University of South-Eastern Norway

Anne Mette Høegh-Larsen

Nursing students' development, transfer and assessment of professional competence and clinical judgment skills

A quantitative study

Dissertation for the degree of Ph.D
Person-centred Health Care

Faculty of Health and Social Sciences

University of
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Abstract

Background: Nurses with professional competence and clinical judgment skills are important to achieve person-centred healthcare and patient safety in healthcare services. Professional competence and clinical judgment skills are therefore desirable learning outcomes in nursing education. Simulation-based education and clinical placement are used as pedagogical approaches in the simulation setting and clinical setting to accomplish this. Debriefing is an important component of simulation-based education. Research on the effectiveness of debriefing methods is limited although it is recognized as important for students' learning. Nursing students' development of professional competence and clinical judgment skills in a longitudinal perspective across learning arenas is of interest to understand the learning progression. Research addressing this is limited. Nursing students' find it challenging to transfer learning from the simulation setting to the more complex and unpredictable situations in the clinical setting. There is lack of research investigating nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting. Assessment of nursing students' professional competence and clinical judgment skills can be used in the simulation and clinical settings to promote learning, evaluate learning outcomes, or conduct research. More research is needed investigating students' self-assessment of clinical judgment skills in different learning arenas.

Aim: The overall aim of this PhD project was: 1) to develop knowledge concerning nursing students' development and assessment of professional competence and clinical judgment skills in the simulation setting and the clinical setting, and 2) to develop

knowledge concerning nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting.

Methods: The aims were addressed through a quasi-experimental study (Paper I), a longitudinal study (Paper II), and a comparative study (Paper III). The quasi-experimental study was conducted to investigate the effect of the PEARLS debriefing on nursing students' professional competence and clinical judgment skills when compared to a standard debriefing. Data was obtained from two groups of nursing students (N=106) through self-reporting questionnaires consisting of the instruments NPC Scale-SF and LCJR-N. Data was collected at three timepoints: pre-test, post-test 1 and post-test 2. Linear regression and paired samples t-tests were used to investigate the effect of PEARLS between and within groups. The longitudinal study was conducted to investigate the change in nursing students' professional competence across the simulation and clinical settings. Nursing students' transfer of professional competence from the simulation setting to the clinical setting and their level of professional competence were also investigated. Data for the longitudinal study was collected from nursing students (N=38) at four points through self-reporting questionnaires including the instrument NPC Scale-SF. A paired samples t-test was used to investigate the change in and transfer of professional competence. Descriptive statistics were used to investigate nursing students' level of professional competence. The comparative study (Paper III) was conducted to compare nursing students' self-assessment of clinical judgment skills to an experienced evaluator's assessment of the same students in the simulation and clinical settings. The presence of the Dunning-Kruger effect was also investigated. Data were obtained from nursing students (N=23) and one evaluator at two timepoints using the

instrument LCJR-N. Scores were compared using a t-test, the intraclass correlation coefficient, Pearson's correlation coefficient, and Bland-Altman plots. Linear regression and a scatter plot were used to investigate the presence of the Dunning-Kruger effect.

Main results: No significant differences in the development of nursing students' self-reported professional competence or clinical judgment skills were found between the students who received PEARLS debriefing and those who received the standard debriefing in the quasi-experimental study (Paper I). Professional competence and clinical judgment skills increased significantly for students who received PEARLS debriefing but not among those who received the standard debriefing. Students' self-reported professional competence and clinical judgment skills developed in non-linear patterns in that it increased in the simulation setting but decreased when they entered the clinical setting (Paper I and II). Students' self-reported professional competence increased significantly from before simulation-based education to the end of clinical placement in the longitudinal study (Paper II). Regarding the transfer process, findings from the quasi-experimental study (Paper I) and the longitudinal study (Paper II) showed that professional competence declined significantly in several areas when students entered clinical placement after simulation-based education. *Value-based nursing care* received the highest score while *Development, leadership, and organization of nursing care* was scored lowest at all timepoints in both the quasi-experimental study (Paper I) and the longitudinal study (Paper II). Findings in the comparative study (Paper III) showed an inconsistency between student self-assessment and evaluator assessment in both the simulation setting and the clinical setting. Students overestimated their clinical judgment skills compared to the evaluator's assessment.

Differences between students' scores and the evaluator's scores were larger when the evaluator's scores were low, indicating the presence of the Dunning-Kruger effect.

Conclusion: There is support for implementation of the PEARLS debriefing in simulation-based education to promote the development of professional competence and clinical judgment skills among nursing students. It is necessary for faculty to receive the training and resources necessary when implementing PEARLS. Results indicate that nursing students' self-reported professional competence increased in a longitudinal perspective, although the development of competence related to *Development, leadership, and organization of nursing care* should be strengthened in nursing education. How to best support nursing students in transferring professional competence and clinical judgment skills to the clinical setting should be addressed in nursing education. Moreover, it is vital to acknowledge that student self-assessment of clinical judgment skills alone may not be a reliable predictor of a student's clinical judgment skills in education or research. Additionally, students with a lower level of clinical judgment skills in this PhD project were less likely to be aware of it. For future practice and research, a combination of student self-assessment and evaluator assessment is recommended to provide a more realistic view of students' clinical judgment skills.

Keywords: Nursing Education; Undergraduate Nursing; Debriefing; Reflection; Simulation-Based Education; Clinical Placement; Nursing Competence; Clinical Judgment Skills; Professional Competence; Clinical Competence; Self-Assessment

List of papers

Paper 1

Høegh-Larsen, A.M., Ravik, M., Reierson, I.Å., Husebø, S.I., & Gonzalez, M. (2022). PEARLS Debriefing Compared to Standard Debriefing Effects on Nursing Students' Professional Competence and Clinical Judgment: A Quasi-Experimental Study.

Clinical Simulation in Nursing. 2023 Jan: https://doi.org/10.1016/j.ecns.2022.09.003

Paper 2

Høegh-Larsen, A.M., Gonzalez, M., Reierson, I.Å., Husebø, S.I., & Ravik, M. (2022). Changes in nursing students' self-reported professional competence in simulation-based education and clinical placement: a longitudinal study.

Nurse education today. 2022 Oct: https://doi.org/10.1016/j.nedt.2022.105592

Paper 3

Høegh-Larsen, A.M., Gonzalez, M., Reierson, I.Å., Husebø, S.I., Hofoss, D., & Ravik, M (2023). Nursing students' clinical judgment skills in simulation and clinical placement: a comparison of student self-assessment and evaluator assessment.

BMC Nursing. 2023 Mar: https://doi.org/10.1186/s12912-023-01220-0

Paper 1 and 2 are omitted from online publication

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Abbreviations

ECTS	European Credit Transfer and Accumulation System
HSSOBP	Healthcare Simulation Standards of Best Practice
INACSL	International Nursing Association for Clinical Simulation and Learning
LCJR	Lasater Clinical Judgment Rubric
LCJR-N	Lasater Clinical Judgment Rubric Norwegian Version
NPC	Nurse Professional Competence
NPC Scale-SF	Nurse Professional Competence Scale Short Form
NSD	Norwegian Centre for Research Data
PEARLS	Promoting Excellence and Reflective Learning in Simulation
RN	Registered Nurse
USN	University of South-Eastern Norway
WHO	World Health Organization

Table of contents

1 INTRODUCTION

Competent nurses are important to ensure safe and high-quality person-centred patient care (Aiken et al., 2017; Huber et al., 2021; McCormack & McCance, 2021). Thus, nursing education, both nationally and internationally, should educate professional nurses who are prepared to provide person-centred, safe, and high-quality healthcare, both in today's complex and specialised health services and in the future (Norwegian Ministry of Education and Research, 2019; WHO, 2013, 2016). Medical, technological, and political developments, along with new organizational structures and performance requirements in the healthcare services are continuously changing the practice of nursing and creating new challenges for the nursing profession and competence requirements (Kavanagh & Sharpnack, 2021). The World Health Organization (WHO) (2016, 2020) has called for investment in nursing education so it is aligned with national health priorities and emerging global issues and emphasises that nurses should be educated to ensure they have the necessary competence. As this competence includes professional competence and clinical judgment skills, these are learning objectives in nursing education (Cant & Cooper, 2017a; Hanshaw & Dickerson, 2020; Jessee, 2021; Nilsson et al. 2018).

Nursing education programmes are organised to promote learning and the development of professional competence and clinical judgment skills using different pedagogical approaches in different learning arenas. The simulation setting and the clinical setting are two established learning arenas used worldwide to promote nursing students' learning and development of professional competence and clinical judgment

skills needed for future practice (EU directive 2013/55/EU, 2013). In the simulation setting, simulation-based education with simulated scenarios is used as a pedagogical strategy to support the development of professional competence and clinical judgment skills. In simulation-based education, debriefing is used to support students in reflecting on experiences from the scenario, thus improving future performance and optimal transfer of competence to practice (Burke & Mancuso, 2012; Decker et al., 2021; Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021; Sahin & Basak, 2021). Although debriefing has been recognised as important for nursing students' learning in the simulation setting, research on the effectiveness of different debriefing methods in nursing education is limited (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021). Being able to transfer professional competence and clinical judgment skills from the simulation setting to the clinical setting is important for nursing students to ensure patient safety (El Hussein & Cuncannon, 2022; Huber et al., 2021; Jessee, 2021). A challenge encountered on an international scale is that nursing students often have difficulty transferring learning objectives, such as professional competence and clinical judgment skills, from the academic setting to more complex patient care situations in a clinical setting (Brentnall et al., 2022). Thus, it is important for nursing students to develop their professional competence and clinical judgment in a longer perspective, looking beyond the simulation setting (El Hussein & Cuncannon, 2022; Huber et al., 2021; Jessee, 2021).

The assessment of students' competence in different learning arenas is a pillar of nursing education to determine students' learning needs (Immonen et al., 2019; Siles-González & Solano-Ruiz, 2016). Assessment is also often used in research to investigate students' skills, behaviour, or experiences concerning their competence (Bradley et al.,

2022). Nursing students' ability to assess their own clinical judgment skills is of particular interest, as self-assessment of clinical judgment skills is widely used as an assessment strategy in education and research.

To contribute to knowledge within this research field, the overall aim of this PhD project was 1) to develop knowledge concerning nursing students' development and assessment of professional competence and clinical judgment skills in the simulation setting and the clinical setting, and 2) to develop knowledge concerning nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting. The more specific research aims were to compare the effects of a structured and scripted debriefing method to a standard debriefing on nursing students' professional competence and clinical judgment skills; to investigate the changes and levels of nursing students' professional competence in a longitudinal perspective; and to compare nursing students' self-assessment of clinical judgment skills to an evaluator's assessment. This document, henceforth called the thesis, is based on three published papers using empirical data.

1.1 Thesis structure

This thesis is structured into seven main chapters. This first chapter introduces the PhD project and its aims. Chapter two lays out the background and rationale for the project. This includes an overview of central terms, relevant theoretical perspectives, and the research field at stake. Chapter three presents the aims and research questions of the three published papers included in this PhD project. Chapter four presents the research methods, as well as the ethical considerations of the complete research process. The

results are presented in chapter five. Chapter six is divided into discussions of the results and methodological considerations. Chapter seven outlines the overall conclusions and presents recommendations for nursing education and future research.

2 BACKGROUND

In this chapter, the background and rationale for the PhD project are presented. First, nursing competence will be outlined in relation to the core concepts of professional competence and clinical judgment skills and further connected to person-centred healthcare. Second, the two core learning arenas in nursing education and the learning approaches used to develop students' professional competence and clinical judgment skills are presented, namely the simulation setting with simulation-based education and the clinical setting with clinical placement. The development of nursing students' professional competence and clinical judgment skills in these learning arenas is presented, as is students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting. Finally, this chapter uncovers different aspects related to the assessment of nursing students' clinical judgment skills in the simulation setting and the clinical setting.

2.1 Nursing competence

Nursing competence is relevant for nursing students and nursing education as the core aim of nursing education is to educate competent nurses. The definition and use of the concept of nursing competence have been extensively debated for decades (Cowan et al., 2005; Immonen et al., 2019; S. A. Smith, 2012). Three main approaches to nursing competence are found in the literature: behaviouristic, psychological, and holistic (Cowan et al., 2005). The behaviouristic approach focuses on the ability to perform tasks; the psychological approach includes more cognitive, affective, and psychomotor skills; and the holistic approach is a more generic concept that combines knowledge,

performance, skills, values and attitudes (Cowan et al., 2005; Immonen et al., 2019; Smith, 2012). A holistic approach to nursing competence not only allows for incorporating dimensions such as attitudes, knowledge, and skills, but it also includes the context of the nursing practice (Cowan et al., 2005). The work of the nursing theorist Patricia Benner (1984) has likewise had an impact on the understanding and perception of nursing competence as it considers the context of nursing practice, in line with a holistic approach. Benner (1984) defined nursing competence as the ability to perform a task and achieve desired outcomes under varied circumstances in the real world. Although there is currently no consensus on the definition of nursing competence, it has been suggested that a definition based on a holistic approach should be used (Cowan et al., 2005).

In this PhD project, professional competence and clinical judgment skills were considered appropriate working definitions for the concept of nursing students' competence, in line with a holistic approach.

2.1.1 Professional competence

Derived from nursing practice and based on a holistic view of nursing, professional competence is described by the WHO (2009) as a complex combination of "skills reflecting knowledge, attitudes, psychosocial and psychomotor elements" (p. 35). It includes professional practice, clinical skills, and reflective practice, as well as cognitive, affective, and psychomotor skills (Lejonqvist et al., 2016). Anchored in WHO's description (2009), a holistic view of nursing competence, ethical conduct in nursing, and a literature review by Kajander-Unkuri et al. (2013), professional competence has

been categorised into six core competence areas by Nilsson et al. (2018). These competence areas are nursing care; value-based nursing care; medical and technical nursing care; care pedagogics; documentation and administration of nursing care; and development, leadership, and organization of nursing care (Nilsson et al., 2018).

The six competence areas described by Nilsson et al. (2018) have been studied in various ways. Identification of nursing students' level of professional competence and potential knowledge gaps may result in improvements in nursing education (Nilsson et al., 2018). In an evaluation of nursing students' level of professional competence related to these areas halfway through their education and at the point of graduation, *Value-based nursing care* was rated highest while *Development, leadership, and organization of nursing care* was rated lowest (Egilsdottir et al., 2023; Forsman et al., 2020; Lachmann & Nilsson, 2021; van de Mortel, Nilsson, & Lepp, 2021). Concerning changes in professional competence over time, Egilsdottir et al. (2023) investigated the development of professional competence among second- and third-year nursing students from before to after their clinical placement studies. They found that students' professional competence increased and that the changes were statistically significant for all six competence areas (Egilsdottir et al., 2023). Although nursing students' professional competence has been investigated in various ways, there is a lack of research investigating how their professional competence develops over time and transfers from the simulation setting to the clinical setting. This type of research is of interest for understanding how competence develops and identifying areas for improvement in nursing education (Cant & Cooper, 2017a; Hanshaw & Dickerson, 2020; Nilsson et al., 2019). Thus, educational interventions to promote development of

professional competence among nursing students in the simulation setting are of interest (Cant & Cooper, 2017b; Hanshaw & Dickerson, 2020).

2.1.2 Clinical judgment skills

A holistic view of nursing competence includes clinical judgment skills and cognitive skills related to reflexive practice (Cowan et al., 2005). In the literature, the concepts of clinical judgment, problem-solving, decision-making, and critical thinking address this competence (Brentnall et al., 2022; Klenke-Borgmann et al., 2020; Manetti, 2019; Tanner, 2006). These concepts tend to be used interchangeably (Brentnall et al., 2022; Jessee, 2021). However, for this PhD project "clinical judgment" will be used as these skills are ranked as a priority dimension of nursing competence that needs to be developed among new graduates (Jessee, 2021; K. C. Lee, 2021; Nielsen et al., 2016). Benner, Tanner, and Chesla (2009) define clinical judgment skills as "the ways in which nurses come to understand the problems, issues, or concerns of clients and patients, to attend to salient information, and to respond in concerned and involved ways" (p. 200).

There has been a notable shift from using the nursing process framework (assessment, diagnosis, planning, intervention, evaluation) as a guide for competence related to nurse-specific thinking to using clinical judgment and clinical reasoning models (Jessee, 2021; Tanner, 2006). As the scope of healthcare and nursing care has shifted from problems to outcomes, it has become increasingly clear that decisions made during the nurse-patient encounter are important for patient outcomes and patient safety (Huber et al., 2021; Jessee, 2021). One established and accepted paradigm for clinical judgment skills in nursing is the intuitive-humanistic model (Benner, 1984; Bjørk & Hamilton,

2011). According to Benner (1984), intuition in nursing is rooted in the ability to recognise patterns of cues. The intuitive-humanistic model (Benner, 1984) was later integrated into Tanner's model of clinical judgment (Dickison et al., 2019; Tanner, 2006). In Tanner's model (2006), clinical judgment involves clinical reasoning and decision-making skills in acute or planned responses to patients' needs and health concerns. Tanner (2006) developed a rubric that breaks down the phases in the development of clinical judgment into noticing, interpreting, responding, and reflecting. These four phases describe the major components of clinical judgment in complex patient care situations that involve changes in status and uncertainty about the appropriate course of action (Lasater, 2007a; Tanner, 2006). The first phase, noticing, involves nurses' expectations of the situation based on knowledge – including knowledge of the particular patient, knowledge from similar patients, and theoretical knowledge – and previous experience (Tanner, 2006). Noticing and getting an initial grasp of the patient's situation supports the nurses in the second phase, interpreting, which involves nurses' interpretation of what they noticed in the clinical situation (Tanner, 2006). In the third phase, the information from the previous two phases triggers an appropriate response. In Tanner's (2006) model, noticing, interpreting, and responding are described as the result of clinical reasoning. In the final phase, the nurses' reflection-in-action and reflection-on-action are significant components (Tanner, 2006). Reflection-on-action refers to a nurse's ability to understand the situation, the patient's response to the intervention, and the ability to adjust the intervention if necessary (Tanner, 2006). Reflection-on-action refers to nurses' ability to learn from the situation and use it for knowledge development and future practice (Tanner, 2006). The overall concepts or

actions may be summarised as the thinking-in-action skills of three steps: noticing, interpreting, and responding (during the situation that requires clinical judgment), followed by the fourth step, the thinking-on-action skill of reflecting after responding to the situation (Lasater, 2007a; Tanner, 2006). Clinical judgment is thus the conclusion drawn from the reasoning process and results in a planned response to the clinical situation (Tanner, 2006).

With the complexity of today's healthcare environment, newly graduated nurses are expected to possess not only theoretical and practical skills to deliver safe care but also cognitive skills, such as clinical judgment, to guide the delivery of this care (Klenke-Borgmann et al., 2020; Lasater, 2007a; K. C. Lee, 2021). However, it has been pointed out that graduate nurses tend to lack clinical judgment skills (Jessee, 2021; Kavanagh & Sharpnack, 2021). It has also been recommended that skills such as clinical judgment and clinical reasoning be made more explicit as learning outcomes, including aspects of teaching and assessment (Jessee, 2021; Parodis et al., 2021). By acknowledging the importance of clinical judgment skills, nursing education programmes are responsible for preparing students to be able to make sound clinical judgments (Gonzalez et al., 2021; Jessee, 2021; K. C. Lee, 2021).

2.1.3 Person-centredness in nursing competence

As this PhD project is part of the PhD programme in person-centred health care, the relevance of person-centredness in nursing competence and education are of interest. Person-centredness is a concept based on holistic ideas and international principles of human rights and dignity (WHO, 2007). It is based on the idea that personhood is a

complex collection of attributes, capabilities, needs, feelings, vulnerabilities, and desires, which makes each of us a unique person (McCormack & McCance, 2017). The concept of person-centredness has become increasingly important in healthcare policy, research, education, and practice (Edgar et al., 2020; Nkowane & Ferguson, 2016). Person-centred practice is defined by McCormack and McCance (2017) as "an approach to practice, established through the formation and fostering of healthful relationships between all care providers, service users and others significant to them in their lives. It is underpinned by values of respect for persons, individual's right to self-determination, mutual respect and understanding. It is enabled by cultures of empowerment that foster continuous approaches to practice development" (p. 80). Implementation of person-centredness in healthcare is associated with positive health outcomes (Elvén et al., 2023; Yun & Choi, 2019).

To support person-centred practice as a nurse, being professionally competent, having developed interpersonal skills, being committed to the job, having clear beliefs and values, and knowing oneself are considered competence requirements (McCormack & McCance, 2017). Thus, research concerning nursing students' professional competence and clinical judgment skills may support person-centred care in future practice. In a person-centred perspective, professional competence focuses on nurses' ability to make decisions and prioritise care using their knowledge and skills (McCormack & McCance, 2017). In Tanner's (2006) perspective, including knowledge of the patient is an essential component of clinical judgment skills. This is in line with the requirements of person-centred care and involves awareness of individual needs and preferences, patient participation, and a holistic perspective in coordination of care (Håkansson et

al., 2019). Moreover, knowing oneself is one of the prerequisites for delivering person-centred healthcare (McCormack & McCance, 2021). For nursing students, this is linked to having insight into one's own competence, which again can be obtained through reflection and self-assessment (McCormack & McCance, 2021). To support person-centred practice, person-centredness is addressed in competence requirements for nursing students. For nursing education, competence requirements are presented in regulations and guidelines (Råholm et al., 2010). In Norway, national guidelines define competence requirements to ensure that students are educated to be professional nurses prepared to deliver person-centred, safe, and high-quality healthcare (Norwegian Ministry of Education and Research, 2019). Thus, focusing nursing students' development, transfer and assessment of professional competence and clinical judgment skills in research might promote for person-centred healthcare.

2.2 Nursing students' development of professional competence and clinical judgment skills

In this PhD project, nursing students' development of professional competence and clinical judgment skills is understood as an active learning process that progresses from simple to complex actions, in line with how Benner (1984) described learning nursing competence. In relation to the development of professional competence and clinical judgment skills in nursing education, Benner (1984) identifies five levels of nursing competence – novice, advanced beginner, competent, proficient, and expert – each of which builds upon the previous one. The Dreyfus and Dreyfus model of skill acquisition (1980) has informed this understanding of the development of nursing competence

(Benner, 2004). In this perspective, the development of professional competence and clinical judgment skills may not always be considered linear but can be treated as cyclical if there is a need to learn new knowledge (Benner, 2004; Dreyfus & Dreyfus, 1980). According to Benner (1984), a novice nurse is a beginner characterised by having little experience and understanding of how to apply new knowledge and skills in new situations. This description also applies to nursing students. A beginner uses general rules in a context-free, inflexible, linear fashion. The performance of novice nursing students is often limited and inflexible, and stable and predictable learning situations are crucial to learn and develop competence (Benner, 2004). Progression from one stage to the next happens based on the frequency and type of experiences and the guided reflection and education provided in relation to these experiences (Thomas & Kellgren, 2017). The basic thrust of Benner's (1984) intuitive-humanist model is that intuitive judgment distinguishes the expert nurse from the novice nurse, with the expert no longer relying on analytical principles alone in connecting their understanding of the situation to perform appropriate actions (Thompson, 1999). This ability develops with experience in providing nursing care for patients (Benner, 1984; Jessee, 2021). For a novice student to develop clinical judgment skills, it is also important that they have opportunities to practice what they have learned (K. C. Lee, 2021; Tanner, 2006).

Acknowledging that learning and development of professional competence and clinical judgment skills are achieved through different experiences and at different stages, nursing education programmes are organised to promote development of professional competence and clinical judgment skills using different pedagogical approaches in different learning settings. In Norway, the bachelor's degree programme in nursing

follows the European Union (EU) directive which assigns half of the study time to mandatory, supervised clinical placement in different areas of healthcare services (EU directive 2013/55/EU, 2013, Norwegian Ministry of Education and Research, 2019). The Norwegian programme applicable to the nursing students in this PhD project gave 180 credits in the European Credit Transfer and Accumulation System (ECTS): 90 ECTS from theoretical courses in the academic setting, a minimum credit of 75 ECTS from clinical placement courses in a variety of places, and a maximum credit of 15 ECTS from simulation-based education courses in simulation laboratories (Ministry of Education and Research, 2008).

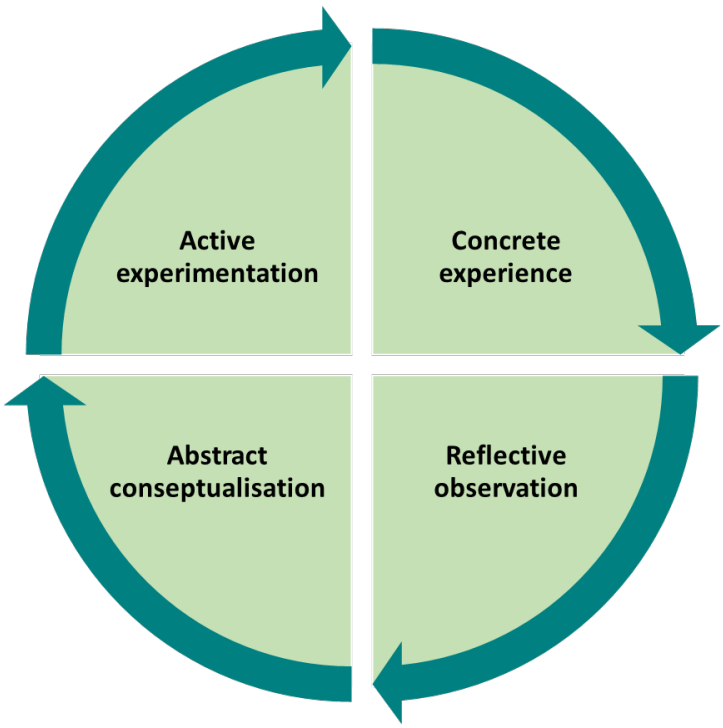
2.3 Learning arenas and pedagogical approaches in nursing education

The simulation setting and the clinical setting are important arenas in nursing education for developing, reflecting upon, and assessing students' professional competence and clinical judgment skills (Dreifuerst, 2012; Gonzalez et al., 2021; Günay & Kılınç, 2018; Jessee, 2021; Kavanagh & Szweda, 2017; Lasater, 2007a; Theobald et al., 2021). In these settings, students can combine theoretical knowledge with learning practical skills when developing professional competence and clinical judgment skills. Such learning is often associated with experiential learning (Kolb, 1984, 2014). Inspired by Dewey (1933), who emphasised experience as significant and valuable for learning, Kolb (1984, 2014) introduced the concept of experiential learning. Experiential learning is defined as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (p.

41). In Kolb's theory, changes in cognitive processes, namely metacognition (thinking about thinking), scaffolding (building upon previously obtained knowledge), and reflection, are at the core of learning (Kolb, 1984, 2014). Related to these issues, Kolb (1984) presents a four-stage experiential learning cycle as a model of experiential learning (Figure 1).

Figure 1.

Modified illustration based on Kolb's learning cycle (1984)



According to Kolb's model, individuals learn through a four-part cycle including concrete experience, reflective observation, abstract conceptualisation, and active experimentation (Kolb, 1984, 2014). When applying this model to nursing students' development of professional competence and clinical judgment skills in the simulation and clinical settings, learning begins with students' involvement in a specific experience.

Later in the process, they reflect on the experience from a variety of perspectives. Through this reflection, the students integrate their observations into more abstract models, create generalisations and principles, and draw conclusions (Kolb, 1984, 2014; Lavoie et al., 2018). Optimally, the students then use the abstract conceptualisation to guide future decisions and actions that again lead to new concrete experiences (Kolb, 1984, 2014). To promote students' development of professional competence and clinical judgment skills, simulation-based education and clinical placement are used as pedagogical approaches in in the simulation setting and the clinical setting respectively (Brentnall et al., 2022).

2.3.1 Simulation setting

In the simulation setting, simulation-based education is used as pedagogical approach. Historically, simulation-based education has been part of traditional nursing education programmes since the mid-1800s with the use of limb models to practice bandaging, bathing, and mobility needs before facing the complexity of the clinical environment (Aebersold, 2018). Simulation in healthcare is defined as "a technique that creates a situation or environment to allow persons to experience a representation of the real health care event for the purpose of practice, learning, evaluation, testing, or to gain an understanding of systems and human actions" (Lioce et al., 2020, p. 44). There has been discussion about how to categorise simulation-based education. The concepts of fidelity, realism, and modality are all used for the purpose of categorisation. Simulation-based education can be categorised as low-, medium-, or high-fidelity depending on the level of realism or authenticity (Lioce et al., 2020; Stayt et al., 2015). Currently, fidelity

in simulation-based education has a broad meaning, including conceptual fidelity, environmental fidelity, and psychological fidelity (P. I. Watts et al., 2021). Fidelity can also relate to students' interactions with each other in the simulation-based education (Rystedt et al., 2019). The term modality is also used to describe the simulation format. Simulation modalities include simulated clinical immersion, in situ simulation, computer-assisted simulation, virtual reality, procedural simulation, and/or hybrid simulation (Lioce et al., 2020; P. I. Watts et al., 2021). These modalities may incorporate, but are not limited to, the following: standardised patients, manikins, haptic devices, avatars, and partial task trainers (Aebersold, 2018; Lioce et al., 2020; P. I. Watts et al., 2021). It is important to use various types of fidelity to create the necessary perception of realism for the learner as not every simulation requires the highest fidelity (P. I. Watts et al., 2021). Today, simulation-based education using simulated scenarios is a cornerstone of the nursing education curriculum, including extensive use of sophisticated technology and high-fidelity simulators providing nursing students with opportunities to rehearse and learn in a secure and supportive environment (Aebersold, 2018; El Hussein & Cuncannon, 2022; J. Lee et al., 2020). For this PhD project and the thesis, simulation-based education included simulated scenarios involving high-fidelity manikin simulators in a simulation laboratory.

