



Turun yliopisto
University of Turku

NURSE COMPETENCE OF GRADUATING NURSING STUDENTS

Satu Kajander-Unkuri

University of Turku

Faculty of Medicine

Department of Nursing Science

Doctoral Programme in Nursing Science

Supervised by

Professor Helena Leino-Kilpi, RN, PhD, FEANS
Department of Nursing Science
University of Turku
Finland

Professor Riitta Suhonen, RN, PhD, FEANS
Department of Nursing Science
University of Turku
Finland

Reviewed by

Adjunct professor Anja Rantanen, RN, PhD
School of Health Sciences
University of Tampere
Finland

Adjunct professor Merja Sankelo, RN, PhD
Department of Nursing Science
University of Turku
Research Principal Lecturer
School of Health Care and Social Work
Seinäjoki University of Applied Sciences
Finland

Opponent

Adjunct professor Paula Asikainen, RN, PhD
School of Health Sciences
University of Tampere
Administrative Head Nurse
Satakunta Hospital District
Finland

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Department of Nursing Science, Faculty of Medicine, University of Turku, Finland
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ABSTRACT

The competence of graduating nursing students is an important issue in health care as it is related to professional standards, patient safety and the quality of nursing care. Many changes in health care lead to increased demand with respect to nurses' competence as well the number of nurses. The purpose of this empirical study was to i) describe the nurse competence areas of nursing students in Europe, ii) evaluate the nurse competence of graduating nursing students, iii) identify factors related to the nurse competence, and to iv) assess the congruence between graduating nursing students' self-assessments and their mentors' assessments of students' nurse competence.

The study was carried out in two phases: descriptive phase and evaluation phase. The descriptive phase focused on describing the nurse competence areas of nursing students in Europe with the help of a literature review (n=10 empirical studies and n=4 additional documents). Thematic analysis was used as the analysis method. In the evaluation phase, the nurse competence with particular focus on nursing skills of graduating nursing students (n=154) was assessed. In addition, factors related to the nurse competence were examined. Also, the congruence between graduating nursing students' self-assessments and their mentors' assessments of students' nurse competence was evaluated by comparing graduating nursing students' self-assessments with the assessments by their mentors (n=42) in the final clinical placement in four university hospitals. Descriptive statistics and inferential statistics were used to analyse the data.

Based on the results, the nurse competence of nursing students in Europe consists of nine main competence areas: (1) professional/ethical values and practice, (2) nursing skills and interventions, (3) communication and interpersonal skills, (4) knowledge and cognitive ability, (5) assessment and improving quality in nursing, (6) professional development, (7) leadership, management and teamwork, (8) teaching and supervision, and (9) research utilization.

Graduating nursing students self-assessed their nurse competence as good. However, when graduating nursing students' nurse competence was assessed by their mentors, the results were poorer. Readiness for practice based on nurse education, pedagogical atmosphere on the ward, supervisory relationship between student and mentor and being in paid work in health care at the moment of the study were the most significant factors related to the nurse competence.

Conclusions: Nurse competence can be evaluated with a scale based on self-assessment, but other evaluation methods could be used alongside to ensure that nurse competence can be completed and evaluated critically. Practical implications are presented for nurse education and nursing practice. In future, longitudinal research is needed in order to understand the development of nurse competence during nurse education and the transition process from a nursing student to a professional nurse.

Key words: Nurse competence, Graduating nursing student, Assessment of competence, Nurse education

Satu Kajander-Unkuri

VALMISTUMASSA OLEVIEN SAIRAANHOITAJAOPISKELIJOIDEN AMMATILLINEN PÄTEVYYS

Hoitotieteen laitos, lääketieteellinen tiedekunta, Turun yliopisto, Suomi
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TIIVISTELMÄ

Valmistumassa olevien sairaanhoitajaopiskelijoiden ammatillinen pätevyys on tärkeä tekijä terveydenhuollossa, sillä se liittyy ammatillisiin normeihin, potilasturvallisuuteen sekä hoidon laatuun. Monet terveydenhuollossa tapahtuneet muutokset ovat lisänneet sairaanhoitajien ammatillista pätevyyttä koskevia vaatimuksia sekä sairaanhoitajien määrän vaatimuksia. Tämän tutkimuksen tarkoituksena oli i) kuvata sairaanhoitajaopiskelijoiden ammatillisen pätevyyden osa-alueet Euroopassa, ii) arvioida valmistumassa olevien sairaanhoitajaopiskelijoiden ammatillinen pätevyys iii) tunnistaa ammatilliseen pätevyyteen yhteydessä olevia tekijöitä sekä iv) arvioida sairaanhoitajaopiskelijoiden ammatillista pätevyyttä koskevien itsearviointien ja heidän ohjaajiensa arviointien vastaavuutta.

Tutkimus toteutettiin kahdessa vaiheessa. Ensimmäisessä vaiheessa ammatillisen pätevyyden osa-alueet sairaanhoitajaopiskelijoille Euroopassa määriteltiin kirjallisuuskatsauksen avulla (n=10 empiiristä tutkimusta ja n=4 dokumenttia). Aineisto analysoitiin teema-analyysillä. Toisessa vaiheessa valmistumassa olevien sairaanhoitajaopiskelijoiden (n=154) ammatillinen pätevyys arvioitiin ja tutkittiin ammatilliseen pätevyyteen yhteydessä olevia tekijöitä. Lisäksi valmistumassa olevien sairaanhoitajaopiskelijoiden itsearviointien vastaavuutta arvioitiin vertaamalla sairaanhoitajaopiskelijoiden itsearviointeja viimeisen kliinisen harjoittelun (neljässä yliopistollisessa sairaalassa) ohjaajien (n=42) arviointeihin. Aineiston analyysissä käytettiin sekä kuvailevia tilastollisia menetelmiä että tilastollista päättelyä.

Tulosten perusteella sairaanhoitajaopiskelijoiden ammatillinen pätevyys Euroopassa koostuu yhdeksästä pääkompetenssialueesta: (1) ammatilliset ja eettiset arvot sekä toiminta, (2) hoitotyön taidot ja interventiot, (3) vuorovaikutustaidot, (4) tiedolliset ja kognitiiviset kyvyt, (5) arviointi ja hoitotyön laadun parantaminen, (6) ammatillinen kehittyminen, (7) johtaminen ja yhteistyötaidot, (8) opetus- ja ohjaamistaidot sekä (9) tutkimustiedon hyödyntäminen.

Valmistuvat sairaanhoitajaopiskelijat itsearvioivat ammatillisen pätevyytensä korkeaksi. Ohjaajien arvioimana opiskelijoiden ammatillinen pätevyys oli kuitenkin matalampi. Sairaanhoitajakoulutuksen antamat valmiudet sairaanhoitajana toimimiselle, harjoitteluyksikön pedagoginen ilmapiiri, ohjaussuhde opiskelijan ja ohjaajan välillä sekä palkkatyö tutkimuksen vastaamishetkellä olivat merkittävimpiä ammatilliseen pätevyyteen yhteydessä olevia tekijöitä.

Johtopäätöksenä voidaan todeta, että ammatillista pätevyyttä voidaan valmistumassa olevilla sairaanhoitajaopiskelijoilla mitata itsearviointiin perustuvan mittarin avulla, mutta sen rinnalla on syytä käyttää myös muita arviointimenetelmiä varmistamaan arvioinnin luotettavuutta. Tutkimuksessa esitetään käytännön sovelluksia hoitotyön koulutukselle sekä käytännölle. Tulevaisuudessa tutkimusta tulisi kohdistaa ammatillisen pätevyyden pitkittäistutkimukseen sairaanhoitajakoulutuksen aikana sekä siirryttäessä työelämään, opiskelijasta ammattilaiseksi.

Avainsanat: Ammatillinen pätevyys, Valmistuva sairaanhoitajaopiskelija, Ammatillisen pätevyyden arviointi, Hoitotyön koulutus

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LIST OF ABBREVIATIONS

ANA	American Nurses Association
ANMC	Australian Nursing & Midwifery Council
ANOVA	One-way analyses of variance
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CLES+T	Clinical Learning Environment and Supervision + Nurse Teacher – questionnaire
EC	European Commission
ECTS	European Credit Transfer and Accumulation System
EEA	European Economic Area
EFN	European Federation of Nurses Association
EHEA	European Higher Education Area
EQF	European Qualifications Framework
ETENE	Valtakunnallinen terveydenhuollon eettinen neuvottelukunta
EU	European Union
HEI	Higher Education Institutions
HOTOHA	Hoitotoimintojen hallinta -questionnaire
FINE	European Federation of Nurse Educators
ICN	International Council of Nurses
LISREL	Structural Equation Model
NCS	Nurse Competence Scale -questionnaire
NQF	National Qualifications Framework
OSCE	Objective Structured Clinical Evaluation
PCA	Principal Component Analysis
RN	Registered Nurse
RN4CAST	Registered Nurse Forecasting Study
SPSS	Statistical package for the Social Sciences
SD	Standard deviation
TENK	Finnish Advisory Board on Research Integrity
THL	National Institute for Health and Welfare
VAS	Visual Analogue Scale
WHO	World Health Organisation

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications, which are referred to in the text with Roman numerals I-IV.

- I Kajander-Unkuri S, Salminen L, Saarikoski M, Suhonen R & Leino-Kilpi H 2013. Competence areas of nursing students in Europe. *Nurse Education Today* 33 (6), 625-632.
- II Kajander-Unkuri S, Meretoja R, Katajisto J, Saarikoski M, Salminen L, Suhonen R & Leino-Kilpi H 2014. Self-assessed level of competence of graduating nursing students and factors related to it. *Nurse Education Today* 34 (5), 795-801.
- III Kajander-Unkuri S, Suhonen R, Katajisto J, Meretoja R, Saarikoski M, Salminen L & Leino-Kilpi H. 2014. Self-assessed level of nursing skills of graduating nursing students. *Journal of Nursing Education and Practice* 4 (12), 51-64.
- IV Kajander-Unkuri S, Leino-Kilpi H, Katajisto J, Meretoja R, Räsänen A, Saarikoski M, Salminen L & Suhonen R. Congruence between graduating nursing students' self-assessments and mentors' assessments of students' nurse competence. Submitted.

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1. INTRODUCTION

In Europe, nurse education has undergone many changes in recent decades because of the Bologna process (Zabalegui et al. 2006, Collins & Hever 2014). The Bologna process started in 1999, when 29 European countries signed the Bologna Declaration. The ultimate goal of setting up a common European Higher Education Area (EHEA) aimed to enhance the competitiveness and attraction of European higher education in relation to other continents. The EHEA was launched in 2010 by 47 member countries (European Ministers of Education 2010) and nurse education is currently offered in 45 of the 47 member countries (Lahtinen et al. 2014). The minimum requirements for nurse education (length and minimum content: theoretical and clinical training) leading to the formal qualification of nurse responsible for general care are defined in the Directive 2005/36/EC (the Recognition of Professional Qualifications). The Directive did not include the common competencies or the level of competence for nursing students required upon degree completion in Europe (European Commission 2005), unlike the Australian Nursing & Midwifery Council (ANMC) and American Nurses Association (ANA). They have common competence standards for nursing in Australia (ANMC 2006) and the United States (ANA 2010). The modernised Directive (2013/55/EU) was published in 2013 and some changes were made to the content of nurse education. Also, eight common competencies for nurses responsible for general care are now mentioned in Article 31 (see Chapter 3.1; Table 1). EU Member States now have two years to transpose the Directive into national law, and nursing students qualifying after 2016 should meet these competencies. (European Commission 2013.)

Nurse education programmes in the EHEA are mostly offered at higher education level at universities. The length of nurse education programmes is usually three years. (Lahtinen et al. 2014). In Finland, nurse education is carried out in polytechnics (also called universities of applied sciences) and it lasts three and half years, i.e., seven semesters (Ministry of Education 2010, 2011, Lahtinen et al. 2014). The term polytechnic is used in this study. The content of nurse education is determined on the basis of European Union directive 2005/36/EC (European Commission 2005, Ministry of Education 2010, 2011). In Finland, polytechnics are independent and have the freedom to develop their own nursing curricula (Ammattikorkeakoululaki 2003/351, Asetus ammattikorkeakoululaista 2003/352, Ammattikorkeakoululaki 2014/932, Valtioneuvoston asetus ammattikorkeakouluista 2014/1129). Curricula vary between polytechnics, but they are based on 10 domains of professional competence in nursing issued by the Finnish Ministry of Education and Culture: 1) ethical activity, 2) health promotion, 3) decision-making in nursing, 4) patient education, 5) collaboration, 6) research and development work and leadership, 7) multicultural nursing, 8) social activity, 9) clinical nursing and 10) medical care. (Ministry of Education 2006.) According to the European Qualifications Framework (EQF) graduating nursing students are at level six (out of eight) (European Commission 2008). According to

National Qualifications Framework (NQF), which follows the EQF, the individual at level six 1) masters wide-ranging and advanced knowledge of a field of work or study, involving a critical understanding of theories and principles, 2) masters advanced skills, demonstrating mastery and innovation required to solve complex and unpredictable problems in a specialised field of work or study, 3) manages complex technical or professional activities or projects, 4) takes responsibility for decision making in unpredictable work or study contexts and 5) takes responsibility for managing professional development of individuals and groups. After graduation, the new nurse has readiness for continuing learning and is capable of independent internationally communication and interaction in Swedish and at least one foreign language in addition to Finnish. (Ministry of Education 2009). In 2011 the Ministry of Education and Culture launched a two-phase polytechnic reform, and in January 2014 polytechnics started operation with their new licenses (Ministry of Education and Culture 2014). Representatives from all polytechnics have been working together to revise a new competence-based curriculum for nurse education and to define minimum competence requirements for general nurse (Eriksson et al. 2013).

