness/Spirituality for Use in Health Research	1	Religiousness/Spirituality	Doctors				X			1
Five items from the anxiety scale	1	Depression, anxiety, stress	Both					X		1
Forms of self-criticising/attacking and self-reassuring scale	1	Self-evaluation	Nurses				X			1
Four-dimensional symptoms questionnaire	1	Depression, anxiety, stress	Nurses					X		1
Framework of factors known to contribute to adverse events in health care	1	Work environment	Doctors	X	X					2
French DUWAS scale	1	Addiction to work	Doctors					X	X	2
Gastroenterologist stress inventory	1	Depression, anxiety, stress	Doctors					X		1
Gender bias scale	1	Discrimination/harassment/abuse	Doctors	X	X					2
General and specific satisfaction in life developed by Fahrenberg	1	Job satisfaction	Doctors					X		1
General index of job satisfaction by Brayfield and Rothe	1	Job satisfaction	Doctors					X		1
General self-rated health question	1	General health	Both					X		1
General stressor questionnaire	1	Depression, anxiety, stress	Doctors	X				X		2
General work stress scale	1	Depression, anxiety, stress	Doctors					X		1
German instrument developed for the nursing context	1	Work environment	Nurses	X	X					2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
German version of the irritation scale	1	Psychological health status	Nurses	X				X		2
Global job performance-single item	1	Job performance	Nurses						X	1
Global job satisfaction instrument	1	Job satisfaction	Nurses					X		1
Global transformational leadership scale	1	Management and leadership	Nurses		X					1
Goleman's emotional intelligence scale	1	Emotional Intelligence	Nurses				X			1
Granada burnout questionnaire	1	Burnout	Nurses					X		1
Gratitude	1	Gratitude	Doctors				X			1
Gratitude questionnaire	1	Gratitude	Nurses				X			1
Group cohesiveness scale	1	Coherence	Nurses		X			X		2
Guarding minds at work	1	Work environment	Nurses	X	X	X		X	X	4
Hamburg burnout inventory	1	Burnout	Doctors				X	X		2
Hamilton anxiety scale	1	Depression, anxiety, stress	Both					X		1
Hamilton depression rating scale	1	Depression, anxiety, stress	Both					X		1
Happiness- single item	1	Happiness	Nurses				X			1
Hardiness resilience score	1	Resilience	Doctors				X			1
Hatch spiritual involvement and beliefs scale	1	Spirituality	Doctors				X			1
Health and Safety Executive's Management Standards Indicator Tool	1	Depression, anxiety, stress	Nurses	X	X					2
Health questionnaire or quality-of-life questionnaires	1	Quality of life	Doctors					X		1
Healthcare environment survey	1	Job satisfaction	Nurses	X	X	X		X		4
Healthcare productivity survey	1	Ability to work	Nurses	X	X				X	3
Health-oriented leadership	1	Leadership	Nurses		X	X				2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Healthy work environment assessment tool	1	Work environment	Nurses		X	X				2
Healthy work environment scales	1	Work environment	Nurses	X	X	X				3
Healthy work-environment inventory	1	Work environment	Both	X	X			X	X	4
Healthy workplace index	1	Work environment	Both		X					1
Heaviness of Smoking Index	1	Abuse	Doctors					X		1
Herth hope index	1	Hope	Doctors				X	X		2
High performance work systems scale	1	Job performance	Nurses	X	X				X	3
Hogan development survey	1	Personality traits	Doctors				X			1
Holmes-rahe life stress inventory	1	Depression, anxiety, stress	Doctors					X		1
Hospital Aggressive Behaviour scaleusers	1	Aggressiveness	Nurses	X						1
Hospital culture scale	1	Culture	Both		X					1
Hospital organizational culture questionnaire	1	Culture	Both		X					1
Hospital organizational environment scale for medical staff	1	Work environment	Doctors	X	X					2
Hospital unit safety climate survey	1	Climate	Doctors		X					1
HRV-Based Measure of Stress	1	Depression, anxiety, stress	Doctors					X		1
HSE work-related stress questionnaire	1	Depression, anxiety, stress	Nurses	X	X			X		3
Human cost at work scale	1	Expended energy	Nurses	X						1
ICMR work stress questionnaire	1	Depression, anxiety, stress	Both					X		1
ICU stressors survey	1	Depression, anxiety, stress	Nurses	X	X		X			3
Individual workload perception scale	1	Workload	Nurses	X	X				X	3

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Individual level job crafting	1	Job crafting	Nurses	X	X					2
Infante verbal aggressiveness score	1	Aggressiveness	Doctors	X	X					2
Innovative culture scale	1	Culture	Nurses		X					1
Instrument adapted to COVID-19 pandemic	1	Depression, anxiety, stress	Doctors	X	X			X		3
Instrument for Stress-Oriented Task Analysis for Hospital Physicians - subscale continuing education and training	1	Personal development	Doctors		X					1
Instruments to assess primary work areas in terms of nurses' and physicians' satisfaction and performance	1	Job satisfaction	Both		X			X		2
Intergroup threat scale	1	Discrimination/harassment/abuse	Doctors			X				1
Intelligent healthcare quality scale	1	Work environment	Nurses		X					1
Intensity of conflict within work environments	1	Conflict	Nurses			X				1
Intent to leave practice or reduce work hours (multicenter hospitalist survey project)	1	Intention to leave	Doctors						X	1
Intent to leave scale	1	Intention to leave	Doctors						X	1
Intent to quit	1	Intention to leave	Nurses						X	1
Intent to stay at job	1	Intention to leave	Nurses						X	1
Intention to leave	1	Intention to leave	Nurses						X	1
Internal medicine residency stress scale	1	Depression, anxiety, stress	Doctors				X	X		2
International physical activity questionnaire	1	Activity	Nurses				X			1
Interpersonal guilt questionnaire-67	1	Shame/guilt	Nurses					X		1
Interpersonal strain 6 item scale	1	Burnout	Nurses					X		1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Intrinsic job characteristics	1	Job characteristics	Doctors					X	X	2
Inventory of depressive symptomology	1	Depression, anxiety, stress	Doctors					X		1
Inventory of Polychronic Values	1	Professional values	Doctors				X			1
Italian version of the nurse manager actions scale	1	Management and leadership	Nurses	X						1
Japanese version of the single question burnout measure	1	Burnout	Doctors					X		1
Job burnout inventory	1	Burnout	Doctors					X		1
Job commitment scale	1	Commitment	Nurses						X	1
Job conflict scale	1	Conflict	Nurses	X						1
Job control items by Jackson	1	Job control	Doctors		X					1
Job demands in nursing scale	1	Job demands	Nurses	X						1
Job dissatisfaction	1	Job satisfaction	Nurses					X		1
Job insecurity scale	1	Job insecurity	Doctors	X						1
Job outcome scale	1	Intention to leave	Nurses						X	1
Job resources	1	Staff perceptions	Nurses	X	X			X	X	4
Job resources in nursing scale	1	Job resources	Nurses		X					1
Job rotation scale	1	Job rotation	Nurses						X	1
Job satisfaction (physician workforce study)	1	Job satisfaction	Doctors					X		1
Job satisfaction assessment tool by Zhang and Feng 2011, Wang 2020	1	Job satisfaction	Both					X		1
Job satisfaction by Agho	1	Job satisfaction	Nurses					X		1
Job satisfaction index	1	Job satisfaction	Nurses		X			X		2
Job satisfaction questionnaire	1	Job satisfaction	Nurses		X			X		2
Job satisfaction questionnaire based on Puchner	1	Job satisfaction	Doctors					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Job satisfaction scale based on Blau, Garcia et al	1	Job satisfaction	Doctors	X	X	X		X		4
Job satisfaction scale developed by Institute of Employment Studies	1	Job satisfaction	Doctors					X		1
Job satisfaction scale for chinese nurses	1	Job satisfaction	Nurses	X	X			X		3
Job satisfaction scale for clinical nurses	1	Job satisfaction	Nurses	X	X			X		2
Job satisfaction scale for that nurses	1	Job satisfaction	Nurses	X	X	X	X	X		5
Job social support scale	1	Social support	Nurses		X					1
Job stress items of Su	1	Depression, anxiety, stress	Nurses					X		1
Job stress items of Yang	1	Depression, anxiety, stress	Doctors					X		1
Job stress survey	1	Depression, anxiety, stress	Doctors					X		1
Job-esteem scale for korean nurses	1	Self-esteem	Nurses		X	X		X		3
Just culture assessment tool	1	Culture	Doctors	X	X					2
Karolinska sleep scale for drowsiness	1	Sleep	Doctors					X		1
KEEPSA-IPV subscale of the PREMIS	1	Workplace and personal factors	Nurses	X			X			2
Kentucky Inventory of Mindfulness Skills	1	Mindfulness	Doctors				X			1
Korean version of the event related rumination inventory	1	Rumination	Nurses				X			1
Kuopio university hospital job satisfaction scale	1	Job satisfaction	Doctors					X		1
Kurzfragenbogen zurarbeitsanalyse	1	Work environment	Both	X	X			X		3
Leadership scale developed by Liden	1	Leadership	Nurses			X				1
Leadership skills questionnaire	1	Leadership	Both				X			1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Learning goal orientation scale developed by van de Walle	1	Goal orientation	Nurses				X			1
Levett-Jones belongingness questionnaire	1	Belongingness	Nurses				X			1
Life engagement test	1	Goal orientation	Nurses				X			1
Life satisfaction scale	1	Well-being	Doctors					X		1
Likert 6-point Autonomy scale by Varjus et al	1	Autonomy	Nurses		X	X				2
Manchester clinical supervision scale	1	Satisfaction with supervisor	Nurses		X					1
Mayo clinic participatory management leadership index	1	Leadership	Doctors			X				1
MBSQR, Mindful self-care and resiliency;	1	Mindfulness	Nurses				X			1
MBSR, Mindfulness-based stress reduction	1	Mindfulness	Nurses				X			1
McCain's intent to stay scale	1	Intention to leave	Nurses						X	1
Meaningfulness of clinical work index	1	Meaning at work	Doctors				X	X		2
Measure of culture conducive to women's academic success	1	Discrimination/harassment/abuse	Doctors		X	X				2
Measurement of burnout	1	Burnout	Nurses					X		1
Measures from Motowidlo	1	Depression, anxiety, stress	Doctors					X		1
Medical outcomes study short form	1	Quality of life	Doctors					X		1
Medical Staff survey of the NHSS	1	Doctors' demographics, perceived job satisfaction, perceived work-family conflict and perceived doctor-patient relationship.	Doctors	X				X		2
Mental health continuum-short form	1	Mental health	Doctors					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Mental health professionals stress scale	1	Depression, anxiety, stress	Nurses	X	X					2
Mental health questionnaire	1	Mental health	Nurses					X		1
Mental Toughness Scale for doctors	1	Mental health	Doctors				X			1
Microaggressions experience and stress scale	1	Depression, anxiety, stress	Doctors	X				X		2
MIDENF nursing workload measurement scale	1	Workload	Nurses	X						1
Miller hope scale	1	Hope	Nurses				X			1
Miscner nurse practitioner job satisfaction scale	1	Job satisfaction	Nurses	X	X			X		3
Modified overt aggression scale	1	Aggressiveness	Nurses	X						1
Modified version of the cultural awareness scale	1	Cultural awareness	Nurses		X					1
Modified yale food addiction scale	1	Abuse	Nurses					X		1
Moral case deliberation scale	1	Moral sensitivity	Nurses		X		X			2
Moral courage scale for physicians	1	Moral courage	Doctors				X			1
Moral disengagement scale	1	Moral disengagement	Nurses				X		X	2
Moral distress in dementia care survey	1	Moral distress	Both	X				X		2
Moral distress sub-categorization survey	1	Moral distress	Nurses	X				X		2
Moral elevation scale in medicine	1	Moral elevation	Doctors				X			1
Moral injury outcome scale	1	Moral injury	Nurses	X				X		2
MOT-2004 questionnaire	1	Job satisfaction	Doctors					X		1
Motivation instrument based on Maslowos and Herzberg	1	Motivation	Nurses		X	X	X	X	X	5
Multi-Cultural Quality of Life Index	1	Quality of life	Doctors	X	X		X	X	X	5
Multidimensional fatigue inventory	1	Fatigue	Nurses				X	X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Multidimensional nursing generations questionnaire	1	Characteristics of different generations of nurses	Nurses	X	X				X	3
Multidimensional work motivation scale	1	Motivation	Doctors				X			1
Munich Evaluation of Mentoring Questionnaire	1	Mentorship	Doctors		X					1
Munich questionnaire	1	Work environment	Both	X	X			X		3
Myers-briggs type indicator	1	Personality traits	Doctors				X			1
National Survey of Satisfaction of Users in Health	1	Job satisfaction	Both					X		1
Neck disability index	1	Functional status	Nurses				X	X	X	3
Negative Feeling toward Patient Frequency scale	1	Emotions towards patients	Nurses					X		1
Negative impact of work on health and personal relationships index	1	Psychological impact	Doctors	X				X		2
Newly graduated nurses' difficulties with end-of-life care for cancer patients	1	Difficulties with end of life care	Nurses				X	X		2
Nine-item empowerment scale	1	Empowerment	Nurses				X			1
Nottingham health profile	1	General health	Doctors					X		1
Novel 9-question survey	1	Burnout	Doctors					X		1
Novice nurse practitioner role transition scale	1	Role transition	Nurses		X		X	X		3
Nurse job satisfaction scale	1	Job satisfaction	Nurses					X		3
Nurse managers boundary spanning scale	1	Boundary spanning	Nurses	X	X		X			2
Nurse managers' empowering behavioral scale for staff nurses	1	Management and leadership	Nurses		X					1
Nurse occupational stigma scale	1	Stigma	Nurses	X						1
Nurse quality of worklife questionnaire	1	Quality of life	Nurses	X	X		X			3

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Nurse retention index	1	Intention to leave	Nurses						X	1
Nurse satisfaction with quality of care scale	1	Satisfaction with performance	Nurses					X		1
Nurse satisfaction with supervisor leadership scale	1	Satisfaction with supervisor	Nurses		X					1
Nurse stress index scale	1	Depression, anxiety, stress	Nurses	X				X		2
Nurse team resilience Scale	1	Team vitality	Nurses		X					1
Nurse turnover intention scale	1	Intention to leave	Nurses						X	1
Nurses' perception of the relationship based care environment scale	1	Relationships	Nurses	X	X					2
Nurse perceived workload	1	Workload	Nurses	X	X					2
Nurses' attitude scale toward the risks in the work environment	1	Attitude to risks	Nurses		X		X			2
Nurses compassion fatigue inventory	1	Compassion fatigue	Nurses	X			X	X		3
Nurses' sense of organizational support questionnaire	1	Organisational support	Nurses			X				1
Nurses to Nurses Work Environment	1	Work environment	Nurses	X	X	X				3
Nurses work functioning questionnaire	1	Job characteristics	Nurses	X			X	X		3
Nurses' workplace mental health questionnaire	1	Mental health	Nurses		X		X	X		3
Nurses' professional commitment scale	1	Commitment	Nurses					X	X	2
Nurses' fatigue scale	1	Fatigue	Nurses					X		1
Nurses' moral distress by Atashzadeh-Shoorideh	1	Moral distress	Nurses	X				X		2
Nurses' spiritual sensitivity scale	1	Spirituality	Nurses				X			1
Nurses' work values scale	1	Work values	Nurses				X			1
Nursing anxiety and self-confidence associated with clinical decision making	1	Anxiety and self-confidence	Nurses				X	X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Nursing burnout scale short form	1	Burnout	Nurses	X			X	X		3
Nursing career assessment scale	1	Job performance	Nurses		X				X	2
Nursing Context Index:78 item	1	Work environment	Nurses	X				X	X	3
Nursing culture assessment tool	1	Culture	Both		X			X		2
Nursing dilemma test	1	Moral sensitivity	Nurses				X			1
Nursing incivility scale	1	Incivility	Nurses	X				X		2
Nursing job satisfaction scale	1	Job satisfaction	Nurses	X				X		2
Nursing moral disengagement scale	1	Engagement	Nurses					X		1
Nursing organizational climate	1	Climate	Nurses	X	X					2
Nursing physical factors evaluation questionnaire	1	Functional status	Nurses	X						1
Nursing professional pride	1	Job satisfaction	Nurses		X		X	X	X	4
Nursing quality of life scale	1	Quality of life	Nurses					X		1
Nursing teamwork scale	1	Teamwork	Nurses		X					1
Nursing teamwork survey	1	Teamwork	Both		X	X				3
Nursing work environment scale	1	Work environment	Nurses	X	X	X				3
Nursing workplace satisfaction questionnaire	1	Job satisfaction	Nurses		X		X	X		3
Observational teamwork assessment for surgery tool	1	Teamwork	Both	X	X	X		X		4
Obsession with COVID-19 scale	1	Covid-19 obsession	Doctors					X		1
Occupant satisfaction survey by the university of california at berkeley's	1	Building satisfaction	Nurses	X	X			X		3
Occupational disidentification scale	1	Occupational disidentification	Doctors				X			1
Occupational fatigue exhaustion recovery scale	1	Fatigue	Nurses	X				X		2
Occupational identity scale	1	Career identity	Nurses		X		X			2

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Occupational risk factors scale	1	Work environment	Nurses	X						1
Occupational self-efficacy expectations	1	Self efficacy	Doctors				X			1
Occupational self-efficacy scale	1	Self efficacy	Nurses				X			1
Occupational stress scale by Revicki and Gershon	1	Depression, anxiety, stress	Nurses					X		1
One item from Abramis	1	Satisfaction with performance	Nurses					X		1
One-item fatigue screen	1	Fatigue	Doctors					X		1
One-item quality of life	1	Quality of life	Both					X		1
Operating room educational environment measure inventory	1	Work environment	Doctors	X	X					2
Operation span task	1	Working memory capacity	Doctors				X		X	2
Organisational innovation climate scale	1	Climate	Nurses		X					1
Organisational Predictors and Consequences of Bullying Scale	1	Bullying	Nurses	X	X			X		3
Organizational assessment survey	1	Autonomy	Both			X	X			2
Organizational climate minimizing error, maximizing outcome study	1	Work environment	Doctors		X					1
Organizational commitment	1	Commitment	Nurses						X	1
Organizational constraints	1	Organizational constraints	Nurses	X						1
Organizational culture index	1	Work environment	Nurses	X	X					2
Organizational culture scale	1	Culture	Both	X	X				X	3
Organizational Role Stress instrument	1	Depression, anxiety, stress	Nurses	X				X		2
Organizational scale	1	Commitment	Nurses						X	1
Organizational wellbeing in the operating unit	1	Well-being	Nurses					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Overall intensive care unit nurse-physician questionnaire	1	Collegial nurse/doctor relations	Nurses		X					1
Overall job satisfaction	1	Job satisfaction	Nurses					X		1
Panic disorder symptoms severity scale-self-report	1	Depression, anxiety, stress	Nurses					X		1
Patient Care Associates'Work-environment scale	1	Work environment	Both	X	X					2
Patient safety culture scale	1	Work environment	Nurses	X	X					2
Patient-doctor relationship scale	1	Hcp-patient relationship	Doctors	X						1
Patterns of Adaptive Learning Scales adapted version	1	Goal orientation	Doctors				X			1
Pemberton happiness index	1	Happiness	Doctors				X			1
Penn inventory	1	PTSD	Nurses					X		1
Perceived appreciation index	1	Gratitude	Doctors		X					1
Perceived nursing work environment	1	Work environment	Nurses	X	X		X			3
Perceived organizational climate scale	1	Climate	Nurses	X	X					2
Perceived organizational justice questionnaire	1	Organizational justice	Nurses		X					1
Perceived vulnerability to disease questionnaire score	1	Vulnerability to Disease	Both	X			X	X		3
Perception and assessment of labor questionnaire	1	Job characteristics	Doctors	X		X				2
Performance oriented behaviors	1	Caring behaviors	Nurses						X	1
Personal feelings questionnaire-2	1	Shame/guilt	Nurses					X		1
Personal innovativeness scale	1	Innovativeness	Nurses		X		X			2
Personal wellbeing index	1	Well-being	Doctors		X			X		2
Physical activity questionnaire	1	Activity	Doctors	X						1
Physician internalized occupational stigma scale	1	Stigma	Doctors	X						1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Physician risk attitude scale	1	Attitude to risks	Doctors				X			1
Physician-felt-trust-from-patient scale	1	Hcp-patient relationship	Nurses		X					1
Physicians dissatisfaction scale	1	Dissatisfaction	Doctors	X				X		2
Pleasure feeling scale	1	Job satisfaction	Nurses		X			X		2
Policy advocacy engagement scale	1	Engagement	Both				X		X	2
Porter nursing image scale	1	Nursing image	Nurses		X		X			2
Positive and negative occupational states inventory	1	Professional state	Doctors	X					X	2
Positive thinking skills scale	1	Professional development	Nurses				X			1
Post-ABSITE survey	1	Well-being	Doctors	X				X		2
Post-code stress scale	1	Psychological health status	Nurses					X		1
Postdeployment readjustment inventory "PDR", a 36-item instrument	1	Readjustment/reintegration	Nurses	X				X		2
Practice environment index	1	Work environment	Nurses		X	X				2
PRENCA* questionnaire	1	Presenteeism	Nurses						X	1
Pressure Management Indicator scale	1	Job satisfaction	Doctors					X		1
Problem-Focused Style of Coping scale	1	Coping	Nurses				X			1
Procedural justice	1	Organizational justice	Nurses	X						2
Professional commitment scale	1	Commitment	Nurses						X	1
Professional plateau	1	Professional development	Doctors		X					1
Professional self-care scale	1	Self-care	Both				X			1
Professional socialization measurement instrument	1	Professional development	Nurses		X	X	X			3
Profile of mood states survey	1	Behavior and mood	Doctors				X	X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
PROMIS short-form	1	Depression, anxiety, stress	Doctors	X				X		2
Promotional opportunities	1	Professional development	Nurses		X					1
Protective nursing advocacy scale	1	Measure beliefs and actions in health advocacy in nursing	Nurses	X	X		X			3
Psychiatric nurse self-efficacy scales	1	Self efficacy	Nurses				X			1
Psychological attachment inventory	1	Psychological attachment	Doctors						X	1
Psychological conditions scale	1	Engagement	Nurses		X		X	X		3
Psychological effects of the relational job characteristics scale	1	Relational dimension of work and its psychological effects in the nursing profession.	Nurses				X	X		2
Psychological empowerment instruments	1	Empowerment	Nurses				X			1
Psychological empowerment questionnaire	1	Empowerment	Nurses				X			1
Psychological general well-being index	1	Well-being	Doctors				X	X		2
Psychological need satisfaction scale	1	Psychological Need Satisfaction	Doctors		X	X	X	X		4
Psychological safety questions	1	Culture	Nurses		X			X		2
Psychological stress item	1	Depression, anxiety, stress	Doctors					X		1
Psychological well-being scale developed by Zheng	1	Well-being	Nurses					X		1
Psychosocial problems scale	1	Psychological health status	Nurses	X				X		2
Psychosomatic symptom checklist	1	Psychological health status	Both					X		1
Qualities of an Empowered Nurse	1	Empowerment	Nurses				X			1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Quality of communication between nurses and physicians questionnaire developed by Schmidt and Svarstad	1	Collegial nurse/doctor relations	Nurses		X					1
Quality of life enjoyment and satisfaction questionnaire	1	Quality of life	Nurses					X		1
Quality of work life systemic inventory	1	Quality of life	Doctors	X	X		X	X		4
Questionnaire measuring organizational conditions	1	Work environment	Nurses		X			X		2
Questionnaire by Vinokur	1	Supervisory support	Doctors		X					1
Questionnaire developed by Bovier	1	Job satisfaction	Doctors					X		1
Questionnaire developed by national research centre for work environment	1	Job satisfaction	Doctors					X		1
Questionnaire for occupational stress	1	Depression, anxiety, stress	Nurses	X			X	X		3
Questionnaire of Self-Efficacy, Optimism and Pessimism	1	Self efficacy	Doctors				X			1
Questionnaire on mental health of medical staff	1	Mental health	Nurses	X	X					2
Questionnaire on the experience and assessment of work	1	Working experience	Nurses		X					1
Questionnaire to measure discrimination/harassment/abuse	1	Discrimination/harassment/abuse	Doctors	X						1
Questions on life satisfaction	1	Quality of life	Doctors					X		1
Quick disability of the arms, shoulder and hand questionnaire	1	Functional status	Nurses				X	X	X	3
Racial microaggressions scale	1	Aggressiveness	Doctors	X						1
Rahim organizational conflict inventory-ii	1	Conflict management	Nurses				X			1
Rapid entire body assessment	1	Functional status	Nurses						X	1
Ratings of self-efficacy (self-developed)	1	Self efficacy	Doctors				X			1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Recognition questionnaire	1	Rewarding	Nurses		X					1
Red tape scale	1	Bureaucratic demands	Doctors	X						1
Reeder stress scale	1	Depression, anxiety, stress	Nurses					X		1
Registered Nurses' Perceptions of Rewarding Scale	1	Rewarding	Nurses		X			X		2
Relational Coordination Survey for Patient Care	1	Collaboration	Nurses		X					1
Relational mentoring index by Riggins	1	Mentorship	Nurses		X					1
Relative deprivation scale	1	Deprivation	Doctors				X			1
Reliable alliance and attachment subscales of the social provisions scale	1	Social support	Doctors				X			1
Re-modified work-style short form questionnaire	1	Psychological health status	Doctors	X				X		2
Repeated exploration and commitment scale	1	Commitment	Nurses						X	1
Researcher-designed communication skills questionnaire	1	Communication skills	Nurses				X			1
Resilience evaluation scale	1	Resilience	Doctors				X			1
Response to Stressful Experiences 18	1	Resilience	Doctors				X			1
Revised health care team vitality instrument	1	Team vitality	Both		X	X				2
Risk Factors of Compassion Fatigue Inventory	1	Compassion fatigue	Nurses	X	X			X	X	4
RN4CAST nurse survey	1	Engagement	Nurses	X	X			X	X	4
Role-related Social Support Scale	1	Social support	Nurses		X					1
Rotter's Locus of Control Scale	1	Feeling of control	Doctors				X			1
Safety organising scale	1	Culture	Nurses		X					1
SATIN questionnaire	1	Well-being	Both	X	X			X		3

