



**TURUN
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UNIVERSITY
OF TURKU

PHD-PREPARED NURSES LEADING THEIR CAREERS

Lisa van Dongen



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ABSTRACT

The aim of this study was to describe the careers of PhD-prepared nurses and analyse leadership practices in the careers as well as support sources for the careers. The first phase comprised the analytics of leadership practices in the careers of PhD-prepared nurses using an interview study with 12 PhD-prepared nurses. Evaluation of a leadership and mentoring program was used to understand leadership practices in the careers and to determine if the program was a support sources for careers. A pre-post-test program evaluation was conducted among 30 participants using questionnaires. Also, focus group interviews were conducted among a convenience sample of 21 participants. The second phase aimed at the analytics of the careers and factors related to the careers including leadership practices in the careers and support sources for careers. An integrative literature review with 22 papers provided a theoretical overview and a cross-sectional survey study with 1308 PhD-prepared nurses was used to gain insight into the current careers and factors related to careers.

The results demonstrate PhD-prepared nurses working in a wide range of positions across different areas of nursing, with most working in positions with research and teaching responsibilities at institutions of higher education. Leadership practices were demonstrated with the aim to advance their careers and included taking initiative for planning and progressing careers. Careers and leadership practices can be supported through programs such as the Nurse-Lead leadership and mentoring program. Factors related to careers that can be influenced by individuals were intrinsic motivation, work-life balance, encountered workplace behaviours, and development of professional and leadership competencies. Support sources for careers included support from family and friends, collegial support, mentoring, educational programs, and organizational infrastructures for careers. The conclusion is that there is large variance in the careers, PhD-prepared nurses demonstrate leadership to advance careers, and there are various support sources for careers. This study provides recommendations for PhD-prepared nurses to lead their careers and recommendations for leaders of professional organizations to develop support sources. Future research is recommended to systematically monitor careers of PhD-prepared nurses and factors related to careers using representative samples.

KEYWORDS: Careers, career support, leadership in careers, leadership practices, multimethod study, PhD-prepared nurses

TURUN YLIOPISTO

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TIIVISTELMÄ

Tämän tutkimuksen tavoitteena oli kuvata tohtorikoulutettujen sairaanhoitajien uria ja analysoida johtamiskäytäntöjä uralla sekä erilaisia tukirakenteita tohtorikoulutettujen sairaanhoitajien uralla. Tutkimuksen ensimmäisessä vaiheessa analysoitiin tohtorikoulutettujen sairaanhoitajien uran johtamiskäytäntöjä haastattelututkimuksen avulla, johon osallistui 12 tohtorikoulutettua sairaanhoitajaa. Tohtorikoulutetuille sairaanhoitajille ja alan väitöskirjatutkijoille suunnatun johtamis- ja mentorointiohjelman avulla analysoitiin uriin liittyviä johtamiskäytäntöjä ja arvioitiin ohjelmaa uran johtamisen tukirakenteena ennen-jälkeen asetelmassa kyselylomakkein 30 osallistujalle, ja teemahaastatteluin 21 osallistujasta koostuvalle harkinnanvaraiselle otokselle. Tutkimuksen toisessa vaiheessa keskityttiin urien analyysiin ja uriin liittyviin tekijöihin, mukaan lukien johtamiskäytännöt ja uran tukilähteet ja -rakenteet. Integroitu kirjallisuuskatsaus (n= 22 artikkelia) tuotti teoreettisen yleiskatsauksen, ja poikkileikkaustutkimus 1308 tohtorikoulutetun sairaanhoitajan maailmanlaajuisessa aineistossa syvensi ymmärrystä urista ja niihin liittyvistä tekijöistä.

Tohtorikoulutettujen sairaanhoitajien urissa on suurta vaihtelua, sillä he työskentelevät monilla eri hoitotyön alueilla erilaisissa tehtävissä. Suurin osa työskenteli tutkimus- ja opetustehtävissä korkeakouluissa. Tohtorikoulutetut sairaanhoitajat hyödynsivät johtamiskäytäntöjä edistääkseen uraansa. Johtamiskäytännöt sisälsivät aloitteellisuutta uran suunnittelussa ja kehittämisessä. Tohtorikoulutettujen sairaanhoitajien uria ja johtamiskompetensseja voidaan tukea ohjelmien, kuten Nurse-Lead-johtamis- ja mentorointiohjelman, avulla. Urakehitykseen vaikuttavia tekijöitä, joita voidaan edistää johtamiskäytännöllä, olivat sisäinen motivaatio, työ- ja yksityiselämän tasapaino, työpaikalla kohdatut käyttäytymismallit sekä ammatillisten ja johtamisosaamisen kehittäminen. Urakehitykselle suotuisiksi lähteiksi kuvattiin kollegiaalinen ja epävirallinen tuki, yhteistyö, mentorointi, koulutusohjelmat ja organisatoriset rakenteet. Johtopäätöksenä on, että työurien välillä on suurta vaihtelua, tohtoriksi valmistuneilla sairaanhoitajilla on johtamiskäytäntöjä työurien edistämiseksi ja että työurien tukemiseksi on erilaisia tukilähteitä. Kehittämis ehdotukset kohdistuvat oman uran johtajuuden ja organisaatioiden uria tukevien rakenteiden edistämiseen. Jatkossa olisi tärkeää kehittää järjestelmällinen tohtorikoulutettujen sairaanhoitajien urien ja niihin liittyvien tekijöiden seurantajärjestelmä, ja jatkaa globaalia tarkastelua.

ASIASANAT: Urat, uran tuki, johtaminen uralla, johtamiskäytännöt, monimene-
telmätutkimus, tohtorikoulutetut sairaanhoitajat

Table of Contents

Abbreviations	7
List of Original Publications	8
List of Figures, Tables and Appendices	9
Figures	9
Tables	9
Appendices	9
1 Introduction	10
2 Review of the Literature	16
2.1 Doctoral education for nurses.....	17
2.2 Workforce of PhD-prepared nurses	20
2.3 Leadership practices of PhD-prepared nurses.....	22
2.3.1 Definition of leadership and leadership practices.....	22
2.3.2 Leadership practices of PhD-prepared nurses in their careers	24
2.3.3 Leadership and leadership practices in this study.....	25
2.4 Support sources for careers of PhD-prepared nurses.....	26
2.4.1 Definition of support sources for careers	26
2.4.2 Significant others and colleagues as support source for careers	26
2.4.3 Mentoring as support source for careers	27
2.4.4 Leadership and mentoring programs as support source for careers	29
2.4.5 Organizational structures as support source for careers	33
2.5 Careers and career experiences of PhD-prepared nurses.....	33
2.5.1 Definition of careers	33
2.5.2 Careers opportunities for PhD-prepared nurses	34
2.5.3 Challenges in the careers of PhD-prepared nurses	36
2.6 Summary and justification for current study.....	37
3 Aims	40
4 Materials and Methods	41
4.1 Study design, sample and setting.....	41
4.2 Data collection methods, instruments and procedures	50

4.3	Data analysis	53
4.4	Ethical procedures and considerations.....	55
5	Results	58
5.1	PhD-prepared nurses practicing leadership in their careers ...	58
5.2	Careers of PhD-prepared nurses	63
5.3	Factors related to careers of PhD-prepared nurses.....	66
	5.3.1 Factors related to PhD-prepared nurses' leading their careers	67
	5.3.2 Factors related to support sources for careers	69
6	Discussion.....	74
6.1	Discussion of the results	74
6.2	Validity and reliability of the study	81
6.3	Practical implications.....	87
6.4	Implications for future research	89
7	Conclusions	91
	Acknowledgements.....	93
	References	96
	Appendices	111
	Original Publications.....	114

Abbreviations

AACN	American Association of Colleges of Nursing
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CVI	Content Validity index
DNP	Doctor of Nursing Practice
DNS	Doctor of Nursing Science
DNSc	Doctor of Nursing Science
DSN	Doctor of Nursing Science
EANS	European Academy of Nursing Science
EUA-CDE	European Council for Doctoral Education
EdD	Doctor of Education
GDPR	General Data Protection Regulation
INDEN	International Network for Doctoral Education in Nursing
JBI	Johanna Briggs Institute
LMNR	Leadership and Mentoring Research program
NAM	National Academy of Medicine
OECD	Organization for Economic Cooperation and Development
PhD	Doctor of Philosophy
VAS	Visual Analogue Scale
WHO	World Health Organization

List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

- I van Dongen, L.J.C., Hafsteinsdóttir, T.B. Leadership of PhD-prepared nurses working in hospitals and its influence on career development: A qualitative study. *Journal of Clinical Nursing*, 2022; 23-24: 3414-3427. doi: 10.1111/jocn.16168.
- II van Dongen, L.J.C., Suidman, L., Henriques, M.A., Jónsdóttir, H., Leino-Kilpi, H., Luderer, C., Suhonen, R., Hafsteinsdóttir, T.B. Improved professional competencies and leadership in PhD-prepared nurses and doctoral students after participating in the cross-national and web-based Nurse-Lead program. *Nursing Outlook*, 2024; 72(2): 102144. doi: 10.1016/j.outlook.2024.102144.
- III van Dongen, L.J.C., Leino-Kilpi, H., Jónsdóttir, H., Meyer, G., Henriques, M.A., Schoonhoven, L., Suhonen, R., Hafsteinsdóttir, T.B. The experiences of doctorally prepared nurses and doctoral nursing students with being mentored in the Nurse-Lead programme: A focus group study. *Nurse Education in Practice*, 2023; 71: 103744. doi: 10.1016/j.nepr.2023.103744.
- IV van Dongen, L., Hafsteinsdóttir, T.B., Broome, M.E., Suhonen, R., Leino-Kilpi, H. Career development of doctorally prepared nurses. *Journal of Advanced Nursing*, 2024; 80(3): 854-870. doi: 10.1111/jan.
- V van Dongen, L.J.C., Hafsteinsdóttir, T.B., Leino-Kilpi, H., Suhonen, R. Careers of PhD-prepared nurses: A global survey. Manuscript.

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List of Figures, Tables and Appendices

Tables

Table 1.	Mentoring programs.....	31
Table 2.	Summary of careers of PhD-prepared nurses.....	36
Table 3.	Summary of challenges	37
Table 4.	Research methods used in the study.....	43
Table 5.	Methods of data analysis	55
Table 6.	Research ethics	56
Table 7.	Development of LPI leadership practices in the Nurse- Lead program	60
Table 8.	Development of professional competencies in the Nurse-Lead program.....	61
Table 9.	Development of research competencies in the Nurse- Lead program	62
Table 10.	Current positions of PhD-prepared nurses	65
Table 11.	Current working organizations of PhD-prepared nurses.....	66
Table 12.	Preparation on professional competencies	68
Table 13.	Summary of strengths and weakness of the study.	86

Figures

Figure 1.	Theoretical framework of the study.	13
Figure 2.	Study phases and steps.....	15
Figure 3.	Study samples.	49
Figure 4.	Summative structure: Factors related to careers of PhD-prepared nurses.	72

Appendices

Appendix 1.	Search strategy per database.....	111
Appendix 2.	Professional and research competencies.	113

1 Introduction

The Doctor of Philosophy (PhD) degree is the highest academic degree and prepares nurses to contribute to the advancement of health care and nursing by conducting research and translating innovative knowledge into the nursing discipline (AACN, 2016; AACN, 2022; EUA Council for Doctoral Education, 2022). Nursing has an important role in improving the health of individuals and populations by – among other things - enhancing care outcomes and experiences as well as advancing health equity, while reducing health care costs (Joseph et al., 2021; NAM, 2021). Individuals with PhD degrees in nursing science (hereafter referred to as PhD-prepared nurses) have a critical role in conducting scientific research on these matters, thereby promoting excellence in nursing to improve the health of individuals and communities (NAM, 2021; Polomano et al., 2021; Thompson et al., 2024). In most countries the PhD degree is the preferred academic credential for nurse educators in university settings, hence PhD-prepared nurses are often engaged in teaching and mentoring of nursing students, nurses, and nurse scientists (Broome et al., 2018; Bullin, 2018; McKenna et al., 2024). In addition to these responsibilities, PhD-prepared nurses are also considered to be stewards of the discipline as they are responsible for the advancement of the nursing discipline, defining the uniqueness of nursing science as well as the preservation of the history, fundamental ideas, and philosophies inherent to nursing science (AACN, 2022).

Careers of PhD-prepared nurses can be established in different areas of nursing, however, PhD-prepared nurses often develop research careers at institutions of higher education (AACN, 2022; Dreifuerst et al., 2016; Oerman et al., 2018). A research career is usually divided into four stages, starting as an early career researcher working on doctoral studies. The second career stage is the postdoctoral stage including those who recently finished their doctorate. The third stage is the level of advanced independent researchers. Finally, the fourth step is professorship (European Commission, 2011). Career opportunities for PhD-prepared nurses also emerge in non-academic settings including clinical settings, politics, and industry (Broome et al., 2018; Clarke, 2024; Dobrowolska et al., 2021). Despite limited knowledge on careers of PhD-prepared nurses, it is known that they often combine various positions and roles in different areas of nursing including research, teaching,

administration, and/or clinical practice (AACN, 2022; Chavez et al., 2021; Rugs et al., 2020). Although working in different areas supports the integration of knowledge and expertise, it can also lead to role complexity and ambiguity (Chavez et al., 2021; Negarandeh et al., 2022).

Challenges related to the careers of PhD-prepared nurses have been reported (de Lange et al., 2019; Hafsteinsdóttir et al., 2017; McKenna, 2021), many of which are similar to challenges experienced by postdoctoral researchers in other disciplines (Engels et al., 2024; European Network of Postdoctoral Associations, 2019). In the early career phase, PhD-prepared nurses experience challenges related to the preparation for postdoctoral positions, and especially the preparation for teaching positions is often discussed (Bullin, 2018; McKenna, 2021; McNelis et al., 2019; McPherson et al., 2023). Also, PhD-prepared nurses may be faced with a lack of career pathways, limited availability of positions, and/or lack of criteria for career advancement (Al-Nawafleh et al., 2013; de Lange et al., 2019; Hafsteinsdóttir et al., 2017; McKenna, 2021; Scarsini et al., 2022). Other issues related to the employment of PhD-prepared nurses include limited opportunities for research funding, high workloads, short term-contracts, and unsatisfactory salaries (Aquino et al., 2018; de Lange et al., 2019; Fang et al., 2016; Hafsteinsdóttir et al., 2017; McKenna, 2021; McKenna et al., 2024; Scarsini et al., 2022).

Leadership is often described as a process that entails influence, occurs within a group setting, and involves achieving goals reflecting a common vision (Northouse, 2016; Northouse, 2019). According to Broome (2015) leadership in science concerns learning the full spectrum of research and developing a personal vision that is inclusive of all knowledge generation and knowledge translation, while demonstrating advocacy skills and showing courage to use innovative approaches. Moreover, leadership in nursing science is not only about serving the needs of individuals and communities through the conduct of research, leadership also involves individual reflective approaches to develop a personal vision and increase self-awareness and self-understanding (Broome, 2015). In this study, the leadership of PhD-prepared nurses is explored with a focus on PhD-prepared nurses demonstrating leadership practices to lead and advance their careers, hereby assuming that individuals can influence their careers by demonstrating leadership practices. The definition of leadership by Cummings (2012) was used to guide the exploration of the leadership practices of PhD-prepared nurses in their careers: “leadership is being able to see the present for what it really is, see the future for what it could be and then take action to close the gap between today's reality and the preferred future of tomorrow” (p. 3325). PhD-prepared nurses are expected to benefit from leadership practices in their careers because they often work in complex positions and/or work environments (NAM, 2021; Singh et al., 2022a). Although limited studies have been conducted on the leadership practices of PhD-prepared

nurses, their leadership is expected to contribute to individual success and organizational outcomes (NAM, 2021; Singh et al., 2022a). However, it seems that the development of leadership practices often is not included in doctoral education for nurses (Broome, 2015; McKenna, 2021). In addition, a limited number of educational opportunities for PhD-prepared nurses to develop leadership practices has been reported (Hafsteinsdóttir et al., 2017).

Support sources for the careers of PhD-prepared nurses have been addressed in the earlier literature. Mentoring was identified as an important support source for careers since mentoring can contribute to career progression and professional development (Busby et al., 2022; Cullen et al., 2017; Hafsteinsdóttir et al., 2017; Loerzel et al., 2021; Nowell et al., 2017). Moreover, formal and informal support from colleagues, managers, and significant others was experienced as highly valuable since it provides opportunities to discuss work challenges and career decisions (de Lange et al., 2019; Poronsky et al., 2012; Orton et al., 2019; Scarsini et al., 2022). Also, international and cross-cultural collaborations were found to support the professional and research development (Scarsini et al., 2022). Various educational programs focusing on professional development of PhD-prepared nurses were found to be valuable sources of support as evaluations showed growth in a range of career and professional outcomes (Hafsteinsdóttir et al., 2017; Hafsteinsdóttir et al., 2020; Kelley et al., 2023; Nowell et al., 2017; Tabloski, 2016; Weaver et al., 2023). Support sources for careers often aim at individuals in early career stages, while it is argued that those in later career stages also benefit from them since responsibilities are increasing and career goals are changing (Eldeirawi et al., 2023). Currently, there is no overview of support sources for careers of PhD-prepared nurses and it is not known to what extent support sources are available.

The aim of this study was to describe the careers of PhD-prepared nurses and analyse leadership practices in the careers and support sources for careers (Figure 1). The findings from this study contribute to the understanding of the careers of PhD-prepared nurses by producing knowledge on – among other things - the positions, areas of nursing PhD-prepared nurses work in as well as the working activities they engage in. Leadership practices in the careers are reported and a summative structure with factors related to careers of PhD-prepared nurses is produced, including factors related to the leadership practices of PhD-prepared nurses and support sources (Polit et al., 2017; Nilsen, 2020). Analysis of factors related to the careers resulted in recommendations to strengthen the careers of PhD-prepared nurses. It is important that PhD-prepared nurses can advance their careers since they have a fundamental contribution to the advancement of nursing science and the nursing discipline (AACN, 2022; Dobrowolska et al., 2021; Joseph et al., 2021). Empowered PhD-prepared nurses with careers in various areas of nursing are needed to secure evidence-based practices of nurses and a well-educated nursing workforce,

contributing health and well-being of individuals, populations and communities worldwide.

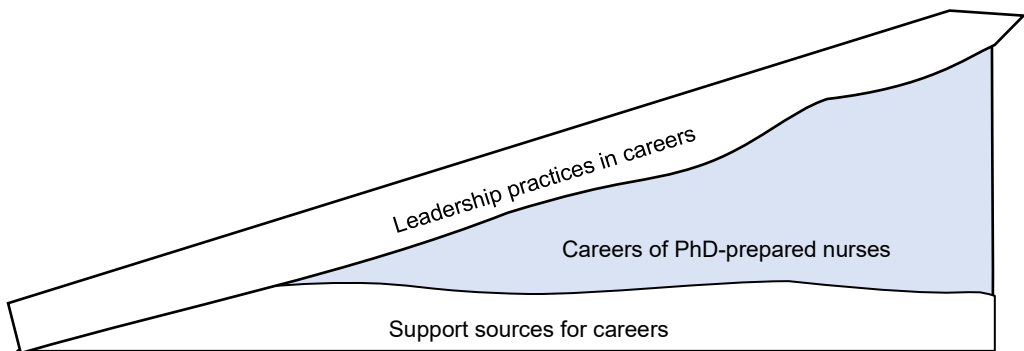


Figure 1. Theoretical framework of the study.

The main concepts in this study are leadership practices in the careers, careers of PhD-prepared nurses, and support sources for the careers (Figure 1), explored in two study phases and five study steps. The first phase comprised the analysis of leadership practices in the careers of PhD-prepared nurses, studied through three steps. The first step consisted of the conduct of an explorative study to gain understanding of the leadership practices of PhD-prepared nurses in their careers (paper I). This study provided insights into how leadership practices were demonstrated in careers. At the same time, there was an opportunity to explore leadership practices of PhD-prepared nurses through a leadership and mentoring program, the Nursing Leadership Educational Program (Nurse-Lead program) (van Dongen et al., 2020). The second and third step of this study focused on the leadership and mentoring program and allowed to study two perspectives. First, evaluations of the program provided an understanding of the contribution of leadership practices to the careers of PhD-prepared nurses (papers II and III). Second, it could be determined if such leadership and mentoring programs are support sources for the careers of PhD-prepared nurses (papers II and III). Thereby, the evaluation of the leadership and mentoring program provides insights into leadership practices of PhD-prepared in their careers as well as support sources for the careers.

While analyzing the leadership in the careers in phase I, it became apparent there is variation in the careers and that multiple factors are related to the careers of PhD-prepared nurses. Due to limited empirical knowledge of the careers and a lack of overview of factors related to the careers of PhD-prepared nurses, it was decided to broaden the scope of the study by exploring careers and factors related to careers in the second phase. The second phase comprised two steps. The first step was the

conduct of an integrative literature review to provide a theoretical overview of the careers of PhD-prepared nurses and factors related to the careers including factors related to PhD-prepared nurses leading their careers and support sources for careers (paper IV). In the second step, a survey study was conducted to analyse the careers and factors related to careers identified in the integrative literature review (paper IV), incorporating global data on the current situation to acquire a comprehensive understanding (paper V). Findings from all study steps were used to produce a summative structure with factors related to the careers of PhD-prepared nurses.

This study is divided into two study phases, nevertheless, the study phases are closely connected and both contributed to knowledge development on the main concepts in this study (Figure 1). Findings from the first phase guided the development of the second phase through the identification of areas benefiting from further research to gain a more comprehensive understanding of the main concepts of this study. This resulted in the development of two study steps in the second phase primarily focusing on the careers and factors related to careers (Figure 2).

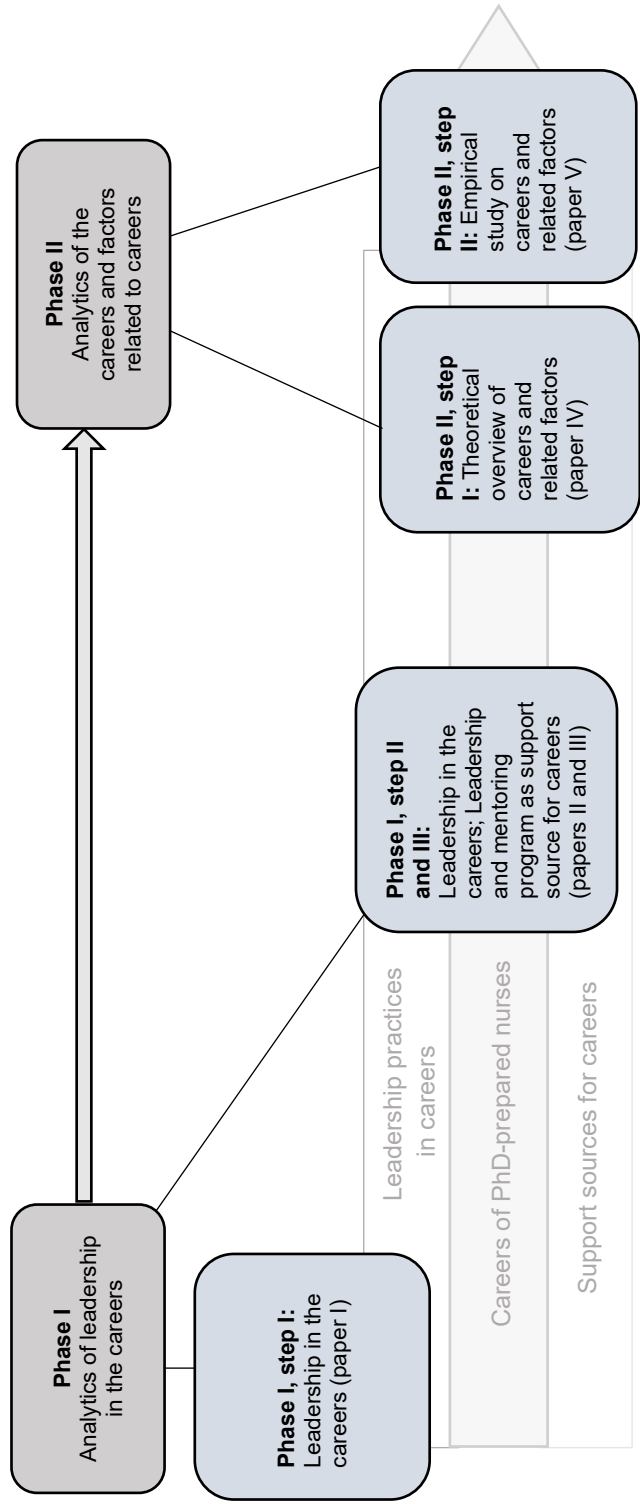


Figure 2. Study phases and steps.