Simulation-based education using simulated scenarios often involves the high-fidelity patient simulator modality and a high level of interactivity and realism for the student (Hanshaw & Dickerson, 2020; Lioce et al., 2020). Such simulation is a recognized approach that provides students with opportunities to develop their knowledge, skills, and attitudes and to analyse and respond to realistic situations in a secure environment

without compromising patients' wellbeing (R. P. Cant & Cooper, 2017b; El Hussein & Cuncannon, 2022; Koukourikos et al., 2021; J. Lee et al., 2020; Li et al., 2022). Simulation-based education corresponds well to Kolb's (1984) experiential learning cycle as nursing students engage in hands-on learning experiences, reflect on those experiences and develop abstract conceptualisations and apply what they have learned in new scenario simulations or situations in the clinical setting (Lavoie et al., 2018; Stocker et al., 2014). In relation to these issues, Laursen (2014) also emphasises that simulation should incorporate elements of active learning, experiential learning, and reflection. Laursen (2014) describes the simulation setting as a third learning arena situated between the theory room and the practice room. Laursen's (2014) perspective on learning in the simulation setting emphasises the importance of creating a realistic and safe learning environment that allows nursing students to develop professional competence and clinical judgment skills. Moreover, Laursen (2014) emphasises the importance of supporting students in bridging the gap between theory and practice in nursing education, noting that the use of simulated scenarios is one way to achieve this goal.

To promote the development of professional competence and clinical judgment skills, simulation-based education should comprise preparation, briefing, clinical scenario, and debriefing (P. I. Watts et al., 2021).

The preparation

Preparation is used in simulation-based education to establish a psychologically safe learning environment before the simulated scenario and debriefing occur (McDermott, 2020; McDermott et al., 2021). Preparation normally involves independent preparatory

work or assignments that prepare students to successfully achieve learning objectives (McDermott, 2020; Potter et al., 2022).

The briefing

Briefing is also used to promote psychological safety for nursing students (McDermott, 2020; McDermott et al., 2021). Briefing often occurs in a group meeting with a facilitator before the simulated scenario (McDermott, 2020; Potter et al., 2022). In the briefing session, the facilitator guides the expectations and logistics to prepare students for the upcoming scenario and promote a safe learning environment to ensure that critical conversations can occur (Potter et al., 2022). The information provided by the facilitator during the briefing is critical for nursing students' understanding of what they will encounter in the scenario, as well as possibly being a prerequisite for mastery (McDermott, 2020; Solli et al., 2020).

The simulated scenario

The simulated scenario is a simulated clinical experience in which students act as nurses in a scenario that mimics a real-life nursing care situation (Bø et al., 2022; Lioce et al., 2020). Simulated scenarios can vary in length and complexity. They should be developed based on an assessment of students' learning needs, the resources available, desired learning outcomes, the learners targeted, and the type of assessment or evaluation method (P. I. Watts et al., 2021). Optimally, clinical progression and cues provide a framework for the progression of the simulated scenario in response to learner actions (P. I. Watts et al., 2021).

The debriefing

Debriefing involves a reflection on the simulation experience and provides support for learning and transfer of the competence gained to future practice (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021; Sahin & Basak, 2021). This corresponds to Laursen's (2014) view of reflection and Kolb's (1984) experiential learning theory. This reflective process supports students' integration of theoretical knowledge and practical skills and helps them develop a deeper understanding of the complex and dynamic nature of the clinical setting (Laursen, 2014). Debriefing methods used in nursing education vary widely, although unstructured facilitator-led debriefing is widely used (J. Lee et al., 2020; Niu et al., 2021). Based on the evidence, the most recent version of the International Nursing Association for Clinical Simulation and Learning's (INACSL) guideline *Healthcare Simulation Standards of Best Practice™* (HSSOBP) The Debriefing Process (Decker et al., 2021) lists criteria necessary to meet standards of best practice. According to these guidelines, debriefing should be planned and incorporated to guide the learner in achieving learning outcomes; it should be constructed and facilitated by a competent person; it should promote self, team, and system analysis; and it should be based on theoretical frameworks or evidence-based concepts (Decker et al., 2021). Several debriefing methods exist and are dependent on frameworks, tools, and facilitators (Decker et al., 2021; Fegran et al., 2023; Niu et al., 2021; Sahin & Basak, 2021). In terms of frameworks, debriefing can be classified as either structured or unstructured (Niu et al., 2021). Two meta-analyses have reported that structured debriefing improved nursing students' clinical judgment, performance skills, critical thinking, clinical reasoning, and problem-solving and contributed to psychological safety and satisfaction

associated with simulation-based education (J. Lee et al., 2020; Niu et al., 2021). Structured debriefing has also been found to provide a better opportunity for reflection and increased student activity (Decker et al., 2021; Neill & Wotton, 2011). Unstructured debriefing is often referred to as *standard debriefing* and tends to be driven by educators' personal preferences and experiences rather than sound evidence (Cheng et al., 2015; J. Lee et al., 2020). While the benefits of structured debriefing are well-known, the lack of adequate resources in nursing education can result in the use of unstructured debriefing (Eppich & Cheng, 2015; J. Lee et al., 2020; Niu et al., 2021). Types of debriefing include verbal debriefing, video-assisted debriefing, and written debriefing with the use of a script (Niu et al., 2021). A scripted approach to structured debriefing can assist facilitators with varying levels of experience and ensure a standardised delivery of debriefing (Cheng et al., 2013). Although there is contrasting evidence concerning use of video in debriefing, video-assisted debriefing has been shown to have a positive impact on nursing students' experiences and critical thinking (Niu et al., 2021). Methods of facilitation include facilitator-led debriefing, peer-led debriefing, or self-debriefing (Decker et al., 2021; Niu et al., 2021; White et al., 2021). Updated research (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021) and current guidelines (Decker et al., 2021; P. I. Watts et al., 2021) strongly emphasise the importance of using effective and sustainable debriefing methods. Although debriefing has been recognised as important for nursing student learning, the most effective methods have not yet been identified and research on the effectiveness of different debriefing methods in nursing education is limited; further research is therefore required (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021).

2.3.2 Clinical setting

In the clinical setting, clinical placement is an essential part of nursing education and an important pedagogical approach (Flott & Linden, 2016; Logue, 2017). Historically, nursing education has always used the clinical setting to provide students with direct patient care experiences (Flott & Linden, 2016). In modern nursing education, clinical placement takes place in a variety of clinical settings with different clinical scopes, such as acute care units, in which nursing students' professional competence and clinical judgment skills can be facilitated as a learning outcome (Günay & Kılınç, 2018; Henriksen, Löfmark, Wallinvirta, Gunnarsdóttir, & Slettebø, 2020). In the clinical setting, students engage in hands-on learning experiences (concrete experience) and reflect on those experiences to identify what worked well and what could be improved (reflective observation) (Kolb, 1984; Lavoie et al., 2018). Students can use this reflection to develop a deeper understanding of the clinical situation and how to improve their practice (abstract conceptualisation), and then they can apply this knowledge in new clinical situations (active experimentation) to refine their professional competence and clinical judgment skills (Kolb, 1984; Lavoie et al., 2018).

In clinical placement, nursing students may practice clinical judgment skills and gradually develop their professional competence in direct patient care learning situations under supervision from nurses and educators to prepare for the professional nursing role (Flott and Linden, 2016; Pedregosa et al., 2020). Moreover, there is a common understanding that clinical experiences should engage students in the cognitive, affective, and psychomotor work of nursing, which is important for gaining the experience needed to inform safe and good practice, rather than focusing on the number of clinical hours and

task completion as indicators of competence (Jessee, 2021). Because the clinical setting is such an essential learning arena in nursing education, it is of interest to understand how students' professional competence and clinical judgment skills develop in this specific setting (Forsman et al., 2020; Kajander-Unkuri et al., 2021).

2.4 Transfer of professional competence and clinical judgment from the simulation setting to the clinical setting

In the clinical setting, students have the possibility to transfer and integrate what they have learned in the academic setting to the simulation setting (Chan et al., 2018; El Hussein & Cuncannon, 2022). In this PhD project, this integration of professional competence and clinical judgment skills is understood as a transfer of learning. Transfer of learning is described as ''the learning process involved when a person learns to use previously acquired knowledge/skills/ competence/expertise in a new situation'' (Eraut, 2004, p. 212). Several theories have attempted to describe and explain different taxonomies of the transfer of learning. The low-/high-road theory of transfer elaborated by Salomon and Perkins (1989) emphasises the importance of common or similar features between occasions of learning for transfer to occur. Low-road transfer occurs when the settings are sufficiently similar and the transfer then depends on pattern recognition and the reflexive triggering of routines, whereas high-road transfer involves deliberate reflective processing and abstraction due to the differences between the settings (Salomon & Perkins, 1989). In this perspective, the transfer of professional competence and clinical judgment skills can be relatively straightforward when the situation in the clinical setting is very similar to what was previously experienced in the

simulated scenario. But when the new situation is less familiar and possibly more complicated, transfer becomes a more challenging process (Eraut, 2004; Salomon & Perkins, 1989). According to Marton (2006), transfer of learning implies relearning in a new situation, and it is not only the similarities but also the differences between situations that matter. He proposed a more inclusive definition of transfer of learning as "relations between what people learn and can do in different situations" (Marton, 2006, s.510). Given the complex nature of the clinical setting, making meaningful connections and applying what was learned in the simulation setting might be challenging. However, if applying Marton's (2006) perspective to the transfer of learning from the simulation setting to the clinical setting, it should be possible even though the experiences and settings are different.

Research addressing the recognized challenges of transferring learning from the simulation setting to clinical setting is limited, and to date, only a few studies have monitored students' professional competence and clinical judgment skills in a setting by conducting follow-up studies after simulation-based education (El Hussein & Cuncannon, 2022). Hustad et al. (2019) indicate that simulation promotes enduring learning in various areas in the clinical setting. However, it is reported that it might be challenging for students to retain experiences and competence from the simulation setting when faced with complex and unpredictable situations in the clinical setting (El Hussein & Cuncannon, 2022; Ravik et al., 2015; Zieber & Sedgewick, 2018). This gap between what they experience in the academic setting, the simulation setting, and the clinical setting may complicate nursing students' learning process and contribute to a lack of understanding of nursing terms and concepts (Koukourikos et al., 2021).

Research addressing nursing students' learning across different educational settings is of interest to better understand how they develop and transfer their knowledge, and thereby identify areas for improvement and further training in nursing education (R. P. Cant & Cooper, 2017a; Hanshaw & Dickerson, 2020; Nilsson et al., 2019).

Corresponding to Kolb's (1984) learning cycle, reflecting upon experiences from the simulated scenario and strengthening the connection to future clinical practice in the debriefing phase of simulation are important steps for achieving learning outcomes (Husebø et al. 2015). As the students' transfer process is complicated by complex, unpredictable, and challenging situations in practice (Booth et al., 2017; Nash & Harvey, 2017), debriefing used in nursing education should aim to promote reflection for further learning and improve future practice (Decker et al., 2021). Student-centred and structured debriefing methods have the potential to provide students with optimal opportunities for reflection and increased activity (Decker et al., 2021; Neill & Wotton, 2011). However, research addressing the transfer of learning outcomes from debriefing to clinical placement is limited (El Hussein & Cuncannon, 2022; J. Lee et al., 2020).

2.5 Assessment of nursing students' clinical judgment skills

Assessment of nursing students' competence in the simulation and clinical settings can be used to promote learning, evaluate learning outcomes, or conduct research. To address assessment of nursing students' competence, this PhD focuses on the assessment of their clinical judgment skills.

In nursing education, assessment of nursing students' clinical judgment skills in the simulation and clinical settings is used to identify their level of competence and thereby determine further learning needs (Immonen et al., 2019; Shinnick & Woo, 2020; Siles-González & Solano-Ruiz, 2016). The main assessment strategies used in nursing education are formative and summative (Billings & Halstead, 2019). Formative assessments are used to enhance students' learning and the development of self-regulated learning practices (Billings & Halstead, 2019). Summative assessments are used for grading purposes, to evaluate learning outcomes, to enable comparisons between learners, and to ensure standards are met (Billings & Halstead, 2019).

In nursing research, it is crucial to continuously define, evaluate, and investigate nursing students' competence, including clinical judgment skills, to identify their learning needs during education and what if any additional education is required to support their development (Lejonqvist & Kajander-Unkuri, 2021). Assessment strategies should be used in an integrated and person-centred manner, ideally combining knowledge, understanding, problem-solving, technical skills, attitudes, and ethics in the assessment process (McMullan et al., 2003). For valid results, it is important to use validated instruments in well-structured educational research projects when assessing nursing students' clinical judgment skills (Immonen et al., 2019). The Lasater Clinical Judgment Rubric (LCJR) has emerged as the most used instrument for the assessment of nursing students' clinical judgment skills (Brentnall et al., 2022; K. C. Lee, 2021).

In the context of nursing education and research, students' competence can be assessed using a variety of methods (Immonen et al., 2019). To develop a broader evidence base,

and thereby increase the validity of the assessment of nursing students' clinical judgment skills, a variety of assessment methods should be used (McMullan et al., 2003). Within a quantitative approach, nursing students' clinical judgment skills in the simulation setting and clinical setting may be assessed by an evaluator, such as a faculty member or clinical supervisor, or by students themselves with self-assessment (Jessee, 2021; Lasater, 2011; K. C. Lee, 2021; Lejonqvist et al., 2016).

For this PhD project, self-assessment and observation were the two assessment methods employed to assess students' clinical judgment skills.

Nursing students' self-assessment of clinical judgment skills

Self-assessment is defined as "the act of monitoring one's processes and products to make adjustments that deepen learning and enhance performance" (Andrade, 2019, p. 10). Boud et al. (2018) emphasise the importance of self-assessment in the assessment of competence. Self-assessment allows students to reflect on their learning and identify areas for improvement, as well as to take ownership of their learning process. In a person-centred perspective, knowing oneself is one of the prerequisites for delivering person-centred healthcare (McCormack & McCance, 2021). This is linked to having insight into one's own competence, which again can be obtained through reflection and self-assessment (McCormack & McCance, 2021). In nursing education, self-assessment of competence is considered one way to promote students' responsibility and self-regulation of learning (Piper et al., 2019). From Benner's (1984) perspective, novice nursing students must be able to self-assess their competence in providing nursing care to become expert practitioners. Boud et al. (2018) emphasise that self-assessment

should be an ongoing process rather than a one-time event. Students should be encouraged to regularly assess their learning and progress and to use this information to set goals and develop action plans for improvement. Moreover, Boud et al. (2018) argue that evaluative judgment is an important aspect of self-assessment. Evaluative judgment involves the ability to critically assess one's own learning and performance (Boud et al., 2018). Evaluative judgment requires individuals to use their metacognitive skills to make critical judgments about their learning and performance. Individuals must be able to accurately assess their strengths and weaknesses and understand how to improve their learning and performance in the future (Boud et al., 2018). Metacognitive skills involve assessing one's own competence development through self-evaluation, self-reflection, and feedback from others (Bradley et al., 2022; Kruger & Dunning, 2009). Such skills may support students in directing and regulating their actions toward learning outcomes and are required in the gradual transformation from novice student to lifelong learner in clinical practice (Brown et al. 2015; Piper et al., 2019; Siles-González & Solano-Ruiz, 2016). A commitment to lifelong learning encompasses the nursing prerequisites necessary to promote person-centred and safe healthcare, namely professional competence, and commitment to the job (McCormack & McCance, 2021). To meet professional standards of ethical practice in today's complex healthcare environment, the International Council of Nurses' (ICN) Code of Ethics for Nurses states that nurses and nursing students must practice within the limits of their own competence (ICN, 2021). Thus, the ability of nurses to self-reflection on their level of competence is critical to avoid unsafe patient care (Piper et al., 2019). In nursing education, both evaluative judgment and metacognitive skills are essential for developing competence (Henderson

et al. 2022; Tai et al., 2018). Students must be able to critically assess their performance and learning and understand how to improve their clinical judgment skills. Developing the ability to assess their own competence requires ongoing practice and reflection and can be facilitated through a variety of teaching and learning strategies (Henderson et al., 2022; Tai et al., 2018), including self-assessment in debriefing in the simulation setting (Cheng et al., 2021).

Self-assessment using self-reporting is commonly used in research to explore and describe aspects of students' behaviour, skills, performance, and experiences (Bradley et al., 2022). In educational research, self-reporting is considered a fast, economical, and non-invasive way to collect data from students (Polit & Beck, 2020). Additionally, student self-assessment is often chosen in education and research to minimise the use of resources, including the involvement of faculty and researcher staff (Andrade, 2019; Bradley et al., 2022; Kajander-Unkuri et al., 2016; Piper et al., 2019).

The response bias from students' self-assessments of clinical judgment skills in education and research is of interest as it may act as a barrier to reflection and learning (Bradley et al., 2022). One example of response bias is the renowned Dunning-Kruger effect (Kruger & Dunning, 2009), which demonstrates that individuals with low competence often tend to overestimate their competence in their self-assessments. If this effect is present among nursing students, relying heavily on student self-assessment may cause inaccurate evaluations in educational learning outcomes and research and ultimately threaten patient safety and patient care (Bradley et al., 2022; Song & McCreary, 2020; Wang et al., 2020).

Observation of nursing students' clinical judgment skills

Observation is a common method for assessing nursing students' competence. It can involve faculty, an experienced nurse, or a clinical educator observing a student performing a specific nursing task or skill and possibly providing feedback on their performance (Bradley et al., 2022). Observation has been used to assess a wide range of nursing competence, including clinical judgment skills using the instrument LCJR (Brentnall et al., 2022; Lasater, 2007a). Assessment of students' clinical judgment skills using observation performed by an evaluator requires that the evaluator be trained in observing and mapping more objectively through observations, as well as in the use of the instrument needed to assess the skills in question (Bradley et al., 2022). The evaluator should also be aware of potential biases and limitations of direct observation and should take steps to minimise these biases (Bradley et al., 2022). Rubrics such as LCJR can be used to assess nursing students' clinical judgment skills through direct observation by an evaluator (Lasater, 2007a). Rubrics provide objective and consistent evaluations, help to reduce subjective biases, and provide clear expectations for performance (Dawson, 2017).

Consistency between different assessment methods has been reported to be valuable to better identify students' knowledge gaps and support their further development (Bradley et al., 2022). Consistency has typically been investigated by comparing student self-assessment with an experienced evaluator's observation-based assessment (Brown et al., 2015; Ross, 2006). Results from research on students' self-assessment has been characterised by inconsistency (W. E. Watts et al., 2009). A few studies have compared nursing student self-assessment and evaluator observation assessment of students'

clinical judgment skills using LCJR (Bertozzi et al., 2023; Jensen, 2013; Strickland et al., 2017; Vreugdenhil & Spek, 2018). The overall conclusion in three studies is that students tend to overestimate their clinical judgment skills in both the simulation setting and the clinical setting compared to an evaluator's assessment (Jensen, 2013; Strickland et al., 2017; Vreugdenhil & Spek, 2018). In contrast, Bertozzi et al. (2023) suggest that LCJR provides a common language for nursing students and teachers when investigating students in the third year of a bachelor's programme. Bertozzi et al. (2023) found students' self-assessment and the evaluator's assessment in the simulation setting to be consistent for all LCJR subscales except for *Noticing*. However, none of these four studies investigated the same students in two different educational settings. The assessment of competence in the simulation setting or the clinical setting will not be clear and simple as it is difficult to measure the contextual factors (McMullan et al., 2003). The context of nursing practice is important in both Benner's (1984) perspective and Cowan et al.'s (2005) holistic view of nursing competence and should therefore be taken into account in the self-assessment of clinical judgment skills. As both simulation and clinical settings are relevant learning arenas in nursing education to facilitate the development of students' clinical judgment skills (Jessee, 2021; Kavanagh & Sharpnack, 2021; Lasater, 2007b), the assessment process in these different educational settings is of particular interest.

3 AIMS AND RESEARCH QUESTIONS

The overall aim of this PhD project was two-fold: 1) to develop knowledge concerning nursing students' development and assessment of professional competence and clinical judgment skills in the simulation setting and the clinical setting, and 2) to develop knowledge concerning nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting.

To address the overall aims, three studies were conducted resulting in three published papers. Research aims and research questions for the three papers will be presented in the following.

Paper I

This study aimed to compare PEARLS debriefing to a standard unstructured debriefing on nursing students' self-reported professional competence and clinical judgment skills in the simulation setting and the clinical setting. The research questions were:

1. Are there differences in self-reported professional competence and clinical judgment skills between nursing students who receive PEARLS debriefing and those who receive a standard debriefing?
2. Are there changes in self-reported professional competence and clinical judgment skills within the PEARLS and standard debriefing groups?

Paper II

This study aimed to investigate changes in nursing students' self-reported professional competence from a longitudinal perspective including the transfer of professional competence from the simulation setting to the clinical setting. Additionally, the study aimed to investigate nursing students' highest- and lowest-rated professional competence areas across four timepoints. The research questions were:

1. What are the changes in nursing students' self-reported professional competence in the simulation setting and the clinical setting across four timepoints?
2. Which of the nursing students' self-reported competence areas are the highest and lowest rated at each timepoint?

Paper III

This study aimed to compare the same group of students' self-assessment of clinical judgment skills with an evaluator's assessment in both simulation and clinical settings. The study further aimed to investigate whether the Dunning-Kruger effect was present in nursing students' self-assessments of clinical judgment skills. The research questions were:

1. Did nursing students' self-assessment of clinical judgment skills in the simulation setting reflect their clinical judgment as assessed by an evaluator?
2. Did the same nursing students' self-assessment of clinical judgment skills in the clinical setting reflect their clinical judgment as assessed by an evaluator?
3. Is the Dunning-Kruger effect present in nursing students' self-assessment of clinical judgment skills in the simulation setting or the clinical setting?

4 METHODS

This chapter describes the methods for the three papers, including the research design, study setting, sample and recruitment, participants, the intervention, data collection, and statistical analysis. At the end of the chapter, ethical considerations are addressed. An overview of the methodological characteristics of Papers I-III is presented in Table 1.

Table 1.

Methodological characteristics of Papers I-III

	Paper I	Paper II	Paper III
Design	Quasi-experimental design	Longitudinal survey design	Comparative design
Study setting	Simulation centre at the university Acute care hospital units	Simulation centre at the university Acute care hospital units	Simulation centre at the university Acute care hospital units
Participants	Intervention group: Full-time nursing students (n=67) Control group: Part-time nursing students (n=39)	Part-time nursing students (n=38)	Full-time nursing students (n=23)
Data collection	Three measurement points May 2019 to February 2020 Paper-based questionnaire	Four measurement points May 2019 to January 2020 Paper-based questionnaire	Two measurement points November 2019 to February 2020 Paper-based questionnaire Observation

Instrument	Nurse Professional Competence Scale Short Form (NPC-Scale SF) Lasater Clinical Judgment Rubric Norwegian Version (LCJR-N)	Nurse Professional Competence Scale Short Form (NPC-Scale SF)	Lasater Clinical Judgment Rubric Norwegian Version (LCJR-N)
Statistical analysis	Paired samples *t*-test Linear regression	Paired samples *t*-test Cohen's d Descriptive tests with mean and standard deviation	Paired samples *t*-test Linear regression Intraclass correlation coefficient Pearson's correlation coefficient Bland-Altman plots

4.1 Design

A quantitative research approach was adopted to investigate nursing students' development, transfer, and assessment of professional competence and clinical judgment skills in the simulation and clinical settings. Due to the Covid-19 pandemic, there were some changes from the original project plan caused by missed data collection points. Consequently, some data from the quasi-experimental study (Paper I) were re-used in the longitudinal study (Paper II) and the comparative study (Paper III). Reporting guidelines were used in all three papers to ensure transparent and quality reporting (Creswell & Creswell, 2018; O'Brien et al., 2020).

For Paper I, a quasi-experimental research design (Creswell & Creswell, 2018; Shadish et al., 2002) was used to compare a debriefing intervention to a standard debriefing on nursing students' self-reported professional competence and clinical judgment skills. According to Creswell and Creswell (2018) and Shadish et al. (2002), this kind of experimental design is suitable to determine whether a specific intervention influences an outcome. Moreover, a quasi-experimental design is appropriate to investigate the effect of an intervention without randomisation (Polit & Beck, 2020; Shadish et al., 2002).

For Paper II, a quantitative longitudinal survey design (Creswell & Creswell, 2018) was used to investigate the change and level of nursing students' self-reported professional competence across four timepoints in the simulation and clinical settings. According to Creswell and Creswell (2018), longitudinal survey design is appropriate to examine the development of trends, attitudes, or opinions in a population over time.

For Paper III, a comparative research design (Creswell & Creswell, 2018) was used to compare nursing students' self-assessment of clinical judgment skills with an evaluator's assessment and to determine whether the Dunning-Kruger effect was present in the simulation and clinical settings. Such a design is appropriate to describe or measure the degree of association or relationship between sets of scores (Creswell & Creswell, 2018).

4.2 Study settings

The overall study setting was a Bachelor of Nursing programme at a Norwegian university. More specifically, a simulation setting and a clinical setting were used as study settings for all three sub-studies (Papers I-III).

The simulation setting was located at the university's simulation centre. The simulation environment mirrored a patient room from a hospital unit. The room was equipped with a patient bed, a bedside table, monitoring equipment, an emergency trolley, medical equipment, a washbasin, a mirror, and some chairs. Laerdal SimMan 3G™ and ALS™ manikins were used as "patients". These high-fidelity manikins include heart and lung sounds, sweating, voice interaction and eye movement. The manikins had different parameters viewed on a monitor. They allowed students to observe and recognize most vital signs through direct interaction with the manikin and observation of the status as viewed on the monitor. LEAP™ software was used to plan and run the scenarios and SimView™ software was used to video record the scenarios.

The clinical setting was in an acute care hospital with two different locations, both nearby the university. The hospital had an agreement with the university to host nursing students in medical and surgical units during clinical placement. These units treated adult patients with acute, critical, and chronic medical conditions. The medical units comprised lung, heart, gastro, infection, blood, and cancer units. The surgical units comprised gastrology, orthopedic, gynecology, plastic surgery, and urology units.

Two existing mandatory educational courses took place in the simulation and clinical settings: a simulation-based education course and a clinical placement course,

respectively. The learning objectives in both courses mirrored clinical judgment skills described by Lasater (2007a) in section 2.1.2 in this thesis and professional competence as described by Nilsson et al. (2018) in section 2.1.1 in this thesis. The learning objectives are presented in Table 2.

Table 2.