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Satisfaction and perception scales	1	Job satisfaction	Doctors					X		1
Satisfaction with job scale	1	Job satisfaction	Nurses					X		1
Satisfaction with supervisor scale	1	Satisfaction with supervisor	Nurses	X						1
Scale developed by Walsh	1	Intention to leave	Nurses						X	1
Scale of emotional functioning: medicine	1	Emotional Intelligence	Doctors				X			1
Scales from the questionnaire organizational stress doetinchem	1	Social support	Doctors	X			X			2
Search behavior	1	Intention to leave	Nurses						X	1
Seelig et al stress survey	1	Depression, anxiety, stress	Doctors					X		1
Self compassion index	1	Self compassion	Doctors				X			1
Self confidence scale	1	Self-confidence	Doctors				X			1
Self efficacy scale by Sherer	1	Self efficacy	Nurses				X			1
Self report altruism scale	1	Altruism	Doctors				X			1
Self-assessment instrument to assess fellow's skills in humanism and professionalism	1	Humanism & professionalism	Doctors	X	X			X		3
Self-care quiz	1	Self-care	Nurses				X	X		2
Self-developed tool for job motivation	1	Motivation	Both					X	X	2
Self-evaluation scale	1	Self-evaluation	Nurses				X			1
Self-perceived person-job fit	1	Job fit	Doctors		X					1
Self-rated health single questions	1	General health	Nurses					X		1
Self-regulation scale	1	Motivation	Nurses					X		1
Self-report burnout inventory for doctors	1	Burnout	Doctors					X		1
Self-Reported Blood Body Fluids Exposures and Motor Vehicle Incidents	1	Functional status	Doctors						X	1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Self-reported musculoskeletal symptoms	1	Functional status	Doctors	X				X	X	3
Sexual experiences questionnaire	1	Discrimination/harassment/abuse	Doctors	X						1
Shame questionnaire	1	Shame/guilt	Doctors					X		1
Shared Vision scale	1	Shared vision / goals	Nurses	X	X			X		2
Sheehan disability scale	1	Disability/consequence of mental health issues	Doctors					X		1
Shift work disorder questionnaire	1	Shift work disorder	Nurses					X		1
Short form of Keyes social well-being	1	Well-being	Nurses		X			X		2
Short-form pwb scale	1	Well-being	Nurses		X	X	X	X		4
Sickness presenteeism questionnaire	1	Presenteeism	Nurses						X	1
Single item job satisfaction measure	1	Job satisfaction	Nurses					X		1
Single item derived from Gardner	1	Intention to leave	Nurses						X	1
Single item from the depression scale	1	Depression, anxiety, stress	Both					X		1
Single item from the NEXT survey	1	Intention to leave	Nurses						X	1
Single item intention to leave measure	1	Intention to leave	Nurses						X	1
Single item measure from the Minimizing Error, Maximizing Outcome Study	1	Work environment	Doctors	X	X					2
Single item measure of Benyamini and Idler	1	General health	Nurses					X		1
Single item of intention to leave the current job	1	Intention to leave	Nurses						X	1
Single item visual analogue scale rating current feelings of perceived stress	1	Depression, anxiety, stress	Nurses					X		1
Single question about bullying	1	Bullying	Doctors	X						1
Single question about sickness absence	1	Sickness absence	Doctors						X	1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Single question item of emotional exhaustion and depersonalization	1	Emotional exhaustion and depersonalization	Doctors					X		1
Single question item: "How would you characterise your overall health?"	1	General health	Nurses					X		1
Single-item measure assessing emotional exhaustion	1	Burnout	Doctors					X		1
Single-item burnout measure	1	Burnout	Doctors					X		1
Single-item global measure of job satisfaction	1	Job satisfaction	Doctors					X		1
Single-item job satisfaction	1	Job satisfaction	Nurses					X		1
Single-item measure	1	Job satisfaction	Doctors					X	X	2
Single-item measure of burnout	1	Burnout	Doctors					X		1
Single-item measure of calling	1	Calling	Doctors				X		X	2
Single-item measure of job satisfaction	1	Job satisfaction	Doctors					X		1
Single-item measure of psychological stress	1	Depression, anxiety, stress	Doctors					X		1
Single-item measure of subjective happiness	1	Happiness	Doctors				X			1
Single-item moral distress frequency	1	Moral distress	Doctors	X				X		2
Single-item screening test for unhealthy alcohol use	1	Abuse	Doctors					X		1
Skin lesion scale	1	Skin lesions related to personal protective equipment	Nurses	X				X		2
Sleep problems questionnaire	1	Sleep	Nurses					X		1
Social connectedness scale-revised	1	Social support	Doctors	X	X					2
Social functioning instrument	1	Social functioning	Nurses	X	X					2
Spanish Quality of Professional Life Questionnaire	1	Job satisfaction	Doctors					X		1

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Spanish version of the SF5-6	1	Presence/absence	Both						X	1
Spanish version of the symptom assessment questionnaire	1	Psychological distress and somatic complaints	Nurses					X		1
Spanish-adapted G <sub>1</sub> clinic satisfaction questionnaire	1	Job satisfaction	Nurses		X		X			2
Spiritual health and life orientation measure	1	Spirituality	Nurses				X	X		2
Spiritual needs scale	1	Spirituality	Nurses		X		X			2
Spirituality scale	1	Spirituality	Nurses				X			1
Sports competition anxiety test	1	Depression, anxiety, stress	Doctors					X		1
St. Elizabeth youngstown hospital wellbeing inventory	1	Well-being	Both				X	X		2
Standard shift work index	1	General health	Nurses	X			X	X	X	4
Standardized nordic questionnaire	1	Functional status	Nurses					X		1
Stanford sleepiness scale	1	Sleep	Nurses					X		1
Strelau temperament inventory	1	Personality traits	Both				X			1
Stress questionnaire	1	Depression, anxiety, stress	Nurses	X	X			X		3
Stress questionnaire for health professionals	1	Depression, anxiety, stress	Nurses	X	X	X		X		4
Stress scale	1	Depression, anxiety, stress	Nurses	X				X		2
Stressor Scale for Clinical Research Coordinators	1	Depression, anxiety, stress	Nurses	X	X					2
Structural Empowerment Scale for Public Health Nurses	1	Empowerment	Nurses				X			1
Study of men's health	1	General health	Nurses					X		1
Study of women's health	1	General health	Nurses					X		1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Subjective happiness scale	1	Happiness	Both				X			1
Subjective health status by Svedberg	1	General health	Nurses					X		1
Subjective sleep quality by Buysse	1	Sleep	Nurses					X		1
Suboptimal health status questionnaire-25	1	General health	Both					X		1
Subscale of the ryff scale	1	Well-being	Nurses					X		1
Substance abuse scale	1	Abuse	Nurses					X		1
Supervisory support	1	Supervisory support	Nurses	X	X					2
Supoptimal patient care subscale	1	Work environment	Doctors	X	X					2
Support-in-workplace scale	1	Support	Nurses		X					1
Survey based on the Italian version of the lateral hostilities questionnaire	1	Violence	Nurses	X					X	2
Survey measuring job preferences	1	Job preferences	Nurses		X	X			X	3
Survey of Perceived Coworker Support	1	Colleague support	Nurses		X					1
Survey of workplace climate	1	Climate	Both	X	X					2
Survey on organizational climate inhealth care institutions	1	Climate	Both	X	X			X		3
Taiwan nursing work environment index	1	Work environment	Nurses	X	X					2
Taiwan patient safety culture survey	1	Culture	Nurses	X	X			X		3
Task load	1	Workload	Doctors	X						1
Team climate inventory	1	Culture	Both		X					1
Team interaction scale	1	Team interaction	Doctors		X					1
Team job crafting scale	1	Job crafting	Nurses	X	X					2
Tedium index score	1	Burnout	Doctors					X		1
Ten conditions of trust inventory	1	Organizational trust	Nurses		X					1
The stress and arousal checklist	1	Depression, anxiety, stress	Nurses				X	X		2

Table D Overview of all instruments (*Continued*)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leadership	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Therapeutic relationship assessment scale-nurse	1	Hcp-patient relationship	Nurses	X						1
Three questions posed by Edwards and Rothbard	1	Job satisfaction	Nurses					X		1
Three questions posed by Kim and Leung	1	Intention to leave	Nurses						X	1
Three-component model of commitment scale	1	Commitment	Nurses						X	1
Three-dimensional inventory of character strengths	1	Personality traits	Nurses				X	X		2
Thriving at work scale	1	Flourishing	Nurses		X			X		2
Thriving scale	1	Flourishing	Nurses					X		1
Tolerance for ambiguity	1	Tolerance for ambiguity	Doctors					X		1
Trauma screening questionnaire	1	Depression, anxiety, stress	Doctors					X		1
Traumatic and Routine Stressors Scale on Emergency Nurses	1	Depression, anxiety, stress	Nurses	X				X		2
Traumatic events questionnaire for nurses in emergency departments	1	Traumatic events	Nurses	X						1
Tri-axial model	1	Culture	Nurses	X	X					2
Trust me scale	1	Satisfaction with supervisor	Nurses		X					1
Turkish version of the general work stress scale	1	Work environment	Nurses					X	X	2
Turkish version of the job stress related presenteeism scale	1	Presenteeism	Nurses					X		2
Turkish version of the perceptions of the prevalence of aggression scale	1	Aggressiveness	Nurses	X						1
Turnover intention by Mobley	1	Intention to leave	Doctors						X	1
Type d scale	1	Personality traits	Doctors				X			1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
U.S. veterans affairs administration's competing values framework instrument	1	Culture	Doctors		X			X		2
UCLA loneliness scale	1	Loneliness	Both					X		1
Utrecht coping list	1	Coping	Nurses				X			1
Validated 20-point questionnaire	1	Depression, anxiety, stress	Doctors	X				X		2
Variety questionnaire	1	Variety	Nurses	X	X					2
Vicarious trauma scale	1	Psychological impact	Doctors	X						1
Views of the therapeutic environment measure	1	Workload	Nurses	X	X					2
Visual analogue scale	1	Pain	Doctors					X		1
Visual analogue scale evaluating nurses motivation	1	Motivation	Nurses				X			1
Ward climate for well-being	1	Well-being	Nurses					X		1
Ward organizational featurescale	1	Work environment	Both		X			X		2
Warr Cook Wall job satisfaction scale	1	Job satisfaction	Doctors					X		1
West haven-yale multidimensional pain inventory	1	Pain	Nurses						X	1
WHO alcohol, smoking and substance involvement screening Test	1	Abuse	Nurses					X		1
WOLF inventory	1	Flow	Doctors		X		X		X	3
Work and Social Adjustment Scale	1	Functional status	Nurses						X	1
Work as a calling	1	Calling	Doctors				X		X	2
Work context assessment scale	1	Work environment	Nurses	X	X					2
Work environment evaluation instrument	1	Work environment	Doctors		X					1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Work environment questionnaire	1	Job satisfaction & psychosocial work environment	Nurses	X	X			X	X	4
Work ethic scale by Sharma	1	Moral courage	Both				X			1
Work excitement scale	1	Work excitement	Nurses		X		X	X		3
Work satisfaction instrument in Japanese	1	Job satisfaction	Nurses					X		1
Work frustration scale	1	Work frustration	Nurses	X						1
Work interruption measurement scale for nurses	1	Work interruption	Nurses	X	X					2
Work life balance scale developed by Zheng	1	Work life balance	Nurses	X						1
Work life climate scale	1	Work life balance	Both	X						1
Work motivation	1	Motivation	Nurses				X	X		2
Work motivation scale based on self-determination theory	1	Motivation	Doctors				X			1
Work performance questionnaire	1	Absenteeism and performance	Nurses						X	1
Work quality index	1	Work environment	Both	X	X			X		3
Work Related Quality of Life questionnaire	1	Quality of life	Doctors	X	X			X		3
Work research and quality improvement questionnaire	1	Management and leadership	Both		X					1
Work satisfaction questionnaire	1	Job satisfaction	Both					X		1
Work stressor inventory for nurses in oncology	1	Depression, anxiety, stress	Nurses	X	X			X		3
Work value and attitude scale	1	Work attitude, values and engagement	Nurses	X	X	X				3
Work/life strain	1	Work life balance	Doctors	X						1

Table D Overview of all instruments (Continued)

Instrument	Number of instruments found	Main constructs	Health-care professional	Demands	Resources	Leader-ship	Personal resources	Well-being	Outcomes	Amount of JD-R categories
Work-Family-School Role Conflicts Scale	1	Conflict	Nurses	X						1
Workgroup cohesion	1	Coherence	Nurses	X	X					2
Work-home and home-work interference- 2 scales	1	Work life balance	Doctors	X						1
Work-home interaction survey nijmegen	1	Work life balance	Doctors	X						1
Work-home interface stress	1	Depression, anxiety, stress	Doctors					X		1
Working conditions and control questionnaire	1	Job control	Doctors		X					1
Workload questionnaire	1	Workload	Nurses	X						1
Workplace atmosphere	1	Work environment	Both		X					1
Workplace breastfeeding support scale	1	Breastfeeding support	Nurses		X					1
Workplace bullying inventory	1	Bullying	Nurses	X				X		2
Workplace Factors in Treatment of IPV	1	Work environment	Nurses	X	X					2
Workplace intimidation instrument	1	Intimidation	Nurses	X						1
Workplace survey	1	Culture	Nurses	X	X	X		X		4
Workplace violent incident questionnaire	1	Violence	Nurses	X						1
Workplace well-Being scale	1	Well-being	Doctors					X		1
Work-Related Behaviour and Experience Pattern	1	Job satisfaction	Doctors					X		1
Work-related flow inventory	1	Flow	Doctors				X	X		2
Worksatisfaction	1	Job satisfaction	Nurses					X		1
World Health Organization Health and Work, Performance Questionnaire	1	Job performance	Nurses						X	1
Worries of epidemic in healthcare scale	1	Worrying	Both	X				X		2
Young impostor syndrome scale	1	Job insecurity	Both	X				X		2

**Additional file 3**

Table E Income classification

<b>Classification</b>	<b>Number of unique instruments at least applied</b>
High income	743 (75,4%)
Upper-middle income	331 (33,6%)
Lower-middle income	155 (15,7%)
Low income	46 (4,7%)

**Additional file 4**

**Table F** Most comprehensive instruments occurring more than 10 times

Instrument	Prevalence*	Main construct	Published since	Income classification	Number of questions	Healthcare professional	Energy compass domains of the JD-R model**					
							Demands	Resources	Leadership	Personal resources	Wellbeing	Outcome
Moral sensitivity questionnaire	40	Moral sensitivity	1994	High, upper-middle, lower-middle	35	Both**	x	x	x			x
Short form health survey	23	General health	1992	High, upper-middle	36	Both**	x	x		x		x
Professional fulfillment index	18	Professional fulfillment	2018	High, upper-middle	16	Both**	x		x		x	x
Professional practice environment scale	13	Work environment	2000	High, upper-middle	38	Both**	x	x		x		x
Copenhagen psychosocial questionnaire	12	Psychological health status	2000	High, upper-middle	141	Both**	x	x		x		x

Note: \* number of times instruments extracted; \*\*both nurses and doctors; \*\*\* Job Demands Resource Model



## Additional file 5

Table G Examples of common instruments per common main construct

Instrument	Number of times extracted	Published since*	Number of questions	Healthcare professional	Energy compass domains of the JD-R model***					Sum Energy compass	
					Demands	Resources	Leadership	Personal resources	Well-being		Outcome
<i>Burnout</i>											
Maslach burnout inventory	314	1986	22	Both**					X		1
Copenhagen burnout inventory	31	2005	19	Both**					X		1
Oldenburg burnout inventory	17	1999	16	Both**					X		1
<i>Commitment</i>											
Organizational commitment scale	10	1990	17	Both**						X	1
Organizational commitment questionnaire	7	1974	15	Both**						X	1
<i>Culture</i>											
C - Change Resident Survey	2	2009	68	Doctors	X					X	3
<i>Depression, anxiety, stress</i>											
Perceived stress scale	58	1983	10	Both**			X			X	2
Patient health questionnaire	57	2001	9	Both**					X		1
Depression anxiety stress scales	37	1995	21	Both**					X		1
<i>Intention to leave</i>											
Anticipated turnover scale	4	1984	12	Both**						X	1
Single item over turnover intention	3	2015	1	Both**						X	1
Turnover Intention Scale	3	1982	6	Nurses						X	1
<i>Job satisfaction</i>											
Index of work satisfaction	7	1997	44	Nurses	X					X	4
Mc. closkey-mueller Satisfaction scale	5	1990	31	Both**	X					X	3

Table G Examples of common instruments per common main construct (Continued)

Instrument	Number of times extracted	Published since*	Number of questions	Healthcare professional	Energy compass domains of the JD-R model**					Sum Energy compass	
					Demands	Resources	Leadership	Personal resources	Well-being		Outcome
Minnesota job satisfaction questionnaire	5	1967	20	Both**					X		1
<i>Quality of life</i>											
Professional quality of life scale	58	2005	30	Both**	X				X		2
Linear analogue self-assessment items	6	1996	6	Both**					X		1
Satisfaction with life scale	5	1985	48	Both**					X		1
<i>Wellbeing</i>											
Well-being index	6	2011	9	Both**					X		1
Patient reported outcomes measurement information system	6	2010	10	Both**					X		1
World health organization well-being index	4	1998	5	Both**					X		1
<i>Work environment</i>											
Practice environment scale of the nursing work index	56	2002	30	Both**	X	X	X				3
Revised nursing work index	18	2000	57	Both**	X	X	X				3
Professional practice environment scale	13	2000	38	Both**	X	X	X	X			4

Note: \* years extracted in this study, \*\*both nurses and doctors; \*\*\* Job Demands Resource Model





**Well-being initiatives for hospital employee's  
provided by the Dutch University Medical Centres:  
an exploratory study**

Boskma A, Sturms L, Franx A, Laan van der M (2025). BMJ Leader

## ABSTRACT

**Background:** Healthcare professionals (HCPs) face a range of sources of stress and dissatisfaction. Decreased well-being among HCPs is one of the causes of the caregivers' shortage and relates to poor patient outcomes. To improve well-being in the workplace, a variety of initiatives are offered. This inventory aims to give an overview of well-being initiatives provided by the university medical centres (UMCs) in the Netherlands. **Method:** We conducted semi-structured video call interviews with all UMCs in 2021, employing a purposive sampling approach. An interview guide was used to ensure similar types of data from all informants was collected. **Results:** 31 interviews were conducted among nurses, doctors, human resource personnel and occupational health department members. 203 initiatives were reported by the seven UMCs to improve or sustain employees' well-being. Initiatives concerned coaching, training, programmes, studies, apps and tools. The initiatives aim to improve physical fitness, mental fitness, personal development and balance, team collaboration, equip managers and function/context. Most of the initiatives are aimed at individual employees, and only few focus on teams, organisations or the healthcare system. We also found that it is not evaluated if initiatives are effective to improve employees' wellbeing. Furthermore, HCPs' needs do not seem to be routinely evaluated upfront in the design of initiatives. **Conclusion:** The urgency of supporting the well-being of HCPs is recognised given the extensive amount of provided initiatives. However, this collection of initiatives must be critically reviewed in order to have a balanced offer that is effective and fits the wishes of HCPs. These results should be taken into consideration when creating, implementing and coordinating well-being initiatives for employees in the healthcare field.

**Keywords:** Well-being at work, Healthcare professionals, Supportive work environment, Tailored and effective initiatives

## INTRODUCTION

Healthcare professionals (HCPs) face a range of occupational risks associated with biological, chemical, physical, ergonomic and psychosocial hazards affecting the safety of both HCPs and patients<sup>1</sup>. The most common occupational hazards for HCPs are ergonomic hazards (heavy lifting, unsafe patient handling), psychosocial hazards (time pressure, lack of control, shift work and lack of support) and violence and harassment (physical, sexual and psychological)<sup>2</sup>. Globally, there are 136 million HCPs<sup>1</sup>, and across diverse healthcare worker types, the prevalence rates of decreased well-being and increased retention are high<sup>3-5</sup>. Poor well-being and occupational burnout among HCPs are associated with poor quality of care and negative patient safety outcomes such as medical errors<sup>2</sup>.

Therefore, there is great importance for long-term sustainable investments in the health workforce in order to ensure that enough HCPs are employed and retained, deployed where needed, and that they have the skills equipment to perform their jobs safely and well<sup>5,6</sup>. This is essential for ensuring the accessibility of high-quality healthcare. Worldwide, a lot of effort is being put into initiatives for maintaining or improving HCPs' well-being<sup>7</sup>. Literature about interventions for HCPs' well-being is increasing at an extremely fast pace<sup>7,8</sup>. A large variety of different interventions are initiated: individual- directed interventions, team-based interventions, organisational-directed interventions and multi-model interventions<sup>7,9</sup>. Interventions are developed for diverse settings, orientations (proactive/prevention, reactive/promotion) and aimed at different populations (for all employees, employees at risk, employees in need)<sup>7,8</sup>. However, there is currently a lack of a comprehensive overview of interventions provided to Dutch HCPs.

Hence, this study investigates the current situation in the Dutch University Medical Centres (UMCs). Herewith, the focus of initiatives, whether they are evidence-based and the involvement of professionals is investigated. This study is part of a programme of the Dutch Federation of University Medical Centres (NFU) about searching for ways to improve and monitor HCPs' well-being. Investigating the current situation regarding available interventions contributes to an understanding of and getting insight into processes, gaps, problems, opportunities and inefficiencies. Understanding the content and focus of ongoing well-being initiatives will contribute to identifying the gap of knowledge, define further scientific delineation and objectives and ultimately developing appropriate strategies for improving quality of care and patient safety, healthcare worker retention as well as environmental sustainability. This study aims to get insight and overview of the current provided/available well-being initiatives for the HCPs in the UMCs of the Netherlands.

## METHODS

### Design

The study approach was explorative and qualitative in design. This approach was chosen because it allows follow-up questions, enabling a better understanding of the context and setting in which (complex) initiatives are offered<sup>10</sup>. The consolidated criteria for reporting qualitative studies (COREQ) are used to facilitate reporting of the results<sup>11</sup>.

### Population

The study population consisted of various employees of the UMCs of the Netherlands. The sampling strategy was purposive, enabling access to people who could provide reach data<sup>12</sup>. Education staff nurses, doctors, human resource (HR) staff members and staff members of the occupational health department were approached since it was expected that they could provide substantial information about which initiatives offered within the organisations. A maximum variation within this purposive sample was tried to be achieved by approaching participants of (a) each hospital and (b) different wards. In such a manner, access to diverse perspectives was accomplished, and the credibility of the data was enhanced<sup>10</sup>.

### Procedures

Employees were contacted by email from July 2021 to October 2021. A few contacts were approached via the network of the NFU colleagues. Through snowballing, extra contacts were gathered and approached. Ultimately, 89 contacts were approached by email. Information about the project and an appointment request were sent<sup>13</sup>.

### Data collection

Information about available well-being initiatives was collected by AB conducting semi-structured interviews from August 2021 to December 2021. Due to COVID-19 measures, interviews took place through videocalls (Microsoft Teams<sup>®</sup>), which are considered to be a proper alternative since differences in quality are sufficiently modest compared to face-to face interviews<sup>14-18</sup>. An interview guide was used to ensure similar types of data from all informants was collected<sup>12</sup>. From the various suitable questions for qualitative research (experience, feeling, knowledge and follow-up questions), the current study used so-called 'knowledge questions' to find answers to the aim<sup>12</sup>. The open nature of the questions provided flexibility in the conversation for both the respondent and the researcher<sup>12</sup>. Each conversation started with the questions: 'Which current initiatives/projects/studies are available for the employees within your organisation to prevent/treat/monitor reduced well-being?' and 'Which current initiatives/projects/studies are available for the employees within your organisation to optimise personal or contextual factors?'. Hereafter, the following information was asked out per initiative/project/study: (a) content of initiatives; (b) purpose of initiatives; (c) target group;

(d) effectiveness/evaluation (eg, results, do's and don'ts, particularities) and (e) implementation (eg, adjustments, needs assessments, barriers, facilitators).

An audit trial was used to write down and link thoughts and methodological choices. Moreover, after analysis, member check was performed to enhance confirmability. Per the medical centre, an overview of collected initiatives and corresponding features were sent to participants. This was in the form of a table in Word. Feedback was requested via email to confirm assumptions and to check missing initiatives/projects/studies. Of every medical centre, a reaction was received. Based on the responses, the overviews for each UMC were adjusted and completed.

### **Data analysis**

The data analysis was inductive. During interviews, notes were made in an Excel spreadsheet, and afterwards, the information was organised and written out related to the subthemes by the first author (content, purpose, target group, effects, implementation). Interviews were not recorded and transcribed regarding the feasibility of the study. By taking notes, the data were reduced and delays in analysis were prevented<sup>19</sup>. Moreover, this approach was supportive in sharpening the focus and bringing the essence to the forefront<sup>19</sup>, since during interviews, a distinction was immediately made between main and secondary issues. While taking systematic notes, initiatives were placed on rows, and information about the hospital and the initiatives were organised in columns. Afterwards, initiatives were categorised independently by the first and second authors. Finally, through discussion, consensus was reached about final categories.

The first author is a nurse with intrinsic motivations in the topic of the current study due to her own experiences and career choices. Being recognisable to participants can offers rapport and familiarity but can also lead to coloured perspectives. The first author was aware of this, and she deliberately aimed to interview with an open, curious view. Furthermore, during analysis, the second author was a good sparring partner to discuss interpretations.

## **RESULTS**

### **Participants**

To get a snapshot of initiatives in 2021, 31 semi-structured interviews were conducted among education staff nurses, doctors, HR staff members and staff members of the occupational health department (see Table 1). Of the 89 approached contacts, some suggested other, more suitable persons and, some did not respond for unknown reasons. Interviews lasted approximately 60 min.

Table 1 Overview of initiatives gathered and characteristics of interviewees per university medical hospital

University medical hospital	Amount of initiatives gathered	Background of interviewees (n=31)
1. Amsterdam UMC	30	HR-staff/occupational health staff (2) Physician (2)
2. UMC Utrecht	27	HR-staff/occupational health staff (1) Researcher (1)
3. Radboud UMC	28	HR-staff/occupational health staff (2) Nurse scientist (3) Physician (1)
4. Erasmus UMC	23	Education staff (1) HR-staff/occupational health staff (2) Nurse scientist (1) Physician (1)
5. Maastricht UMC	45	Education staff (1) HR-staff/occupational health staff (3) Nurse (1)
6. UMC Groningen	39	HR-staff/occupational health staff (2) Nurse (1) Physician (1) Other (3)
7. Leiden UMC	11	HR-staff/occupational health staff (1) Nurse scientist (1)

### Initiatives categorised

In total, 203 initiatives were identified by the seven UMCs. Based on the detailed description of notes, the following categories were inductively identified by AB and LS: (a) physical fitness; (b) mental fitness; (c) personal development and balance; (d) team collaboration; (e) equipping managers; (f) function and context (eg, roles, tasks, work environment). Some initiatives were suitable for several categories. Results will be further described by category.

### Physical fitness

The category 'physical fitness' included initiatives to support physical health. All participants mentioned the organisational attention for healthy food and exercise/sports. For example, for all employees, fruits and protein snacks are offered, and lunch walks, sport lessons and physiotherapist consults are organised, rewarded and promoted. Besides, workshops and health checks are possible to participate in as an individual worker/employee.