2 Review of the Literature

This chapter provides a theoretical background on the main concepts of this study. The main concepts of this study are leadership practices in the careers of PhD-prepared nurses, careers of PhD-prepared nurses, and support sources for careers. This chapter starts with elaborating on context of the careers of PhD-prepared nurses, thereby the context of this study, by describing the historical progression and current state of doctoral education for nurses as well as characteristics of the PhD-prepared nursing workforce. Hereafter, the main concepts of the study will be presented corresponding to the sequence of the study phases and steps, starting with leadership practices in the careers, followed by support sources for the careers and careers of PhD-prepared nurses.

This review of the literature provides definitions or descriptions of the main concepts of this study, followed by the presentation of current knowledge on the concepts. Varying definitions of the main concepts exist in the literature, therefore, this chapter clarifies how the concepts were perceived in the current study (Rodgers, 1989; Slife et al., 2016). This chapter supplements the integrative literature review (paper IV), which lacked definitions of the main concepts and did not cover all main concepts of this study, such as the analytics of leadership practices in the careers of PhD-prepared nurses. The findings of the integrative literature review (paper IV), however, guided the development of the review of the literature. The findings of the integrative literature review (paper IV) were used to comprehensively address the careers and support sources for careers in this chapter. This chapter also builds upon the findings of the integrative literature review (paper IV) by providing new insights into these main concepts through the inclusion of studies published after the completion of the integrative literature review (paper IV), as well as other data sources and types of studies, such as books, systematic reviews, and editorials. The methods and findings of the integrative literature review (paper IV) are presented in full in the following chapters (chapter 4 Materials and methods and chapter 5 Results).

To cover the whole area of the main concepts addressed in the study, seven searches were conducted, including: 1) doctoral education for nurses; 2) the PhD-prepared nursing workforce; 3) leadership and leadership practices of PhD-prepared

nurses; 4) mentoring of PhD-prepared nurses; 5) Leadership and/ or mentoring programs for PhD-prepared nurses; 6) support sources for careers of PhD-prepared nurses; and 7) careers of PhD-prepared nurses. Searches were performed in PubMed (Medline), Cumulative Index in Nursing and Allied Health Literature (CINAHL), and the Cochrane Library from earliest until 8 December 2023. In the search strings the following search terms were used: nurse faculty, academic nurs*, postdoctoral nurs*, nurse professor, doctorally prepared nurse*, PhD nurs*, PhD-prepared nurse*, nurse scientist*, Faculty Nursing, doctoral education, PhD degree, Doctor of Philosophy, workforce, careers, leadership, leadership development, mentoring, mentoring program, leadership program, support, informal support, collegial support, peer support, and career support. Although mentoring and leadership, and/or mentoring programs are part of the support sources for the careers, separate searches were conducted on these topics since this study addresses the development and evaluation of a leadership and mentoring program for PhD-prepared nurses (papers I and II). A thorough understanding of these concepts is essential to justify the program's development and enhances the interpretation of findings in the program evaluations.

The reference lists of relevant studies were reviewed and several books were used. In addition to the searches in literature databases, books, and websites of relevant organizations were searched. The websites encompassed global, European, and national health care and nursing (science) organizations as well as organizations aiming at (postdoctoral) researchers, including the World Health Organization (WHO), International Council of Nursing, International Network for Doctoral Education in Nursing, European Academy of Nursing Science, EUA Council for Doctoral Education, European University Association, Organisation for Economic Co-operation and Development (OECD), American Association of Colleges of Nursing (AACN), and the National Academy of Medicine (NAM).

2.1 Doctoral education for nurses

The **history of doctoral education** for nurses started in the early 1920's with the first doctoral program for nurses being founded at the Teacher College at the Columbia University in the United States (Hafsteinsdóttir et al., 2019). Although PhD degrees have been awarded to nurses since the 1920s, many nurses continued to pursue Doctor of Education (EdD) degrees or earned PhDs in other disciplines, such as the basic and social sciences, until the 1960s (Dobrowolska et al., 2021a; Hafsteinsdóttir et al., 2019; Reid Ponte et al., 2015). Worldwide the number of doctoral programs for nurses increased since the 1970's with an exponential growth in the last decades (Dobrowolska et al., 2021a; Villarruel et al., 2021; Reid Ponte et al., 2015). Doctoral education for nurses also has a long history in Europe

(Dobrowolska et al., 2021; Hafsteinsdóttir et al., 2017; McKenna, 2018), starting with nurses obtaining EdDs and PhDs in other disciplines. Although the PhD in nursing became available 1961 in the United Kingdom, the numbers of nurses graduating from PhD programs in nursing started to grow in 1990's (Kim et al., 2022; McKenna, 2018). At this time, in Europe, the development of doctoral education was strengthened by the Salzburg Principles as a part of the Bologna Process, which focused on more cohesiveness in the higher education systems across Europe (Dobrowolska et al., 2021a; EUA Council for Doctoral Education, 2022). In recent decades, there has been a growth of doctoral programs for nurses in Europe (Dobrowolska et al., 2021a), with doctoral education currently being offered in most Western European countries (Hafsteinsdóttir et al., 2019). There is large variation in the state of doctoral education for nurses worldwide. There are countries with advanced numbers of programs and structures for doctoral education for nurses, while other countries recently launched the first doctoral program or have no doctoral programs for nurses (Dobrowska et al., 2021a; Hafsteinsdóttir et al., 2019; Kim et al., 2022; Taneva et al., 2023). Differences also have been reported in the titles, the curriculum, competencies, and career opportunities after the doctoral programs for nurses within and across countries (EUA Council for Doctoral Education, 2022b; Dobrowska et al., 2021a; McPherson et al., 2023).

The **PhD degree** serves as an academic degree that expresses the ability to conduct research following academic standards, demonstrated through a dissertation memo or publishing of scientific articles (AACN, 2022; EUA Council for Doctoral Education, 2019). The PhD degree in nursing prepares individuals to create and translate innovative knowledge and to be the stewards of the nursing profession by contributing to the development of nursing science, define its uniqueness, maintain its professional integrity, and educate the next generation of nurses and nurse scientists (AACN, 2022; McNett et al., 2021). The PhD degree in nursing science, therefore, primarily prepares individuals for careers in research and scholarship (AACN, 2022; Bednash et al., 2014; Dobrowolska et al., 2021a). Nurses with PhD degrees often work at nursing science departments within universities. These nursing science departments can also employ other (allied) health care professionals. PhD-prepared nurses can also be employed at health science departments or at faculties of medicine (Kim et al., 2015; Zungolo, 2003).

Doctoral education comprises the conduct of research in a particular area related to nursing and includes the development of methodological research expertise, development of competencies to conduct socially meaningful science, development of transferable skills as well as the development of knowledge within the science of nursing (AACN, 2022; Villarruel et al., 2021; Weaver et al., 2023). The research is supervised by senior academics (EUA Council for Doctoral Education, 2019). PhD education is considered as a post-master's educational

pathway (AACN, 2022; European Commission, 2021). In European PhD programs, doctoral students generally conduct (funded) research, spending up to 4 years (full-time) or longer (part-time) on producing a thesis (European Education Area, 2021; Ketefian et al., 2005; McKenna, 2018). The thesis describes a research project, often including different studies on a coherent line of research. In the United States, PhD programs are often structured programs with taught curricula, while students are also conduct research projects to complete a dissertation thesis (AACN, n.d.). Doctoral programs in Europe focus on the conduct of original scientific research and the programs often include flexible, individualized theoretical coursework to support diverse paths for professional growth alongside research activities (EUA Council for Doctoral Education, 2019; Ketefian et al., 2005). Most of the European doctoral programs also include some required theoretical courses (European University Association, 2010; McKenna, 2018)

PhD-prepared nurses need to develop **a wide range of competencies** to be able to develop careers within different academic or non-academic settings (Numminen et al., 2019; Smaldone et al., 2021). Therefore, in addition to the development of research competencies during PhD education, individuals also need to develop more generic competencies and skills (EUA Council for Doctoral Education, 2019), which is also common in other disciplines (EUA Council for Doctoral Education, 2019). Numminen et al. (2019) reported 15 competencies important for establishing successful research careers of postdoctoral nurses which include the management of: research field; research skills; research ethics; cognitive competence; self-management; research communication; team working; team leadership; resources; career; pedagogical elements; implementation of research results; future visions; technical competence; and intercultural competence. To what extent these competencies are expected from PhD-prepared nurses may differ between the field of work, type of position, and career stage (Numminen et al., 2019).

The structure and content of doctoral nursing programs have **evolved to sustain and enhance the quality of PhD education** since the structure and content of doctoral programs for nurses needs to correspond to contemporary advancements in science, nursing, and healthcare (Broome et al., 2023). A recent development that has been reported includes doctoral programs reducing the core requirements and expanded opportunities for individualization in the programs, accommodating diverse careers and research interests with varying content and approaches (Fairman et al., 2021). Also, reflections on the content of the doctoral curricula resulted in the introduction of new topics into the doctoral programs including topics such as innovation and design thinking, data science, population health, health equity, health policy, informatics, community building, team science, and interprofessional teamwork (Broome et al., 2023; Fairman et al., 2021; Giordano et al., 2021). In recent years, there also has been a debate on the preparation for teaching and faculty

roles during doctoral education as some of the graduates did not feel sufficiently prepared to become independent teachers (AACN, 2022; Broome et al., 2018; Broome et al., 2023; Stanfill et al., 2019; Villarruel et al., 2021). Given the fact that teaching is often a required part of the work of PhD-prepared nurses, various studies reported there may be too little attention for the development of teaching and pedagogical competencies compared to the development of research competencies (Dobrowska et al., 2021a; McNelis et al., 2019; Nehls et al., 2016).

The **professional doctoral degree** is available to nurses in addition to the research-orientated PhD degree. In the 1960's some universities in the United States started with the professional doctorate; the Doctor of Nursing Science (DNS, DNSc or DSN) degree. This doctorate primarily focused on knowledge implementation (Reid Ponte et al., 2015). While the distinctions between the PhD degree and professional doctoral degrees appeared to be well-defined initially, they became increasingly ambiguous in practical application. This resulted in the development of another professional degree, the purely clinically oriented Doctor of Nursing (Reid Ponte et al., 2015). In 2004, the AACN recommended the new Doctor of Nursing Practice (DNP) degree for advanced practice nurses, thereby passing out earlier professional doctorates (AACN, 2004; Bednash et al., 2014; Reid Ponte et al., 2015). The DNP prepares clinical leaders with a focus on translating and applying research findings with the purpose of improving patient and organizational outcomes (AACN, 2004; Bednash et al., 2014; Reid Ponte et al., 2015; Dobrowska et al., 2021). Currently, the DNP degree is implemented in a limited number of countries, including the United States and the United Kingdom (AACN, 2022; Murphy et al., 2015). Although the PhD and DNP are different degrees, in practice unclarity and blurring of requirements and responsibilities has been reported (Cowan et al., 2019; Parse, 2021). Nurses with PhD and DNP degrees have complementary competencies, therefore collaboration between nurses with different types of doctoral degrees is expected to have a positive impact on the quality of care (Cygan et al., 2019).

2.2 Workforce of PhD-prepared nurses

PhD-prepared nurses account for a **small proportion of the nursing workforce** (AACN, 2022). Globally no reliable data exist on the number of nurses with PhD degrees due to a lack of central registration in most countries (Kim et al., 2022). Kim et al. (2022) reported the percentages of PhD-prepared nurses within the nursing workforce across a sample of countries and found percentages ranging between 0.05% in Egypt and 4.7% in Brazil, with the majority of countries reporting a percentage below 1%. This is similar to the estimation of the AACN in 2022, reporting a percentage below 1% (AACN, 2022).

The size of the PhD-prepared nursing workforce has been identified as a **critical issue** for the nursing profession well over a decade ago (AACN, 2010; Boamah et al., 2021; Vance et al., 2020). The Institute of Medicine reported this to be a direct risk for the quality and safety of patient care and well-being of health care workers (Institute of Medicine, 2011; Margolis et al., 2023). The shortage of PhD-prepared nurses contributes to nursing shortages since there are not enough PhD-prepared nurses to teach nurses at the Bachelor, Master, and doctoral level (Feldman et al., 2015; Margolis et al., 2023). In the United States, a shortage of qualified nursing faculty has resulted in the rejection of many qualified applicants to nursing programs (AACN, 2022b). The urge to strengthen the PhD-prepared nursing workforce is enforced by **workforce characteristics** such as the relatively high age of the current workforce (Vance et al., 2020). Additionally, nurses often pursue PhD education at a relatively advanced age, which can lead to shorter careers before retirement (Vance et al., 2020; Boamah et al., 2021).

Despite the critical need to increase the number of nurse scientists, to this day the **enrolments into most PhD programs** have remained nearly flat (AACN, 2022). However, the applications to doctoral nursing programs and the numbers PhD-prepared nurses seem to only have been systematically monitored and published in United States (AACN, 2022). The OECD in Europe monitors the number of applications for doctoral programs in health and welfare. Increased numbers of applications were found in 37 European countries between 2013 and 2020, however, these numbers are not specific to nursing (OECD, 2024). The rapid growth of the professional doctorates in some countries may have influence on the number of applicants for PhD programs (Vance et al., 2020). The number of applicants to nursing PhD programs may also be impacted by limited funding opportunities for doctoral research (Vance et al., 2020). However, it may be that few nurses are interested in doctoral education since it is associated with high educational costs, expectations of poor financial compensation, high workloads, and some report negative perceptions of academic politics (Boamah et al., 2021; Fang et al., 2016). **Recruitment strategies** to increase the number of PhD-prepared nurses have been explored, mostly in the United States, and included encouraging early entry of nurses into PhD programs, shortening time to degree completion, and attracting potential students from other disciplines to doctoral programs for nurses (AACN, 2010; Fairman et al., 2021; Giordano et al., 2023). Also, personalized approaches such as identifying and supporting promising students may be effective (Bourgault et al., 2023).

There are **global and local organizations, initiatives, and networks** to support the PhD-prepared nursing workforce through the advancement of nursing science and doctoral education for nurses. The International Network for Doctoral Education in Nursing (INDEN) is a professional association dedicated to the advancement of

quality doctoral nursing education globally by, among other things, supporting global networking and professional advancement, advancement of curricula, program evaluation of doctoral education, encouraging collaborative research, educational initiatives, and the dissemination of innovation in doctoral nursing education (INDEN, 2023). In Europe, the European Academy of Nursing Science (EANS) is a network aiming to advance nursing science by building a scientific community and facilitating collaboration and leadership in nursing through excellence in research and scholarly achievement. Collaboration among universities and individuals is fostered through summer schools, conferences, and annual meetings (EANS, n.d.). There are also initiatives to advance doctoral and postdoctoral education across disciplines. One example is the European Council for doctoral education. In 2008 the EUA-CDE was launched at the initiative of the European University Association, responding to a growing interest in doctoral education and research training. Currently, over 260 institutions in 36 countries collaborate to advance doctoral education (EUA Council for Doctoral Education, n.d.).

2.3 Leadership practices of PhD-prepared nurses

2.3.1 Definition of leadership and leadership practices

Leadership has been defined in many ways (Northouse, 2016; Northouse, 2019). Most definitions of leadership include a person who is effective in influencing others to achieve goals that reflect a common vision (Cummings et al., 2018; Northouse, 2016). In line with this, leadership is often described as a process that entails influence, occurs within a group setting, and involves achieving goals reflecting common vision (Northouse, 2016). Cummings (2012) established a definition of leadership focusing on the leader's approach to reach a goal: "Leadership is being able to see the present for what it really is, see the future for what it could be and then take action to close the gap between today's reality and the preferred future of tomorrow" (p. 3325). This definition is grounded in self-awareness, serving as a basis for shaping interpersonal relationships (Cummings, 2012).

Many **theories on leadership** have been developed in the last decades. Consensus about the definition and meaning of these theories is often lacking (Harrison, 2017; Marshall et al., 2020). It is beyond the scope of this chapter to comprehensively report each of the leadership theories available. Leadership, however, has a long history and the perspectives on leadership have evolved (Marshall et al., 2020). Earlier leadership theories often focused on formal organizational processes. These more conservative perspectives emerged in the industrial revolution and often focused on hierarchical lines of power and persons

with authority. In the mid-20th century a shift was made from the focus on organizational structures to the individuals in the organization, resulting in behavioural or trait theories. These theories emphasize characteristics of the leader and emotional intelligence was recognized as an attribute for effective leaders (Marshall et al., 2020). Through this development a shift was made from assigned leaders to emergent leadership (Northouse, 2016). Situational leadership theories became popular in response to the trait theories, emphasizing the influence of situational characteristics on the emerging of leaders (Harrison, 2017; Marshall et al., 2020). Currently, common approaches to leadership include the trait approach, skills approach, behavioural approach, and the situational approach as well as transformational leadership, authentic leadership, and adaptive leadership (Northouse, 2016).

Recent views on leadership in nursing state that leaders can be found throughout all levels of organizations, including the leadership of nurses with academic degrees (Broome, 2015). Broome (2015) reported a **definition of leadership in nursing science** describing that leadership in nursing science involves the full spectrum of the planning and conduct of research, while developing a personal vision that is inclusive of all knowledge generation and knowledge translation, while demonstrating advocacy skills and showing courage to use innovative approaches. Therefore, in the context of nursing science, leadership goes beyond the conduct of research to meet the needs of individuals and communities; it also involves individual reflective practices that require a personal vision, self-awareness, self-understanding, and self-efficacy (Broome, 2015; Singh et al., 2022a).

Leadership practices are defined as specific actions, behaviours, and strategies used to achieve goals (Bass et al., 2006). The different approaches to leadership include a variety of leadership practices, skills, and behaviours as well as personality traits (Bass et al., 2006; Marshall et al., 2020; Northouse, 2016). In general, leadership practices focus on actions, behaviours, and strategies necessary to plan and carry out significant changes (Northouse, 2016). Kouzes & Posner (2017) have developed a model with leadership practices that is commonly used to describe leadership practices of individuals without focusing on specific disciplines. The model includes five categories with leadership practices: a) Model the way; b) Inspire a shared vision; c) Challenge the process; d) Enable others to act; and e) Encourage the heart (Kouzes et al., 2017). Model the way involves an individual setting the example by aligning their actions with shared values. Inspire a shared vision involves an individual that is able to envision a future with exciting possibilities and involve others in this. Challenge the process includes an individual searching for innovative ways to improve including taking risks and learning from experience. Enable other to act involves the development of trusting and facilitating relations and supporting others in their competence development. Encouraging the heart includes an individual that shows

appreciation for individual excellence and development of a community of spirit, in which successes are celebrated (Kouzes et al., 2017).

2.3.2 Leadership practices of PhD-prepared nurses in their careers

The **importance and need for leadership** practices of nurses across all areas and levels of nursing and health care has been emphasized in various global reports (All-Party Parliamentary Group on Global Health, 2016; Global Advisory Panel on the Future of Nursing & Midwifery, 2017; International Council of Nurses, 2021; Institute of Medicine, 2011; NAM, 2021). In addition to these reports, different literature reviews reported that leadership practices of nurses contributed to improved health outcomes of patients as well as improved workforce and organizational outcomes (Alilyyani et al., 2018; Cummings et al., 2018; Wong et al., 2013). These literature reviews, however, included studies focusing on leadership of nurses working in clinical settings, and therefore did not take into account the outcomes of leadership practices by nurses with masters or doctoral degrees.

In this study, it was decided to focus on the leadership practices of PhD-prepared nurses, focusing on how they exhibit **leadership practices to advance their careers**. This was decided based on the premise that leadership practices of PhD-prepared nurses contribute to their careers and professional success. Currently there are limited studies on leadership practices of PhD-prepared nurses as well as outcomes of the leadership practices. It, however, may be expected that leadership of nurses with master's and doctoral degrees contributes to their professional success as well as positive outcomes for organizations and students (NAM, 2021; Singh et al., 2022a). Besides, it is reported that PhD-prepared nurses often work in complex roles and/or work environments, and therefore it is expected that they will encounter challenges and/or setbacks in their careers (Joseph et al., 2021; McKenna, 2023; NAM, 2021; Park et al., 2023; Patterson et al., 2020; Singh et al., 2022). At these times, leadership practices may support the careers of PhD-prepared nurses through having a clear vision on their careers as well as showing persistence in reaching career goals and showing resilience (de Lange et al., 2019; Joseph et al., 2021).

One of few studies addressing leadership of PhD-prepared nurses and the influence of leadership practices on careers was conducted by de Lange et al. (2019). This study reported that PhD-prepared nurses show leadership with the aim of being a role model for others by advising them and sharing their vision on nursing. The perspectives of the PhD-prepared nurses were in line with the earlier mentioned definitions by Northouse (2016) and Cummings (2012) since the PhD-prepared nurses described leadership as having a vision for the future as well as the potential influence they can have on others. Regarding the leadership practices in the careers,

it was reported that the PhD-prepared nurses took the lead in their career and perceived their careers to be a conscious process, in which they needed to be vocal about their career ambitions and have a career plan. Differences in gender were described; men were more vocal about their ambitions and took the initiative for promotion, while women were less vocal and more modest about their ambitions as they did not describe personal ambitions but addressed their contribution to nursing instead (de Lange et al., 2019).

Although leadership practices may be expected from nurses (All-Party Parliamentary Group on Global Health, 2016; Global Advisory Panel on the Future of Nursing & Midwifery, 2017; Institute of Medicine, 2011; International Council of Nurses, 2021), including PhD-prepared nurses, it has been reported that PhD-prepared nurses have limited opportunities for **development of leadership practices** (Broome, 2015, Hafsteinsdóttir et al., 2017; McKenna, 2021). It may be expected that leadership practices are developed during doctoral education, however, there are differences in opportunities for doctoral students to work on their leadership practices. Doctoral nursing students (i.e. doctoral researchers, PhD students) often work alone on their own research project (Broome, 2015). Singh et al. (2022a) studied personal and professional leadership of nurse academics' from the United States, with leadership being defined as the confidence individuals have in their own capabilities to lead others. Findings indicated that 69% of the participants, of which most held a PhD degree, had experienced some type of leadership training. However, 81% of participants thought that additional leadership training would be beneficial (Singh et al., 2022a).

2.3.3 Leadership and leadership practices in this study

In summary, this study focuses on leadership practices of PhD-prepared nurses defined as actions, behaviours, and/or strategies used to achieve (career) goals. This study explores leadership practices in the careers of PhD-prepared nurses, whereby leadership was introduced following the definition of Cummings (2012): "Leadership is being able to see the present for what it really is, see the future for what it could be and then take action to close the gap between today's reality and the preferred future of tomorrow" (p. 3325). Hereby, PhD-prepared nurses were stimulated to reflect on leadership practices in their careers, while using a uniform definition of leadership that allowed reflection on their leadership practices from a broad perspective, suitable for a topic that received limited attention in existing research (Pilot et al., 2017). The definition of Northouse (2016) was introduced in the latter study steps. This definition includes concrete and measurable elements, operationalized in validated instruments, which proved valuable in evaluating leadership practices and determining whether the leadership and mentoring program could be a support source for the careers of PhD-prepared nurses.