Learning objectives in the simulation-based education and the clinical placement courses mirroring clinical judgment skills, as described by Lasater (2007), and professional competence, as described by Nilsson et al. (2018)

	Learning outcome in the simulation-based education	Learning outcome in the clinical placement
Clinical Judgment		
Noticing		
Focused observation	Yes	Yes
Recognising deviations from expected patterns	Yes	Yes
Information seeking	Yes	Yes
Interpreting		
Prioritising data	Yes	Yes
Making sense of data	Yes	Yes
Responding		
Calm, confident manner	Yes	Yes
Clear communication	Yes	Yes
Well-planned intervention/Flexibility	Yes	Yes
Being skillful	Yes	Yes
Reflecting		
Evaluation/Self-analysis	Yes	Yes
Commitment to improvement	Yes	Yes
Professional competence:		
Nursing Care:		
Independently apply the nursing process	Yes	Yes
Meet patient's basic physical needs	Yes	Yes
Meet patient's specific physical needs	Yes	Yes

Document patient's physical status	Yes	Yes
Document patient's psychological status		Yes
Value-based Nursing Care		
Respectfully communicate with patients, relatives, and staff	Yes	Yes
Show respect for patient autonomy, integrity, and dignity		Yes
Enhance patients' and relatives' knowledge and experiences		Yes
Show respect for different values and beliefs	Yes	Yes
Contribute to a holistic view of the patient		Yes
Medical and Technical Care		
Manage drugs and clinical application of knowledge in pharmacology	Yes	Yes
Independently administer prescriptions	Yes	Yes
Pose questions about unclear instructions	Yes	Yes
Support patients during examinations and treatments	Yes	Yes
Follow up on patient's conditions after examinations and treatments	Yes	Yes
Handle medical/technical equipment according to legislation and safety routines	Yes	Yes
Care Pedagogics		
Provide patients and relatives with support to enhance participation in patient care	Yes	Yes
Inform and educate individual patients and relatives	Yes	Yes
Inform and educate groups of patients and relatives		
Make sure that information given to the patient is understood	Yes	Yes
Motivate the patient to adhere to treatments		Yes
Documentation and Administration of Nursing Care		
Make use of relevant data in patient records	Yes	Yes
Use information technology as a support in nursing care	Yes	Yes
Document according to current legislation		Yes
Comply with current legislation and routines	Yes	Yes
Handle sensitive personal data in a safe way		Yes
Observe work-related risks and prevent them	Yes	Yes
Continuously engage in professional development	Yes	Yes
Lead and develop health staff teams		
Development, Leadership, and Organization of Nursing Care		
Act adequately in the event of unprofessional conduct among employees		Yes
Apply principles of disaster medicine	Yes	Yes

Search and review relevant literature for evidence-based nursing		Yes
Interact with other professionals in care pathways	Yes	Yes
Teach, supervise, and assess students	Yes	Yes
Supervise and educate staff		

4.2.1 The simulation-based education course

In the simulation centre, nursing students participated in a two-day simulation-based education course including six scenario simulation sessions. This two-day course was part of a larger course worth 10 ECTS credits that also included training in various practical skills. The simulation scenarios were developed in collaboration with nurse experts in relevant clinical fields and inspired by the National League for Nursing Simulation Scenarios (Laerdal, 2020). Each scenario focused on a patient with a deteriorated condition and one of the following diagnoses: chest pain resulting from angina pectoris, cardiac arrest, hypovolemia following postoperative bleeding, ileus onset, acute deterioration in chronic obstructive lung disease, and hypoglycaemia in an adolescent newly diagnosed with Type 1 diabetes. The six scenarios are presented in Appendix 1 along with their specific learning objectives. Nine faculty members were involved in the simulation-based education course. All were experienced in scenario simulation and had completed a three-day theoretical and practical facilitator training course before the study occurred. The scenarios were led by two faculty members who rotated between the facilitator and operator roles. The facilitator managed the briefing, simulated scenario and debriefing. The operator managed the manikin. To meet the standard of best practices that was in effect when the project was carried out, each simulation session comprised preparation, briefing, a simulated scenario, and debriefing

(INACSL, 2016). These four phases correspond to today's standards of best practice (P. I. Watts et al., 2021). Each of the six simulation sessions lasted for 90 minutes, broken down as follows: briefing (15 minutes), simulated scenario (15 min), watching video recording/discussion of observations (15 min), and debriefing (45 min).

In preparation for the simulation-based education course, the students received written information regarding the content, learning outcomes, and organisation via a digital learning platform. Descriptions of all the scenarios with references to relevant literature were also accessible via a digital learning platform. The students were pre-organised into learning groups consisting of 6-11 members in each simulation. These groups stayed the same on both course days to promote a secure learning environment (Turner & Harder, 2018).

The briefing was facilitator-led and aimed to prepare students for the scenario simulation. The facilitator provided information about the simulated scenario, the learning objectives, the environment, the manikin, the medical equipment, the technology used, and the need for mutual respect and confidence.

In the simulated scenario, two students acted as nurses. During the two-day course, each student acted as a nurse at least once. The remaining students were present in the simulation environment as observers. The facilitator was also present in the simulation environment to answer questions and guide students if needed while the operator ran the scenario from a room behind a mirrored glass. If necessary, the facilitator and operator communicated during the simulated scenario using headsets and a microphone. The standardised National Early Warning Score (NEWS) scoring system was

used in all scenarios to increase nursing students' awareness of the significance of vital signs. NEWS is a tool consisting of a simple algorithm based on physiological parameters, such as heart rate, systolic blood pressure, respiratory rate, temperature, and mental state (Alam et al., 2014). The use of NEWS has been proven to affect nurses' competence in assessing and caring for patients (Jensen et al., 2018). To facilitate learning and guide observation of the simulated scenario, students were encouraged to make notes using a locally developed observation tool. The observation tool described correct nursing observations and nurse interventions related to each specific scenario. This tool was developed based on pedagogical principles from experiential learning theory (Kolb, 1984). The idea behind using the observation tool in the simulated scenario was to involve students in a specific scenario experience and then reflect on it from a variety of perspectives. Through this reflection, the students optimally integrate their observations into more abstract models, create generalisations and principles, and draw conclusions. Students then ideally use these principles and conclusions to guide subsequent decisions and actions that lead to new concrete experiences (D. Kolb, 1984; Stocker et al., 2014a). All six scenarios were video recorded.

After the simulated scenario, the students who acted as nurses watched the video recording of their performance on a large screen in the simulation environment before the debriefing started. Meanwhile, the students who been observing were waiting outside the simulation environment and discussing their observations. Watching a video recording of the simulated scenario before verbal debriefing is often valued by students because it allows them to relive the simulated scenarios, verify comments, and reduce errors (Zhang et al., 2019). It has also been shown to have a positive impact on students'

critical thinking and their overall simulation experience (Niu et al., 2021). The pedagogical choice of using video recording was based on the same principles from experiential learning theory as the observation tool (Kolb, 1984).

The facilitator-led group debriefing lasted 45 minutes for all students. The intervention from the quasi-experimental study (Paper I) concerned this debriefing phase. One student group received the standard unstructured debriefing that the university had used in the simulation-based education course for years, and the other student group received a debriefing intervention with the PEARLS debriefing (Eppich & Cheng, 2015). Details concerning the debriefing phase and the PEARLS intervention are provided in section 4.5 *The PEARLS debriefing intervention.*

4.2.2 The clinical placement courses

All students participated in one medical and one surgical clinical placement course held in acute care units at the hospital. Each course lasted for 8 weeks and was worth 12.5 ECTS credits. In the first course, each student had a clinical placement in a medical or surgical unit. For the second course, those students who had a placement in a medical unit in first course switched to a surgical unit in the second course and vice versa. The core learning objectives for the clinical placement courses were related to professional competence and clinical judgment skills involving providing nursing care for patients with acute, critical, and chronic conditions.

The students were organised into groups of 2-10 students in each hospital unit. Each student was assigned one registered nurse (RN) from the respective unit, who acted as a supervisor and was responsible for guiding them in providing nursing care to patients.

Implemented in this care, NEWS was used systematically and frequently to detect physiological changes, identify at-risk patients, and facilitate appropriate responses. The students followed their RN supervisor in shift work for four days each week and had one day each week for studying. In parallel, nurse educators supervised the students in groups outside of the hospital units to promote reflection and learning and evaluate learning outcomes. Halfway and at the end of the courses, the RN supervisor and nurse educator were responsible for evaluating students' learning objectives and ensuring they had the expected level of professional competence and clinical judgment skills to proceed with their education.

4.3 Sample and recruitment

The target group of this PhD project was bachelor nursing students attending a simulation-based education course followed by a clinical placement course at a Norwegian university. It was necessary to recruit from a nursing programme at a university where the faculty and study administration were willing to assist in the data collection and implementation of the debriefing intervention included in the quasi-experimental study (Paper I). Thus, students were recruited using a convenience sampling strategy. Convenience sampling is commonly used in research projects with limited time and resources, as it is economical and fast (Polit & Beck, 2020; Shadish et al., 2002). At the chosen university, the nursing students were already divided into two programmes, part-time and full-time, both of which earned a total of 180 credits in the ECTS. The full-time programme entailed 3 years of full-time (100%) study, and the part-time programme entailed the same studies part time (75%) over 4 years.

Students were recruited from both programmes. The recruitment process started with meetings with faculty administration and faculty staff at the university to gain insight into how to best plan recruitment and data collection. A key person from the faculty was chosen to support the organising and accomplish the recruitment process and data collection.

A total of 133 nursing students were enrolled in the two programmes when the recruitment started. Before this point, all students had completed theoretical courses addressing pathology and core nursing issues related to patients with acute, critical, and chronic conditions, had passed a six-week clinical placement course in a nursing home focusing on basic nursing care, were certified in cardiopulmonary resuscitation, and had attended compulsory classes in practical nursing skills. In April 2019, 44 part-time students in the second semester of year two were invited to participate in data collection for the quasi-experimental study (Paper I) and the longitudinal study (Paper II). In October 2019, 89 full-time students in their first semester of year two were invited to participate in data collection for the quasi-experimental study (Paper I) and the comparative study (Paper III). Students received oral and written information about the studies from the thesis author in a university lecture 4 weeks before the data collection occurred. This information included an invitation to participate, a description of the project's aim, data collection procedures, confidentiality protections, the right to withdraw, and the thesis author's role in the educational activities and the research. The written information provided to the students is attached in Appendices 2, 3, and 4.

4.4 Participants

For the quasi-experimental study (Paper I), full-time students were predetermined as the intervention group, whereas part-time students served as the control group for reasons of convenience. To know whether the available sample with the students from the two programmes was adequate to achieve statistical conclusion validity in the quasi-experimental study (Paper I), a power analysis was used to estimate sample size needs (Kang, 2021; Polit & Beck, 2020). The software program G*Power 3.1.9.7 was used to calculate the sample size. G*Power is helpful and recommended for researchers to easily estimate the sample size for various statistical methods (Kang, 2021). The intervention group to control group ratio was set to 2:1. This difference was not manipulated but predetermined because the student groups already differed in size with the same ratio. The use of unequal groups is common in quasi-experimental studies (Rusticus & Lovato, 2014). Equal-sized groups are not needed to compute accurate statistics in experimental studies, and most software will adjust for this difference (Rusticus & Lovato, 2014). The sample size calculation showed that 51 participants were required in the intervention group and 25 in the control group to detect a between-group effect size of d = 0.70 with a maximum risk of 5 % for Type 1 error (p = 0.05), and a maximum risk of 20 % for Type 2 error (power = 0.80). To manage dropout risk, all enrolled students (n=133) were invited to participate in the quasi-experimental study (Paper I): 89 full-time students for the intervention group and 44 part-time students for the control group. At baseline, 121 students consented to participate: 77 in the intervention group and 44 in the control group. Fifteen students dropped out during the study. To keep the participants' background characteristics constant across the data

collection timepoints, only scores from students who answered at all timepoints were considered as participants and included in the statistical analyses. Finally, N=106 students were included in the analysis (intervention n = 67; control n = 39). The sample in the intervention group consisted of 62 women (92.5 %) and 5 men (7.5 %), with ages ranging from 20 to 54 (Mean = 26.1). The sample in the control group consisted of 37 women (94.9 %) and 2 men (5.1 %), with ages ranging from 20 to 42 (Mean 24.4).

For the longitudinal study (Paper II), 44 students from the part-time programme were invited to participate. All 44 consented to participate, but 6 students dropped out during the study. To keep the participants' background characteristics constant across the data collection timepoints, only scores from students who answered at all timepoints were considered as participants and included in the statistical analyses. Finally, N=38 students were included in the analysis. The sample in the longitudinal study (Paper II) consisted of 36 women (94.7 %) and 2 men (5.3 %), with ages ranging from 20 to 42 (Mean = 24.5).

For the comparative study (Paper III), the lack of resources for the research project resulted in the use of only one evaluator. Additionally, the predetermined organisation of the simulation-based education and the clinical placement courses affected the data collection feasibility and allowed for a maximum of 24 participants. Consequently, of the 67 full-time students who consented to participate in the quasi-experimental study (Paper I), only the first 24 students who showed interest in participating in the comparative study (Paper III) were formally invited. To determine whether the available sample size was adequate to achieve statistical conclusion validity, the number of comparisons needed was calculated to ensure that the 95% confidence interval around

the evaluator-student average score difference did not include the value 0, assuming a difference of 2 with a standard deviation of 4. A sample size calculation showed that 16 student-evaluator comparisons were sufficient. Finally, N=23 students consented to participate and were included in the analysis. There were no dropouts. The sample in the comparative study (Paper III) consisted of 19 women (82.6 %) and 4 men (17.4 %), ranging in age from 20 to 54 years old (Mean = 28).

4.5 The PEARLS debriefing intervention

For the quasi-experimental study (Paper I), the Promoting Excellence and Reflective Learning in Simulation (PEARLS) debriefing was implemented as an intervention in the simulation-based education course to investigate its effect on nursing students' self-reported professional competence and clinical judgment skills when compared to a standard debriefing.

PEARLS is an evidence-based, scripted, and structured debriefing framework (Eppich & Cheng, 2015). PEARLS have a blended debriefing approach, integrating different recognised debriefing strategies and providing guidance on their implementation (Eppich & Cheng, 2015). The development of the PEARLS framework drew on a combination of the developers' debriefing experience and simulation development work and on the education and simulation literature, including empirical evidence when available (Eppich & Cheng, 2015). PEARLS was developed for use in education and healthcare and to support and guide faculty at all levels of experience (Eppich & Cheng, 2015). It is a learner-centred, active, collaborative, and self-directed learning approach (Eppich & Cheng, 2015). PEARLS is proven to facilitate quality debriefings for students

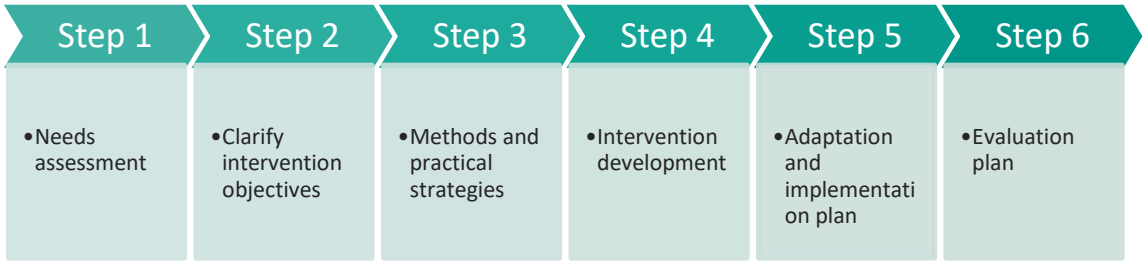
at all performance levels (McNutt et al., 2021). The PEARLS healthcare debriefing tool (Appendix 5) was developed to assist both novice and experienced facilitators to implement PEARLS debriefing (Cheng et al., 2016; Eppich & Cheng, 2015). Meguerdichian et al. (2022) suggest that the tool provides an opportunity to support faculty development by decreasing cognitive load. PEARLS meets the standards of best practice for debriefing as an evidence-based and structured debriefing model that uses a blended approach in the debriefing process with appropriate integration of feedback, debriefing, and/or guided reflection (Decker et al., 2021). PEARLS has in HSSOBP been listed as one of many debriefing resources to meet standards of best practice (Decker et al., 2021). PEARLS is structured into phases: setting the scene, reactions, description, analysis, and summary (Eppich & Cheng, 2015). Setting the scene is an introduction. The reaction phase includes sharing emotions/feelings. During the description phase, participants discuss their understanding of different parts of the scenario. In the analysis phase, recognised debriefing strategies including learner self-assessment, facilitated focused discussion, directive feedback and teaching are combined to optimally promote reflection. The summary phase focuses on the key learning points and how to improve future practice. The phases in more details are provided in Appendix 5.

4.5.1 The PEARLS intervention adaptation

The identification, adaptation, and implementation of the PEARLS intervention in the quasi-experimental study (Paper I) was inspired by elements from the Intervention Mapping framework (Bartholomew, 2016; Bartholomew et al., 1998). Figure 2 illustrates a modified version of the framework.

Figure 2.

Modified illustration of Bartholomew's (2016) Intervention Mapping framework



Intervention Mapping is a six-step planning approach that uses theory and evidence as a foundation for both implementing an intervention and stimulating community participation (Bartholomew, 2016). According to Bartholomew (2016), this framework may be useful for developing interventions in educational research projects and can be used regardless of the time or resources available in a research project. For the quasi-experimental study (Paper I), a rapid approach was used and only some elements from the six steps in the intervention mapping framework guided the debriefing intervention. Using the Intervention Mapping framework may also contribute to a person-centred intervention as this framework encourages taking the needs and demands of the individual end users into account (van Dulmen et al., 2017). Because this PhD project is a part of the PhD programme in Person-Centred Healthcare, having a person-centred approach has been a core concern throughout the research process. The core principle of *connectivity* in person-centred research posits that we do not do research *about* others, but *with* them as human beings (Jacobs, 2017). In the intervention mapping in this PhD project, connectivity refers to being aware of the person in the data while

ensuring the well-being of faculty and students during planning, data collection, and afterward when disseminating the research (Jacobs, 2017).

In the following, the identification, adaptation, and implementation of the PEARLS debriefing intervention from the quasi-experimental study (Paper I) will be presented using elements from Intervention Mapping (Bartholomew, 2016).

Step 1 Needs assessment

In being a part of ReCCiNE, the focus on educational strategies and learning processes in simulation-based education was predetermined for this specific PhD project and guided the direction taken in the needs assessment. The thesis author and the supervisors of the PhD project worked as a planning team. The assessment included investigating the relevant existing evidence base concerning educational strategies and learning processes in simulation-based education with use of high-fidelity simulators. To take nursing students' perspectives into account in the needs assessment, previous qualitative and quantitative research was used to involve student perspectives. In this process, although debriefing was found to be an important component in achieving learning outcomes in simulation-based education, a research gap concerning the effectiveness of existing debriefing models was also identified (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021). Faculty members from the simulation-based education course were considered stakeholders and thus included in the process of needs assessment. In this process, they highlighted the role of debriefing and the need for a more consistent use of debriefing in the scenario simulation. Following the predetermined theme of the PhD project, the research gap, and the faculty involvement,

a need to investigate the effect of different debriefing models was identified. Another crucial part of this first step was to become familiar with the simulation setting, the nursing bachelor's programme, and the faculty involved in the learning activities.

Step 2 Clarify intervention objectives

This step involved specifying who and what would change because of the intervention (Bartholomew, 2016). Nursing students' professional competence and clinical judgment skills corresponded to nursing students' learning objectives in the simulation-based education course. Consequently, students' self-reported professional competence and clinical judgment skills were identified as a desirable outcome for the debriefing intervention in the quasi-experimental study (Paper I).

Step 3 Methods and practical strategies

In this step, the planning team used the work from the previous steps to design a coherent, deliverable intervention (Bartholomew, 2016). Following steps 1 and 2, the existing PEARLS debriefing (Eppich & Cheng, 2015) was identified as an appropriate intervention.

Step 4 Intervention development

As the PEARLS debriefing already existed, this step included identifying and evaluating existing materials needed to implement the intervention (Bartholomew, 2016). For the PEARLS debriefing, a faculty development guide (Cheng et al., 2016) and the PEARLS healthcare debriefing tool (Appendix 5) (Bajaj et al., 2018) were identified as the most relevant materials.

Step 5 Adaptation and implementation plan

First, the adaptation process was discussed with the Debrief2Learn editorial board, represented by Adam Cheng and Walter Eppich, to ensure that adaptations were in line with the intended application of PEARLS debriefing. Second, they approved the translation of the PEARLS healthcare debriefing tool (Bajaj et al., 2018) into a Norwegian version. The overall aim of such a translation process is to achieve content, semantic, technical, criterion, and conceptual equivalence between two different languages (C.-C. Lee et al., 2009). To accomplish this, a recognised back-and-forward translation procedure with five steps inspired by Brislin (1970) was used, as presented in Table 3. The translated Norwegian version is available as Appendix 6 and at www.debrief2learn.no. Adaptation of the PEARLS healthcare debriefing tool was discussed with faculty members so that they could not only use their former experience to facilitate this part of the process but also feel ownership and thus hopefully promote successful implementation.

Table 3.

Translation procedures for the PEARLS healthcare debriefing tool

Translation steps	The procedure in this PhD
Step 1: Forward translation	Forward translation from English to Norwegian was done by three people. A faculty member, whose native language was Norwegian, translated in a team with another person, whose native language was English. The third person, whose native language was Norwegian, translated individually.
Step 2: Review	This was done by the research team, who are bilingual and familiar with the relevant terminology. The team reviewed the forward translations, identified differences in meaning, and adapted the target language version to achieve the most accurate culturally equivalent meaning.
Step 3: Back translation	This was done by a professional bilingual translator with English as the native language. The translator was blinded to the original English version.
Step 4: Comparison	The research team compared the back-translated version with the original versions. This process continued until the team agreed on the culturally equivalent meaning in the source- and target-language versions.
Step 5: Validation/pre-testing	The final version was discussed among the research team and other experts until a consensus was reached.

Faculty training in PEARLS debriefing was essential for adaptation and implementation. The faculty training occurred after the control group completed the simulation-based education course to avoid contamination of the standard debriefing (Shadish et al., 2002). The faculty development guide (Cheng et al., 2016) inspired the training. The guide includes a PEARLS debriefing checklist developed for teaching and implementing the PEARLS debriefing (Cheng et al., 2016). This faculty guide and checklist inspired a

theoretical and practical 6-hour faculty course. This course was planned, organised, and accomplished in collaboration with two simulation instructors from the local hospital simulation centre. These instructors were familiar with the PEARLS debriefing and educated, as well as experienced, in supervising facilitators. As a preparation for the course, faculty members were informed orally about the PEARLS debriefing intervention in a faculty meeting and in writing in the form of the original PEARLS research paper (Eppich & Cheng, 2015) and the faculty development guide (Cheng et al., 2016). The course took place in the simulation centre at the university. The theoretical part of the course comprised a lecture by the thesis author. The content of this lecture comprised debriefing in general, the rationale for the PEARLS debriefing, the content of PEARLS, the different debriefing strategies, how to use PEARLS, and a presentation of the PEARLS healthcare debriefing tool. The practical part of the course comprised the briefing and the simulated scenario followed by the PEARLS debriefing. All nine faculty members practiced the PEARLS debriefing once during the course. The thesis author and the instructors supervised the faculty members during the course.

Step 6 Evaluation plan

The quasi-experimental study (Paper I) was used to investigate the effect of the PEARLS debriefing intervention on nursing students' professional competence and clinical judgment skills when compared to a standard debriefing. The intervention group received the PEARLS debriefing while the control group received the standard debriefing that had been used in the simulation-based education course for years. The overall differences and similarities between the PEARLS debriefing and the standard debriefing are presented in Table 4.

Table 4.

Differences and similarities between the PEARLS debriefing and the standard debriefing

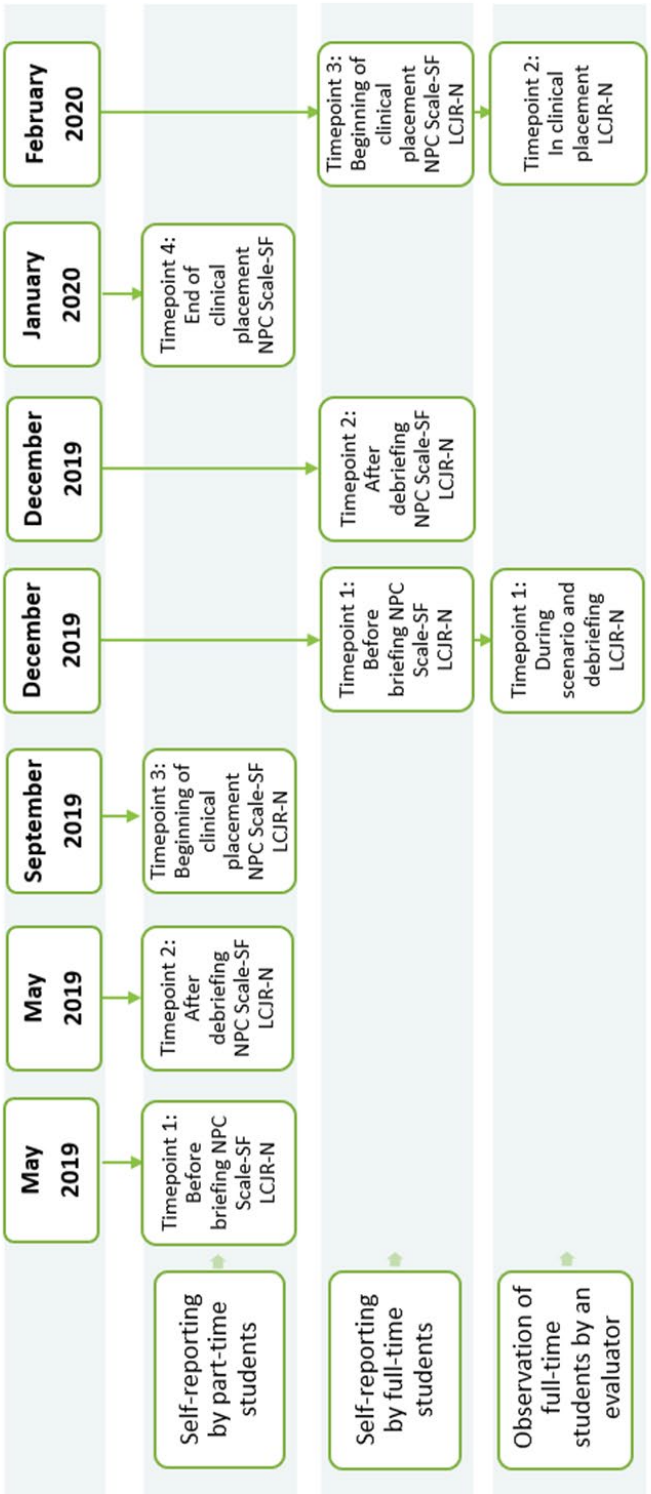
	PEARLS debriefing	Standard debriefing
Debriefing method	The Promoting Excellence and Reflective Learning in Simulation debriefing framework (PEARLS).	No framework.
Key principles in the method	1. Active learning 2. Collaborative learning 3. Self-directed learning 4. Learner-centred learning	The use of principles was faculty members' own choice, thereby somehow used different.
Timeframe	45 min	45 min
Location	Simulation room	Simulation room
Facilitator's competence	Three-days facilitator course One-day theoretical and practical PEARLS debriefing course.	Three-days facilitator course.
Facilitator's role	Facilitator-led debriefing including a student-centred approach.	Facilitator-led debriefing including a student-centred approach.
Facilitator script	PEARLS Healthcare Debriefing Tool.	A locally developed observation tool describing scenario-related, correct nursing observations and interventions.
Structure	Structured into phases conducted in this order: 1. Introduction 2. Reactions 3. Description 4. Analysis 5. Application/Summary	No specific structure.
Debriefing approach	Used appropriate approaches as specified in the PEARLS Healthcare Debriefing Tool: 1. Learner self-assessment 2. Focused facilitation 3. Provide Information	The use of debriefing approaches was faculty members' own choice, thereby somehow used different.
Learning objectives	Highlighted by the facilitator in all PEARLS debriefing phases.	Randomly highlighted by the facilitator.
Tools used by students	A locally developed observation tool describing scenario-related, correct nursing observations and interventions.	A locally developed observation tool describing scenario-related, correct nursing observations and interventions.

4.6 Data collection

Data for the three studies were collected from June 2019 to February 2020. The data collection strategies are presented in detail in the following. An overview of timepoints, study participants, instruments, and settings for data collection is presented in Figure 3.

Figure 3.

An overview of timepoints, participants, instruments, and settings for the data collection



4.6.1 Data collection strategies

Two strategies were applied for data collection: self-reporting using self-reported questionnaires in paper-and-pencil format and observation by an evaluator using a rubric. Self-reporting instruments were used for data collection in the quasi-experimental study (Paper I) and the longitudinal study (Paper II). For the assessment of students' clinical judgment skills in the comparative study (Paper III), a self-reporting instrument was used to address students' self-assessment. Further, observation with use of a rubric was used to address the evaluator's assessment. The use of different assessment methods in this PhD project may contribute to a broader evidence base concerning nursing students' professional competence and clinical judgment skills (McMullan et al., 2003).

4.6.2 Instruments used in the data collection

Two different instruments were used to collect data: one concerning nursing students' professional competence and one concerning their clinical judgment skills. The instruments are presented in this section, along with an evaluation of their validity and reliability. When selecting an instrument, it is important to look for evidence of the scale's psychometric soundness, traditionally measured as reliability and validity (Bolarinwa, 2015; Polit & Beck, 2020). Table 1 (p.35) and Figure 3 provide an overview of the instruments used in the different studies.