The transition process where a nursing student becomes a professional nurse is a vital period. During this process the new nurse adjusts to the role as a registered nurse (RN) and the responsibilities it entails (Newton & McKenna 2007, Duchscher 2008, 2009). Problems during the transition process could drive new nurses towards leaving the profession (Duchscher 2009, Flinkman 2014). The process can be challenging and stressful as new nurses have reported difficulties in the role transition (from being a student to the role of RN) and experiences of stress in many countries, such as Canada (Duchscher 2008, 2009), Taiwan (Yeh & Yu 2009), United Kingdom (Higgins et al. 2010) and Ireland (Suresh et al. 2013). Kramer (1974) and Kramer et al. (2013) describe this transition process as having three phases and use the term “reality shock” to describe the conflict between the qualification expectations and the actual reality of clinical practice. Duchscher (2008, 2009) has developed Kramer’s concept of reality shock and uses the concept of “transition shock” to describe the reaction of new nurses entering clinical practice as new RNs. Based on the previous literature, the length of this challenging transition process is from 12 to 18 months (e.g. Schoessler & Waldo 2006, Duchscher 2008, 2009). As an aging population needs more nursing care (Sherman et al. 2013) and older registered nurses are retiring from the profession (KEVA 2009, Graham & Duffield 2010, Juraschek et al. 2012), pressure has been placed on new nurses to fill the workforce gap (European Commission 2012). However, results from the recent Nurse Forecasting in Europe study (RN4CAST) indicate approximately one in ten (9%) nurses in Europe having an intent to leave their profession (Heinen et al. 2013). This intention of leaving the profession has been highest among nurses under 35 years in many European countries (Hasselhorn et al. 2005). In Finland, 26% of young nurses (under 30 years) have often thought of giving up nursing during the past year (Flinkman et al. 2008). Also, according to the RN4CAST study, the proportion of nurses in Finland intending to leave their current job within a year is high, 49% (Aiken et al. 2012, Aiken et al. 2013). This generates

costs and leads to a temporary reduction in the productivity of the organization (Li & Jones 2013).

New nurses enter a clinical practice which has experienced major changes around the world (e.g. Auerbach et al. 2013). These changes are expected to continue as populations continue to age and health care costs to rise (Chreim et al. 2012) and new technological solutions make new treatments possible. In Europe, the major public health challenge is the increasing number of people living with chronic conditions and needing long-term care. Another challenge is to ensure an adequate workforce of health professionals in the health system. (WHO 2009.) In Finland, the number of patients cared for in somatic specialized health care, for example, decreased by almost 3% from 2002 to 2012, but at the same time, the number of patients taken care of in outpatient care increased by almost 8% (THL 2013). There have been major changes in the psychiatric care system as well, from inpatient hospital care to outpatient services. Between 1980 and 2011, the number of psychiatric care beds decreased from 20,000 (Lehtinen & Taipale 2001) to just over 4,000. (Tuori 2011). As beds and the number of days in whole health care system have decreased, patients are now taken care of in their own homes or in outpatient clinics or in nursing homes. In Finland, it has been estimated that by the year 2030, almost half (49.7%) of currently practising nurses will retire (KEVA 2009), and the shortage of RNs is expected to worsen as there will be 66,660 new workplaces opening in the social and health care sector (Ministry of Social Affairs and Health 2009). The total workforce gap in the social and health care sector is estimated to be 20,000 employees or even higher (Koponen et al. 2012). These changes in health care lead to increased demand with respect to nurses' competence as well the number of nurses.

The nurse competence of graduating nursing students is an important issue in health care as it is related to professional standards, patient safety and the quality of nursing care (WHO 2006, 2010). When approaching graduation, nursing students are expected to have adequate nurse competence to fulfil their duties safely and effectively, as an adequate supply of competent RNs is necessary to provide high-quality, safe and patient-centred care (Aiken et al. 2003, Lang et al. 2004, Kane et al. 2007, You et al. 2013, Aiken et al. 2014). Benner (1982a) has proposed that nurse competence develops along a continuum from novice to expert. Novices are nurses who have no experience in the situation they are practising in. Through being an advanced beginner, competent and proficient, a nurse will finally become an expert. However, according to Benner, competent nurses have usually been in the same job or situation for two to three years. (Benner 1982a). The RN4CAST study has reported that the educational level of nurses is crucial as higher competence level among nurses in hospital wards leads to reduced incidence of mortality, morbidity and adverse events (Aiken et al. 2014).

There is no earlier study in Europe concerning the nurse competence of graduating nursing students in this scope. The purpose of this study was to i) describe the nurse competence areas of nursing students in Europe, ii) evaluate the nurse competence of graduating nursing students, iii) identify factors related to the nurse competence and iv)

assess the congruence between graduating nursing students' self-assessments and mentors' assessments of students' nurse competence. The study was carried out in Finland during the years 2010-2014.

The evaluation of nurse competence of graduating nursing students is part of the quality assurance of nurse education, particularly as graduated nurses transit from school to clinical practice. The results of this study could benefit both nurse education and health care organisations. Common nurse competence areas could support to harmonise nurse education in Europe and could be a solution to facilitate nurse mobility in Europe. Evaluation of nurse competence of graduating nursing students and identifying related factors could be useful for developing the nursing curricula and clinical learning environment and supervision. The results could also be used to develop new nurses' practical work orientation and mentorship programmes to reduce intentions to leave their jobs or the profession and to ensure even more safe and holistic nursing. Furthermore, the results improve knowledge in the field of student assessment in clinical practice.

2. DEFINITION OF THE CONCEPTS

The main concepts used in the study are nurse competence, graduating nursing student, clinical training and mentor.

2.1. Nurse competence

The concept of competence is widely discussed in nursing, but a common understanding or definition is still not agreed upon. The term competence refers to a state of being or a quality. It is a holistic term that refers to one's overall capacity or ability to do something successfully (ten Cate & Scheele 2007). Three main approaches to conceptualising competence can be found in the literature: 1) behaviouristic; a task and skill based approach, 2) generic; focus on transferable attributes and 3) holistic; brings together knowledge, skills, attitudes and values. (Gonczi 1994, Watson et al. 2002, Cowan et al. 2005, Garside & Nhemachena 2013).

Systematic definitions of competence in nursing are based on four concept analysis (Axley 2008, Scot Tilley 2008, Valloze 2009, Garside & Nhemachena 2013). Competence in nursing mainly refers to knowledge and/or skills (Axley 2008, Scott Tilley 2008, Valloze 2009, Garside & Nhemachena 2013). In addition, competence refers to actions (Axley 2008, Valloze 2009), professional role model or professional standards (Axley 2008, Valloze 2009). In the literature, competence is defined for example as "the nurse's ability to integrate cognitive, affective and psychomotor skills when delivering care", i.e. psychological construct and as "the ability to perform tasks" (Giroit 1993, p. 84), as a holistic conception, which includes knowledge, skills, attitudes and values (Cowan et al. 2005). Nurse competence is also defined as "the ability to perform the task with desirable outcomes under the varied circumstances of the real world" (Benner 1982b, p. 304) and "functional adequacy and the capacity to integrate knowledge, skills, attitudes and values" (Meretoja et al. 2004b, p. 330). Competence "builds on a foundation of basic clinical skills, scientific knowledge, and moral development" (Epstein & Hundert 2002, p. 226). Also regulatory bodies have defined the concept to reach national or international consensus. International Council of Nurses (ICN) defines competence as "a level of performance demonstrating the effective application of knowledge, skill and judgment" (ICN 1997, p. 44), the ANMC (2006, p. 14) defines competence as "a combination of skills, knowledge, attitudes, values and abilities that underpin effective and /or superior performance in a professional/occupational area" and the ANA (2010, p. 20) defines competence as "an expected level of performance that integrates knowledge, skills, abilities, and judgment". In Europe, for example, the Nursing and Midwifery Council (NMC) uses the term competence referring to "the combination of skills, knowledge, and attitudes, values and technical abilities that underpin safe and effective nursing practice and

interventions” (NMC 2010, p. 11). According to the European Parliament and the Council “competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development”. And in the context of the EQF, competence is described in terms of responsibility and autonomy. (European Commission 2008.)

In conclusion, nurse competence seem to be based on three parts: *nursing skills* (Giro 1993, ICN 1997, Epstein & Hundert 2002, Meretoja et al. 2004b, Cowan et al. 2005, ANMC 2006, Axley 2008, European Commission 2008, Scott Tilley 2008, Valloze 2009, ANA 2010, NMC 2010, Garside & Nhemachena 2013), *knowledge* (ICN 1997, Epstein & Hundert 2002, Meretoja et al. 2004b, Cowan et al. 2005, ANMC 2006, Axley 2008, European Commission 2008, Scott Tilley 2008, Valloze 2009, ANA 2010, NMC 2010, Garside & Nhemachena 2013) and *moral*, i.e. attitudes and values (Epstein & Hundert 2002, Meretoja et al. 2004b, Cowan et al. 2005, ANMC 2006, Axley 2008, Valloze 2009, ANA 2010, NMC 2010). (Figure 1.)

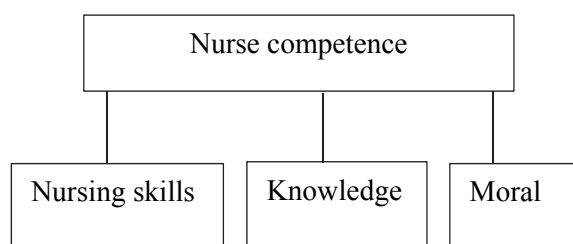


Figure 1. Nurse competence (cf. Ääri et al. 2008)

In this study, a holistic approach (Gonczi 1994, Watson et al. 2002, Cowan et al. 2005, Garside & Nhemachena 2013) to nurse competence was adopted. It refers to expected level of knowledge, nursing skills, values and attitudes of the graduating nursing student and can be transferred between nursing contexts.

2.2. Graduating nursing student

In Finland, the nurse education is based on Directive 2005/36/EC (European Commission 2005, Ministry of Education 2010, 2011). It is carried out in polytechnics (Higher Education Institutions, HEI), its extent is 210 ECTS, and it usually takes three and half years, i.e., seven semesters as full-time study (Ministry of Education 2010, 2011, Lahtinen et al. 2014). In 2011, there were 23 polytechnics with education given in Finnish and Swedish languages (21 and 2 respectively). The amount of clinical training is 90 ECTS (Ministry of Education 2010, 2011, Lahtinen et al. 2014) and usually the final clinical placement is situated in the seventh semester. Graduating nursing student [Bachelor of Health Care, suom. sairaanhoitaja (AMK)] refers to a nursing student in his/her seventh semester in nurse education.

2.3. Clinical training and mentor

The EU directives 2005/36/EC and 2013/55/EU regulate, that nurse education consists of at least 4 600 hours of clinical training and the duration of the clinical training represent at least one half of the minimum duration of the nurse education. In clinical training “the trainee nurse shall learn not only how to work in a team, but also how to lead a team and organise overall nursing care, including health education for individuals and small groups, within health institutes or in the community”. Clinical training “should be gained under the supervision of qualified nursing staff and in places where the number of qualified staff and equipment are appropriate for the nursing care of the patient” (European Commission 2005, 2013 p. 151). A qualified nurse i.e. registered nurse (RN) refers to a mentor. His or her nurse education is nurse (Bachelor of Health Care), specialist nurse or nurse (vocational college level). The role of the mentor is to facilitate learning, supervise and assess nursing students. Mentor supports and helps nursing student to develop the necessary nursing skills to become a competent and knowledgeable practitioner. (e.g. Neary 2000, Saarikoski et al. 2007, Myall et al. 2008).

3. LITERATURE REVIEW

This literature review aims to the nurse competence of nursing students. The nurse competence is analysed especially as an outcome of nurse education. The literature review sought answers to following questions: 1) What are nurse competence areas of nursing students in Europe? 2) What kind of studies are there about nursing students' nurse competence?, 3) What is nurse competence of graduating nursing students?, and 4) What methods have been used to assess nurse competence of graduating nursing students?

3.1. Nurse competence areas of nursing students in Europe

In Europe, nurse education is currently offered in 45 of the 47 EHEA countries. The majority (68%) of nurse education is offered at the higher educational level, 33% of it at universities. Nurse education at diploma level (32%) is offered at nursing schools or colleges. Nurse education programmes usually last three years (range two to four years). The majority (68%) of all the nursing education programmes lead to a bachelor's degree or equivalent. (Lahtinen et al. 2014.) Directive 2005/36/EC and the modernised Directive 2013/55/EU regulate that nurse education at higher levels must be at least three years long and include 4,600 hours of theoretical and clinical training. The duration of the clinical training must be at least half of the minimum duration of the training, i.e. 2,300 hours (European Commission 2005, 2013).