2.4 Support sources for careers of PhD-prepared nurses

2.4.1 Definition of support sources for careers

There is no universal definition of support sources for careers. Earlier research on career development, however, addressed support sources for careers as sources of formal and informal support to foster professional growth (Parson et al., 1992; Lent et al., 2012). Alternative terms such as 'support systems' and 'career support' are also used to describe this concept (Lent et al., 2012). Both informal and formal support sources for careers were reported (Parson et al., 1992). Among informal sources of support for careers are the daily interactions with colleagues and others who share similar professional interests as well as support provided by family and friends. Formal support sources for careers often refer to structural sources of support provided by the organization where the individual works, such as formal mentoring trajectories or educational programs (Parson et al., 1992; Lent et al., 2012).

In this study, support sources for careers were defined as both informal and formal sources to foster professional growth (Parson et al., 1992; Lent et al., 2012). Support sources for careers of doctorally prepared nurses were identified in the **integrative literature review** (paper IV) and included informal sources of support by family, friends, and colleagues. Also, formal sources support for careers were identified including educational opportunities such as leadership and mentoring programs as well as organizational structures for careers. Mentoring was also recognized as a support source for careers and mentoring can be considered as informal or formal source of support, depending on the approach to mentoring (Bourgault et al., 2023; Busby et al., 2022).

2.4.2 Significant others and colleagues as support source for careers

Support from significant others, such as family and friends, was found to be a support source for careers of PhD-prepared nurses. Earlier studies have addressed challenges of balancing the responsibilities of family and academic careers (Poronsky et al., 2012; Kippenbrock et al., 2022; Rice et al., 2020; Yedidia et al., 2014). Kippenbrock et al. (2022) found that faculty members who were able to find balance in their work and family life, often with support of others, were more satisfied with their work and reported higher levels of intent to stay in their current career. The significance of support of family and friends was also recognized by nurses enrolled in doctoral nursing programs (Volkert et al., 2018). At this time, support from family and friends helped them to continue with their education. The

support often included practical support such as sharing the load of family responsibilities (Adynski et al., 2023; Merry et al., 2021).

Collegial support was found to be important for careers as it provides opportunities to share work challenges and to learn from others (Al-Nawafleh et al., 2013; Bice et al., 2019; de Lange et al., 2019; Heinrich, 2005; Loerzel et al., 2021; Viveiros et al., 2021; Wilson et al., 2017). This support often was provided by peers and was beneficial in adjusting to postdoctoral roles, deciding on the focus of research, and development of professional networks (Berman, 2015; Heinrich, 2005; Jacelon et al., 2003). Support from colleagues was provided through informal conversations, but also by collaboration in research teams (Wyllie et al., 2019). Collaboration with senior colleagues and managers also supported the careers (Cotter et al., 2019; Loerzel et al., 2021; McPherson et al., 2023; Singh et al., 2022). Support from colleagues was often present, however, it was noted that relationships among colleagues could be strengthened in some cases (Loerzel et al., 2021). Some PhD-prepared nurses experienced a lack of collegial support due to the absence of colleagues with similar backgrounds, in some cases resulting in feelings of loneliness (Al-Nawafleh et al., 2013; Bice et al., 2019; Cotter et al., 2019; Loerzel et al., 2021; Singh et al., 2022; Wyllie et al., 2019). More formal forms collegial support could be organized through learning communities, mentoring, and/or educational programs (Busby et al., 2023; Jacelon, 2003; Pancheri et al., 2013). Also, during doctoral education the importance of the support of colleagues was reported and was often provided by (non-academic) colleagues, supervisors outside the PhD-program, and networks in professional organizations (Adynski et al., 2023).

2.4.3 Mentoring as support source for careers

Mentoring is defined as a transactional process transmitting information, advice, support, and expertise from an experienced to a less experienced individual (Bowen, 1985) and mentoring is a widely accepted source to support professional and career advancement in academic settings. Various studies recommended mentoring for nurses working in academic settings to support the socialization and retention of novice faculty (Busby et al., 2022; Dahlke et al., 2021; Ephraim, 2021; McPherson et al., 2023; Park et al., 2023; Singh et al., 2022). Mentoring was also found to support professional growth by strengthening leadership competencies, professional networks, and self-esteem (Busby et al., 2022; Hafsteinsdóttir et al., 2017). Moreover, mentoring contributes to workforce outcomes such as higher job satisfaction, low job-related stress, and better work-life balance as well as lower levels of role conflict and role ambiguity (Busby et al., 2022; Savard et al., 2023). More academic productivity was found in those who had mentors (Busby et al., 2022; Hafsteinsdóttir et al., 2017). Mentoring also has the potential to support

underrepresented groups in nursing science and thereby may contribute to the diversity in the workforce (Costa et al., 2023; Iheduru-Anderson et al., 2023; Mokel et al., 2022). Cross-national mentoring was found to support the development of nursing science in low and middle income countries (Buser et al., 2021; Rosser et al., 2020).

Mentoring is an intentional strategy to support the competency development of PhD-prepared (Broome et al., 2021). Since PhD-prepared nurses need to develop a wide range of competencies, it is important that mentoring aligns with goals and needs of the mentee (Bourgault et al., 2023). There are various **approaches to mentoring** including one-to-one mentoring as well as group mentoring and peer mentoring (Bourgault et al., 2023; Busby et al., 2022). Although extensive descriptive research has been conducted, studies have not identified one mentoring approach to be more effective than others (Busby et al., 2022; Hafsteinsdóttir et al., 2017; Nowell et al., 2017a). Support in the development of the variety of competencies may not be expected from one mentor and therefore, it could be considered to have multiple mentors, inside and outside own organization and region (Broome et al., 2021).

Although mentoring has been implemented in many **PhD programs and universities** in global regions with an advanced state of nursing science, such as North America, there are less strong traditions for mentoring in other global regions (Bourgault et al., 2023; Hafsteinsdóttir et al., 2017; McKenna, 2021). The literature review of Busby et al. (2022) reported a prevalence of mentoring in nurse faculty between 25% and 83%. Various studies, however, reported unmet mentoring needs in PhD-prepared nurses (Al-Nawafleh et al., 2013; Bice et al., 2019; de Lange et al., 2019; Heinrich, 2005; Hafsteinsdóttir et al., 2017; Loerzel et al., 2021), some explicitly addressing unsatisfied is needs of mid-career researchers (Bourgault et al., 2022; Hafsteinsdóttir et al., 2017; Loerzel et al., 2021; Matthews et al., 2021).

Challenges related to mentoring include role confusion, where mentors experienced difficulty distinguishing between their roles as a mentor and those of an experienced faculty member, friend, or course coordinator (Busby et al., 2022). Additionally, a lack of time and resources for mentoring, along with limited opportunities for the development of mentoring competencies, were reported (Cullen et al., 2017; Hafsteinsdóttir et al., 2017) as well as a lack of incentives for mentors (Broome et al., 2021)

2.4.4 Leadership and mentoring programs as support source for careers

Although educational programs are an effective method to develop leadership practices (Cummings et al., 2020), the review of Hafsteinsdóttir et al. (2017), identified no **leadership programs** for postdoctoral nurses. Through the literature searches, however, various recent leadership programs, focusing on PhD-prepared nurses and nurse faculty, have been identified. Hafsteinsdóttir and colleagues (2020) reported on the Dutch Leadership and Mentoring Research (LMNR) program aiming to increase the cadre of nurse scientists and support the careers of PhD-prepared nurses. The evaluation of the program showed statistically significant improvement on a variety of leadership and professional competencies of those following the program (van Dongen et al., 2021). In addition, two programs were identified aiming at the development of leadership competencies. A 12-month mentoring and coaching program (Patterson et al., 2022) and a leadership program of focusing on nurse faculty and clinicians in leadership positions (Franklin et al., 2020). In addition, the Nurse Faculty Leadership Academy, offered by Sigma Theta Tau International and Elsevier Foundation, was developed to stimulate leadership development using workshops, individual leadership plans, and mentorship. Furthermore, the Robert Wood Johnson Foundation launched diverse programs to develop and support PhD-prepared nurses who are committed to a long-term leadership career. This foundation created opportunities for nurse scientist to develop their leadership and professional competencies to prepare them for postdoctoral and leadership positions (Kelley et al., 2023; Tabloski, 2016).

PhD-prepared nurses are expected to benefit from **mentoring programs** and many mentoring programs aiming at academic nurses have been identified in two earlier systematic literature reviews (Hafsteinsdóttir et al., 2017; Nowell et al., 2017a). The review of Hafsteinsdóttir et al. (2017) focused on leadership and mentoring programs for postdoctoral nurses and included 15 papers. Two studies were identified that described outcomes of mentoring programs. Both programs were found to improve research competencies and productivity as well as supporting career development (Cumbie, 2005; Gennaro et al., 2007). It should be noted that more mentoring programs were identified in the literature review of Hafsteinsdóttir et al. (2017), however, these programs were not included due to the lack of research papers on the programs (Beverley et al., 2006; Coffmann et al., 2013; Fagin et al., 2006; Franklin et al., 2011; Hadidi et al., 2013; Heinrich et al., 2012; Jacelon et al., 2003; Jacob et al., 2010; Lewallen et al., 2003; Maas et al., 2006; McBride et al., 2006). The purpose of literature review of Nowell et al. (2017a) was to identify mentoring programs for academic nurses and to describe the key components of the programs. The review identified 30 mentorship programs describing various approaches to mentoring such as traditional mentorship, peer mentorship, group

mentorship, distance mentorship, learning partnership mentorship, highly relevant mentorship (e.g. the mentee learns through their work while being provided with practical opportunities to develop skills), and constellation mentorship (e.g. one mentee who has more than one mentor). The traditional mentorship approach, where mentees are paired with more experienced mentors, was most common (Nowell et al., 2017a). Core elements of mentoring programs included appointing of a program coordinator, orientation to the program by familiarizing with the program and goals of the mentee, selectively matching mentors and mentees, clear goals and vision of the program, frequent communication between mentors and mentees, faculty development workshops as part of the mentoring programs, facilitation of socialization and networking opportunities, and administrative support for the program. Nowell et al. (2017a) described the lack of outcomes measures of the mentoring programs and found no evidence for one approach being more effective than others. In both literature reviews the majority of the mentoring programs originated from the United States and descriptive approaches were often used for the evaluation of the programs (Hafsteinsdóttir et al., 2017; Nowell et al., 2017a).

After the conduct of the literature reviews of Hafsteinsdóttir et al. (2017) and Nowell et al. (2017a), novice mentoring programs for academic and PhD-prepared nurses have been identified in the literature (Abraham et al., 2021; Jeffers et al., 2017; Patterson et al., 2022; Rosser et al., 2020; Shieh et al., 2019; Vanderzwan et al., 2021; Viveiros et al., 2021; Volkert, 2021; Webber et al., 2020; Welk et al., 2021; Yoder et al., 2021). Ten studies describing mentoring programs were found, representing eight different initiatives. In the programs different target populations and approaches to mentoring were reported (Table 1). All programs were evaluated positively, however, there was a lot of variation in the outcomes used. In addition, the literature increasingly emphasizes the need for mentoring programs based on international collaboration (Buser et al., 2021; Rosser et al., 2020; Volkert, 2021; Welk et al., 2021).

Table 1. Mentoring programs.

Publication	Description of the program	Target population	Mentoring approach	Outcomes
Abraham et al., 2021	Interprofessional fellowship program by the Department of Veterans Affairs. The program has distinctive elements including mentoring	Interprofessional group of health professionals including predoctoral and doctoral-trained nurses	Individualized mentoring	Completed research and improvement projects, scholarly productivity and transitions in positions
Martin et al., 2018	A faculty mentorship program aiming to support ongoing professional and personal development for nurse faculty	Nurse faculty members	Traditional and nontraditional mentoring models	Beneficial aspects of the mentoring were improved writing, collaboration, and networking, talking about challenges of the academic environment, sharing of resources and sharing perspectives.
Rosser et al., 2020	The online Global Leadership Mentoring Community of Sigma Theta Tau International brought mentors and mentees together from across the world to build leadership capacity	Senior and junior nurse faculty members	Online/virtual one to one mentoring	The program was found to facilitate achievement of professional development goals
Shieh et al., 2019	The three-year clinical Track Faculty Mentoring Initiative was designed to foster scholarship development and academic promotion	Clinical assistant professors	One to one mentoring	Increased knowledge of promotion processes and scholarship productivity
Van derzwan et al, 2021	The CAP mentorship workgroup was developed to increase understanding of the promotion process, increase motivation to pursue scholarship, and to support peer support	Clinical assistant professors	Hybrid mentoring in a group setting	Completion of probationary review processes, promotion to clinical associate professors and retention of CAPs
Viveiros et al., 2021	A Cohort Model of Mentoring to facilitate the Transition to an Academic Nurse Faculty Position	PhD-prepared nurses	Individual mentoring and cohort mentoring	The cohort model created a supportive culture facilitating a sense of community for new nurse educators

Publication	Description of the program	Target population	Mentoring approach	Outcomes
Volkert, 2021	The faculty mentoring program developed as part of the NLN LEAD Program and aimed to support professional and scholarly development of new faculty and their experienced faculty mentors	New and experienced faculty members	Paired and group mentoring	The program was rated as successful due to high levels of satisfaction with the program, completion of scholarly projects and strong scholarly productivity
Webber et al., 2020	The program included mentoring where new faculty members were mentored by a tenured and a midcareer faculty member	New faculty and midcareer faculty members	Mentoring in teams	The mentoring contributed to a smooth onboarding of new faculty and provided scholarship support for the midcareer faculty member
Welk et al., 2021	One-year virtual program through Sigma Theta Tau International's Global Leadership Mentoring Community to build teaching, scholarship and service capacity	Nurse educators	One-to-one mentoring	The mentees reported newly-built or enhancements of their accomplishments in their teaching roles, scholarship, and service
Yoder et al., 2021	The Roundabout Model was created to address the need for developing and retaining adjunct clinical faculty addressing education, mentoring, and ongoing evaluation	Adjunct clinical faculty	Layered mentoring by clinical director, course coordinator and program director	Increased clinical faculty retention, reduced student complaints, and enhanced the likelihood to rehire adjunct clinical faculty

2.4.5 Organizational structures as support source for careers

A lack of **organizational structures for careers**, such as career paths and positions with clear role expectations, can make it difficult for PhD-prepared nurses to find meaningful positions and progress their careers (Al-Nawafleh et al., 2013; Berman, 2015; de Lange et al., 2019; Heinrich, 2005; Loerzel et al., 2021). Research-oriented organizations more often have implemented structures and policies to support the careers and work of PhD-prepared nurses. These types of organizations often provide additional support such as internal funding opportunities, staff to support the conduct of research, such as statisticians and grant officers (Rice et al., 2020). Although career paths may be more common in academic settings, the importance of implementation of sustainable career pathways in clinical practice has been addressed. These clinical career paths for PhD-prepared nurses can prevent role confusion and secure opportunities for career advancement (Dobrowolska et al., 2021; Paterson et al., 2023; Sanders et al., 2022).

In many countries the number of available **positions for PhD-prepared nurses** has not grown according to the number of nurses obtaining doctorates (McKenna, 2021). Additionally, positions with poor terms of employment, including short term contracts and low salaries exist, leading some of these individuals to find other career opportunities (Fang et al., 2016; Kroning et al., 2023; McKenna, 2021). Therefore, it can be argued that more permanent positions for PhD-prepared nurses are needed (McKenna, 2021). Responsibilities within these positions should be clearly defined (McPherson et al., 2023) and securing of protected time for research is important, especially for those in early career stages since the conduct of research requires substantial time (LaBaron, 2023; McKenna, 2021; Stanfill et al., 2019). Therefore, it is important that funding opportunities are secured and that teaching and administrative workloads of PhD-prepared are considered (LeBaron, 2023; Loerzel et al., 2021; McPherson et al., 2023).

2.5 Careers and career experiences of PhD-prepared nurses

2.5.1 Definition of careers

Different definitions of careers exist, however, careers are often referred to as individual mobility paths, describing a sequence of positions, not limited to a specific occupation (Brown et al., 2013; Greenhaus et al., 2010; Patton et al., 2006). According to Greenhaus et al. (2010) careers include a “pattern of work-related experiences that span the course a person’s life”. Work-related experiences include

subjective interpretations of work experiences and therefore can include attitudes, expectations, feelings, and needs of individuals. Both objective and subjective components needs to be included to understand the complexity of careers (Greenhaus et al., 2010). Therefore, **in this study**, careers comprise a unique series of positions and experiences within these positions (Brown et al., 2013; Patton et al., 2006).

2.5.2 Careers opportunities for PhD-prepared nurses

Few studies have addressed the careers of PhD-prepared nurses. These studies explored the careers of PhD-prepared nurses from a national perspective (Chavez et al., 2021; Rugs et al., 2020; Sørensen et al., 2019). However, in the current literature there are no empirical studies exploring the careers of PhD-prepared nurses addressing the global PhD-prepared nursing workforce. Based on the available literature, it can be concluded that PhD-prepared nurses can build careers in different setting such as academia and clinical practice (Chavez et al., 2021; Rugs et al., 2020; Sørensen et al., 2019; Dobrowolska et al., 2021) (Table 2).

The earlier studies report that PhD-prepared nurses often build **careers in academia** (Chavez et al., 2021; Rugs et al., 2020; Sørensen et al., 2019). Faculty positions, primarily focusing on research and education, were also often referred to in papers reporting on the PhD-prepared nursing workforce (Ali Zeilani et al., 2011; Al-Nawafleh et al., 2013; Aquino et al., 2018; Berman, 2015; de Lange et al., 2019; Loerzel et al., 2021; Poronsky et al., 2012; Smeltzer et al., 2014; Sørensen et al., 2019). In many studies references were made to faculty positions, however, details on these positions were not provided. In the papers that did elaborate on the positions, large variation in the commitments of PhD-prepared nurses was found. Earlier research suggest that PhD-prepared nurses often have full-time positions combining positions and/or roles in various areas of nursing such as research, education, management, and clinical practice (Chavez et al., 2021; de Lange et al., 2019; Heinrich, 2005; Rugs et al., 2020). Research commitments include being principal investigator, co-investigator, or project coordinator as well as more specific roles as for example data manager. Clinical commitments can include direct patient care, implementation of evidence-based practices, and/or quality improvements. Educational commitments can include formal and informal instruction to students and professionals as well as course development and assessment of skills and competencies. Administrative commitments were often related to management of individuals as well as administrative work related to the teaching and/or research work (Rugs et al., 2020).

PhD-prepared nurses can also build **careers in clinical settings**. The review of Dobrowolska et al. (2021) found that PhD-prepared nurses with careers in clinical settings can act as practice developers, clinical leaders, and clinical teachers.

Clinical-academic positions are highly valued by PhD-prepared nurses as these positions are expected to contribute to evidence-based nursing, improved patient outcomes by being able to identify relevant research topics, and implementation of research findings (Andreassen et al., 2018; de Lange et al., 2019; Dobrowolska et al., 2021; Sørensen et al., 2019; Orton et al., 2019; Trusson et al., 2019). PhD-prepared nurses can also serve as role models by mentoring and supporting others in undertaking academic careers and by introducing changes into nursing care (Trusson et al., 2019). Various studies reported challenges related to careers in clinical settings including a lack of resources, lack of time for research, and limited research funding as well as a lack of clear role expectations, job descriptions, and career directions (Andreassen et al., 2018; de Lange et al., 2019; Dobrowolska et al., 2021; Orton et al., 2019; Trusson et al., 2019).

Career opportunities in non-academic settings are also available to PhD-prepared nurses (Broome et al., 2018). Although it is suggested that PhD-prepared nurses become more interested in non-academic careers (AACN, 2022), it was also found that most doctoral nursing students preferred to have academic careers within educational institutions with positions focusing on research and education (Bai et al., 2018). Currently, there are no empirical studies focusing on career experiences of PhD-prepared nurses working outside academic settings, other than the clinical settings. Therefore, there is limited understanding of careers of PhD-prepared nurses in non-academic settings as it is not known what types of positions these careers include and how many PhD-prepared nurses establish careers in non-academic settings.

PhD-prepared nurses reported the need to balance the work and responsibilities of **different positions and/or roles** (de Lange et al., 2019). Positions including commitments in various fields were experienced as complex and role ambiguity was reported (Chavez et al., 2021; Dobrowolska et al., 2021). These positions, however, were found to strengthen their professional performances since it enabled PhD-prepared nurses to integrate all their knowledge and expertise (Chavez et al., 2021). Some studies report that PhD-prepared nurses preferred to spend more time on research and less on teaching or administrative commitments (Bittner et al., 2017; Loerzel et al., 2021; Singh et al., 2021; Smeltzer et al., 2014).

Table 2. Summary of careers of PhD-prepared nurses.

Topic	References
Careers in academia	Ali Zeilani et al., 2011; Al-Nawafleh et al., 2013; Aquino et al., 2018; Berman, 2015; Chavez et al., 2021; de Lange et al., 2019; Loerzel et al., 2021; Poronsky et al., 2012; Rugs et al., 2020; Smeltzer et al., 2014; Sørensen et al., 2019
Careers in clinical settings	Andreassen et al., 2018; de Lange et al., 2019; Dobrowolska et al., 2021; Sørensen et al., 2019; Orton et al., 2019; Trusson et al., 2019
Non-academic careers	Broome et al., 2018; AACN, 2022

2.5.3 Challenges in the careers of PhD-prepared nurses

Various challenges related to careers of PhD-prepared nurses have been reported (Table 3). Novice nurse faculty members reported challenges with the orientation and socialization into **academic working environments** since this environment is different from other settings such as clinical settings (Grassley et al., 2020; McPherson et al., 2023; Savard et al., 2023; Scheese et al., 2023). Furthermore, PhD-prepared nurses need to adjust to new positions and responsibilities and **develop additional competencies** to meet expectations of the postdoctoral positions (Al-Nawafleh et al., 2013; Han et al., 2022; Heinrich, 2005; McMillian-Bohler et al., 2023; McNelis et al., 2019; Savard et al., 2023; Scheese et al., 2023). Preferences for additional development included grant writing, academic writing, conflict resolution, and team management (Al-Nawafleh et al., 2013; Bice et al., 2019, de Lange et al., 2019; Heinrich, 2005; Loerzel et al., 2021).

High workloads are a significant challenge for PhD-prepared nurses (Bice et al., 2019; Melnyk et al., 2023; Savard et al., 2023) and result in difficulties with balancing professional and personal commitments (Al-Nawafleh et al., 2013; de Lange et al., 2019; Singh et al., 2021). Some PhD-prepared nurses reported feeling overwhelmed with the expectations of their roles and experienced emotional exhaustion and/or fatigue (Aquino et al., 2018; Loerzel et al., 2021; Zangaro et al., 2023). In earlier studies it was reported that PhD-prepared nurses needed to work on research in evenings and weekends, thereby limiting their family time (Al-Nawafleh et al., 2013; Poronsky et al., 2012; Smeltzer et al., 2014; Viveiros et al., 2021). The high workload may be considered as a risk for burn-out (Loerzel et al., 2021; Melnyk et al., 2023; Zangaro et al., 2023). This may be especially apparent for individuals starting families and/or those having other caring responsibilities (McKenna, 2021; Poronsky et al., 2012; Trusson et al., 2021).

Challenges related to the academic environment have been reported (Al-Nawafleh et al., 2013; McKenna et al., 2023; Park et al., 2023). **Disruptive behaviours** such as belittlements, bullying and harassment, exclusion, and

discrimination based on gender, race, or life stage, and misuse of hierarchical power were reported by PhD-prepared nurses (Bice et al., 2019; Park et al., 2023; Savard et al., 2023). Reasons for these behaviours may be the strong competition for research funding and positions as well as the pressure to produce academic output (McKenna et al., 2023; Park et al., 2023).