Nurse Professional Competence Scale

The Nurse Professional Competence Scale Short Form (NPC Scale-SF) was used in the quasi-experimental study (Paper I) and the longitudinal study (Paper II) to collect data

concerning students' self-reported professional competence. The NPC Scale-SF was developed to measure self-reported professional competence among nursing students and registered nurses (Nilsson et al., 2018). The Norwegian version of this scale (Skaug et al., 2020) was used in this PhD project as it corresponded well to students' learning objectives in the simulation-based education and clinical placement courses (Table 2, p.39). The scale consists of 35 items. For each of the 35 items, self-reported professional competence is rated on a 7-point scale (1= "to a very low degree" and 7= "to a very high degree"). The 35 items are distributed into 6 competence areas (CA): *CA1 Nursing Care* (5 items); *CA2 Value-based Nursing Care* (5 items); *CA3 Medical and Technical Care* (6 items); *CA4 Care Pedagogics* (5 items); *CA5 Documentation and Administration of Nursing Care* (8 items); and *CA6 Development, Leadership, and Organization of Nursing Care* (6 items) (Nilsson et al., 2018). In accordance with the NPC user manual, nursing students' self-reported professional competence in the quasi-experimental study (Paper I) and the longitudinal study (Paper II) is reported using these CAs. In line with the NPC user manual (NPC Research Group, 2021), the competence area sum score was calculated and transformed to a scale ranging from 0 to 100 before analysis. Permission to use this instrument was obtained from the NPC Research Group (2021) (Appendix 7). The NPC Scale-SF has shown good validity and reliability in other studies regarding construct validity and internal consistency (Forsman et al., 2020; Lachmann & Nilsson, 2021; Nilsson et al., 2018; van de Mortel et al., 2021; Xu et al., 2021). The psychometric properties of the Norwegian version of the NPC Scale-SF have not yet been tested in a Norwegian context. The scale has, however, demonstrated good validity and reliability in comparable settings, such as Sweden, with regard to construct validity and internal

consistency (Nilsson et al., 2018). A Swedish setting is considered culturally comparable to a Norwegian one. In Nilsson et al. (2018), construct validity was tested using principal component analysis (PCA) and confirmative factor analysis, and the factor solution explained 54% of the overall variance. Reliability measured as internal consistency showed α-values >0.70 for all six competence areas (Nilsson et al., 2018). For the quasi-experimental study (Paper I) and the longitudinal study (Paper II), the internal consistency expressed by the Cronbach's alpha analysis has been conducted and reported for the NPC-SF Scale competence areas. For the quasi-experimental study (Paper I), Cronbach's alphas ranged from 0.82 to 0.91. For the longitudinal study (Paper II), Cronbach's alphas ranged from 0.76 to 0.91, except for the value 0.68 for CA1 at the first measurement point. Values above 0.7 indicate good internal consistency according to recommended criteria (DeVellis, 2012).

Lasater Clinical Judgment Rubric

The Lasater Clinical Judgment Rubric (LCJR) (Lasater, 2007a) was used to assess nursing students' clinical judgment skills in the quasi-experimental study (Paper I) and the comparative study (Paper III). Concerning assessment of nursing students' clinical judgment skills using a quantitative approach, LCJR has emerged as the most used instrument and was developed for use among nursing students (Brentnall et al., 2022; K. C. Lee, 2021). The LCJR corresponded well to the learning objectives in both simulation-based education and clinical placement (Table 2, p.39). LCJR is a self-assessment instrument but was also developed for use among educators and researchers when observing and assessing students' clinical judgment skills in the simulation setting and actual patient care in the clinical setting (Lasater, 2007a). LCJR

consists of 11 items divided into four aspects used as subscales: *Noticing* (3 items), *Interpreting* (2 items), *Responding* (4 items), and *Reflecting* (2 items) (Lasater, 2007a). Assessment ratings were based on four performance levels with higher values indicating better clinical judgment abilities (1= "Beginning", 2= "Developing", 3= "Accomplished", and 4= "Exemplary") (Lasater, 2007a). Katie Lasater, the instrument's developer, approved the use of the LCJR for this project (Appendix 8).

LCJR has been translated and validated in several countries, including Sweden, Germany, and China (Kristiansen et al., 2015; Vreugdenhil & Spek, 2018; Yang et al., 2019). In these studies, LCJR's internal consistency was tested using Cronbach's alpha, test-retest correlation using Pearson's r, reproducibility using intra-class correlations, and bias using Bland-Altman plots. Feasibility was tested using a numeric rating scale (NRS) and content validity was tested using the content validity index (CVI). Confirmatory factor analysis (CFA) was used to evaluate LCJR dimensionality. Until now, LCJR has not been translated into Norwegian. For use in this PhD project, approval to translate the LCJR into Norwegian (LCJR-N) was given by Katie Lasater, the instrument's developer (Appendix 8). The translation was carried out in accordance with Brislin's (1970) guidelines for translation as presented in Table 3 (p.55). These guidelines included five steps comprising forward translation, review, back translation, comparison of translated versions, and validation/pre-testing. In addition to the steps presented in Table 3, a pilot test was conducted on nine nursing students from another university campus to check for face validity and understanding of the items in LCJR-N. Students' oral and written responses resulted in zero changes. In addition, three RNs checked the instrument. They found the items understandable and relevant to their profession.

In this PhD project, LCJR-N internal consistency was tested using Cronbach's alpha. For the quasi-experimental study (Paper I), Cronbach's alphas ranged from 0.87 to 0.91 for the total score and 0.74 to 0.84 for the LCJR-N *Noticing* and *Responding* subscales. For the comparative study (Paper III), the Cronbach's alphas for the LCJR-N total score ranged from 0.87 to 0.91, and from 0.69 to 0.85 for the *Noticing* and *Responding* subscales. Values above 0.7 indicate good internal consistency according to recommended criteria (DeVellis, 2012). As the *Interpreting* and *Reflection* subscales had only two items each, alpha values were not calculated.

4.6.3 Procedures for data collection

The data collection was guided by the foundation for being a person-centred researcher (Jacobs, 2017). To be a person-centred researcher as described by Jacobs (2017), values such as respect, reciprocity, mutuality, and self-determination guided the researcher when engaging stakeholders and participants in the data collection process.

Data for the quasi-experimental study (Paper I) were collected at three timepoints, both in the control group and the intervention group, from June 2019 to February 2020 (Figure 3, p.59). The research department at the acute care hospital and the faculty members at the university guided the planning of the data collection. Faculty members and the thesis author handed out and collected the questionnaires at all timepoints. The participants were asked to recall the last situation where they were assessing vital signs on a manikin or a patient to make sure the participants used the same frame of reference when filling out the questionnaires.

Data for the longitudinal study (Paper II) were collected at four timepoints from June 2019 to January 2020 (Figure 3, p.59). Data from the three first timepoints were the same as those collected for the control group in the quasi-experimental study (Paper I). For the last timepoint, faculty members and the first author handed out and collected the questionnaires.

Data for the comparative study (Paper III) were collected in December 2019 and February 2020 (Figure 3, p.59). Nursing students' self-reported data used in this study was part of the data collected at timepoints 2 and 3 in the quasi-experimental study (Paper I). One evaluator collected observation data by observing nursing students and scoring them using the LCJR-N in two different settings. The thesis author, who was considered qualified to observe students' clinical judgment skills by virtue of being an RN holding a Master's degree in Nursing Science (MSN), a researcher, and a former faculty member, performed the role of evaluator. Additionally, the evaluator had several years of experience with the simulation setting and pedagogical methods in simulation-based education, as well as with supervising and assessing students in clinical placements. The evaluator had worked in acute care units for 15 years, which entailed using clinical judgment skills when caring for deteriorating patients in an acute care setting. The evaluator prepared for the data collection by developing a theoretical understanding of the concept of clinical judgment and the LCJR; corresponding with the instrument's creator, Kathie Lasater; and testing the LCJR-N as an observation tool in the simulation setting.

In the simulation setting, the evaluator completed the LCJR-N while observing the students in the simulation scenario. Data concerning the subscale *Reflecting* were collected by observing the students in the debriefing phase. In the clinical setting, the evaluator completed the rubric while observing the students in a patient care situation where the student monitored a patient's vital signs. Data concerning the subscale *Reflecting* were collected by asking each student three questions after they left the patient's room ("If you had to do it again, would you do anything differently?", "What would you do then?", "Why would you do this differently?").

4.7 Statistical analysis

All statistical analyses were conducted using SPSS Statistics version 26-28. Different statistical analyses were used to analyse data from the three studies. This process is described in the following sections. Statistical significance was set as a p-value of less than 0.05 for all tests. An overview of the statistical analysis performed in the three published papers is presented in Table 1 (p.35).

4.7.1 Statistical analysis for the quasi-experimental study (Paper I)

To investigate the effects of the PEARLS debriefing when compared to the standard debriefing on students' scores on the NPC Scale-SF and LCJR-N, a linear regression of post-test scores adjusted for their earliest scores was performed (Vickers & Altman, 2001). The assumptions concerning sample size, multicollinearity, singularity, outliers, and normal distribution of scores for performing this regression were checked and met (Pallant, 2020). The choice of linear regression was based on Vickers and Altman's (2001) suggestion that this regression model also controls for baseline imbalance, in contrast

to statistical models that only analyse change. To compare the pre-test to post-test 1 score, the NPC Scale-SF or LCJR-N post-test 1 score was entered as the dependent variable, and the debriefing model (PEARLS = 1, Standard = 0) and NPC Scale-SF or LCJR-N pre-test scores were entered as independent variables. Pre-test to post-test 2 comparisons used a similar statistical approach, using the NPC Scale-SF or LCJR-N post-test 2 scores as the dependent variable. The NPC Scale-SF or LCJR-N post-test 2 scores were entered as the dependent variable, and the debriefing model and NPC Scale-SF or LCJR-N post-test 1 score were entered as independent variables to compare post-test 1 to post-test 2.

To investigate within-group changes in the NPC Scale-SF and LCJR-N pre-test to post-test 2 scores, and post-test 1 to post-test 2 scores, paired-sample t-tests were used. The assumptions concerning the level of measurement, random sampling, independence of observations, normal distribution, and homogeneity of variance for doing such t-tests were checked and met (Pallant, 2020).

As missing data comprised less than 4% for each item, the group mean substitution technique (Fox-Wasylyshyn & El-Masri, 2005) was used to replace missing data. According to Fox-Wasylyshyn and El-Masri (2005), group mean substitutions are an appropriate technique to treat missing data in self-reporting questionnaires with variables that are measured at the interval level when the extent of missing data is very small. To determine the differences between the intervention group and control group, participant characteristic homogeneity was compared using the chi-square test for the categorical data and independent samples t-test for the continuous data (Field & Field,

2018; Polit & Beck, 2020). Independent-samples t-tests and chi-square tests were used to investigate differences between participants and dropouts. Dropouts did not differ significantly from the participants with regard to demographic characteristics.

4.7.2 Statistical analysis for the longitudinal study (Paper II)

To investigate changes in nursing students' self-reported professional competence across the two different educational settings at four timepoints, a pairwise comparison with a paired-sample t-test was used. As it focused on the change in competence between different educational settings more than on the time pattern of change, pairwise comparison was suited to answer our research questions. The assumptions for doing paired sample t-tests were checked and met. It is also of interest to investigate the magnitude of the change when comparing variables (Pallant, 2020). Cohen's *d* was therefore calculated to determine the effect size for the changes and interpreted as small (> 0.20), medium (>0.50), or large (>0.80) (Cohen, 2013). Descriptive statistics were used to present the demographics and the highest and lowest NPC Scale-SF competence areas' mean scores. Due to the small sample size, correlations and associations were not attempted (Schonbrodt & Perugini, 2013).

Missing data on each item was less than 4%, and the group mean substitution technique was used to replace missing data (Fox-Wasylyshyn & El-Masri, 2005).

4.7.3 Statistical analysis for the comparative study (Paper III)

A paired-samples t-test was used to compare the students' self-assessment and the evaluator's assessment of LCJR-N in both the simulation and clinical settings. The

assumptions for doing paired sample t-tests were checked and met. The intraclass correlation coefficient (ICC), Pearson correlation coefficient, and Bland-Altman plots were used to measure the magnitude of the difference. ICC was used to investigate degrees of correlation and agreement between students and evaluator assessment, as suggested by Koo and Li (2016). ICC estimates and their 95% confidence intervals were based on a mean rating (k=2), consistency, and 2-way mixed-effect model (Koo & Li, 2016). ICC was interpreted according to Landis and Koch (1977): ≤0.20 indicating slight agreement, 0.21–0.40 indicating fair agreement, 0.41–0.60 indicating moderate agreement, 0.61–0.80 indicating substantial agreement, and ≥0.81 indicating almost perfect agreement. The Pearson correlation coefficient was used to investigate the relationship between students' self-assessment and the evaluator's assessment of LCJR-N. Pearson's correlation coefficient was interpreted according to Cohen's guidelines of r = 0.10, 0.30, and 0.50 to interpret the strength of association as small, medium, or large, respectively (Cohen, 2013). Bland-Altman plots were created to illustrate the average bias and to investigate whether there were systematic differences between student and evaluator assessments (Bland & Altman, 1999).

Linear regression analysis was used to investigate whether the Dunning-Kruger effect was present in students' self-assessments of clinical judgment in the simulation setting or the clinical setting. When compared to other statistical approaches, regression is argued to be a valid test of the Dunning-Kruger hypothesis (Gignac & Zajenkowski, 2020). In the linear regression analysis, we investigated the relationship between the evaluator assessment of LCJR-N and the difference between student self-assessment

and evaluator assessment scores from LCJR-N. Plots were created to visually illustrate the results from the linear regression.

There were no missing data.

4.8 Ethical considerations

The PhD project was approved by the Norwegian Centre for Research Data (NSD) (ref. no. 624052), the university administration, the acute care hospital administration, and the acute care hospital's data protection representative. Ethical approval from the Regional Ethics Committee was not needed. See Appendices 9 to 12 for research approvals.

The university administration allowed the researchers to inform the students and faculty members about the PhD project and data collection. Information about the study aim, data collection methods, confidentiality, voluntary participation, and the right to withdraw from the study at any time was provided by the thesis author in oral and written form. All participants completed a written signed consent form before they were enrolled in data collection (Appendices 2 to 4). Faculty members completed a signed consent form to approve the collection of data when they were present in the simulation-based education course (Appendix 13).

The patients in the hospital units whose vital signs the student monitored while the evaluator observed and collected data for the comparative study (Paper III) were not considered by NSD or the data protection representative at the hospital to be participants in the study. However, these patients received written information before

the data collection started. Patients gave written consent for the data collection that occurred in the care situation with the evaluator present in the room (Appendix 14). Nurses involved in supervision at the hospital received written information about the study (Appendix 15).

The thesis author did not know the students and had not previously been involved in students' educational activities at the university or the hospital. Students, faculty members, and nurses at the hospital units were informed that the evaluator would not supervise or comment during the data collection. Although the thesis author is an RN, she was present in the patient situation in the clinical setting as a researcher and not a nurse. Due to patient safety concerns, students were informed that their performance potentially could be interrupted by the researcher to protect patients from potential harm. However, this was never an issue.

All data were handled anonymously, and all information was processed confidentially. Identifiers were removed from all data material and a unique identification code was generated for each participant. Completed questionnaires, identification codes, and signed consent forms (paper versions) were stored separately in a locked safety deposit box in an appropriate location at the USN. The completed questionnaires and identifying information will be deleted according to the rules and regulations set by NSD.

5 RESULTS

5.1 Main results from the quasi-experimental study (Paper I)

Nursing students' self-reporting on NPC Scale-SF and LCJR-N was used to compare the effects of PEARLS debriefing on nursing students' professional competence and clinical judgment skills to the effects of a standard debriefing.

There were no statistically significant differences between the two groups in students' self-reported professional competence or clinical judgment skills at any timepoints. This was measured by the NPC Scale-SF competence area (CA) mean scores and LCJR-N total and subscale mean scores. Figures 4 and 5 present an overview of results concerning differences in scores between groups.

Figures 4 and 5 presents an overview over results concerning differences in scores within the intervention groups and within the control group. When investigating changes within the groups from the pre-test before scenario simulation to post-test 2 the first week in clinical placement, a significant increase was found for the intervention groups' self-reported scores on all NPC Scale-SF competence areas ($p = < 0.05$), except for *Value-based nursing care*. Additionally, the intervention group's self-reported scores on LCJR-N total and LCJR-N subscales increased significantly ($p = < 0.05$) from pre-test to post-test 2. For the control group, there were no significant changes from pre-test to post-test 2 on NPC Scale-SF or LCJR-N.

Figure 4.

Nursing students' self-reported scores on NPC Scale-SF Competence areas

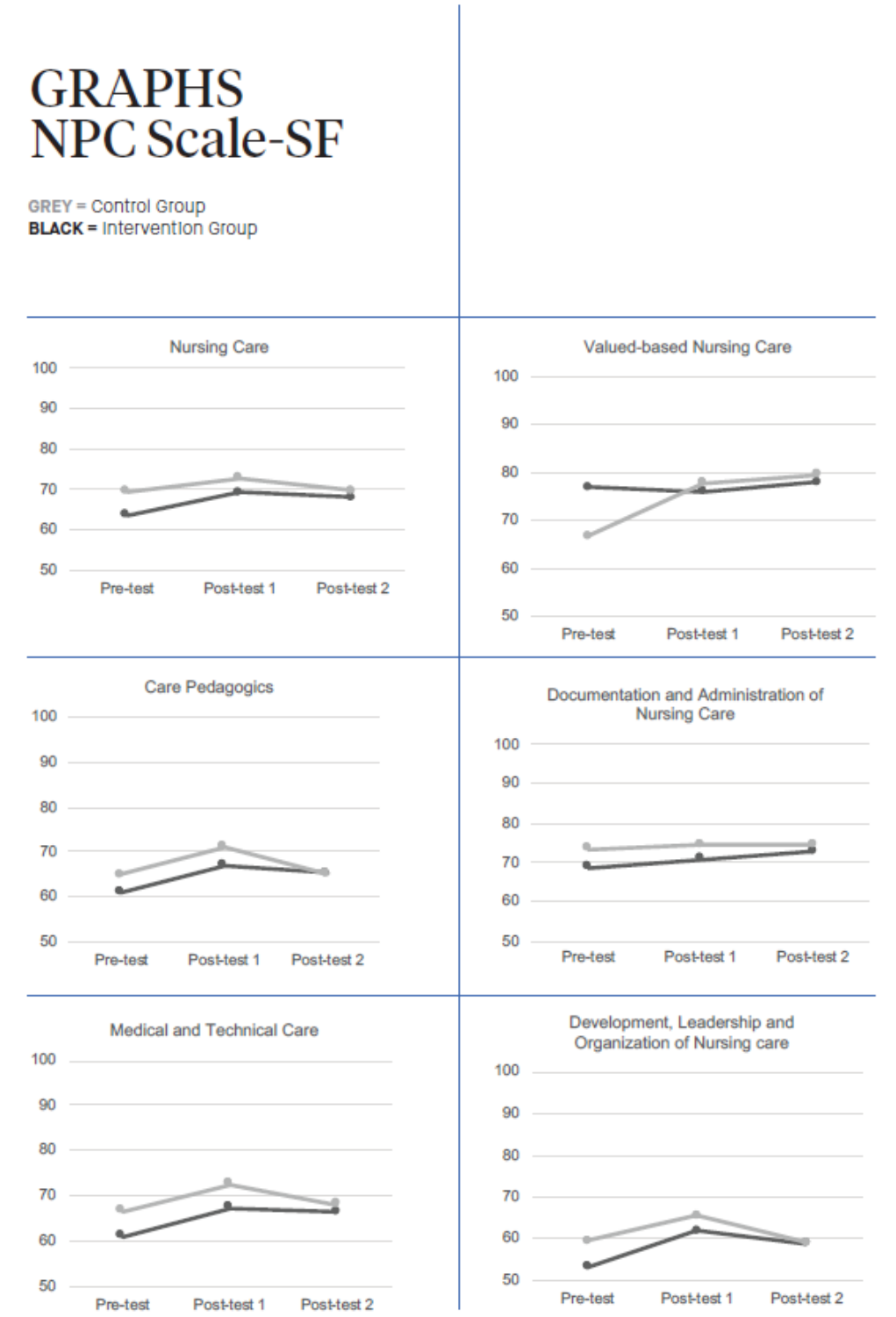


Figure 5.

Nursing students' self-reported scores on LCJR-N

When investigating changes within the groups from post-test 1 after debriefing to post-test 2 during the first week of clinical placement, the self-reported scores from the students in the intervention group showed a significant decrease for the NPC Scale-SF

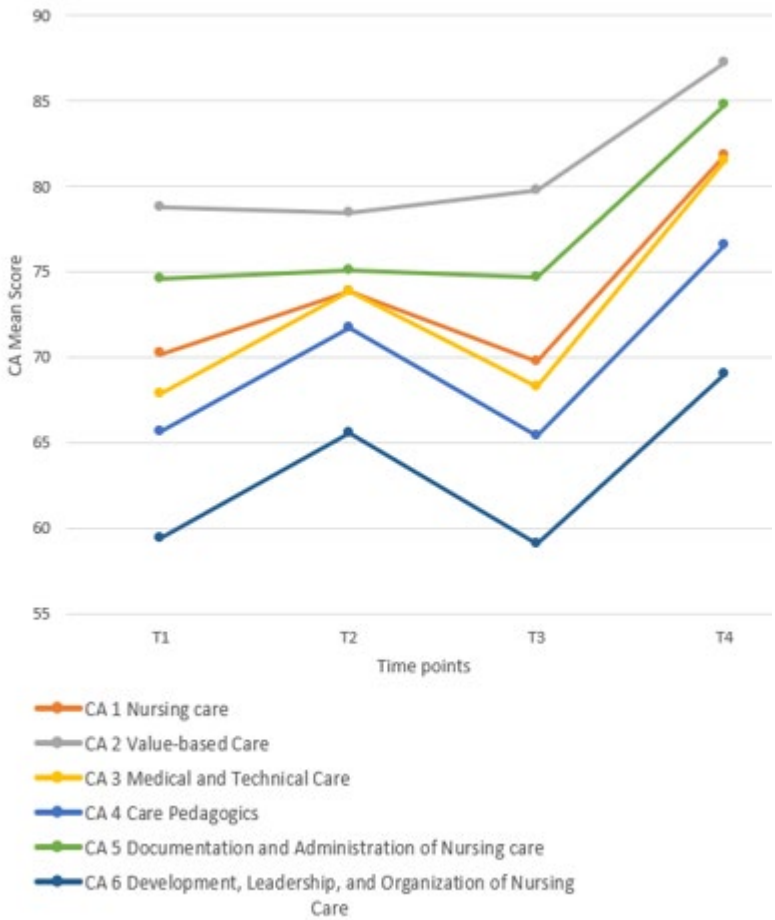
competence area *Development, leadership, and organization of nursing care* ($p = < 0.05$). For the students in the control group, a significant decrease was found in the self-reported scores for the three competence areas *Medical and technical care*; *Care pedagogics; and Development, leadership, and organization of nursing care* ($p = < 0.05$).

5.2 Main results from the longitudinal study (Paper II)

Nursing students' self-reporting on the NPC Scale-SF was used to investigate changes and levels of professional competence from a longitudinal perspective. Figure 6 presents an overview over nursing students' scores at all four timepoints.

Figure 6.

Nursing students self-reported scores on NPC Scale-SF competence areas in a longitudinal perspective



From an 8-month longitudinal perspective, students' self-reported scores on all NPC Scale-SF competence areas increased significantly (p = < 0.05) from timepoint 1 before the scenario simulation to timepoint 4 at the end of the clinical placement course.

Concerning changes in the NPC Scale-SF from timepoint 1 before scenario simulation to timepoint 2 after scenario simulation, students' self-reported scores for the four competence areas *Nursing care*; *Medical and technical care*; *Care pedagogics*; and *Development, leadership, and organization of nursing care* increased significantly (p = < 0.05). The competence area of *Documentation and administration of nursing care* increased in the same period, although this change was not significant. In contrast, the competence area of *Value-based nursing care* declined, but not significantly.

Concerning changes in the NPC Scale-SF from timepoint 2 after scenario simulation to timepoint 3 during the first week in clinical placement, the students' self-reported scores for the three competence areas *Medical and technical care*; *Care pedagogics*; and *Development, leadership, and organization of nursing* care declined significantly (p = < 0.05). Additionally, the competence areas of *Nursing care* and *Documentation and administration of nursing care* declined, albeit not significantly. The competence area *Value-based nursing care* decreased in the same period, albeit not significantly.

Concerning changes from timepoint 3 at the first week of clinical placement to timepoint 4 at the end of clinical placement, students' self-reported scores for all six competence areas increased significantly (p = < 0.05).

When investigating nursing students' highest self-reported competence area scores, *Value-based nursing care* had the highest score at all timepoints (Mean: 78.50–87.29).

Further, *Development, leadership, and organization of nursing care* had the lowest scores at all timepoints (Mean: 59.09–69.05).

5.3 Main results from the comparative study (Paper III)

Nursing students' self-assessment and the evaluator's assessment using LCJR-N in the simulation setting and the clinical setting were used to compare nursing students' self-assessment of clinical judgment skills to an evaluator's assessment.

In the simulation setting, students' self-assessed LCJR-N total scores and subscale scores were significantly higher than the evaluator's scores (p = <0.05). Pearson correlation coefficients for student and evaluator assessments for both total scores and subscales were quite low (-0.01 to 0.32) in the simulation setting, with none reaching statistical significance. The ICCs of the LCJR-N total score and the subscale *Noticing* were within the -0.01 to 0.17 range, indicating no more than "slight agreement" between the students' and the evaluator's assessments in the simulation setting. The ICC scores for the subscales *Interpreting, Responding*, and *Reflecting* were within the 0.32 to 0.39 range, indicating a "fair agreement" between the students' and the evaluator's scores. The Bland-Altman plots showed a systematic difference and wide limits of agreement between students' and evaluator's LCJR-N scores. Each Bland-Altman plot illustrated that student self-assessed scores were higher than the evaluator's scores in the simulation setting.

In the clinical setting, students' self-assessed LCJR-N total scores and subscale scores were higher than the evaluator's scores; however, this difference was not significant. In

the same setting, the Pearson correlation coefficient (r) for student and evaluator assessments on LCJR-N total score and subscales was quite low (-0.27 to 0.19) and none reached statistical significance. The ICC value of the LCJR-N total score and all subscales ranged from -0.26 to 0.19, indicating only "slight agreement" between the students' and the evaluator's assessments. The Bland-Altman plots indicated a systematic difference and wide limits of agreement between students' and the evaluator's LCJR-N scores. Each Bland-Altman plot showed that student scores were higher than the evaluator's scores in the clinical setting.

The Dunning-Kruger effect was present in both the simulation setting and the clinical setting. In the simulation setting, the difference between students' self-assessed score and the evaluator's score increased significantly as the evaluator's score decreased (p = < 0.05) for LCJR-N total score and all subscales: the differences were larger when the evaluator's score was low. In the clinical setting, the difference between students' self-assessed score and the evaluator's score increased significantly as the evaluator's score decreased (p = < 0.05) for LCJR-N total score and all subscales except for *Responding*.

5.4 Summary of results

Overall, when investigating the effect of PEARLS debriefing on students' professional competence and clinical judgment skills when compared to a standard debriefing, results demonstrated no significant differences between the students who received PEARLS and those who received the standard debriefing. However, the professional competence and clinical judgment skills of students who received the PEARLS debriefing increased significantly. Additionally, the results of this PhD project demonstrate that

nursing students' self-reported professional competence and clinical judgment skills increased in a longitudinal perspective. This development was non-linear in that students' self-reported professional competence and clinical judgment skills increased in the simulation setting but decreased when they entered the clinical setting. Nursing students' highest and lowest self-reported professional competence areas across several timepoints were also investigated. Results demonstrated that the highest scores were related to the competence *Value-based nursing care* and the lowest scores to *Development, leadership, and organization of nursing care*. Finally, results concerning nursing students' self-assessment process demonstrated that when compared to an evaluator's assessment, student self-assessment of clinical judgment skills tends to be higher, and that the Dunning-Kruger effect was present in both the simulation setting and the clinical setting.

6 DISCUSSION

The overall aim of this PhD project was 1) to develop knowledge concerning nursing students' development and assessment of professional competence and clinical judgment skills in the simulation setting and the clinical setting, and 2) to develop knowledge concerning nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting. In this chapter, the results are discussed in light of the research's aims, previous research, literature, and relevant theories. This chapter also includes methodological reflections on the research. The chapter is organised into the following sections: (a) nursing students' development of professional competence and clinical judgment skills; (b) nursing students' transfer of professional competence and clinical judgment skills; (c) assessment of nursing students' professional competence and clinical judgment skills; and (d) methodological reflections.

6.1 Nursing students' development of professional competence and clinical judgment skills

First in this section, nursing students' development of self-reported professional competence and clinical judgment skills is discussed in relation to the PEARLS debriefing. Second, nursing students' development of professional competence in a longitudinal perspective is discussed. Third, the non-linear patterns in nursing students' development of professional competence and clinical judgment skills are discussed. Finally, nursing students' self-reported level of professional competence is discussed.

6.1.1 The effect of the PEARLS debriefing on nursing students' development of professional competence and clinical judgment skills

The quasi-experimental study (Paper I) aimed to compare the PEARLS debriefing to a standard, unstructured debriefing on nursing students' self-reported professional competence and clinical judgment skills in the simulation and clinical settings. The main result from Paper I was that there were no statistically significant differences between the group that received the PEARLS and the group that received the standard debriefing in terms of students' self-reported professional competence or clinical judgment skills. This result is among the most novel in this thesis, as there is a lack of research testing the effect of the PEARLS debriefing. When comparing the results to previous studies, several reviews have reported the effect of different debriefing models in nursing education (Fegran et al., 2023; J. Lee et al., 2020; Niu et al., 2021; Sahin & Basak, 2021). Although the PEARLS debriefing is not included in these reviews, no conclusions can so far be made as to which of the debriefing models is most effective when compared to others (J. Lee et al., 2020; Niu et al., 2021).