### Mental fitness

The category 'mental fitness' included initiatives to support mental health. Of the 203 initiatives, most initiatives on mental health were pointed out (43%). Lots of education

options (workshops, courses, lectures, e-learning) were described targeting fatigue, coping with stress, mindfulness and sustainable work. Moreover, professional coaching and peer support were remarked as available at all of the UMCs. Participants indicated most of the coaching initiatives are aimed at individuals; however, some initiatives. Such as debriefing and intervention sessions, are eligible for teams. Finally, apps are highlighted as being used to track, for instance, symptoms of stress.

### **Personal development and balance**

Participants of all UMCs indicated personal coaching purposing career development. Moreover, courses and e-learning about this topic are described. According to interviewees, education within this theme is, for example, about leadership, time management and improving resilience.

### **Team collaboration**

Some interviewees described initiatives focusing on teams. Likewise, in some UMCs, training and coaching are possible for teams. Many participants indicated that training and coaching are targeting improving communication, culture or practising simulated clinical cases interdisciplinary. One interviewee mentioned an intervention that challenges teams using an app to stimulate healthy patterns (eg, sleep, exercise). Lastly, in all the seven hospitals, teambuilding and festivity are organised as indicated by participants.

### **Equipping managers**

A few courses were revealed during interviews, especially for (direct) managers. Participants highlighted these initiatives are organised to improve employee support from managers in the context of job resources. Interviewees mentioned these courses are targeting on remarking problems, providing advice about how to discuss these problems with employees and applying appropriate actions.

### **Function and context**

Together with the theme 'equipping managers' this is the smallest category, with only 11 initiatives as indicated by participants. A few participants described examples of initiatives changing functions or the context. Examples remarked are assistance for nurses, working in pairs, self-scheduling, combining jobs and projects to support taking the stairs/making work spaces attractive.

### **Highlighting some features**

Some features emerged from the conducted interviews that need to be considered. Strikingly, participants described most of the initiatives as aimed at individual professionals rather than teams and work context (eg, education options, coaching). Moreover, according to participants,

more than half of the offered initiatives are not evaluated. Lastly, some interviewees noted HCPs' wishes and needs do not seem to be evaluated upfront as a routine in the design of initiatives.

## DISCUSSION

In our study overviewing well-being initiatives for HCPs in the seven Dutch UMCs, the semi-structured interviews provided insight into the current situation and understanding of ongoing well-being initiatives. A variety of activities are offered. The number of different initiatives is a reflection of the perceived need. Despite this, there is room for improvement in contributing to the well-being of HCPs. Strikingly, most of the initiatives aimed at changing individual professionals rather than teams and work context. Moreover, it remains unknown whether these initiatives are effective in order to improve employees' well-being since effects of the majority are not evaluated. Lastly, HCPs' wishes and needs do not seem to be evaluated upfront as a routine in the design of initiatives.

### Findings in context

First, most of the initiatives aim at changing the individual professional. On one hand, strengthen individuals mediates the relationship between job resources and engagement/exhaustion<sup>20</sup>. On the other hand, personal resources cannot offset job demands<sup>20</sup>. So, when the context and system are sickening, we are not solving the right problem. This is in a way only addressing the symptoms but not the underlying disease. Altogether, since well-being is a multidimensional concept, organisations should not focus mainly on changing individuals but also on changing teams and work environments, such as in multi-model interventions<sup>9,21</sup>. This often neglected focus on preventive organisational-level interventions and the need for a more shared responsibility is highlighted in previous (literature review) research<sup>22,23</sup>, making our findings more probable.

Second, up to now, there is no structural evaluation of the effectiveness of well-being initiatives. Evaluations of about half of the initiatives are predominantly targeted at experiences and improving the initiatives rather than on the effectiveness of the initiatives. Insight in the cost-effectiveness of initiatives on retaining staff and optimising well-being can be substantially improved<sup>24</sup> and is urgently needed. Currently, the revealed initiatives are context dependent. Despite the fact that testing health promotion initiatives is challenging (many factors influence the effect (eg, personal factors and organisational factors))<sup>24-26</sup>, initiatives will benefit from continues learning and improvement processes, such as action research or PDCA cycles. Thorough evaluation and insight into outcomes will contribute to understanding of what does and does not work and how initiatives work in practice and will provide evidence that informs policy and practice<sup>2,24,27</sup>.

Moreover, initiatives should better fit and be tailored to professionals' needs to improve their professional performance<sup>28,29</sup>. Strikingly, there is often a mismatch between organisations' perceptions of health and the interventions they offer employers<sup>30</sup>. To bridge this gap, organisations can make informed choices by timely querying and monitoring wants and needs. The primary objective should be creating an intervention that effectively tackles a specific problem while being cost-efficient, feasible, replicable, and responsive to the needs of its users<sup>31</sup>. Therefore, investigating the needs and perceptions of the recipients and providers regarding the identified problem, on the one hand, and the preferences and capacities with regard to the proposed solution, on the other hand, is crucial<sup>31</sup>.

Lastly, as mentioned, a variety of activities are offered. These initiatives were divided into several categories. Based on the initiative description, the categorisation was made. However, despite the categorisation being done independently and consensus being reached on it, it was sometimes difficult to classify initiatives, and some initiatives were suitable for multiple categories. One example is coaching and intervision, which is sometimes described as support for mental issues, but at the same time, it is also about learning and therefore fits into personal development and balance. Another example is a platform for e-learning. The platform features various types of e-learning, making it possible to categorise them into multiple categories. Programmes have also been included, containing various elements or modules (coaching, webinars, team sessions in one programme), resulting in them being suitable for multiple categories. Finally, there are sessions included that operate on demand. This means that depending on the team's needs, support from HR is used. Consequently, the classification of the initiative into categories is also dependent on the team's request. These are examples and a possible explanation for why most initiatives were linked to mental fitness.

### **Methodological considerations**

The study approach was qualitative, which was considered appropriate for the aim of the current study. A quantitative cross-sectional survey study could also have been considered, as it is suitable for describing the status, prevalence, and distribution of a phenomenon at a fixed point in time<sup>32</sup>. However, the goal of this study was not to investigate associations in relation to certain well-being outcomes, for example. Additionally, questionnaires rely on responses, validating the constructed questionnaire is necessary, and it is common practice to ask short questions such as yes/no and always/sometimes/never<sup>32</sup>, which can be limiting in this case. Despite the fact that a questionnaire has the advantage of potentially reaching a large group and allowing for anonymity<sup>32</sup>, the research group supports a qualitative approach. The qualitative research supports an iterative, exploratory approach. This means that insights from data collection (first interviews) can inform subsequent data gathering for further interviews, contributing to a more comprehensive understanding<sup>32</sup>. Additionally, the qualitative approach made it possible to build a relationship with participants, resulting in an open environment

where rich data was shared. Moreover, this rapport facilitated referrals to key contacts and helped in gathering accurate information from participants with the relevant knowledge, leading to a more complete perspective and fostering positive collaboration in future projects and research in the field.

### **Strengths and limitations**

The heterogeneous participant group with different backgrounds provided very diverse information and perspectives about the initiatives within the different UMCs. This contributed to achieving a very complete impression and inventory of the current situation. Moreover, intersubjectivity agreement was enhanced by the independent analysis/labelling of categorising the initiatives by the first author and second author<sup>33</sup>. Consensus was reached after discussion within the research team. Likewise, memos, assumptions, methodological choices and thoughts were logged. Lastly, member checking was conducted to optimise confirmability<sup>33</sup>.

Some study limitations need to be discussed. First, interviews were not recorded and transcribed. This could result in missed information or incorrect interpretations. However, careful attention was paid to this by writing down memos during interviews. Additionally, due to the absence of transcripts, it was not possible to add quotes to the results section. The use of quotes can support the interpretation of the results<sup>34</sup>. However, quotes are mostly used to provide a better understanding of the language, reactions, and behaviour of the participants<sup>34</sup>, which is considered less relevant in our study. Second, it was complicated to determine data saturation. Finding participants who were able to provide comprehensive information was challenging sometimes, which resulted in an incomplete overview eventually. To address this inconvenience, participants were asked for other key contacts and a member check. Lastly, this study is a snapshot of a fluctuating set of initiatives offered by UMCs in 2021. This needs to be taken into account during the interpretation of the data, and causal relationships could not be established.<sup>35</sup> However, the current study aims to generate an overview, and the outlined results are suitable for informing future directions<sup>35</sup>.

### **Implications for clinical practice and future research**

Caring for and protecting HCPs should be a fundamental part of the health sector<sup>2</sup>. It is the shared responsibility of healthcare organisations to facilitate adequate occupational health services and to provide and equip HCPs with needed skills, knowledge and capacity to protect themselves<sup>2</sup>. These study outcomes indicate direction for future research and can be used by researchers, leaders, policy makers and staff. Outlined results should be taken into consideration when creating, implementing and coordinating well-being initiatives for employees in the field of healthcare. Understanding the content and focus of ongoing/available well-being initiatives will contribute to identifying the gap of knowledge, defining further scientific delineation and objectives and ultimately developing appropriate strategies

for improving quality of care and patient safety, healthcare worker retention as well as healthcare system sustainability<sup>2</sup>. Effective ways to improve well-being among HCPs will not only contribute to reduced absenteeism, lower turnover, and satisfied HCPs, but will also indirectly enhance the quality and safety of care.

#### *Individual-level.*

Individuals should communicate their wishes and needs so these can be addressed. Demonstrating leadership and empowerment in this process is crucial. Participating in surveys to achieve the highest possible response rate, as well as expressing wishes and needs during other opportunities such as annual meetings with the manager or team meetings, can help facilitate this.

#### *Leadership-level.*

Actions tweaking the work environment of healthcare workers to improve well-being must be conducted according to quality cycles, since this supports evidence-based working. Actions must be evaluated to ensure efficient and meaningful care. Leaders have a role in ensuring safe, supportive and welcoming teams and work contexts and facilitating and creating coherence within the organisation and between organisations. The challenge must be taken up to care for healthcare workers with healthcare workers.

Future research is recommended to investigate which organisational initiatives are matching the wants and needs of HCPs. Furthermore, studies about well-being initiatives' effectiveness are favourable to being able to constructively improve the well-being of HCPs (teams) in a supportive work environment<sup>7</sup>.

## CONCLUSION

Interviews revealed an overview of 203 initiatives. The study provides insight into initiatives types, fragmentation and shortcomings. In conclusion, initiatives should focus on predetermined needs and problems and should be based on evidence. Opportunities for togetherness and collaboration appeared by discovering the overlap in comparable initiatives among hospitals. The more specific initiatives and the differences between provided initiatives among hospitals lead to opportunities to learn from each other's best practices. The future needs to offer evidence -based initiatives in collaboration with professionals in a context-adaptive fashion, like action research.

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**Effectiveness of organization-directed  
interventions on healthcare professionals'  
well-being, work environment, retention, and  
quality of care in hospitals: a systematic review**

Boskma A, Braak van der K, Hooft L, Oerbekke M, Franx A, Laan van der M. (2025).  
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## ABSTRACT

**Background:** Healthcare professionals' well-being at work seriously influences individuals, organizations, and care quality and safety. Many institutions focus on individual-level approaches. This review evaluates organization-directed interventions targeting the work environment of HCP, supporting a futureproof and supportive work environment. Working conditions are considered part of evidence-based protective factors for well-being at work, similar to how addressing causes of diseases is more effective than merely treating symptoms. This review aims to assess the effects of organization-directed interventions on hospital staff well-being, work environment, retention, and quality of care. **Methods:** MEDLINE, Embase, and CINAHL were searched from 2012 to October 2022. Extracted data encompassed study characteristics, population details, intervention and comparator features, and outcomes. The Job Demands – Resources model was used as a theoretical basis. Risk of bias was evaluated. Interventions were categorized into *management & building*, *social resources & support*, *personal development & recovery*, and *multi-categorical*. Results were synthesized per outcome, effects were assessed using forest plots, and the direction of effects is presented by Tables. Data analysis and visualization were performed using Excel and R. **Findings:** Screening of 2319 hits resulted in 49 included studies. Intervention effects are described and analyzed for outcomes: misconduct, workload, communication, job control, support, team climate, leadership, concentration, coping, efficiency, emotions, psychological characteristics, anxiety, burnout, depression, general health, job satisfaction, lack of energy, physical discomfort, quality of life, sleep, stress, employability, engagement, turnover intentions, patient quality, patient safety, and unwanted events. **Interpretation:** This review provides an overview of interventions, some show improvements in well-being, while others may be detrimental. Interventions focusing on social resource & support showed the most consistent significant improvements over a variety of outcome categories. This review guides organizations in effective decision-making in selecting interventions to support and promote retention of healthcare professionals. **Funding:** NFU and ZIN.

**Keywords:** Healthcare professionals, well-being at work, work environment, organization-directed interventions

## INTRODUCTION

Improving employee health is top priority in hospital strategies,<sup>1,2</sup> especially as healthcare systems face rising demand and shortages of professionals.<sup>3,4</sup> Addressing healthcare professionals' (HCP) working conditions and well-being is crucial for safe, high-quality care.<sup>5-8</sup> Well-being at work involves '*creating an environment promoting contentment and allows employees achieving full potential, benefiting both themselves and their organization*'.<sup>9</sup>

Multi-level strategies are more effective than individual interventions for improving HCPs' well-being.<sup>10-12</sup> Here, individual-directed interventions focus on physiological, emotional, or behavioral changes,<sup>13</sup> while organization-directed interventions target systemic issues as policy and processes<sup>13</sup> and impact larger groups of HCPs, are more symptom-controlled, sustainable, and integrate into organizational culture, ultimately boosting engagement and morale. It is in effect the equivalent of treating symptoms (individual-directed interventions) or treating causes (organization-directed interventions). Research shows that organization-directed interventions improve well-being, work engagement, and quality of life.<sup>14</sup>

However, many institutions focus on individual-directed interventions,<sup>15,16</sup> which places responsibility on individuals and offers limited statistical evidence of effectiveness.<sup>17</sup> Programs for peer-support and resilience,<sup>18,19</sup> for example, are offered but provide weak evidence. Furthermore, the effect of such interventions may not always be beneficial for HCPs. For example, literature indicates that non-professionally organized (peer) support for resilience can have negative effects on well-being outcomes.<sup>20</sup> Organization-directed interventions can address systemic causes of stress and dissatisfaction, similar to treating root cause of diseases rather than its symptoms.

Despite their complexity and resource demands, organization-directed interventions are necessary for sustainable improvements in HCPs' well-being. There is a need to provide an overview of organization-directed interventions and their (un)beneficial effects on multiple outcomes. Understanding where the benefit and harm on HCPs occur needs to be recognized when selecting, performing, and evaluating such an organization-directed intervention. A shift in focus of these efforts of symptom control is needed to tackle root causes.<sup>21</sup> This study aims to provide an evidence-based overview of organization-directed interventions for healthcare professionals' well-being, work environment, retention, and quality of care. Nevertheless, working conditions are considered as protective factors for well-being at work.<sup>22</sup> Giving an overview of existing and effective interventions tweaking contexts will contribute to a sustainable, future proof and supportive work environment.<sup>23</sup>

## METHODS

This systematic review and meta-analysis are developed and reported according to PRISMA guidelines.<sup>24</sup> The protocol has been registered in May 2022 in PROSPERO (CRD42023390474).<sup>25</sup>

### Search strategy and selection criteria

Studies that targeted HCP in hospitals, evaluated organization-directed interventions, compared these with no intervention or other organization-directed interventions, used experimental designs, focused on well-being, work environment, retention, or quality outcomes, and were published after 2012 for relevant interventions for daily practice<sup>26</sup> in English were considered eligible. Studies targeting individual HCPs' psychological, emotional, or behavioral response or coping mechanisms were excluded. Studies were searched in October 2022 in MEDLINE Ovid, Embase Ovid, and CINAHL (see additional file 1 for the complete search strings). An update of the search was performed in November 2024. Titles and abstracts were screened in pairs, after the first 10% discrepancies were resolved. Full-text screening followed with consensus on discrepancies.

### Data analysis

AB and KvdB extracted data using a standardized, piloted Excel form. Extracted data were<sup>27</sup>: study, population, intervention/control characteristics, and outcomes of interest. Personal communication with the WHO and developer of the Job-demands resources model (JD-R model)<sup>28</sup> informed the construction of seven outcome categories: six JD-R categories and 'Quality of care'. Risk of bias was assessed by AB and checked by KB.<sup>29</sup> Disagreements were discussed and solved. AB and KvdB categorized interventions inductively into four types and sub-categories: (1) *Management & Building* (workhours, continuous improvement, environment, equipment support & patient handling, workflow improvement, care model); (2) *Social resources & support* (emotional support, (additional) staff support, optimizing teams); (3) *Personal development & recovery* (role opportunities, relaxation opportunities, other team/setting opportunities); (4) *Multi-categorical* (detailed in additional file 2). Results per study per outcome domain were characterized by their effect direction (favorable intervention/control, unclear, no change) based on author reports.<sup>30,31</sup> For multiple measurements in a single outcome domain, the overall effect was based on the majority. An effect was unclear when insufficient information was reported to characterize the direction. When studies reported mean differences of 0, the effect was indicated as no change. Feasibility of meta-analyses was assessed, and forest plots with standardized mean differences (SMDs) were created for continuous variables.<sup>32</sup> Records and data are managed using Endnote 20.1 (Clarivate Analytics, US), Rayyan (Rayyan systems Inc, US), Excel, Mendeley Reference Manager 2.590 (Elsevier Inc, New York), and R statistics 4.2.2 (Foundation for statistical computing, Austria).

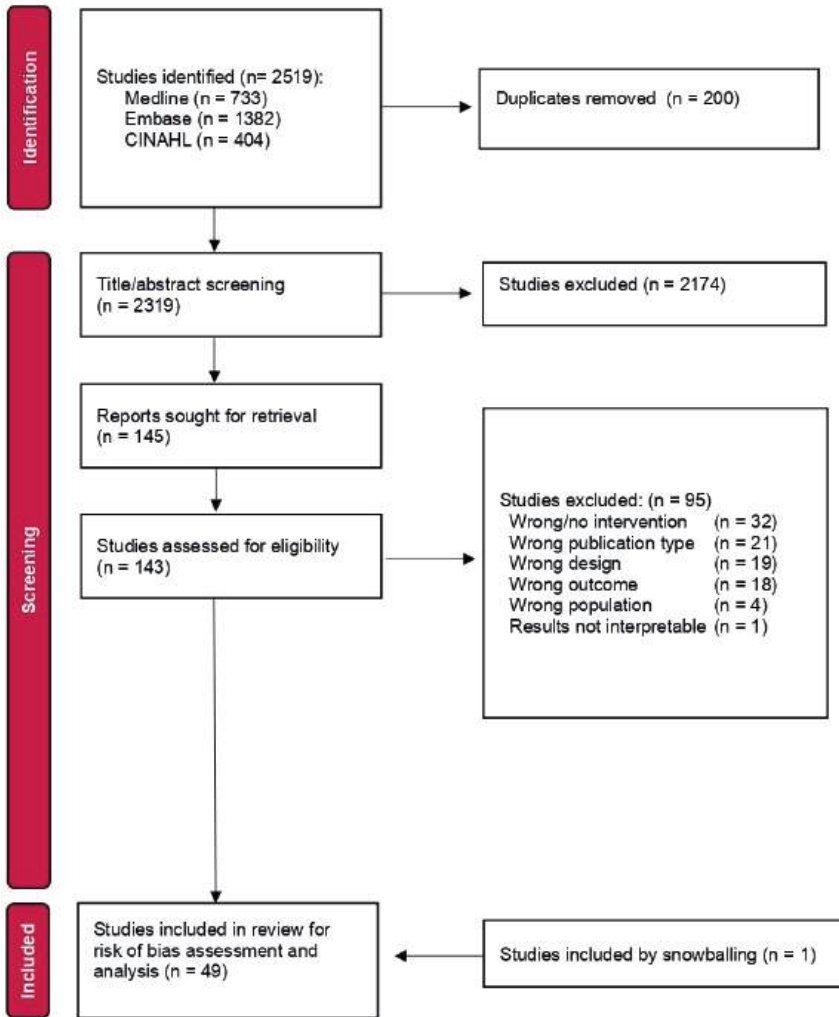


Figure 1 Flow diagram of selected studies

## RESULTS

The search retrieved 2319 unique records, with 49 studies included in this review<sup>33–80</sup> (one added through cross-referring<sup>81</sup>). Figure 1 and Table 1 present the study selection flow and characteristics, respectively. Participants were nurses, doctors, and/or other professionals. Sample sizes ranged from 4 to 9000, with one study reporting the number of measurements instead of the number of individuals.<sup>65</sup> Intervention types (subcategories)

included: (a) *Management & Building* (workhours, continuous improvement, environment, equipment support & patient handling, workflow improvement, and care model); (b) *Social resources & support* (emotional support, (additional)staff support, and optimizing teams); (c) *Personal development & recovery* (role opportunities, relaxation opportunities, and other team/setting opportunities); (d) *Multi-categorical*.

Altogether 389 outcomes were extracted following the JD-R categories: (a) Job demands (workload, misconduct); (b) Job resources (communication, support, team climate); (c) Leadership; (d) Personal resources (concentration, coping, efficiency, emotions, psychological characteristics); (e) Well-being (anxiety, burnout, depression, general health, job satisfaction, lack of energy, physical discomfort, quality of life, sleep, stress); (f) employability/engagement/turnover intentions; (g) Quality/safety outcomes (patient quality, patient safety, unwanted events).

One study was judged to be at overall low risk of bias, as all ratings were assessed as 'low risk'.<sup>44</sup> Remaining studies were all considered to have some risk of bias. Two studies received one 'unclear' or 'high risk' rating<sup>65,66</sup>. Four studies received two 'unclear' or 'high risk' ratings.<sup>34,43,47,70</sup> Other studies received more than two 'unclear' or 'high risk' ratings (detailed in additional file 3).

Results are presented per outcome category. Table 2 shows effect directions per outcome and intervention type for critical outcomes selected by the WHO as most relevant. Effect directions, statistical significance of effects (significant, non-significant, unclear significance), and unclear effects are determined and visualized. Forest plots are provided for eligible outcomes (additional file 4: Supplementary plots (plot A Workload; plot B Support; plot C Team Climate; plot D Burnout; plot E Depression; plot F Job satisfaction; plot G Employability; plot H Patient safety)). A complete overview of effect directions is shown in additional file 5. The effect direction Table encompassing interventions evaluated on nurses are presented in additional file 6 and interventions evaluated on doctors are presented in additional file 7. A description of results on outcomes deemed important but not critical are given in additional file 8.

## Job demands

This domain contains workload (critical) and misconduct (important) outcomes. Results for the misconduct outcomes can be found in additional file 5 and 8.

### *Workload*

Seven studies measured workload outcomes<sup>51,56,59,66,71,73,80</sup>, using seven different measurements (e.g., NASA Task Load Index, 5-item job demands scale, numeric rating scales, SWAT questionnaire) of which two outcome measures were not reported. One study on a multi-categorical intervention showed a significant effect versus no intervention.<sup>59</sup> Two studies on 'surgery technique' found the control intervention significantly more effective (gastrectomy and laryngoscopy positions). Five studies from four intervention categories were meta-analyzed (plot A).<sup>56,59,66,73,80</sup> Given some non-overlapping confidence intervals, effects on workload are particularly heterogeneous with SMDs from -1.09 to 0.28.

## Well-being

*All outcomes within this outcome domain were deemed critical and are presented below.*

### *Anxiety*

Three studies measured anxiety outcomes,<sup>51,60,71</sup> including three questionnaires (e.g., Hospital anxiety and depression scale, State-trait anxiety inventory-state). Two significantly favored the intervention: one 'environment' intervention (music versus no music during operations),<sup>71</sup> and an 'emotional support' intervention (rational emotional intervention, integrated with hierarchical management, involved weekly one-hour sessions versus no intervention).<sup>51</sup>

### *Burnout*

Seventeen studies measured burnout outcomes,<sup>35,38,39,43,44,49–52,58,60,61,64,66,69,76,80</sup> using six questionnaires with the Maslach burnout inventory being most commonly. Seven significantly favored the intervention,<sup>35,39,43,44,49–51</sup> including two 'workhours' interventions (12-hours shifts versus 8-hours shifts and duty-hour regulations versus no regulations),<sup>35,50</sup> one 'equipment support & patient handling' intervention (video versus nurse education),<sup>51</sup> three 'emotional support' interventions (rational emotional intervention, integrated with hierarchical management, involved weekly one-hour sessions, motivational messages versus no intervention and self-facilitated group meetings with and without structured discussion guide),<sup>43,44,51</sup> and one 'staff support' intervention (volunteers/informal cuddlers versus no intervention).<sup>39</sup> Two studies favored the control groups<sup>52,61</sup> (4-week rotations versus 2-week rotations,<sup>52</sup> EU Working Time Directive versus no intervention<sup>61</sup>). Six studies were appropriate for meta-analysis (plot D),<sup>35,49,58,61,66,80</sup> showing heterogeneous effects given non-overlapping confidence intervals with SMDs from -0.59 to 1.52. Few studies improved burnout, with some interventions illustrating contradicting effects.

### *Depression*

Nine studies measured depression outcomes,<sup>37,50,51,54,60,66,68,73,76</sup> using six questionnaires (e.g., Hospital and depression scale, Beck depression inventory). One significantly favored an 'emotional support' intervention (rational emotional intervention, integrated with hierarchical management, involved weekly one-hour sessions versus no intervention).<sup>51</sup> Five studies were appropriate for meta-analysis (plot E),<sup>37,54,66,68,73</sup> showing moderate heterogeneity with variation but overlapping confidence intervals with SMDs from -0.44 to 0.64. None of the interventions significantly improved depression.