Table 3. Summary of challenges related to careers of PhD-prepared nurses.

Topic	References
Socialization into academic working environments	Grassley et al., 2020; McPherson et al., 2023; Savard et al., 2023; Scheese et al., 2023
Adjustment to new positions and development of additional competencies	Al-Nawafleh et al., 2013; Bice et al., 2019; Han et al., 2022; Heinrich, 2005; Loerzel et al., 2021; McMillian-Bohler et al., 2023; McNelis et al., 2019; Savard et al., 2023; Scheese et al., 2023
High workloads	Al-Nawafleh et al., 2013; Bice et al., 2019; de Lange et al., 2019; Melnyk et al., 2023; Poronsky et al., 2012; Savard et al., 2023; Singh et al., 2021; Smeltzer et al., 2014; Trusson et al., 2019; Viveiros et al., 2021; Zangaro et al., 2023
Challenges related to the academic environment including disruptive behaviours	Al-Nawafleh et al., 2013; Bice et al., 2019; McKenna et al., 2023; Park et al., 2023; Savard et al., 2023

2.6 Summary and justification for current study

This chapter summarizes the literature on the main concepts of this study: leadership practices in the careers of PhD-prepared nurses, support sources for careers, and careers of PhD-prepared nurses. The summary is based on scientific literature as well as information from relevant reports, websites, and books. A first summative notion is that in the last years an increasing number of (descriptive) studies and editorials has been published on the main concepts of this study, however, these publications often address a specific topic related to one of the main concepts. For example, many publications refer to one specific career challenge or support source for careers. Currently, there are no empirical studies that comprehensively address the careers of PhD-prepared nurses, and an overview of support sources for careers is lacking.

This review of literature demonstrated the existence of many definitions and theories of **leadership**. Leadership in the careers of PhD-prepared nurses is one of the main concepts of this study, and the leadership practices were explored using the definition of Cummings (2012): “Leadership is being able to see the present for what it really is, see the future for what it could be and then take action to close the gap between today's reality and the preferred future of tomorrow” (p. 3325), while the definition of Northouse (2016) guided the exploration of the development of leadership practices in the careers and to determine if the leadership and mentoring

program could be a support source for the careers of PhD-prepared nurses. The current literature included limited numbers of studies addressing leadership and leadership practices of PhD-prepared nurses, and especially limited numbers of studies report on the leadership practices in the careers. There were, however, some studies indicating that leadership practices by nurses with masters and doctoral degrees can contribute to professional success (NAM, 2021; Singh et al., 2022a). The existing gap of knowledge regarding the leadership practices of PhD-prepared nurses in their careers justifies its inclusion as a main concept in this study.

Support sources for careers were defined as informal and formal support sources to foster professional growth. In this chapter, it was possible to deepen our understanding on the support sources for careers identified in the integrative literature review (paper IV), by means of inclusion of information from books, findings from novice studies, and studies that were excluded in the integrative literature review due to the type of the study design. Similar to the integrative literature review (paper IV), support from family and friends was found to be important for careers, mainly because of sharing the caring responsibilities and support from colleagues supported career decisions and navigating of work challenges. Through this chapter, it was possible to demonstrate the importance of mentoring as support source for careers as well as the difference in approaches and challenges related to mentoring. In addition, recent leadership and mentoring programs were identified, reporting positive experiences on a variety of outcomes. Most of the leadership and mentoring programs for PhD-prepared nurses originated from the United States, with limited studies describing leadership and mentoring programs in other global regions (Hafsteinsdóttir et al., 2017). As a response to this gap, a consortium developed and executed the Nurse-Lead leadership and mentoring program to support the leadership and careers of PhD-prepared nurses and doctoral nursing students, providing a valuable opportunity to study the leadership practices in the careers. The review of the literature provided the justification for the inclusion of support sources for careers as main concept in this study, since the review of literature determined that there are no studies describing support sources for careers comprehensively and it remains unknown to what extent the support sources are available and/or used by PhD-prepared nurses.

In this study, **careers** were defined as an unique series of positions, and experiences within these positions (Brown et al., 2013; Patton et al., 2006). While the growing body of knowledge on the PhD-prepared nursing workforce offers some valuable insights into their careers, a comprehensive understanding of the careers remains lacking. Findings from the empirical studies were often limited to general information on current positions, reported in a limited number of studies addressing a national perspective. Empirical studies on the careers of the global PhD-prepared nursing workforce are not available. Most empirical studies provided information on

challenges in the careers of PhD-prepared nurses. The findings, in this chapter, are similar to the conclusions of the integrative literature review (paper IV). This literature review included all types of papers, including editorials, while the integrative review (paper IV) focused only on empirical studies. Therefore, this review of literature contributed to a somewhat better understanding of the areas in which PhD-prepared nurses develop their careers, such as the clinical and non-academic settings as well as career experiences of PhD-prepared nurses. This literature review justifies the inclusion of the careers of PhD-prepared nurses as a main concept in this study, given the limited understanding of the careers, the lack of global perspectives, and the absence of a comprehensive overview of the factors related to the careers.

A **limitation of this review of literature** was that a substantial part of the used studies did not clearly describe their sample and/or used diverse samples including nurses with other educational backgrounds as well. This was particularly the case in the studies reporting on support sources for careers. Therefore, it is unclear to what extent the outcomes are specific for the PhD-prepared nursing workforce. In addition, a considerable number of studies in this review of literature used qualitative study designs with small samples focusing on national perspectives. This review of literature, therefore, also highlights the lack of large-scale international studies investigating careers and factors related to the careers of PhD-prepared nurses.

3 Aims

The aim of this study was to describe the careers of PhD-prepared nurses and analyse leadership practices in the careers as well as the support sources for careers of PhD-prepared nurses. The study included two phases:

Phase 1: Analytics of PhD-prepared nurses' leading their careers

The aim of this study phase was to analyse the leadership practices of PhD-prepared nurses in their careers.

The following research questions were used to guide this study phase:

1. What leadership practices do PhD-prepared nurses demonstrate in their careers? (paper I)
2. How does the development of leadership practices in a leadership and mentoring program support the careers of PhD-prepared nurses? (papers II and III)

Phase 2: Analytics of the careers and factors related to the careers

The aim of this study phase was to describe the careers of PhD-prepared nurses and to analyse factors related to the careers including factors concerning PhD-prepared nurses leading their careers and support sources for careers (papers I, IV and V)

The following research questions were used to guide this study phase:

1. What are the careers of PhD-prepared nurses? (papers I, IV and V)
2. What factors are related to the careers of PhD-prepared nurses? (papers I, IV and V)

4 Materials and Methods

In this chapter the study design, samples, and setting are described, followed by the methods and procedures of data collection and the data analysis. At last, ethical procedures and considerations are presented.

In the first phase of this multimethod study, the first step focused on exploration of leadership practices in the careers of PhD-prepared nurses (paper I). At the same time, leadership practices of PhD-prepared nurses were studied through a leadership and mentoring program, the Nursing Leadership Educational Program (Nurse-Lead). In the second and third step, the leadership and mentoring program was evaluated to increase the understanding on the contribution of leadership practices in the careers of PhD-prepared nurses and to determine if such leadership and mentoring program is a support source for careers of PhD-prepared nurses (papers II and III). A pre-post-test mixed-methods program evaluation was conducted in the second step (paper II) and the third step included a focus group study (paper III).

The second phase of this study focused on the careers of PhD-prepared nurses and factors related to the careers, since it became apparent in phase I that there is limited understanding on the careers and factors related to the careers. Factors related to the careers included factors related to leadership in the careers as well as support sources for careers. In the first step in the second phase, an integrative literature review was conducted to provide a theoretical overview of careers and factors related to the careers (paper IV). The second step in this phase comprised a survey study on the careers and factors related to the careers to provide current knowledge on these concepts from a global perspective (paper V). Based on the results of phase I and II, a summative structure with factors related to the careers of PhD-prepared nurses was produced.

4.1 Study design, sample and setting

A multimethod design was employed, utilizing various study designs and methods across the different phases and steps of the study, including two qualitative studies with individual interviews (paper I) and focus group interviews (paper III), a pre-post-test program evaluation with online surveys (paper II), a systematic integrative literature review (paper IV), and a descriptive cross-sectional survey study (paper V) (Table 4). The multimethod design enabled the researcher to gain a comprehensive

understanding of main concepts in this study. This approach allowed merging of different perspectives and integration of different types of data when responding to multifaceted study questions (Brewer et al., 2006; Fetters et al., 2013; Hesse-Biber et al., 2015; Sweetman et al., 2010). In the conduct of this study, the researcher had to cross borders between different epistemological and methodological approaches, while respecting the nature of different approaches (Hesse-Biber et al., 2015). The decision to include different methodological approaches was justified by selecting the most appropriate approaches and methods to respond to the study aim and research questions of the two study phases. The five study steps were conducted sequentially, with exception of the steps II and III, which were conducted concurrently.

The first phase of this study comprised a predominantly qualitative approach to increase the understanding on leadership practices of PhD-prepared nurses in their careers and to gain insight into how the development of leadership practices contributes to the careers of PhD-prepared nurses from a person-centred and holistic approach (papers I and III) (Holloway et al., 2010; Polit et al., 2017). In second step, aiming to increase understanding on the contribution of leadership practices to the careers of PhD-prepared nurses and the potential of such programs to be a support source for careers (paper II), a mixed methods pre-post-test program evaluation was used. In this step, quantitative data enabled the researchers to gain insight into the leadership practice development, while qualitative data added in-depth insights on the competency development, its importance for the careers, and potential of the program to be support sources for careers. Also, the qualitative data enabled validation of the quantitative data (Halcomb, 2019; Irvine et al., 2020; McKenna et al., 2021).

In the second phase, an integrative literature review (paper IV) was conducted to gain insight into the current theoretical knowledge on the careers and factors related to the careers including factors related to leadership practices of PhD-prepared nurses and support sources for careers. The design of the integrative literature review allowed inclusion of diverse empirical studies (Toronto et al., 2020). A global survey study, aiming at similar topics, was conducted to generalize the findings from the literature, providing state-of-start knowledge, and deepen understanding on these topics from a global perspective (Polit et al., 2017).

This study was conducted between 2018 and 2024 among the PhD-prepared nursing workforce. It was decided to focus on PhD-prepared nurses, since the PhD and DNP degrees address different competencies and resulting in different careers (Cygan et al., 2019). Although a growing number of countries are offering professional doctorates to nurses, such as the DNP, globally the PhD degree remains the traditional doctoral education pathway (Molassiotis et al., 2020). In the first phase, a sample of Dutch PhD-prepared nurses was used, reflecting a national perspective (paper I) and a sample with European PhD-prepared nurses was used in the second and third step (papers II and III), while the second phase comprised

addressed the global perspective (papers IV and V) (Figure 3). In phase I, the three study samples consisted of nurses with a PhD degree. In the first step in phase II, the integrative literature review, nurses with different types of doctoral degrees were included due to limitations in reporting on the type of doctoral degree in the original studies. In the second step of phase II, individuals with a PhD degree in nursing science were included, which resulted in a small proportion of the sample (2.5%) having a professional degree in a field other than nursing.

Table 4. Research methods used in the study.

Paper and topic	Period	Design	Setting	Sampling and sample	Data collection	Data analysis
I. Leadership in careers	2018-2022	A descriptive qualitative study	Seven Dutch hospitals	Purposive sampling; 12 PhD-prepared nurses employed at clinical hospital wards	Semi-structured interviews focusing on perspectives on leadership, leadership in careers and barriers to leadership	Thematic analysis (Braun et al., 2006)
II. Leadership in careers; Leadership and mentoring program as support source for careers	2018-2024	A pre-post-test mixed methods program evaluation	Six European universities and affiliated organizations	Consecutive sampling; 30 PhD-prepared nurses and doctoral nursing students following the Nurse-Lead program	Online structured surveys with closed-ended questions and narratives focusing on leadership practices, professional, and research competencies as well as career development	Content analysis, descriptive statistics, and statistic inference (Paired sample t-tests the Wilcoxon signed rank test)
III. Leadership in careers; Leadership and mentoring program as support source for careers	2019-2023	A descriptive qualitative study	Six European universities and affiliated organizations	Convenience sampling; 21 PhD-prepared nurses and doctoral nursing students following the Nurse-Lead program	Semi-structured focus group interviews on mentoring relationships and meaning of mentoring for leadership and professional development	Thematic analysis (Braun et al., 2006)
IV. Theoretical overview of careers and related factors	2022-2023	Integrative literature review	PubMed (MEDLINE), CINAHL, and EMBASE	22 empirical research studies	Systematic literature search using keywords	Systematic data extraction and thematic analysis (Polit et al., 2017)
V. Empirical study on careers and related factors	2022-2024	Cross-sectional survey study	The global nursing science community	Convenience sampling; 1308 PhD-prepared nurses from 57 countries	Online survey focusing on careers and factors related to the careers	Descriptive statistics

Phase I

The aim of the **first step** was to explore leadership practices in the careers of PhD-prepared nurses working at hospitals (paper I). A qualitative descriptive study was conducted to gain an understanding of the PhD-prepared nurses' leadership without adhering to a specific qualitative approach (Polit et al., 2017). Semi-structured interviews were conducted and analysed between February and June 2018. The sample included nurses with a PhD degree working at clinical hospital departments from seven Dutch hospitals. Purposive sampling was used to recruit a sample with a maximum variation regarding age, years of work experience, positions, and type of hospitals. At the time of the study, there were approximately 40 PhD-prepared nurses who complied with the earlier mentioned inclusion criteria. Potential participants were recruited using a national database developed through earlier research (Regelink, 2017). Invitations with study information were distributed through email by the research team. The recruitment strategy resulted in a sample of 12 PhD-prepared nurses with a median age of 54 years. The eight woman and four men worked in three general and four academic hospitals, and were employed as researcher (n = 7), clinical nurse specialist (n = 4), or manager (n = 1).

The **second step** included an evaluation of the leadership practices of PhD-prepared nurses and doctoral nursing students following the leadership and mentoring program to determine if such programs can be support sources for careers of PhD-prepared nurses, using a pre-post-test mixed-methods program evaluation (paper II). The evaluation was carried out between the start of the program in 2018 and the end of the program in 2020 and used online questionnaires with closed-ended questions and narratives. The narratives were used to explain, elaborate on, and validate responses to the closed-ended questions (Creswell, 2013). The target population included the 60 PhD-prepared nurses and doctoral nursing students participating in the program, who were approached through the program's online platform. A total of 30 participants was included in the study sample, of which sixteen were PhD-prepared nurses and 14 were doctoral nursing students. Most were female (n = 28) and the participants had a mean age of 41.3 years. The participants originated from seven European countries with Portugal (n = 11), the Netherlands (n = 8), and Finland (n = 7) being the most common. Participants were primarily employed as PhD student (n = 13), teacher (n = 10), or postdoctoral researcher (n = 7).

Furthermore, the **third step** comprised a qualitative study with focus group interviews to explore the contribution of mentoring in the program to the leadership practices of PhD-prepared nurses and doctoral nursing students following the program and to determine if the leadership and mentoring program can be a support source for the careers (paper III). Potential participants were Nurse-Lead participants attending an on-site program meeting in the Netherlands in 2019. The convenience

sample included 21 participants with 13 PhD-prepared nurses and 8 doctoral nursing students. Most participants were female ($n = 19$) and the participants had a mean age of 41 years. The majority of participants were from Portugal ($n = 7$), Finland ($n = 6$), and the Netherlands ($n = 4$). Most participants were employed at universities ($n = 13$).

Nursing Leadership Educational Program

In 2017 nurse scientists from six European countries initiated the development of the Nursing Leadership Educational Program, the Nurse-Lead program. The 18-month cross-national and web-based program aimed to support professional growth of the future generation of leaders in nursing, research, and education by supporting them to enhance their leadership practices and research competencies (van Dongen et al., 2020). The Nurse-Lead program was developed based on the Dutch Leadership and Mentoring Program, the LMNR-program (Hafsteinsdóttir et al., 2020; van Dongen et al., 2021) and the competencies required for postdoctoral nurses working in research (Numminen et al., 2019). The program included various components. The first component was the *leadership development plans*, based on 360° leadership assessments (Kouzes et al., 2016). In this plan the participants described their personal goals and actions how to reach them. The second component included the *individual mentoring trajectories*. The participants identified mentors, which preferably were international experts in nursing or health science from other countries, who had similar research interests, and who had demonstrated ability to be mentors. Participants were advised to have monthly or bimonthly meetings to follow up on their leadership development plan. The third component comprised the *online course modules*. The course modules for the PhD-prepared nurses included the following topics: development of a vision on research, clinical credibility, strategic leadership, research management, entrepreneurship in research, national and international research collaboration, grant funding, work-life balance, team leadership, and global leadership. The modules for doctoral nursing students included: leadership in nursing, the first steps as a leader, development of a vision on research, clinical credibility, research dissemination and implementation, research management, and ethical issues in nursing research (van Dongen et al., 2020). Participants provided feedback after each module and the content of the program was adjusted based on this. The fourth component were the *online meet the expert sessions*, in which leading scientists in nursing shared experiences with building their careers and shared recent insights of their work and research expertise. The fifth component included the *Nurse-Lead symposia* with lectures of keynote speakers, presentations by the Nurse-Lead participants, and interactive sessions to exchange experiences on career building.

Both PhD-prepared nurses and doctoral nursing students could apply for the program since the development of leadership practices and research competencies was considered relevant for nurses in doctoral and postdoctoral career stages (Broome, 2015; Numminen et al., 2019). Variations in career stage (e.g. doctoral student or PhD-prepared nurse) may lead to distinct focus in developmental needs. Therefore, the program was designed for the separate groups of doctoral nursing students and PhD-prepared nurses, to be able to respond to needs of both groups. To take part in the Nurse-Lead program, PhD-prepared nurses were required to have a PhD degree, while the doctoral nursing students needed to have a registered position as a doctoral nursing student. Both groups needed to be involved in research and had to work or study at one of the six universities involved in the Nurse-Lead project, or an organization associated with one of the universities. There were no requirements regarding career stage or stage of the doctoral studies. A committee with representatives from each of the involved universities selected participants with the aim of selecting those who would benefit most from the program with an equal number of participants from each of the organizations involved in the project.

Phase II

The **first step** in this phase included an integrative literature review aiming to produce a theoretical overview with empirical studies focusing on careers and factors related to careers of doctorally prepared nurses (paper IV). MEDLINE (PubMed), CINAHL, and EMBASE were searched from earliest until 10 June 2022 using the following search terms: nurse faculty; academic nurs*; doctorally prepared nurse*; PhD nurs*; postdoctoral nurs*; tenure*; nurse professor*; Doctor of Nursing Practice; nursing scientist*; nursing researcher*; nurse researcher*; nurse scholar*; nursing scholar*; Faculty, Nursing [Mesh]; Nursing Faculty Practice [Mesh]; Career*; tenure track*; leadership development; developing leadership; professional development; personal development; and work experiences. The search strategies per database are presented in appendix 1. An academic librarian supported the development of the search strategy, resulting in different combinations of search terms being used in different literature databases. Also, additional studies were retrieved through the reference lists of relevant studies.

Studies were included if they were peer-reviewed empirical studies describing careers and/or factors related to careers. Doctorally prepared nurses included nurses different types of doctoral degrees, such the PhD and DNP degree. The decision to include nurses with different types of doctoral degrees was made, since studies often included samples of nurses with PhD and DNP degrees or studies not specifying the type of degree. There were no restrictions regarding the study designs. Studies in other languages than English were excluded.

After the conduct of the searches, duplicates were removed. Titles and abstracts of the studies were screened, followed by the screening of full-texts of potentially relevant studies to determine compliance with the inclusion criteria. The quality of the studies was evaluated using checklists relevant for the study design. This resulted in the Checklists for Qualitative Research and the Checklist for Analytical Cross-sectional studies from the Johanna Briggs Institute (JBI) being used (JBI, 2020). In addition, the GRAMMS checklist was used for mixed method studies (O'Cathain et al., 2008). The quality appraisal was conducted to determine the methodological quality of the studies, not to exclude studies. Two researchers independently conducted the study selection and quality appraisal. The majority of studies were of moderate or high quality (paper IV). Discussion between the researchers took place to reach agreement on the inclusion and quality of the studies.

The integrative literature review included 22 studies. The studies included 1194 doctorally prepared nurses, with most participants originating from the United States ($n = 1077$). Based on studies reporting the type of doctorate, it was found that the majority held a PhD degree ($n = 564$). In the studies reporting the academic ranks, 143 were (full) professors, 214 were assistant professors, and 245 were associate professors.

The **second step** in this phase included the cross-sectional survey study (paper V) aiming to explore the careers and factors related to the careers including factors related to leadership practices in careers and support sources for careers. The secondary aim of this study was to describe the factors related to the careers for each of the WHO global regions (WHO, n.d.). The study was conducted among the global PhD-prepared nursing workforce between January 2022 and November 2024. A convenience sample of individuals with a PhD in nursing science was recruited across the WHO regions of Africa, America, Europe as well as the Eastern Mediterranean, South-East Asia, and the Western Pacific region (WHO, n.d.). Different recruitment strategies were employed due to the absence of global and often national registers of PhD-prepared nurses. Recruitment included approaching of presidents of international, European, and national nursing (science) organizations. The presidents received study information and were asked to share the study information with their members. Also, contact persons were located in the global regions based on the networks of the research team and information on internet. The contact persons were asked to support recruitment through identification of relevant organizations in their country as well as forwarding study information to potential participants. Study information was also directly sent to potential participants if they could be identified through internet pages of organizations. Also, the study information was shared on the research team's personal social media channels. At last, participants who finalized the survey were asked to share the study invitation with colleagues. The persons assisting in the

recruitment and potential participants received standardized messages with information on the study. In the recruitment 23 professional organizations were contacted as well as 454 contact persons and 2353 potential participants.

The recruitment strategy resulted in a sample of 1308 PhD-prepared nurses from 57 countries. Most participants were females ($n = 794$) and the mean age of the sample was 50.1 years. Most respondents were employed as professor ($n = 195$), associate professor ($n = 153$), or assistant professor ($n = 156$) at universities ($n = 507$) or university medical centers ($n = 228$). Most responses were from the United States ($n = 206$), Italy ($n = 58$), Germany ($n = 53$), Turkey ($n = 52$), and the United Kingdom ($n = 52$). Most participants originated from the regions of Europe ($n = 590$) or region of America ($n = 271$). Of the sample, 31.5% ($n = 265$) reported to be in the early postdoctoral career stages within five years of obtaining the doctorate, 39.5% ($n = 332$) reported to be in the mid-career stage, and 29% reported to be in late career stages within five years of retirement. Details on the samples of the global regions are provided in paper V.

Various methodological considerations were encountered in the design of this study. It was not possible to use a more structured recruitment strategy due to the lack of central registration of PhD-prepared nurses globally, and often at national levels (Kim et al., 2022). Also, there are substantial differences in the state of nursing science between countries (Hafsteinsdóttir et al., 2019; Hanssen et al., 2018; Thompson et al., 2024; Watson et al., 2021; Yanbing et al., 2021). Therefore, the merging of the individual countries into global regions requires careful interpretation of the findings.