The purpose of this literature review was to seek nurse competence areas for nursing students in Europe (within the European Union, EU) as identified in previous studies and other documents. In this study, the EU also includes the three European Economic Area (EEA) countries (Iceland, Lichtenstein and Norway), which have transposed the Directive 2005/36/EC (European Commission 2005) on the Recognition of Professional Qualifications into their national legislation. Nurse competence areas were systematically searched from international [Medline (Ovid) and CINAHL (Ebsco)] databases from studies published between 1999 and 2012 (I). The search was updated in 2012–2014 in this summary. The search terms were: *students, nursing* OR *nurs* student* OR *newly graduated nurse* OR *undergraduate nurse* OR *Education, nursing* AND *clinical competenc** OR *professional competenc** OR *competenc**. The search terms were purposely broad to achieve as comprehensive result as possible. The limitations were English language, abstracts available and peer reviewed. The inclusion criteria were: 1) the main focus of the article was on generic nursing competencies in the EU, 2) methodology included literature reviews and/or empirical studies, 3) the participants in empirical studies were general nursing students and/or newly graduated nurses (up to 12 months after graduation), and 4) the competence areas were identified in the article. Studies conducted outside of the EU, focusing on specific competencies

or on the effectiveness of the teaching method or studies where the participants were not general nursing students were excluded. The reference lists of the initially retrieved articles were searched manually. Also websites of the European Council and Parliament, European Federation of Nurses Associations (EFN), Bologna Process, European Federation of Nurse Educators (FINE) and WHO Europe were searched in order to find documents (reports, working papers etc.) identifying generic nursing competence areas.

As a result of updating the search, three new empirical studies (Ulfvarson & Oxelmark 2012, Wangensteen et al. 2012, Nilsson et al. 2014) and one document (Directive 2013/55/EU) were found. Based on the literature (14 empirical studies and documents), there were several nurse competence areas, but further examination revealed that many areas were identical or similar in terms of the contents or definitions of the nurse competence areas. The nurse competence areas in these empirical studies and documents referred to ethical values and attitudes, interpersonal skills, assessing the quality of nursing, nursing skills and patient care, teaching and supervising patients, their families, colleagues and nursing students, management of care and leadership in nursing, and utilisation of research. (Table 1.)

Table 1. Nurse competence areas of nursing students in Europe (n=14 empirical studies and documents)

Nurse competence area	Titles of competence areas	References
Ethical values and attitudes	Attitudes, values and transfer Legislation in nursing and safety planning Policy awareness Professional / Ethical practice Professional values and role of the nurse Professional responsibilities Value based nursing care Nursing Personal and professional development Professional development	EFN 2011 Nilsson et al. 2014 Clinton et al., 2005 EHTAN 2005; O'Connor et al., 2009 Tuning 2005 O'Connor et al., 2001 Nilsson et al. 2014 Ulfvarson & Oxelmark 2012 EHTAN 2005; O'Connor et al., 2009 Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005 EHTAN 2005; Löfmark et al., 2006 Tuning 2005; EFN 2011 European Commission 2013
Interpersonal skills	Communication Communication and interpersonal competences/ relationship Communicate professionally and to cooperate with members of other professions in the health sector Interaction and communication Interpersonal relationship Social participation Personal characteristics Ego strength Cognitive ability Knowledge and cognitive competence	Hartigan 2010 O'Connor et al., 2009 Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005 Löfmark et al., 2006 Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005 Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005 Tuning 2005
Assessing the quality of nursing	Assessment Assessment and diagnosis/quality Patient assessment Quality assurance and evaluation of care Independently assure the quality of, and to evaluate, nursing care Ensuring quality Analyse the care quality to improve his own professional practice as a nurse responsible for general care	Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005; EHTAN 2005 EFN 2011 Hartigan et al., 2010 O'Connor et al., 2001 European Commission 2013 Wangenstein et al. 2012 European Commission 2013

Table 1. Nurse competence areas of nursing students in Europe (n=14 empirical studies and documents)

Nurse competence area	Titles of competence areas	References
Nursing skills and patient care	Approaches to care and the integration of knowledge	O'Connor et al., 2009
	Innovative approaches to care	O'Connor et al., 2001
	Independently diagnose the nursing care	European Commission 2013
	Care delivery/patient care/nursing care/caring	EHTAN 2005; Löfmark et al., 2006; Ulfvarson & Oxelmark 2012; Nilsson et al. 2014
	Helping role	Wangenstein et al. 2012
	Health promotion	O'Connor et al., 2001; EHTAN 2005
	Promoting and preventing	EFN 2011
	Empower individuals, families and groups towards healthy lifestyles and self-care	European Commission 2013
	Intervention/nursing intervention	Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005; EFN 2011
	Diagnostic functions	Wangenstein et al. 2012
Nurse skills, intervention/activities to provide optimum care	Tuning 2005	
Specialist skills and knowledge	O'Connor et al., 2001	
Skills and manual handling	Ulfvarson & Oxelmark 2012	
Technical/clinical skills/ medical technical care	Hartigan 2010; Nilsson et al., 2014	
Therapeutic interventions	Wangenstein et al. 2012	
Nursing practice and clinical decision making	Tuning 2005	
Clinical decision making	Hartigan 2010	
Planning	Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005; EFN 2011	
Documentation and information technology	Nilsson et al. 2014	
Documentation	Ulfvarson & Oxelmark 2012	
Independently initiate life-preserving immediate measures and to carry out measures in crises and disaster situations	European Commission 2013	

Table 1. Nurse competence areas of nursing students in Europe (n=14 empirical studies and documents)

Nurse competence area	Titles of competence areas	References	
Teaching and supervising patients, their families, colleagues and nursing students	Education and supervision of staff/students	Nilsson et al., 2014	
	Teaching	EFN 2011	
	Teaching and learning/ Teaching/ learning and support	O'Connor et al., 2001; Nilsson et al. 2014	
	Teaching – coaching	Wangenstein et al. 2012	
	Independently give advice to, instruct and support persons needing care and their attachment figures	European Commission 2013	
	Management of care and leadership in nursing	Organisation and management of care	O'Connor et al., 2009
		Management of care	EFN 2011
		Managing change	O'Connor et al., 2001
		Managing situations	Wangenstein et al. 2012
		Leadership	Bartlett et al., 2000; Norman et al., 2002; Clinton et al., 2005
Leadership in nursing and safety planning		Nilsson et al. 2014	
Leadership, management and team competences		Tuning 2005	
Service management		EFN 2011	
Team work		EHTAN 2005; EFN 2011	
Work together effectively with other actors in the health sector		European Commission 2013	
Utilisation of research	Work role	Wangenstein et al. 2012	
	Research /research awareness	EFN 2011; Clinton et al., 2005	
	Research based practice	O'Connor et al., 2001	
	Research and development	EHTAN 2005	
	Knowledge utilisation	Löfmark et al., 2006	
	Using information to inform decisions	O'Connor et al., 2001	

3.2. Nurse competence of nursing students and related factors

Competence studies of nursing students were systematically searched from international [Medline (Ovid) and CINAHL (Ebsco)] and national (Medic) databases using several keywords and their combinations: “*clinical competence*”, “*professional competence*”, “*nursing student*”, “*education, graduate nursing*”, “*assessment, self*” (MeSH-terms) and the subject headings “*graduating nursing student*”, “*undergraduate nurs* student*”, “*new* graduated nurse*”, “*recently graduated nurse*”, “*final-year student nurse*”, “*graduate nurse*”, “*evaluation*”, “*assessment*” and “*competence*”. The search was limited into English, abstract available, peer reviewed and the years 2000–2014. A manual search of the reference lists of the retrieved articles was also used. The aim was to gain comprehensive understanding of nursing students’ nurse competence: 1) What has been studied? 2) What is the nurse competence of nursing students and 3) Which methods have been used to assess the nurse competence? After analysis of titles and abstracts, 63 articles were included in the final analysis. (Table 2.)

Based on the results of the review, the terms competence, professional competence and clinical competence are used interchangeably in previous studies, contributing to the lack of clarity of the concept. In the majority of studies, the term used was competence and it covered both professional and clinical competence. The term nurse competence is used in this literature section as a top concept to cover concepts competence, professional and clinical competence used in previous studies. Eight main viewpoints of nurse competence were identified from the studies: 1) single specific nurse competence, 2) as an outcome of nurse education, 3) development of an assessment method to measure nurse competence, 4) effectiveness of an assessment method of nurse competence, 5) curricula evaluation from the perspective of nurse competence, 6) teaching/learning methods to increase nurse competence, 7) effect of clinical practicum on nurse competence, and 8) effect of mentorship programme on nurse competence. (Table 2.)

The majority (n=15) of the articles focused on specific nurse competencies studied with a wide variety of methods. Thirteen studies evaluated nurse competence as an outcome of nurse education. The number of studies concerning the development of an assessment method to measure nurse competence was 12. These results indicate that nurse competence assessment is an interesting study field at the moment globally, as the effectiveness of assessment methods of nurse competence has been studied in nine studies as well. The most common method to study nurse competence of nursing students was survey based on self-assessment. Among specific nurse competencies, qualitative methods, such as critical incidents, knowledge test and focus groups interview, were popular. (Table 2.)

Table 2. Studies of different perspectives of nursing students' nurse competence (n=63)

Theme (number of studies)	Method	Authors and country
Specific nurse competencies (cultural competence, medication competence, vaccination competence, quality and safety competencies, information technology competencies, competence of children's pain management, hand hygiene competence, competence in intensive and critical care nursing, competence in delivering spiritual care) (15)	critical incidents, knowledge test, survey (self-assessment), focus groups interview, simulation assessment	Ääri et al. 2004, Finland; Hanley & Higgins 2005, Ireland; Sargent et al. 2005, USA; Chiang et al. 2006, China; Kardong-Edgren & Campinha-Bacote 2008, USA; Cole 2009, UK; Fetter 2009, USA; Koskinen et al. 2009, Finland; Sullivan et al. 2009, USA; Hemingway et al. 2011, UK, Sumpter & Carthon 2011, USA; Nikula et al. 2012, Finland; Macdonald et al. 2013, UK, Lakanmaa et al. 2014, Finland, Ross et al. 2014, UK
Nurse competence as an outcome of nurse education (13)	survey (self-assessment, mentors'/ nurses'/ nurse leaders' assessment)	Bartlett et al. 2000, UK; O'Connor et al. 2001, UK; Clinton et al. 2005, UK; Löfmark et al. 2006, Sweden; Berkov et al. 2008, USA; Hengstberger-Sims et al. 2008, Australia; Hickey 2009, USA; Raines 2010, USA; Doody et al. 2012, Ireland; Wangensteen et al. 2012, Norway; Lima et al. 2014, Australia; Numminen et al. 2014, Finland, Takase et al. 2014, Japan
Development of an assessment method to measure nurse competence (instrument, Objective Structured Clinical Evaluation (OSCE), responsive assessment) (12)	psychometric testing, evaluation questionnaire, pilot test, review	Löfmark & Thorell-Ekstrand 2000, Sweden; Neary 2001, UK; Norman et al. 2002, UK; Hsu & Hsieh 2009, Taiwan; McWilliam & Botwinski 2009, USA; O'Connor et al. 2009, Ireland; Walsh et al. 2010, USA; Hsu & Hsieh 2013, Taiwan; Löfmark & Thorell-Ekstrand 2014, Sweden; Nilsson et al. 2014, Sweden; Perng & Watson 2013, Taiwan; Liou & Cheng 2014, Taiwan
Effectiveness of an assessment method of nurse competence (portfolio, eportfolio, revised system, self-assessment) (9)	interview, observation, review, focus groups interview, content analysis, OSCE	Dolan 2003, UK; McMullan et al. 2003, UK; Scholes et al. 2004, UK; McCready 2007, UK; Taylor et al. 2009, Australia; Walsh et al. 2009, Canada; Rouse 2010, UK; Baxter & Norman 2011, Canada; Garrett et al. 2013, Canada
Curricula evaluation in perspective of nurse competence (5)	survey (self-assessment), interview, evaluation	Uys et al. 2004, South-Africa; Farrand et al. 2006; Gebru et al. 2008, Sweden; Lauder et al. 2008b, UK; Klein & Fowles 2009, USA
Teaching/ learning methods to increase nurse competence (simulation) (5)	questionnaire, focus groups interview	Lasater 2007, USA; Dillard et al. 2009, USA; Wagner et al. 2009, USA; Hope et al. 2011, UK; Watt & Pascoe 2013, Australia
Effect of clinical practicum on nurse competence (2)	survey (self-assessment)	Edwards et al. 2004, Australia; Hsieh & Hsu 2013, Taiwan;
Effect of mentorship programme on competence (2)	survey (self-assessment),	Kim 2007, USA; Komarat & Oumtane 2009, Thailand

In previous studies many terms have been used to describe new nurses in the transition process where a nursing student becomes a professional nurse. The terms are

associated with the stage of the transition process at which nursing students are examined. (Figure 2.)