### *General health*

Nine studies measured general health outcomes,<sup>37,38,48,50,62,63,69,74</sup> using eight questionnaires, e.g., on wellness/feeling good (e.g., Wellbeing index, Short form health survey). One significantly favored an 'environment' intervention (Luminette light glasses versus no intervention).<sup>37</sup>

### *Job satisfaction*

Sixteen studies measured job satisfaction,<sup>38,40-43,45,53,55,59,66,67,69,75-77</sup> using fifteen questionnaires (e.g., Physician job satisfaction scale, Global measure of work satisfaction). Nine significantly favored the interventions,<sup>41,43,45,53,57,59,67,75,77</sup> including one 'workhours' (8.5-hours shifts versus 12-hours shifts),<sup>75</sup> two 'continuous improvement' (PDCA-cycle management),<sup>53,57</sup> one 'workflow' (hospital-based primary-care center versus traditional emergency department),<sup>45</sup> one 'emotional support' (motivational messages versus no intervention),<sup>43</sup> one 'optimizing teams' (interdisciplinary versus physician bedside rounds),<sup>41</sup> one 'role opportunities' (stabilized care delivery versus no intervention),<sup>67</sup> one 'other team/setting opportunities' (fixed-nursing teams versus non-fixed nursing teams),<sup>77</sup> and one *multi-categorical* intervention (nine strategies versus no intervention).<sup>59</sup> Five studies were appropriate for meta-analysis (plot F),<sup>40,42,45,57,66</sup> showing heterogeneous effects given non-overlapping confidence intervals with SMDs from -0.46 to 3.56. One 'continuous improvement' intervention favored the control,<sup>66</sup> while another significantly favored the intervention.<sup>57</sup>

### *Lack of energy*

Nine studies measured lack of energy outcomes,<sup>36,37,50,51,56,58,64,68,79</sup> using seven questionnaires, e.g., on sleep/fatigue/exhaustion (e.g., Fatigue assessment scale, Epworth sleepiness scale). Five significantly favored the intervention,<sup>36,37,51,58,79</sup> including one 'workhours' intervention (16-hours shifts versus 24-hours shifts),<sup>58</sup> one 'environment' intervention (Luminette light glasses versus no intervention),<sup>37</sup> one 'emotional support' intervention (rational emotional intervention, integrated with hierarchical management, involved weekly one-hour sessions versus no intervention),<sup>51</sup> one 'staff support' intervention (in-hospital nighttime intensivist versus intensivists available by phone),<sup>36</sup> and one 'relax opportunities' intervention (nightly powernap versus no powernap).<sup>79</sup>

*Physical discomfort*

Five studies measured physical discomfort outcomes,<sup>35,37,56,63,81</sup> using five questionnaires, e.g., on back/shoulder/wrist/knee/back pain (e.g., Nordic questionnaire). One significantly favored an ‘environment’ intervention (Luminette light glasses versus no intervention).<sup>37</sup>

*Quality of life*

Five studies measured quality of life,<sup>47,50,69,76</sup> using five questionnaires (e.g., Satisfaction with life scale, single-item assessment). One significantly favored an ‘emotional support’ intervention (motivational messages versus no intervention).<sup>47</sup> Another study effect favored the control group (standard light settings) over high-intensity dynamic light.<sup>68</sup>

*Sleep*

Four studies measured sleep outcomes,<sup>36,50,75</sup> using four questionnaires (e.g., Pittsburgh sleep quality index, numeric rating scale). Two significantly favored interventions: one ‘workhours’ (8.5-hours shifts versus 12-hours shifts),<sup>75</sup> and one ‘staff support’ (in-hospital nighttime intensivist versus phone ability).<sup>36</sup>

*Stress*

Nine studies measured stress outcomes,<sup>36,42,43,49,52,59,69,76,80</sup> using nine questionnaires (e.g., perceived stress scale, Kessler psychological distress scale). Two significantly favored the interventions: one ‘equipment support & patient handling’ (video versus nurse education),<sup>49</sup> and one ‘emotional support’ (motivational messages versus no intervention).<sup>43</sup> One study significantly favored the control (2-week rotations) over the intervention (4-week rotations).<sup>52</sup>

**Outcome**

All outcomes within this outcome domain were deemed critical and are presented below.

*Employability*

Fourteen studies measured employability,<sup>35–37,44,55,61,63,65,72,74,75,80,81</sup> using thirteen measurements (e.g., hospital data, self-rated sickness/productivity/performance). One significantly favored an ‘environment’ intervention (Luminette light glasses versus no intervention).<sup>37</sup> Two study effects significantly favored the control group (EU Working Time Directive versus no intervention, 12-hour shifts versus 8-hour shifts<sup>61,65</sup>). Six studies were appropriate for meta-analysis (plot G),<sup>36,37,44,61,74,80</sup> showing moderately heterogeneous effects given variation but overlapping confidence intervals with SMDs from -0.26 to 0.66. None of the interventions significantly improved employability.

*Engagement*

Four studies measured engagement outcomes,<sup>38,44,76,80</sup> using four questionnaires (e.g., Job

embeddedness measure, Utrecht work engagement scale). Two significantly favored 'emotional support' interventions (group meetings).<sup>44,76</sup>

#### *Turnover intention*

Three studies measured turnover intention outcomes,<sup>38,66,75</sup> using three questionnaires (e.g., single-item assessment, 3-item turnover intention scale). None favored the intervention. One significantly favored the control group (no intervention) over solution meetings to discuss stressors.<sup>66</sup>

### **Quality & safety of care**

All outcomes within this outcome domain were deemed critical and are presented below.

#### *Patient quality\_*

Five studies measured quality of care outcomes,<sup>50,67,70,77,78</sup> using five measurements for quality indicators as length of stay and drug delivery time (four self-developed). Two significantly favored the intervention,<sup>67,78</sup> specifically 'staff support' (nightly huddle to discuss patients versus no intervention), and 'role opportunities' (stabilization care model versus no intervention).

#### *Patient safety\_*

Four studies measured patient safety outcomes,<sup>33,41,66,81</sup> using eight measurements for perceptions on patient safety, experienced patient safety culture and handling (e.g., Hospital survey on patient safety culture). Four significantly favored the intervention<sup>33,41,81</sup>: one 'equipment support & patient handling' (safe patient handling and mobilization program versus no intervention),<sup>81</sup> and two 'optimizing teams' interventions (empowerment program versus no intervention and interdisciplinary versus physician bedside rounds).<sup>33,41</sup> Four studies were appropriate for meta-analysis (plot H),<sup>33,41,66,81</sup> showing heterogeneous effects given the non-overlapping confidence intervals with SMDs from -0.23 to 1.91. The 'optimizing teams' category had the highest SMDs and significant effects.

#### *Unwanted event\_*

Eleven studies measured unwanted event outcomes,<sup>33,34,39,40,42,58,63,66,70,75,77</sup> using ten methods (e.g., hospital data, self-rated accidents/errors/infections/patient falls/readmissions). None significantly favored the interventions.

### **Job resources, Leadership and Personal resources**

The outcomes of the Job resources, Leadership and Personal resources domains were all deemed important but not critical. Their results can be found in additional file 5 and 8. The outcomes within the Job resources domain: communication, job control, support, and team climate. Personal resources outcomes were concentration, coping, efficiency, emotions, and psychological characteristics.

Table 1: sample characteristics

References	Design	Sample	Characteristics of the intervention and the comparator		Outcomes	Measurement instrument
Author Publication year Country		Healthcare professional Sample size: (N=) Age: mean (SD) Gender: % female	Intervention description	Comparator description	Outcomes extracted	Measurement methods
Richter (2014) <sup>61</sup> Germany	Before/after study	Physicians (N = before: 328, after: 994)   Age before: 39.4, (9.1), age after: 39.8 (9.3)   Gender before: 29.4% female, gender after: 36.6% female	Management & Building   Workhours European Union Working Time Directive.	No European Union Working Time Directive.	Sick Leave, burnout (emotional exhaustion, depersonalization, personal accomplishment)	Maslach burnout inventory, Sick leave from system
Ripp (2015) <sup>64</sup> USA	Before/after study	Internal medicine physicians (N = before: 108, after: 123)   Age: NR   Gender before: 56% female, gender after: 42% female	Duty hour restrictions. In 2011, the ACGME modified the duty hours standards to limit continuous duty of first-year residents to 16 hours.	No duty hour restrictions.	Burnout prevalence, burnout, excessive sleepiness	Epworth sleepiness scale, Maslach burnout inventory
Turunen (2020) <sup>72</sup> Finland	Quasi-experimental study	Nurses, midwives, practical nurses, administrative assistants, pharmacists, physiotherapists, and other non-nursing professions (N = approximately 9000)   Age: NR   Gender: 89% female	Participatory working time scheduling software. It empowers hospital employees to actively participate in scheduling while considering operational needs, staffing, legal requirements, and fairness. Employees can input their preferred shifts within shift demands, and the software provides transparency and guidance for individual scheduling. Rules for participatory scheduling are established at the ward level.	Traditional scheduling. No participatory working time scheduling software.	Incident sickness absence spells, number of short sickness absence days per employee	Unknown instrument
Webster (2019) <sup>75</sup> Australia	Before/after study	ICU nurses (N = before: 114, after: 152)   Age: NR   Gender: 79% female	An 8 ½-hour shift, which includes a 1/2-h meal break representing the standard working model for providing 24-h nursing care.	12-h shift rostering	Satisfaction with roster, sleep, sick leave, number of incidents, accessed professional development, turnover	Self-devised, hospital administrative data on sick leave and incidents



Battle (2018) <sup>35</sup> UK	Before/after study	ICU nurses (N= 123 (CG: 60, IG: 63))   Age: NR   Gender: NR	In the experimental period, nurses could opt for 12h shifts instead of 8h shifts.	In the control period, all nurses worked according to the traditional 8h shift pattern.	Burnout (emotional exhaustion, depersonalization, personal accomplishment), sickness, personal injuries	Maslach burnout inventory. Number of physical injuries reported each month. All sickness data were taken from the official system.
Levin (2019) <sup>48</sup> Canada	Randomized cross-over trial	Physicians (N = 124 (CG: 60, IG: 64)   Age CG: 28.9 (3.7), age IG: 30.1 (5.5)   Gender CG: 47%, gender IG: 52% female	Casino shifts either from 2000 to 0400 hours (casino A) or 0400 to 1200 hours (casino B). Attending physicians all worked standard shifts during the entire 12-month period.	Physicians worked standard overnight shifts from midnight to 0800 hours.	Resident well-being, mood	Brief resident wellness profile
Lucas (2012) <sup>52</sup> US	Randomized controlled trial	Physicians (N = 60)   Age median: 38 (range 29-55)   Gender: 48% female	Assignment to random sequences of 4-week rotations.	Assignment to random sequences of 2-week rotations.	Perceived stress, emotional exhaustion, inadequate workplace control, burnout	Minimizing error, maximizing outcomes, Maslach burnout inventory, National job burnout survey, Perceived stress scale
Lindeman (2013) <sup>50</sup> USA	Before/after study	Physicians (N = before: 108, after: 104)   Age: mean 30 (range 25-36)   Gender: NR	The July 2011 resident physician duty-hour regulations: 16-hour continuous duty rule.	Before the implementation of duty hour regulation.	Quality of life (balance with personal commitments, balance with family, optimal functioning), satisfaction (work life quality, personal life quality, sleep amount), patient care quality, health, mental wellness, burnout, sleepiness	Center for epidemiologic studies depression scale, Epworth sleepiness scale, Maslach burnout scale, Self-devised, Short-form health survey.
Nomura (2016) <sup>54</sup> Japan	Before/after study	Pediatric physicians (N = before: 34, after: 41)   Age: 29.0 (1, 9)   Gender: 44% female	Duty hour regulations. An overnight call shift system was implemented in July 2011 to address the extended duty hours for pediatric residents.	No duty hour regulations.	Depression	Center for epidemiologic studies depression scale

<p>Parshuram (2015)<sup>58</sup></p> <p>Canada</p>	<p>Randomized cross-over trial</p>	<p>ICU physicians (N = 41 (CG: 13, IG1: 14, IG2: 14 (807 patients))   Age 25 to 30: 66% aged 30 to 35: 21%, age &gt;35: 9%, unknown/not reported: 4%   Gender: NR</p>	<p>Intervention 1 involved a 16-hour schedule with overnight shifts from 4:30 pm to 8:30 am, followed by 24 hours off. On weekdays, non-overnight residents worked from 8 am to 5 pm, and one resident covered daytime on weekends.</p> <p>Intervention 2 featured a 12-hour overnight shift starting at 8:30 pm and ending at 8:30 am, with 3 or 4 consecutive nights followed by 72 hours off. Daytime duty ranged from 8 am to 4:30 pm or 8:30 pm, requiring one additional handover at 8:30 pm.</p>	<p>24-hour schedule (standard for Canadian ICU's): the resident's duty period began at 8 am and finished at 8:30 am the next morning. Overnight duty was followed by 24 hours free of duty.</p>	<p>Sleepiness during the day, sleepiness during the night, burnout (depersonalization, emotional exhaustion, personal accomplishment), preventable adverse events, mortality</p>	<p>Maslach burnout inventory, Stanford sleepiness scale, Trained nurses observed handover and multidisciplinary ward rounds</p>
<p>Rodriguez (2020)<sup>65</sup></p> <p>UK</p>	<p>Interrupted time series</p>	<p>Mental health ward nurses and patient care assistants (N = average number of staff per month before: 31,35, after: 29,21. Total number of observed weeks per ward before: 296, after: 167 )   Age before: 45,01 (4,12), age after: 44,74 (4,05)   Gender before: 79,40% female, gender after: 78,03% female</p>	<p>12 hour shifts.</p>	<p>8 hour shifts.</p>	<p>Sickness absences</p>	<p>Hospital administrative data on sickness</p>

Management & Building   Continuous improvement						
Uchiyama (2013) <sup>32</sup> Japan	Randomized controlled trial	Nurses (N= 308 (CG: 163, IG: 145))   Age CG: 31.7 (9.1), age IG: 33 (9.6)   Gender CG: 97.6% female, gender IG: 100% female	Participatory intervention. An intensive intervention period for the first 3 months and a subsequent implementation period for the following 3 months. The intervention was unit-based and emphasized active employee participation and action planning to enhance the work environment. Each intervention unit designated subchief nurses as key facilitators responsible for unit activities. During the intensive period, key persons participated in group meetings and shared experiences and challenges from their units. Individual interviews with key persons provided guidance for facilitating activities. Key persons then conveyed necessary information to their unit staff and filled out task sheets after each group meeting to track progress. A booster session was conducted two months after the intensive period to review unit activities.	No participatory intervention.	Mental health, job demands, job control, supervisor support, coworker support, effort, reward, goals, efficiency, participatory management, competence development, work climate, leadership, feedback	Job content questionnaire, Quality work competence questionnaire, Center for epidemiology studies depression scale
Luo (2022) <sup>33</sup> China	Controlled before/after study	Obstetric nurse (N = CG: 51, IG: 146)   Age CG: 32.82 (6.5), age IG: 34.53 (6.5)   Gender CG: 100% female, gender IG: 99% female	Continuous plan-do-check-act cycle was implemented. Nurses in the experimental group were trained on the obstetric nursing-sensitive quality indicators online and offline based on the KAP model. The indicators were applied in clinical practice, and obstetric nursing quality was continuously improved.	The quality control group included 2 head nurses, 8 delivery room leaders, 3 ward leaders, and 6 primary nurses. The head nurses organized seminars on obstetric nursing-sensitive quality indicators, emphasizing their importance and motivating nurses. Ward and primary nurse leaders collected and reported data on these indicators. The group met monthly to devise continuous quality improvement strategies.	Job satisfaction	Obstetric nurses' job satisfaction questionnaire

<p>Pan (2022)<sup>57</sup> China</p>	<p>Non-randomized controlled trial</p> <p>Nurses (N = 160 (CG: 80, IG: 80)   Age CG: 31.56 (1.34), age IG: 31.64 (1.33)   Gender: 98% female</p>	<p>PDCA cycle management model to ensure continuous improvement. The model comprises four stages: (1) Planning Stage; (2) Implementation Stage; (3) Inspection Stage; (4) Summary and Treatment Stage.</p>	<p>Routine nursing management.</p>	<p>Job satisfaction (family/work balance, job recognition, personal growth and development, wages and benefits, the work itself, relationship with colleagues, workload, management)</p>	<p>Job satisfaction rating scale</p>
<p>Niks (2018)<sup>55</sup> Netherlands</p>	<p>Quasi-experimental study</p> <p>Nursing department, laboratories, emergency department (N = at T1: 60 nurses, CG: 32, IG: 28; N = at T1: 35 laboratory, CG: 18, IG: 17   Age nursing department CG: 34.1 (10.8), age IG: 40.4 (10.2), age laboratory department CG: 45.5 (10.5), age IG: 48.6 (11.4)   Gender nursing department CG: 90.6% female, IG: 92% female, gender laboratory department CG: 73.7% female, IG: 88.2% female</p>	<p>The DIScovery method consisted of three successive steps: (1) psychosocial risk diagnosis; (2) development of interventions; and (3) implementation of the interventions.</p>	<p>No DIScovery method.</p>	<p>Cognitive resources, emotional resources, physical resources, cognitive detachment, emotional detachment, physical detachment, work satisfaction, individual work performance, work performance team, work break conditions, concentration problems, teamwork, work satisfaction</p>	<p>Unknown instrument, visual analog scale, DISC questionnaire, One item: "I am satisfied with my present job"; Rating own work performance and the work performance of their team</p>
<p>Schneider (2019)<sup>66</sup> Germany</p>	<p>Interrupted time series</p> <p>Emergency department physicians, nurses and administrators (N = 41)   Age: NR   Gender: NR</p>	<p>Ten multi-professional meetings in which emergency department physicians and nurses developed solutions to work stressors in a systematic moderated process. Most solutions were consecutively implemented.</p>	<p>Control period with no meetings developing stress solutions.</p>	<p>Work system factors (patient stressors, job control, participation opportunities, work overload, personnel resources, information problems, uncertainty, overtime, social support, supervisor feedback), provider well-being (emotional exhaustion, depersonalization, depressive symptoms, job satisfaction, turnover intentions), quality of care (frequency of errors, patient safety)</p>	<p>Systems engineering initiative for patient safety, Maslach burnout inventory, One-item job satisfaction, Patient health questionnaire, One-item turnover intention, 3-item scale on the frequency of medical errors, One-item "Please rate the degree of patient safety in your department from your point of view"</p>

<p>von Thiele Schwarz (2015)<sup>74</sup> Sweden</p>	<p>Quasi-experimental study</p>	<p>Physicians, nurses, assistant nurses, physiotherapists, managers, medical secretaries (N = 195 (CG: 90, IG: 105))   Age CG: 45 (12.1), age IG: 46.7 (9.2)   Gender CG: 91.2%, gender IG: 96.4</p>	<p>Health protection with a continuous improvement system (Kaizen). The structure consists of regular, short meetings at the unit-level that all employees are to attend, and where work problems are identified, possible solutions discussed, chosen, tested, and evaluated. One to three employees serve as Kaizen representatives at each unit. The meetings are held one to four times a month.</p>	<p>No continuous improvement system (Kaizen).</p>	<p>Workability, productivity, self-rated health, self-rated sickness (frequency, duration)</p>	<p>One-item general health, Health and work questionnaire, One-item work ability index, Self-rated sickness with STEM questionnaire</p>
<p>Management &amp; Building   Environment</p>						
<p>Feeley (2019)<sup>22</sup> Canada</p>	<p>Before/after study</p>	<p>NICU nurses (N = before: 54, after: 54)   Age: 32.94 (9.8)   Gender: 96.3% female</p>	<p>Redesign of the ward to single patient or family rooms and pods. The design is a combination of five 6-bed pods and 10 family rooms. New-borns are admitted to a pod for acute and intermediate care and moved to a family room for step-down care as they near discharge. There are 2 rooms for parents to sleep overnight on a full-size bed, and in the family rooms, a lounge chair can be used for overnight stays. The new unit has new ventilators, monitors, and robotic arms. The lighting is indirect fluorescent, and in all the pods there are large windows with blinds for light control. To communicate, nurses use the telephone, walk, or send a text message. There are also portable phones provided in the case of emergencies.</p>	<p>Previous design of the ward was an open ward with fluorescent lighting and windows on only 1 of the 4 walls. There was 1 room designated for mothers to express breast milk, and a parent room with 1 sofa bed for overnight stays.</p>	<p>Total stress, total obstacles, support from colleagues, support from supervisors, team effectiveness, global work satisfaction, adverse events</p>	<p>Team effectiveness tool, Job content questionnaire, Global measure of work satisfaction, Nurse stress scale, Data on incident reports</p>
<p>Bragard (2013)<sup>37</sup> Belgium</p>	<p>Randomized cross-over trial</p>	<p>Physicians, nurses, psychologists and secretaries of the radiation therapy department (N = 25)   Age: 36.6 (7.7)   Gender: 84% female</p>	<p>The subjects used Luminette light glasses at work in the morning between 7:00 and 9:00 for a maximum of 30 minutes daily at least five days a week.</p>	<p>Not using Luminette.</p>	<p>Depression, sleepiness, general health, physical functioning, pain, emotional wellbeing/problems</p>	<p>Beck depression inventory, Epworth sleepiness scale, Short Form 36 survey</p>

Copeland (2017) <sup>40</sup> USA	Quasi-experimental and before/after study	Acute care unit nurses (N = before: 26, after: 35)   Age before: 24.4 (9.8), age after: 35.7 (10.7)   Gender before: 92% female, gender after: 91% female	Centralized nurses' stations.	Decentralized nurses' stations.	Job satisfaction, patient fall data	Visual analog scale, Electronic patient record data
McNeer (2016) <sup>56</sup> USA	Randomized cross-over trial	Anesthesiologists (N = 20)   Age: NR   Gender: 40% female	The hypothesis that anesthesia residents would perceive greater task load and fatigue while being given simulated lunch breaks in noisy environments was tested.	Quite lunch breaks.	Workload, lack of motivation, physical exertion, physical discomfort, sleepiness	NASA task load index, Swedish occupational fatigue inventory
Simons (2018) <sup>58</sup> Netherlands	Randomized cross-over trial	ICU nurses (N = 10)   Age: 34   Gender 70% female	High-intensity dynamic light. The dynamic lighting application offers bright light intensities (up to 1700 lux, compared with 300 lux in standard settings) and colors according to a fixed rhythm via conventional, ceiling-mounted fluorescent tubes inside patients' rooms.	Standard lighting settings.	Depression, fatigue, quality of life, sleep quality, feeling dull, feeling good, subjective sleep duration, activity, positive thoughts, organization quality	Rating scale diary, Center for epidemiology studies depression scale, Fatigue assessment scale, World health organization quality of life scale
Tseng (2022) <sup>71</sup> Taiwan	Non-randomized controlled trial	Operating room circulating nurses and nurse anesthetists (N = 20 circulating nurses, 16 nurse anesthetists, 18 operations with noise and 18 operations with popular Chinese songs, 17 operations with radio and 17 operations with Mozart)   Age: NR   Gender: NR	Music during operations was tested. The experimental group received next to operating noise three types of music (surgeries with popular Chinese songs, FM radio talk show programs, and Mozart's music). The volume of music was also considered (55-60 dB vs. 75-80 dB, within-subjects).	Operating noise only	Workload, anxiety/emotional states	Subjective workload assessment technique questionnaire, State-trait anxiety inventory-state

Management & Building   Equipment support & patient handling			
Dennerlein (2017) <sup>34</sup>	Controlled before/after study	Registered nurses, licensed practical nurses, clinical nurse specialists and patient care assistants (N = before: hospital A: 580; hospital B 1011, after: hospital A: 499; hospital B: 971)   Age hospital A: 42.7 (0.49), age hospital B: 40.6 (0.43)   Gender hospital A: 93,5% female, gender hospital B: 91,4% female	The safe patient handling and mobilization program. The program included an organizational policy, the investment in equipment, broad-based training, and risk assessments. Additionally, the program included building a hospital-wide infrastructure for maintaining and servicing equipment, providing clean slings, embedding the use of equipment and practices into the care plan for each patient, implementing a mentoring program and utilizing a strong communication program with leaders, workers and clients.
USA			No safe patient handling and mobilization program.
			Any pain, work interference, safe patient handling, unsafe patient handling, safety practices
			Nordic occupational safety climate questionnaire, Question: In general, how much did this pain interfere with your normal work? Three questions asked how often workers 1) transferred patients who could not bear weight without the use of equipment but with the help of a coworker, 2) transferred patients who could not bear weight without the use of equipment or the help of a coworker and 3) who were combative patients.