Although there was no statistical difference between the two groups in the quasi-experimental study (Paper I), it is important to report these so-called negative results since publishing only positive results tends to give a limited and skewed view of research (Mlinarić et al., 2017). Solid decision-making based on the potential benefits and difficulties associated with an intervention such as the PEARLS debriefing may be encouraged through the publication of studies indicating negative results (Kratochwill

et al., 2000). As the PEARLS debriefing has not yet been compared to other debriefing models, the quasi-experimental study (Paper I) contributes to the advancement of knowledge in this research field. HSSOBP has listed PEARLS as an available debriefing resource in their standards of best practice (Decker et al., 2021); accordingly, the research results may be of international interest for simulation networks in research, education and practice. Reporting the negative results may motivate others to choose to investigate the effect of the PEARLS debriefing in other ways (Mlinarić et al., 2017). However, the negative results may not be entirely a consequence of the PEARLS intervention and can perhaps be explained by assessment, methodological and statistical issues. Publishing negative results can provide meaningful information if the researcher has adhered to high-quality assessment, methodological, and statistical criteria in outcome intervention research (Kratochwill et al., 2000). These issues related to the quasi-experimental study (Paper I) are discussed in depth in the section 6.4 *Methodological considerations.*

Given the negative results, it is also of interest to discuss the degree to which it might be possible to fully investigate the effects of the PEARLS debriefing on nursing students' professional competence and clinical judgment skills. The study outcomes in the quasi-experimental study (Paper I) – professional competence and clinical judgment skills – were included as learning objectives in courses in that study participants had taken previously. Thus, the development of professional competence and clinical judgment was most likely in progress during education and not only in the simulation setting for both the intervention group and the control group. In lines with Benner (1984), the development of professional competence and clinical judgment skills is understood as

an active process that involves a progression from simple to complex actions. Simulated scenarios followed by debriefing can be understood as complex actions and play a role in this development process. Thus, the role of debriefing alone might not explain the development of professional competence and clinical judgment despite debriefing being a crucial component of simulation (Decker et al., 2021; J. Lee et al., 2020; Niu et al., 2021; Sahin & Basak, 2021).

It may also be questioned whether the choice of self-reported professional competence and clinical judgment skills as study outcomes for the quasi-experimental study (Paper I) was a good methodological choice. The results from the comparative study (Paper III) showed that students' self-assessment of clinical judgment skills was inconsistent when compared to an evaluator's assessment. Thus, students' clinical judgment skills in the quasi-experimental study (Paper I) could potentially be more realistic if more than one assessment method is used to reveal a potential effect of debriefing. The use of self-reported data in research is discussed in more detail in sections 6.3.2 *Nursing students' self-assessment of professional competence and clinical judgment skills in research and education*, and 6.4 *Methodological considerations*.

Some results from the quasi-experimental study (Paper I) support the use of the PEARLS debriefing. When investigating the within-group differences from the pre-test before the simulation-based education to the post-test 2 at the beginning of the clinical placement course, the intervention group students' self-reporting of all competence areas increased significantly, except for *Value-based nursing care* which increased, but not significantly. When looking into the control group's self-reporting, no competence

areas increased significantly in the same period, although *Value-based nursing care* and *Medical and technical care* did increase. Interestingly, the students in the control group reported that the areas of *Nursing care, Care pedagogics, Documentation and administration of nursing care*, and *Development, leadership, and organization of nursing care* decreased from pre-test to post-test 2, albeit not significantly.

As the structured and scripted approach is a unique feature of the PEARLS debriefing when compared to other debriefing models, it may explain the positive self-reported development of professional competence and clinical judgment skills in the intervention group. This explanation is supported by two meta-analyses that report that structured debriefing improves students' competence (J. Lee et al., 2020; Niu et al., 2021). A scripted approach to structured debriefing may serve as an educational complement to assist facilitators (Cheng et al., 2013; Meguerdichian et al., 2022). HSSOBP also emphasise the importance of a structured and supportive debriefing process to facilitate learning and improve performance (Decker et al., 2021). Reflection and conceptualisation, as described in Kolb's (1984) learning cycle may be important when exploring why students receiving the PEARLS debriefing had a significant self-reported increase in professional competence and clinical judgment skills. In debriefing, reflection is used to develop a better understanding of the learning objectives, such as professional competence and clinical judgment skills, and how these might be improved in future clinical practice (Lavoie et al., 2018). To promote reflection, the PEARLS debriefing model contains a blended approach, with the appropriate integration of feedback, debriefing, and/or guided reflection (Eppich & Cheng, 2015). These approaches correspond well to Kolb's model (1984), in which reflection on experiences is essential

to achieve learning. Applying Kolb's perspective to explain the development in the intervention group, the reflection after the simulated scenarios prompted by the PEARLS debriefing might have played a role.

6.1.2 Development of nursing students' professional competence in a longitudinal perspective

To understand how professional competence develops over time in a more longitudinal perspective, the students' self-reported professional competence in the control group in the quasi-experimental study (Paper I) was further investigated after 16 weeks of clinical placement (Paper II). The results revealed that all competence areas increased significantly. This result contributes to the research field as the NPC Scale-SF has not previously been used to investigate students' self-reported changes in professional competence in a longitudinal perspective across different educational settings. It is therefore not possible to compare our results with those of similar studies. The longitudinal results from Paper II are nevertheless supported by other studies using other study outcomes that may be compared to professional competence as measured by the NPC Scale-SF. Zieber and Sedgewick (2018) reported a statistically significant increase in students' self-reported competence using the Nursing Student Competence Scale (Watson et al., 2002) to measure leadership, professional development, assessment, planning, intervention, cognitive ability, social participation, and ego strength in a three-month follow-up study after simulation, which supports the results from Paper II. Additionally, the longitudinal increase in students' professional competence found in Paper II is supported by findings reported in a systematic review

by Svellingen et al. (2021). These authors reported that a combination of simulation-based education and clinical placement appeared to support nursing students' learning outcomes. The simulation-based education and clinical placement courses that the students in this PhD project participated in are geared toward supporting nursing students in achieving learning outcomes that reflect professional competence. However, as discussed above, the development of professional competence most likely happens over the entire programme and cannot be explained by the simulation-based education and clinical placement courses alone. Following Laursen (2014), who considers the simulation setting as a learning arena between the theoretical room and the clinical setting, the increase in nursing students' professional competence in the longitudinal perspective may be explained by the combination of the theoretical component of the nursing programme with the simulation-based education and clinical placement courses.

When investigating the development of students' professional competence within the clinical setting from the beginning to the end of the clinical placement courses, findings indicate that competence in all areas increased significantly (Paper II). These findings are supported by the results of Egilsdottir et al. (2023), who investigated second-year nursing students' professional competence in a longitudinal perspective before and after medical or surgical clinical placement in hospitals and third-year students before and after home-based nursing care clinical placement in community healthcare services. Egilsdottir et al. (2023) reported that the change in students' self-reported professional competence from before to after clinical placement reached statistical significance in all NPC Scale-SF's six competence areas. The statistically significant increase in students'

self-reported professional competence after clinical placement studies is additionally supported by findings reported by Cant et al. (2021) in a recent systematic review where nursing students self-reported their clinical placement learning experiences to be efficient and positive overall.

6.1.3 Nursing students' non-linear development of professional competence and clinical judgment skills

The results from the quasi-experimental study (Paper I) and the longitudinal study (Paper II) indicate that the development of professional competence and clinical judgment skills tends to be non-linear, as illustrated in Figures 4, 5, and 6 (p.74-77).

The non-linear patterns in students' development of professional competence and clinical judgment skills (Papers I and II) lead back to the current debate in nursing education concerning whether clinical placement should be partly replaced with simulation-based education. Some studies indicate that the simulation setting as a learning arena can partially replace clinical placement hours in the clinical setting (Breymier et al., 2015; Hayden et al., 2014; Olaussen et al., 2022). Limited availability of clinical placement places, limited access to supervision, and limited learning situations pose challenges to the use of the clinical setting as learning arena (Olaussen et al., 2022). The appeal of the clinical setting as a learning arena is also challenged by the increased focus on the benefits of simulation-based education, as research demonstrates that simulation-based education with the use of simulated scenarios is effective (Aebersold, 2018; Koukourikos et al., 2021; Li et al., 2022). Although students' professional competence and clinical judgment skills develop in non-linear patterns (Papers I and II),

the longitudinal study (Paper II) shows that in a longitudinal perspective across two learning arenas, professional competence increased. Hence, the clinical setting remains not only relevant and important as a learning arena but also irreplaceable. In the light of these results, more research investigating nursing students' development of competence in a longitudinal perspective is needed before the suggested replacement should take place.

To be prepared for future work in healthcare services, it is vital that students face truly complex clinical situations before graduating. While scenario simulation can mimic patient situations in clinical practice, it can never replace real-life patient situations. Moreover, when development is understood in light of Kolb's (1984) learning cycle, students' professional competence and clinical judgment skills develop by facing repeated experiences in the simulation and clinical settings. By providing nursing students with varied experiences from both settings, nurse educators can help them develop a deeper understanding of the different aspects of professional competence and clinical judgment skills and enhance their ability to use their professional competence and clinical judgment skills in new situations.

6.1.4 Nursing students' level of professional competence

Investigation of nursing students' level of professional competence was also of interest in this PhD project to identify knowledge gaps and potentially improve nursing education (Nilsson et al., 2018). Nursing students rated *Value-based nursing care* highest at all timepoints in both the quasi-experimental study (Paper I) and the longitudinal study (Paper II). These results are supported by Egilsdottir et al. (2023), who

investigated nursing students' competence areas in their second and third years of study. The results from Papers I and II are also in line with results from four cross-sectional studies using the NPC-Scale at the point of graduation (Forsman et al., 2020; Lachmann & Nilsson, 2021; S. J. Lee et al., 2023; van de Mortel et al., 2021). Interestingly, Halabi et al. (2021) also found *Value-based nursing care* to be one of the highest reported competence areas among experienced nurses. In contrast, experienced nurses reported *Value-based nursing care* to be the third highest area and *Documentation and administration of nursing care* as the highest area (Al-Maaitah et al., 2023). According to Nilsson et al. (2018), *Value-based nursing care* involves respectful communication, showing respect for patients, enhancing patients' and relatives' knowledge, showing respect, and contributing to a holistic view of the patient. This corresponds to the person-centred values of respect for the person, individual autonomy, mutual respect and understanding (McCormack & McCance, 2021). Thus, having this competence may contribute to person-centred practice. The findings concerning the level of this competence among nursing students are not surprising: there is a focus on all elements of nursing care from early in nursing education, and nurses are expected to perform high-quality nursing care during their education and especially upon graduation (Halabi et al., 2021).

Concerning the lowest-scored competence area, *Development, leadership, and organization of nursing care* was rated lowest at all time-points in Papers I and II. These results are also supported by Egilsdottir et al. (2023), Forsman et al. (2020), Lachmann and Nilsson (2021), and Halabiet al. (2021). The students in S. J. Lee et al.'s (2023) study rated *Development, leadership, and organization of nursing care* second lowest. These

low ratings are reasonable as nursing students and most nurses are more educated and involved in bedside care than in leadership roles. However, *Development, leadership, and organization of nursing care* has been pointed to as an important nursing competence area for the provision of safe, high-quality care (Regan et al., 2016; Wong et al., 2013). This competence is essential to be able to shape and deliver effective person-centred healthcare to meet the needs of patients, families, and communities (WHO, 2020). This competence area should thus be understood as one that should be improved in educational institutions aiming to provide well-educated nurses. Furthermore, there is a global shortage of nurses (WHO, 2020). This creates challenges for global and national healthcare. As a result, there is a need for forward-looking interventions to strengthen the nursing force. Because nurses are already a scarce resource, and will be even more so in the future, interventions could possibly be related to nursing competence and expertise. A recent report from the Norwegian Ministry of Health and Care Services (2023), states that shortage of healthcare employees makes it important to be conscious of different healthcare workers' roles and what they should accomplish during a workday. This also involves assigning tasks that do not require healthcare expertise to other personnel (Ministry of Health and Care Services, 2023). Consequently, newly graduated nurses may be expected to take more leadership and contribute to the development and organization of healthcare. Thus, it is important to enhance nursing students' proficiency in areas such as *Development, leadership, and organization of nursing care.*

6.2 Nursing students' transfer of professional competence and clinical judgment skills

In this section, nursing students transfer of professional competence and clinical judgment will be discussed in relation to results from the quasi-experimental study (Paper I) and the longitudinal study (Paper II). In this PhD project, the change in nursing students' self-reported professional competence and clinical judgment skills upon entering the clinical setting after the simulation setting is understood as the transfer of learning, following Eraut (2004). The findings concerning transfer of learning from Papers I and II are some of this thesis's principal findings. Students' self-reported professional competence and clinical judgment skills did not increase significantly when they entered the clinical setting after the simulation setting in either the quasi-experimental study (Paper I) or the longitudinal study (Paper II). In fact, some competence areas reflecting professional competence decreased in this transfer process in both studies. Concerning the transfer of professional competence in the intervention group in the quasi-experimental study (Paper I), the students self-reported a significant decrease in the competence area of *Development, leadership, and organization of nursing care* when they entered the clinical setting. A similar result was found for the students in the control group in the quasi-experimental study (Paper I) and the students from the longitudinal study (Paper II) for *Medical and technical care*; *Care pedagogics*; and *Development, leadership, and organization of nursing care*.

Despite being recognized as important, research addressing nursing students' transfer of learning between learning arenas is limited (El Hussein & Cuncannon, 2022).

Consequently, neither the NPC-Scale SF nor LCJR had previously been used to investigate the transfer of nursing students' self-reported professional competence and clinical judgment skills from the simulation setting to the clinical setting. However, other studies have investigated the transfer process using other outcomes and perspectives (Booth et al., 2017; Ewertsson et al. 2015; Hustad et al., 2019; Johnston et al., 2019; Miles, 2018; Nash & Harvey, 2017; Ravik & Bjørk, 2023; Ravik et al., 2015; Ravik et al., 2017; Zieber & Sedgewick, 2018). Concerning the transfer of professional competence, the absence of transfer in some of the competence areas in this PhD project contrasts with Zieber and Sedgewick's (2018) results; the authors found that students reported significant increases in nursing competence and knowledge retention when they entered the clinical setting after simulation. Likewise, Johnston et al. (2019) found that students reported significant increase in clinical reasoning after simulation-based education, and they felt prepared to transfer this competence into the clinical setting. The results in this thesis concerning the absence of transfer of professional competence also contrast results from qualitative studies reporting that nursing students did transfer knowledge (Booth et al., 2017; Miles, 2018), communication and team collaboration (Hustad et al., 2019), practical skills (Ewertsson et al., 2015; Hustad et al., 2019; Miles, 2018; Ravik et al., 2017), and leadership and clinical judgment (Booth et al., 2017; Hustad et al., 2019) when they entered the clinical setting after the simulation setting. Other qualitative studies, however, support the results in this PhD project, in that students experienced the transfer process as complicated and the real clinical situations as more complex, unpredictable, and challenging than those in the simulation scenarios (Booth et al., 2017; Nash & Harvey, 2017; Ravik & Bjørk, 2023; Ravik et al., 2015, 2017). In summary,

earlier studies have reported that while some students self-reported a transfer of competence from the simulation setting, other students did not. Given the complex nature of the clinical setting, making meaningful connections and applying professional competence and clinical judgment skills that students have learned in simulation scenarios might be challenging (Koukourikos et al., 2021).

Some theoretical perspectives can be used to understand the findings in this thesis concerning the absence of increased professional competence (Papers I and II) and clinical judgment skills (Paper I) when the students enter the clinical setting. On the one hand, in Salomon and Perkins' (1989) perspective, nursing students' transfer of professional competence and clinical judgment skills is relatively straightforward when situations in the clinical setting are highly similar to what the students experienced in the simulation setting; as such, in this PhD project, students' transfer of professional competence and clinical judgment skills was challenging because the new situation in the clinical setting was less familiar and possibly more complicated than the simulation scenario (Eraut, 2004). On the other hand, according to Marton's (2006) transfer perspective, both differences and similarities between the simulation and the clinical settings are considered necessary for the transfer of professional competence and clinical judgment skills to the clinical setting. Indeed, following Salomon and Perkins (1989) and Marton (2006), the lack of transfer of professional competence and clinical judgment skills among the students in this thesis may be explained by a lack of similarities between the two learning arenas and situations the students experienced. Although the simulation-based education, with its extensive use of sophisticated technology and high-fidelity simulators, gives nursing students opportunities to practice

and learn in an environment experienced as realistic (Aebersold, 2018; El Hussein & Cuncannon, 2022; J. Lee et al., 2020), it lacks the complexity, unpredictability, stress and tempo of the clinical setting.

The findings concerning the transfer of professional competence and clinical judgment skills thus lead back to the discussion of whether clinical placement should be partly replaced by simulation. The fact that students tend to not transfer professional competence and clinical judgment skills into the clinical setting (Papers I and II) implies that the clinical setting is vital and irreplaceable learning arena. As students tend to struggle with the transfer of professional competence and clinical judgment skills to the clinical setting (Papers I and II), they must also face the realities and the complexity of clinical settings before graduating to be fully prepared to fill nursing roles after graduation (Ravik & Bjørk, 2023). Providing nursing students with varied experiences from both the simulation and the clinical settings might enhance their ability to transfer professional competence and clinical judgment skills to new situations in the future.

While Benner's (1984) theory does not explicitly focus on the transfer of professional competence and clinical judgment skills, it highlights the importance of experience, practice, reflection, and feedback in the development of competence – all factors that can facilitate the transfer of professional competence and clinical judgment skills from the simulation to the clinical setting. Benner (1984) suggests that as individuals gain experience and expertise, they are better able to transfer their knowledge and skills to new situations and contexts. Thus, when progressing from a novice level, students develop a deeper understanding of the underlying principles and concepts of

professional competence and clinical judgment skills, which allows them to apply their knowledge and skills in new and varied contexts. However, students at a novice level might struggle with this and need educational support. Such support may include reflection and feedback, which Benner (1984) emphasises as important in the development of competence. Reflection on experiences and seeking feedback from others occurs in the debriefing phase and can enhance students' ability to transfer learning to new situations.

Marton's (2006) perspective can guide facilitators in nursing education when assisting novice students in the debriefing phase in simulation-based education. To promote students' transfer of professional competence and clinical judgment skills from the simulation to the clinical setting, the facilitator should support students to better recognise and reflect upon both critical similarities and differences between the two settings. If the facilitator doesn't pay attention to both the similarities and differences in the subject they're trying to learn, they won't be able to identify important elements. As a result, Marton (2006) states that their ability to transfer what they've learned in new situations will be limited. Although all students in the quasi-experimental study (Paper I) and the longitudinal study (Paper II) underwent 45 minutes of debriefing after the scenario simulation, the similarities and differences were not explicitly focused in either the PEARLS debriefing or the standard debriefing. However, for the group who received PEARLS debriefing, only one competence area decreased significantly when they entered the clinical setting (Paper I). Thus, the reflection promoted in the PEARLS debriefing may facilitate transfer. On the other hand, novice students may need more experience to take advantage of the potential of debriefing. While novice learners may

not have the same level of expertise as more experienced learners, they can still transfer their learning to some extent, particularly when the learning is relevant and meaningful to the new situation (Marton, 2006; Salomon & Perkins, 1989). If novice learners progress toward the expert level (Benner, 1984), their ability to transfer professional competence and clinical judgment skills to new situations may continue to improve.

6.3 Assessment of nursing students' professional competence and clinical judgment skills

In this section, results concerning the assessment of nursing students' clinical judgment skills will be discussed related to results from Paper III. This will be followed by a discussion of the consequences of using self-reported data in the empirical material in Paper I and II.

6.3.1 Assessment of nursing students' clinical judgment skills

The overall results in the comparative study (Paper III) showed inconsistency in both the simulation and clinical settings when students' self-assessments of clinical judgment skills were compared to those of a more experienced evaluator. When comparing the findings related to the two assessment methods using various statistical tests, the results revealed that students assessed their clinical judgment skills higher than the evaluator did in both the simulation and clinical settings (Paper III). Additionally, the Dunning–Kruger effect (Kruger & Dunning, 2009) was present in the student group in Paper III; differences between students' and the evaluator's assessments were larger when the evaluator's assessments were low. The inconsistency identified in Paper III

concurs with previous research. Three other studies using the LCJR conclude that students tend to estimate their clinical judgment skills higher than the evaluator (Jensen, 2013; Strickland et al., 2017; Vreugdenhil & Spek, 2018). Strickland et al.'s (2017) and Jensen's (2013) studies were conducted in the simulation setting, while Vreugdenhil and Spek (2018) investigated assessment in the clinical setting. The results from the comparative study (Paper III), along with previous research, demonstrate that students tend to overestimate their clinical judgment skills when compared to evaluators, regardless of whether they were investigated in one or two settings. Contrastingly, Bertozzi et al. (2023) found students' self-assessments and evaluators' assessments in the simulation setting to be consistent for all LCJR subscales except for *Noticing*. Concerning the presence of the Dunning–Kruger effect (Kruger & Dunning, 2009), no previous studies have investigated whether it is present in nursing students' self-assessment of clinical judgment skills. However, similar results were found among social science students in a recent review (Bradley et al., 2022).

The inconsistency between the students' self-assessment and the evaluator's assessment might be explained by different perceptions of clinical judgment skills. Consequently, students and the evaluator interpreted the assessment criteria in the LCJR-N differently. Following Benner's (1984) perspective, the nursing students participating in the comparative study (Paper III) were likely to be at a novice level, characterised by having little experience with and understanding of the situations they encountered in the simulation and clinical settings, in which they were expected to use their clinical judgment skills. This might have affected their understanding of the contextual meaning of clinical judgment skills and how to apply these skills in simulation

scenarios or clinical situations, thus also influencing their self-assessments. Novice students quite often have low levels of abstract thinking skills in self-assessment processes and therefore tend to focus on more superficial features of their performance when assessing themselves (Bradley et al., 2022; Ross, 2006). The findings in Paper III demonstrate that when students' self-assessments are compared to an experienced evaluator's assessment, student self-assessment of clinical judgment alone may not be a reliable predictor in the simulation or clinical settings.

6.3.2 Nursing students' self-assessment of professional competence and clinical judgment skills in research and education

The findings from the comparative study lead to a discussion concerning validity of the empirical data in the quasi-experimental study (Paper I), the longitudinal study (Paper II), and use of self-assessment of competence in research and education in general. In the quasi-experimental study (Paper I) and the longitudinal study (Paper II), self-reporting was used as a data collection method. Hence, students self-assessed their professional competence and clinical judgment in the self-reporting questionnaire.

It is known that self-assessment of competence in educational research has several disadvantages, including bias, lack of objectivity, limited validity and reliability, social desirability bias, and lack of accountability (Polit & Beck, 2020). Students may overestimate or underestimate their abilities, as self-assessment relies on subjective judgments that may be influenced by personal factors (Bradley et al., 2022; Polit & Beck, 2020). Students may have different criteria for assessing their competence, and these criteria may be inconsistent with discipline standards; moreover, students may rate

themselves higher than they should to conform to social norms or expectations (Polit & Beck, 2020). To sum up, one may question whether the disadvantages of self-assessment in research affected the interpretation of students' self-reported professional competence and clinical judgment skills in the quasi-experimental study (Paper I) and the longitudinal study (Paper II). Assessing students' professional competence and clinical judgment skills involves measuring a construct, which requires attention to psychometrics and the minimisation of measurement error (Field & Field, 2018; Polit & Beck, 2020). The validity and reliability of the NPC Scale-SF and LCJR-N are crucial for the interpretation of the self-assessment in Papers I and II, and they will be discussed in more detail in section 6.4 *Methodological considerations.*

Use of formative self-assessment of professional competence and clinical judgment in education might influence the validity of self-assessment in educational research. When self-assessment is used in education with a learning-oriented purpose, the self-assessment should be formative only (Andrade, 2019). For use in education, both Benner (1984) and Boud (2018) emphasise the importance of using formative self-assessment in the learning process. When taking the self-assessment perspective of Boud et al. (2018), nursing students' self-assessment of professional competence and clinical judgment skills should be an ongoing process during education, rather than a one-time event. In this perspective, students should regularly self-assess their professional competence and clinical judgment skills and be supported by nurse educators to use this information to set goals and develop action plans for improvement (Boud et al., 2018; Tai et al., 2018). Moreover, Boud et al. (2018) argue that evaluative judgment is an important aspect of self-assessment as it involves the ability to critically

assess one's own learning and performance (Boud et al., 2018). This corresponds to Benner's (1984) perspective, in which novice students' self-assessment of professional competence and clinical judgment skills may be a competence in itself and is considered part of their development from novice to expert practitioners. In a person-centred perspective, the students' ability to self-assess clinical judgment skills could promote person-centred healthcare as knowing oneself is a prerequisite for delivering person-centred healthcare (McCormack & McCance, 2021)

Expanded use of formative self-assessment of professional competence and clinical judgment skills in nursing education may benefit future research. Students' ability to identify their level of professional competence and clinical judgment skills may improve if self-assessment is a formative process during education. Thus, the validity of data collected for research will be stronger. This is important, as the data collected in this manner can provide valuable insights into levels of students' skills, strengths, and challenges related to competence (Polit & Beck, 2020). However, in research, self-assessment of clinical judgment skills should be supplemented with other forms of assessment to give a more comprehensive picture of students' competence levels.

6.4 Methodological considerations

The design and methods of the quasi-experimental study (Paper I), the longitudinal study (Paper II), and the comparison study (Paper III) have limitations that are important to be aware of when interpreting the results. In this section, methodological reflections on the validity and reliability of the studies are discussed.

6.4.1 Validity

Potential threats to validity in the three studies will be identified, presented and the steps taken to minimise them will be discussed. The four types of validity used in this thesis are chosen according to the validity typology introduced by Cook et al. (1979): statistical conclusion validity, internal validity, construct validity, and external validity (Cook et al., 1979; Shadish et al., 2002).

Statistical validity

Statistical validity is concerned with sources of random error and the appropriate use of statistical tests (Cook et al., 1979; Shadish et al., 2002). Regarding the statistical conclusion for all three studies, the assumptions of all the statistical tests were checked and met and are thus considered appropriate. Additionally, two statisticians have provided support and supervision to the thesis author during the statistical analysis process. This support is considered a strength of the statistical conclusion validity (Grobler, Harris, & Jooste, 2001). However, the statistical conclusion validity for the quasi-experimental study (Paper I) has some limitations. Statistical power is of central importance in experimental design and can be a threat to statistical conclusion validity (Cook et al., 1979; Shadish et al., 2002). For the quasi-experimental study (Paper I), the minimum sample size was calculated using the G*Power software program. For this calculation, the effect size was set to d = 0.70, which may have caused low statistical power and increased the risk of Type II errors (Creswell & Creswell, 2018; Shadish et al., 2002). The effect size used when calculating the sample size may have enabled the detection of statistically significant differences between the groups in the quasi-experimental study (Paper I) and could be considered a limitation and thus a threat to

the statistical conclusion validity. For the comparative study (Paper III), the study design did not entail comparing the average scores of two groups' (evaluators and students) assessment of clinical judgment skills. However, a sample size calculation was conducted and is considered a strength. This study aimed to compare only one evaluator's assessment of some students' clinical judgment skills with each student's self-assessment these same skills. To establish the sample size necessary, the number of comparisons needed to ensure that the 95% confidence interval around the evaluator-student average score difference did not include the value 0, assuming a difference of 2, with a standard deviation of 4 was calculated. The sample size calculation showed that 16 student-evaluator comparisons were sufficient.

Internal validity

Internal validity is achieved by ensuring that extraneous variables have been controlled and cofounds have been eliminated (Cook et al., 1979; Shadish et al., 2002). Because of the use of convenience sampling and small sample sizes, there is a risk that selection bias threatens the internal validity of all three studies. Threats to internal validity in the quasi-experimental study (Paper I) are also linked to history and maturation (Shadish et al., 2002), in that all events that occurred between the pre-test and post-test could affect the students' professional competence and clinical judgment skills. For nursing students' development of professional competence and clinical judgment, the natural maturation in professional competence and clinical judgment that potentially could occur even in the absence of debriefing might have been a confounding factor. The lack of randomisation in using a quasi-experimental design (Paper I) is also a potential threat to internal validity. Without randomisation, the known and unknown confounders are

not equally distributed between the groups (Shadish et al., 2002). However, there were no significant differences between the two groups in terms of participant characteristics, which strengthens the internal validity of the results.

External validity

External validity is concerned with generalisability, and this is sought by observing and measuring variables in natural conditions (Cook et al., 1979; Shadish et al., 2002). For the comparison study (Paper III), a potential threat to external validity and to whether inferences can be generalised is observational bias (Mahtani et al., 2018). As in any observational study of behaviour, the students' performance of clinical judgment skills may have been affected by the study situation. This is a confounding factor, also known as the Hawthorne effect (Waring & Gillespie, 1992). This may have coloured students' performance in both the quasi-experimental study (Paper I), the longitudinal study (Paper II), and especially the comparative study (Paper III), where the students knew their performance was being assessed by an experienced evaluator. However, this threat was reduced by using an evaluator that did not know the students and was not involved in any of their educational activities.