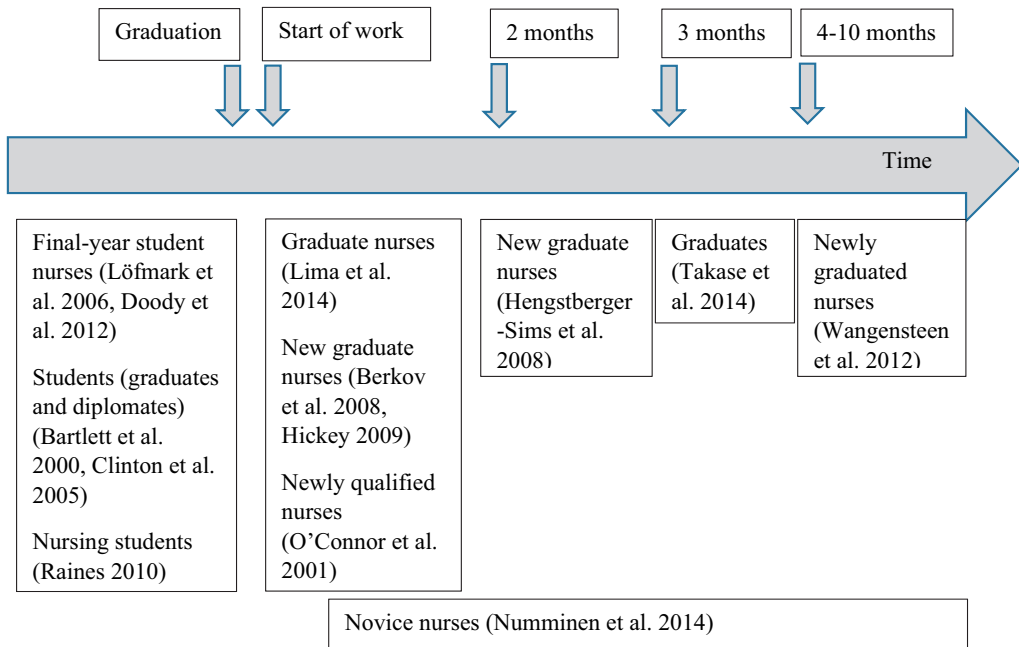


Figure 2. Terms used for new nurses in transition process competence studies (n=13)

Nurse competence of new graduate nurses (Berkov et al. 2008, Hengstberger-Sims et al. 2008, Hickey 2009), newly graduated nurses (Wangensteen et al. 2012), graduate nurses (Lima et al. 2014), students [graduates (degree programme) and diplomates (diploma programme), Bartlett et al. 2000, Clinton et al. 2005], final-year student nurses (Löfmark et al. 2006, Doody et al. 2012), nursing students (Raines 2010), graduates (Takase et al. 2014), novice nurses (Numminen et al. 2014) or newly qualified nurses (O'Connor et al. 2001) as an outcome of nurse education was examined in 13 studies. The most common method of evaluating the nurse competence was surveys based on self-assessments. Nurse competence was also evaluated by comparing self-assessments and assessments by nurse experts (Raines 2010)/qualified nurses (Löfmark et al. 2006)/line managers (Clinton et al. 2005)/mentors (Bartlett et al. 2000). The remaining methods were surveys based on assessments by mentors (Hickey 2009) or nurse leaders (Berkov et al. 2008) or nursing managers and educators (Numminen et al. 2014). (APPENDIX 1, Table 3.)

In three studies, the nurse competence was self-assessed with the generic Nurse Competence Scale with VAS 0-100 mm (=NCS; Meretoja et al. 2004a); for descriptive purposes, the VAS had divided into four parts to represent the level of competence as low, rather good, good and very good (Meretoja et al. 2004a). Two months after graduation, new graduate nurses reported good self-assessed nurse competence. The

new graduate nurses assessed themselves to be the most competent in helping the patient to cope and in providing ethical and individualized care and the least competent in planning and making decisions concerning patient care according to clinical situation. (Hengstberger-Sims et al. 2008.) Newly graduated nurses also reported good self-assessed nurse competence four to ten months after graduation. The newly graduated nurses assessed themselves to be the most competent in helping the patient to cope and in providing ethical and individualized care and the least competent in evaluating outcomes and contributing to further development of patient care. (Wangensteen et al. 2012.) At the time of commencing employment in graduate nurse programme, graduate nurses reported rather good nurse competence. The graduate nurses assessed themselves to be the most competent in evaluating outcomes and contributing to further development of patient care and the least competent in identifying educational needs of patients and their family and enlarging possibilities to self-care and coaching other team members. (Lima et al. 2014.) (APPENDIX 1, Table 3.)

In two studies, the nurse competence was assessed with Nursing Competencies Questionnaire with a scale from 1 to 4 (never – always) (=NQC; Bartlett et al. 1998). Students (graduates and diplomates) from UK nursing programmes reported good self-assessed nurse competence. The graduated and diplomates assessed themselves the most competent in carrying out nursing actions effectively and with flexibility and evaluating the nursing actions accurately and objectively. The lowest assessments were in participation and concern in social affairs. There were no significant differences between the graduates' and diplomates' assessments. (Bartlett et al. 2000, Clinton et al. 2005.) Also, there were no statistically significant differences between students' and mentors' assessment concerning the nurse competence (Bartlett et al. 2000), and line managers' assessments supported the self-assessments of students (Clinton et al. 2005). (APPENDIX 1, Table 3.)

Final-year student nurses reported their nurse competence to be good or strongly developed, as did qualified nurses, although to a lesser extent, using a questionnaire with a scale from 1 to 4 (low ability – strongly developed ability). The final-year student nurses assessed themselves the most competent in ethical awareness, accuracy, reliability and self-knowledge, and the least competent in using theoretical knowledge and the use of research and developmental work. (Löfmark et al. 2006.) The final-year student nurses reported themselves as competent across a range of competence domains using a questionnaire with a scale from 1 to 5 (strongly disagree – strongly agree). The final-year student nurses assessed themselves the most competent in having effective interpersonal skills and the least competent in educating clients/patients and families regarding health issues. (Doody et al. 2012.) Nursing students at the end of a nursing program reported their nurse competence just below the midpoint of the scale, indicating not being competent. The instrument used was an investigator-developed survey with a scale from 1 to 7 (not competent – highly competent). However, when asked about their competence to begin practice as a professional nurse, the nursing students assessed themselves as competent. The nurse experts' assessments were

consistently higher than students' self-assessments. The nursing students assessed themselves the most competent in helping role of the nurse, and the least competent in effective management of rapidly changing situations. (Raines 2010.). The graduates with Bachelor in Nursing (BN) and non-BN educational backgrounds reported to be reasonably competent three months after graduation with Holistic Nursing Competence Scale with a scale from 1 to 7 (not competent at all – extremely competent). The mean scores of competence increased as the length of clinical experience increased (up to 12 months), rapidly in the first half of the graduate year, and slowly after that. (Takase et al. 2014.) (APPENDIX 1, Table 3.)

Nurse leaders have not been satisfied with new graduate nurses' nurse competence. Only about one in every four nurse leaders was fully satisfied with new graduate nurses' performance, while more than a quarter were somewhat dissatisfied or worse. The new graduate nurses met the performance expectations of nurse leaders in only two competencies: utilization of information technologies and rapport with patient and families. (Berkov et al. 2008.) Nursing managers reported only rather good nurse competence of novice nurses (one to ten months of work experience). However, the educators reported good nurse competence of novice nurses, and the assessments of the educators were at significantly higher level in every nurse competence category than those of nursing managers. Both groups assessed novice nurses to be the most competent in helping the patient to cope and in providing ethical and individualized care, and the least competent in planning and making decisions concerning patient care according to clinical situation and consulting other team members. (Numminen et al. 2014.) (APPENDIX 1, Table 3.)

The mentors reported several areas of weaknesses in new graduate nurses' nurse competence. The areas of weaknesses were: psychomotor skills, assessment skills, critical thinking, time management, communication and teamwork. More than half of the responses to two open questions indicated that clinical experiences during the academic programme do not adequately prepare the nursing student for practice. Mentors believed that nursing students should experience more of the reality of nursing during their academic preparation. (Hickey 2009.) Comparing the expectations of senior nurses regarding the nurse competence of newly qualified nurses with that of the actual level of nurse competence by observation of mentors showed that newly qualified nurses consistently performed at higher level of nurse competence than that expected by senior nurses. Newly qualified nurses were the most competent in promoting personal hygiene and the least competent in quality assurance and evaluation of care. (O'Connor et al. 2001.) (APPENDIX 1, Table 3.)

Table 3. Nurse competence areas of studies concerning nurse competence of nursing students (n=13)

Author, year, country, instrument, scale, assessment method	Nurse competence areas
Bartlett et al. 2000, UK, Nursing Competencies Questionnaire (NQC), 4-point scale (1= never – 4= always), self-assessment and mentors' assessment	1) Leadership, 2) Professional development, 3) Assessment, 4) Planning, 5) Intervention, 6) Cognitive ability, 7) Social participation and 8) Ego strength
O'Connor et al. 2001, UK, questionnaire, 5-point Likert (not able to perform/achieve – able to discuss and teach knowledge, skills and care to others), mentors' assessment	1) Professional responsibilities, 2) Specialist knowledge, 3) Research based practice, 4) Team work, 5) Innovative approaches to care, 6) Health promotion, 7) Teaching & learning, 8) Using information to inform decisions, 9) Quality assurance & evaluation of care and 10) Managing change
Clinton et al. 2005, UK, revised NQC, 4-point scale (1=never – 4=always), self-assessment and line-managers' assessment	1-8 as Bartlett et al. 2005 + 9) Research awareness and 10) Policy awareness
Löfmark et al. 2006, Sweden, questionnaire, 4-point scale (1= low ability – 4= strongly developed ability), self-assessment and qualified nurses' assessment	1) Communication, 2) Patient care, 3) Personality characteristics and 4) Knowledge utilization
Berkov et al. 2008, USA, New Graduate Nurse Performance Survey, 6-point Likert scale (1= strongly disagree – 6= strongly agree), nurse leaders' assessment	1) Clinical knowledge, 2) Technical skills, 3) Critical thinking, 4) Communication, 5) Professionalism and 6) Management of responsibilities
Hengstberger-Sims et al. 2008, Australia, Nurse Competence Scale (NCS), VAS 0-100 (0= low competence – 100= high competence), self-assessment	1) Helping role, 2) Teaching – coaching, 3) Diagnostic functions, 4) Managing situations, 5) Therapeutic interventions, 6) Ensuring quality and 7) Work Role
Hickey 2009, USA, Clinical Instructional Experience Questionnaire, 5-point Likert scale (1= never – 5= always), mentors' assessment	1) Clinical teaching and 2) Clinical competence
Raines 2010, USA, Investigator-developed survey, 7-point Likert scale (1= not competent – 7= highly competent), self-assessment and nurse experts' assessment	1) Helping role, 2) Teaching – coaching role, 3) Diagnostic and patient monitoring role, 4) Effective management of rapidly changing situations, 5) Administration and monitoring of therapeutic interventions and regimens, 6) Monitoring and ensuring quality of health care practice and 7) Organizational and work roles of the nurse
Doody et al. 2012, Ireland, questionnaire, 5-point Likert scale (1=strongly disagree – 5= strongly agree), self-assessment	1) Role preparation, 2) Role competence and 3) Organisation and support
Wangenstein et a. 2012, Norway, NCS, VAS 0-100, self-assessment	as Hengstberger-Sims et al. 2008
Lima et al. 2014, Australia, NCS, VAS 0-100, self-assessment	as Hengstberger-Sims et al. 2008
Numminen et al. 2014, Finland, NCS, VAS 0-100, nursing managers' and educators' assessments	as Hengstberger-Sims et al. 2008
Takase et al. 2014, Japan, Holistic Nursing Competence Scale, 7-point Likert scale (1= not competent at all – 7= extremely competent), self-assessment	1) Staff education and management, 2) Engaging in ethically-oriented practice, 3) Providing nursing care in teams and 4) Managing one's own professional development

There were also studies analysing the factors related to nurse competence. Factors related positively to better nurse competence include critical thinking and health care experience prior to nurse education (Wangensteen et al. 2012), frequency of nurse competence use (Hengstberger-Sims et al. 2008) and length of clinical experience (Takase et al. 2014). Also, supervision has increased the overall level of nurse competence of nursing students (Kim 2007).

3.3. Assessment of nurse competence of nursing students

Based on the systematic search, the assessment of nurse competence has been found difficult in the literature (Watson et al. 2002, Redfern et al. 2002, Yanhua & Watson 2011) and various methods and instruments have been developed (Robb et al. 2002, Redfern et al. 2002, Watson et al. 2002, Yanhua & Watson 2011). The most common methods are structured or non-structured instruments based on self-assessment (Schwirian 1978, Bartlett et al. 1998, Meretoja et al. 2004a, Cowan et al. 2008, Raines 2010). In addition, observation (Brosnan et al. 2006, McWilliam & Botwinski 2009, Walsh et al. 2009) and portfolios (McMullan et al. 2003, Scholes et al. 2004, McCready 2007, Taylor et al. 2009) have been used.

Only a few instruments used have been tested for psychometric properties: the Six-dimension Scale of Nursing Performance (Schwirian 1978), the Nursing Competencies Questionnaire (Norman et al. 2002), the Nurse Competence Scale (e.g. Meretoja et al. 2004a, Salonen et al. 2007, Cowin et a. 2008, Istomina et al. 2011, O'Leary 2012), EHTAN questionnaire scale (Cowan et al. 2008) and the Holistic Nursing Competence Scale (Takase & Teraoka 2011). This can lead to problems with the validity and reliability of the assessments. The instruments with psychometric properties tested were originally developed for practising nurses (Schwirian 1978, Meretoja et al. 2004a, Takase & Teraoka 2011). Only one instrument, the Nursing Competencies Questionnaire (Bartlett et al. 1998), with psychometric properties tested (Norman et al. 2002) and used to assess nurse competence of nursing students (Bartlett et al. 2000, Clinton et al. 2005) was originally developed for students. It has been suggested, however, that this instrument should be replaced with a more conceptually sophisticated and validated instrument (Clinton et al. 2005). Based on the results of the systematic search, there were 12 studies focusing mainly on the development of an assessment method of nursing students' nurse competence. (Table 4.)