<p>Risor (2017)<sup>68</sup> Denmark</p>	<p>Controlled before/after study</p>	<p>Nurses, service assistants and therapists (N = CG 2010: 201, CG 2011: 172, IG 2010: 293; IG 2011: 271)   Age CG 2010 (number, %) &lt;24: 4 (2%), 25-34: 85 (42%), 35-44: 48 (24%), 45-54: 31 (15%), 55-70: 28 (14%), unknown: 5 (2%), age CG 2011 (number, %) &lt;24: 9 (5%), 25-34: 69 (40%), 35-44: 36 (21%), 45-54: 31 (17%), 55-70: 20 (12%), unknown: 9 (1%), age IG 2010 (number, %) &lt;24: 10 (3%), 25-34: 128 (44%), 35-44: 53 (18%), 45-54: 64 (22%), 55-70: 34 (12%), unknown: 4 (1%), age IG 2011 (number, %) &lt;24: 15 (6%), 25-34: 117 (43%), 35-44: 51 (19%), 45-54: 58 (21%), 55-70: 25 (9%), unknown: 5 (2%)   Gender CG 2010: 95% female, gender CG 2011: 93% female, gender IG 2010: 92% female, gender IG 2011: 92% female</p>	<p>Patient-handling equipment intervention. (1) Developing and sharing patient-handling guidelines to clarify responsibilities among staff groups and ensure proper use of equipment. (2) Establishing guidelines for purchasing new equipment, with a focus on reducing high physical workloads like manual patient lifting; (3) Allocating funds to purchase new patient-handling equipment at a rate of ¥13,300 per bed-ward; (4) Implementing a comprehensive training program for nursing staff in intervention bed-wards, including local instructors, manager training, and full-day training for other staff. New nursing staff received two-day training covering the use of patient-handling equipment (5) Weekly visits from the project manager to provide support and guidance to local instructors, managers, and nursing staff as needed.</p>	<p>No intervention.</p>	<p>Lower back problems, lower back medical support, absent due to lower back problems, neck and shoulder problems, neck and shoulder medical support, absent due to neck and shoulder problems, knee problems, knee medical support, absent due to knee problems, hand/wrist problems, hand/wrist medical support, absent due to hand/wrist problems, aggression (experienced) physically aggressive episodes, average number of physically aggressive episodes, experienced mentally aggressive episodes, average number of mentally aggressive episodes), staff with good or better health, number of accidents, number of accidents low-back</p>	<p>Respondents were asked if they had experienced physically or mentally aggressive episodes within the last 12 months, and if so, how many episodes. Respondents were asked about how many days they had experienced pain or disorder within the last 12 months. Respondents were asked if they had experienced a work-related accident within the last 12 months. Short-form health survey,</p>
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Li (2021) <sup>69</sup> China	Controlled before/after study	Nurses (N = CG: 10, IG: 10)   Age: NR   Gender: NR	Standardized exercise plan for total knee arthroplasty patients which was showed through a 3-minute video and a bedside interactive system for playing the video.	Patients received oral education, exercise demonstrations via a bedside interactive system, and quizzes to assess their understanding of the exercise plan, with additional tutorials as necessary.	Burnout (emotional exhaustion, depersonalization, reduced personal accomplishment), job stress	Nurses job stressors scale, Maslach burnout scale
Management & Building   Workflow improvement						
Thanarajasingam (2012) <sup>70</sup> USA	Interrupted time series	Internal medicine physicians (N = 280, 15,926 patients on resident and nonresident services)   Age: NR   Gender: NR	A census cap implementation, which meant setting a maximum number of patients that could be cared for on each of the 6 departments. Additionally, a unit-based admission process was developed, where patients and their care teams of physicians were geographically grouped together on one hospital unit. This meant that each physician was assigned to oversee a specific hospital unit, and patients assigned to these units were placed in rooms on the corresponding unit. This arrangement brought together physicians, supervising physicians, nurses, healthcare professionals, and patients from a particular hospital unit all in the same location.	No consensus limit and no unit-based admission process	Census/caseload was appropriate, opportunity to manage diverse pathology, opportunity and guidance to develop skills, patient safety (rapid response team events, cardiopulmonary resuscitation events, intensive care unit transfers, patient safety indicators, readmission within 30 days)	Self-divised, Unknown instrument
Hess (2015) <sup>45</sup> Switzerland	Before/after study	Emergency department physicians, general practitioners and nurses (N = before: 20, interim: 18, after: 22 participants)   Age: 36.3 (8.3)   Gender: 84.2% female	Implementation of a hospital-based primary care center, involving patient flow process redesign and formal integration of services for general practitioners. They can choose to work in the new center or the city's traditional out-of-hours service. Patients at the hospital are triaged by a nurse, assessed on the Emergency Severity Index (1 for life-threatening, 5 for least severe), and directed to either the primary care center as a "fast track" or the conventional emergency department.	Before the intervention, all emergency patients were treated in the traditional emergency department.	Overall job satisfaction	Visual analog scale

Management & Building   Care model	
Hansson (2020) <sup>80</sup> Sweden	<p>Before/after study</p> <p>Midwives (N = before: 58, after: 58)   Age: mean 44 (range 27-65)   Gender: NR</p> <p>Midwifery model of care. The model includes among other things: midwife is together with the woman, using grounded knowledge, forming a reciprocal relationship to create a birthing atmosphere, women are centered.</p> <p>No midwifery model of care.</p> <p>Social support, work ability (knowledge, mental, emotional, collaborate, physical), worrying about reorganization, technology, worrying about manage at work, worrying about get unemployed, worrying about bullying, worrying to sex harassment, climate (boss consider your opinions, conflict involvement, uneasiness going to work), stress</p> <p>Burnout (personal, work related, client-related), demand, control, work environment (engagement, high demands on oneself, hard to say no, responsibility), sense of coherence</p> <p>5-item job demands scale, 6-item job control scale, Karasek scale, Work stress questionnaire, Copenhagen Perceived stress scale, Unknown instrument</p>

		Social resources & support   Emotional support	
Liu (2022) <sup>51</sup>	Emergency department nurses (N = 50)   Age: 25-75 (2.64)   Gender: 92% female	The rational emotional intervention, integrated with hierarchical management, involved weekly one-hour sessions. During the psychological diagnosis stage, nurses were engaged in open communication to uncover the causes of their nervousness, anxiety, and stress in a calm environment. Emotional expressions were observed to identify reasons for their psychological distress. Hierarchical management involved mutual support and education.	No intervention.
China			Anxiety, depression, work stress ( nursing profession/work score, time allocation/workload, working environment/ equipment, patient nursing score, management/ interpersonal), stress response (solve the problem, self-blame, ask for help, fantasize, retreat, rationalize), burnout, sleepiness
Goktas (2022) <sup>45</sup>	Emergency department nurses (N = 60 (CG: 30, IG: 30))   Age CG: 28,70 (6,95), age IG: 29,86 (7,56)   Gender CG: 43,3% female, gender IG: 53,5% female	Motivational messages sent to nurses during Covid-19 pandemic.	Job satisfaction, compassion fatigue, Secondary trauma, occupational burnout
Turkey			Compassion fatigue scale, Job satisfaction scale
Hata (2022) <sup>44</sup>	Physicians, nurse practitioners, and certified nurse midwives (N = 23 (CG:10, IG: 13))   Age: NR   Gender CG 91% female, gender IG 100% female	Monthly self-facilitated group meetings with structured discussion guide.	High depersonalization, high emotional exhaustion, overall high burnout, engagement, continuous burnout, empowerment at work, reaction to uncertainty, feel that department is committed to faculty wellbeing, feel sense of connection and community at work
USA			Unknown instrument, physicians reaction to uncertainty scale, Maslach burnout inventory, Utrecht work engagement scale
Kose (2022) <sup>47</sup>	ICU nurses (N = 87 (CG: 46, IG: 41))   Age CG: 26.9 (3.7), age IG: 28.4 (7.6)   Gender CG: 73.9% female, gender IG: 80.5% female	Nurses had 5-10 minute breaks approved by the head nurse upon receiving message alerts. Motivational messages were sent to the nurses' mobile phones at 09:00 AM, 12:00 PM, 05:00 PM, and 07:00 PM daily for 21 days in the motivational group.	No intervention.
Turkey			Hopelessness, satisfaction with life, life orientation
			Beck hopelessness scale, Life orientation test, Satisfaction with life scale

	Before/after study	Neurology physicians (N = before: 21, after: 25)   Age: NR   Gender: NR	Resident Wellness Committee. The Committee was led by resident and staff neurologist co-chairs and had as its vision to promote well-being through initiatives centered in work-life integration, emotional and physical well-being, and social engagement.	No resident Wellness Committee	Overall wellness	Self-devised
Ramanan (2020) <sup>62</sup> USA	Randomized controlled trial	ICU nurses (N = 83 (CG: 42, IG: 41)   Age <40 CG: 72%, age <40 IG: 69%   Gender CG: 80% female, gender IG: 78% female	Initially, psychological support involved sessions led by two psychologists using a systemic approach, with caregivers discussing their problems. The study was meant to last 9 months, with groups of 5 to 6 caregivers attending monthly sessions with psychologists at their convenience. However, within the first 3 months, it became clear that this approach didn't work in the ICU context due to caregivers' work constraints and preferences. The methodology was then adjusted, and sessions took place during individual working hours from July 2009 to March 2010.	No psychological support sessions.	Burnout, hospital anxiety, hospital depression	Hospital anxiety and depression scale, Maslach burnout inventory
Ricou (2020) <sup>60</sup> Switzerland	Randomized controlled trial	Physicians (N = 424 (CG: 37, IG: 37, non-study cohort: 350))   Age: NR   Gender CG: 35.1% female, gender IG: 32.4% female	The intervention involved 19 biweekly physician discussion groups over 9 months, focusing on mindfulness, reflection, shared experiences, and small-group learning. Participants in the intervention arm received protected time (1 hour of paid time every other week). These discussion groups, consisting of 8-10 physicians with similar compositions by sex and specialty, covered topics such as self-patient, and balance. Each session included check-in, preparation, facilitated discussion, skill learning, and summary components.	Both trial arms received 1 hour of protected time. In the control arm, participants could schedule and use this hour as they saw fit, without participating in discussion groups.	Engagement in work, overall burnout, stress, depression, overall quality of life, job satisfaction	Maslach burnout inventory, Perceived stress scale, Physician job satisfaction scale, Positive depression screen, Visual analog scale, Empowerment at work scale

		Social resources & support   (Additional) staff support	
Bakhru (2019) <sup>36</sup> USA	Randomized observation study	ICU fellows and faculty (N = 33 (13 fellows, 20 faculty))   Age: faculty median: 38.5 (range 36.5-14), fellow median: 32 (range 30-33)   Gender: faculty 30% female, fellows 61,5% female	<p>Nighttime staffing model. In the intervention, there were in-hospital residents with an in-hospital nighttime intensivist.</p> <p>During the standard staffing model, there were in-hospital residents, with a fellow and faculty member available at nighttime by phone.</p> <p>Falling asleep, trouble overnight being awaked and unable to fall asleep, waking up, quality of sleep last night, current feeling in AM, KSS sleepiness, alertness, stress, happiness, sickness, physical exhaustion, mental exhaustion</p> <p>Visual analog scale, Pittsburgh sleep quality index</p>
Clubbs (2019) <sup>39</sup> USA	Quasi-experimental and before/after study	NICU nurses (N = before: 25, after: 32)   Age: NR   Gender: NR	<p>A volunteer-based developmental care partner program, to ensure infants received sensory exposures necessary for optimal brain development, was implemented from November 2014 to October 2015. Volunteers were students and faculty. Partners committed to volunteering at least once a week and completing 50 contact hours within the calendar year.</p> <p>No volunteers/informal cuddlers.</p> <p>Burnout (emotional exhaustion, personal accomplishment, depersonalization), infections infants (relative risk, absolute risk difference, preventive fractions, number needed to treat, exposed cases impact number, incident rates</p> <p>Maslach burnout inventory, electronic patient record data</p>
Zhu (2020) <sup>38</sup> USA	Before/after study	Acute care unit nurses and residents (N = before: 121 nurses; 6 residents, after: 155 nurses; 40 residents)   Age: NR   Gender: NR	<p>The nightly huddle included: 1) a regular face-to-face meeting between the night float resident and the unit charge nurse to discuss patients with clinical concerns and ensure clear communication of action items and contingency plans; 2) bedside evaluations of patients based on reported concerns by any team member; and 3) resident review of a unit-wide list of non-urgent nursing requests using a standardized checklist to ensure consistent addressing of these components.</p> <p>No nightly huddle</p> <p>Quality of teamwork, communication, staff ever failed to notify you regarding important pt care info, understanding of patients plan, rating of timeliness in resident response</p> <p>Self-devised</p>

		Social resources & support   Optimizing teams			
Ahn (2021) <sup>34</sup> South Korea	Quasi-experimental study	Perioperative nurses (N = 60 (CG: 32, IG: 28))   Age: 28,25 (4,48)   Gender: 96,7% female	Teamwork Improvement Program (TIP), 4 sessions (60-min) and a web-based learning, 4-5 nurses per team. Team activities: teamwork games, discussions, simulations. Modules part of the sessions: introduction, team structure, communication, leadership, situation monitoring, mutual support, summary.	Control group receives no intervention.	Teamwork competencies (knowledge, attitudes, communication self-efficacy, skills and behavior, experience of surgical nursing errors  Learning benchmarks, Teamwork attitudes questionnaire, Teamwork perceptions questionnaire, Unknown survey
Amiri (2018) <sup>35</sup> Iran	Randomized controlled trial	ICU nurses and supervisors (N = 61 (CG: 31, IG: 30))   Age: 33,46 (7,91)   Gender: 86,9% female	Educational empowerment program. 2-day workshop (8h). Hanging posters geared towards patient safety, patient safety culture, speaking out in situations of threat to patient safety and skills of the Team Strategies and Tools to Enhance Performance and Patient Safety, including communication, leadership, mutual support, situational monitoring skills.	Control group receives no intervention.	Teamwork within units, manager expectations and actions promoting patient safety, organizational learning and continuous improvement, management support for patient safety, overall perception of patient safety, feedback and communication on errors, openness, frequency of events reported, teamwork across hospital units, staffing, handoffs and transitions, Non-punitive response to errors, total scores of patient safety culture, safety score

Gausvik (2015) <sup>41</sup>	Non-randomized controlled trial	Nurses, social workers, physical and occupational therapists and patient care assistants (N = 62 (CG:38, IG: 24))   Age: NR   Gender: NR	Structured interdisciplinary bedside rounds on an acute care for the elderly unit.	The control group units utilized traditional physician-centric rounding.	Teamwork, understanding of plan, addresses fears/worries, team communication, family communication, efficiency, safety, job satisfaction	Self-devised
Personal development & recovery   Role opportunities						
Keenan (2018) <sup>46</sup>	Before/after study	Neurosurgery nurses (N = before: 31, after: 41)   Age: NR   Gender: NR	Implementing the advanced practice nurse role. Two nurse practitioners were chosen for new advanced practice nurse positions with clinical responsibilities. They performed health assessments, ordered tests, medications (excluding benzodiazepines and opioids), and discharged patients. They collaborated with neurosurgery residents daily, participated in decision-making, consulted other medical services, and led family meetings and discharge planning. The APNs maintained open communication with the healthcare team, focusing 80% on clinical and consulting work and evenly dividing the remaining 20% among education, research, and leadership.	No advanced practice nurse positions.	Communication, learning opportunities	Self-devised
Canada						
Shamsi (2016) <sup>47</sup>	Quasi-experimental and before/after study	Emergency department nurses (N = 35)   Age: 31.63 (7.7)   Gender: 31.4% female	The "Stabilization care delivery model" is a dynamic process initiated upon a patient's admission to the emergency department and continues until their condition stabilizes. The process starts with patients categorized into five groups based on their problems, followed by nurses being classified into five groups based on their specialties and interests.	No stabilization model.	Length of stay, job satisfaction	Mohr man-Cooke-Mohr man job satisfaction scale, length of stay with a chronometer
Iran						

Personal development & recovery   Relax opportunities						
	Before/after study	Nurses (N = 109)   Age: 39.0 (9.1)   Gender: 100% female	Scheduled 30-min nap during an 8-hr night shift (23:00–7:00).	No powernap.	Subjective sleepiness	Karolinska sleepiness scale
Zion (2019) <sup>79</sup> Israel	Non-randomized cross-over trial	Otolaryngology physicians (N = 19)   Age: NR   Gender: 47% female	Participants were allocated 2 hours per week of protected nonclinical time. This time could be used for work-related administrative tasks or personal health and well-being activities that required normal business hours.	No 2 hours per week of protected time.	Burnout (emotional exhaustion, depersonalization, personal accomplishment), wellbeing, quality of life, job satisfaction, job stress, burnout, control over workload, sufficient time for documentation, time spent at home on EMR	Mini-Z survey, Maslach burnout inventory, One-item quality of life, Well-being index
Stevens (2020) <sup>80</sup> USA						



Personal development & recovery   Other team/setting opportunities		
Zhong (2022) <sup>7</sup> China	<p>Non-randomized controlled trial</p> <p>Operating room nurses (N = 5371 (CG: 2474, IG: 2891))   Age: NR   Gender: NR</p> <p>Fixed nurse teams are defined as operating room nurse teams within a surgical subdiscipline that work together for an extended duration, typically at least one year.</p> <p>Non fixed nursing teams.</p>	<p>Quality (surgical patient assessment rate, surgery location mark assessment rate, allergy history assessment rate, rate of assessing antibiotics use 60 minutes before incision, sterilization indicator results assessment rate, surgical equipment and surgical materials availability rate, surgery name confirmation rate, surgical tools inventory rate, surgical specimen checking rate, postoperative surgical equipment inspection rate, patient acute pressure ulcer rate during surgery, rate of leaving surgical foreign objects behind, rate of perioperative drug use, transfusion reaction rate during the surgical period, unplanned extubation rate, incidence of needle punctures among medical personnel, incidence of surgical patients falling or falling out of bed, incidence of electrical burns, incidence of surgical site infections), job satisfaction</p> <p>Rating scale, Unknown instrument</p>

<p>Byrne (2020)<sup>38</sup> Australia</p>	<p>Non-randomized controlled trial</p> <p>Nurses and midwives (N = 54 (CG: 29, IG: 24))   Age: NR   Gender: NR</p> <p>Exchange program, matching a rural/remote nurse or midwife with a metropolitan/regional nurse or midwife. A professional job swap was facilitated. Candidates could choose to exchange over three or six months.</p> <p>No exchange program.</p> <p>Job Satisfaction, turnover intention, occupation attrition, burnout, global health, leadership, network adequacy, community fit, community sacrifice, organizational fit, organizational sacrifice</p> <p>Rating scale, General health questionnaire, Burnout measure—short version, job embeddedness measure, Turnover intention scale</p>
<p>Multi-categorical</p>	
<p>Petrie (2022)<sup>39</sup> Australia</p>	<p>Before/after study</p> <p>Physicians (N = before: 279, after: 344)   Age before: 21-30: 46.2%, 31-40: 29.5%, 41-50: 11.4%, 51-60: 8.9%, &gt;61: 4% vs. 5% age after: 21-30: 44.1%, 31-40: 26.7%, 41-50: 14%, 51-60: 10.2%, &gt;61: 5%   Gender before: 47.2% female, gender after: 46.6% female</p> <p>Multi-modal intervention consisted of nine strategies: (1) Employing 1 additional full-time junior doctor to reduce unrostered overtime; (2) Establishing the Doctors Wellness Committee with 5 meetings per year; (3) Improving the process for claiming unrostered overtime by removing pre-approval requirements, streamlining the online claiming process, and increasing staff awareness through communication and promotion; (4) Conducting the Doctors Wellness Survey in 2017; (5) Organizing the Doctors Wellness Forum in 2017 to discuss survey results; one-time event with optional attendance by over 100 doctors; (6) Presenting mental health and grand rounds throughout the year, with mandatory attendance at grand rounds by over 100 doctors; (7) Offering a 3-hour mental health training course for staff involved in training and supervision, with optional participation by 50 staff; (8) Providing a 2-hour mental health awareness/resilience training session for doctors-in-training, which is mandatory; (9) Implementing mentoring programs, including an informal peer support 'buddy' program for interns lasting at least one term, with optional participation.</p> <p>Control period without multi-modal intervention</p> <p>Overall job satisfaction, work-related stressors, work-life balance, workplace support, workload, workplace bullying and harassment, psychological distress, suicidal ideation</p> <p>Medicine in Australia: Balancing employment and life, self-divysed, Kessler psychological distress scale</p>

Notes NR: not reported; IG: intervention group; CG: control group; ICU: intensive care unit



Table 2 effect direction table

	Intervention	Healthcare professional <sup>a</sup>	Job Demands	Wellbeing										Outcome			Quality & safety of care		
			Workload	Anxiety	Burnout	Depression	General Health	Job satisfaction	Lack of energy	Physical discomfort	Quality of life	Sleep	Stress	Empowerment	Engagement	Turnover	Patient quality	Patient safety	Unwanted
Management & building	Intervention category: Workhours																		
	EU working time directive <sup>11</sup>	D			▲					▲					▼				
	2011 duty hour regulations <sup>11</sup>	D			▲					▲									
	Participatory working scheduling <sup>12</sup>	N/O												▲			▼	▼	
	8.5-hour shifts <sup>13</sup>	N								▲				▲					
	12-hour shifts <sup>14</sup>	N												▲					
	Casino shifts <sup>15</sup>	D												▲					
	4-week rotations <sup>16</sup>	D												▲					
	2011 duty hour regulations <sup>17</sup>	D												▲				▲	
	2011 duty hour regulations <sup>18</sup>	D												▲					
	16-hour overnight shifts <sup>19</sup>	D												▲					
	12-hour shifts <sup>20</sup>	N/O												▲				▲	
	Intervention category: Continuous improvement																		
	Participatory action planning <sup>24</sup>	N		▲															
	PDSA-cycle management <sup>24</sup>	N																	
	PDSA-cycle management <sup>27</sup>	N																	
	DIScovery method <sup>23</sup>	N/O																	
	Moderated solution meetings <sup>24</sup>	N/D/O	—			▼	▼								▼			▼	▼
	Kaizen continuous improvement <sup>24</sup>	N/D/O													▼				
	Intervention category: Environment																		
Single patient/family rooms/pods <sup>41</sup>	N													▼				▲	
Luminette light glasses <sup>27</sup>	N/D/O																	▲	
Centralized nurses' stations <sup>40</sup>	N																	▲	
Breaks in noisy environments <sup>46</sup>	D	◀												▼					
High-intensity dynamic light <sup>48</sup>	N													▼					
Music during operations <sup>73</sup>	N	★																	
Intervention category: Equipment support & patient handling																			
Patient handling and mobilization <sup>71</sup>	N/O																		
Patient handling equipment <sup>71</sup>	N/O	—																▲	
3-minute video to patients <sup>78</sup>	N																	▼	
Intervention category: Workflow improvement																			
Consensus limit admission <sup>76</sup>	D																	▲	
Hospital-based primary care center <sup>76</sup>	N/D																	▲	
Intervention category: Care model																			
Midwifery model <sup>60</sup>	O	▼												★	★	★			
Intervention category: Emotional support																			
Rational emotional intervention <sup>42</sup>	N	◀																	
Motivational messages <sup>43</sup>	N																		
Meetings with discussion guide <sup>44</sup>	N/D/O																		
Motivational messages <sup>47</sup>	N																		
Wellness committee <sup>43</sup>	D																		
Psychological support sessions <sup>48</sup>	N																		
Protected time/discussion groups <sup>73</sup>	D																		
Intervention category: (Additional) staff support																			
In-hospital nighttime intensivist <sup>59</sup>	D																		
Volunteer/informal cuddlers <sup>59</sup>	N																		
Nightly huddle to discuss patients <sup>59</sup>	N/D																		
Intervention category: Optimizing teams																			
Teamwork improvement program <sup>34</sup>	N																		
Educational empowerment program <sup>33</sup>	N																		
Interdisciplinary bedside rounds <sup>41</sup>	N/O																		
Intervention category: Role opportunities																			
Advanced practice nurse role <sup>46</sup>	N																		
Stabilization care delivery model <sup>47</sup>	N																		
Intervention category: Relax opportunities																			
30-min nap during nightshift <sup>79</sup>	N																		
Protected non-clinical time <sup>79</sup>	D																		
Intervention category: Other team/setting opportunities																			
Facel nurse teams <sup>77</sup>	N																		
Exchange program <sup>38</sup>	N/O																		
Intervention category: Multi-categorical																			
Nine strategies changing workplace <sup>28</sup>	D																		

Notes: ▲ = significant intervention directed; △ = insignificant intervention directed; ▲ = significance unknown, intervention directed; ▼ = significant control directed; ▽ = insignificant control directed; ▽ = significance unknown, control directed; ★ = unclear; — = no change; ◀▶ = inconsistency in outcomes; Sample size = > 100; Sample size > 50; Sample size < 50;

<sup>a</sup> = N is based on amount of measurements instead of sample size; + = N= nurses, D= doctors, O= other healthcare professionals

## DISCUSSION

This systematic review lays the groundwork for evidence-based decisions regarding organization-directed interventions on HCPs' well-being, work environment, retention,

and quality of care. Our research highlights the focus on HCP well-being in recent years. However, we noted a wide variety of described interventions targeting numerous outcomes using diverse instruments. When synthesizing these interventions, some show improvements in well-being, while others may be detrimental.<sup>66</sup> Certain interventions might be effective in one aspect of well-being but have negative effects on another, complicating intervention selection. Therefore, careful consideration of multiple factors is crucial for making effective decisions.

Interventions focusing on *social resource & support* showed the most consistent significant improvements over a variety of outcome categories based on the effect direction Table (e.g., rational emotional intervention). This result may be related to the fact that these interventions align with HCP' needs (recognizing, personal attention and support), making them practical and adaptable to local contexts, which are features of ideal workplace interventions within healthcare organizations.<sup>82</sup> Understanding target groups, their fears, preferences and fulfilling their needs are key issues in intervention development.<sup>83,84</sup>

*Personal development & recovery* interventions showed mixed results: 'role opportunities' were effective, while 'relax opportunities' and 'other team/setting opportunities' were less so. Apart from one study, sample sizes, study designs, settings, and HCPs were similar. Inconsistencies in effects may stem from manual intervention categorization. Interventions like the stabilization care model,<sup>67</sup> advanced practice nurses,<sup>46</sup> and nightly 30-minute naps<sup>79</sup> have shown favorable effects on job satisfaction, quality of care, and reducing unwanted events. In contrast, interventions such as protected nonclinical time,<sup>69</sup> and exchange programs<sup>38</sup> showed no significant effects or lacked sufficient information to judge their effectiveness. The midwifery model showed unclear effects, sometimes favoring the control group. Further research is needed to explore underlying mechanisms to understand and explain when and why interventions work or not. Inconsistencies may arise from interventions not effectively addressing underlying problems.<sup>83</sup>

Within the intervention types *Management & building*, the category 'workhours' showed also mixed results, however this explanation differs. Within this example mixed results appear possibly due to variety in the comparator interventions. Two studies, e.g., compare 8-hour and 12-hour shifts.<sup>65,75</sup> One study described 12-hour shifts as the intervention, while another describes 12-hour shifts as the control, demonstrating local context is essential to consider. Starting from a different baseline impacts results significantly. Both studies show positive effects for 12-hour shifts. Inconsistency might also be due to group sizes and study quality. Interventions, e.g., in the 'emotional support' category, high bias or small samples led to less significant results.

We found fourteen interventions evaluated solely among doctors and 21 among nurses.

Unlike nurses, no interventions for doctors targeted equipment support & patient handling, optimizing teams, or role/setting opportunities. Unlike doctors, no interventions for nurses targeted on a multi-categorical intervention.

### **Practical implications**

Examples of effective interventions include Bragard's study<sup>37</sup> on Luminette light glasses, which improved general health, energy, physical discomfort, and employability. Liu's hierarchical management sessions<sup>51</sup> enhanced coping, anxiety, burnout, depression, and energy. Goktas' motivational messages<sup>43</sup> reduced burnout, stress, and increased job satisfaction. Hata's monthly group meetings<sup>44</sup> improved team climate, burnout, and engagement. Bakhru's nighttime intensivists<sup>36</sup> improved concentration, energy, and sleep. Gausvik's interdisciplinary bedrounds<sup>41</sup> enhanced communication, team climate, efficiency, job satisfaction, and patient safety. Petrie's multi-model intervention<sup>59</sup> improved misconduct, workload, support, and job satisfaction.

Besides adherence and implementation success, when healthcare leaders and/or organizations aim to improve HCP' well-being by selecting the most appropriate evidence-based interventions, it is important to consider how data on their well-being have been captured. For example, when the burnout rate was obtained through the human resource department, then the burnout rate is valid. However, if the rate was collected from a well-being survey, the response rate might introduce bias, as only a selective group may have participated, possibly skewing results toward those with burnout issues. Organization-directed interventions could benefit survey respondents but might not help, or could harm, non-respondents who may not have burnout issues.

Understanding outcome's cause is crucial, as it may be work-related or non-work related. In some populations, non-work-related burnout may be more prevalent.<sup>85</sup> Organization-directed interventions, e.g., targeting work-related burnout (e.g., adjusting work hours) might be ineffective if burnout is non-work-related. However, interventions for non-work-related issues (e.g., free counseling) could help. Population characteristics, such as gender distribution and job roles (nurses vs. doctors), also influence intervention effectiveness. This variability contributes to observed heterogeneity in interventions and outcomes. The direction Table is split out for nurses and doctors in additional files 5 and 6.

Providing straightforward recommendations for selecting right interventions is challenging. The selection process starts with an in-detail analysis of the root causes of the problem and a needs assessment of the HCP's. If the intended outcome is clear, Table 2 can help determine possibly fitting interventions. Within this process, organizations must carefully consider potential positive and negative effects. Interventions, e.g., 12 vs. 8-hour work shifts, video versus nurse education, and volunteer-based programs, showed significant positive effects on

burnout (Table 2) but may decrease employability. Thus, “if it does not help, it does not hurt” does not apply. Table 2 helps weigh potential effects but also highlights gaps in information on essential outcomes (empty cells), complicating decision-making. Furthermore, it is evident that selecting the right intervention needs to be followed by implementation, adaptation, and evaluation to reach maximal impact and quality improvement.<sup>86</sup>

To make better informed decisions with more certainty and less data heterogeneity, consensus on aspects of HCP’ well-being and their measurement is needed. Some interventions reported only positive outcomes, yet many well-being outcomes were unassessed (as shown by empty cells in Table 2). For effective decision-making, information on potential negative impacts is crucial. Developing a core outcome set reflecting positive and negative effects of interventions on well-being is essential.