Construct validity

Construct validity is achieved by using well-established definitions and measurement procedures (Cook et al., 1979; Shadish et al., 2002). NPC SF-scale and LCJR-N are established instruments and are considered appropriate for measuring the construct of interest accurately (Lasater, 2007a; Nilsson et al., 2018). For use in this PhD project (Papers I and III), LCJR was translated and cross-culturally adapted into Norwegian (LCJR-

N). The translation process and cross-cultural validation of the instrument LCJR-N have some strengths and limitations. In the translation and cross-cultural validation of a research questionnaire, conceptual and semantic equivalence validity is important (Beaton et al., 2000; Brislin, 1970; C.-C. Lee et al., 2009). To ensure the semantic equivalence of the LCJR-N, a rigorous translation process inspired by the guidelines of Brislin (1970) was conducted by a professional translator, the research team, faculty members, and nurses (Table 3, p.55). The use of guidelines in the translation process and the involvement of all the stakeholders can be considered a strength. Following the translation process, a pre-test of the LCJR-N was conducted among a group of nursing students at the same education level as the participants in the study. They were asked if the statements in the questionnaire were precise, well-articulated, and understandable. The pre-test resulted in no changes and can together with the translation process considered evidence of the validity of LCJR-N. Still, when you select an instrument, you should seek evidence of the scale's psychometric soundness to evaluate the amount of error associated with the chosen instrument (Bolarinwa, 2015; Smith et al., 2008). The possibility of conducting psychometric testing of the Norwegian version of NPC and LCJR-N in the data material in this PhD was discussed. Psychometric experts disagree on the number of participants necessary for factor analysis, but generally, it is recommended to have a sample larger than 100 and a minimum of five times as many observations as the number of variables (DeVon et al., 2007; Munro, 2005). Given this, with a minimum of 175 study participants recommended for testing of the NPC Scale-SF it was decided not to implement this. As psychometric testing of NPC Scale-SF or LCJR-N was not conducted in this project, some aspects concerning the

validity of the measurements are unknown which can be considered a limitation (Polit & Beck, 2020).

6.4.2 Reliability

In this PhD project, the reliability of the instruments was investigated. For multi-item instruments, an important reliability issue is internal consistency. It is important to investigate to what degree sets of items behave in the same way because they are supposed to assess the same underlying construct (Creswell & Creswell, 2018). NPC Scale-SF competence areas and LCJR-N subscales are both examples of such sets of items. This degree is quantified by Cronbach's alpha. Cronbach's alpha values above 0.7 indicate good internal consistency (DeVellis, 2012).

Concerning reliability in the quasi-experimental study (Paper I) and the comparative study (Paper III), Cronbach's alpha values for LCJR-N total score and subscale *Responding* indicated good internal consistency ranging from 0.75 to 0.91. There was an exception to this for the value 0.69 on the subscale *Noticing*. Since the *Interpreting* and *Reflection* subscales had only two items each, alpha values were not calculated. Concerning reliability in the quasi-experimental study (Paper I) and the longitudinal study (Paper II), Cronbach's alpha values for NPC SF-Scale competence areas ranged from 0.76 to 0.91 indicating good internal consistency. The value 0.68 for the competence area of *Value-based nursing care* in the longitudinal study (Paper II) was an exception to this.

Nevertheless, the test-retest is a central part of psychometric testing of an instrument as a measure of consistency over time and provides information about the stability of the construct being measured (Bolarinwa, 2015). The lack of psychometric testing and

test-retest of both LCJR-N and NPC SF-Scale is considered a threat to reliability in this PhD project.

7 CONCLUSIONS

The overall aim of this PhD project was 1) to develop knowledge concerning nursing students' development and assessment of professional competence and clinical judgment skills in the simulation setting and the clinical setting, and 2) to develop knowledge concerning nursing students' transfer of professional competence and clinical judgment skills from the simulation setting to the clinical setting.

The results provide some support for the use of PEARLS debriefing to promote the development of nursing students' self-reported professional competence and clinical judgment skills. The results indicate that nursing students' self-reported professional competence and clinical judgment skills tend to develop in non-linear patterns although self-reported professional competence increased in a longitudinal perspective. Nursing students find it challenging to transfer professional competence and clinical judgment skills from the simulation setting to the clinical setting. The results indicate that students tended to have a higher estimation of their clinical judgment skills when compared to an evaluator's assessment.

7.1 Implications for nursing education and research

Based on the results from this PhD project, several recommendations for nursing education can be made.

- PEARLS debriefing can be used in nursing education to increase students' development of professional competence and clinical judgment skills. When implementing PEARLS debriefing in future nursing education, it is

recommended that nurse educators undergo the necessary training and utilise existing PEARLS resources.

- Although simulation-based education is a recognised strategy to develop nursing students' professional competence and clinical judgment skills, scenario simulation alone is not enough to achieve the competence necessary for the level of complexity found in modern healthcare. It is suggested that nursing students' development of professional competence and clinical judgment skills can be better understood when seen from a longitudinal perspective that covers the entirety of their education. In this development process, the role of the clinical setting as learning arena is considered irreplaceable.
- Nursing students need more support to better transfer professional competence and clinical judgment skills from the simulation setting to the clinical setting. It is therefore recommended that the support provided to students by nurse educators and RN supervisors in this transfer process should be strengthened. Debriefing could be used for this purpose. Students need support to identify the differences and similarities between the simulation setting and the clinical setting. Additionally, it is recommended that students be adequately prepared for the complex clinical settings they will encounter in other parts of the nursing programme besides simulation-based education.
- It is recommended to strengthen students' professional competence related to *Development, leadership, and organization of nursing care* in future nursing education, as students self-assess their competence in this area as low. With a

shortage of nurses, such competence may be a key element to achieve future person-centred healthcare services.

- Caution should be taken when interpreting nursing students' self-assessments of clinical judgment in nursing education. Formative assessment should be used to assess students' clinical judgment skills in the simulation and clinical settings to strengthen their ability to reflect and their evaluative judgment. Moreover, a combination of assessment methods is recommended to offer a more realistic interpretation of students' clinical judgment skills, including student self-assessment, evaluator or nurse educator assessment, and feedback.
- It is important to acknowledge the presence of the Dunning-Kruger effect among nursing students' self-assessments of clinical judgment skills in nursing education. This effect can be addressed by promoting students' meta-cognitive skills and self-reflection to support students' learning processes. Promoting nursing students' self-reflection concerning clinical judgment skills in the simulation setting and various clinical settings may be done using the LCJR. This tool may help students gain a deeper understanding of the concept of clinical judgment before graduation.

Based on the results from this PhD, several recommendations for further research within this field can be made.

- To increase research-based knowledge regarding PEARLS debriefing, PEARLS should be compared with other structured debriefing models in future research. Using larger samples across several educational settings and other study

outcomes would strengthen the evidence. Likewise, experimental studies with more experienced students and novice and experienced nurses would provide information on the advantages or disadvantages of using PEARLS debriefing. There is also a need to investigate nurse educators' and students' experiences with the PEARLS debriefing tool using qualitative research methods.

- It is further recommended that researchers apply a variety of methodological approaches when addressing the development of professional competence and clinical judgment skills across educational settings. Intervention studies should be conducted to investigate how different pedagogical approaches can strengthen students' ability to transfer professional competence and clinical judgment skills to the clinical setting. Similarly, research in a longitudinal perspective should be conducted to better understand where students need more support during their education to develop professional competence and clinical judgment skills.
- More research is needed to investigate whether clinical placement in nursing education could partly be replaced with simulation-based education to develop nursing students' competence such as professional competence and clinical judgment skills.
- Researchers should be aware of the Dunning-Kruger effect and its potential impact on validity when students' self-assessments of clinical judgment skills are the only available data source.

- For future research, pedagogical interventions that aim to promote nursing students' metacognitive skills concerning clinical judgment skills using controlled designs should be performed.
- The presence of the Dunning-Kruger effect in nursing students' self-assessment of clinical judgment skills should be investigated using larger samples and more than one evaluator. The potential presence of the Dunning-Kruger effect in nursing students' self-assessment of other aspects of nursing competence should also be investigated using other instruments.
- Studies using a qualitative approach to explore nursing students' experiences with self-assessment of clinical judgment are needed to gain a more in-depth knowledge of the self-assessment process.
- As it is important to use valid and reliable assessment tools, researchers should further investigate NPC-SF's and LCJR-N's measurement properties.

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Appendices

Appendix 1: Simulation scenarios

Appendix 2: Information and consent form for full-time students for Paper I

Appendix 3: Information and consent form for part-time students for Paper I and II

Appendix 4: Information and consent form for full-time students for Paper III

Appendix 5: The PEARLS healthcare debriefing tool (English version)

Appendix 6: PEARLS debriefingsverktøy for helsetjenesten (Norwegian version)

Appendix 7: Approval to use the NPC Scale-SF

Appendix 8: Approval to translate and use the LCJR

Appendix 9: Approval from the Norwegian Centre for Research Data

Appendix 10: Approval from the university administration

Appendix 11: Approval from the hospital administration

Appendix 12: Approval from the hospital's data protection representative

Appendix 13: Information and consent form for faculty members

Appendix 14: Information and consent form for patients

Appendix 15: Information for nurses

	1. Angina pectoris	2. Hypoglycemia	3. Cardiac arrest
Learning outcomes	- Observes, assesses, and prioritizes action - Communicates efficiently - Takes the lead	- Observes, assesses, and prioritizes action - Communicates efficiently - Takes the lead	- Identifies signs of cardiac arrest. - Performs CPR according to current guidelines - Retrieves and prepares the necessary equipment - Communicates effectively
Role description	Two students act as nurses, the remaining students as observers.	Two students act as nurses, one student is a friend who follows the patient, and the remaining students act as observers.	Three students act as nurses, the remaining students as observers.
Utilities	The operator acts as a doctor who can be called.	The operator acts as a doctor who can be called and plays next of kin who call the hospital.	The operator acts as a doctor who can be called.
Description of the patient's health condition	Carl Jensen, male, 56 years old. Weight 95 kg, height 175 cm. Admitted to the emergency room due to sudden onset of chest pain and wheezing. When the scenario begins: The patient is awake and ready, seems scared and anxious, sweat beads on the forehead, breathes quickly. The patient is seen by the doctor, and he ordinates glyceryloltrinitrat sublingually and acetylsalicylic acid. After the second administration of glyceryloltrinitrat, the patient suffers a drop in blood pressure.	Susan Hansen, female, 18 years (age majority). Weight 60 kg, height 170cm. Admitted to the ward with type 1 diabetes. For the past three months, she has been experienced increasing thirst, frequent urination and weight loss, and has generally felt unwell. She has no signs of infection, no known allergies, and no fever during her stay. On the actual day, the patient was walking in the park with a friend. The friend explained that Ms. Hansen suddenly became irritable, she expressed hunger, felt slightly shaky and light-headed. The friend became concerned and escorted her to the ward.	Carl Jensen, male, 56 years. Admitted to the medical ward 24 hours after he visited the emergency room on his own due to his symptoms (murmuring chest pains and wheezing). Now he has suffered new severe chest pains, no effect of glyceryloltrinitrat. He has been given a total of Morphine 15 mg intravenous, blood tests have been taken and electrocardiogram shows ST-elevation consistent with acute heart attack. He is waiting for a transfer to another hospital to perform percutaneous coronary intervention. When the scenario begins:

		When the scenario begins: The patient still seems somewhat unconcentrated and is uncooperative. At the end of the scenario, her mother calls the hospital and asks for information about the patient's condition. The patient has informed the nurses that she does not want the mother to get any information about her status.	The patient is still in pain, and a new dose of Morphine 5mg intravenous must be set. In a short period of time, he will have a cardiac arrest.
Expected progress	The students are expected to follow the local facility protocol for the treatment of chest pain suggestive of ischemia.	The students are expected to recognize symptoms of hypoglycemia, treat appropriately, and keep patient information confidential. During the phone call with the mother, the students are expected to provide duty of confidentiality.	The students are expected to follow the local facility protocol for the treatment of cardiac arrest.

	4. Postoperative bleeding	**5. Worsening of obstructive lung disease**	**6. Ileus**
Learning outcome	- Observes, assesses, and prioritizes action - Communicates efficiently - Takes the lead	- Observes, assesses, and prioritizes action - Communicates efficiently - Takes the lead.	- Observes, assesses, and prioritizes action - Communicates efficiently - Takes the lead
Role description	Two students act as nurses, the remaining students as observers.	Two students act as nurses, the remaining students as observers. One of the students acts as next of kin.	Two students act as nurses, the remaining students as observers.
Utilities	The operator acts as a doctor who can be called.	The operator acts as a doctor who can be called.	The operator acts as a doctor who can be called.
Description and	Lars Berntsen, male, 76 years old. He came to the emergency room last night. He had	Vidar Broby, male, 69 years old. Weight 70 kg, height 172 cm.	Stian Carlsen, male, 52 years old. Weight 76 kg, height 160 cm.

development of the situation	fallen outdoors and incurred a fractura colli femoris on the left side. He underwent immediate surgery, and a hip replacement was inserted. When the scenario begins: 12 o'clock: First postoperative day. The patient calls and complains that he is dizzy, in pain and feeling very tired. He seems alert and adequate, has a pale complexion, vomits, has rapid breathing, and there is blood in the bandage. His blood pressure drops and he loses consciousness.	In the emergency department due to worsening chronic obstructive pulmonary disease, COPD, stage 3. He complained of increasing fatigue and difficulty sleeping at night. He has been increasingly suffering from mucus production and coughing in recent days. His wife is with him, she's worried about the situation. The patient is awake and alert, uses respiratory auxiliary muscles, has a barrel-shaped chest and "drumstick fingers". The patient coughs something and brings up some clear expectorate. He sleeps with O^2 1 l/min and uses nebulizer. When the scenario begins: The patient condition has deteriorated, his SpO^2 has fallen below his habitual level. The patient is in distress.	Has previously undergone several surgical procedures; cholecystectomy, appendectomy, right-sided inguinal hernia. Alle performed more than 5 years ago. He arrives at the emergency room due to severe abdominal pain and vomiting in recent days. The stomach is bloated. He has dry mucous membranes. The urine has been concentrated the recent days, with no urine output in the last 24 hours. He's been feeling dizzy and tired all afternoon and has eaten and drunk little during the last few days. Upon admission, the patient is lethargic and pale, expressed pain. When the scenario begins: The patient is becoming increasingly dizzy and tired.
Expected progress	The students are expected to demonstrate basic assessment skills to detect signs and symptoms of postoperative bleeding and provide appropriate treatment.	The students are expected to initiate a respiratory assessment and provide appropriate interventions.	The students are expected to demonstrate basic assessment to detect signs and symptoms of severe dehydration and impending hypovolemic shock. They are expected to provide appropriate treatment.

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The PEARLS Healthcare Debriefing Tool

	Objective	Task	Sample Phrases
1 Setting the Scene	Create a safe context for learning	State the goal of debriefing; articulate the basic assumption*	"Let's spend X minutes debriefing. Our goal is to improve how we work together and care for our patients." "Everyone here is intelligent and wants to improve."
2 Reactions	Explore feelings	Solicit initial reactions & emotions	"Any initial reactions?" "How are you feeling?"
3 Description	Clarify facts	Develop shared understanding of case	"Can you please share a short summary of the case?" "What was the working diagnosis? Does everyone agree?"
4 Analysis	Explore variety of performance domains	See backside of card for more details	**Preview Statement** *(Use to introduce new topic)* "At this point, I'd like to spend some time talking about [insert topic here] because [insert rationale here]" **Mini Summary** *(Use to summarize discussion of one topic)* "That was great discussion. Are there any additional comments related to [insert performance gap here]?"
Any Outstanding Issues/Concerns?			
5 Application/ Summary	Identify take-aways	Learner centered	"What are some take-aways from this discussion for our clinical practice?"
		Instructor centered	"The key learning points for the case were [insert learning points here]."

*Basic assumption, Copyright © Center for Medical Simulation. Used with permission.

The Analysis Phase

Performance Domains

The analysis phase can be used to explore a variety of performance domains:

Three Approaches

1. **Learner Self-Assessment**

   Promote reflection by asking learners to assess their own performance

2. **Focused Facilitation**

   Probe deeper on key aspects of performance

3. **Provide Information**

   Teach to close clear knowledge gaps as they emerge and provide directive feedback as needed

Sample Phrases

- What aspects were managed well and why?
- What aspects do you want to change and why?
- **Advocacy:** I saw [observation], I think [your point-of-view].
- **Inquiry:** How do you see it? What were your thoughts at the time?
- I noticed [behavior]. Next time you may want to consider [suggested behavior], because [rationale].

PEARLS Debriefingsverktøy for Helsetjenesten

	Hensikt	Oppgave	Eksempler
1 Innledning	Skape et trygt læringsmiljø	Fastslå hensikten med debrifingen; sette ord på grunnleggende forutsetninger*	«La oss bruke x minutter på debrifing. Læringsmålene er å forbedre hvordan vi samarbeider og hvordan vi ivaretar våre pasienter.» «Alle her har mye kompetanse, men vi ønsker også å bli bedre»
2 Reaksjoner	Undersøke reaksjoner	Få frem umiddelbare reaksjoner & følelser	«Noen umiddelbare reaksjoner?» «Hvilke følelser kjenner du på etter scenariet?»
3 Beskrivelse	Klargjøre fakta	Få en felles forståelse av hendelsesforløpet	«Kan du vennligst gi en kort oppsummering av hendelsesforløpet?» «Hva var sentralt i dette scenariet? Er alle enige?»
4 Analyse	Utforske læringsmålene	Se kortets bakside for flere detaljer	**Introduksjon** *(brukes for å introdusere nytt tema/læringsmål)* «På dette tidspunktet, vil jeg gjerne bruke litt tid til å snakke om [Sett inn tema/læringsmål her] fordi [Sett inn begrunnelse her]» **Minioppsummering** *(Brukes til å oppsummere diskusjonen rundt ett tema/læringsmål)* «Det var en god diskusjon. Er det noen tilleggskommentarer knyttet til [Sett inn kunnskapshull her]?»
Noen problemstillinger/ bekymringer som utmerker seg?			
5 Anvendelse/ Oppsummering	Identifisere hva man kan ta med seg videre	Deltakersentrert	«Hva tar du med deg fra dette scenariet som kan anvendes i klinisk praksis?»
		Fasilitatorsentrert	«Sentrale læringsmål i dette scenariet var [Sett inn læringsmål her].»

*Grunnleggende forutsetninger, *Opphavsrett Center for Medical Simulation, Gjengitt med tillatelse.

Analysefasen

Læringsmål

Analysefasen kan brukes til å utforske læringsmål som:

Tre strategier

1 **Deltakernes egenvurdering**

Fremme refleksjon gjennom å be deltakerne om å vurdere egen prestasjon

2 **Fokusert fasilitering**

Undersøke nærmere læringsmål og sentrale punkter fra scenariet

3 **Gi informasjon**

Undervise for å lukke kunnskapshull og gi målrettet feedback etter behov

Eksempler

- Hva håndterte du på en god måte? Hvorfor var dette bra?
- Hva ønsker du å endre, og hvorfor ønsker du å endre?

- **Støttende:** Jeg observerte [observasjonen], jeg tror [ditt synspunkt]
- **Undersøkende:** Hvordan ser du på det? ? Hva tenkte du på dette tidspunktet?

- Jeg la merke til [adferd]. Neste gang bør du kanskje vurdere [foreslått adferd], fordi [begrunnelse].

Fra: Jörg Werner Kirchhoff <jorg.kirchhoff@hiof.no>

Sendt: torsdag 28. februar 2019 13:05

Til: Anne Mette Høegh-Larsen

Emne: RE: Tilgang til NPC-scale

Hei Anne Mette,

Vet ikke om det er en misforståelse her.

Siden du fikk tilsendt NPC skalaen fra meg kan du bruke den i prosjektet.

Det jeg imidlertid gjorde deg oppmerksom på var at 35 item versjonen ikke er testet i Norge ennå, men at vi kjører en test i april.

Vennlig hilsen

Jörg Werner Kirchhoff

From: Anne Mette Høegh-Larsen <Anne.Mette.Hoegh-larsen@usn.no>
Sent: Thursday, February 28, 2019 10:03 AM
To: Jörg Werner Kirchhoff <jorg.kirchhoff@hiof.no>
Subject: SV: Tilgang til NPC-scale

Hei Jørg!

Henviser til mail sendt forrige uke. Er det lang behandlingstid for dette?

Mvh Anne Mette Høegh-Larsen

—

Stipendiat

Fakultet for helse- og sosialvitenskap

Institutt for sykepleie- og helsevitenskap

Tel: +47 35 57 53 86/+47 95 24 35 88

anne.mette.hoegh-larsen@usn.no

www.usn.no

Fra: Anne Mette Høegh-Larsen
Sendt: onsdag 20. februar 2019 17.32
Til: jorg.kirchhoff@hiof.no
Emne: Tilgang til NPC-scale

Hei,

Her følger min søknad om tilgang til NPC-Scale.

Gi meg beskjed dersom du mangler noe informasjon.

Mvh Anne Mette Høegh-Larsen

—

Stipendiat

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Institutt for sykepleie- og helsevitenskap

Tel: +47 35 57 53 86/+47 95 24 35 88

anne.mette.hoegh-larsen@usn.no

www.usn.no

Fra: Kathie Lasater [mailto:lasaterk@ohsu.edu]
Sendt: onsdag 20. februar 2019 00.34
Til: Anne Mette Høegh-Larsen <Anne.Mette.Hoegh-larsen@usn.no>
Emne: RE: Access to LCJR

Hello Anne Mette,

Thank you for your interest in the Lasater Clinical Judgment Rubric (LCJR). You have my permission to use the tool for your project. I ask that you (1) cite it correctly, and (2) send me a paragraph or two to let me know a bit about your project when you've completed it, including how you used the LCJR. In this way, I can help guide others who may wish to use it. Please let me know if it would be helpful to have an electronic copy.

You should also be aware that the LCJR describes four aspects of the Tanner Model of Clinical Judgment—Noticing, Interpreting, Responding, and Reflecting—and as such, does not measure clinical judgment because clinical judgment involves much of what the individual student/nurse brings to the unique patient situation (see Tanner, 2006 article). We know there are many other factors that impact clinical judgment in the moment, many of which are impacted by the context of care and the needs of the particular patient.

The LCJR was designed as an instrument to describe the trajectory of students' clinical judgment development over the length of their program. The purposes were to offer a common language between students, faculty, and preceptors in order to talk about students' thinking and to serve as a help for offering formative guidance and feedback (See Lasater, 2007; Lasater, 2011). For measurement purposes, the rubric appears to be most useful with multiple opportunities for clinical judgment vs. one point/patient in time.

Regarding your specific use of the LCJR, my only concern is how you will be able to score students' clinical experiences. The difference between a simulation, which has specific cues as well as a beginning and ending, and the clinical experience could be challenging. I might suggest you share the LCJR with students and perhaps come up with some sort of a debriefing for the clinical experiences because it can be difficult to get at all of the 11 dimensions in the LCJR without asking certain questions (especially in the Interpreting and Reflecting sections).

There really aren't instructions, but are you planning to have multiple raters? If so, I would highly suggest doing some inter-rater reliability consensus activities before beginning your study, e.g., watching tapes and doing the scoring with discussion to follow. I do have a podcast as well as a training video that was for another study; I could send you links to those if you would like.

Please let me know if I can be of help,

Kathie

Kathie Lasater, EdD, RN, ANEF, FAAN
Professor, (Ret.), OHSU School of Nursing
3455 SW Veterans' Hospital Rd., SN-4S

Portland, OR 97239; (503)494-8325

Kathie Lasater is also Assistant Editor of Nurse Education Today
http://www.nurseeducationtoday.com

NSD sin vurdering

Skriv ut

Prosjekttittel
Sykepleierstudenters utvikling av klinisk kompetanse gjennom simuleringsbasert trening: En intervensjonsstudie.

Referansenummer
624052

Registrert
29.03.2019 av Anne Mette Høegh-Larsen - Anne.Mette.Hoegh-larsen@usn.no

Behandlingsansvarlig institusjon
Universitetet i Sørøst-Norge / Fakultet for helse- og sosialvitenskap / Institutt for sykepleie- og helsevitenskap

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)
Anne Mette Høegh-Larsen, anne.mette.hoegh-larsen@usn.no, tlf: 95243588

Type prosjekt
Forskerprosjekt

Prosjektperiode
01.01.2019 - 31.12.2021

Status
04.12.2019 - Vurdert

Vurdering (4)

04.12.2019 - Vurdert

NSD har vurdert endringen registrert 27.11.2019. Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 03.12.2020. Behandlingen kan

fortsette. Av endringer du har foretatt er blant annet at du ikke lenger skal ta i bruk lydopptak eller filming. Du har erstattet utvalg 2 med studenter fra deltidsskullet [redacted] ved Bachelorutdanning og tatt ut Universitetslektorer, førstelektorer og førsteamenuensiser ansatt ved [redacted] som er deltakende som fasilitator eller operatør i simuleringstrening ettersom du ikke skal behandle personopplysninger om disse. OPPFØLGING AV PROSJEKTET NSD vil følge opp underveis (hvert annet år) og ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet/pågår i tråd med den behandlingen som er dokumentert. Lykke til med prosjektet! Kontaktperson hos NSD: Henriette N. Munthe-Kaas Tlf. Personverntjenester: 55 58 21 17 (tast 1)

04.10.2019 - Vurdert
Vi viser til endring registrert 16.09.19 og dialog i etterkant. Vi kan ikke se at det er gjort noen oppdateringer i meldeskjemaet eller vedlegg som har innvirkning på NSD sin vurdering av hvordan personopplysninger behandles i prosjektet. Les mer om hvilke endringer som skal registreres hos NSD før endringer meldes inn i fremtiden: nsd.uib.no/personvernombud/meld_prosjekt/meld_endringer.html OPPFØLGING AV PROSJEKTET NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet. Lykke til videre med prosjektet! Kontaktperson hos NSD: Henriette N. Munthe-Kaas Tlf. Personverntjenester: 55 58 21 17 (tast 1)

19.09.2019 - Vurdert
Vi viser til endring registrert 16.09.19. Vi kan ikke se at det er gjort noen oppdateringer i meldeskjemaet eller vedlegg som har innvirkning på NSD sin vurdering av hvordan personopplysninger behandles i prosjektet. Les mer om hvilke endringer som skal registreres hos NSD før endringer meldes inn i fremtiden: nsd.uib.no/personvernombud/meld_prosjekt/meld_endringer.html OPPFØLGING AV PROSJEKTET NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet. Lykke til videre med prosjektet! Kontaktperson hos NSD: Tlf. Personverntjenester: 55 58 21 17 (tast 1)

14.05.2019 - Vurdert
Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet den 14.05.19 med vedlegg, samt i meldingsdialogen mellom innmelder og NSD. Behandlingen kan starte. Vi forutsetter at endelig godkjennelse fra sykehuset foreligger når du skal foreta observasjonen av sykepleiestudentene, i tillegg til samtykke fra pasientene når du observerer sykepleiestudentene når de undersøker pasienter. Vi minner deg om taushetsplikten som gjelder helsepersonell og lærere. MELD VESENTLIGE ENDRINGER Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde: https://nsd.no/personvernombud/meld_prosjekt/meld_endringer.html Du må

vente på svar fra NSD før endringen gjennomføres. TYPE OPPLYSNINGER OG VARIGHET Prosjektet vil behandle særlige kategorier av personopplysninger om pasienter og alminnelige personopplysninger frem til 31.12.2021. LOVLIG GRUNNLAG Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 nr. 11 og art. 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse, som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes uttrykkelige samtykke, jf. personvernforordningen art. 6 nr. 1 a), jf. art. 9 nr. 2 bokstav a, jf. personopplysningsloven § 10, jf. § 9 (2). PERSONVERNPRINSIPPER NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om: - lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen - formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke viderebehandles til nye uforenlige formål - dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet - lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet DE REGISTRERTES RETTIGHETER Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: åpenhet (art. 12), informasjon (art. 13), innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), underretning (art. 19), dataportabilitet (art. 20). NSD vurderer at informasjonen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13. Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned. FØLG DIN INSTITUSJONS RETNINGSLINJER NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32). For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og eventuelt rådføre dere med behandlingsansvarlig institusjon. OPPFØLGING AV PROSJEKTET NSD vil følge opp underveis (hvert annet år) og ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet/pågår i tråd med den behandlingen som er dokumentert. Lykke til med prosjektet! Med vennlig hilsen Henriette N. Munthe-Kaas, NSD: Tlf. Personverntjenester: 55 58 21 17 (tast 1)

Universitetet i Sørøst-Norge

Til Dekan .d Fakultet for Oslo, 12/4 2019

Jeg tar kontakt med deg for å be om tillatelse til å gjennomføre datasamling blant sykepleierstudenter, samt implantere en pedagogisk intervensjon i emne 9 «Metoder og intervensjoner 2» ved [redacted] Jeg ber også om tillatelse til å gjennomføre en pilottest av spørreskjemaet på en mindre gruppe studenter ved campus [redacted] eller Campus

Som du vet startet jeg i januar i år med mitt PhD-prosjekt. Det overordnede formålet er å utvikle og teste hvordan en kompleks intervensjon i simuleringsbasert trening kan ha effekt på sykepleierstudenters kliniske kompetanse. Det planlegges en intervensjonsstudie med kvasi-eksperimentelt design hvor data skal innhentes ved hjelp av spørreskjemaer og observasjon ved flere målepunkter.