Table 4. Studies focusing on the development of an assessment method of nursing students' nurse competence (n=12)

Author, year, country	Purpose
Norman et al., 2002, UK; Hsu & Hsieh, 2009, Taiwan; Hsu & Hsieh, 2013, Taiwan; Nilsson et al. 2014, Sweden; Perng & Watson 2013, Taiwan; Liou & Cheng 2014, Taiwan	To test the psychometric properties of the developed competence instruments.
Löfmark & Thorell-Ekstrand, 2000, Sweden; O'Connor et al., 2009, Ireland; Walsh et al., 2010, USA; Löfmark & Thorell-Ekstrand 2014, Sweden;	To develop a competence assessment tool for clinical placements
McWilliam & Botwinski, 2009, USA	To develop a successful nursing objective structured clinical examinations (OSCE)
Neary, 2001, UK	To develop a continuous assessment (responsive assessment) of clinical competence of nursing students

Tension between academic qualification and competence to practice is identified in the literature, and this tension is further complicated by the lack of consensus about what to assess (Redfern et al. 2002, Watson et al. 2002, EdCaN 2008). Also, determining the level of nurse competence at which a student should be deemed competent is problematic (Watson 2002, Watson et al. 2002, Garside & Nhemachena 2013). There is no clear definition of nurse competence at the beginning nurse level and this has not been progressing since Watson (2002 p. 477) stated that “we all have an inherent notion of what incompetence is, we know it when we see it” and that “what we describe as competence is often no more than lack of incompetence, which may not be competence of a particularly high standard.” He also stated that “what is being considered as competence is simply not being incompetent”, and went on to ask “If someone is 90% competent, as judged by a series of tasks or observations, are they competent to practise or do they have to receive 100%?” (Watson et al. 2002, p.423). Mason-Whitehead et al. (2008) suggest that competence should not be seen only as the aptitude for the health care practitioner to perform effectively once. Competence requires that practitioners have the ability to repeat their performance on each attempt by a satisfactory standard.

Description of the instruments with psychometric properties tested and used to assess nurse competence of graduating nursing students based on the systematic search are in Table 5.

Table 5. Description of the instruments for assessing nurse competence of nursing students (n=8)

Author, year, country, name of the instrument	Categories (number of items, if available)
Schwirian, 1978, USA, the Six-dimension Scale of Nursing Performance (Six-D Scale)	Leadership (5), Critical care (7) Teaching/collaboration (11), Planning/evaluation (7), Interpersonal relations/ communications (12), Professional development (10)
Bartlett et al., 1998, UK, the Nursing Competencies Questionnaire (NCQ)	Leadership (12), Professional development (9), Assessment (8), Planning (7), Intervention (21), Cognitive ability (6), Social participation (9) Ego strength (6)
Meretoja et al., 2004a, Finland, the Nurse Competence Scale (NCS)	Helping role (7), Teaching – coaching (16), Diagnostic functions (7), Managing situations (8), Therapeutic interventions (10), Ensuring quality (6), Work role (19)
Hsu & Hsieh, 2009, Taiwan, the Self-Evaluated Core Competencies Scale (SECC)	Critical thinking and reasoning, General clinical skills, Basic biomedical science, Communication and team work capability, Caring, Ethics, Accountability, Lifelong learning
Hsu & Hsieh, 2013, Taiwan, the Competency Inventory of Nursing Students (CINS)	Basic biomedical science (5), General clinical nursing skills (5), Communication and cooperation (6), Critical thinking (5), Caring (5), Ethics (9), Accountability (7), Lifelong learning (5)
Nilsson et al., 2014, Sweden, the Nurse Professional Competence scale (NPC)	Nursing care (15), Value-based nursing care (8), Medical technical care (10), Teaching/ learning and support (11), Documentation and information technology (4), Legislation in nursing and safety planning (9), Leadership in and development of nursing (26), Education and supervision of staff/ students (5)
Peng & Watson, 2013, Taiwan, The Nursing Students Core Competencies scale (NSCC)	Critical thinking and reasoning (6), General clinical skills (6), Basic biomedical science (6), Communication and teamwork capability (6), Caring (6), Ethics (6), Accountability (6), Lifelong learning (6)
Liou & Cheng, 2014, Taiwan, the Clinical Competence Questionnaire (CCQ)	Nursing professional behaviors (16), Skills competence: General performance (12), Skills competence: Core nursing skills (12), Skills competence: Advanced nursing skills (6)

Self-assessment was the most common method to assess nurse competence in the clinical context (Watson et al. 2002; Yanhua & Watson 2011) and is considered time-saving and cost-effective method (Cowan et al. 2008). Self-assessment is a process of self-directed assessment initiated and driven by the individual for identifying his/her strengths and weaknesses. Identifying strengths allows the individual to act with appropriate confidence and to ensure that the individual can set challenging learning goals and objectives, rather than choosing courses reiterating what the individual already knows. Identifying weaknesses can help the individual to set appropriate learning goals. (Ewa & Regehr 2005.) The process of self-assessment requires skills in identifying self-ability in comparison to the required standards and skills in seeking and using constructive feedback (Dearnley & Meddings 2007).

Self-assessment has been found to encourage students' metacognition, deep-level learning (Brown 2004) and problem-solving skills (Dochy et al. 1999). Students have found self-assessment to stimulate deep-level learning and critical thinking (Segers & Dochy 2001). Self-assessment is a necessary skill for lifelong learning (Dearnley & Meddings 2007, Galbraith et al. 2008), which has become ingrained in the fabric of nursing practice (Cowan et al. 2008) as nurses are responsible for their own training during their careers (O'Shea 2003). Lifelong learning is one of the strategic objectives of the new strategic framework for the Education and Training 2020 programme in Europe (Council of the European Union 2009) and is linked to self-directed learning (O'Shea 2003, Levett-Jones 2005).

Previous studies in nursing have reported conflicting results between graduating nursing students' self-assessment and assessments made by qualified nurses (Löfmark et al. 2006), mentors (Bartlett et al. 2000), line-managers (Clinton et al. 2005) or nurse experts (Raines 2010). Typically, the differences between these two assessments were studied comparing the assessments at group level with paired samples t-test (Bartlett et al. 2000, Clinton et al. 2005, Löfmark et al. 2006, Raines 2010). Studies comparing the congruence between graduating nursing students' self-assessments and assessments made by another party at single level (matched pairs) do not exist in the nursing literature.

3.4. Summary of the literature review

1) Several nurse competence areas for nursing students in Europe were found in previous studies and other documents. The nurse competence areas referred to ethical values and attitudes, interpersonal skills, assessing the quality of nursing, nursing skills and patient care, teaching and supervising patients, their families, colleagues and nursing students, management of care and leadership in nursing, and utilisation of research.

2) The systematic literature search found 63 studies about nursing students' nurse competence. Eight main viewpoints of nurse competence were identified from the studies 1) single specific nurse competence, 2) as an outcome of nurse education, 3) development of an assessment method to measure nurse competence, 4) effectiveness of an assessment method of nurse competence, 5) curricula evaluation from the perspective of nurse competence, 6) teaching/learning methods to increase nurse competence, 7) effect of clinical practicum on nurse competence, and 8) effect of mentorship programme on nurse competence.

3) By self-assessment, nurse competence was assessed as being between moderate and good, while nurse leaders were more critical in their assessments. The studies were conducted during the years 2000-2014, mostly in Europe. (Table 2.)

4) Nurse competence was evaluated mostly by self-assessment. Several studies suggested that no single method is appropriate for assessing nurse competence and that a multi-method approach is recommend.

5) Only one instrument (the NCQ) was originally developed for evaluation of nurse competence of nursing students. Usually the instruments with psychometric properties tested were originally developed for practising nurses. Only in five European studies was the instrument used tested for psychometric properties.

There is a lack of valid and multi-method nurse competence studies among graduating nursing students in Europe; it was seen that the instruments used previously were not developed for nursing students and the psychometric properties were not tested. As nursing skills are the foundation of nurse competence with scientific knowledge and moral development (Epstein & Hundert 2002), it is necessary to include this skill component in nursing students' nurse competence assessment.

4. PURPOSE OF THE STUDY

The purpose of this study was to describe and evaluate nurse competence of graduating nursing students and the factors related to nurse competence by seeking the reference basis in the literature and the self-assessed nurse competence with particular focus on nursing skills and assessments by mentors. The goal was to obtain a greater understanding of nurse competence of graduating nursing students in Europe. Evaluation of nurse competence of graduating nursing students and identifying related factors could be useful for developing the nursing curricula and clinical learning environment and supervision. The results could also be used to develop new nurses' practical work orientation and mentorship programmes to reduce intentions to leave their jobs or the profession and to ensure even more safe and holistic nursing.

More specifically, the research tasks of this study were as follows:

Descriptive phase:

1. To describe the nurse competence areas for nursing students in Europe (I, Summary).

Evaluation phase:

2. To describe and evaluate the nurse competence of graduating nursing students (II, III).
3. To identify factors related to the nurse competence (II, III).
4. To assess the congruence between graduating nursing students' self-assessments and mentors' assessments of students nurse competence (IV).

5. MATERIAL AND METHODS

The research was carried out in two phases. This chapter describes the design of the study, the study samples, data collection and ethical questions of the study.

5.1. Design, setting and sampling

This study was carried out in Finland in two phases between 2011 and 2014. (Figure 3.)

Phase	Aims	Methods	Samples
Phase I: descriptive phase	Study 1: To describe the nurse competence areas for nursing student in Europe	Literature review, 1999–2012 (I)	7 studies 3 additional documents
		Updated literature review 2012–2014(Summary)	3 studies 1 additional document
Phase II: evaluation phase	Study 2: To describe and evaluate the nurse competence of graduating nursing students.	Cross-sectional survey, data collected with structured instrument 2011 (II, III)	154 graduating nursing students (response rate 51%) representing 9 polytechnics
	Study 3: To identify factors related to the nurse competence.	Cross-sectional survey, data collected with structured instrument 2011 (II, III)	154 graduating nursing students (response rate 51%) representing 9 polytechnics
	Study 4: To assess the congruence between graduating nursing students' self-assessments and mentors' assessments of students' nurse competence.	Cross-sectional comparative survey, data collected with structured instrument 2011 (IV)	42 student-mentor pairs

Figure 3. Study phases

In the descriptive phase, a literature review was conducted in two sequential parts. First, a literature review concerning competence areas of nursing students in Europe was conducted, covering the period from 1999 to August 2012 (I). Secondly, the review was updated to cover the period 2012–2014. (APPENDIX 2.) Electronic databases MEDLINE® and CINAHL were searched. In addition, the reference lists of

the initially retrieved articles were searched manually. Furthermore, websites of the European Council and Parliament, European Federation of Nurses Associations (EFN), Bologna Process, European Federation of Nurse Educators (FINE) and WHO Europe were searched in order to find documents (reports, working papers etc.) where generic nursing competence areas were identified. Finally, after proper inclusion and exclusion analysis, 10 studies and four additional documents (two project reports, one working paper and one directive) were analysed. (I and summary.)

In the evaluation phase, a cross-sectional survey design was employed. When planning the study, a power analysis was done with nQuery Advisor (power = 0.90, alpha = 0.05, effect size = 0.1) commensurate with the number of categories of background factors. The data were collected in February - December 2011 by an on-line survey (graduating nursing students) and a paper survey (mentors) in the last week of final clinical placement of nurse education. Four university hospitals (out of five) were chosen for the study because of their mutual similarity (bed number, staff number and treatment periods; THL 2012), as well as with wide geographical coverage. The sampling was total sampling for graduating nursing students practising in their final clinical placement in these university hospitals (N=302, response rate 51%). The sampling was total sampling for mentors supervising graduating nursing students in medical, surgical or paediatric ward in these university hospitals (N=51, response rate 98%) (II, III and IV). An overview of the characteristics of the studies I-IV is shown in Table 6.

Table 6. Characteristics of the studies I-IV

Study	I	II	III	IV
Sample	7 references 2 project papers 1 working paper	154 students	154 students	42 student-mentor pairs
Design	Descriptive review	Cross-sectional survey	Cross-sectional survey	Cross-sectional comparative survey
Data collection	Systematic search from databases	On-line survey	On-line survey Paper survey	On-line survey
Instruments		NCS ¹	mHOTOHA ²	NCS ¹ mHOTOHA ²
Data analysis	Qualitative Thematic analysis	Descriptive and inferential statistics	Descriptive and inferential statistics	Descriptive and inferential statistics

¹ NCS – the Nurse Competence Scale (Meretoja et al. 2004a)

² mHOTOHA – the modified Hoitotoimintojen hallinta (Command of nursing functions, Räisänen 2002)

5.2. Instruments

In the *evaluation phase*, three previously developed and validated instruments were used. The instruments were: 1) the generic Nurse Competence Scale (NCS; Meretoja et al. 2004a) to assess nurse competence, 2) the modified HOTOHA (Hoitotoimintojen

hallinta; Command of Nursing Functions; Räsänen 2002) to assess nursing skills, and 3) Clinical Learning Environment and Supervision + Nurse Teacher (CLES+T; Saarikoski & Leino-Kilpi 2002, Saarikoski et al. 2008) to assess pedagogical atmosphere on the ward and supervisory relationship (student-mentor) as background factors. The other background factors of graduating nursing students included socio-demographic factors [e.g. student's age, gender, previous professional qualifications (yes/no) and previous working experience in health care (yes/no)]. In addition, factors of studies and future career were requested [e.g. graduating to 1st choice profession (yes/no), working in health care during semesters (yes/no, and the number of days per month approximately), working in paid work in health care at this moment (yes/no), workplace in health care after graduation (specialized health care, primary health care, other), and having considered to leave the profession (yes/no, and if yes; why)]. Finally, satisfaction with the nurse education altogether (0 = not satisfied at all; 10 = very satisfied), readiness for practice based on nurse education (0 = totally insufficient; 10 = totally sufficient), development of competence supported by supervision during clinical placement (extremely bad, bad, moderately, well, extremely well) and clinical speciality in final clinical placement were requested. The background factors of mentors included socio-demographic factors (age and gender) and factors of career (e.g. length of work experience in health care and work experience in current ward). In addition, mentors were asked about their experience of supervising nursing students and annual number of supervised students.