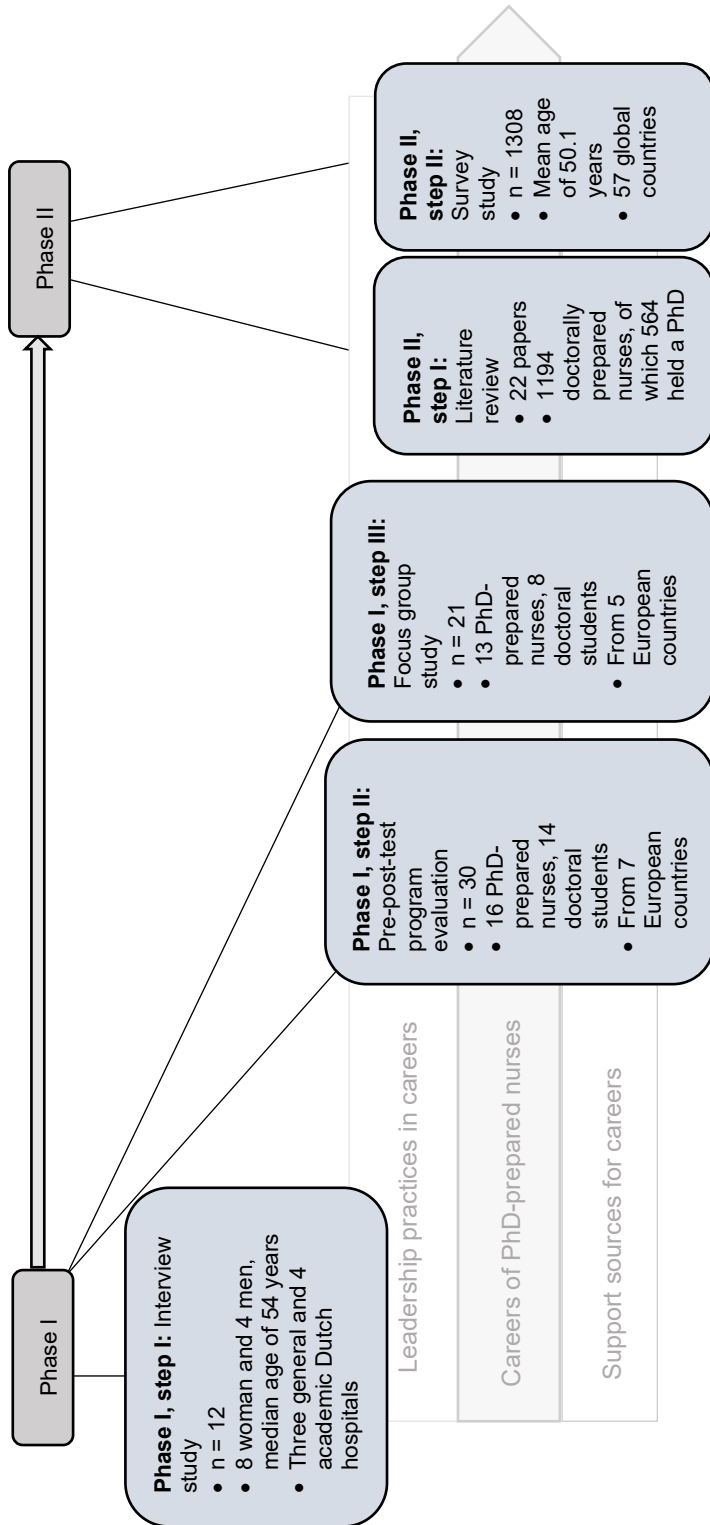


Figure 3. Study samples.

4.2 Data collection methods, instruments and procedures

Phase I

In the **first step** of phase I, data were collected using one-time semi-structured interviews with PhD-prepared nurses working in hospitals (Polit et al., 2017). The interview guide was established based on earlier research concerning leadership of academic nurses combined with studies reporting on work experiences of academic or PhD-prepared nurses in clinical settings (Al-Nawafleh et al., 2013; Hafsteinsdóttir et al., 2017; van Oostveen et al., 2017). Data were collected between February and June 2018. At this time leadership was a relatively new concept (Hafsteinsdóttir et al., 2017) and therefore the interviews started with the question “How would you define leadership in your position as postdoctoral nurse?” Followed by questions on leadership practices and experiences in the careers as well as barriers to leadership. Interviews were conducted until data saturation was reached, which in this step, was referred to as the point when no additional codes were identified in the analysis (Hennink et al., 2017). To determine if data saturation had occurred, data collection and analysis were performed iterative.

Prior to the interviews, participants were asked to send their Curriculum Vitae to the researcher to familiarize with the career and work of the participant. Interviews were audio-taped and member checks were performed by sending a summary with main conclusions from the interviews to the participants (Noble et al., 2015) (paper I).

In the **second step** of phase I, data were collected using online surveys, with the pre-test measurement being conducted at the start of the program in October 2018 and the post-test measurement being conducted at the end of the program in April 2020 (Pilot et al., 2017). The survey comprised a self-created survey instrument with the variables: demographic characteristics, leadership practices, professional competencies, research competencies, and career development. The *leadership practices* were evaluated using the Leadership Practices Inventory (LPI) (Kouzes et al., 2017). The LPI is a validated instrument to measure the frequency of leadership behaviours on a 10-point Likert scale (Posner, 2016). The LPI measures the performance on the following subscales: a) Model the way; b) Inspire a shared vision; c) Challenge the process; d) Enable others to act; and e) Encourage the heart (Kouzes et al., 2016). The LPI consisted of a self-assessment as well as observer assessment, both including 30 items. Only the self-evaluations were used in this study due to insufficient response rates of the observers in the post-test measurement. The *professional competencies* were evaluated using the competencies required for postdoctoral researchers working in research, identified by Numminen et al. (2019).

The professional competencies and their definitions are presented in Appendix 2. Participants rated their performance on the professional competencies using a 100mm VAS-scale ranging from ‘not at all’ to ‘extremely’ competent. Fourteen *research competencies* were measured in a similar manner (Virtanen et al., 2018). The measured research competencies are also presented in Appendix 2. *Career development* was measured with multiple choice questions on current satisfaction with career progress, perceived impact of the program on career development, and the extent to which participant felt prepared for a career in academe after the program. *Demographic data* included gender, age, nationality, information on the PhD degree, work position, and working organization. Similar questions were used in the pre-test and post-test measurement to evaluate the participants’ progress (Pilot et al., 2017). In the post-test measurement, participants were asked to write narratives to gain insight into their competence and career development (paper II).

Prior to data collection, a pilot was conducted among six professors from the Nurse-Lead consortium to optimize the content of the survey as well as technical functions. The pilot resulted in minor changes in wording of questions and answer categories. The survey was developed in English and was distributed using the electronic tools Explora (pre-test measurement) and Castor EDC (post-test measurement). The researcher shared study invitations with the participants through email and the online learning platform of the program. Weekly reminders were sent in the learning platform to increase the response rate (paper II).

In the **third step** of phase I, data were collected through three semi-structured focus group interviews. Each of the focus groups comprised seven participants, with a mix of PhD-prepared nurses and doctoral nursing students. The topics were established based on prior research on mentoring of academic nurses (Cullen et al., 2017; Hafsteinsdóttir et al., 2017; Nick et al., 2012). The focus groups started with the following question: “Could you share your experiences with being a mentee in the Nurse-Lead program so far?” Other topics were establishing of a mentoring relationship, content of mentoring conversations, roles of the mentor and mentee, and the meaning of mentoring for leadership and professional development. The focus groups were organized during a Nurse-Lead program meeting in 2019, approximately one year after the start of the program. The interviews were moderated by three professors of the Nurse-Lead consortium. Observers made notes on the main discussions and group interactions.

The focus group interviews were conducted in a conference room with only the researchers and participants present. The interviews were conducted in English and audio-taped. Members checks were not conducted (paper III).

Phase II

In the **first step** in phase II, data from the included empirical studies was extracted into a data extraction form. The following data were extracted: author(s), year, country, aim(s), design, population, and outcomes. Data extraction was executed by one researcher and checked by a second researcher. Extracted data were transferred into Nvivo for the analysis (QRS international, version 12) (paper IV).

In the **second step** of phase II, data were collected using one-time online surveys covering the careers of PhD-prepared nurses and factors related to the careers identified in the first step of this phase, the integrative literature review, including preparedness for postdoctoral positions, mentoring, value and facilitation of research, career pathways and positions, support from others, educational programmes, work-life balance, and encountered workplace behaviours. Also, demographic information was collected including personal information and information on the educational background. The survey-instrument was developed for this study. Definitions or descriptions for each of the study variables were formulated based on earlier research, topics for the study variables were developed, and for each of the variables questions or items were developed as well as corresponding answer categories (Polit et al., 2017). The items about factors related to the careers focused on the current employment of the participants, except for the questions about doctoral education and preparedness for postdoctoral positions. In total the survey-instrument included 74 items with mostly multiple choice questions and questions with Visual Analogue Scales (VAS-scale) (Sung et al., 2018). Skip logic was used to reduce the burden on the participants. Open-ended questions were used to identify preferences for additional preparation and best practices regarding the careers (Polit et al., 2017). The survey was developed in English and not translated to other languages assuming English as the international language of science. Data were collected between December 2022 and June 2023 (paper V).

Before data collection a two-phase pilot was conducted. The first phase included testing of the survey by four doctoral students and two senior researchers. In the second phase, 12 PhD-prepared nurses tested the survey. In both phases feedback was asked on the clarity and accuracy of the questions and answer categories as well as the lay-out, technical aspects, and length of the survey. The pilot resulted in minor changes in the wording of questions and response categories.

The survey was distributed using the electronic survey tool RedCap. The participants received a survey invitation with study information and a web link to the online form. Participants were approached through contact persons, direct messages of the research team, nursing (science) organizations, and/or social media of the research team. The contact persons and nursing (science) organizations were asked to send reminders after two weeks. Also, those approached directly by the research team received a reminder after two weeks (paper V).

4.3 Data analysis

Phase I

In the analysis of the **first step** in phase I, the interview data were analyzed using the steps of thematic analysis according to Braun and Clarke (2006). First, audiotapes of the interviews were transcribed verbatim. Then, open coding was applied by two researchers to identify meaningful information for the study purposes in the transcripts. Once open coding was applied to five transcripts, development of the themes started by classifying the codes into categories based on similarities. During coding of the remaining manuscripts, the themes were adjusted based on new findings. After ten interviews, the researchers drew an overview of the themes and the relationships between them to clarify the meaning of the themes and construct an overall story. Then translation of the findings from Dutch to English took place. In the reporting phase, quotes were carefully selected (Polit et al., 2017). The themes and their meanings were discussed among the researchers frequently. Nvivo 11 was used for the management and storage of data during the analysis (QRS international, n.d.) (paper I).

The analysis of the **second step** in phase I included analysis of descriptive statistics and statistical data analysis as well as content analysis for the qualitative data. The analysis started with the calculation of means, standard deviations, frequencies, and percentages for the demographic characteristics, leadership practices, professional, and research competencies, as well as questions on career development for the pre-test measurement and post-test measurement separately. Before statistical comparisons between pre- and post-test measurements, histograms were plotted and assumptions of normal distributions were checked using the Shapiro-Wilk test. In normally distributed data, paired sample t-tests were used and the Wilcoxon signed rank test was used in non-normally distributed variables (Polit et al., 2017; Portney et al., 2014). A significance level of 0.05 was followed. The analyses were performed in SPSS (version 26) by two researchers separately to increase the reliability (Polit et al., 2017).

The textual data from open-ended questions was analysed after the completion of the statistical analysis. Content analysis was used, with open coding applied to the data before categorizing the codes based on similarity (Polit et al., 2017). The analysis was conducted by one researcher and was reviewed by a second researcher. The outcomes of the quantitative and textual data were merged per study measure by comparison of the key findings. Regular meetings were held with the research team to discuss the findings and their interpretation (paper II).

In the **third step** of phase I, similar to the first step in this phase (paper I), thematic analysis according to Braun et al. (2006) was used. In this step a pre-defined number

of three focus groups was decided upon based on practical considerations and therefore the analysis started after the data collection (Creswell, 2013). The research team determined that data saturation was not reached as each interview revealed different insights and perspectives on the mentoring. The data, however, was highly relevant to the study aim, included variation in mentoring experiences provided by a specific group of participants, and data were collected based on high quality dialogue between researchers and participants (Malterud et al., 2016) (paper III).

The analysis started with transcribing of the audiotapes. The researcher familiarized with the transcripts and started with the application of open coding to identify meaningful information. After coding of the transcripts, merging of the codes took place based on their similarities, connections, and relevance to the aim of this step. Constant comparison was used in a sense that the researcher moved between the transcripts, codes, and themes (Creswell, 2013). After the development of an initial set of themes, the themes and coding process was critically reviewed by three members of the research team, who reflected on the link between the transcripts, themes, and aim of this study step. Quotations to support the themes were selected by the research team. Nvivo 11 was also used in this step for data management and storage (QRS international, n.d.) (paper III).

Phase II

In the analysis of the **first step** in phase II, data from the studies included in the literature review were combined using a convergent integrated approach (Lizarondo et al., 2020). Findings from the quantitative studies were transferred into textual data to enable thematic analysis to produce an overall summary (Lizarondo et al., 2020). The analysis was carried out by two researchers, who both familiarized themselves with the data. Data were coded by one researcher within the pre-defined categories: careers, experiences with career development, and factors related to careers. Within the pre-defined categories, codes were categorized into themes based on their similarity (Polit et al., 2017). The coding and categorization process was checked by a second researcher. Progress of the analysis as well as the themes and their meaning were discussed regularly with the research team. Nvivo 11 was used for the management and storage of data during the analysis (QRS international, n.d.) (paper IV).

The analysis in the **second step** of phase II included analysis of descriptive statistics for the total sample and for the samples of the WHO regions. Available case analysis was performed. First, descriptive statistics were used to summarize outcomes for the variables by calculation of frequencies and percentages or means and standard deviations and/or the ranges for the whole sample, followed by the calculations for the samples of the WHO regions (Portney et al., 2014). Then, textual data from the open-ended questions was transferred into Nvivo 11. A summative

content analysis was performed (Hsieh et al., 2005). In this approach the researcher categorized the data based on similarities, followed by counting the number for each of the categories (Hsieh et al., 2005). The process of categorization was checked by a second researcher (paper V) (Table 5).

Table 5. Methods of data analysis.

Study phase	Method of data analyses
Phase I	Step I: Thematic analysis according to Braun et al. (2006) (paper I) Step II: <ul style="list-style-type: none"> • Descriptive statistics: means, standard deviations, frequencies and percentages • Statistical tests: Paired sample t-tests or the Wilcoxon signed rank test (paper II) Step III: Thematic analysis according to Braun et al. (2006) (paper III)
Phase II	Step I: Convergent integrated approach with thematic analysis (paper IV) Step II: <ul style="list-style-type: none"> • Descriptive statistics: frequencies and percentages or means, standard deviations and/or ranges • Qualitative data: summative content analysis (Hsieh et al., 2005) (paper V)

4.4 Ethical procedures and considerations

This study was conducted according to the ethical guidelines in scientific research (Iphofen, 2020) and the European Code of Conduct for Research Integrity (ALLEA, 2023). In addition, the General Data Protection Regulation (GDPR) was followed (European Union, 2016). Ethical approval was asked for each of the steps involving human research subjects (papers I, II, III, and V). In the first phase, for step I, II, and III, ethical review was completed by the Medical Research Ethics committee from UMC Utrecht in the Netherlands (papers I and II) and for step II and III ethical review was also conducted by the Scientific Committee from the University of Iceland in Iceland. For step II in the second phase, ethical review was completed by the Ethical Committee for Human Science from the University of Turku in Finland (paper V). An overview of the research ethics in this study is provided in Table 6.

In phase I, the contribution of Nurse-Lead program to leadership practices in careers as well as the potential to be a support sources for career was evaluated. In step III, it is important to address that Nurse-Lead consortium members and participants from the same organizations met each other in the focus groups. All consortium members were aware of the importance of being transparent about their roles and potential consequences (Finnish Advisory Board on Research Integrity TENK, 2019; McDermid et al., 2014). Actions were taken to reduce the potential

influence of pre-existing relationships in the focus groups as special attention was paid to divide consortium members and Nurse-Lead participants into different focus groups (paper III). This was, however, not realized in all cases, which may have resulted in more positive experiences being reported. The pre-existing relationships may also had influence on the outcomes of the pre-post-test program evaluation (paper II). This risk, however, is expected to be limited since no directly traceable information was collected in the surveys. Also, consortium members ensured that participants knew that their contributions were valued in all cases.

The participants' involvement in the Nurse-Lead program may be publicly known due to information on the Nurse-Lead website and social media posts. Therefore, in the reporting of the outcomes of steps II and III in phase I (papers II and III), the decision was made to not to refer to individual participants in the presentation of the demographic information and quotations were not linked to demographical information.

Table 6. Research ethics.

Topic	Actions
Planning of the study	<ul style="list-style-type: none"> • Analysis of evidence gaps in the literature was used to determine the direction and rationale for the whole study as well as for each of the study steps.
Ethical review	<ul style="list-style-type: none"> • Ethical reviews were completed for each of the studies involving human subjects.
Recruitment and informed consent	<ul style="list-style-type: none"> • Potential participants were informed through information letters with information on the study objective, participants contributions', processing of information, the informed consent procedure, as well as voluntary participation, advantages and disadvantages of participation, and information about the research team. In step I, in phase I, participants were recruited based on a database development through earlier research and all participants received study information using the contact details in the database, sent through email by the researcher. In step II and III in phase I, potential participants were approached and informed by the researcher through email and the online learning platform of the leadership and mentoring program. In phase II, step II, participants were approached by the researcher, local contact persons, professional organizations, and/or social media. Information on the study was provided at the webpage before starting the online survey. • In all study steps study information was provided through information letters, which were send to participants prior to data collection. If data were collected in person, which was the case in step I and III in phase I, the opportunity to ask additional questions, to refuse participation, and the opportunity to withdrew from the study were emphasized prior to data collection (papers I and III). In case of online data collection, in step II in phase I and step II in phase II, additional information could be requested from the researcher through e-mail and/or telephone. • In phase I, steps I and III, written informed consent was obtained by the researcher prior to the start of the interviews (papers I and III). Informed consent was obtained at the start of the online surveys, in phase I, step II and in the second step in phase II (papers II and V).

Topic	Actions
Privacy	<ul style="list-style-type: none"> • No personal information or directly identifiable information was collected for study purposes. • If personal data occurred within the qualitative studies in phase I, steps I and III, the information was coded by the researcher before the start of the analysis (papers I and III). Codes and original information were stored at different places in a secured online environment. • Individuals cannot be recognized in publications.
Electronic systems	<ul style="list-style-type: none"> • Data were collected and analyzed using electronic tools and systems recommended by the universities involved in the study step (Explora, Castor EDC, RedCap, SPSS, Nvivo). The used tools and systems complied with the GDPR.
Data management	<ul style="list-style-type: none"> • Data management plans were produced for each step, corresponding with the GDPR. • In each study step only pre-determined members of the research team had access to the study data and the original data could only be accessed by the researcher. • Data were stored and archived at the universities' secured online environment. • Data will be kept for 10 years after the end of each of the study corresponding to the guidelines of the university. • Data of all study steps will be archived using the resources provided by the university. • Original data will not be shared with third parties.
Publication ethics	<ul style="list-style-type: none"> • Findings were published through five original publications. The publications are published in open access format in journals relevant to the study topic (papers I, II, III, IV). One paper is in the process of publication (paper V). • The journals' guidelines on authorship were followed.

5 Results

The results of this study are reported following the two study phases and the corresponding study aims and research questions. Therefore, the first section focuses on leadership practices in the careers of PhD-prepared nurses and the contribution of a leadership and mentoring program to development of leadership practices and careers (paragraph 5.1). The second part describes the careers of PhD-prepared nurses (paragraph 5.2) and factors related to the careers (paragraph 5.3). In this last paragraph, the findings on factors related to the careers are integrated in a summative structure (Figure 4). Factors related to the careers include factors connected to leadership practices of PhD-prepared nurses as well as factor describing support sources for careers. Support sources refer mostly to support systems that can be created within organizations where PhD-prepared nurses work, whereas the factors connected to leadership of practices in careers of PhD-prepared nurses include factors that may be influenced by individuals.

5.1 PhD-prepared nurses practicing leadership in their careers

The findings showed that PhD-prepared nurses demonstrate leadership practices in their work through leading research activities focusing on the nursing discipline, through the conduct of research within multidisciplinary settings, and by leading quality improvement initiatives. Effective leadership practices included being visionary, motivating, enthusiastic, and decisive while being self-determined. Good communication skills and being organization sensitive were found to be important leadership practices. According to the PhD-prepared nurses, it was also important to have expert knowledge, a passion for nursing, and courage to stand out. Being persevering was also considered important, since PhD-prepared nurses often had to pioneer in their careers due to limited organizational structures for careers and work in nursing research (paper I).

Leadership practices were found to be important for the careers of PhD-prepared nurses. According to the participants, leadership practices in careers were demonstrated by taking initiative for developing a career vision and planning actions to reach those career goals. Careers were often reflected upon as an intentional

process, in which the PhD-prepared nurses were in the lead and took initiative (paper I).

Leadership practices in the careers of PhD-prepared nurses were influenced by the working context. Most PhD-prepared nurses described the hospital setting as complex and two-folded experiences were found. Some PhD-prepared nurses were able practice leadership and advance their careers, while others experienced difficulties in their work and struggled with advancing their careers and/or reaching career goals. Some participants experienced working in the hospital as rewarding and feel supported, while others considered it as a challenging work setting. The differences in experiences were related to the progression of nursing research cultures and infrastructures in the organizations, availability of suitable positions, experiences of managerial support, and opportunities for collaboration inside and outside the hospital (paper I).

The leadership and mentoring program as support source for careers, leadership practices, and professional competencies

Evaluation of the Nurse-Lead leadership and mentoring program showed that such programs can be considered as support source for the careers and leadership practice development of PhD-prepared nurses. In the narratives, participants reported the program to be a support source as the program encouraged them to explore career ambitions, to develop career visions, and to plan and execute actions to reach their career goals. In addition, the program contributed to their leadership practice development and careers through the development of individual leadership development plans, mentoring, and connections and/or collaboration with (international) colleagues in the program (paper II).

The Nurse-Lead program was found to be a support source for the development of leadership practices, professional competencies, and research competencies of PhD-prepared nurses as well as doctoral nursing students. Regarding the *leadership practices*, improved averages scores on all five leadership practices were found at the end of the program, for the total sample as well as for the groups of PhD-prepared nurses and doctoral nursing students separately. Statistically significant improvements were observed in all LPI leadership practices for the total sample (Table 7). In the narrative responses, 23 participants reported increased knowledge on leadership theories and being able to transfer this knowledge into their work practices. Participants reported being more confident in their work, taking on new responsibilities, and incorporating more creative approaches in their work. According to ten participants, the program helped them to strengthen their team management competencies as they – among other things – felt better equipped to

manage team processes, develop shared visions, while having a better understanding of their own role within the team (paper II).

Table 7. Development of LPI leadership practices in the Nurse-Lead program (Kouzes et al., 2017), measured on a 10 point scale. *Modified table from van Dongen et al., 2024 (paper II).*

Leadership practices	Pre-test: Mean (SD)			Post-test: Mean (SD)			Total sample: pre-test vs. post-test
	PhD nurses	Doctoral students	Total sample	PhD nurses	Doctoral students	Total sample	
Model the way ^a	44 (6.0)	41 (8.4)	41.7 (7.2)	49.3 (4.7)	49.6 (4.7)	49.4 (4.6)	$p < .001^*$
Inspire a shared vision ^a	41.3 (8.7)	38.4 (11.3)	39.7 (9.7)	48.3 (6.2)	46.2 (6.2)	47.2 (6.2)	$p < .001^*$
Challenge the process ^a	43.3 (6.9)	41.3 (9.9)	42.1 (8.0)	49.2 (5.3)	47.7 (6.8)	48.5 (6.0)	$p < .001^*$
Enable others to act ^b	49.2 (4.4)	45.5 (10.9)	47.6 (8.0)	53.7 (5.3)	53.1 (2.6)	53.4 (2.9)	$p < .001^*$
Encourage the heart ^b	45.2 (9.6)	41.4 (9.0)	42.6 (8.6)	50.6 (5.4)	48.8 (4.6)	49.7 (5.0)	$p = .001^*$

^a Paired sample t-test

^b Wilcoxon signed rank test

Regarding the development of *professional competencies*, the participants showed higher average scores on all 15 professional competencies after participation in the program. Improved scores were observed in the total sample, as well as the samples of PhD-prepared nurses and doctoral nursing students separately. Moreover, statistically significant improvements were found on all professional competencies for the total sample (Table 8). In the narrative responses, 25 of the 30 participants described that the program made them aware of the importance of focusing on their professional development. Three participants indicated a limited contribution of the program to their professional development as it did not lead to long term changes in their professional behaviour. Of these participants, one participant was unable to determine if the professional development was a result of the program or other learning or work experiences (paper II).