Det er ønskelig at utvalget skal bestå av studenter ved bachelorutdanningen i sykepleie ved Campus Porsgrunn. Deltidskull [redacted] vil være kontrollgruppe, og heltidskull [redacted] være intervensjonsgruppe. Datasamlingen i kontrollgruppen vil starte i mai 2019 og vil innebære bruk av spørreskjema. Datasamlingen i intervensjonsgruppen vil starte i november 2019, og innebærer bruk av spørreskjema samt observasjon i simuleringssenteret og i praksisstudiene. Intervensjonen planlegges vår/sommer 2019 og vil implementeres høsten 2019.

Jeg har allerede etablert et godt samarbeid med emnegruppen som vil berøres av datainnsamling og intervensjonen. Prosjektet er meldt til NSD, svar foreligger ikke ennå. Det er også etablert samarbeid med fagdirektør [redacted] ved Sykehuset [redacted] og formell tillatelse til innsamling av data der vil også innhentes.

Jeg håper på positivt svar fra deg!

Mvh Anne Mette Høegh-Larsen

Stipendiat
Fakultet for helse- og sosialvitenskap
Institutt for sykepleie- og helsevitenskap

Tel: +47 35 57 53 86/+47 95 24 35 88
anne.mette.hoegh-larsen@usn.no

Jeg gir mitt samtykke til følgende:

☒ Gjennomføre pilottesting av spørreskjema ved

☒ Gjennomføre datasamling ved

☒ Implementere intervensjonen ved

Underskrift: [redacted]

tir. 24.09.2019 09.08

[redacted]

SV: Tillatelse til å gjennomføre doktorgradsprosjekt ved STHF

Til: [redacted] Anne Mette Høegh-Larsen Anne.Mette.Hoegh-larsen@usn.no

Kopi: [redacted]

Hei Anne Mette

Dette er jeg positiv til. Jeg videresender mail til avd.leder [redacted]

[redacted]

Klinikksjef

Kirurgisk klinikk, Sykehuset [redacted]

[redacted]

[redacted]

Fra: [redacted] <[redacted]>
Sendt: 24. september 2019 08:39
Til: 'Anne Mette Høegh-Larsen' <Anne.Mette.Hoegh-larsen@usn.no>; [redacted]
<[redacted]>
Kopi: [redacted] <[redacted]>; [redacted] <[redacted]>;
[redacted] <[redacted]>; [redacted] <[redacted]>; [redacted]
<[redacted]>
Emne: SV: Tillatelse til å gjennomføre doktorgradsprosjekt ved STHF

Hei Anne Mette

Flott initiativ.

Dette er helt greit for meg. Lykke til.

Jeg har satt PVO og avdelings-/seksjonsledere som kopister.

Du bør utforme en søknad til PVO - gjerne i samråd med henne selv.

Lykke til

Mvh

[redacted]

Fra: Anne Mette Høegh-Larsen <Anne.Mette.Hoegh-larsen@usn.no>
Sendt: 24. september 2019 08:36
Til: [redacted] <[redacted]>; [redacted] <[redacted]>
Kopi: [redacted] <[redacted]>
Emne: Tillatelse til å gjennomføre doktorgradsprosjekt ved [redacted]

Til klinikksjef [redacted] og klinikksjef [redacted],

Jeg er PhD-stipendiat ved Universitetet i Sørøst- Norge (USN) ved Fakultet for Helse- og sosialvitenskap og jobber som sykepleier ved Nyfødt Intensiv ved STHF. Hensikten med mitt doktorgradsprosjekt er å undersøke hvordan simuleringsbasert trening i utdanningen kan påvirke sykepleierstudentenes kliniske kompetanse. En av delstudiene vil være en observasjonsstudie hvor studenter observeres både i simuleringssenteret på skolen og i praksisfeltet, med hensikt i å få kunnskap om overføring og utvikling av klinisk kompetanse.

Etter anbefaling fra Forskningsavdelingen [redacted] tar jeg kontakt med dere for å be om tillatelse til å gjennomføre datasamling blant sykepleierstudenter fra [redacted] når de har praksisstudier ved medisinsk og kirurgisk klinikk ved [redacted] fra februar 2020 til juni 2020. Forhåpentligvis vil 30 studenter inkluderes i studien, og de vil observeres av meg 2 ganger. Aktuelle seksjoner for datasamling vil i medisinsk klinikk være Medisin 2, Nevrologi sengepost og Infeksjon sengepost. Aktuelle seksjoner i kirurgisk klinikk vil være Kirurgen 1 sengepost og Gastrokirurgisk sengepost.

Jeg har fått tillatelse fra Norsk Senter for Dataforskning (NSD) til å observere studenter når de gjennomfører National Early Warning Score (NEWS) på pasienter den første eller andre uken de er i praksisfeltet, og på nytt den siste uken de er i praksisfeltet. Data som innhentes vil være knyttet til studentenes utøvelse av NEWS-scoring, det vil ikke samles inn opplysninger om pasienten. Det vil allikevel være nødvendig å innhente samtykke fra pasienten da jeg vil være tilstede i rommet og få tilgang til personopplysninger.

Dersom jeg får tillatelse fra dere klinikkledere til å gjennomføre datasamlingen ved utvalgte seksjoner, vil jeg videre søke tillatelse hos Personvernombudet (PVO) ved [redacted] og deretter avtale praktisk gjennomføring direkte med seksjonsledere. Etter anbefaling fra Forskningsavdelingen vil en mail fra dere være godt nok som dokumentasjon til PVO.

Jeg håper på positivt svar!

Mvh Anne Mette Høegh-Larsen

—

Stipendiat

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Tel: +47 35 57 53 86/+47 95 24 35 88

anne.mette.hoegh-larsen@usn.no

www.usn.no

Universitetet i Sørøst-Norge

Personvernombud

NOTAT

Til: Anne Mette Høegh-Larsen, Universitetet i Sørøst-Norge	**Kopi til:** Forskningssje[redacted] Klinikksjef[redacted] Klinikksjef[redacted]
Fra: Personvernombudet	**Ref.:** 20/00140
Dato: 10.01.2020	

PERSONVERNOMBUDETS TILRÅDING

Innsamling av personopplysninger for forskningsprosjektet: Sykepleierstudenters utvikling av klinisk kompetanse gjennom simuleringsbasert trening: En intervensjonsstudie.

Prosjektbeskrivelse:
Formålet med dette prosjektet er å utvikle en pedagogisk intervensjon knyttet til simuleringstrening for sykepleierstudenter, for deretter å undersøke om intervensjonen har effekt på utvikling av klinisk kompetanse. Formålet med delstudie 1 er å undersøke om intervensjonen har effekt på utvikling av klinisk kompetanse. Data vil samles gjennom spørreskjema som deles ut i utdanningsinstitusjonen. Formålet med delstudie 2 er å teste om intervensjonen har effekt på utviklingen av klinisk vurderingsevne. Data vil samles gjennom ikke-deltakende observasjon (fra prosjektets side på NSD).

- Prosjektperiode: 01.01.2019-31.12.2021
- Forskningsansvarlig: Universitetet i Sørøst-Norge / Fakultet for helse- og sosialvitenskap / Institutt for sykepleie- og helsevitenskap
- Behandlingsansvarlig institusjon: Universitetet i Sørøst-Norge / Fakultet for helse- og sosialvitenskap / Institutt for sykepleie- og helsevitenskap
- Prosjektleder: Anne Mette Høegh-Larsen

Sakens dokumenter
- NSDs vurdering av 04.12.2019 og 14.05.2019 med meldingsutveksling
- Meldeskjema til NSD av 02.10.2019
- Informasjonsskriv til pasientene som involveres i studien

Behandling av person-/helseopplysninger ved oppretting og bruk; behandlingsgrunnlag
Lokalt personvernombud skal på vegne av dataansvarlig vurdere prosjektet ut fra personvernkonsekvenser og om kravene til informasjonssikkerhet og internkontroll ivaretas. Dette følger av personvernforordningen art. 39 nr. 1 a) - c).

Det er et absolutt krav at det foreligger adgang til behandling av helseopplysninger (behandlingsgrunnlag jf. personvernforordningen art. 6 og art. 9 og i nasjonale lovbestemmelser).

NSD er sykehusets personvernrådgiver og har vurdert saken på vegne av sykehuset (dataansvarlig). Det vises til NSDs vurdering datert 04.12.2019 og 14.05.2019 med meldingsutveksling. Personvernombudet ved[redacted]vurderer behandlingen av personopplysninger for våre pasienter. Behandlingsgrunnlag for behandlingen av personopplysninger om sykepleiestudentene må vurderes av forskningsansvarlig institusjon.

Personvernombudet i[redacted]slutter seg til NSDs vurderinger og konkluderer slik:

- Det skal ikke behandles personopplysninger om pasienter i prosjektet. Ved at prosjektdeltager observerer sykepleiestudenter som utfører NEWS-måling på våre pasienter, vil det kunne tilflyte prosjektdeltager taushetsbelagte opplysninger. Pasientene må skriftlig samtykke til denne informasjonsutvekslingen. Det er utarbeidet samtykkeskriv som dekker dette formålet. Det anses ikke å være en høy risiko for fysiske personers rettigheter og friheter som krever en personvernkonsekvensvurdering (DPIA) jf personvernforordningen art. 35.
- Det anses å foreligge et lovlig behandlingsgrunnlag; det skal gjøres en samtykkebasert behandling av personopplysninger i tråd med personvernforordningen art. 4 nr. 11 og art. 7. Behandlingsgrunnlaget er ut fra det personvernforordningen art. 6 nr. 1 bokstav a) jf.art 9 nr 2 bokstav a, jf. personopplysningsloven § 10 jf. § 9 (2)
- Prosjektet slik det er beskrevet, følger prinsippene i personvernforordningen jf. art 5.1 a - e og krav til sikkerhet art. 32 (lovlighet, rettferdighet og åpenhet, formålsbegrensning, dataminimering, riktighet, integritet og konfidensialitet samt lagringsbegrensning).

Behandlingen anses å være i samsvar med personvernregelverket så fremt den gjennomføres i tråd med det er som er dokumentert i meldeskjemaet til NSD.

Behandling av person-/helseopplysninger ved oppretting og bruk; nærmere om innhenting, bruk og sletting
Databehandlingen (fra tilsendt dokumentasjon):

- Det skal ikke behandles personopplysninger om pasienter i prosjektet. Ved at prosjektdeltager observerer sykepleiestudenter som utfører NEWS-måling på våre pasienter, vil det kunne tilflyte prosjektdeltager taushetsbelagte opplysninger.
- Det innhentes informert samtykke fra pasientene til denne informasjonsutvekslingen.
- Det skal ikke utleveres personidentifiserbare opplysninger til utlandet
- Det skal ikke lagres personopplysninger om sykehusets pasienter, bortsett fra samtykkeskjema, som lagres i tråd med gjeldende retningslinjer.

Personvernombudet ved [redacted] **tilrår** at personopplysninger utleveres til/brukes i prosjektet som beskrevet i tilsendt dokumentasjon under disse forutsetningene:

1. Dataansvarlig: Universitetet i Sørøst-Norge
   Prosjektleder: Anne Mette Høegh-Larsen
   Prosjektperiode: 01.01.2019-31.12.2021

2. Behandling av personopplysninger i prosjektet skjer i samsvar med og innenfor det formål som er oppgitt i melding til NSD og NSDs vurdering. Dersom formålet eller databehandlingen endres må lokalt personvernombud informeres om dette.

3. Skriftlig godkjennelse til deltagelse i prosjektet fra klinikksjef i både medisinsk og kirurgisk klinikk. Bekreftelse fra klinikksjef [redacted] er forelagt personvernombudet. Ber om at godkjennelse fra [redacted] ettersendes til personvernombudet.

4. Prosjektleder sørger for at sykehusets retningslinjer og prosedyrer for forskning og personvern/informasjonssikkerhet overholdes og at sluttmelding sendes til NSD senest prosjektslutt. Kopi av sluttmeldingen sendes til personvernombud@

Personvernombudet informerer prosjektleder, klinikksjef og forskningssjef om tilrådingen.

Personvernombud [redacted]

e-post: personvern...bud@

Til **deg som er operatør og/eller fasilitator i emne 9 «Metoder og intervensjoner 2»**

Informasjon om forskningsprosjektet

” Sykepleierstudenters utvikling av klinisk kompetanse ved bruk av simuleringsbasert trening»

Denne studien er en del av en doktorgrad i personorientert helsearbeid ved Universitetet i Sørøst-Norge (USN). I dette skrivet vil du få informasjon om prosjektet og hvordan det vil påvirke deg.

Formål
Et av formålene med sykepleierutdanningen er å sørge for at sykepleierstudenter har tilstrekkelig klinisk kompetanse for å utøve helsehjelp som har høy kvalitet og som ivaretar pasientsikkerheten. Slik kompetanse kan omtales som klinisk kompetanse. Klinisk kompetanse er sammensatt og består blant annet av ferdigheter, kunnskap, holdninger, personlige egenskaper og evner. Denne studien vil undersøke om PEARLS strukturert debrifing i simuleringsbasert trening i sykepleierutdanningen kan ha effekt på utviklingen av sykepleierstudentenes kliniske kompetanse. Nærmere bestemt i scenariotreningen i emne 9: «Metoder og intervensjoner 2». Deltidskulle[redacted]fulgte våren 2019 det daværende pedagogiske opplegget i debrifing, mens PEARLS strukturert debrifing nå vil testes ut på heltidskulle[redacted] Studentene vil bli invitert til å svare på spørreskjema fire ganger, samt å bli observert i simuleringstrening i emne 9 «Metoder og intervensjoner 2», og to ganger i praksisfeltet i emne 10: «Klinisk sykepleie- Medisin og legemiddelhåndtering» eller emne 11: «Klinisk sykepleie-Kirurgi» mens de utfører NEWS-målinger.

Hva innebærer prosjektet for deg?
Doktorgradsstipendiaten vil være tilstede og observere noen av studentene i emne 9 når du er du er fasilitator eller operatør. Data er knyttet til hvordan studentene utfører og gjør kliniske vurderinger ved NEWS-måling. Hun vil gjøre notater under observasjonene og vil derfor ikke være tilgjengelig for veiledning av studenten. Det skal ikke samles inn data knyttet til deg og din rolle. Doktorgradskandidaten vil også dele ut spørreskjemaer til alle studentene i emne 9.

Hvorfor får du denne henvendelsen?
Du får denne informasjonen fordi du er fasilitator og/eller operatør i emne 9.

Hvem er ansvarlig for forskningsprosjektet?
Universitetet i Sørøst-Norge er ansvarlig for prosjektet.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, ta kontakt med:

- Universitetet i Sørøst-Norge ved PhD-stipendiat Anne Mette Høegh-Larsen, på epost (anne.mette.hoegh-larsen@usn.no) eller telefon: 95 24 35 88.
- Vårt personvernombud ved Universitetet i Sør-øst Norge, Paal Are Solberg, på epost (personvernombud@usn.no) eller telefon: 35 57 50 53.
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen
Anne Mette Høegh-Larsen

Til pasienter ved [redacted]

Vil du delta i forskningsprosjektet

«Sykepleierstudenters utvikling av klinisk kompetanse ved bruk av simuleringsbasert trening»?

Formål
I dette forskningsprosjektet skal det undersøkes hvordan [redacted] kan bidra til at sykepleierstudentene utvikler kompetanse gjennom å øve på avanserte pasientsimulatorer (dukker) i utdanningen før de kommer ut i praksisfeltet. På universitetet har sykepleierstudentene blitt observert når de måler blodtrykk, puls, pust, temperatur og bevissthetsnivå på pasientsimulatorer (dukker). Nå skal studentene observeres når de gjør disse målingene på pasienter for å se hvordan denne kompetansen har utviklet seg.

Hva innebærer studien for deg?
En forsker vil være sammen med sykepleierstudenten når han/hun observerer blodtrykk, puls, pust, temperatur og bevissthetsnivå på deg. Fokuset for forskeren vil være på studentene og hvordan de løser denne oppgaven, ikke på deg. Det vil ikke samles inn opplysninger om deg, men forskeren som er tilstede kan få tilgang til taushetsbelagte opplysninger om deg. Derfor ber vi deg om skriftlig samtykke til at forskeren får være tilstede når du undersøkes. Dersom du ikke ønsker at forskeren skal være tilstede når studenten utfører målingene, kan du når som helst gi beskjed om dette, og vedkommende vil forlate rommet. Forskeren har taushetsplikt.

Hvem er ansvarlig for forskningsprosjektet?

Universitetet i Sørøst-Norge er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Du får spørsmål om å delta i dette forskningsprosjektet fordi du er pasient og skal undersøkes av en sykepleierstudent som har sagt ja til å være med i dette prosjektet.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Dersom du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller hvis du senere velger å trekke deg.

Ditt personvern – hvordan opplysningene oppbevares og brukes
Opplysningene om deg vil kun brukes til formålene som er beskrevet i dette skrivet. Opplysningene behandles konfidensielt og i samsvar med personvernregelverket. Opplysningene som samles inn om deg vil ikke kunne gjenkjennes i publikasjoner. Det er doktorgradskandidaten, oppnevnte veiledere og eventuelle medforfattere som har tilgang til data mens denne studien pågår. Ditt navn vil erstattes med en kode som lagres på egen navneliste adskilt fra øvrige data.

Hva skjer med opplysningene dine når doktorgradprosjektet avsluttes?

Doktorgraden skal etter planen avsluttes 31.12.2021. Data innhentet om studenten vil fra 31.12.2021 anonymiseres.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Opplysninger om deg behandles basert på ditt samtykke.

På oppdrag fra Universitetet i Sørøst-Norge har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Universitetet i Sørøst-Norge ved Anne Mette Høegh-Larsen, på epost (anne.mette.hoegh-larsen@usn.no) eller telefon: 95 24 35 88.
- Universitetet i Sørøst-Norge ved hovedveileder Monika Ravik, på epost (monika.ravik@usn.no) eller ved telefon: 35 57 54 40.
- Vårt personvernombud ved Universitetet i Sørøst-Norge, Paal Are Solberg, på epost (personvernombud@usn.no) eller telefon: 35 57 50 53.
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen
Prosjektansvarlig
Anne Mette Høegh-Larsen

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet «Utvikling av sykepleierstudenters kliniske kompetanse ved bruk av simuleringsbasert trening: En intervensjonsstudie», og har fått anledning til å stille spørsmål. Jeg samtykker til:

☐ å la en forsker observere sykepleierstudenten når han/hun undersøker meg

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, 31. desember 2021

(Signert av prosjektdeltaker, dato)

Til Sykepleiere ved[redacted]

Informasjon om forskningsprosjektet

” Sykepleierstudenters utvikling av klinisk kompetanse ved bruk av simuleringsbasert trening»

Dette er et forskningsprosjekt hvor formålet er å undersøke hvordan simuleringsbasert trening i sykepleierutdanningen kan bidra til utvikling av klinisk kompetanse. Denne studien er en del av en doktorgrad i personorientert helsearbeid ved Universitetet i Sørøst-Norge (USN). I dette skrivet vil du få informasjon om prosjektet og hvordan prosjektet vil påvirke deg og ditt arbeid.

Formål
Et av formålene med sykepleierutdanningen er å sørge for at sykepleierstudenter har tilstrekkelig klinisk kompetanse for å utøve helsehjelp som har høy kvalitet og som ivaretar pasientsikkerheten. Slik kompetanse kan omtales som klinisk kompetanse. Klinisk kompetanse er sammensatt og består blant annet av ferdigheter, kunnskap, holdninger, personlige egenskaper og evner. Denne studien vil teste om et nytt pedagogisk opplegg i simuleringsbasert trening i sykepleierutdanningen kan ha effekt på utviklingen av sykepleierstudentenes kliniske kompetanse. Alle studentene i deltidskulle[redacted]og heltidskulle[redacted]vil inviteres til å delta i studien. Det nye pedagogiske opplegget vil testes ut i simuleringssenteret på universitetet på heltidskulle[redacted] mens deltidskulle[redacted]vil følge det nåværende pedagogiske opplegget. Studentene vil inviteres til å svare på spørreskjema. I tillegg vil studentene observeres i simuleringssenteret når de utfører NEW på en dukke, og observeres på nytt to ganger i praksisfeltet når de utfører NEWS på pasienter. Det vil ikke samles inn data om pasientene.

Hva innebærer prosjektet for deg?
Det innebærer at doktorgradskandidaten vil være tilstede to ganger når din student skal utføre NEWS på en pasient. Hun vil gjøre notater under observasjonene og vil derfor ikke være tilgjengelig for veiledning av studenten. Du kan selv velge om du vil være tilstede eller ikke. Datasamlingen vil foregå høsten 2019 for deltidskulle[redacted] og våren 2020 for heltidskulle[redacted]

Hvem er ansvarlig for forskningsprosjektet?
Universitetet i Sørøst-Norge er ansvarlig for prosjektet.

Hvorfor får du denne henvendelsen?
Du får denne informasjonen fordi du er kontaktsykepleier for sykepleierstudenter i emne 10 *Klinisk sykepleie- Medisin og legemiddelhåndtering,* eller emne 11 *Klinisk sykepleie- Kirurgi.*

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien ta kontakt med:

- Universitetet i Sør-øst Norge ved Anne Mette Høegh-Larsen, på epost (anne.mette.hoegh-lasren@usn.no) eller telefon: 95 24 35 88.
- Vårt personvernombud ved Universitetet i Sør-øst Norge, Paal Are Solberg, på epost (personvernombud@usn.no) eller telefon: 35 57 50 53.
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen
Prosjektansvarlig
Anne Mette Høegh-Larsen

Paper I

Høegh-Larsen, A.M., Ravik, M., Reierson, I.Å., Husebø, S.I., & Gonzalez, M. (2022). PEARLS Debriefing Compared to Standard Debriefing Effects on Nursing Students' Professional Competence and Clinical Judgment: A Quasi-Experimental Study. *Clinical Simulation in Nursing*, Vol.74, p.38-4. https://doi.org/10.1016/j.ecns.2022.09.003

Paper II

Høegh-Larsen, A.M., Gonzalez, M., Reierson, I.Å., Husebø, S.I., & Ravik, M. (2022). Changes in nursing students' self-reported professional competence in simulation-based education and clinical placement: a longitudinal study. *Nurse education today,* Vol.119. https://doi.org/10.1016/j.nedt.2022.105592

Paper III

Høegh-Larsen, A.M., Gonzalez, M., Reierson, I.Å., Husebø, S.I., Hofoss, D., & Ravik, M (2023). Nursing students' clinical judgment skills in simulation and clinical placement: a comparison of student self-assessment and evaluator assessment. *BMC Nursing,* Vol.22 (1), p.64-64. https://doi.org/10.1186/s12912-023-01220-0

BMC Nursing

RESEARCH Open Access

Nursing students' clinical judgment skills in simulation and clinical placement: a comparison of student self-assessment and evaluator assessment

Anne Mette Høegh-Larsen[1*], Marianne Thorsen Gonzalez[1], Inger Åse Reierson[1], Sissel Iren Eikeland Husebø[2,3], Dag Hofoss[1] and Monika Ravik[1]

Abstract

Background Clinical judgment is an important and desirable learning outcome in nursing education. Students must be able to self-assess their clinical judgment in both the simulation and clinical settings to identify knowledge gaps and further improve and develop their skills. Further investigation is needed to determine the optimal conditions for and reliability of this self-assessment.

Aims This study aimed to compare the same group of students' self-assessment of clinical judgment with an evaluator's assessment in both simulation and clinical settings. The study further aimed to investigate whether the Dunning-Kruger effect is present in nursing students' self-assessment of clinical judgment.

Methods The study applied a quantitative comparative design. It was conducted in two learning settings: an academic simulation-based education course, and a clinical placement course in an acute care hospital. The sample consisted of 23 nursing students. The Lasater Clinical Judgment Rubric was used to collect data. The scores were compared using a *t*-test, intraclass correlation coefficient, Pearson's correlation coefficient, and Bland-Altman plots. The Dunning-Kruger effect was investigated using linear regression analysis and a scatter plot.

Results The results showed an inconsistency between student self-assessment and evaluator assessment of clinical judgment in both simulation-based education and clinical placement. Students overestimated their clinical judgment when compared to the more experienced evaluator's assessment. Differences between students' scores and the evaluator's scores were larger when the evaluator's scores were low, indicating the presence of the Dunning-Kruger effect.

Conclusion It is vital to acknowledge that student self-assessment alone may not be a reliable predictor of a student's clinical judgment. Students who had a lower level of clinical judgment were likely to be less aware that this was the case. For future practice and research, we recommend a combination of student self-assessment and evaluator assessment to provide a more realistic view of students' clinical judgment skills.

*Correspondence:
Anne Mette Høegh-Larsen
anne.mette.hoegh-larsen@usn.no

Full list of author information is available at the end of the article

Keywords Nursing education research, Nursing students, Clinical judgment, Simulation training, Clinical placement, Self-assessment

Background

Clinical judgment skills are required to provide safe patient care and is therefore an important and desired learning outcome in nursing education [1–4]. The term clinical judgment skills are defined by Benner and Tanner [5] (p200) as "the ways in which nurses come to understand the problems, issues, or concerns of clients and patients, to attend to salient information, and to respond in concerned and involved ways". Simulation-based education and clinical placement are the learning activities in nurse education most relevant to facilitating the development of students' clinical judgment [2, 3, 6–9]. Failure for students to receive educational support and thereby achieve an adequate level of clinical judgment constitutes a major threat to patient safety, potentially leading to negative consequences for patients and society [10, 11].

Assessment of student competence is a pillar of education and is necessary to determine students' further learning needs [12–14]. Hence, it is important to assess nursing students' level of clinical judgment in the simulation setting and the clinical setting. Having the most accurate picture possible of nursing students' clinical judgment skills can help educators identify knowledge gaps that hinder students in making sound clinical judgments [13]. By identifying students' knowledge and skill gaps, educators can further support the development of competence to better meet professional nursing care standards for patients with multifaceted issues [6, 8, 13, 14].

Nursing students' clinical judgment skills can be assessed by an evaluator, such as a faculty member or clinical supervisor, or by students themselves using self-assessment [8, 11, 15]. Evaluators who perform assessments must be trained in observing and mapping more objectively based on observations, as well as in the use of the instrument assessing the skills in question [16]. Andrade [17] defines self-assessment as "the act of monitoring one's processes and products in order to make adjustments that deepen learning and enhance performance". As used in education, self-assessment is considered to promote students' responsibility for and self-regulation of their own learning [18]. Students' ability to judge the quality of their own and other's work is vital for patient safety and healthcare quality [19]. This capability can also be defined as evaluate judgment and such skill might support students' learning after graduating [19, 20]. Self-regulatory skills such as self-assessment and evaluating judgment may support students in directing and regulating their actions towards learning outcomes and are thus necessary for the transition from novice student to lifelong learner in clinical practice [12, 18, 19, 21]. In research, self-assessment is commonly used to explore and describe students' behaviour, skills, performance, and experiences [16]. Additionally, student self-assessment is often chosen in education and research to minimize the resources required, such as faculty and researcher staff time [16–18, 22].

Students' self-assessment processes have been investigated in various ways. Consistency between different assessment methods has been found to be valuable for identifying students' knowledge gaps and subsequently improving their nursing skills, performance, and behaviour [16]. Consistency has typically been investigated by comparing students' self-assessments with an experienced evaluator's assessment [21, 23]. To our knowledge, three previous studies [24–26] have compared nursing students' self-assessment and evaluators' assessment of students' clinical judgment using the Lasater Clinical Judgment Rubric (LCJR) [6]. The use of rubrics is considered the key to reliable assessment in education and research [27]. Rubrics include assessment criteria, levels of performance and the weights of each criterion [28]. According to a recent systematic literature review, LCJR is currently the most recognized instrument for assessing nursing students' clinical judgment [29]. Two of the three previous studies comparing students' and evaluator assessment were conducted in the simulation setting [24, 26] while the third study [25] was conducted in the clinical setting. The overall conclusion in all these three studies is that students tend to overestimate their clinical judgment skills in both the simulation and the clinical setting when compared to an evaluator assessment. However, none of the studies investigated the same students in different settings, even though it has been argued that self-assessment should be investigated under different settings [16, 17, 21, 23]. Thus, looking at the same group of students' self-assessment of clinical judgment skills in two settings may provide valuable knowledge.

Addressing the process of assessing clinical judgment skills, the response bias from students' self-assessment is of interest as it may act as a barrier to reflection and learning [16]. One example of response bias is the Dunning-Kruger effect [30], which identifies that individual with low competence overestimate their competence. The Dunning-Kruger effect can be identified by a simple calculation of the difference between a student's subjective self-assessment and a more objective assessment performed by an experienced evaluator [16, 30]. If the Dunning-Kruger effect is present among nursing students and they are unable to recognize their deficits in

clinical judgment, relying heavily on student self-assessment of clinical judgment may lead to inaccurate evaluations in educational learning outcomes and research, and ultimately threaten patient safety and patient care [16, 31, 32].