The Nurse Competence Scale (NCS)

The Nurse Competence Scale (NCS; Meretoja et al. 2004a) was developed for practising nurses to assess nurse competence, and it has also been used for newly graduated nurses (Hengstberger-Sims et al. 2008, Wangenstein et al. 2012, Lima et al. 2014). The NCS consists of 73 items structured in seven competence categories: Helping role (7 items), Teaching-coaching (16 items), Diagnostic functions (7 items), Managing situations (8 items), Therapeutic interventions (10 items), Ensuring quality (6 items) and Work role (19 items) (Meretoja et al. 2004a) (Table 7). The instrument has been used to measure nurse competence in a wide range of work experience and clinical care contexts in different countries, where it has been shown to be valid, reliable and sensitive (e.g. Meretoja et al. 2004a,b, Salonen et al. 2007, Dellai et al. 2009, Bahreini 2011, Istomina et al. 2011, Stobinski 2011, Hamström et al. 2012, Meretoja & Koponen 2012, O'Leary 2012, Numminen et al. 2013, Meretoja et al. 2014). The level of competence was measured by a Visual Analogue Scale (VAS) from 0 to 100 (0 = low competence; 100 = high competence). For descriptive purposes, the VAS was divided into four parts to represent the level of competence as low (0-25), rather good (>25-50), good (>50-75) and very good (>75-100). The frequency with which individual items are used in clinical practice is indicated on a four-point scale. (Meretoja et al. 2004a.) The frequency scale was not used in this study. (II.)

The content validity of the NCS has been confirmed by assessments by an international expert panels and pilot test (e.g. Meretoja et al. 2004a, Istomina et al. 2011) and by

using the NCS in different cultural and environmental settings with practising nurses (e.g. Meretoja et al. 2004a,b Salonen et al. 2007, Dellai et al. 2009, Bahreini et al. 2011, Istomina et al. 2011, Stobinski 2011, Hamström et al. 2012, Meretoja & Koponen 2012, O'Leary 2012, Numminen et al. 2013, Meretoja et al. 2014) and newly graduated nurses (Hengstberger-Sims et al. 2008, Wangensteen et al. 2012, Lima et al. 2014). Construct validity has been tested with practising nurses by factor analysis (Meretoja et al. 2004a, Istomina et al. 2011) and concurrent validity with practising nurses by using the 6D Scale (Meretoja et al. 2004a) and with newly graduated nurses by using the Australian National Competency Standards; ANCI (Cowin et al. 2008) as the closest existing instruments. The reliability of the NCS has been estimated by alpha-if-deleted values and determination of correlations. In the analyses, the Cronbach's alpha coefficient for the NCS categories has ranged from 0.78 to 0.96 with practising nurses (Meretoja et al. 2004a, Salonen et al. 2007, Istomina et al. 2011, O'Leary 2012, Numminen et al. 2013) and from 0.61 to 0.96 with newly graduated nurses. (Hengstberger-Sims et al. 2008; Wangensteen et al. 2012, Lima et al. 2014). When planning the study, the choice to use this instrument was discussed in the research team. Although the NCS was developed for practising nurses, it was chosen for the study because nurse competence can be required of nursing students at the point of graduation. Also, at the time of planning the study, there were not reported any other instrument with psychometric properties tested. (Table 5). A pilot study was conducted before the actual data collection in December 2010 with graduating nursing students (n=17) in one polytechnic. Students answered to the NCS and separate questions concerning understanding of the items, time used for answering and functionality of the on-line survey. Based on the results, the content validity was satisfactory and all items were relevant for students.

The mHOTOHA

The mHOTOHA was modified from the validated Finnish HOTOHA instrument (Hoitotoimintojen hallinta; Command of nursing functions; Räisänen 2002), which is based on the literature of the psychosocial and physiological basis of nursing practice and the analysis of the aims of nursing curricula in Finland. The mHOTOHA consists of 92 items structured into 9 nursing skill categories: infection prevention control (4 items), hygiene and skin integrity (7 items), sleep and rest (4 items), exercise (5 items), fluid balance, urinary and bowel elimination (9 items), nutrition (8 items), cardiovascular circulation (14 items), oxygenation and respiration (8 items), body temperature regulation (5 items), medication administration (11 items), pain management (10 items) and care of a dying patient (7 items) (Table 7). The level of nursing skills was measured by using a VAS from 0 to 100 (0 = very low; 100 = very high level of nursing skills). For descriptive purposes, the VAS was divided into four parts to represent the level of nursing skills as low (0-57), moderate (>57-66.8), good (>66.8-76.2) and very good (>76.2-100). (III.)

The content validity of the original HOTOHA has been assessed as high by careful operationalization of the concepts used in the HOTOHA and by a multi-item

instrument. The content validity was also confirmed by assessments by an expert panel. The construct validity of the original HOTOHA has been tested by factor analysis (Räsänen 2002). The reliability of the original HOTOHA categories has been estimated by determination of correlations and alpha-if-deleted values. In the analysis, the Cronbach's alpha coefficient for the original HOTOHA categories ranged from 0.87 to 0.96. (Räsänen 2002.) When planning the study, the selection of HOTOHA for the study to assess basic nursing skills of graduating nursing students was discussed in the research team. After the development of HOTOHA (in the late 1990s), the content of nurse education in Finland has changed. It was thus necessary to update the terminology, and because of the use of the NCS, to remove overlapping items (e.g. patient education). The content validity of mHOTOHA was assessed by the research team and by nurse educators (n=7). A pilot study was conducted before the actual data collection in December 2010 with graduating nursing students (n=17) in one polytechnic. Students answered to the mHOTOHA and separate questions concerning understanding of the items, time used for answering and functionality of the on-line survey. Based on the results, the content validity was satisfactory and all items were relevant for students.

The Clinical Learning Environment and Supervision + Teacher (CLES+T)

The Clinical Learning Environment and Supervision (CLES; Saarikoski & Leino-Kilpi 2002) was developed to assess the quality of clinical learning environment and supervision. The CLES consisted originally of 27 items in five sub-dimensions. (Saarikoski & Leino-Kilpi 2002.) A new sub-dimension, the nurse teacher, was developed for the scale in 2008 (Saarikoski et al. 2008), and at the time of planning the study, the CLES+T consisted of 34 items forming five sub-dimensions: Pedagogical atmosphere on the ward (9 items), Supervisory relationship (8 items), Leadership style of ward managers (4 items), Premises of nursing (4 items) and Role of the nurse teacher (9 items) (Table 7). Since its development the instrument has been used widely around the world, both in primary and specialized health care, where it has been proven to be valid and reliable (e.g. Saarikoski et al. 2007, Papastavrou et al. 2009, Saarikoski et al. 2009, Johansson et al. 2010, Sims et al. 2010, Warne et al. 2010, Bos et al. 2012, Bergjan & Hertel 2013, Watson et al. 2014). In Finland, the CLES+T scale has become part of the quality assurance system within the national health care organizations covering approximately 80% of health care services and is used via electronic survey portals (Meretoja & Saarikoski 2012). In this study, two sub-dimensions of the CLES+T were used as background factors. These were supervisory relationship (student-mentor) and pedagogical atmosphere on the ward, and the items were rated by using a scale from 0 to 10 (0= extremely bad experience; 10= extremely good experience). (II and III.)

The content validity of the CLES+T has been confirmed during the entire development project (Saarikoski & Leino-Kilpi 2002, Saarikoski et al. 2008, Watson et al. 2014). The construct validity has been tested by factor analysis in several studies (e.g. Saarikoski & Leino-Kilpi 2002, Saarikoski et al. 2005, Saarikoski et al. 2008,

Papastavrou et al. 2009, Johansson et al. 2010, Sims et al. 2010, Watson et al. 2010, Bos et al. 2012, Watson et al. 2014). The reliability of the CLES+T has been estimated with alpha-if-deleted values and determination of correlations. In the analysis, the Cronbach's alpha coefficient for the sub-dimensions of CLES+T has ranged from 0.73 to 0.96 (e.g. Saarikoski et al. 2005, Saarikoski et al. 2008, Papastavrou et al. 2010, Johansson et al. 2010, Watson et al. 2014). Assessment of test-retest reliability has also been conducted in order to evaluate the instrument's stability. The correlations of single items ranged from 0.52 to 0.89 ($p < 0.001$), and the coefficients of sub-dimensions from 0.71 to 0.91 (Saarikoski 2002).

Table 7. Instruments and variables of the study

To assess	Sub-areas	Instrument
Background factors (students)	Socio-demographic	CLES+T
	Studies and career	
	Supervision	
Background factors (mentors)	Learning environment	CLES+T
	Socio-demographic	NCS
	Studies and career	
Supervision		
Nurse competence	Learning environment	NCS
	Nurse competence in:	
	Helping role	
	Teaching – coaching	
	Diagnostic functions	
	Managing situations	
	Therapeutic interventions	
Ensuring quality		
Nursing skills	Work role	mHOTOHA
	Nursing skills related to:	
	Infection prevention control	
	Hygiene and skin integrity	
	Sleep and rest	
	Exercise	
	Fluid balance, urinary and bowel elimination	
	Nutrition	
	Cardiovascular circulation	
	Oxygenation and respiration	
	Body temperature regulation	
	Medication administration	
	Pain management	
Care of a dying patient		

When planning the evaluation phase, there were not reported any other instruments with psychometric properties tested to assess nurse competence with particular focus on nursing skills. At the item level, these instruments covered most of the eight common nurse competence areas found in the study 1. Based on that understanding of nurse competence, these instruments were chosen for the study to measure nurse competence with particular focus on nursing skills.

5.3. Data collection and samples

In the descriptive phase, a literature review search was carried out by the researcher from two databases: the MEDLINE and CINAHL (1999 – 2014). The sample of this study phase was 10 empirical studies and four additional documents (two project reports, one working paper and one directive). (I and summary.)

In the evaluation phase, the data were collected by on-line survey with the support of contact teachers at each polytechnic in the spring term of 2011 (2nd March – 28th May 2011) and in autumn term of 2011 (19th September - 18th December 2011). Based on information from contact teachers, there were 302 graduating nursing students from 14 polytechnics practising in their final clinical placement in four university hospitals. Contact teachers sent the study information letter with the Internet link of the survey by e-mail to the nursing students and they answered anonymously. The contact teachers also sent two reminders, two and four weeks after first contact. (II, III and IV.)

The data collection from the mentors was carried out by paper survey with the support of contact nurses in the university hospitals in autumn term of 2011 (1st November – 17th December 2011). The contact nurses in the university hospitals contacted the nurse managers (ward heads) in medical, surgical and paediatric wards and the nurse managers sent the contact addresses of the mentors to the researcher. The researcher contacted the mentors and distributed the study information letter to the mentors either by e-mail or in sessions organised by the researcher and the contact nurses. The questionnaire was delivered to the mentors, who gave their consent (N=51), with an envelope addressed to the researcher. There was a code number in the mentor's questionnaire and each mentor gave the code to their students, who filled it in the on-line questionnaire in order to match the evaluations in the data analysis. The student knew that his/her mentor has assessed his/her nurse competence as well. (IV.)

A total of 154 graduating nursing students participated in the study. The age of the graduating nursing students ranged from 21 to 49 years (mean 25.5). A total of 50 mentors participated in the study; 42 of them were matched with their graduating nursing students for the sub-sample of the study. The remaining mentors' assessments (n=8) were excluded from the analysis. The mean age of the 42 mentors was 39.2 years (range 25-49). For more detailed description of the participants, see Table 8 and II; Table 2.

Table 8. Characteristics of samples

Characteristics	Students (n=154)				Mentors (n=42)			
	mean	SD	min	max	mean	SD	min	max
Socio-demographic								
Age (years)	25.5	5.1	21	49	39.2	11.0	25	59
Gender	<i>n</i>	%			<i>n</i>	%		
female	139	90			42	100		
male	15	10			0	0		
Previous professional qualification (yes)	60	39						
Previous working experience in health care (yes)	54	35						
Studies and career	<i>n</i>	%						
Graduating to 1 st choice profession (yes)	136	88						
Working during semesters in health care (yes)	125	81						
Working at the moment in paid work in health care (yes)	121	79						
Workplace in specialized health care after graduation	128	83						
Considered to leave profession (yes)	33	21						
	<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>				
Satisfied with the education altogether	6.3	1.7	0	9				
Readiness for practice based on nurse education	6.5	1.8	0	10				
					<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>
Work experience in health care (years)					14.5	9.7	1.5	32
Work experience in current ward (years)					10.4	8.7	0.5	31
Supervision	<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>				
Supervisory relationship	8.2	1.9	0	10				
The supervision during the clinical placement supported the development of competence extremely well	<i>n</i>	%						
	70	46						
Personal mentor and supervision came true as planned	119	77						
					<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>
Supervising experience (years)					11.8	9.0	0.5	32
Students/ year					4	2.8	1	15
Happy to supervise nursing students					8.3	1.5	5	10
Learning environment	<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>	<i>mean</i>	<i>SD</i>	<i>min</i>	<i>max</i>
Pedagogical atmosphere on the ward	8.1	1.6	0.9	10				
The duration of final clinical placement (weeks)	6.0	2.2	2.0	11	5.5	2.4	3.0	11
	<i>n</i>	%						
The final clinical placement developed the competence extremely significantly	77	50						

5.4. Data analysis

In the descriptive phase, thematic analysis (Aveyard 2007) was used as the analysis method in the literature review. In the first step, all studies and documents were read carefully and codes were assigned. The titles of competence areas used in the studies and documents were used as codes in the analysis. Altogether 86 codes were assigned. Secondly, the codes were collected on a data extraction sheet. Thirdly, all codes that were identical or alike according to the contents or definition of the competence area were grouped together and were referred to as a theme. Fourthly, each theme was

named reflecting the contents of the theme. Patient education and supervising their relatives was originally part of nursing skills and intervention (I), but in the studies and documents found during the updating process, this area came up as an important area of nurse competence and therefore it yielded a new main nurse competence area. The quality of the studies was assessed by applying criteria for qualitative and quantitative research, and most of the studies met the quality criteria described by the Centre for Reviews and Dissemination (2009), but there was limited reporting of research questions and further research needs. (APPENDIX 2.)