### **Strengths and limitations**

This review highlights the importance and effectiveness of organization-directed interventions. It emphasizes organization-directed over individual-directed interventions and includes a wide range of outcomes. Meta-analyses were conducted where feasible, with effect-direction Tables for other results to maximize data utilization. Moreover, the study followed the registered protocol, using pre-established criteria ensuring systematic conduct. Categories were determined inductively instead of using the predetermined non-supportive types.

This study also holds some limitations. First, data screening and extraction by different researchers may introduce interpretation variations, despite calibration attempts. However, the procedure we followed with the high number articles identified was unavoidable. We trust that this has not led to large differences in selection and interpretation of studies, given the iterative discussions the author team had in the course of the execution of the study. Second, diverse reporting of outcomes and effects led to subjective interpretations, with doubtful cases excluded from meta-analysis. Third, the meta-analyses included heterogeneous data, complicating analyses and conclusions. Meta-analysis was only performed with at least five studies, categorized by intervention type.<sup>87</sup>

Future research should identify relevant situations and objectives for interventions, evaluate multi-type intervention bundles with larger sample sizes, and tailor them to local contexts. Sharing and understanding intervention effects is crucial to ensure they benefit or at least do not harm HCP well-being.

### **Conclusion**

This review provides essential guidance for selecting organization-directed interventions aimed at well-being, work environment, retention, and quality of care. Meticulous implementation

and evaluation are crucial. Interventions focused on *social resource & support* are likely to be most effective (e.g., for burnout and engagement). Ultimately, no single intervention can be universally recommended, as decisions must be context dependent. Factors such as data origins, underlying causes, and population characteristics play a significant role. This review supports more evidence based decision-making by allowing healthcare leaders and organizations to weigh potential effects using our reported findings. It is important to point out that selection of the most appropriate intervention is only feasible after identification the exact cause of reduced well-being in a team, department, or organization. While this review enhances evidence-based decisions and guidance for developing interventions, it also emphasizes that a one-size-fits-all approach is not feasible. Interventions may have both positive and negative impacts on various aspects of HCPs' well-being.

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## Additional files

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## Additional file 1: search strategy

#	Searches MEDLINE	Results
1	("Healthcare professionals" or "Healthcare providers" or Practitioners or Doctor or nurse* or nursing or physician? or resident? or "healthcare worker" or "health staff").ti. or exp *"physicians"/ or exp *"Medical staff"/ or *"Residents"/ or exp *"Nurses"/ or exp *"Nursing Staff"/	604063
2	exp Hospitals/	310449
3	(inpatient* or hospital* or department* or ward or ICU or ((healthcare or health-care) adj cent*)).ti,ab,kf.	1906733
4	2 or 3	2001371
5	Personnel Turnover/	5826
6	((((job or work) adj3 (satisfaction or culture or environment)) or work-load or workload or (sick adj2 leave) or absenteeism or presenteeism or ((turnover or leave) adj3 intention) or ((Employee or Personnel) adj3 (Turnover* or Retention*))).ti,ab,kf.	74773
7	exp Job Satisfaction/	28062
8	exp Organizational Culture/	18866
9	exp Workload/	23641
10	exp Absenteeism/	9713
11	exp Presenteeism/	561
12	exp Burnout, Psychological/ or exp Personal Satisfaction/ or (((work or job) adj3 satisfaction) or workload or well-being or fulfilment or burnout or thriving).ti,ab,kf.	187842
13	Work-Life Balance/	1010
14	exp Sick Leave/	6644
15	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	269119
16	1 and 4 and 15	14934
17	exp Controlled Before-After Studies/	707
18	exp Interrupted Time Series Analysis/	1730
19	exp Randomized Controlled Trial/	583524
20	exp Cluster Analysis/	71819
21	exp Comparative Study/	1911827
22	((control* adj2 before) or CBA or (interrupted adj2 time-ser*) or (cluster adj2 (random* or RCT))).ti,ab,kf. or comparative.ti.	232563
23	17 or 18 or 19 or 20 or 21 or 22	2526482
24	16 and 23	1138
25	limit 24 to yr="2012 -Current"	500
	Total	733

#	Searches Embase	Results
#14	#13 AND (2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py)	1382
#13	#12 AND [embase]/lim NOT 'conference abstract'/it	1866
#12	#8 AND #11	3458
#11	#9 OR #10	10643505
#10	'controlled study'/exp OR 'randomized controlled trial'/exp OR 'cluster analysis'/exp OR 'comparative study'/exp	10532428
#9	((control* NEAR/2 before):ti,ab,kw) OR cba:ti,ab,kw OR ((interrupted NEAR/2 'time ser*'):ti,ab,kw) OR ((cluster NEAR/2 (random* OR rct)):ti,ab,kw) OR comparative:ti	287378
#8	#3 AND #4 AND #7	16256
#7	#5 OR #6	315714
#6	'job satisfaction'/exp OR 'organizational culture'/exp OR 'workload'/exp OR 'absenteeism'/exp OR 'presenteeism'/exp OR 'burnout'/exp OR 'life satisfaction'/exp OR 'work-life balance'/exp OR 'medical leave'/exp	145164
#5	((((job OR work) NEAR/3 (satisfaction OR culture OR environment)):ti,ab,kw) OR 'work load':ti,ab,kw OR workload:ti,ab,kw OR ((sick NEAR/2 leave):ti,ab,kw) OR absenteeism:ti,ab,kw OR presenteeism:ti,ab,kw OR (((turnover OR leave) NEAR/3 intention):ti,ab,kw) OR (((employee OR personnel) NEAR/3 (turnover* OR retention*)):ti,ab,kw) OR (((work OR job) NEAR/3 satisfaction):ti,ab,kw) OR 'well being':ti,ab,kw OR fulfilment:ti,ab,kw OR burnout:ti,ab,kw OR thriving:ti,ab,kw	246825
#4	'hospital'/exp OR inpatient*:ti,ab,kw OR hospital*:ti,ab,kw OR department*:ti,ab,kw OR ward:ti,ab,kw OR icu:ti,ab,kw OR ((healthcare NEAR/1 cent*):ti,ab,kw) OR (('health care' NEAR/1 cent*):ti,ab,kw)	3460508
#3	#1 OR #2	650695
#2	'health care personnel'/mj OR 'medical personnel'/mj OR 'nurse'/mj OR 'nursing staff'/mj	137726
#1	'healthcare professional*':ti OR 'healthcare provider*':ti OR practitioner*:ti OR doctor*:ti OR nurse*:ti OR nursing:ti OR physician*:ti OR resident*:ti OR 'healthcare work*':ti OR 'health staff':ti	583435
	Total	1382

#	Searches Cinahl	Results
S25	S9 AND S16 AND S22 AND S23 (Limiters - Exclude MEDLINE records)	1,329
S24	S9 AND S16 AND S22 AND S23	2,29
S23	S17 OR S18 OR S19 OR S20 OR S21	464,47
S22	S1 OR S2 OR S3 OR S4	421,434
S21	TI(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)	145,799
S20	AB(satisfaction or well-being or fulfilment or burnout or ((psychological or mental) N1 health) or thriving or environment or ethic*)	365,66
S19	(MH "Mental Health")	44,106
S18	(MH "Job Satisfaction") OR (MH "Personal Satisfaction")	35,259
S17	(MH "Burnout, Professional")	12,506
S16	S11 OR S12 OR S13 OR S14 OR S15	502,496
S15	TI(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)	80,499
S14	AB(valid* or (cronbach* N3 (alpha or alphas)) or interrater or inter-rater or intrarater or intra-rater or intertester or inter-tester or intratester or intra-tester or interobserver or inter-observer or intraobserver or intraobserver or interexaminer or inter-examiner or intraexaminer or intra-examiner or interindividual or inter-individual or intraindividual or intra-individual or kappa or kappa?s or kappas or ((replicab* or repeated) and (measure or measures or findings or result or results or test or tests)) or concordance or (intraclass and correlation*) or (uncertainty and (measurement or measuring)) or "standard error of measurement" or sensitiv*)	417,988
S13	(MH "Kappa Statistic")	17,505
S12	(MH "Reproducibility of Results")	67,821
S11	(MH "Interrater Reliability")	27,493
S10	S1 OR S2 OR S3 OR S4 OR S5	820,33
S9	S6 OR S7 OR S8	753,761
S8	TI(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))	124,83
S7	AB(clinimetr* or clinometr* or psychometr* or survey? or score or scale or subscale or (measurement N3 instrument) or subscale* or item-discriminant or interscale correlation* or "ceiling effect" or "floor effect" or "Item response model" or Rasch or "Differential item functioning" or "item bank" or (item N3 (correlation* or selection* or reduction* or bank)))	694,621
S6	(MH "Psychometrics") OR (MH "Measurement Issues and Assessments")	32,107
S5	AB("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")	556,739
S4	TI("Healthcare professionals" or Caregivers or "Healthcare providers" or Practitioners or Doctor or nurse? or physician? or resident? or "healthcare worker" or "health staff")	296,467
S3	(MM "Nurses+")	141,674
S2	(MM "Medical Staff, Hospital+")	3,977
S1	(MM "Physicians+")	64,766

## Additional file 2: themes and categories specified

Themes	Category	Description
1. Management & Building (29)	Workhours (11)	The intervention is about changing shift hours, shift length and schedules
	Continuous improvement (6)	Interventions in which a continuous improvement method is implemented, such as PDCA/Kaizen
	Environment (6)	The intervention is about a change in the space/ environment, such as light, sound, room lay-out
	Equipment support & patient handling (3)	The intervention is about a form of support in terms of materials/technology for the purpose of care tasks
	Workflow improvement (2)	Interventions in which the improvement of steps and processes and the reorganization of healthcare are central
	Care model (1)	The interventions is about a framework or system that outlines the principles, strategies, and practices used to provide healthcare services
2. Social resources & support (13)	Emotional support (7)	The intervention is about actions to provide psychological support/empathy/encouragement, such as intervision/messages
	(Additional) staff support (3)	The intervention involves deploying additional personnel, such as supervisors, volunteers
	Optimizing teams (3)	The intervention is about actions in which the team collaboratively works on teamwork.
3. Personal development & recovery (6)	Role opportunities (2)	The intervention is about development opportunities within professional roles
	Relax opportunities (2)	The intervention is about facilitating action or periods suitable for relaxation/resting
	Other team/setting opportunities (2)	The intervention describes opportunities to gain experience in a new team/setting
4. Multi-categorical (1)	Multi categorical (1)	The intervention contains various categories as described above

### Additional file 3: risk of bias assessment



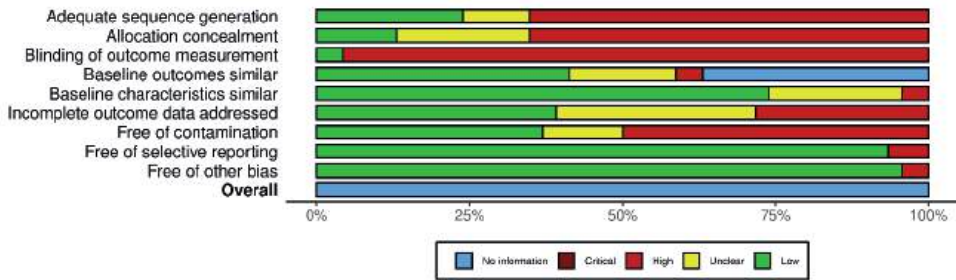
Additional file 3: Risk of bias assessment -Traffic plot nRCT

		Risk of bias								
		D1	D2	D3	D4	D5	D6	D7	D8	Overall
Study	Rodriguez Santana 2020	+	+	+	+	-	+	+	+	
	Schneider 2019	+	+	+	X	+	+	+	+	
	Thanarajasingam 2012	+	+	+	X	-	+	+	+	

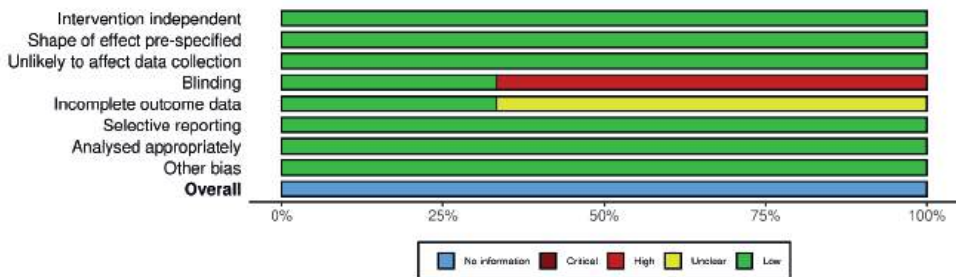
D1: Intervention independent  
 D2: Shape of effect pre-specified  
 D3: Unlikely to affect data collection  
 D4: Blinding  
 D5: Incomplete outcome data  
 D6: Selective reporting  
 D7: Analysed appropriately  
 D8: Other bias

**Judgement**  
 X High  
 - Unclear  
 + Low  
 Not applicable

Additional file 3: Risk of bias assessment -Traffic plot ITS



Additional file 3: Risk of bias assessment -Summary plot nRCT

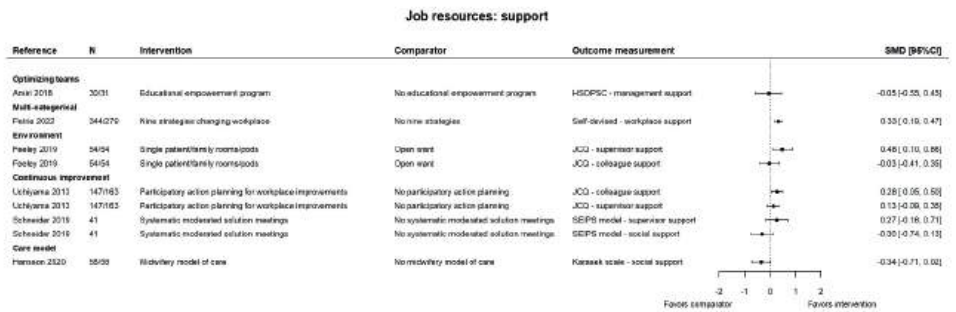


Additional file 3: Risk of bias assessment - Summary plot ITS

## Additional file 4: Forest plots

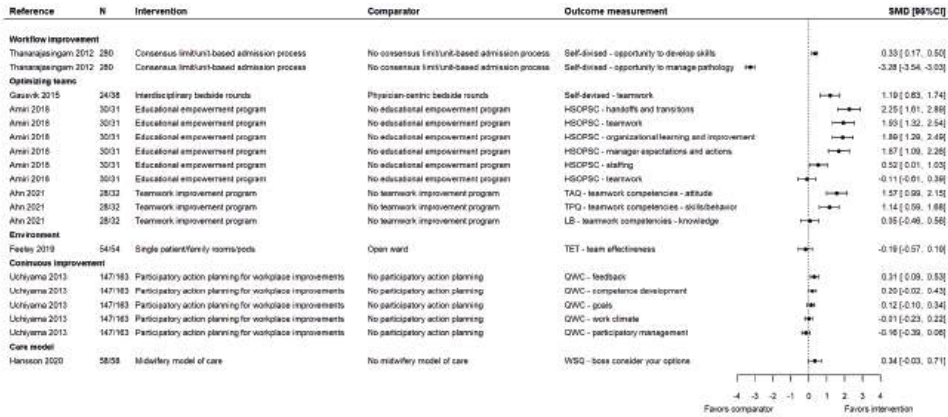


Notes: MABEL: Medicine in Australia: Balancing employment and life; SOFI: Swedish occupational fatigue inventory; NASA-TLX: National Aeronautics and Space Administration - Task Load Index; JCQ: Job content questionnaire; SEIPS: Systems engineering initiative for patient safety; JDS: Job demands scale  
*Additional file 4: Forest plot A – Job demands: Workload*



Notes: HSOPSC: Hospital survey on patient safety culture; JCQ: Job content questionnaire; SEIPS: Systems engineering initiative for patient safety  
*Additional file 4: Forest plot B – Job resources: Support*

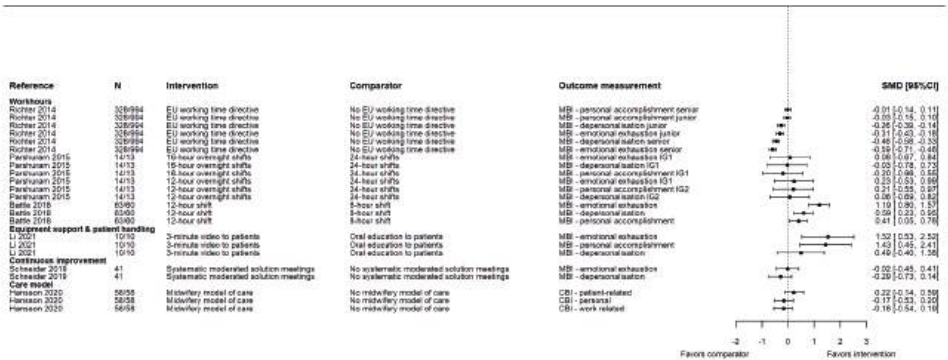
Job resources: team climate



Notes: HSOPSC: Hospital survey on patient safety culture; TAQ: Teamwork attitudes questionnaire; TPQ: Teamwork perceptions questionnaire; LB: Learning benchmarks; TET: Team effectiveness tool; QWC: Quality work competence questionnaire; WSQ: Work stress questionnaire

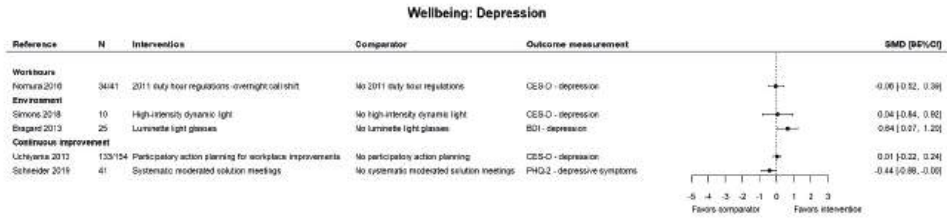
Additional file 4: Forest plot C – Job resources: Team climate

Wellbeing: burnout



Notes: MBI: Maslach burnout inventory; CBI: Copenhagen burnout inventory

Additional file 4: Forest plot D – Wellbeing: Burnout



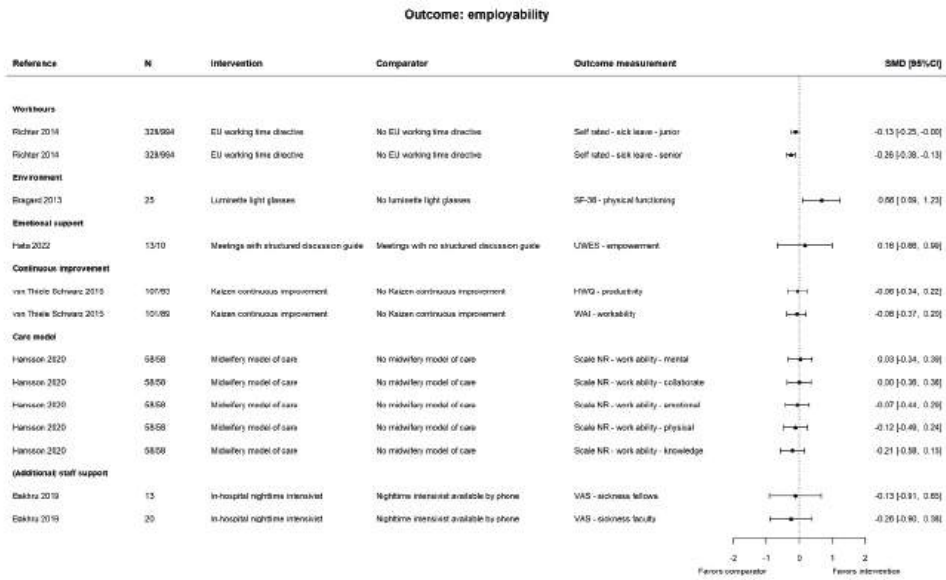
Notes: CES-D: Center for epidemiologic studies depression scale; BDI: Beck depression scale; PHQ-2: Patient health questionnaire 2

Additional file 4: Forest plot E – Wellbeing: Depression

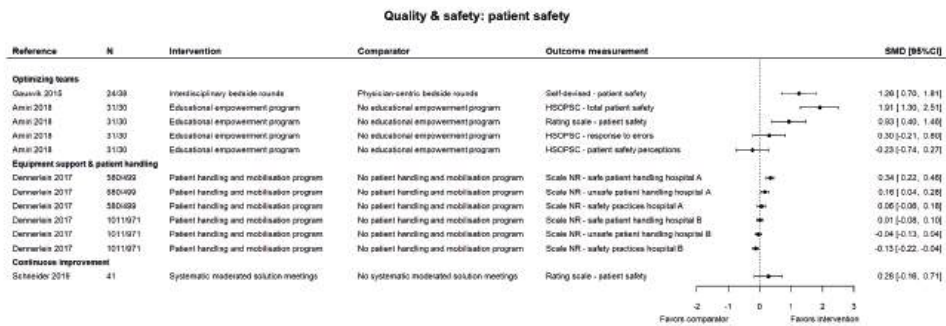


Notes: VAS: Visual analog scale; GMWS: Global measure of work satisfaction

Additional file 4: Forest plot F – Wellbeing: Job satisfaction



Notes: SF-36: Short form 36; UWES: Utrecht work engagement scale; HWQ: Health and work questionnaire; WAI: Work ability index; VAS: Visual analog scale  
 Additional file 4: Forest plot G – Outcome: Employability



Notes: HSOPSC: Hospital survey on patient safety culture; NR: Not reported  
 Additional file 4: Forest plot H – Quality & safety: Patient safety

Additional file 5: Direction table complete

	Healthcare professional (N/D/O)#	Job demands				Job resources				Leadership		Personal resources				Wellbeing				Outcome				Quality & safety of care									
		MIs conduct	Workload	Communication	Job control	Support	Team climate	Leadership	Concentration	Coping	Efficiency	Emotions	Psychological characteristics	Anxiety	Burnout	Depression	General Health	Job satisfaction	Lack of energy	Physical discomfort	Quality of life	Sleep	Stress	Employability	Engagement	Turnover intention	Patient quality	Patient safety	Unwanted event				
Intervention category: Workhours																																	
EU working time directive <sup>21</sup>	D																																
2011 duty hour regulations <sup>24</sup>	N/O																																
Participatory working scheduling <sup>21</sup>	N																																
8.5-hour shifts <sup>21</sup>	N																																
12-hour shifts <sup>21</sup>	N																																
Casino shifts <sup>24</sup>	D																																
4-week rotations <sup>21</sup>	D																																
2011 duty hour regulations <sup>24</sup>	D																																
2011 duty hour regulations <sup>24</sup>	D																																
16-hour overnight shifts <sup>24</sup>	D																																
12-hour shifts <sup>24*</sup>	N/O																																
Intervention category: Continuous improvement																																	
Participatory action planning <sup>21</sup>	N																																
PDCA-cycle management <sup>24</sup>	N																																
PDCA-cycle management <sup>21</sup>	N																																
DISCOVERY method <sup>21</sup>	N/O																																
Moderated solution meetings <sup>24</sup>	N/O																																
Kaizen continuous improvement <sup>24</sup>	N/D/O																																
Intervention category: Environment																																	
Single patient/family rooms/pods <sup>21</sup>	N																																
Luminette light glasses <sup>21</sup>	N/D/O																																
Centralised nurses' stations <sup>24</sup>	N																																
Breaks in noisy environments <sup>24</sup>	D																																
High-intensity dynamic light <sup>24</sup>	N																																
Music during operations <sup>21</sup>	N																																
Intervention category: Equipment support & patient handling																																	
Patient handling and mobilization <sup>21</sup>	N/O																																
Patient handling equipment <sup>21</sup>	N/O																																
3-minute video to patients <sup>21</sup>	N																																
Intervention category: Workflow improvement																																	
Consensus limit admission <sup>21</sup>	D																																
Hospital-based primary care center <sup>24</sup>	N/D																																
Intervention category: Care model																																	
Midwifery model <sup>24</sup>	O																																







Additional file 7: Direction table doctors

	Healthcare professional (N/D/O)	Job demands	Job resources	Leader ship	Personal resources	Wellbeing	Outcome	Quality & safety of care																					
		Mbs conduct	Workload	Communication	Job control	Support	Team climate	Leadership	Concentration	Coping	Efficiency	Emotions	Psychological characteristics	Anxiety	Burnout	Depression	General Health	Job satisfaction	Lack of energy	Physical discomfort	Quality of life	Sleep	Stress	Employability	Engagement	Turnover intention	Patient quality	Patient safety	Unwanted event
Intervention category: Work-hours																													
EU working time directive <sup>1</sup>																													
2011 duty hour regulations <sup>4*</sup>																													
Casino shifts <sup>6</sup>																													
4-week rotations <sup>2</sup>																													
2011 duty hour regulations <sup>5</sup>																													
2011 duty hour regulations <sup>4*</sup>																													
16-hour overnight shifts <sup>8</sup>																													
Intervention category: Continuous improvement																													
Moderated solution meetings <sup>6*</sup>																													
N/D/O																													
N/D/O																													
Intervention category: Environment																													
Kaiser continuous improvement <sup>14</sup>																													
N/D/O																													
Lumettec light glasses <sup>27</sup>																													
Breaks in noisy environments <sup>24</sup>																													
D																													
Intervention category: Workflow improvement																													
Compensate limit admissions <sup>3</sup>																													
D																													
Hospital-based primary care centers <sup>15</sup>																													
N/D																													
Intervention type: Social resource & support																													
Intervention category: Emotional support																													
Meetings with discussion guide <sup>4*</sup>																													
N/D/O																													
Wellness committee <sup>23</sup>																													
D																													
Protected time/discussion groups <sup>16</sup>																													
D																													
Intervention category: (Additional) staff support																													
In-hospital nighttime intensivist <sup>25</sup>																													
D																													
Nightly huddle to discuss patients <sup>29</sup>																													
N/D																													
Intervention type: Personal development & recovery																													
Intervention category: Relax opportunities																													
Protected non-clinical time <sup>9</sup>																													
D																													
Nine strategies changing workplace <sup>13</sup>																													
D																													
Multi-categorical																													

Notes: ▲ = significant intervention directed; Δ = insignificant intervention directed; Δ = significance unknown; intervention directed; ▼ = significant control directed; ▼ = insignificant control directed; ▼ = significance unknown, control directed; ★ = unclear; — = no change; <Δ> = inconsistency in outcomes; Sample size > 100; Sample size > 50; \* = N based on amount of measurements instead of sample size; 1 = N= nurses, D= doctors, O= other healthcare professionals

## **Additional file 8: Description of results on outcomes Job resources, Leadership and Personal resources**

### Job demands

#### *Misconduct*

Two studies measured misconduct outcomes<sup>63,59</sup>, assessing experienced bullying, aggressiveness and/or harassment. One significant favored a multi-categorical intervention<sup>59</sup>, which used nine strategies to reduce un-rostered overtime and enhance doctors' well-being.