Table 8. Development of professional competencies in the Nurse-Lead program (Numminen et al., 2019), measured on a VAS scale ranging from 0 to 10 (100mm). *Modified table from van Dongen et al., 2024 (paper II).*

Professional competencies	Pre-test: Mean (SD)			Post-test: Mean (SD)			Total sample: pre-test vs. post-test
	PhD nurses	Doctoral students	Total sample	PhD nurses	Doctoral students	Total sample	
Research field management ^a	7.2 (1.0)	5.6 (1.9)	6.4 (1.7)	7.9 (0.9)	6.9 (0.9)	7.4 (1.0)	$p = .001^*$
Research skill management ^b	7.2 (1.2)	5.5 (2.1)	6.4 (1.9)	7.9 (1.0)	6.9 (1.0)	7.4 (1.1)	$p = .003^*$
Research ethics management ^a	7.9 (1.1)	6.9 (1.4)	7.4 (1.3)	8.7 (0.7)	8.0 (1.2)	8.4 (1.0)	$p = .001^*$
Cognitive management ^a	7.7 (1.0)	7.0 (1.2)	7.3 (1.2)	8.5 (0.8)	7.7 (0.7)	8.1 (0.9)	$p = .001^*$
Self-management ^b	7.8 (1.5)	6.8 (1.6)	7.3 (1.6)	8.2 (1.0)	7.7 (1.3)	8.0 (1.2)	$p = .016^*$
Research communication management ^a	7.9 (1.0)	6.7 (1.7)	7.2 (1.5)	8.1 (0.7)	7.5 (1.0)	7.8 (0.9)	$p = .042^*$
Team working management ^a	7.9 (1.0)	7.3 (1.4)	7.6 (1.2)	8.4 (0.6)	8.3 (1.0)	8.4 (0.8)	$p = .001^*$
Team leadership management ^b	6.8 (1.7)	5.8 (2.2)	6.3 (2.0)	8.1 (0.9)	7.5 (1.2)	7.8 (1.1)	$p < .001^*$
Resource management ^b	7.1 (1.1)	5.6 (2.0)	6.3 (1.8)	8.0 (0.7)	7.3 (0.9)	7.7 (0.8)	$p < .001^*$
Career management ^a	7.4 (1.3)	5.9 (1.6)	6.7 (1.6)	8.2 (0.9)	7.2 (0.7)	7.7 (1.0)	$p = .001^*$
Pedagogy management ^b	7.9 (1.2)	6.8 (2.2)	7.4 (1.8)	8.5 (0.7)	7.9 (1.3)	8.2 (1.1)	$p = .013^*$
Implementation management ^a	7.1 (1.3)	5.8 (1.9)	6.4 (1.8)	8.0 (0.9)	7.3 (0.9)	7.6 (1.0)	$p = .001^*$
Future vision management ^a	7.0 (1.5)	6.0 (2.0)	6.5 (1.8)	8.3 (0.9)	7.5 (0.7)	7.9 (0.9)	$p < .001^*$
Intercultural management ^a	7.5 (1.5)	7.2 (2.3)	7.3 (1.9)	8.4 (0.8)	7.8 (0.9)	8.1 (0.9)	$p = .017^*$
Technology management ^a	7.0 (0.9)	6.2 (2.6)	6.6 (2.0)	7.9 (0.8)	7.5 (1.3)	7.7 (1.1)	$p = .001^*$

^a Paired sample t-test

^b Wilcoxon signed rank test

Regarding the *research competencies*, higher average scores on the 14 research competencies were found after completion of the program in the post-test measurement, for the total sample as in the sample of PhD-prepared nurses. Statistically significant improvements were found for most competencies for the

total sample, with expectations of the competencies: academic writing, the ability to share information grant writing, and presentation skills (Table 9) (paper II).

Table 9. Development of research competencies in the Nurse-Lead program (Virtanen et al., 2018), measured on a VAS scale ranging from 0 to 10 (100mm). *Modified table from van Dongen et al., 2024 (paper II).*

Competency	Pre-test: mean (SD)			Post-test: mean (SD)			Total sample: pre-test vs. post-test
	PhD nurses	Doctoral students	Total sample	PhD nurses	Doctoral students	Total sample	
Academic writing ^b	7.3 (1.6)	6.7 (1.9)	7.0 (1.7)	8.0 (0.5)	6.8 (1.4)	7.5 (1.2)	P = .178
Understanding of the literature related to topic of interest, construct research proposal ^a	8.2 (0.8)	7.1 (1.5)	7.7 (1.3)	8.7 (0.6)	7.6 (1.1)	8.2 (1.0)	P = .037*
Critical and creative thinking competence ^a	7.7 (1.2)	7.2 (1.3)	7.4 (1.2)	8.5 (0.9)	7.7 (1.1)	8.1 (1.1)	P = .002*
Scientific thinking ^b	7.9 (0.9)	7.0 (1.3)	7.5 (1.2)	8.6 (0.8)	7.6 (0.9)	8.1 (0.9)	P = .003*
Ability to network ^a	7.4 (1.8)	6.6 (2.3)	7.0 (2.1)	8.3 (0.9)	7.7 (1.1)	8.0 (1.0)	P = .004*
Ability to share information ^a	8.1 (0.6)	7.7 (1.4)	7.9 (1.1)	8.6 (0.8)	8.0 (0.9)	8.3 (0.9)	P = .070
Defend one's ideas ^a	7.9 (0.8)	7.3 (1.4)	7.6 (1.1)	8.6 (0.7)	7.7 (1.0)	8.2 (1.0)	P = .002*
Defend of one's performance ^b	7.5 (0.8)	7.3 (1.3)	7.4 (1.1)	8.3 (0.5)	7.6 (1.1)	8.0 (0.9)	P = .003*
Publishing skills ^b	7.1 (1.4)	5.6 (1.5)	6.4 (1.6)	8.0 (0.6)	6.0 (2.2)	6.9 (1.9)	P = .005*
Ethical guidelines and codes ^a	8.5 (0.7)	8.0 (1.1)	8.3 (1.0)	9.1 (0.6)	8.4 (0.6)	8.8 (0.7)	P = .009*
Grant writing ^a	6.6 (1.5)	5.5 (2.0)	6.1 (1.8)	7.6 (0.9)	5.5 (2.3)	6.5 (2.0)	P = .245
Conference presentations ^b	8.0 (1.0)	7.2 (2.0)	7.6 (1.6)	8.4 (0.7)	7.7 (1.0)	8.1 (0.9)	P = .025*
Presenting skills ^b	7.9 (1.0)	7.4 (1.7)	7.6 (1.4)	8.4 (0.7)	7.8 (0.8)	8.1 (0.8)	P = .112
Language skills ^a	7.4 (1.2)	6.6 (1.8)	7.0 (1.6)	8.3 (0.7)	7.0 (1.6)	7.6 (1.4)	P = .007*

^a Paired sample t-test

^b Wilcoxon signed rank test

Program-based mentoring as support source for careers and leadership practices

Mentoring, as a part of a leadership and mentoring program, was found to be a support source for the careers and leadership practices of the PhD-prepared nurses and doctoral nursing students. New insights in career ambitions emerged based on the mentoring conversations. The participants described that they listened better to their inner voice and had more belief in their own capacities, resulting in stepping out of their comfort zones more often. Emotional support and reassurance of mentors contributed to this professional development. Also, mentoring supported the participants to lead and progress their research, while guiding them to overcome challenges in their work. Mentors encouraged participants to reflect on their team management competencies and take on new roles within the team. Mentoring supported them to take into account ideas and opinions of others, reward contributions of others, and invest in growth of others (paper III).

The mentoring in the program provided a structure that resulted in mentoring being a support source for the careers of PhD-prepared nurses and doctoral nursing students. Multiple factors contributed to rewarding mentoring experiences. It appeared that the decision on who to choose as mentor was based on the professional experience of the mentor since most participants choose internationally leading scientists, who had extensive experience with international research, and were recognized as leaders within the discipline. Others chose mentors based on existing relationships, ensuring trust and familiarity with the work of the mentee. Trusting mentoring relationships were built over time. In the beginning some participants were hesitant to approach potential mentors because of their status and schedule, however, all participants had positive experiences as the mentors responded with enthusiasm and showed genuine interest. As the mentoring trajectories progressed, participants and mentors became more familiar with each other, trusting relationship emerged enabling the discussion of personal matters. The characteristics of mentors were found to contribute to the development of these trusting relationships as mentors were committed and friendly, while also being critical in a supportive manner (paper III).

5.2 Careers of PhD-prepared nurses

Careers refer to sequence of the positions held over one's work life and the experiences within these positions (Brown et al., 2013; Patton et al., 2014). Findings of the integrative literature review showed that there was limited information on the sequence of positions held by doctorally prepared nurses during their career. Limited information on current positions of PhD-prepared nurses was reported in most of the included studies (paper IV). Within the cross-sectional survey study, positions after

the doctorate were explored. This resulted in participants' describing a multitude of positions and careers, whereby it was not possible to describe patterns in sequence of the positions of PhD-prepared nurses in this study (paper V).

Two important moments in the careers of doctorally prepared nurses were identified: '*The crossroad after the doctorate*' and '*Maturing into a confident doctorally prepared nurse*'. The crossroad after the doctorate was referred to as the period after the doctoral studies and was characterized by reflecting on doctoral experiences and planning for the future. Planning of the future included determining career direction and research focus as well as reconsidering the balance between private and professional life. Regarding the private life, the consideration to give back to significant others after relying on their support during the doctoral period was voiced by some PhD-prepared nurses. Maturing into a confident doctorally prepared nurse was described in the earlier literature and it became apparent that doctorally prepared nurses needed to adjust to new roles and responsibilities in their postdoctoral career, which could take several years. The doctorally prepared nurses were aware of the importance and need to further develop their competencies. A variety of competencies on which further development of preferred was reported (paper IV).

Positions

The findings of the integrative literature review revealed that doctorally prepared nurses often worked in research and education oriented careers. They often balance work in different (part-time) positions involving teaching, research, administrative, and/or clinical activities. Although the descriptions lacked details, variation was found in the combinations of positions and/or roles in different areas of nursing. A trend that became apparent were difficulties with balancing work and responsibilities from different positions and/or roles. High workloads were experienced by doctorally prepared nurses and may be a result of limited protected time for research combined with heavy teaching commitments and administrative demands. The teaching workload was referred to as invisible as it often was not included in the documented workload. Doctorally prepared nurses working in clinical patient care reported patient care always having more priority than research activities (paper IV).

PhD-prepared nurses held various positions, at the time of the study, with positions of professor (24%), assistant professor (19.2%), and associate professor (18.9%) being reported most (Table 10). PhD-prepared nurses worked in various areas of nursing, with most respondents working in the areas of education (78%), research (73.6%), management (25.7%), and clinical settings (22.8%), while limited numbers of PhD-prepared nurses worked in industry (1.3%). Most of the respondents were employed at universities (62.7%), university medical centres (25%), or

university of applied sciences (11.6%) (Table 11). Most PhD-prepared nurses had one position in one organization (50.4%), while 28% held multipole (separate) positions at different organizations and/or departments. Of the sample, 17.9% had more than one positions which were integrated within one organization (paper V).

Table 10. Current positions of PhD-prepared nurses. Modified table from van Dongen et al. (manuscript, paper V).

Current positions of PhD-prepared nurses *	% (n)
Professor	24 (195)
Assistant professor	19.2 (156)
Associate professor	18.9 (153)
Postdoctoral researcher	15.8 (128)
Lecturer, Master education	12.8 (105)
Nurse scientist	11.5 (93)
Lecturer, Bachelor education	10.7 (87)
Clinical nurse specialist	6.5 (53)
Senior manager (strategical level)	5.2 (42)
Nurse practitioner	4.6 (37)
Project manager	4.3 (35)
Clinical nurse	3.9 (32)
Dean of Nursing (School of Nursing / University)	3.6 (29)
Clinical lecturer	3.6 (29)
Director of Nursing	3 (24)
First-line manager	2.3 (19)
Owner of company/business	2.1 (17)
Chief Nursing Officer	2 (16)
Dean of Health Sciences	1.1 (9)
Policy officer	0.7 (6)
Head of University	0.1 (1)
Other	20.1 (163)

*Respondents could select multiple answers

PhD-prepared nurses engaged in a broad range of working activities, with 10 work activities being average. The following research related activities were reported most frequently by the PhD-prepared nurses: a) reviewing for scientific journals (67.1%); b) participation in national research projects (54.6%); c) leading own research programme (37%); and d) principal investigator in national research

projects (35.1%). Participation in international research projects was reported by 34.3% of the respondents and 11.1% was principal investigator in international research projects. The following educational activities were reported most frequent: a) supervision of Master students (57.6%); b) mentoring of students (54.4%); c) teaching courses for master’s students (54%); d) supervision of PhD/DNP students (50.7%); and e) mentoring of colleagues (50.6%). Of the total sample, 12.2% was active in the delivery of direct patient care. Also, the respondents contributed to the development of organizational (40.8%), national (28.5%), and international (12.1%) procedures, protocols, and guidelines. Almost a quarter of the PhD-prepared nurses (24.6%) reported to contribute to the national public debate on healthcare and nursing. Of the total sample, 22% was responsible for the management of a team (paper V).

Table 11. Current working organizations of PhD-prepared nurses. *Modified table from van Dongen et al. (manuscript, paper V).*

Current working organizations of PhD-prepared nurses *	% (n)
University	62.7 (570)
University medical centre	25 (228)
University of applied science	11.6 (106)
General hospital	7.7 (70)
Research institute	4 (36)
Specialty hospital	2.8 (25)
Community care	2 (18)
Governmental agency	1.8 (16)
Public health care organization	1.4 (13)
Mental health care organization	0.7 (8)
Nursing home	0.9 (8)
Commercial company	0.7 (6)
Rehabilitation institute	0.3 (3)
Other	6.2 (56)

*Respondents could select multiple answers

5.3 Factors related to careers of PhD-prepared nurses

Factors related to careers of PhD-prepared nurses were identified in both study phases and each of the study steps (papers I, II, III, IV, V). The following factors were identified and analysed: a) intrinsic motivation; b) preparation of professional

and leadership competencies; c) work–life balance; d) workplace behaviours; e) collegial and informal support; f) collaborations; g) mentoring; h) educational programs; and i) organizational infrastructures for career advancement. The factors are divided into factors connected leadership practices of PhD-prepared nurses in their careers and support sources for careers (Figure 4).

5.3.1 Factors related to PhD-prepared nurses' leading their careers

Intrinsic motivation

It was found that doctorally prepared nurses were highly motivated to develop strong careers to contribute to advancement of health outcomes of individuals and to contribute to nursing practices by generating and disseminating new knowledge through leading research, quality improvement projects, or innovative programs (papers I and IV). Also, the doctorally prepared nurses were also highly motivated to develop careers in which they contribute to the education of (under)graduate students and nurse scientists (paper IV).

Preparation on professional and leadership competencies

PhD-prepared nurses reported the need for additional preparation on professional competencies (papers IV and V). The integrative literature review described that doctorally prepared nurses needed to further develop competencies to meet the expectations of postdoctoral positions. Several competencies were identified as areas where additional preparation was preferred, including grant writing, publishing, team management, and conflict management (paper IV). Regarding the preparation of leadership competencies, it was found that the development of leadership competencies was part of doctoral education in 27% of the sample of PhD-prepared nurses (paper V).

PhD-prepared nurses felt best prepared for careers in research, followed by positions in education, policy development, and management. They felt least prepared for careers in business or industry. Regarding the professional competencies, the PhD-prepared nurses felt best prepared for the competencies: research ethics management, research skill management, and self-management, while they felt least prepared on the competencies: pedagogy management, career management, and resource management (Table 12) (paper V).

Table 12. Preparation on professional competencies (Numminen et al., 2019), measured with a 100mm VAS-scale. *Modified table from van Dongen et al. (manuscript, paper V).*

Professional competencies	Mean (SD)
Research ethics management	78.7 (19.4)
Research skill management	76.4 (18.4)
Self-management	75.6 (22)
Cognitive management	73.7 (21.4)
Research communication management	72.8 (21.6)
Research field management	67.2 (23.1)
Team working management	63.9 (25.7)
Future vision management	58.7 (25.7)
Intercultural management	58.2 (28.1)
Team leadership management	56.8 (27)
Implementation management	56.1 (27.7)
Technology management	55.5 (26.7)
Resource management	54.6 (27)
Career management	53.5 (27.6)
Pedagogy management	51.9 (28.2)

During doctoral education, 46.7% of the sample of PhD-prepared nurses would have liked to receive additional preparation on one or more topics and/or competencies. Pedagogical and teaching competencies, career planning, grant applications, implementation and dissemination of research, leadership, and team management were reported most frequently. In current positions, addressing the postdoctoral phase, 65.1% of the sample would have preferred additional preparation. The following competencies and/or topics were reported most frequently: grant applications, teaching and pedagogical competencies, research methodologies leadership competencies, leading research teams, research project management, and statistical analysis (paper V).

Work–life balance

The careers and work of PhD-prepared nurses resulted in the need to navigate challenges related to the work-life balance. High workloads were found in the interview study (paper I) and integrative literature review (paper IV). Many doctorally prepared nurses experienced challenges with combining professional and private commitments. Difficulties with keeping the balance between work and private life were reflected by the need to work on research in private time and

limiting family time in evenings and weekends (paper IV). Satisfaction with the work-life balance of PhD-prepared nurses, measured on a 100mm VAS-scale, was rated with a score of 56.4 (SD 27.2) (paper V).

Encountered workplace behaviors

PhD-prepared nurses can experience disruptive behaviors at the work place including belittlements, speaking down to others, and inappropriate behaviors among co-workers. It was found that nurses clinical doctorates in some cases received negative comments due to having a clinical doctorate instead of a research-orientated doctoral degree (paper IV). Bullying at the workplace was experienced by 22.5% of the sample of PhD-prepared nurses. Age discrimination was reported by 15% and discrimination linked to ethnic background, race, or sexuality was reported by 7.7%. Sexual harassment was reported by 2.9% of the sample of PhD-prepared nurses (paper V).

5.3.2 Factors related to support sources for careers

Collegial and informal support

The importance of collegial support for careers was reported (papers I and IV). Positive experiences related collegial support included learning from each other, sharing of work challenges, and development of professional networks. However, some PhD-prepared nurses did not experience collegial support from other nurses with a PhD due to a lack of colleagues at their workplace (paper I). Support of managers was also found to be important for careers of PhD-prepared nurses (papers I and IV). In general, the PhD-prepared nurses felt valued and supported by their managers, while there were also cases in which a lack of recognition and support was experienced. In some cases managers had other priorities, resulting in participants' feeling tolerated instead of feeling appreciated. According to some PhD-prepared nurses, this may be the result of managers' having limited knowledge of research. Support also came from managers or professors in the medical domain as they were considered to be valuable discussion partners because of their knowledge in science (paper I). When comparing different support sources, the highest levels of support, measured on a 100mm VAS score, were observed in family and friends (78.9), followed by support from colleagues with a nursing background (68.7), support from colleagues with another professional background (65.1), and the management (64.2) (paper V).

Collaborations

Collaborations are important for the careers of PhD-prepared nurses, however, variation in satisfaction with opportunities for collaboration was found. Some PhD-prepared nurses described strong professional collaborations, while others felt isolated, especially those working outside academic settings. These participants emphasized the importance of collaboration between colleagues working in academic and non-academic settings. Also, PhD-prepared nurses described that the collaboration with physicians could be strengthened, as they were often competing for resources. Clinical nurse specialists with PhD-degrees seemed to have more effective research collaborations with physicians. Collaboration with nurses in clinical practice was highly valued by the PhD-prepared nurses, and clinical nurses often contributed to the research. However, the PhD-prepared nurses also experienced a distance between the clinical nurses and themselves (paper I).

Mentoring

Mentoring was found to be beneficial for the careers of PhD-prepared nurses (papers II, III, IV and V). In the integrative literature review, mentoring was found to contribute to the transition into postdoctoral careers, understanding of the work, development of professional competencies and research collaborations, ongoing research productivity, career planning, and supportive work environments (paper IV). In this study, it was also found that mentoring, as part of a leadership and mentoring program, contributed to careers as well as development of leadership practices and professional competencies (papers II and III). PhD-prepared nurses reported that mentoring was supported by 40.5% of current employers (paper V). A desire for more mentoring opportunities was found (papers IV and V).

Educational programs to support careers

Five different educational programs were identified in the integrative literature review. The programs included different approaches and content. The programs focused on leadership development, mentoring, career planning, and development of research competencies. Despite the programs being evaluated using different methods, all programs were found to contribute to the careers and professional development of doctorally prepared nurses (paper IV). This study also found that approximately half of respondents had access to postdoctoral programs (50.6%). In addition, 87.6% of the PhD-prepared nurses had the opportunity to participate in educational courses or programs (paper V). The satisfaction with educational opportunities to support professional development, measured on a 100mm VAS-

scale, was rated with a score of 56.7 (SD 27.3) in the sample of PhD-prepared nurses (paper V).

The contribution of the Nurse-Lead leadership and mentoring program to the careers and development of leadership practices and professional competencies is reported in the first paragraph of this chapter (papers II and III).

Organizational infrastructures for careers

In the integrative literature review a lack of organizational infrastructures for careers of PhD-prepared nurses was reported. This was reflected by a lack of career paths with clear descriptions of roles and research duties as well as criteria for promotion (paper IV). Also, limited numbers of available positions were found (papers I, IV and V). The importance of the development of clinical-academic positions was emphasized (papers I and V). Of the sample, 71.8% of PhD-prepared nurses reported that there are suitable positions for them within their current organizations. However, 54.4% (n = 403) indicated that there were not enough positions available. Approximately half of the organizations had implemented career paths for PhD-prepared nurses (50.1%) (paper V).

Some PhD-prepared nurses reported progression of nursing research cultures and infrastructures for nursing research by appointing professors in nursing and increasing opportunities for research funding. However, most hospitals remained medically oriented, resulting in limited organizational infrastructures for research careers of nurses (paper I).

Summative structure: factors related to careers of PhD-prepared nurses

The findings from the study steps (papers I, II, III, IV and V) were combined into a summative structure with factors related to careers including factors connected to leadership practices of PhD-prepared nurses and factors describing support sources. Support sources predominantly describe factors focusing support systems that could be implemented within organizations. Factors related to the leadership practices in careers include factors that may be influenced through practicing leadership (Figure 4).