In the evaluation phase, data analysis was based on statistical methods and the data analysis was performed by using SPSS 19 (SPSS Inc., Chicago, USA) software. Descriptive statistics (frequencies, percentages, mean values, SD) and inferential statistics Independent Samples T-test, One-Way ANOVA with post hoc tests (Tukey test or Tamhane test, depending on the results of Homogeneity of Variance Test), Paired T-test, Multifactor Analysis of Covariance (with Sidak adjustments for multiple comparisons) and Pearson/Spearman correlation coefficients were used to analyse the data. (Table 9, see also II, III and IV.) Cluster analysis was performed in the summary to identify groups of graduating nursing student-mentor pairs that were more similar to each other but different from the graduating nursing students-mentors pairs in other groups. Cluster analysis is the statistical method of partitioning a sample into homogeneous classes to produce an operational classification. A clustering method of k-means clustering was employed. In k-means clustering, k is the number of clusters wanted and a case is assigned to the cluster for which its distance to the cluster mean is the smallest. (Everitt et al. 2011.) At first, a two-cluster solution was evaluated, but it didn't describe the data the best possible way. After analysis, a four-cluster solution was considered the most suitable. Finally, when four clusters had been identified within the samples, group comparison was performed with the χ^2 -test and one-way ANOVA to examine any significant differences between the clusters. (Table 9.)

Table 9. Statistical tests used in studies II, III and IV

Purpose	Statistical test	Study
To describe basic data (background factors, mean scores of sum variables and total scores)	Descriptive statistics (frequencies, percentages, mean values, SD)	II, III, IV
To compare nurse competence mean scores	Independent samples t-test One-way ANOVA (with post hoc tests: Tukey test/Tamhane test)	II II
To test dependence between background factors and sum variables/total score of nurse competence	Independent samples t-test	II
To test dependence between background factors and sum variables/total score of nurse competence including nursing skills	Spearman/ Pearson correlation coefficient	II, III
To test differences between overall nursing skills and individual skills categories	Paired T-tests	III
To model the effect of each background variable on nursing skills	Multifactor Analysis of Covariance	III
To test congruence in assessments between students and mentors	Paired samples t-test	IV
To test dependence between student's assessment and mentor's assessment	Spearman correlation coefficient	IV
To identify groups of graduating nursing student-mentor -pairs that were similar to each other	Cluster analysis (k-means clustering) with one-way ANOVA and the χ^2 -test.	IV

5.5. Ethical considerations

During the study, ethical guidelines (ETENE 2006, Pauwels 2007, TENK 2012) were followed. The most essential ethical questions related to human research are consent to participate and risks and benefits for the participants (ETENE 2006), and these need to be considered in the planning stage of research (Polit & Beck 2008). It was important to study the nurse competence of graduating nursing students as there is only little research of it at this scope in Europe. The nurse competence of graduating nursing students is an important issue in health care as it is related to professional standards, patient safety and the quality of nursing care (WHO 2006, 2010). For polytechnics, the results of this study are part of quality assurance of nurse education: the results could be used in developing the nursing curricula as well as clinical practice and supervision in clinical placements. The results could also be used to develop new nurses' practical work orientation and mentorship programmes to reduce intentions to leave their jobs or the profession and to ensure even more safe and holistic nursing.

Ethical approval was given by the Ethical Committee of the University of Turku in evaluation phase [3 February 2011]. Permissions to use the Finnish version of the NCS was given by Dr. Riitta Meretoja (23.4.2010) and the Finnish version of the CLES by Dr. Mikko Saarikoski (23.4.2010). The permission to use and modify the HOTOHA was given by Dr. Anu Räisänen (23.4.2010). Research permission was obtained separately from each participating university hospital (e.g. record numbers 58/2011 and 176/2011), and permissions to conduct the research were obtained from the directors/rectors (in 2010 and 2011 before data collection) of the polytechnics concerned (*evaluation phase*).

There were no vulnerable subjects in the study; all participants were adults. Participation was voluntary and based on anonymity for both graduating nursing students and mentors. The voluntary nature of the study was mentioned in the study information letter. The study information letter described the research, the confidentiality of the data, the anonymity of the subjects, and provided the contact information of the researcher and her supervisors in case the subjects wished to contact them later for any reason. For nursing students, answering the on-line survey was assumed to indicate consent to participate. Mentors who gave their oral consent in the sessions at the hospitals or written consent by e-mail participated in the study. The polytechnics or hospitals were not compared with each other in any phase of the study. The data (electronic and paper) of the study are stored according to ethical guidelines (anonymously and in safe storage). All data are reported in the studies and summary.

6. RESULTS

The main findings are reported in four parts, according to the research tasks. In this summary, the main findings are introduced and more detailed results are presented in the original papers I-IV. In this section student refers to graduating nursing student.

6.1. Nurse competence areas of nursing students in Europe

As an outcome of the literature review (I and summary), classification of nurse competence of nursing students in Europe was created. This classification of nurse competence was verified in the *descriptive study phase* and comprised nine main nurse competence areas: (1) professional/ethical values and practice, (2) nursing skills and interventions, (3) communication and interpersonal skills, (4) knowledge and cognitive ability, (5) assessment and improving quality in nursing, (6) professional development, (7) leadership, management and teamwork, (8) teaching and supervision and (9) research utilisation. (Figure 4.)

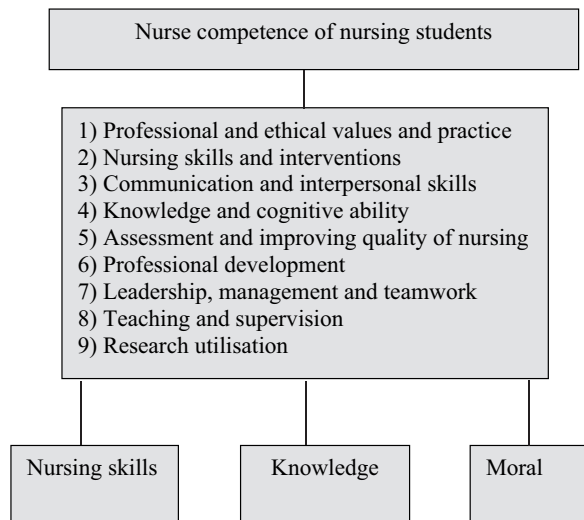


Figure 4. Nurse competence of nursing students with main nurse competence areas

6.2. Nurse competence of graduating nursing students

Students' self-assessed nurse competence was 66.7 ± 15.7 (mean \pm SD), indicating a "good" nurse competence. In all 88.7% of the students reported their nurse competence total score as "good" (62.9%; VAS > 50-75) or "very good" (25.8%; VAS > 75). The remaining respondents reported their nurse competence level as "rather good" (10%;

VAS > 25-50) or “low” (1.3%; VAS \leq 25). The highest self-assessments were in the categories of helping role (75.6 \pm 11.5) and diagnostic functions (72.1 \pm 14.3), and the lowest in work role (59.4 \pm 16.4) and therapeutic interventions (59.7 \pm 17.7). (II.)

At the category level, more than 40% of the students self-assessed their nurse competence as “very good” for helping role (59.7%) and diagnostic functions (47.4%). Over 20% of the students self-assessed their nurse competence as “rather good” in therapeutic interventions (23.4%) and in work role (28.6%). (Figure 5.)

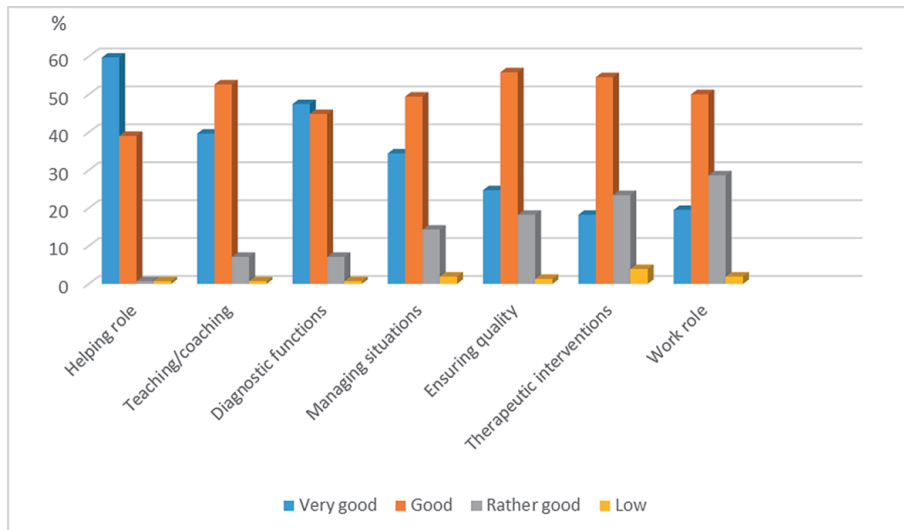


Figure 5. Percentage of students for all nurse competence categories (NCS)

At item level of nurse competence, the mean scores revealed that the highest item mean scores for all nurse competence categories indicated a “very good” nurse competence (range 77.4 – 86.8). The lowest item mean scores indicated “good” nurse competence in four categories and “rather good” nurse competence in three categories. (APPENDIX 3.)

In nursing skills, the total score was 75.4 \pm 10.9 indicating a “good” level. In all 81.2% of the students reported their nursing skills total score as “good” (31.2%; VAS > 66.8–76.2) or “very good” (50.0%; VAS > 76.2-100). The remaining respondents reported their nursing skills’ level as “moderate” (13.6%; VAS > 57-66.8) or “low” (5.2; VAS 0-57). The highest self-assessments were in the categories of body temperature regulation (81.0 \pm 11.5) and infection prevention, control and patient hygiene (80.2 \pm 10.4), and the lowest in care of a dying patient (63.1 \pm 18.3) and fluid balance, urinary and bowel elimination (73.8 \pm 12.7). (III.)

At the category level of nursing skills, more than 60% of the students self-assessed their nursing skills as “very good” in patient’s body temperature regulation (72.7%), oxygenation and respiration (66.2%), medication administration (61.7%) and infection prevention, control and patient hygiene (61%). Over 20% of the students self-assessed

their nursing skills as “low” or “moderate” in the categories of care of a dying patient (46.8%), sleep, rest and exercise (23.4%), fluid balance, urinary and bowel elimination and nutrition (23.3%) and cardiovascular circulation (22%). (Figure 6.)

At item level of nursing skills, the mean scores revealed that the highest item mean scores for all nursing skills categories indicated a “very good” level (range 80.3 – 93.4), except for care of a dying patient (VAS 72.5 = good level). The lowest item mean scores indicated “good” level in four categories, “moderate” in four categories, and “low” level in one category. (APPENDIX 4.)

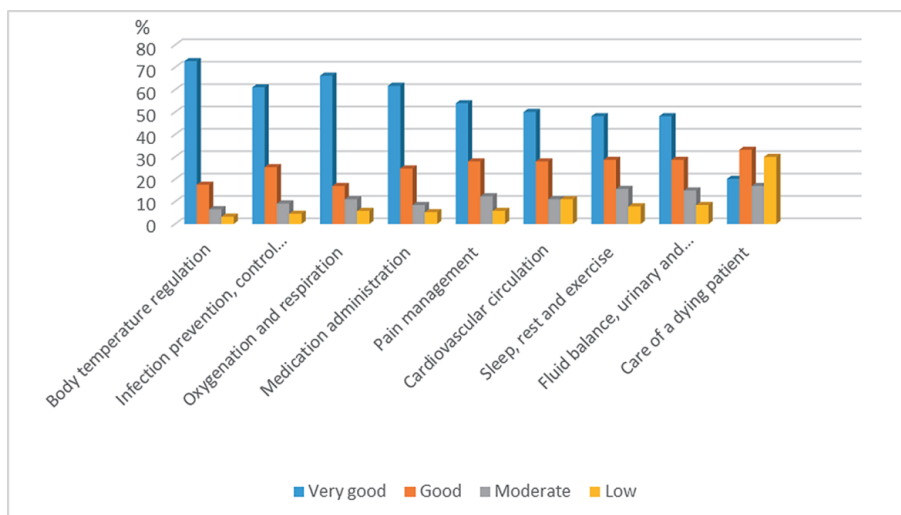


Figure 6. Percentage of students for all nursing skills categories (mHOTOHA)

In summary, the evaluation revealed good nurse competence of students based on their self-assessments of nurse competence with particular focus on nursing skills.