Irrespective of the benefits mentioned above and the established use of self-assessment of nursing students' clinical judgment skills in education and research, knowledge gaps concerning the assessment process still exist. As the organizational and pedagogical approaches used in the simulation setting and the clinical setting differ, it is of interest to investigate the self-assessment process in both settings. Such knowledge may enable educators to apply appropriate pedagogical approaches to further develop students' clinical judgment. To our knowledge, there are no existing studies comparing the same group of students' self-assessments with evaluators' assessments in two different settings. Moreover, no previous studies have investigated whether the Dunning-Kruger effect [30] is present in nursing students' self-assessment of clinical judgment skills.

Thus, this study aimed to compare the same students' self-assessments of clinical judgment with evaluators' assessments in both simulation and clinical settings. The study further aimed to investigate whether the Dunning-Kruger effect [30] is present in nursing students' self-assessment of clinical judgment. The research questions were as follows:

1. Did nursing students' self-assessment of clinical judgment in the simulation setting reflect their clinical judgment as assessed by an evaluator?
2. Did the same nursing students' self-assessment of clinical judgment in the clinical placement setting reflect their clinical judgment as assessed by an evaluator?
3. Is the Dunning-Kruger effect present in nursing students' self-assessment of clinical judgment in the simulation setting or the clinical setting?

Methods

Research design

This study uses a quantitative, comparative design and is reported in accordance with the STROBE guidelines (Additional file 1) and the Reporting Guidelines for Health Care Simulation Research [33]. The study is part of a larger study addressing nursing students' professional competence and clinical judgment.

Research settings

The study took place in the second year of a three-year Bachelor of Nursing programme at a Norwegian university. This undergraduate nursing education programme entailed 180 credits in the European Credit Transfer and Accumulation System (ECTS) [34]. More specifically, the nursing students got 90 ECTS credits from theoretical courses mainly in the academic setting, minimum 75 ECTS credits from clinical placement in a variety of settings, and maximum 15 ECTS credits from simulation-based education in laboratories [34]. The study was conducted in two learning settings: a simulation centre on the university campus and an acute care hospital unit.

In the simulation setting, the students took part in a two-day simulation-based education course comprising six simulation sessions focusing on different deteriorated patient conditions and diagnoses. Nine faculty members were involved as facilitators and operators. Students were divided into groups of six to nine, alternating between the roles of nurse and observer. The simulation environment mirrored a patient room in a hospital unit and Laerdal SimMan 3G™ and ALS™ manikins were used. Each simulation session (90 min) consisted of a prebriefing (15 min), a simulated scenario (15 min), a viewing of the video recording of the simulated scenario (15 min), and a facilitator-led group debriefing (45 min). For the debriefing, the Promoting Excellence and Reflection in Simulation (PEARLS) structured and scripted debriefing [35] method was used.

After the simulation-based education course, the students attended an eight-week clinical placement course in a medical or surgical hospital unit hosting adult patients with acute, critical, and chronic conditions. Students provided nursing care under the supervision of a registered nurse working in the relevant unit. Nurse educators supervised the students in groups to promote reflection and learning and to evaluate their learning outcomes.

The learning outcomes for both courses entailed the same clinical judgment skills.

Recruitment and participants

The target group for the study was second-year nursing students. In advance of the recruitment, all students had completed theoretical courses addressing pathology and core nursing issues related to patients in need of acute care, had passed a six-week clinical placement course in a nursing home, were certified in cardiopulmonary resuscitation, and had attended compulsory classes in practical nursing skills. For recruiting, information about the study was published on the university's digital learning platform and distributed in a pre-clinical course by the first author. Eligible participants were informed about the study aim, data collection methods, confidentiality, voluntary participation, and their right to withdraw. A sample size calculation showed that 16 student-evaluator comparisons were sufficient to identify an average 2-point difference between student and evaluator scores on the LCJR, with a standard deviation of 4 points. Due to the predetermined organisation of the simulation-based education and the clinical placement

courses, it was impossible to collect data from more than one student at a time. Consequently, the study allowed for a maximum of 24 participants out of the 89 students attending the courses. Of these, the first 24 students who signed up to participate were formally invited, of which N=23 participated. The sample consisted of 19 women (82.6%) and four men (17.4%), with ages ranging from 20 to 54 years (Mean=28 years). None of the participants had previous experience with scenario simulation, and 78.3% had experience working in healthcare services.

Measure

The Norwegian version of the Lasater Clinical Judgment Rubric (LCJR-N) [9] was used to collect data concerning nursing students' clinical judgment skills. The original LCJR was developed by Lasater [6] to directly observe and evaluate students' individual performance of clinical judgment in a simulation setting. It was designed to provide a common language for learners, faculty, and preceptors to talk about learners' thinking and to serve as a help for offering formative guidance and feedback [6, 11]. It is based on Benner's novice to expert model [36] and Tanner's clinical judgment model [4]. LCJR has emerged as a tool used by evaluators for observation and by students for self-assessment in both simulation and clinical settings [11, 15, 37]. The LCJR corresponded well to students' learning outcomes in the simulation-based education course and the clinical placement course. The LCJR consists of four dimensions, called subscales in the present study, with a total of 11 items: *Noticing* (3 items), *Interpreting* (2 items), *Responding* (4 items), and *Reflecting* (2 items) [6]. The items on students' performance were scored from 1 to 4 with higher scores indicating better clinical judgment: 1 point=beginning, 2 points=developing, 3 points=accomplished, and 4 points=exemplary [6]. The total score ranges from 11 to 44.

The LCJR has been translated into Norwegian, Swedish, German, Chinese and several other languages [9, 25, 38, 39]. In a recent review, internal consistency was supported for both evaluator and student self-assessment [15]. Regarding reliability and validity for the Norwegian version of LCJR (LCJR-N) in previous research, Cronbach's alphas (0.74–0.91) indicated good internal consistency and face validity was verified [9]. In the current study, the Cronbach's alphas for the LCJR-N total score ranged from 0.87 to 0.91, and from 0.69 to 0.85 for the *Noticing* and *Responding* subscales. Alpha values were not calculated for the *Interpreting* and *Reflection* subscales as these scales only had two items each.

Data collection

Data were collected from students and the evaluator in December 2019 in the simulation setting and in February 2020 in the clinical setting. Data on students' self-assessments using the LCJR-N were collected by self-reported questionnaires in pen and paper format together with demographic information. Data from the evaluator were also collected by using LCJR-N in pen and paper format.

In the simulation setting, the evaluator completed the LCJR-N for each student while observing the student in the simulation scenario. Data for the subscale *Reflecting* was collected by observing the students in the debriefing. Immediately after the simulation-based education course, the LCJR-N was handed out to the students. Each student completed the LCJR-N while recalling the simulation scenario, in which they had monitored vital signs on the manikin. The questionnaires were distributed and collected by faculty members who were not otherwise engaged in the study.

In the clinical setting, the same evaluator completed the LCJR-N for each student while observing the students in a patient care situation where the student monitored a patient's vital signs. Data for the subscale *Reflecting* were collected by posing three questions to each student after they left the patient's room ("If you had to do it again, would you do anything differently?", "What would you do then?", and "Why would you do this differently?"). Immediately after, each student completed the LCJR-N while recalling the patient care situation. The LCJR-Ns were distributed to the students and collected by the evaluator.

The term "evaluator" in this study refers to first author, who is a registered nurse (RN) with a Master's degree in Nursing Science (MSN), a researcher, and a faculty member. The evaluator was not involved in any of the participants' educational activities. The evaluator has years of experience with the simulation setting and pedagogical approaches in simulation-based education, as well as with supervising and assessing students in clinical placements. Moreover, the evaluator is a clinically experienced RN having worked 15 years in acute care units entailing using clinical judgment skills when caring for deteriorating patients. The evaluator's preparatory work for data collection included examining the concept of clinical judgment and using LCJR-N as an observation tool by testing it in a simulation scenario. During this preparation, the evaluator corresponded with the LCJR's developer Kathie Lasater regarding the use of the LCJR in various assessments and the use of only one evaluator. Because using only one evaluator may create evaluation biases [40], this issue was carefully considered. The credibility of data collected by only one evaluator was considered acceptable and in line with reported findings in a recent review by Lee [15] demonstrating high interrater reliability metrics for the LCJR. All students had previous experience with use of the LCJR-N from having participated in an earlier research study.

Table 1 Comparison of students' self-assessment and evaluator's assessment on LCJR-N

	In the simulation setting			In the clinical setting		
	Students	Evaluator		Students	Evaluator	
Variables	**Mean ± SD**	**Mean ± SD**	***p***	**Mean ± SD**	**Mean ± SD**	***p***
LCJR-N						
Total score	31.26 ± 5.28	26.65 ± 4.37	0.002*	30.48 ± 4.40	29.65 ± 2.81	0.465
Noticing	8.52 ± 1.76	6.39 ± 1.47	0.000*	8.04 ± 1.43	7.65 ± 0.83	0.274
Interpreting	5.39 ± 1.20	4.65 ± 1.11	0.038*	5.35 ± 1.03	5.35 ± 0.78	1.000
Responding	11.09 ± 1.93	10.00 ± 1.83	0.027*	10.91 ± 1.89	10.61 ± 1.08	0.475
Reflecting	6.26 ± 1.18	5.61 ± 1.12	0.029*	6.17 ± 0.89	6.04 ± 1.02	0.613

Note. LCJR-N = Lasater Clinical Judgment Rubric Norwegian Version. *$p < 0.05$

Table 2 Agreement and correlation between students' self-assessment and evaluator's assessment on LCJR-N

	In the simulation setting				In the clinical setting			
Variables	**ICC**	**95% CI**	***p***	***r***	**ICC**	**95% CI**	***p***	***r***
LCJR-N								
Total score	0.17	-0.25 - 0.54	0.210	0.18	-0.04	-0.44 - 0.37	0.581	-0.05
Noticing	-0.01	-0.41 - 0.39	0.522	-0.01	-0.02	-0.42 - 0.39	0.540	-0.03
Interpreting	0.39	-0.37 - 0.44	0.429	0.04	-0.26	-0.60 - 0.16	0.892	-0.27
Responding	0.32	-0.10 - 0.64	0.063	0.32	0.14	-0.28 - 0.52	0.257	0.16
Reflecting	0.32	-0.09 - 0.64	0.062	0.32	0.19	-0.23 - 0.55	0.187	0.19

Note. LCRJ-N = Lasater Clinical Judgment Rubric Norwegian Version; ICC = Intraclass Correlation Coefficient

Statistical analysis

Data were analysed by SPSS version 28.0. A paired-samples *t*-test was used to compare the students' and the evaluator's LCJR-N scores. Intraclass correlation coefficient (ICC) was used to investigate degrees of correlation and agreement between students' and the evaluator's LCJR-N scores, in line with the suggestions of Koo and Li [41]. ICC estimates and their 95% confidence intervals were based on a mean rating ($k=2$), consistency, and a 2-way mixed-effects model [41]. ICC was interpreted in line with Landis and Koch [42], with values ≤ 0.20 indicating slight agreement, from 0.21 to 0.40 indicating fair agreement, 0.41 to 0.60 indicating moderate agreement, 0.61 to 0.80 indicating substantial agreement, and ≥ 0.81 indicating almost perfect agreement. Pearson's correlation coefficient was used to investigate the relationship between students' and the evaluator's LCJR-N scores. Pearson's correlation coefficients were interpreted as $r=0.10$, 0.30, and 0.50 indicating a small, medium, or large correlation, respectively [43]. Bland-Altman plots were created to illustrate the average bias and to investigate whether there were systematic differences between students' and the evaluator's LCJR-N scores [44].

Linear regression analysis was used to investigate whether the Dunning-Kruger effect was present in nursing students' self-assessment of clinical judgment skills in the simulation setting or the clinical placement setting. The linear regression analysis determined whether the discrepancy between student LCJR-N scores and evaluator LCJR-N scores was the same across the evaluator's LCJR-N scores or increased with lower values on the evaluator's LCJR-N scores. A scatter plot was created to illustrate the results of the linear regression.

The *p*-value for statistical significance was set at <0.05.

Results

Comparison of student self-assessment and evaluator assessment of students' clinical judgment in the simulation setting

In the simulation setting, students' LCJR-N total score and subscale scores were significantly higher than the evaluator's scores (Table 1). The Pearson's correlation coefficients for student and evaluator assessments for both total score and subscales were quite low (-0.01 to 0.32), with none of them reaching statistical significance (Table 2). The ICC of the LCJR-N total score and the subscale *Noticing* ranged from −0.01 to 0.17, indicating "slight agreement" between the students' and the evaluator's assessments. The ICC scores for the subscales *Interpreting*, *Responding*, and *Reflecting* ranged from 0.32 to 0.39, indicating "fair agreement" between the students' and evaluator's scores in the simulation setting (Table 2). The Bland-Altman plots showed a systematic difference and wide limits of agreement between students' and evaluator's LCJR-N total score and subscale scores. The Bland-Altman plots for all LCJR-N subscales and total score illustrated that students' scores were higher than the evaluator's score. Figure 1 shows an example of the Bland-Altman plot for the LCJR-N total score in the simulation setting.

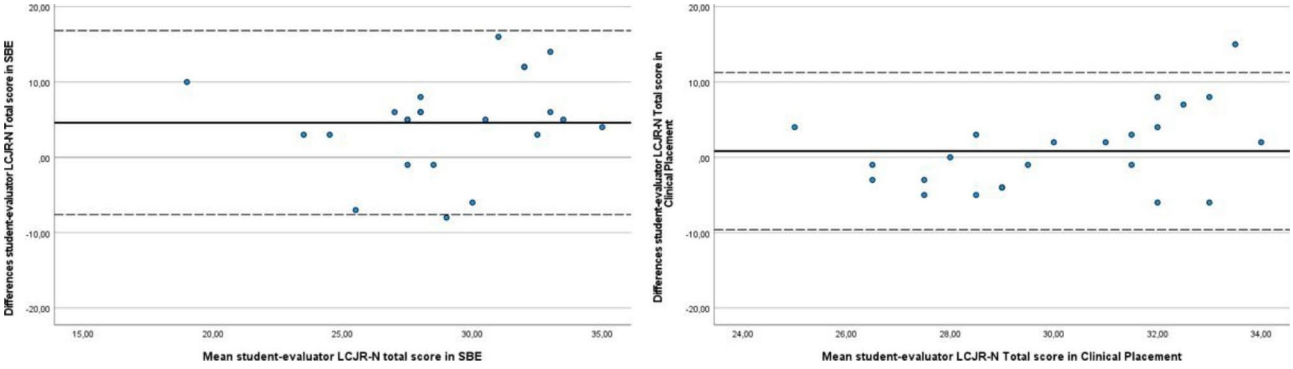

Fig. 1 Bland-Altman plots of students' self-assessment and evaluator's assessment on LCJR-N total scores in simulation-based education (SBE) and clinical placement

Table 3 Changes in student-evaluator differences on LCJR-N by evaluators assessment on LCJR-N

	In the simulation setting		In the clinical setting	
Variables	**b**	***p***	**b**	***p***
LCJR-N				
Total score Student-Evaluator difference	-0.787	0.006*	-1.076	0.005*
Noticing Student-Evaluator difference	-1.015	< 0.001*	-1.043	0.011*
Interpreting Student-Evaluator difference	-0.958	< 0.001*	-1.362	< 0.001*
Responding Student-Evaluator difference	-0.662	0.006*	-0.717	0.071
Reflecting Student-Evaluator difference	-0.660	0.006*	-0.833	< 0.001*

Note. LCJR-N = Lasater Clinical Judgment Rubric Norwegian Version. *$p < 0.05$

Comparison of student self-assessment and evaluator assessment of students' clinical judgment in the clinical setting

In the clinical setting, students' LCJR-N total score and subscale scores were higher than the evaluator's scores; however, this difference was not significant (Table 1). The Pearson's correlation coefficient (*r*) for student and evaluator assessments on LCJR-N total score and subscales were quite low (-0.27 to 0.19) and none of them reached statistical significance (Table 2). The ICC values of the LCJR-N total score and all subscales ranged from −0.26 to 0.19, indicating "slight agreement" between the students' and the evaluator's assessments (Table 2). The Bland-Altman plots indicated a systematic difference and wide limits of agreement between students' and the evaluator's LCJR-N total score and all subscale scores. Each Bland-Altman plot showed that students' scores were higher than the evaluator's scores. Figure 1 shows an example of the Bland-Altman plot for LCJR-N total score in the clinical setting.

The Dunning-Kruger effect in students' self-assessment of clinical judgment

In the simulation setting, the linear regression analysis of LCJR-N total score and subscales showed that the difference between the students' scores and the evaluator's score increased significantly as the evaluator's score decreased (Table 3; Fig. 2). This means that the differences between student and evaluator scores were larger when the evaluator's score was low.

In the clinical setting, the linear regression analysis of LCJR-N total score and the subscales *Noticing*,

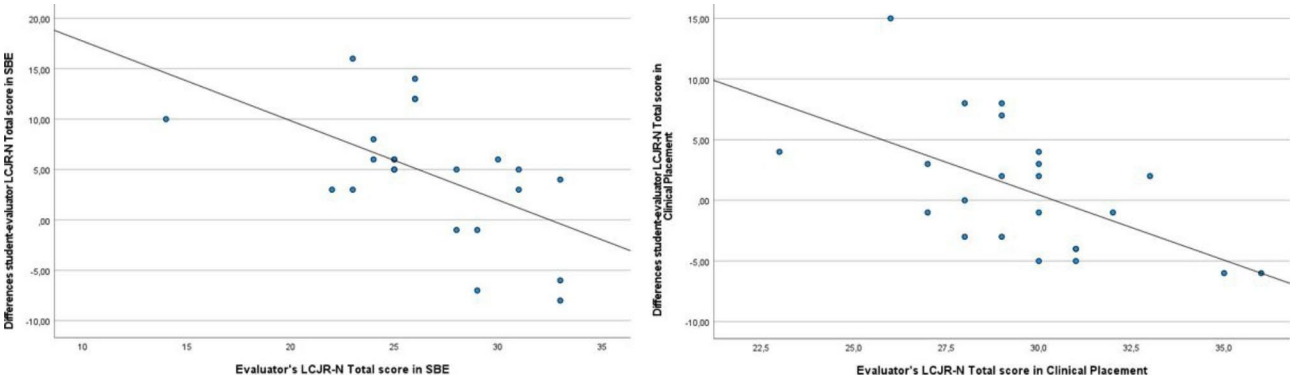

Fig. 2 Scatter plots of differences in student-evaluator LCJR-N total scores by evaluator's LCJR-N total score in simulation-based education (SBE) and clinical placement

Interpreting, and *Reflecting* showed that the difference between student and evaluator scores increased significantly as the evaluator's score decreased (Table 3; Fig. 2). In absolute terms, the patterns were similar for the subscale *Responding*, however, this regression effect was not significant (Table 3; Fig. 2).

Discussion

Comparison of student self-assessment and evaluator assessment of students' clinical judgment

Comparing students' self-assessment and evaluator assessment of students' clinical judgment skills, the overall results showed an inconsistency in both the simulation and clinical settings. Students assessed their clinical judgment as being higher than the evaluator did. When comparing the assessments using *t*-tests, this difference was significant in the simulation setting but not in the clinical setting. However, using supplementary statistical tests such as Pearson's r, ICC, and scatter plots, we found the inconsistency between student and evaluator assessment to be present independently of the learning setting. These findings regarding assessment of nursing students' clinical judgment both in the simulation and clinical settings add valuable knowledge to this research field.

Because no existing research has investigated the same group of students in two educational settings, in what follows we compare our results with findings from research conducted in one educational setting. The student-evaluator inconsistency identified in our study concurs with previous studies concluding that students tend to overestimate their clinical judgment compared to evaluators [24–26]. In accordance with our findings from the simulation setting, Strickland and Cheshire [26] found student self-assessment in the simulation setting to be higher than evaluator assessment, and they reported a positive, although not strong, correlation ($r=0.31$) between these assessments. Likewise, Jensen [24] found that students rated themselves higher than the evaluator did in the simulation setting, although not significantly higher. Corresponding to our findings, Jensen [24] also reported weak correlations (r = -0.14–0.27) between students' assessment and evaluators' assessment. In accordance with our findings from the clinical placement setting, Vreugdenhil and Spek [25] found the student-evaluator difference to be systematic and significant ($p=0.020$) when investigating agreement, with students tending to score themselves significantly higher (6.1%) than the evaluator did. As in our findings, Vreugdenhil and Spek [23] did not find any significant differences between students' and evaluators' assessments in a *t*-test analysis, but they did find a strong positive correlation ($r=0.78$) between students' self-assessment and evaluator assessment, which is different from our findings. Taken together, previous studies and our study show that students tend to rate their clinical judgment higher than the evaluator, regardless of being studied in the simulation or the clinical setting and regardless of being studied in one or two settings.

The inconsistency between the same students' and same evaluator's assessments in the simulation setting and the clinical setting in our study may have several explanations. The student-evaluator inconsistency might be due to different understandings of the concept of clinical judgment. Although students were trained in the use of the LCJR-N, the items on which corresponded to the learning outcomes in the simulation-based education course and the clinical placement course, their cognitive or linguistic representation of clinical judgment might still be limited [45]. On this issue, the use of a rubric as LCJR-N in the assessment process could make it easier for students and evaluators to recognize the expectations for clinical judgment [6]. However, assessing clinical judgment is complicated and requires metacognitive skills, the ability to think abstractly, and an in-depth understanding of nurses' responsibilities and role in the clinical setting [29]. The students and the evaluator might have had different perceptions of clinical judgment and therefore interpreted the assessment criteria in the LCJR-N differently. The students might have focused on specific tasks more than on cognitive processes in clinical judgment. Novice students often lack capability to reflect abstractly on theoretical and practical aspects of a skill and thus tend to focus on superficial features of their performance in the self-assessment process [16, 23]. This argument aligns well with Benner's "from novice to expert" theory [36], which identifies five levels of competence in nursing – novice, advanced beginner, competent, proficient, and expert – each of which builds upon the previous one. Benner [36] describes nursing students as being at a novice level, characterised by having little experience and understanding of the situations in which they are expected to perform, which is often the case. In the current study, students' limited experience might have affected their understanding of the contextual meaning of clinical judgment and how to apply these skills in simulation scenarios or clinical situations, and thus also influenced their self-assessments.

The Dunning-Kruger effect in student self-assessment of clinical judgment

To investigate whether the Dunning-Kruger effect was present in students' self-assessment of clinical judgment, the evaluator's score for students' clinical judgment was considered more accurate due to the evaluator's training in the use of LCJR-N and her higher level of education, competence, and experience.

The findings indicate that the Dunning-Kruger effect was present in students' self-assessment of clinical judgment in both the simulation setting and the clinical

setting due to the larger student-evaluator differences when the evaluator's score was low. These findings are consistent with findings reported in a recent review on the Dunning-Kruger effect in a variety of educational contexts in the social sciences [16].

An explanation for our findings might be students' lack of metacognitive awareness of their own clinical judgment. In other words, the students who were assessed by evaluator as having a lower level of clinical judgment were unaware of having a low level, and therefore were more likely to overestimate their clinical judgment [30]. It is questionable whether novice nursing students' halfway through a bachelor's programme have sufficient metacognitive skills and a sufficient level of self-reflection to accurately assess their own clinical judgment. Metacognitive skills involving assessing one's own competence develop through self-evaluation, self-reflection, and feedback from others [16, 30]. Reflection itself is vital and valued in simulation-based education and clinical placement in nursing education. Reflection in these settings comprises students' assessment of their actions and previous clinical situations followed by the integration of new knowledge and adjustment of clinical performance [4, 46]. Such assessment might promote learning and has the potential to develop students' evaluative judgment and further lifelong learning [19, 47]. In the simulation setting in this study, students' self-reflection on clinical judgment was carefully promoted by using the student-centred and structured Promoting Excellence and Reflection in Simulation (PEARLS) debriefing [35]. While student-centred and structured debriefing approaches have the potential to provide students with optimal opportunities for reflection and increased activity [48, 49], a pitfall in debriefing is that facilitators do not appropriately close all relevant performance gaps [50]. Hence, the facilitator might not have been attentive to students' performance gaps concerning clinical judgment, resulting in missed learning opportunities.

Acknowledging the potential for the Dunning-Kruger effect in students' self-assessment of clinical judgment in nursing education offers opportunities for establishing meaningful feedback discussions while learning and improving [16]. As novice students gradually develop metacognitive skills over the course of their education, blind spots regarding their own clinical judgment might decrease [36]. Hence, students' metacognitive skills and the potential presence of the Dunning-Kruger effect should always be considered when deciding on an assessment method for nursing student's clinical judgment.

Limitations

The study has some limitations. The sample size and the fact that there was only one sampling site limit the generalisability of the findings. There may also be measurement errors due to the use of only one evaluator [51]. Despite the evaluator's theoretical and practical preparation to avoid observational biases, having only one evaluator eliminated the possibility of doing interrater reliability analysis on scores between evaluators [40]. Although the evaluator was prepared for the observation and not involved with students from other learning activities, objective observation and assessment of skills such as clinical judgment is always a challenge [40, 51]. Another potential measurement error is that students' behaviour in the data collection situations might have been atypical due to their awareness of being observed [52], also known as the Hawthorne effect [53]. Finally, there is also a risk of instrumentation bias as the LCJR-N has not been psychometrically tested for the Norwegian context.

Implications for education and future research

Although nursing students' self-assessment is widely used and considered valuable for evaluation and learning [15, 16, 29], our findings urge caution when interpreting nursing students' self-assessment of clinical judgment in education. Students' ability to determine their own level of competence and identify knowledge gaps is decisive for clinical performance within the limits of their competence in a lifelong learning perspective [19, 54–56]. Therefore, nurse educators should facilitate students' metacognitive skills and their evaluative judgement related to clinical judgment. Further, acknowledging the presence of the Dunning-Kruger effect among nursing students may inspire faculty to promote students' metacognitive skills and self-reflection, thereby supporting students in their learning process [16]. Promoting nursing students' self-reflection regarding clinical judgment by using LCJR in simulation-based education and various clinical placement settings may help students gain a deeper understanding of the concept of clinical judgment before graduating. For future educational assessment practice in simulation and clinical settings, a combination of assessment methods is recommended [13]. Student self-assessment, evaluator assessment, and feedback may offer a more realistic interpretation of students' clinical judgment and help faculty to identify those students who require additional support during their education before graduation [24, 26, 57].

For future research, pedagogical interventions aiming to promote nursing students' metacognitive skills in relation to clinical judgment using controlled designs should be performed. Researchers should be aware of the Dunning-Kruger effect and its potential impact on validity when having students' self-assessments as the only data source. Moreover, the Dunning-Kruger effect among nursing students should also be investigated using larger samples and other instruments. Finally, studies using a

qualitative approach to explore nursing students' experiences from self-assessment of clinical judgment are welcomed.

Conclusion

This study contributes to the body of knowledge regarding assessment of nursing students' clinical judgment using the LCJR-N in the field of nursing education and research. Overall, our findings indicate an inconsistency between student self-assessment and evaluator assessment in the simulation setting and in the clinical setting, with students tending to have a higher estimation of their own clinical judgment compared to an evaluator's assessment. The findings further demonstrate that the Dunning-Kruger effect was present in our sample, as students whom the evaluator assessed as having a lower level of clinical judgment were likely to be unaware of their own low level.

For future practice and research, it is vital to acknowledge that student self-assessment alone may not be a reliable predictor of a student's clinical judgment. Thus, we recommend a combination of student self-assessment and evaluator assessment to provide a more realistic view of students' clinical judgment.

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Author Contribution
AMHL: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing-original draft, Writing- reviewing and editing, Project administration. MTG: Conceptualization, Methodology, Writing- reviewing and editing, Supervision. IÅR: Conceptualization, Methodology, Writing- reviewing and editing, Supervision. SIEH: Conceptualization, Methodology, Writing-reviewing and editing, Supervision. DH: Conceptualization, Methodology, Formal analysis, Writing- reviewing and editing, Supervision. MR: Conceptualization, Methodology, Writing- reviewing and editing, Supervision. All authors have read and agreed to the published version of the manuscript.

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Data Availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The Norwegian Centre for Research Data approved every aspect of this study (approval number 624052). The Faculty of Health and Social Sciences at the university, the hospital administrations, and the hospital's data protection representative approved the study. The patients involved through the data collection during the clinical placement course in the hospital unit received written and oral information about the study from the student before the evaluator entered the room, including the level of patient involvement, voluntary nature of participation, and the right to reject or withdraw from the study. Patients consented in writing to the evaluator's presence in the room where data were collected. All participants provided written informed consent. According to national regulations, approval from a medical ethical committee to collect this type of data was not necessary. All methods in this study were carried out in accordance with relevant guidelines and the Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guideline was used to report the study.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Department of Nursing and Health Sciences, Faculty of Health and Social Sciences, University of South-Eastern Norway, Postbox 235, Kongsberg 3603, Norway
[2]Department of Quality and Health Technology, Faculty of Health Sciences, University of Stavanger, Stavanger, Norway
[3]Department of Surgery, Stavanger University Hospital, Stavanger, Norway

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