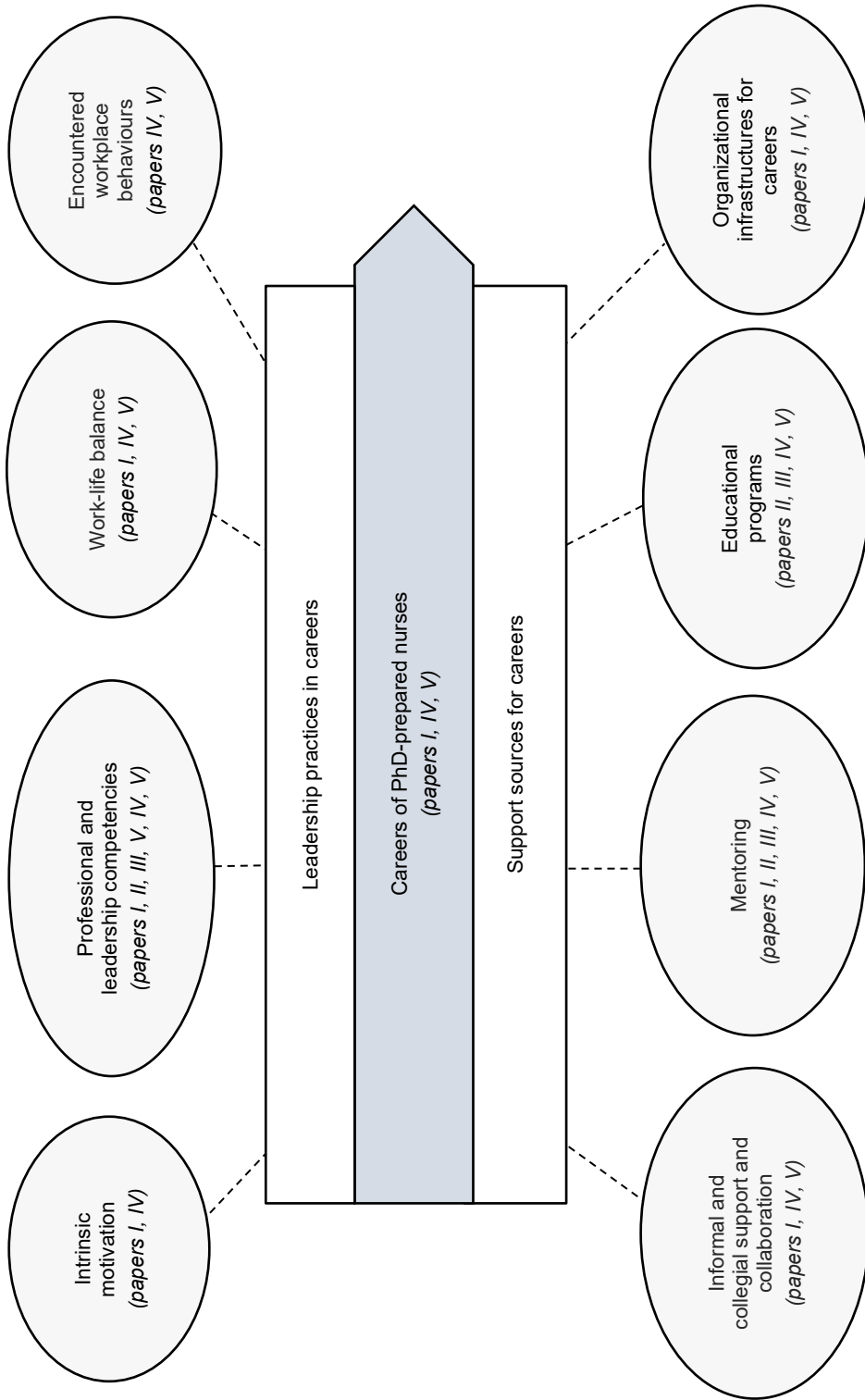


Figure 4. Summative structure: Factors related to careers of PhD-prepared nurses.

Recommendations for careers of PhD-prepared nurses

A total of 304 PhD-prepared nurses provided recommendations for the careers. Mentoring was reported most frequent as recommendation (n = 66). Two recommendations focusing on career pathways were suggested and included the development of structured and diverse career pathways (n = 40) and development of clinical academic positions (n = 36). Recommendations on employment and facilitation of work were also reported and included increasing the opportunities for research funding (n = 21) as well as securing of protected time for research (n = 14) and higher salaries (n = 12). Investment in postdoctoral training opportunities was also recommended (n = 18) (paper V).

Factors related to the careers in different global regions

In the cross-sectional global survey study (paper V) analyses of the factors related to the careers were conducted for each of the WHO regions including the region of Africa, America, and Europe as well as the Eastern Mediterranean, South-East Asia, and the Western Pacific regions (WHO, n.d.). These analyses indicated that there may be differences among the global regions on the factors related to careers such as organizational support for mentoring, the value and facilitation of research, availability of positions, satisfaction with work-life balance, and access to postdoctoral programs.

The sample of this step was not representative and samples from the region of Africa, the Eastern Mediterranean region, the South-East Asia region, and the Western Pacific region were limited. As a result, the outcomes of the analyses of the global regions should be interpreted carefully. Also, in the interpretation of the findings, differences in the progression of nursing science in countries within one global region need to be taken into consideration (Hafsteinsdóttir et al., 2019; Kim et al., 2022; Seltrecht, 2016; Thompson et al., 2024; Yanbing et al., 2021). Therefore, the analyses of the global regions can be seen as first step in understanding factors related to the careers of PhD-prepared nurses on the regional level. However, further research with more strategic and coherent recruitment strategies is needed to obtain representative samples, to provide a thorough understanding of the regional situations. Details are provided in paper V.

6 Discussion

The discussion section presents the main results of the study, including interpretations of the results and comparisons with earlier research. Also, the validity and reliability of the study are described including strengths and limitations for each of the steps. Recommendations are provided for PhD-prepared nurses, leaders and policymakers of organizations where PhD-prepared nurses work, leaders of nursing science organizations, and leaders of doctoral nursing programs. The chapter ends with recommendations for future research.

6.1 Discussion of the results

Leadership practices in the careers of PhD-prepared nurses

The main finding related to PhD-prepared nurses leading their careers is that they demonstrated leadership practices by taking initiative to develop their own career vision and setting actions to realize their career goals with the support of mentors and colleagues (paper I). Nursing is a multi-faced discipline with many career opportunities for PhD-prepared nurses. The wide range of career opportunities is observed in this study and has been reported in other studies as well (Broome et al., 2021; Fisher et al., 2022). Since there are many career opportunities, it is important that (aspiring) PhD-prepared nurses are proactive in finding their career interests and passion (Bourgault et al., 2022; Joseph et al., 2021). Doctoral students and novice PhD-prepared nurses are expected to benefit from gaining understanding on the meaning, context, and opportunities of potential careers early in their careers (de Lange et al., 2019; Joseph et al., 2021; Snethen, 2023). Experienced colleagues could have an important role in supporting novice colleagues' to find their preferred postdoctoral career path (Bourgault et al., 2023; Hafsteinsdóttir et al., 2017).

This study demonstrated the importance of PhD-prepared nurses leading their careers. Mentoring and support from others were identified as valuable sources of career support, as they contribute to professional development, increase awareness of career opportunities, and strengthen resilience (Bourgault et al., 2023; Busby et al., 2022; Fisher et al., 2022; Hafsteinsdóttir et al., 2017; Joseph et al., 2021).

However, PhD-prepared nurses should not rely on others for their career development and need to be self-directive towards their career and professional development (Rice et al., 2020). Others can be consulted for career discussions or assist in finding support sources for careers, however, the individual should lead the career. This study demonstrates the importance of PhD-prepared nurses being aware of the importance of their leadership practices and professional development, as well as being aware of the potential influence they can have on their own careers. During doctoral education, it is important that individuals learn to take responsibility and initiative for their career and professional development as this may help them to become adequately prepared for their preferred career by making conscious choices on their educational pathway (Snethen, 2023). Reflection on career goals, leadership practices, and professional competencies is suggested in all career stages, not only the early career stages, so that individuals are able to (continue to) lead and excel in their careers (Eldeirawi et al., 2023; Numminen et al., 2019).

In the current, often challenging and/or competitive, working environments (Park et al., 2023; Melnyk et al., 2023), it is inevitable that PhD-prepared nurses will encounter difficulties in their careers. They may experience competitive cultures and inequality may be introduced due to a lack of policies on career advancement (Park et al., 2023). For leaders of departments or teams, it is recommended to stimulate workplace behaviours characterized by support and collaboration rather than environments based on competition. Although it is important to address these potential challenges, it can also be argued that it is just as important to prepare individuals to deal with these potential career challenges (Joseph et al., 2021). The development of strong professional competencies and leadership practices, therefore, could be considered fundamental for the careers of PhD-prepared nurses.

Strong leadership practices are needed for PhD-prepared nurses to be the leaders of nursing science and the stewards of the discipline (Broome, 2015; Fisher et al., 2022). Leadership practices focusing on themselves are important (e.g. reflective practices and seeking feedback to identify own strengths and weaknesses) as well as practices focusing on leading others (e.g. by building trusting relationships, being open to others' ideas inspire others to use their creativity) (Broome, 2015). A finding of this study is that leadership development was often not a formal part of the curricula of doctoral programs for nurses. This may implicate that there are limited opportunities to develop leadership practices in the early stages of research careers. Limited opportunities for leadership practice development were also reported in earlier studies and editorials (Broome, 2015; Hafsteinsdóttir et al., 2017; Singh et al., 2022a). In line with findings from our study, earlier studies found that leadership practices can be strengthened using different methods such as development of professional networks, establishing structures for support as well as participation in

educational programs focusing on leadership development (Broome, 2015; Hafsteinsdóttir et al., 2017; Martini et al., 2023).

Results of this study demonstrate that careers can be supported through development of leadership and professional competencies using leadership and mentoring programs, such as the Nurse-Lead program (papers II and III). At the time of the study, the Nurse-Lead program was the first cross-national web-based leadership and mentoring program for PhD-prepared nurses and doctoral nursing students, to our knowledge. The evaluations showed that these type of programs can support the development of leadership practices of PhD-prepared nurses and doctoral nursing students. The personalized approach, mentoring, peer support, and international collaboration were recognized as valuable aspects of the program. According Cummings et al. (2012) leadership practices include taking well-considered risks, supporting the development of others, listening to others as well as progressing work using the feedback of others, which all were recognized by the participations as results of the program. The results of this study also correspond to the results of the mixed-method evaluation of the Leadership and Mentoring in Nursing Research (LMNR) program for postdoctoral nurses developed by Hafsteinsdóttir and colleagues (Hafsteinsdóttir et al., 2020; van Dongen et al., 2021). The programs included similar components, however, the LMNR program was conducted face-to-face, while the Nurse-Lead program was web-based. Both programs reported growth on leadership practices and professional competencies of PhD-prepared nurses. Recently reports have been published on other leadership programs, which use a variety of approaches in the programs and instruments for evaluation. All of the programs were evaluated positively. However, due to differences in the goals, structure, and content of the programs as well as the methods for evaluation, it is unknown if one approach to leadership development may be more effective compared to others (Franklin et al., 2020; Patterson et al., 2022; Tabloski, 2016).

Careers of PhD-prepared nurses

Through this study, it was possible to deepen the understanding of the careers of PhD-prepared nurses. A wide range of positions across different areas of nursing was found, but most positions of PhD-prepared nurses comprised research and teaching responsibilities. PhD-prepared nurses often worked at institutions of higher education (paper V). These main results are in line with two earlier survey studies from the United States demonstrating that doctorally prepared nurses have commitments in different areas of nursing including research, clinical practice, education, and administration (Chavez et al., 2021; Rugs et al., 2020). Rugs et al. (2020), however, reported lower levels of research engagement and higher levels of

clinical commitments compared to our study. This may be the result of data being collected in the medical facilities of the Veterans Health Administration. Also, the study of Sørensen et al. (2019), focusing on PhD-prepared nurses in the Nordic European countries, found that most PhD-prepared nurses worked at institutions of higher education, often in joint positions with hospitals, with research, supervision, and teaching responsibilities being the most common. However, similar to our results, many differences were found in the positions and responsibilities of PhD-prepared nurses.

PhD-prepared nurses have an important role in advancing nursing and nursing science by conducting research and implementing research findings, preparing the next generation of nurses and nurse scientists, while being stewards of the discipline (AACN, 2022; NAM, 2021). Therefore, it is important to foster positions primarily focusing on research and teaching since they have contributed to the development of nursing science in the last decades (Hafsteinsdóttir et al., 2019; Hanssen et al., 2018; Yanbing et al., 2021). This is especially important when taking into account the high numbers of retirement and withdrawn within the doctorally prepared workforce globally, while transformations in health care and nursing are needed (AACN, 2022; Boamah et al., 2021; Salerno et al., 2017; Vance et al., 2020). It is also known that the implementation of research findings is challenging and often takes long time (van Achterberg et al., 2008). The potential of PhD-prepared nurses to strengthen the connection between research and practice has been addressed in earlier studies (Andreassen et al., 2018; Dobrowolska et al., 2021; Orton et al., 2019) and clinical scientist were found to contribute to clinically relevant research and improved application of research findings in clinical settings (Barry et al., 2019; van Oostveen et al., 2017). Clinical-academic positions were also addressed by the PhD-prepared nurses in this study as recommendation for the careers (paper V). These types of positions may strengthen the influence of PhD-prepared nurses on the health and well-being of individuals (Dobrowolska et al., 2021).

Career opportunities broader than the 'traditional' academic positions have been addressed in the earlier literature (Broome et al., 2018; Fairman et al., 2021; Polomano et al., 2021; Scroggins et al., 2023). Polomano et al. (2021) described opportunities for PhD-prepared nurses to be leaders in health systems, practice settings, and health policy within healthcare organizations, professional organizations, governmental agencies, or in industry. The influence of the work of PhD-prepared nursing is expected to be strengthened if PhD-prepared nurses are able to generate and disseminate knowledge in and across different fields of health care (Dobrowolska et al., 2021; Polomano et al., 2021). Based on our results, it could be argued that these positions may already have been introduced to some extent, since around a quarter of the PhD-prepared nurses reported contributing to the national debates on healthcare and nursing as well as the development of national and/or

international policies or guidelines. The results also demonstrate that there already are PhD-prepared nurses leading programs, departments, and organizations. However, this concerns a small proportion of the sample PhD-prepared nurses in this study (paper V). It could be argued that more PhD-prepared nurses need to be in strategic positions and be included at boards of divisions and boards organizations of health care and educational organizations. Also, PhD-prepared nurses' expertise would be of value for national and international professional organizations in the health care and well-being sector. Communities and patients are expected to benefit from PhD-prepared nurses being positioned as leaders and policy advocates as they contribute to evidence-based health care since PhD-prepared nurses are considered to be system-level thinkers with advanced expertise in, among other, research, healthcare, nursing, and implementation (AACN, 2022; Chavez et al., 2021; NAM, 2021; Polomano et al., 2021; Ridenour et al., 2009).

This study can be considered as a first step to understand the careers of the PhD-prepared nursing workforce. This study followed the definition of a career as a unique series of positions, and experiences within these positions (Brown et al., 2013; Patton et al., 2006). It was, however, not possible to describe the careers of PhD-prepared nurses to the full extent of this definition, since it was not possible to unravel trends in the sequence of positions after the doctorate, due to high variation in reporting as well as a lack of understanding on the meaning of the positions. It was, however, possible to produce novel knowledge on the careers of PhD-prepared nurses, including a summative structure with factors related to the careers. Moreover, this study highlighted two important moments in the careers: the PhD degree is a starting point for the postdoctoral career, and, consistent with earlier research, the finding that development of professional competencies is often necessary to become an independent scientist or educator. The need for further professional development after the doctorate may not be specific to nursing. Postdoctoral scholars in other disciplines also were found to benefit from professional learning opportunities after the doctorate (Ganapati et al., 2021; Nowell et al., 2018).

Support sources for careers of PhD-prepared nurses

Support sources for the careers were identified and included support from significant others, mentoring, collegial support and collaboration, organizational structures for careers, and educational programs (papers I, II, III, IV and V). The study highlighted the importance of mentoring for careers of PhD-prepared nurses, which is corresponding to earlier literature reporting positive effects of mentoring for careers of academic nurses (Busby et al., 2022; Cullen et al., 2017; Hafsteinsdóttir et al., 2017; Jeffers et al., 2017; Iheduru-Anderson et al., 2023; Martin et al., 2018; Tabloski, 2016). Although most studies on mentoring address nurse researchers in

early career stages (Busby et al., 2023; Dahlke et al., 2021; Jeffers et al., 2017; Ephraim, 2021), in our study, it was recognized that mentoring is a support source across all career stages (paper V). The mentoring needs of mid-career nurse scientists are expected to differ from those of novice scientists, who primarily require support in familiarizing themselves with the academic work environment, developing competencies, and finding their career path. In contrast, at later career stages, individuals should be supported in further developing their leadership and professional competencies, defining their career direction, and preparing to become effective mentors themselves (Broome et al., 2021; Eldeirawi et al., 2023; Matthews et al., 2020; Loerzel et al., 2021; Numminen et al., 2019).

Colleagues and peers were also found to be important support sources for the careers in this study as well as the earlier literature (Al-Nawafleh et al., 2013; Bice et al., 2019; de Lange et al., 2019; Heinrich, 2005; Loerzel et al., 2021; Scarsini et al., 2022; Viveiros et al., 2021; Wilson et al., 2017). Therefore, PhD-prepared nurses are suggested to connect with peers and colleagues, which also can be individuals with different professional backgrounds. Leaders of departments and teams can support these connections through the development of supporting peer communities and peer mentoring groups. Studies on peer communities and peer mentoring in nursing faculty reported improved research productivity, job satisfaction, and research collaborations as well as higher levels of professional fulfilment (Brody et al., 2016; Heinrich et al., 2012; Jacelon et al., 2003, vanderZwan et al., 2023). It is not only important for PhD-prepared nurses to proactively invest in their own supportive network, but PhD-prepared nurses should also be aware of the potential contribution on the careers of others. This requires broadening of thinking from individual incentives to engage in the shared responsibility for the development of colleagues and progression of nursing science (Heinrich, 2012).

Educational programs focusing on professional and leadership development were found to be support sources for the careers of PhD-prepared nurses (papers II, III, IV and V). Our study found that most PhD-prepared nurses have access to educational opportunities. In the earlier literature limited numbers of empirical studies on such educational programs for PhD-prepared nurses were identified, the numbers were limited, especially in global regions other than North America (Buser et al., 2021; Busby et al., 2022; Carter et al., 2020; Draucker et al., 2022; Gillespie et al., 2023; Hafsteinsdóttir et al., 2017; Kelley et al., 2023; Rosser et al., 2020; Shieh et al., 2018; van Dongen et al., 2023; Welk et al., 2021). Further exploration may be conducted to gain insight into the educational opportunities currently are available to PhD-prepared nurses and the extent to which they meet the needs of the workforce since this study revealed a broad range of suggested competencies and topics for further preparation.

In this study, it was found that leadership and mentoring programs, such as the Nurse-Lead program, are support sources for careers and competency development of doctoral nursing students. Based on the results of this study, it may be concluded that these types of programs can support the transition from doctoral student to postdoctoral nurse since the program allows doctoral nursing students to reflect on their career goals and strengthen their leadership practices and professional competencies. Due to its potential to support careers, it could be explored how such programs can be offered to a larger group of PhD-prepared nurses and doctoral nursing students. It may be worth to support cross-national collaboration across universities to develop such leadership and mentoring programs, so that a larger group of PhD-prepared nurses and doctoral nursing student have access. Also, in this case, countries with less robust nursing research cultures and mentoring traditions could benefit from the opportunities already available (Buser et al., 2021; Hafsteinsdóttir et al., 2017; Nkimbeng et al., 2021).

The study showed that approximately half of the sample had access to postdoctoral programs (paper V). These programs are important to support PhD-prepared nurses to become independent scientists (Sherry et al., 2013; Weaver et al., 2023). A considerable number of the PhD-prepared nurses in this study reported a preference to strengthen competencies after obtaining the doctorate as well as in their current positions. Many of the areas on which additional preparation was preferred could be addressed through postdoctoral programs (Fisher et al., 2022; Weaver et al., 2023). Also, postdoctoral programs can be a support source for the careers through facilitation of the development of (international) networks for collaboration and support (Rice et al., 2019; Stanfill et al., 2019). Based on this study, it was not possible to determine the satisfaction with the access to postdoctoral programs and the potential needs of PhD-prepared nurses in relation to these programs. Therefore, more research is needed to understand needs of the workforce in relation to the postdoctoral programs.

This study reported a lack organizational structures for careers in a part of organizations, including limited numbers of available positions in some cases (papers IV and V). This is in line with earlier studies (Al-Nawafleh et al., 2013; Dobrowolska et al., 2021; Heinrich, 2005; Loerzel et al., 2021). PhD-prepared nurses in the study of Al-Nawafleh et al. (2013) noted that even though career structures and regulations were in place, there were no specific agreement about the research duties, resulting in limited opportunities to conduct research. The lack of organizations structures for careers was – among others – highlighted in the study conducted in the hospital setting (paper I). It is expected that organizations employing larger numbers of PhD-prepared nurses, such as universities, have implemented career pathways with opportunities for career progression, especially in countries with strong traditions in nursing science. However, this may not be the

case in countries with less advanced traditions in nursing science, as well as in organizations where fewer PhD-prepared nurses work (Rice et al., 2020). Also, the lack of structures for careers may not be unique to nursing science, as limited structures for careers were also reported in other academic disciplines across Europe (Engels et al., 2024). In addition to the suggestion for organizations to implement structures for careers with career paths and positions, flexibility and diversity in careers is desirable to allow PhD-prepared nurses to establish careers outside structured career paths. Hereby, it is important to adopt an individualized approach and support PhD-prepared nurses in exploring their career ambitions (Joseph et al., 2021; Orton et al., 2019).

This study showed that support sources are available to many PhD-prepared nurses. PhD-prepared nurses should be self-directive and proactive towards their professional development by identifying sources of support that are available to them (Rice et al., 2020). There were, however, indications that the support sources for careers could be strengthened as there were limited numbers of leadership and mentoring programs for PhD-prepared nurses, there seem to be unmet mentoring needs in a part of the PhD-prepared nurses, there were reports of scarce collaborations as well as potential for implementation of organizational structures across more organizations. Organizations where PhD-prepared nurses work should be encouraged to share best practices regarding the support sources and explore opportunities to broaden existing opportunities to provide them to a larger group of PhD-prepared nurses, with a special focus on regions with less developed traditions in nursing science.

6.2 Validity and reliability of the study

The validity and reliability of the study are reported, with validity referring to the extent which an instrument measures what it is intended to measure (Altheide et al., 1994; Kimberlin et al., 2008) and reliability referring the accuracy and consistency of the information obtained (Cook et al., 2006; Kimberlin et al., 2008) (Table 13). Both empirical data and theoretical literature have been used and triangulation of approaches, methods, and data sources contributed to the validity and reliability of this study (Moon, 2019). While validity and reliability are common in quantitative studies, there has been debate whether these also apply to qualitative studies (Morse et al., 2002; Whittemore et al., 2001). Therefore, the criteria of Lincoln and Guba (1985) were used to reflect on the steps using qualitative approaches including credibility (e.g. confidence in the truth of data and interpretations), dependability (e.g. stability of time and conditions), confirmability (e.g. data representing the information as presented by participants), and transferability (e.g. extent to which findings can be transferred to other contexts).