### Job resources

#### *Communication*

Four studies measured communication outcomes<sup>78,33,41,46</sup>. One used a subscale of the Hospital survey on patient safety culture; three used self-developed questionnaires. Three significant favored the intervention<sup>78,41,46</sup>, including 'staff support' (nightly huddle to discuss patients), 'optimizing teams' (interdisciplinary versus physician bedside rounds), and 'role opportunities' (advanced practice nurse).

#### *Job control*

Four studies measured job control outcomes<sup>73,66,80,69</sup>, using four questionnaires (e.g., Mini-Z survey). One significant favored a 'continuous improvement' intervention<sup>66</sup>, with professional solution meetings versus no meetings.

#### *Support*

Six studies measured experienced support outcomes<sup>73,66,42,80,33,59</sup>, using five questionnaires (e.g., SEIPS model). One significant favored a 'multi-categorical' intervention versus no intervention<sup>59</sup>. Six studies were appropriate for meta-analysis<sup>73,66,42,80,33,59</sup>. Effects showing moderate heterogeneity with variation but overlapping confidence intervals, with SMDs from -0.34 to 0.48. Following plot B none of the interventions significantly improved support.

#### *Team climate*

Twelve studies measured team climate<sup>52,73, 55, 42, 70, 80, 44, 78, 34, 33, 41, 46</sup>, using ten questionnaires (e.g., Work stress questionnaire). Six significant favored the interventions<sup>55, 34, 33, 41, 46</sup>: one 'continuous improvement' (DIScovery Method versus no intervention), one 'emotional support' (monthly self-facilitated group meetings with/without structured discussion guide), three 'optimizing teams' (e.g., two learning programs for teams versus no intervention), and one

'role opportunities' (advanced practice nurse versus no intervention). Lucas et al. found the control (2-week rotations) more effective than the intervention (4-week rotations). Seven studies were appropriate for meta-analysis (plot C)70, 41, 33, 34, 42, 73, 80, showing moderate heterogeneity with variation but overlapping confidence intervals, with SMDs from -3.28 to 2.25. The SMD of -3.28 can be described as an outlier, as this data point markedly deviates from the rest. 'Optimizing teams' and 'equipment support & patient handling' interventions showed most potential for improving team climate.

### Leadership

Two studies measured leadership outcomes73, 38, using two instruments (e.g., Self rated leadership). None significant favored the intervention.

### Personal resources

#### *Concentration*

Two studies measured concentration outcomes55, 36, using two questionnaires for self-rated concentration/alertness/focus problems (e.g., visual analog scale). One indicated significant effects: one favoring a 'staff support' intervention (nighttime staffing in hospital versus phone ability)36.

#### *Coping*

Two studies measured coping outcomes51, 41, using two questionnaires for response/reaction to uncertainty/stress/problems/fear (e.g., Coping style questionnaire). Both indicated significant effects: one for an 'emotional support' intervention (hierarchical management versus no intervention)51, and one for an 'optimizing teams' intervention (interdisciplinary versus physician bedside rounds)41.

#### *Efficiency*

Two studies measured efficiency outcomes73,41, using two questionnaires of which one was self-developed. One significant favored an 'optimizing teams' intervention (interdisciplinary versus physician bedside rounds)41.

#### *Emotions*

Four studies measured emotions outcomes48, 68, 47, 36, using three questionnaires for self-rated mood/happiness/hopelessness/positivity (e.g., Brief resident wellness profile). One significant favored an 'emotional support' intervention (breaks with/without motivational messages)47.

*Psychological characteristics*

Five studies measured psychological characteristics outcomes<sup>55, 56, 80, 47, 41</sup>, using five questionnaires, e.g., on motivation/responsibility (e.g., Life orientation test). Two significant favored 'emotional support' interventions (breaks with versus without motivational messages)<sup>47</sup>, and an 'optimizing teams' intervention (interdisciplinary versus physician bedside rounds)<sup>41</sup>. McNeer et al. showed significant effects favoring the control group (quiet lunchbreaks) over the intervention (noisy lunchbreaks)<sup>56</sup>.







## **Summary**

**Chapter 1** introduces the need for a solid evidence based approach of the increasing problems concerning well-being of healthcare professionals. Giving insight and an overview of the current state of well-being among healthcare professionals, the monitoring instruments, and eligible interventions to improve healthcare professionals' well-being will contribute to a sustainable, futureproof and supportive environment. Addressing well-being at work for healthcare professionals is crucial for (1) ensuring the well-being of individuals, (2) prevent and act on negative health in workplaces, (3) bridge the gap between employees and employers, (4) gaining insight into the unique challenges and needs of these, (5) evaluating interventions' effectiveness, (6) and the quality and safety of patient care. Our findings serve as an essential step for hospitals on this transformative journey.

Understanding healthcare professionals' experiences, perspectives, barriers, facilitators, and current state of well-being enables professionals, organizations and researchers to tailor interventions, projects and studies.

With the study described in **Chapter 2** we aimed to investigate how registered nurses and nursing students working in learning departments experience the requirements for career opportunities, since experienced career perspective is one of the influencing factors for well-being at work. Some departments were developed into learning departments to provide more and attractive internship places. The approach was qualitative, and we conducted semi-structured interviews. We found career perspective is experienced differently among registered nurses and nursing students. For students, the requirements to experience career perspective seem to be largely existing, as learning departments fit with personal goals, increases self-efficacy and provide coaching mentoring. Students felt learning departments contributed positively to becoming more skilled in working independently and collaborating with fellow students. This resulted in students feeling well prepared for the future. Nurses' career perspectives varied from wanting more personal development to experiencing opportunities by having great colleagues, a challenging patient category, satisfaction from sharing knowledge and a decreasing physical workload. Nurses who had an affinity with coaching students experience more career perspective on learning departments. Students mostly focus on questions as 'Do I want to work in healthcare and this setting?' and 'Am I competent enough?', while nurses focus on the aspects of job satisfaction (colleagues, challenge, workload). This suggests that requirements to experience career perspective seems partially existing for students and nurses in learning departments.

In the study described in **Chapter 3** we studied how physicians and nurses experience healthcare complexity, workload, quality of care delivered, and how these aspects influence their individual well-being. The approach was qualitative, and we conducted focus group interviews. We found nurses and physicians experience complexity and quality of care differently. It was mentioned

that care complexity, influenced by coordination and patient factors, affects their well-being negatively, while care quality impacts their professional satisfaction. Shared key factors include time and attention for patients, and the ability to perform at least basic care, and patient satisfaction. Balancing care complexity and quality is essential for individual well-being at work. Participants described high turnover and changing teams cause frustration and discomfort, as do barriers in time and resources to organize care logistically. Coping mechanisms, work experience, team support, routine, and workflow help manage care complexity and maintain quality. Physicians rely on personal competencies, while nurses depend more on team support.

In the study described in **Chapter 4** we aimed to evaluate the content of employee surveys currently used in university medical centres in the Netherlands from a well-being perspective (phase 1) and to analyse the survey results at a national level (phase 2). This quantitative study is multicentered, retrospective and included a secondary analysis on existing longitudinal employee survey data.

In Phase 1, the analysis revealed considerable variation in survey items, response options, and timing. Overlap in areas was limited and revealed in only the categories: work-overload, performance feedback, possibilities for learning and development, team effectiveness, inspiring leadership, job satisfaction, and organization commitment. Reflecting these inconsistencies, it is challenging to create the big picture on a national level. Moreover, outcomes barely differ over time, and most categories focus on job resources (e.g., experiences with teams, supervisors, and career opportunities), while it is recognized organizations primarily offer interventions targeting personal resources (e.g., enhancing resilience and self-efficacy). In Phase 2, the results revealed generally positive perceptions of the work environment and individual factors across both hospitals, with strong ratings for coworker support, team atmosphere, and job satisfaction, but notable variability and areas for improvement in job control, collaboration across care chains, and inspiring leadership. In conclusion, there is a lack of cohesion in employee surveys which complicates evidence-based decision-making. A more targeted, cohesive, theory-driven approach will facilitate meaningful benchmarking, actionable insights, and evidence-informed strategies and intervention planning to improve work environments and well-being.

With this, it is recognized that getting a grip on the multi-dimensional concept of well-being at work is complex and how to measure and monitor well-being at work remained uncertain. In **Chapters 5 and 6** the protocol and scoping review are presented providing an overview of validated instruments suitable for assessing well-being of physicians and nurses. Within **Chapter 5** the protocol is described supporting transparency, methodological quality, and reproducibility of the study. Additionally, the protocol can serve as an example and methodological guide for conducting broad scoping reviews and studies on well-being

at work. In **Chapter 6** we present 986 unique instruments revealing the broad variety in available instruments and their corresponding constructs. Institutions should be aware of the holistic nature of well-being at work and acknowledge the absence of a single comprehensive instrument that covers the whole concept. Therefore, a combination of different instruments or a selection based on the most relevant domains should be considered. In this review we present instruments into two groups categorized following the JD-R categories assisting readers in selecting appropriate instruments for their specific context: comprehensive instruments and most common instruments. For a more focused evaluation of specific domains, more common and specific instruments can be used. Another option is to screen with a broader purpose, aiming to measure multiple concepts of well-being at work.

Results of our studies investigates how we can improve healthcare professionals' well-being are presented in the last two chapters. **Chapter 7** illustrates initiatives collected and undertaken in the Dutch context and **Chapter 8** includes a systematic literature review and meta-analysis.

In **Chapter 7** we qualitatively explored well-being initiatives provided by the Dutch university medical centers. A total of 203 initiatives were gathered through semi-structured interviews. This snapshot of initiatives concerned coaching, training, programs, studies, apps, and tools. The initiatives are categorized and aim to improve physical fitness, mental fitness, personal development and balance, team collaboration, equip managers and function/context. Most of the initiatives are aimed at individual employees and only few focus on teams. We also found that it is unknown if initiatives are effective to improve employees' wellbeing. Furthermore, healthcare workers' wishes and needs do not seem to be routinely evaluated upfront in the design of initiatives.

With our systematic review in **Chapter 8** we aimed to assess the effects of organization-directed interventions on hospital staffs' well-being, work environment, retention outcomes and quality of care. Fifty-four studies and interventions were included and described in this review. Interventions included: (a) *Management and Building* (workhours, continuous improvement, environment, equipment support adn patient handling, workflow improvement, and care model); (b) *Social resources and support* (emotional support, (additional) staff support, and team optimalization); (c) *Personal development and recovery* (role opportunities, relaxation opportunities, and other team/setting opportunities) and (d) *Multi-categorical*. Intervention effects are described and analyzed for outcomes: misconduct, workload, communication, job control, support, team climate, leadership, concentration, coping, efficiency, emotions, psychological characteristics, anxiety, burnout, depression, general health, job satisfaction, lack of energy, physical discomfort, quality of life, sleep, stress, employability, engagement, turnover intentions, patient quality, patient safety, and unwanted events. The effect directions varied widely across outcomes, with standardized mean differences ranging from -3.28 to 3.56

and heterogeneous effects due to non-overlapping confidence intervals in most meta-analyses. This review highlights that organization-directed interventions can contribute to improving healthcare professionals' well-being, work environment, retention, and quality of care. Interventions focused on social resources and support consistently yielded positive effects across different outcome domains. This pattern should be interpreted with caution due to the overall low quality of the evidence. Furthermore, the overall findings are mixed. Some interventions demonstrated beneficial effects for certain outcomes while showing neutral or even detrimental effects for others. These variations underscore the importance of further research with more rigorous study designs, larger sample sizes, a consistent core outcome set, in collaboration with healthcare professionals and considering local contextual factors.

Finally, **Chapter 9** is the general discussion integrating all findings. Results are discussed and placed in a broader context and perspective of the literature. Likewise, we overviewed the methodological strengths and limitations of this thesis, present ideas for future research and end up with recommendations for practice and policy.



# 10

**General discussion**

## OVERVIEW OF MAIN FINDINGS

The overarching question of this thesis was: “How can we transition from arbitrariness and fragmentation to evidence-based strategies to improve and monitor healthcare professionals’ well-being and their work environment.” The findings include healthcare professionals’ perspectives on well-being, validated measurement instruments, and strategies for improvement.

### **Healthcare professionals’ perspectives on well-being (Chapters 2 – 4)**

Nurses and students in learning departments experience career perspective by aligning with personal goals, increasing self-efficacy, mentoring, and offering opportunities for skill development and job satisfaction<sup>1</sup>. However, challenges such as care complexity, workload, and fragmented employee surveys hinder evidence-based decision-making and systematic improvements<sup>2</sup>. These findings reveal critical areas for intervention, particularly in fostering team support and improving job control.

### **Measurement tools (Chapters 5 – 6)**

The scoping review<sup>3</sup> identified 986 unique instruments to measure well-being, emphasizing the need for a multi-dimensional approach to capture the complexities of healthcare professionals’ experiences. Existing tools often fall short of fully addressing the most relevant domains or aligning with practical application needs.

### **Intervention strategies (Chapters 7 – 8)**

A review of 203 initiatives undertaken by the seven Dutch University Medical Centers and 54 organizational-directed interventions highlighted gaps in focus and evaluation. While interventions focusing on social resources and support show promise, their effectiveness is often limited by misalignment with healthcare professionals’ needs and routine evaluation.

In conclusion, this thesis underscores the urgent need for cohesive strategies that integrate measurement, intervention, and evaluation to sustainably enhance healthcare professionals’ well-being.

## FINDINGS IN CONTEXT

### **Current state of wellbeing**

#### *Career perspective*

Healthcare professionals’ well-being is influenced by career perspective, workload, mentoring, care quality, and team dynamics. Research on student well-being shows that context plays a significant role in how students feel<sup>4</sup>. For example, settings like home care and disability

care can serve as protective factors, while the hospital setting often exacerbate stress<sup>4</sup>. As students advance in their training and complete more internships, they experience higher levels of stress<sup>4</sup>. Effective mentorship and a supportive environment, as outlined in Chapter 2, is essential for fostering resilience and well-being, especially in a challenging environment. Fortunately, education on students' own well-being is increasingly incorporated into the curriculum, teaching them not only to support others but also to care for themselves. Despite demanding course structures, space is created to teach students how to maintain control over their own well-being, including understanding their own downward and upward spirals<sup>4</sup>.

#### *Support, collaboration and leadership*

Chapters 3 and 4 highlight the critical roles of support and collaboration, aligning with existing literature<sup>5-7</sup>. The systematic review in this thesis reveals that interventions focusing on support, team cohesion, and leadership show significant potential. These interventions offer a means to bridge the gap between needs and evidence, with implementation as a key factor<sup>8</sup>. However, mixed outcomes of interventions (e.g., improving workflow interventions) suggests the need for developing and testing tailored approaches in this area<sup>9</sup>.

The role of leadership is crucial for healthcare professionals in this context<sup>10</sup>. Leaders must be able to identify problems and implement appropriate interventions, ideally serving as the primary, safe point of contact. Also, leaders should feel a powerful sense of responsibility for the well-being of healthcare professionals in their teams<sup>10</sup>. Research indicates that this responsibility is often seen as the individual's responsibility rather than a shared one<sup>11</sup>. Additionally, current team sizes are probably too large for effective supportive management, since the optimal team size is around 10 employees to flourish and enable leaders to provide the best possible support<sup>12,13</sup>.

Further, external factors such as family support and personal life influence professionals' well-being, reinforcing the need for a holistic perspective. While this thesis did not directly examine these external factors, models like Huber's Positive Health<sup>14</sup> offer useful frameworks (developed for patients) for integrating broader determinants of well-being.

#### **Measuring wellbeing**

The **Chapters 4 and 6** gained insights into available measurement tools and how and which instruments are used within the Dutch context. Two key aspects have emerged from this: (1) the organization of measurement processes and (2) the content of what is being measured.

Challenges in data collection and integration hinder data-driven policy decisions, underscoring the need for streamlined and standardized measurement practices. Fragmented and inconsistent measurement practices hinder the ability to derive actionable insights. Additionally, the lack

of direct control over data may lead to increased costs. Greater standardization is needed in both literature and practice to improve data integration and inform policy effectively.

Current measurement instruments inadequately capture the multi-dimensional nature of well-being. For example, patient-related factors such as satisfaction and care quality, identified in **Chapter 4**, could serve as proxies for healthcare professionals' well-being. This aligns with value-based healthcare, as learning cultures enhances team engagement and well-being by adding professional meaning<sup>8</sup>. Focusing on patient outcomes and experiences might be a professional need and could therefore be considered for inclusion in core outcome sets for measuring healthcare professionals' well-being. Patient-Reported Experience Measures (PREM) are increasingly used to improve care quality and deliver person-centered care<sup>15</sup>, aligning with what healthcare professionals value and find fulfilling. Integrating patient outcomes and experiences into core outcome sets can unify these aspects. PREM, as satisfaction with communication, care planning, support, and accessibility, may contribute to bridge this gap. To address this, we need validated questionnaires that are both interpretable and practically applicable.

### **Improving wellbeing**

To address the fragmentation identified in Chapters 7 and 8, we advocate for: (1) a cohesive system aimed at continuous improvement, and (2) a preventive perspective.

Interventions and measurement tools often target disparate aspects of well-being, leading to misalignment and limiting effectiveness<sup>9</sup>. For example, job resources such as support, team collaboration, and career opportunities are typically measured in employee surveys, while interventions focus on personal resources like resilience, balance, and goal directiveness. This mismatch hinders evaluation and neglects the broader context needed for optimal outcomes.

Healthcare institutions should integrate measurements, learning, and improvements into daily work by implementing a cohesive quality system at both team and organizational levels<sup>16,17</sup>. Such a system aligns care delivery, patient outcomes, and professional well-being, following the JD-R model<sup>18</sup> and supporting evidence-based improvements across all aspects of care.

Additionally, we want to highlight the improvement of healthcare professionals' well-being in the context of prevention<sup>19,20</sup>. Preventive strategies should operate across four levels<sup>21</sup>: (1) primordial prevention: which addresses risk factors like environmental and work conditions that contribute to stress and reduced well-being, (2) primary prevention: which focuses on healthcare professionals not yet experiencing symptoms of stress or burnout, with the goal of keeping them healthy; (3) secondary prevention: which focuses on early detection of well-being issues in healthcare professionals with early signs but no severe symptoms,

including well-being check-ins, screenings, and accessible guidance or counseling; and (4) tertiary prevention: which focuses on healthcare professionals with clear symptoms of stress or burnout, aimed at reducing the severity and consequences. Each level of prevention requires tailored, evidence-based strategies to achieve sustainable outcomes.

## METHODOLOGIC CONSIDERATIONS

This thesis adopted a multi-dimensional view of well-being, operationalized through the Job Demands-Resources model<sup>18</sup> to move beyond individual resilience and incorporate contextual factors.

The triangulation in research methods has strengthened the reliability and validity of our findings<sup>22,23</sup>. Working as both a bed-side nurse and a researcher presented unique advantages and challenges during this thesis. My personal experiences and career choices were shaped by intrinsic motivations, with an initiative-taking attitude, strong engagement and a commitment to deliver high quality. My background as a nurse was particularly valuable to determining the feasibility and practical relevance of the research, ensuring that our findings could be effectively translated into real-world applications.

Being recognizable to respondents can offers rapport and familiarity, but can also lead to colored perspectives<sup>24</sup>. Being aware of this (focus-group) interviews were approached with an open, curious view. Working within a multi-disciplinary team contributed to scientific discussions, interpreting findings, and formulating practical implications from various perspectives, leading to critical thinking, a deeper understanding and personal and professional growth.

## RECOMMENDATIONS FOR PRACTICE AND POLICY

The findings presented in this thesis should be taken into consideration within the current healthcare landscape, especially in policy changes, implementation of interventions, and restructuring of care.

### **Measure well-being to monitor and align with healthcare professionals and to evaluate interventions.**

To gain a comprehensive understanding of which levers to pull for improving well-being, a broader multi-dimensional measurement tool is needed—one that encompasses various well-being aspects while remaining concise and time-efficient<sup>3</sup>. As shown in Chapter 8, interventions to increase well-being can sometimes have positive effects on one outcome

but unintended negative effects on another. To avoid overlooking such adverse impacts, a broad assessment approach is recommended, covering a range of specific well-being factors. This holistic approach aligns with general well-being models (apart from the work context) such as the PERMA model<sup>25</sup>. In addition to using a broad tool, it is crucial to ensure that the psychometric properties, validity, reliability, and responsiveness, are robust<sup>26</sup>. Without these qualities, measurements may lack accuracy and could fail to detect subtle changes over time. Lastly, the frequency of survey administration plays a role (**Chapter 4**), as it should align with the tool's responsiveness and account for relevant changes and events in the work environment.

**Improve healthcare professionals' well-being by adapting the work environment and offer actionable strategies by emphasizing cohesion, prevention, and evidence-based approaches.**

The findings of this thesis emphasize the importance of focusing not only on individual interventions but also on improving and adapting the work environment. Healthcare professionals cannot thrive in sickening environments<sup>27</sup>. Hospitals face limited budgets, struggle with staffing shortages, and cope with competing interests and priorities. However, organizations should intervene at organizational and system levels to ensure sustainable professionals for the future<sup>28</sup>. The recommendations are described and divided as follows: care level, team level, organizational level, healthcare system level.

*Care level* – For the well-being of professionals, for example, time for patients and job control are highlighted key factors in this thesis, consistent with findings from previous research<sup>29,30</sup>. Another well-established factor is the administrative burden. What stands out as more novel and noteworthy is the inconsistency between professionals regarding rules and guidelines: nurses tend to view these as valuable tools for delivering quality care, while physicians perceive them as barriers due to regulatory pressure and risk management concerns. Achieving a balance between experiencing support from guidelines and maintaining flexibility and autonomy in decision-making and time for patients is essential in order to create a thriving work environment. Trust in professionals and their self-confidence are critical elements in this dynamic.

*Team level* – For flourishing and performing healthcare professionals' teams should be safe and supportive. For healthcare professionals it is helpful when routines and workflow (within the care chain) are integrated to reduce the sense of uncertainty and to ensure perceiving care as less complex. Given the high turnover in colleagues, it is valuable to invest in teambuilding to create familiarity with each other and knowing each others strengths and weaknesses. This will result in a better understanding, leveraging colleagues and reduce a sense of discomfort. Communication, agreements, responsibilities, and roles requires to be clear to allow for a

low-threshold approach and collaboration. Focusing on optimization of multidisciplinary teams can improve team climate, personal resources, and patient safety.

*Organizational level* - Actions to evaluate and adapt the work environment of healthcare professionals to improve well-being must be conducted using quality cycles. This supports data-based approaches and evidence-based working. Organizations have a role in facilitating and creating coherence within the organization to connect needs, preferences, and interventions. It revolves around the question of how healthcare professionals and organizations can best balance offering valuable interventions while respecting the needs and preferences of individuals. For example, we found room for improvement in areas such as collaboration in the care chain. However, the question remains whether this is also the wish and need of the professionals. Organizations should weigh two approaches for integrating interventions: (1) proactively implementing interventions because it is proven effective regardless of whether individual healthcare providers or patients currently feel the need for them. The idea is that even if some people may not use them, it is important to make this knowledge or these tools available because they can enhance the quality of care; (2) offering (effective) interventions based on wishes and needs of staff. Lastly, organizations should be open with each other about the insights gained from measurements and evaluated actions in order to learn from each other.

*Healthcare system level* – To ensure sustainable and future-proof healthcare, care delivery must prioritize cost-effectiveness. The current fee-for-service payment system incentivizes excessive health care activities, often not driven by efficiency or value. A shift toward different reimbursement models, focused on meaningful outcomes with patients, is expected to improve the wellbeing of both patients and professionals. Achieving this transformation requires collaboration with the government, healthcare authorities, insurers, educational institutions, and professional associations. All stakeholders must work together to design policies and systems that incentivize quality of care and align resources with long-term sustainability goals.

## RECOMMENDATIONS FOR RESEARCH

### Measuring well-being

Future research should focus on the development of a core outcome set for well-being at work. A Delphi study is needed to standardize the measurement of well-being at work. Rather than developing new instruments, it may be more effective to modify, refine, and shorten existing ones to minimize confusion, inefficiency, and duplication of effort. It is crucial determining which instruments should be combined and how patient attention/satisfaction should be added, while considering the load and length of the questionnaires to ensure relevance and practical applicability. Alternatively, combined single-item questionnaires on various aspects

should be evaluated by clinimetric research. Subsequently, psychometric properties should be evaluated, including responsiveness.

### **Improving well-being**

We recommend conducting future rigorous research on organizational interventions, moving beyond individual-focused approaches. Action research and feasibility studies should precede larger-scale evaluations to optimize intervention design. This approach is crucial to better understand what is appropriate and effective for different healthcare contexts to enhance evidence-based decision-making in collaboration with bed-side healthcare professionals. In the work we have done up to now, we collected relatively few examples of interventions that do not focus on adapting individuals. Such actions and projects are likely ongoing in hospitals but are often part of continuous improvement programs rather than structured as research initiatives. By approaching these projects from a research perspective, the effects of interventions can be evaluated more effectively, and results can be disseminated.

## **CONCLUSION**

This thesis provides a foundation for transforming the healthcare work environment, paving the way for a sustainable, evidence-based future that prioritizes the well-being of healthcare professionals.

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11

**Nederlandse samenvatting**

**Hoofdstuk 1** introduceert het proefschrift en de noodzaak voor een solide op bewijs gebaseerde benadering van de groeiende problemen rondom het welzijn van zorgprofessionals. In hoofdstuk 1 wordt de opbouw van het proefschrift beschreven. Dit proefschrift bevat drie onderdelen: (1) onderzoek naar de huidige situatie van het welzijn van zorgverleners; (2) onderzoek naar monitoringsinstrumenten om het welzijn op het werk onder zorgprofessionals te meten en (3) onderzoek naar mogelijke interventies om het welzijn van zorgprofessionals te verbeteren. Deze drie onderzoeksrichtingen samen dragen bij aan meer kennis over hoe we een duurzame, toekomstbestendige en ondersteunende werkomgeving voor zorgprofessionals kunnen creëren.