Phase I

In the **first step** (paper I), a qualitative approach was used to explore leadership practices of PhD-prepared nurses. *Credibility* of this step was supported by recruitment of participants who were able to share experiences with the phenomenon of interest, while having different backgrounds and work experiences (Lincoln et al., 1985). In addition, the interview guide was based on pre-existing literature on the topic (e.g. Al-Nawafleh et al., 2013; Hafsteinsdóttir et al., 2017; van Oostveen et al., 2017) and participants completed member checks after the interviews to verify the main conclusions and interpretations of the researchers (Creswell, 2013). Collaboration between the researchers took place in the analysis (Patton, 1999; Glaser et al., 1966) and quotations from different participants were selected to support the findings (Lincoln et al., 1985). Regarding the *dependability*, the qualitative approach with semi-structured interviews and thematic analysis was an appropriate approach to gain insight into the participants' experiences with leadership practices in their careers (Polit et al., 2017). In addition to the researchers involved in the research, another researcher, not involved in the conduct of the study, reviewed the research process and analysis (Lincoln et al., 1985). *Conformability* was supported by the development of a rigorous research protocol. Reflexivity was aimed for throughout the research, and thereby frequent reflection on the role and influence of the researchers took place (Barry et al., 1999; Lincoln et al., 1985). The researchers had an open and reflective approach and had a neutral stance towards information provided by participants (Barry et al., 1999; Polit et al., 2017). At the time of the study, leadership was a relatively new concept to some participants, resulting in participants' having different levels of understanding of leadership. The influence of different levels of understanding is expected to be limited since the definition of Cumming et al. (2012) was introduced and was used to guide the exploration of the leadership practices in the careers during the interviews. Although a deeper understanding of leadership practices was obtained, *transferability* of the results should be considered carefully since the data have been collected in a small sample of PhD-prepared nurses working in Dutch hospitals. The methods, processes, and context were thoroughly documented to enable others to evaluate transferability (Lincoln et al., 1985).

The **second step** (paper II) focused on understanding of the leadership practices in the careers and evaluation of the Nurse-Lead program as support source for careers of PhD-prepared nurses and doctoral nursing students. The validity and reliability of this step are discussed in relation to the research process, the instruments used, and the outcomes achieved. Regarding the *research process*, a pre-post-test design, deemed appropriate for the study's purposes, was used as this design allows to capture changes in leadership practices and professional competencies (Creswell, 2013; de Moya et al., 2024; Halcomb, 2019). The collection of qualitative data

enabled validation of the quantitative data and provided additional insight into the leadership practices, its importance for careers, and the program being a support source for careers. In addition, a sample with participants from several countries was used and therefore multiple perspectives were incorporated (Polit et al., 2017). A methodological consideration was encountered in the development of this step, since the Nurse-Lead program cannot be considered to be a systematic intervention. Therefore, it is not possible to distinguish between the influence of the program and other contextual factors such as other educational opportunities or work experiences. A comparison cohort could have been used to control for this to some extent, however, a thorough understanding of sample and context of the participants would be required (Tesch, 2016; Liu, 2011). In addition, analyses of the quantitative data focused on the group level, evaluations on the individual may have provided additional insights leadership practice and competence development (Tesch, 2016).

Regarding the *instrument* used in this, data on leadership practices was collected with the validated LPI instrument (paper II) (Kouzes et al., 2012). The LPI has demonstrated excellent face validity, internal reliability, and internal consistency in Dutch PhD-prepared nurses (Regelink, 2017). Other instruments, used to measure professional competencies, research competencies, and career development, were not validated. Experts determined that the instruments were appropriate for the research purposes, however, this step would have benefited from evaluation of psychometric properties, such as determining the Content Validity index (CVI), internal consistency, and the stability of the instrument (Almanasreh et al., 2019; Cook et al., 2006; Kimberlin et al., 2008; Knapp et al., 2010). In addition, the *outcomes* were based on self-reporting which may introduced problems with the recall of information or estimation (Althubaiti, 2016; Kimberlin et al., 2008). To reduce the potential bias, observer assessments were planned (Althubaiti, 2016), however, due to insufficient responses of the observers in the post-test, the observer perspectives were included in this study.

In the **third step** (paper III), a qualitative approach was used to explore the contribution of mentoring in the Nurse-Lead program to the leadership practices and careers of PhD-prepared nurses and doctoral nursing students. In this step the *credibility* was enhanced by recruitment of participants from several countries who had experience with the phenomenon of interest, the development of topics for the focus groups interviews based on pre-existing literature and experts, as well as collaboration of researchers in the data analysis (Polit et al., 2017; Patton, 1999; Lincoln et al., 1985). Participants visiting an on-site program meeting were approached for participation in the focus groups. This approach may have introduced bias into the findings since those who more invested in the program and/or had more positive experiences with the program may were more likely to attend the program meeting and to participate in this evaluation. In future research, it could be

considered to invite all participants in the program for participation in the study, including those who may be less active in the program and those who have withdrawn from the program.

An open approach and reflective attitude were important in this step since the participants and consortium members, who collected and analysed the data, may have known each other as they were working and/or studying at the same organizations. Although it was aimed to divide persons working at the same organizations into different groups, this was not realized in all cases, which may resulted in more positive experiences being shared (Althubaiti, 2016). To enhance the credibility of this step, members checks could have been performed (Thomas, 2017). Similar to the first step, also in this step, *dependability* was supported by selecting an appropriate approach to gain insight into experiences of participants (Polit et al., 2017) and *confirmability* was supported by the use of a rigorous research protocol. Also in this study, reflexivity was aimed for throughout the research (Barry et al., 1999; Lincoln et al., 1985).

While both in **steps II and III** positive outcomes of the program were found, the *external validity* or *transferability* should be interpreted carefully since both steps include small samples with participants from one global region, who were not representative for the whole PhD-prepared nursing workforce (Ferguson, 2004).

Phase II

Validity and reliability in this study phase are described according to research processes, instruments (not applicable in the first step), and outcomes.

The *research process* in the **first step** (paper IV) included searches in the electronic literature databases MEDLINE/PubMed, CINAHL, and EMBASE. These databases are the most relevant ones to identify studies related to the topic of this research (Whittemore et al., 2005). To ensure comprehensive searches, the search strategy was established in collaboration with an academic librarian (Cooper, 1998; Shaheen et al., 2023; Whittemore et al., 2005). Inclusion and exclusion criteria were established within the research team and two researchers selected the studies, conducted the quality appraisals using structured checklist and collaborated in data analysis, while regular discussions were held among the whole research team (Shaheen et al., 2023; Whittemore et al., 2005). A strength of this step is the inclusion of empirical studies with different methodological approaches, allowing a comprehensive understanding of the phenomenon of interest (Whittemore et al., 2005). However, bias may have been introduced by the exclusion of editorials and grey literature (Shaheen et al., 2023). Another methodological decision impacting the *outcomes*, is the exclusion of studies with samples that not only consisted of doctorally prepared nurses. Although this allowed conclusions could be drawn about

the doctorally prepared nursing workforce, it may result in exclusion of studies with relevant experiences (Patino et al., 2018). Also, it was decided to include studies focusing on doctorally prepared nurses including both nurses with PhD degrees and other types of doctoral degrees. Therefore, the outcomes of this study are reflecting the doctorally prepared nursing workforce. Different outcomes may have occurred if studies with only PhD-prepared nurses were included. Due to limitations in the reporting of the original studies, only a limited number of studies would have remained and therefore this was expected to constrain the findings. Generalisability of the findings (e.g. external validity) needs to be considered carefully since most studies originated from the United States and therefore may not be representative for the whole doctorally prepared nursing workforce (Ferguson, 2004).

In the **second step** (paper V), a cross-sectional survey study was a suitable approach to analyse careers and factors related to the careers. The study was conducted according to a pre-defined research protocol (Polit et al., 2017; Wang et al., 2020). In the *research process* methodological challenges were encountered including the recruitment of potential participants. The recruitment strategy was – among other strategies - based on the networks of the research team, impacting the representatives of the sample since the research team had most contacts in one global region and had strongest connections in the academic setting. This probably contributed to limited responses of some global regions. Originally it was planned to statistically compare the findings of the different global regions. However, this was not possible due to limitations in the sample. Descriptive analyses of the global regions were conducted, however, also these analyses need to be also considered with caution since there are differences in the state of nursing among countries within the global regions (Hafsteinsdóttir et al., 2019; Hanssen et al., 2018; Moreno-Cabas, 2005; Thompson et al., 2024; Yanbing et al., 2021; Watson et al., 2021). Although a more strategic and cohort recruitment strategy would be recommended in future research, the sample can also be recognized as strength since a sufficient number of PhD-prepared nurses was included with participants originating from 57 countries addressing all global regions. Although *the instrument* was created for this study and not validated prior data collection, the development of the instrument followed a thorough process, including defining of the concepts and variables under study, item development based on earlier literature as well as validation of the content by several experts (DeVellis et al., 2021; Kimberlin et al., 2008). In addition to the aforementioned concerns about the generalizability of the sample, the *results* on the preparedness for postdoctoral positions need to be also considered with caution. The results may not adequately reflect the current status of doctoral education since experiences of participants who completed doctoral education long ago may not represent the current situation since changes in doctoral education have taken place in the last decades (Althubaiti, 2016; Weaver et al., 2023; Yanbing et al., 2021).

Table 13. Summary of strengths and weakness of the study.

Study step	Strengths	(Potential) weaknesses
Phase I, step 1	<ul style="list-style-type: none"> • Selection of an appropriate study approach. • Development of a rigorous study protocol. • Inclusion of participants with different backgrounds, able to share experiences with the phenomenon of interest. • Open and reflective approach by the researchers. • Collaboration between the researchers in the analysis. • The conduct of member checks. 	<ul style="list-style-type: none"> • Generalizability is limited due to the small sample of participants working in a specific region and setting.
Phase I, step 2	<ul style="list-style-type: none"> • The use of a mixed-methods approach, in which the qualitative data were used to explain and validate quantitative data. • Development of a rigorous study protocol. • Data collection using the validated LPI instrument. • Collaboration between the researchers in the analysis. 	<ul style="list-style-type: none"> • The design did not allow to distinguish between influence of the program and other contextual influences influencing careers and professional development. • Data on research and professional competencies as well as career development were collected using non-validated instruments. • Outcomes were based on self-reporting and observer assessments were not included. • Generalizability may be limited due to specific setting and small sample.
Phase I, step 3	<ul style="list-style-type: none"> • Selection of an appropriate approach to gain insight into the participants' experiences. • Development of a rigorous study protocol. • Inclusion of participants who are able to share experiences with the phenomenon of interest. • Open and reflective attitude of the researchers. • Collaboration between the researchers in the analysis. 	<ul style="list-style-type: none"> • Data collection during a program meeting may resulted in more positive experiences being reported since those who more invested in the program were more likely to attend the meeting. • Member checks were not conducted. • Generalizability may be limited due to small sample from a specific global region.
Phase II, step I	<ul style="list-style-type: none"> • Searches in relevant literature databases. • Development of a search strategy in collaboration with an academic librarian. • Inclusion of studies with variety of methodological approaches. • Collaboration of researchers in the study selection, quality appraisal, data extraction, and data analysis. 	<ul style="list-style-type: none"> • Exclusion of editorials and grey literature. • Generalizability is limited since studies mostly originated from the region of North-America.
Phase II, step II	<ul style="list-style-type: none"> • Selection of an appropriate approach and development of an rigorous research protocol. • A sample of 1308 PhD-prepared nurses, representing 57 countries. • A thorough process for the instrument development, including a two-phase pilot. 	<ul style="list-style-type: none"> • Representativeness of the sample as a result of the recruitment strategy. • Use of non-validated instruments. • Limited generalization due to limited responses from some global regions.

6.3 Practical implications

The findings of this study resulted in implications for PhD-prepared nurses, leaders and policymakers of organizations where PhD-prepared nurses work as well as leaders of nursing (science) organizations. Also, implications for leaders of doctoral education in nursing are suggested.

Implications for PhD-prepared nurses

- PhD-prepared nurses need to be aware of the influence they have on their careers and are suggested to take initiative and responsibility for their careers.
- PhD-prepared nurses are advised to invest time into the planning of their careers and reflect on their professional development regularly.
- PhD-prepared nurses are encouraged to work on their professional development throughout different career phases, for example by participating in leadership and mentoring programs.
- In demanding times in their careers, PhD-prepared nurses are advised to search for support sources that are often available such as mentoring and collegial support.
- Mentoring is advised for PhD-prepared nurses in the early career stages as well as in more advanced career stages to reflect on and progress their careers and professional development.
- PhD-prepared nurses are advised to invest in the development of a supportive network. This network could include supportive colleagues and/or peers with nursing or other professional backgrounds as well as informal support provided by significant others.
- PhD-prepared nurses are advised to be aware of the potential influence they can have on careers of others and act on this by being role models and support sources for colleagues.
- Membership of national and/or international nursing science organizations is advised since this provides opportunities to meet colleagues to share experiences, learn from each other, and establish networks and collaborations.

Implications for organizational leaders and policymakers

- It is suggested that leaders frequently engage in career discussions with PhD-prepared nurses. Although career planning may be the primary responsibility of the PhD-prepared nurses, leaders/managers are suggested to engage in exploring opportunities to support PhD-prepared nurses in their careers.
- Leaders and policymakers are recommended to engage in development of support sources for careers of PhD-prepared nurses. Effective support sources are expected to support recruitment and retention of PhD-prepared nurses within organizations.
- It is suggested to consider mentoring as an integral part of the work of PhD-prepared nurses, including both being a mentor for others and being a mentee themselves.
- Development and implementation of career paths with criteria for advancement is advised, if they are not yet in place. At the same time, it is advised to be open to PhD-prepared nurses' building careers outside structured career pathways.
- It is suggested to monitor workplace cultures and behaviours regularly and take actions, if needed, to improve safety and well-being at work.

Implications for nursing science organizations

- Nursing science organizations are advised to organise opportunities for PhD-prepared nurses to meet and exchange experiences, including (international) postdoctoral symposia and seminars focusing on career building and network development.
- Nursing science organizations are suggested to take the lead in organizing network meetings with various stakeholders to discuss the advancement of nursing science, including careers of PhD-prepared nurses. It is also advised to periodically publish reports or statements focusing on the importance, progression, and opportunities to enhance nursing science and to strengthen the PhD-prepared nursing workforce.
- Nursing science organizations are encouraged to highlight the importance of specific funding programs for nursing research at international, regional, and national governmental organizations and funding bodies.
- Nursing science organizations are suggested to engage in development of cross-national educational programs focusing on leadership and mentoring

for doctoral nursing students and PhD-prepared nurses, in collaboration with universities and health care organizations.

- Nursing science organizations are suggested to take initiative to build databases with PhD-prepared nurses to facilitate monitoring of the workforce as well as future research.

Implications for doctoral education

- It is suggested for leaders of doctoral and postdoctoral programs to meet regularly to share best practices and collaborate to explore opportunities to advance education on national and international levels.
- It is advised to include leadership and individual professional development in the curricula of doctoral programs for nurses to equip them with the competencies to lead their careers and prepare them for their preferred career path.
- Doctoral nursing students are expected to benefit from gaining knowledge about career opportunities early in their doctoral journey to support early career planning, therefore it is advised to include career planning in the curricula.
- Collaboration between doctoral programs is advised on national and international levels to enable doctoral nursing students to build a network early in their careers. The collaboration is also expected to contribute to the efficient development of support sources such as (international) educational programs.

6.4 Implications for future research

This study can be considered a first step to gain insight into the careers of PhD-prepared nurses and factors related to the careers. It is important to continue the research on this topic and of the many opportunities for future research, five research areas are prioritized. *First*, it is important to systematically collect data on the careers of PhD-prepared nurses to increase the understanding on the careers and monitor how careers evolve. Studies similar to the cross-sectional survey study could be used for this (paper V). In the conduct of follow-up studies, it is important to have representative samples of the global and regional levels. This requires a more structured and cohort recruitment approach. Findings should be representative of the global PhD-prepared nursing workforce as well as regional and national workforce since this will enable the development of recommendations to support careers and support sources for careers corresponding with the national, regional, and global

situation of the PhD-prepared nursing workforce. *Second*, future research is recommended to address the needs and preferences towards support sources for careers of PhD-prepared nurses. This study shows the importance of PhD-prepared nurses leading their careers, therefore it is important that PhD-prepared nurses voice their needs to support their career advancement. Also, it is worth exploring preferences regarding support sources across various career stages. *Third*, it is recommended to explore connections between the factors related to the careers and career outcomes of PhD-prepared nurses. In this study various factors related to careers are described. It, however, is not known to what extent the identified factors influence the careers, career satisfaction, and career outcomes. In order to conduct this research, it is necessary to define career outcomes for different types of careers. *Fourth*, to advance the careers, further research should be conducted on the competencies required for careers of PhD-prepared nurses (Numminen et al., 2019). It is suggested to explore differences in required competencies for PhD-prepared nurses in different types of careers and work settings. It would be worth to translate these competencies into an instrument, which should be validated. Such an instrument is expected to support PhD-prepared nurses in monitoring and guiding their professional development (Cook et al., 2006). *Fifth*, future research should also address the careers, leadership practices, and support sources for careers of nurses with other types of doctoral degrees, including those with professional doctorates, to gain a comprehensive overview of the doctorally prepared nurses workforce.

7 Conclusions

The aim of this study was to describe the careers of PhD-prepared nurses and analyse leadership practices in the careers as well as support sources for careers of PhD-prepared nurses. This study allowed to take the first step to study the careers of PhD-prepared nurses from a global perspective. The findings demonstrated a variance in the careers of PhD-prepared nurses as they worked in a broad range of positions across different fields of nursing, while engaging in a diverse palette of working activities. The majority of PhD-prepared nurses in this study, however, worked in positions that comprised research and teaching responsibilities at institutions of higher education. These positions are important to advance nursing science and evidence-based nursing. In addition to these positions, it could be recommended for more PhD-prepared nurses to engage in strategic positions within healthcare and educational organizations so that they can use their expertise to contribute to advancements in nursing and healthcare. In order to strengthen the careers of PhD-prepared nurses, it is advised to optimize the organizational infrastructures for nursing research including implementation of structured career paths with sufficient numbers of positions and clinical academic positions being available to PhD-prepared nurses. Mentoring, investment in research funding, protected time for research, opportunities to develop leadership practices, and postdoctoral training opportunities were suggested by PhD-prepared nurses to support their careers.

Careers are influenced by multiple factors, some related to the PhD-prepared nurses themselves and others are connected to the organizations and environment they work in. In this study, it was found that leadership practices of PhD-prepared nurses were important for the careers since PhD-prepared nurses were responsible for development of a career vision and actions to reach the career goals. It is important for PhD-prepared nurses to be aware of the responsibility to lead their careers and use leadership practices to realize their career ambitions. Although PhD-prepared nurses may experience difficult times in their careers, such as the lack of career pathways and positions, challenging work-life balance, and disruptive behaviours at the workplace, there is often career support available to them such as mentoring or support from colleagues, family and/or friends.

Many PhD-prepared nurses reported the desire to further develop their professional competencies. Educational programs such as the Nurse-Lead leadership and mentoring program can be used to support PhD-prepared nurses to lead their careers. These types of programs were found to stimulate the development of various leadership, professional, and research competencies. Institutions of higher education and nursing science organizations are suggested to collaborate in the development of educational opportunities to support career and professional development, so that a larger group of PhD-prepared nurses can benefit from them.

Whilst this study provided insight into the careers of PhD-prepared nurses and factors related to the careers, it is recommended to continue research on this topic. It would be advised to systematically analyse and discuss the careers and factors related to careers from a national, regional, and global level to support the development of careers. PhD-prepared nurses have great potential to contribute to the advancement of nursing and nursing science in the current rapidly changing health care environment, therefore they should be supported to take the lead in their careers and fully leverage their leadership, professional, and research competencies. Thereby, PhD-prepared nurses will be able to contribute to the development of the nursing discipline and the science of nursing and to the health care of individuals and communities worldwide.

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Appendices

Appendix 1. Search strategy per database.

MEDLINE (PubMed)	CINAHL	Embase
<p>Nurse faculty[Title/Abstract] OR academic nurs*[Title/Abstract] OR postdoctoral nurs*[Title/Abstract] OR tenure*[Title/Abstract] OR nurse professor*[Title/Abstract] OR doctorally prepared nurse* [Title/Abstract] OR PhD nurs*[Title/Abstract] OR "Doctor of nursing practice" [Title/Abstract] OR nursing scientist*[Title/Abstract] OR nurse researcher* [Title/Abstract] OR nursing researcher*[Title/Abstract] OR nurse scholar*[Title/Abstract] OR nursing scholar* [Title/abstract] OR "Faculty, Nursing"[Mesh] OR "Nursing Faculty Practice"[Mesh] OR AND leadership development[Title/Abstract] OR developing leadership[Title/Abstract] OR professional development*[Title/Abstract] OR career*[Title/Abstract] OR tenure track*[Title/abstract] OR work experiences[Title abstract] OR personal development*[Title/abstract] OR</p>	<p>TI "nurse faculty" OR TI "academic nurs*" OR TI "postdoctoral nurs*" OR TI tenure* OR TI "nurse professor*" OR TI "doctorally prepared nurse*" OR TI "PhD nurs*" OR TI "Doctor of Nursing Practice" OR TI "nursing scientist*" OR TI "nurse researcher*" OR TI "nursing researcher*" OR TI "nurse scholar*" OR AB "nurse faculty" OR AB "academic nurs*" OR AB "postdoctoral nurs*" OR AB tenure* OR AB "nurse professor*" OR AB "doctorally prepared nurse*" OR AB "PhD nurs*" OR AB "Doctor of Nursing Practice" OR AB "nursing scientist*" OR AB "nurse researcher*" OR AB "nursing researcher*" OR AB "nurse scholar*" OR</p>	<p>'nurs* faculty':ti,ab,kw OR 'academic nurs*':ti,ab,kw OR 'tenure*':ti,ab,kw OR 'nurse professor':ti,ab,kw OR 'doctorally prepared nurse*':ti,ab,kw OR 'phd nurse':ti,ab,kw OR 'doctor of nursing practice':ti,ab,kw OR 'nursing scientist':ti,ab,kw OR 'nurse researcher':ti,ab,kw OR 'nursing researcher':ti,ab,kw OR 'nurse scholar*':ti,ab,kw OR 'nursing scholar':ti,ab,kw AND 'career'/exp OR 'career' OR 'leadership development':ti,ab,kw OR 'developing leadership':ti,ab,kw OR 'professional development*':ti,ab,kw OR 'career*':ti,ab,kw OR 'tenure track*':ti,ab,kw OR 'work experience':ti,ab,kw OR 'personal development*':ti,ab,kw. Filter: Embase (excl. medline)</p>

	MH "Faculty, Nursing" OR MH "Doctorally Prepared Nurses" OR MH "Nurse Researchers" AND TI career* OR TI leadership development OR TI professional development* OR TI tenure track* AB career* OR AB leadership development OR AB professional development* OR AB tenure track*	
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Appendix 2. Professional and research competencies.

Professional competencies by Numminen et al. (2019) and research competencies by Virtanen et al. (2018)

Professional competencies	
Competency	Description
Research field management	Knowledge base of the research field and ability to synthesize appropriate theory and use insights for research design and conduct research
Research skill management	Knowledge on research methodologies and techniques and their appropriate application in research
Research ethics management	Knowledge of general principles and requirements and ability to act to fundamental principles appropriate to their discipline
Cognitive management	Ability to scrutinize and synthesize ideas and information, establish priorities and to deal with complex problems
Self-management	Personal resources to manage the research process and research projects
Research communication management	Scientific productivity through publications and oral presentations of own research results and communication in research team
Team working management	Knowledge of working in a team as a member, co-operative networks and relationships in a team
Team leadership management	Ability to work in a team as a leader and to lead teams
Resources management	Knowledge and the ability to use opportunities of research funding, research facilities and services enabling research
Career management	Setting of the career goals and improving employability
Pedagogy management	Teaching, supervision and mentoring skills
Implementation management	Knowledge on promoting taking research into healthcare and for improving patient care and ability to explain research to professional health care workers
Future vision management	Knowledge of the role and aim of research in the societies, and possibilities of scientific knowledge to improve the truth and good in the world
Intercultural management	Cultural communication and acceptance of different cultures
Technology management	Management of technological solutions needed in research and for working in the laboratories
Research competencies	
Academic writing	
Understanding of the literature related to topic of interest, construct research proposal	
Critical and creative thinking/competence	
Scientific thinking	
Ability to network	
Ability to share information	
Defend one's ideas	
Defend of one's performance	
Publishing skills	
Ethical guidelines and codes	
Grant writing	
Conference presentations	
Presenting skills	
Language skills	



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