Het monitoren en verbeteren van het welzijn onder zorgprofessionals is cruciaal in het kader van: (1) het waarborgen van het welzijn van individuen op het werk; (2) het voorkomen van gezondheidsproblemen onder zorgprofessionals zoals stress en burnout; (3) het overbruggen van de kloof tussen zorgmedewerkers en zorgorganisaties; (4) het verkrijgen van inzicht in de unieke uitdagingen en behoeften van zorgprofessionals; (5) het evalueren van de effectiviteit van interventies; en (6) de kwaliteit en veiligheid van de patiëntenzorg. Onze conclusies bieden richting en een stevig fundament voor ziekenhuizen om de werkomgeving anders te organiseren.

Het begrijpen van de ervaringen, perspectieven, obstakels, facilitators en het welzijn van zorgprofessionals stelt professionals, leiders, organisaties en onderzoekers in staat om interventies, projecten en studies beter aan te laten sluiten en daardoor meer impact te maken.

In de studie beschreven in **Hoofdstuk 2** wilden we onderzoeken hoe verpleegkundigen en verpleegkundestudenten op leerafdelingen de voorwaarden voor loopbaankansen ervaren, aangezien een ervaren loopbaanperspectief één van de beschermende factoren is die het welzijn op het werk kan beïnvloeden. Sommige verpleegafdelingen zijn ontwikkeld tot leerafdelingen om meer en aantrekkelijkere stageplaatsen te bieden. Het onderzoek beschreven in hoofdstuk 2 is kwalitatief van aard. Met behulp van semi-gestructureerde interviews ontdekten we dat het loopbaanperspectief verschillend wordt ervaren door verpleegkundigen en studenten. Voor studenten lijken de voorwaarden voor loopbaanperspectief grotendeels aanwezig, aangezien leerafdelingen aansluiten bij persoonlijke doelen, zelfeffectiviteit vergroten en coaching bieden. Studenten vonden dat leerafdelingen positief bijdroegen aan het zelfstandig leren werken en samenwerken met medestudenten. Dit zorgde ervoor dat studenten zich goed voorbereid voelden op de toekomst. Het loopbaanperspectief van verpleegkundigen liep uiteen van de wens om zich persoonlijk te ontwikkelen tot het ervaren van kansen door fijne collega's, werken met uitdagende patiëntgroepen, voldoening halen uit kennisdeling en het ervaren minder fysieke werkdruk. Verpleegkundigen die affiniteit hadden met het coachen van studenten ervoeren meer loopbaanperspectief op leerafdelingen. Studenten richtten

zich vooral op vragen als ‘Wil ik in de zorg en in deze setting werken?’ en ‘Ben ik bekwaam genoeg?’, terwijl verpleegkundigen zich richten op aspecten van werktevredenheid (collega's, uitdaging, werkdruk). Dit onderzoek suggereert dat de voorwaarden voor het ervaren van loopbaanperspectief deels aanwezig lijken te zijn voor zowel studenten als verpleegkundigen op leerafdelingen.

In de studie beschreven in **Hoofdstuk 3** onderzochten we hoe artsen en verpleegkundigen de complexiteit van zorg, werkdruk en kwaliteit van de geleverde zorg ervaren en hoe deze aspecten hun eigen welzijn beïnvloeden. Het onderzoek was kwalitatief van aard. Met behulp van focusgroep interviews ontdekten we dat verpleegkundigen en artsen complexiteit en zorgkwaliteit anders ervaren. Het blijkt dat zorgcomplexiteit (door coördinatie- en patiëntfactoren) het welzijn negatief kan beïnvloeden, terwijl het kunnen leveren van zorgkwaliteit de tevredenheid op het werk positief beïnvloedt. Belangrijke factoren die artsen en verpleegkundigen beide aangaven zijn tijd en aandacht voor patiënten, het vermogen om ten minste basiszorg te kunnen bieden en patiënttevredenheid. Het vinden van een balans tussen zorgcomplexiteit en zorgkwaliteit is essentieel voor het individuele welzijn op het werk van zorgprofessionals. Uit de focusgroepen bleek dat een hoge turnover en wisselingen in teams frustratie en ongemak veroorzaken, evenals barrières in tijd en middelen om zorg logistiek te organiseren. Coping mechanismen, werkervaring, teamondersteuning, routine en workflow helpen om met zorgcomplexiteit om te gaan en kwaliteit te behouden. Artsen gaven aan te vertrouwen op persoonlijke competenties, terwijl verpleegkundigen meer richten op ondersteuning vanuit het team.

In de studie beschreven in **Hoofdstuk 4** was het doel om medewerkersbelevingsonderzoeken die momenteel worden gebruikt in de Nederlandse universitair medische centra te evalueren (fase 1) en om de resultaten van deze medewerkersbelevingsonderzoeken op nationaal niveau te analyseren. Deze kwantitatieve studie was multicenter, retrospectief en bevatte een secundaire analyse op bestaande longitudinale vragenlijst data. Uit fase 1 kwam naar voren dat er variatie in vragen, antwoordmogelijkheden en frequentie van uitvragen aanwezig is. Overlap was minimaal en werd gevonden voor de categorieën: werkdruk, feedback, doorgroeimogelijkheden, teameffectiviteit, inspirerend leiderschap, werktevredenheid, en organisatie betrokkenheid. Door deze inconsistenties is het moeilijk om een alomvattend beeld te krijgen op nationaal niveau. Bovendien verschillen de uitkomsten nauwelijks over de tijd en richten de meeste categorieën zich op werk gerelateerde hulpbronnen (bijv. ervaringen met teams, leidinggevend en loopbaankansen), terwijl organisaties voornamelijk interventies aanbieden gericht op persoonlijke hulpbronnen (bijv. het vergroten van veerkracht en zelfeffectiviteit). Uit fase twee kwam naar voren dat over het algemeen de zorgprofessionals positief waren. Zorgprofessionals waren voornamelijk positief over ondersteuning van collega's, teamsfeer en werktevredenheid. Meer variatie werd gevonden voor de thema's: autonomie,

samenwerking in de keten en inspirerend leiderschap. Concluderend blijkt er samenhang te ontbreken in medewerkersbelevingsonderzoeken wat evidence-based besluitvorming bemoeilijkt. Een meer doelgerichte, coherente, op theorie gebaseerde aanpak zal wederzijds leren en benchmarking vergemakkelijken. Bovendien zullen betrouwbaardere inzichten beter illustreren op welke gebieden verbetering noodzakelijk is wat kan leiden tot betere interventies en daarmee een verbeterde werkomgeving en welzijn.

Hiermee wordt erkend dat grip krijgen op het multidimensionale concept van welzijn op het werk complex is en dat het meten en monitoren van welzijn op het werk onzeker blijft. In **Hoofdstukken 5 en 6** worden het protocol en de scoping review gepresenteerd die een overzicht bieden van gevalideerde instrumenten die geschikt zijn voor het meten van het welzijn van artsen en verpleegkundigen. In **Hoofdstuk 5** wordt het protocol beschreven in het kader van transparantie, methodologische kwaliteit en reproduceerbaarheid van de studie. Daarnaast kan het protocol dienen als voorbeeld en methodologische hand-out voor het uitvoeren van grote scoping reviews en studies over welzijn op het werk. In **Hoofdstuk 6** presenteren we 986 unieke instrumenten, waarmee de brede variëteit aan beschikbare meetinstrumenten en hun bijbehorende constructen zichtbaar wordt. Zorgorganisaties moeten zich bewust zijn van de holistische aard van welzijn op het werk. Uit dit onderzoek blijkt dat geen één instrument bestaat dat het hele concept dekt. Daarom moet een combinatie van verschillende instrumenten of een selectie op basis van de meest relevante domeinen worden overwogen bij het meten van welzijn. In deze review hebben we de instrumenten in twee groepen verdeeld: veel omvattende instrumenten en meest voorkomende instrumenten. Hierbij hebben we gebruik gemaakt van de categorieën van het Job-Demands Resource model. Dit helpt lezers bij het selecteren van geschikte instrumenten voor hun specifieke context. Voor een meer gerichte evaluatie van specifieke domeinen kunnen specifieke instrumenten worden ingezet. Om de zorgprofessionals goed in kaart te brengen, adviseren we naar aanleiding van deze studie om te starten met een brede screening, gericht op het meten van meerdere welzijnsconcepten op het werk.

De resultaten van onze studies over het verbeteren van het welzijn van zorgprofessionals worden gepresenteerd in de laatste twee hoofdstukken. **Hoofdstuk 7** illustreert de initiatieven die zijn opgehaald vanuit de Nederlandse universitair medische centra en **Hoofdstuk 8** omvat een systematische literatuurreview en meta-analyse.

In **Hoofdstuk 7** hebben we kwalitatief de welzijnsinitiatieven onderzocht die werden aangeboden door de Nederlandse universitair medische centra. In totaal werden 203 initiatieven verzameld via semigestructureerde interviews. Deze snapshot van initiatieven omvatte coaching, trainingen, programma's, studies, apps en tools. De opgehaalde initiatieven zijn gecategoriseerd en gericht op het verbeteren van fysieke fitheid, mentale fitheid, persoonlijke ontwikkeling en balans, teamwerk, het toerusten van leidinggevendenden en de functie/context.

De meeste initiatieven zijn gericht op individuele zorgprofessionals en slechts enkele richten zich op teams. Uit de analyse blijkt dat de effectiviteit van de aangeboden interventies vaak onbekend is. Bovendien kwam naar voren dat de wensen en behoeften van zorgmedewerkers niet structureel wordt uitgevraagd bij het ontwerpen van initiatieven.

Met de systematische review in **Hoofdstuk 8** wilden we het effect van interventies op het welzijn van zorgprofessionals onderzoeken. Hierbij hebben we gezocht naar interventies die de werkomgeving en het systeem aanpassen. We hebben interventies uitgesloten die zich richten op het aanpassen van individuen. We hebben 54 interventies gevonden die voldeden aan de inclusiecriteria. De interventies omvatten: (a) Management en Organisatie interventies (aanpassen van werkuren, continue verbeteren sessies, aanpassingen van de omgeving zoals licht en geluid, hulpmiddelen ondersteuning in de patiëntenzorg, workflow verbeteringen en het aanpassen van het zorgmodel); (b) Sociale middelen en ondersteuning (emotionele ondersteuning, (extra) personeelsondersteuning en teamoptimalisatie); (c) Persoonlijke ontwikkeling en herstel (nieuwe rolmogelijkheden, ontspanningsmogelijkheden en uitwisselingsprogramma's) en (d) één multi-categorische interventie. De effecten van interventies zijn geanalyseerd voor de uitkomsten: grensoverschrijdend gedrag, werkdruk, communicatie, werkcontrole, support, teamklimaat, leiderschap, concentratie, coping, efficiëntie, emoties, psychologische kenmerken, angst, burn-out, depressie, algemene gezondheid, werktevredenheid, energietekort, fysieke klachten, kwaliteit van leven, slaap, stress, inzetbaarheid, betrokkenheid, verloopintentie, patiëntkwaliteit, patiëntveiligheid en ongewenste gebeurtenissen. Met deze review bieden we een overzicht van effectieve interventies, interventies met onduidelijke effectiviteit en interventies die mogelijk schadelijk kunnen zijn voor zorgprofessionals. Interventies gericht op sociale middelen en ondersteuning laten consistent de meest positieve effecten zien voor verschillende uitkomsten. Echter deze bevinding moet worden geïnterpreteerd met voorzichtigheid, omdat de kwaliteit van het bewijs over het algemeen laag is. Daarnaast zien we veel heterogeniteit in de interventies, uitkomsten en effecten. Dit pleit voor verder onderzoek naar organisatorische interventies met robuustere studie designs, grotere steekproeven, een vaste uitkomsten set voor welzijn, in samenwerking met zorgprofessionals en oog voor contextuele factoren

Tot slot bevat **Hoofdstuk 9** de algemene discussie waarin alle bevindingen worden geïntegreerd en bediscussieerd. Hierbij worden de resultaten in perspectief geplaatst, gereflecteerd op dit proefschrift en aanbevelingen gedeeld.



# **Appendix**

List of publications

PhD Portfolio

About the Author

Dankwoord

Bijschrift omslag

## LIST OF PUBLICATIONS

Boskma A, Braak van der K, Hooft L, Oerbekke M, Franx A, Laan van der M. (2025). Effectiveness of organization-directed interventions on healthcare professionals' well-being: a systematic review. *eClinicalMedicin*. doi.org/10.1016/j.eclinm.2025.103496

Boskma, A., Sturms, L., Franx, A., & van der Laan, M. (2025). Well-being initiatives for hospital employees provided by the Dutch University Medical Centres: an exploratory study. *BMJ Leader*, leader-2023-000891. <https://doi.org/10.1136/leader-2023-000891>

Boskma, A. C. P., Oerbekke, M. S., Hooft, L., Franx, A., Schaufeli, W., & van der Laan, M. J. (2025). Uncovering gaps in workforce well-being: a national look at survey practice in Dutch university medical centres – an exploratory quantitative study. *BMJ Open*, 15(7), e094939. <https://doi.org/10.1136/bmjopen-2024-094939>

Boskma, A., Braak, K., Demenaga, K., Idema, D., Hooft, L., Wietasch, G., Franx, A., & van der Laan, M. J. (2024). Prioritising nurses' and doctors' health at work: a scoping review of monitoring instruments. In *BMJ open* (Vol. 14, Issue 8, p. e079861). <https://doi.org/10.1136/bmjopen-2023-079861>

Boskma, A., van der Braak, K., Ansari, N., Hooft, L., Wietasch, G., Franx, A., & van der Laan, M. (2023). Assessing the Well-Being at Work of Nurses and Doctors in Hospitals: Protocol for a Scoping Review of Monitoring Instruments. *JMIR Research Protocols*, 12. <https://doi.org/10.2196/43692>

Boskma, A. C. P., Wolthuis, F. W., Roelofs, P. D. D. M., van Wijlen, A. T., van Schie, J. E., de Man- van Ginkel, J. M., & Finnema, E. J. (2023). Experienced career perspectives of nursing students and their supervisors in learning departments: a qualitative study. *BMC Nursing*, 22(1). <https://doi.org/10.1186/s12912-023-01479-3>

Boskma, A., & Finnema, E. (2022). Loopbaanpad wetenschappelijk onderzoek. *TVZ - Verpleegkunde in Praktijk En Wetenschap*, 132(2), 40–43. <https://doi.org/10.1007/s41184-022-1091-3>

## PHD PORTFOLIO

**PhD Candidate:** A.C.P. (Amber) Boskma  
**PhD period:** 2021-2025  
**PhD supervisors:** Prof. Dr. Lotty Hooft, Prof. Dr. Arie Franx, Dr. Maarten van der Laan

PhD training and teaching	Year(s)	ECTs
<b>Courses</b>		
General English course	2022	1.80
Live PhD course: introduction session	2023	0.30
Live PhD course: Introduction to biostatistics	2023	1.00
Online course: Introduction to R statistics	2023	1.80
BROK course	2025	0.70
<b>Workshops, masterclasses, seminars</b>		
Grow mindset	2021	0.10
Personal coaching in academic presenting	2022	0.15
Music in Healthcare – NVONN network meeting	2022	0.05
Retaining healthcare professionals – NVONN network meeting	2022	0.10
Risk of Bias assessment – Cochrane webinar	2022	0.10
Introduction to conducting systematic reviews – Cochrane e-learning	2022	0.10
Online course: How to write your DMP	2023	0.50
Online course: REDCAP	2023	0.10
Online course: Privacy in research	2023	0.10
Workshop: Endnote	2023	0.10
Introduction to open access publishing	2023	0.10
Workshop: State of the art in health and welfare – AZW network meeting	2023	0.30
Family care – NVONN network meeting	2023	0.05
The changing role of nurses – NVONN network meeting	2024	0.10
Challenges and Opportunities in a Changing Healthcare Landscape – Alumni Network Meeting Nursing Science Association	2024	0.10
Six-weekly Nursing Research Hub meetings	2024-2025	0.40
Tips & Tricks for Finalizing your PhD	2025	0.10
Grant Support information meetings	2025	0.10

<b>Oral presentations</b>		
'Initiatives of the University Medical Centers in scope' – NFU conference 'Resilient healthcare professionals'	2021	0.50
'Promotion of resilient healthcare professionals' – FMS network meeting	2022	0.50
'Academic career pathways for nurse' – European Nursing Congress 'Future Proof Nursing'	2022	0.50
Served as a panellist in the webinar 'National Action Plan on Professional Autonomy'	2022	0.50
'Measuring and improving the well-being of healthcare professionals' – NFU conference 'Caring for the future'	2023	0.50
'Measuring and improving the well-being of healthcare professionals' – HoRizon knowledge Festival	2023	0.50
'Effectiveness of organizational interventions to improve wellbeing of healthcare professionals: a systematic review' - International Society for Quality in Health Care	2024	0.25
'Well-being works: A work environment that empowers' – NVONN network meeting	2024	0.50
'Well-being works: A work environment that empowers' – Over de Bogen conference	2024	0.25
Keynote session: 'Sustainable Dreams: Well-being science' – Over de Bogen conference	2024	0.25
'Organizational interventions to improve well-being of healthcare professionals' - International Forum on Quality and Safety in Healthcare	2025	0.20
'Well-being of healthcare professionals monitoring and improving' – BM network meeting UMCG	2025	0.10
<b>Poster presentations</b>		
'Assessing nurses and doctors' welfare at work in hospitals: a scoping review of monitoring instruments' - International Forum on Quality and Safety in Healthcare	2023	0.40
'Keep track of doctors' and nurses' well-being' - International Forum on Quality and Safety in Healthcare	2025	0.20
<b>Teaching</b>		
Coaching and supervision of one master's student of Nursing Science	2024-2025	1.00
Coaching and supervision of five junior researchers	2024-2025	3.00
<b>(Inter)national conferences</b>		
RN2Blend conference, Utrecht	2022	0.30
International Forum on Quality and Safety in Healthcare, Gothenburg	2022	0.85
Symposium on Workplace Happiness, WZA Assen	2022	0.15
International Forum on Quality and Safety in Healthcare, Copenhagen	2023	0.50
NFU conference Academic Workplace for Healthcare Practice and Policy: Bridging the Gap Between Practice and Policy, Utrecht	2023	0.30
Symposium on Leadership, WZA, Assen	2023	0.15

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International Forum on Quality and Safety in Healthcare, London	2024	0.60
ZonMw Nursing & Care network meeting, Amersfoort	2024	0.30
International Society for Quality in Health Care, Istanbul	2024	0.25
International Forum on Quality and Safety in Healthcare, Utrecht	2025	0.10
Symposium on Leadership, UMCG, Groningen	2025	0.30
Conference 'Professional Autonomy in Healthcare and the Social Domain', Utrecht	2025	0.30

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## ABOUT THE AUTHOR

Amber Boskma was born on June the 3rd, 1995, in Den Helder, the Netherlands. Her childhood unfolded in Den Oever, where within the warmth of her family, Amber's connection to healthcare began to take shape.



In 2015, she completed her vocational nursing training at Horizon College and began her professional journey as a registered nurse at the Dijklander Hospital in Hoorn. That same year, eager to expand her horizons, Amber moved to Groningen, a place where lectures, friendships, and late-night reflections shaped her, both academically and personally. While studying, she worked at Buurtzorg, immersing herself in primary care. It was during these formative years that Amber's curiosity to research took flight, leading her to the University of Utrecht, where she completed a Master's in Nursing Science. There, she not only explored how to elevate nursing practice through evidence and innovation but also stepped into the field of policy-making. She co-founded the student association *Scientia Una Sanitatis*, a reflection of her vision that knowledge fosters unity. Under supervision of Professor Evelyn Finnema, she completed a policy internship focused on the integration of academic nursing career pathways, planting the seeds of an enduring commitment to the topic of healthcare professionals' well-being. Her Master's thesis built upon the lived experiences of nurses and nursing students, exploring how they perceive their career opportunities. During this time, she also worked as a nurse at the Wilhelmina Hospital in Assen, applying her academic insights to clinical settings and strengthening the connection between theory and practice.

From 2021 to 2024, Amber combined clinical work with her PhD research. She began her PhD at the Netherlands Federation of University Medical Centers, under the guidance of Lotty Hooft, Arie Franx, and Maarten van der Laan. She investigated how to monitor and enhance the well-being of healthcare professionals, a mission that fueled her forward throughout her career. Her research was collaborative, involving policymakers, researchers, and multi-disciplinary healthcare professionals across organizations. She presented her team's work at international conferences such as the International Forum on Quality and Safety in Healthcare and the ISQua Conference, and published in esteemed journals including *BMJ Open*, *BMC Nursing*, and *eClinicalMedicine* (part of *The Lancet*).

Currently, Amber works as a staff advisor at the University Medical Center of Groningen. Her work focuses on advancing the academization of nursing and fostering supportive work environments. Through innovations in technology, workload management, and workflow efficiency, her work consistently aims to strengthen a healthcare system where professionals

can thrive and patients receive the best possible care. It is a vision rooted in empathy, driven by evidence, and sustained by her unwavering belief in the value of those who care.

## DANKWOORD

‘What we call the beginning is often the end. And to make an end is to make a beginning.’– T.S.

*Eliot*

Graag wil ik iedereen bedanken die een bijdrage heeft geleverd aan dit proefschrift.

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Prof. Dr. L. Hooft, beste Lotty, dank voor je kritische blik en motiverende gesprekken. Jij leerde mij hoe ik een goede literatuurreview moet doen. Naast ingewikkelde Sankey-diagrammen, search-updates en evidence synthesis hebben we ook veel gelachen, selfies gemaakt en genoten van R-plotjes. Je hebt altijd oog voor mij als persoon en dat waardeer ik.

Collega's van de NFU, en in het bijzonder Leontien Sturms, dank voor je steun en nabijheid tijdens dit traject. Dank voor de fijne gesprekken die we hebben gehad, je bent een echt mensen mens. Ik ben blij dat jij als mentor betrokken bent geweest. En als ik aan jou denk, denk ik nog altijd aan ons 'ABBA-avondje' in Göteborg.

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Collega's van het Wilhelmina Ziekenhuis Assen, dank voor jullie betrokkenheid en interesse. Met name het team van 'Adeux', het was een feest om met jullie samen te werken. De diensten op de verpleegafdeling waren een welkome afwisseling met het promoveren. Treja de Boer, dank voor de steun en ruimte die je me gaf. Terwijl ik me bezighield met het welzijn van anderen, hield jij oog voor het mijne. Aan de collega's van de Verpleegkundige Staf, dank dat ik deel mocht uitmaken van jullie hechte team. Jullie werk is van onschatbare waarde. De

werksessies in elkaars achtertuin, de open gesprekken, kaartjes en persoonlijke cadeautjes zal ik nooit vergeten.

Graag wil ik mijn mede-promovendi, co-auteurs en collega's bedanken waaronder Tom Bazuin, Eline Groeneweg, Iris Reijmerink, Charlotte Lentz, Götz Wietasch, Dave Dongelmans en Wilmar Schaufeli. Daarnaast wil ik Prof. dr. M.J. Lombarts, Prof. dr. S. Repping, Prof. dr. L. Schoonhoven, Prof. dr. M.J. Schuurmans, Prof. dr. N.J. de Wit en Prof. dr. J.P. Ruurda bedanken voor hun bereidheid zitting te nemen in de lees- en promotiecommissie. Ook wil ik alle deelnemers aan de verschillende studies bedanken voor hun tijd en vertrouwen.

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Ik ben enorm dankbaar voor alle lieve vrienden en familie om me heen. Elisa en Celeste, jullie zijn onmisbaar. Onze vriendschap betekent ontzettend veel, jullie voelen altijd dichtbij. Ik ben enorm trots op jullie! Saskia, je bent een geweldige vriendin geworden. Jij leerde mij dat professioneel samenwerken en vriendschap elkaar niet uitsluiten. Het is heel speciaal dat je mijn paranimf wilt zijn. JC Felime, dank voor al jullie liefde en gezelligheid. Door jullie voelde studeren aan een universiteit als een toegankelijke stap. De herinneringen die we samen hebben gemaakt koester ik, en anders blader ik gewoon door één van onze fotoboeken. Milou, Marleen, Daphne en Annemarie, ondanks de afstand blijven we elkaar vasthouden, en dat betekent veel voor mij. Vrienden van PM, door jullie voelt Groningen als thuis.

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Lieve Matthijs, ik hou ontzettend veel van je. Je laat me vrij, laat me lachen, reflecteren en neemt me mee op avontuur. Jij bent mijn veilige thuishaven.

## BIJSCHRIFT OMSLAG

Wat zie je op het schilderij dat ik voor jou gemaakt heb? Waar we samen uren over hebben gepraat, nagedacht, ideeën over hebben bijgesteld of verworpen hebben, kleuren uitgezocht en bovenal: of het ook recht doet aan jouw onderzoek?

Ik hoop dat jij je in het eindresultaat kunt vinden en er blij mee bent. Het is mij heel dierbaar dat je mij gevraagd hebt, dat je mij het vertrouwen hebt gegeven om je onderzoek in iets visueels om te zetten. Voor mij geldt: ik vond het ontzettend leuk en waardevol om dit proces met jou mee te maken en samen iets te creëren en je zo ook beter te hebben leren kennen.

Het werkkapitaal van een bedrijf, dat zijn alle mensen die er werken, het is het ‘goud’ van elk bedrijf. Ze zijn verschillend van ‘kleur’, net als de persoonlijkheden van de mensen die er werken. De mensen, die als werkgevers en werknemers op het schilderij tegenover elkaar staan (in die zin dat ze naar elkaar kijken en met elkaar in gesprek gaan) zijn samen op weg om in gesprek te blijven voor een betere toekomst in de zorg. Ieder wil het beste voor zijn of haar patiënten, op welke positie je ook zit.

Er is een (symbolische) kloof tussen werkgevers en de zorgprofessionals die met elkaar gedicht moet worden. De mensen kijken elkaar niet onvriendelijk aan. De ideeën en ervaringen die uitgewisseld worden stromen als het ware uit hun hoofd, worden steeds vaster omljnd en gaan al doende een pad vormen. Dat moet samen gelopen worden zodat er met elkaar aan gewerkt wordt. Hierdoor kan het welzijn en de werkomgeving van de professionals in al zijn vormen zich in optima forma ontwikkelen. De weg is lang en slingert, tussen en over heuvels en door bergen. Er zijn al zeker successen geboekt maar het is een lange weg die er afgelegd moet worden die loopt tot ergens in de verte waarvan het einde niet zichtbaar is.

Bergen zijn voor jou een belangrijk element in je leven. De vele vakanties in het buitenland hebben jou natuurschoon en vele vergezichten gebracht, daarvan wilde je graag iets verwerkt zien in het schilderij.

Omdat het zo'n lang traject is en de start van de samenwerking soms lang heeft geduurd zijn er ook mensen die dit niet meer kunnen volhouden of volbrengen. Zij zijn gedurende het traject afgehaakt of buiten de boot gevallen (de leegloop in de zorg). Ook dit is zichtbaar in het schilderij. De poppetjes van goud die een ander pad dan het gezamenlijke pad opgaan/inslaan.

Het goud voert de boventoon met positieve kracht en inzet!

Liefs Janny