6.3. Factors related to nurse competence of graduating nursing students

The relationships between background factors and total score of nurse competence and nurse competence categories were studied with independent samples t-test and Spearman and Pearson’s correlation coefficient. Two background factors were statistically significantly related to overall nurse competence assessed with the NCS. The higher students assessed the pedagogical atmosphere on the ward and readiness for practice based on nurse education, the higher was their overall nurse competence ($p=0.012$ and $p<0.001$, respectively). Supervisory relationship between student and mentor was also a significant factor. Students who found that supervision during clinical placement supported their development of competence extremely well, assessed their nurse competence to be higher in every NCS category compared to students who did not assess the support of supervision so highly. (Table 10 and II.)

Table 10. The background factors of students (n=154) related to nurse competence categories in the self-assessments (II)

Socio-demographic	<p>Previous professional qualification</p> <p>- students who had previous professional qualifications assessed their nurse competence in diagnostic functions to be better $p=0.047$ compared to other students</p>
Studies and career	<p>Working at the moment in paid work in health care</p> <p>- students who were in paid work at the moment assessed their nurse competence in ensuring quality to be better $p=0.043$ compared to other students</p> <p>Considered leaving the profession</p> <p>- students who had not considered leaving the profession assessed their nurse competence in teaching – coaching to be better $p=0.050$ compared to other students</p>
Supervision	<p>Supervisory relationship</p> <p>- the higher the assessment of supervisory relationship, the higher the assessment in</p> <ul style="list-style-type: none"> * helping role $p=0.018$ * managing situations $p=0.018$ <p>Supervision during the clinical placement supported the development of competence</p> <p>- students who found that supervision during clinical placement supported their development of competence extremely well assessed their nurse competence in helping role to be better $p=0.004$ compared to other students</p>
Learning environment	<p>Pedagogical atmosphere on the ward</p> <p>- the better the pedagogical atmosphere on the ward, the higher the assessment in</p> <ul style="list-style-type: none"> * helping role $p<0.001$ * teaching – coaching $p=0.003$ * diagnostic functions $p=0.006$ * therapeutic interventions $p=0.011$ * managing situations $p=0.017$

The relationships between background factors and total score of nursing skills and nursing skills categories were studied with Multifactor Analysis of Covariance and Spearman and Pearson's correlation coefficient. In Spearman and Pearson's correlation tests, four background factors correlated positively with the overall level of nursing skills. These were pedagogical atmosphere on the ward ($r=0.264$, $p=0.001$), supervisory relationship ($r=0.249$, $p=0.002$), satisfaction with the nurse education ($r=0.251$, $p=0.002$) and readiness for practice based on nurse education ($r=0.343$, $p<0.001$). Multifactor Analysis of Covariance showed that the higher students assessed the readiness for practice based on nurse education, the higher was their overall level of nursing skills ($p=0.012$); this factor was also related statistically significantly to six nursing skills categories. (Table 11 and III.)

Table 11. The background factors of students (n=154) related to the nursing skills categories in the self-assessments (III)

Socio-demographic	Gender Male students assessed their nursing skills in cardiovascular circulation to be better p=0.050
Studies and career	Readiness for practice based on nurse education - the higher the readiness for practice based on education, the higher the level of nursing skills in * infection prevention, control and patient hygiene p=0.001 * medication administration p=0.003 * sleep, rest and exercise p=0.005 * fluid balance, urinary and bowel elimination and nutrition p=0.005 * body temperature control p=0.018 * oxygenation and respiration p=0.041 Working at the moment in paid work in health care - students who were working at the moment in paid work in health care assessed their nursing skills to be better in * fluid balance, urinary and bowel elimination and nutrition p=0.005 * medication administration p=0.024 Considered leaving the profession - students who had not considered leaving the profession assessed their nursing skills to be better in * care of a dying patient p=0.002 * body temperature control p=0.046
Supervision	Supervisory relationship - the higher the assessment of supervisory relationship, the higher the level of nursing skills in * oxygenation and respiration p=0.016 * cardiovascular circulation p=0.017 * body temperature regulation p=0.032
Learning environment	The final clinical placement developed the competence - students who found that final clinical placement developed their competence extremely well assessed their nursing skills in medication administration to be better p=0.044

In summary, several factors were related to the nurse competence. Readiness for practice based on nurse education, pedagogical atmosphere on the ward, supervisory relationship between student and mentor and working at the moment of the study in paid work in health care were the most significant of these.

6.4. The congruence between graduating nursing students' self-assessments and mentors' assessments of students' nurse competence

The congruence between graduating nursing students' self-assessments and mentors' assessments (n=42 student-mentor pairs) of students' nurse competence was studied by determining the congruence between self-assessment and assessment by mentors in the last week of final clinical placement of nurse education.

Students assessed themselves to have higher nurse competence than was assessed by their mentors (64.5±12.2 vs. 56.7±19.0, mean±SD, p=0.013). Higher assessments were seen in all NCS categories as well; the difference between the two assessments was statistically

significant in five categories. The correlations between self-assessments of graduating nursing students and their mentors concerning the NCS categories were generally low: no statistically significant associations were found. (Figure 7 and IV: Table 1.)

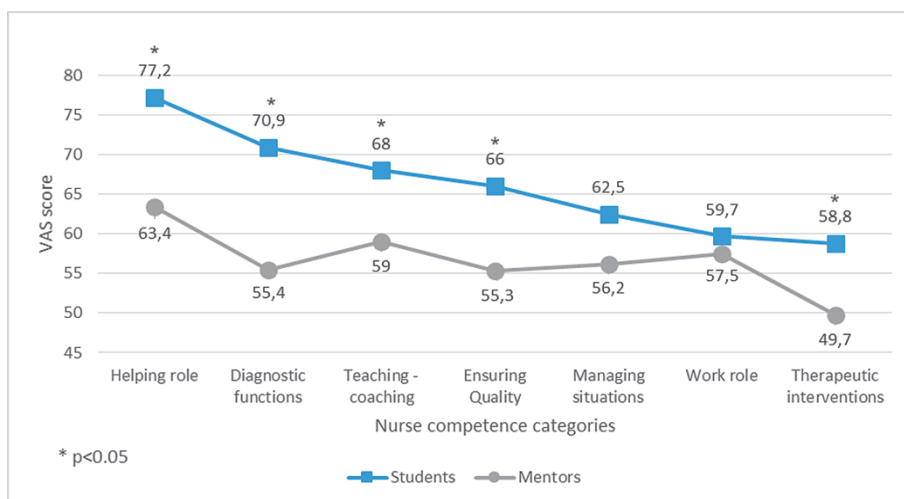


Figure 7. The congruence between students' self-assessments and mentors' assessments of the nurse competence categories (NCS)

Investigation of the nurse competence at the single student-mentor level (matched pairs) showed no congruence between the two assessments. Over half of the students (68.3%) assessed their nurse competence higher than their mentors. A few congruent assessments were found in the categories of therapeutic interventions (3), helping role (2), diagnostic functions (1) and ensuring quality (1). (APPENDIX 5, Figure 8 and IV: Table 2.)

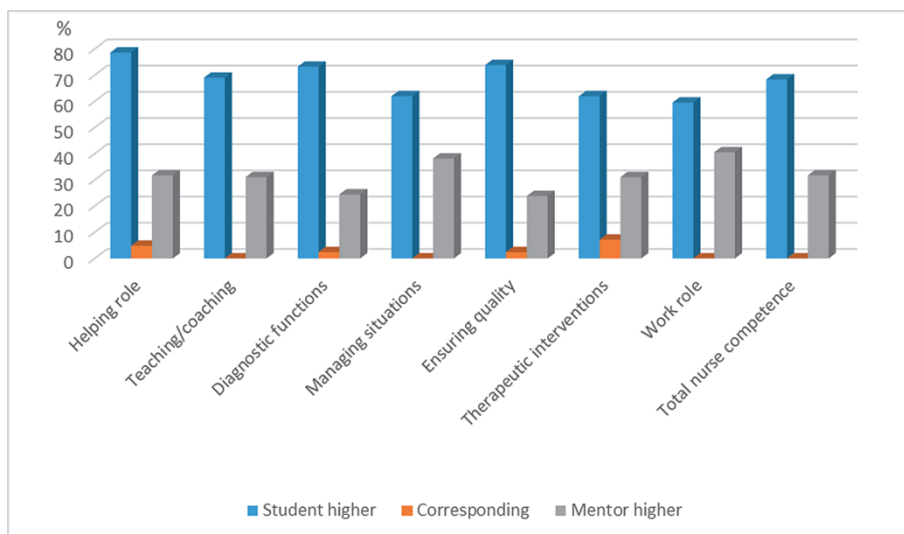


Figure 8. The congruence between students' self-assessments and mentors' assessments concerning nurse competence at single student-mentor level (NCS)

In nursing skills, students assessed themselves to have slightly better nursing skills compared to their mentors (75.4 ± 12.8 vs. 72.2 ± 16.7) in every category of nursing skills, except for care of a dying patient. Statistically significant differences were not found between the two assessments. The correlations between self-assessments of students and their mentors' assessments concerning nursing skills were low and only one statistically significant association was found in the category of nursing skills related to fluid balance, urinary and bowel elimination and nutrition ($r = .367$, $p = .017$). (Figure 9 and IV: Table 1.)

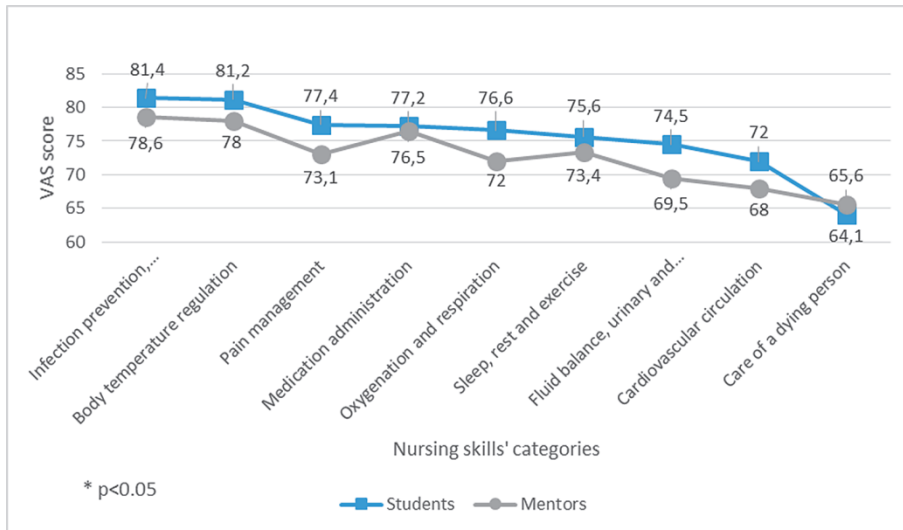


Figure 9. The congruence between students' self-assessments and mentors' assessments of nursing skills categories (mHOTOHA)

Investigation of the nursing skills at the single student-mentor level (matched pairs) showed no congruence between the two assessments. Over half of the students (61.0%) assessed their nursing skills higher than their mentors. A few congruent assessments were found in all categories, except for pain management and medication administration (APPENDIX 5, Figure 10 and IV: Table 2.)

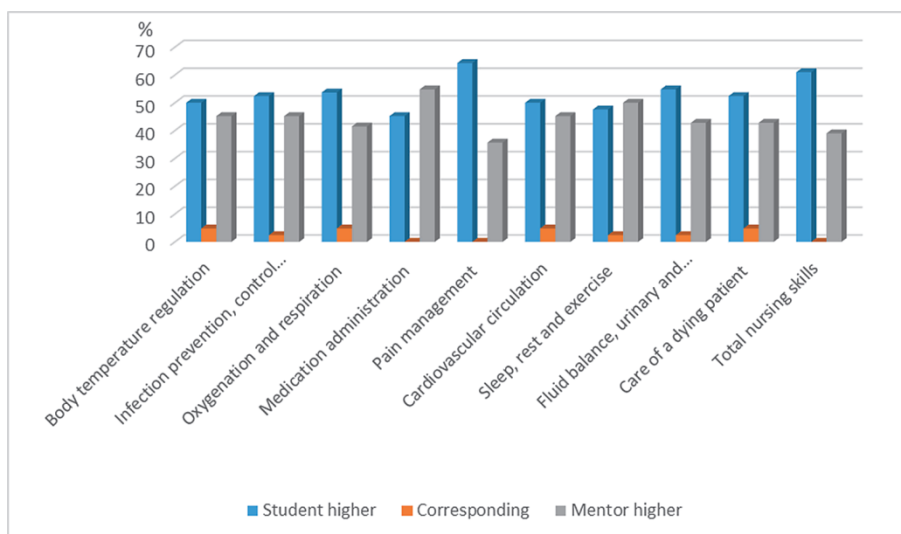


Figure 10. The congruence between students' self-assessments and mentors' assessments concerning nursing skills at single student-mentor level (mHOTOHA)

Cluster analysis was performed to identify groups of student-mentor pairs that were more similar to each other but different from the student-mentor pairs in other groups. A four-cluster solution was considered the most suitable. (Figure 11.)

In cluster 1 (n=14), the two assessments of students' nurse competence with particular focus on nursing skills were far apart; students' assessments were higher compared to mentors' assessments. In this cluster, students' assessments of the supervisory relationship with their mentor and pedagogical atmosphere on the ward were the lowest compared to other clusters. (Figure 11.)

In cluster 2 (n=17), the two assessments of students' nurse competence with particular focus on nursing skills were close to each other, however, students' assessments still remain higher than mentors'. In this cluster, students found the supervision during the final clinical placement to support the development of their competence extremely well. Students' self-assessed nurse competence was higher compared to students in other clusters ($p=0.018$). (Figure 11.)

In cluster 3 (n=4), the two assessments of students' nurse competence with particular focus on nursing skills were far apart; mentors' assessments were higher compared to students' assessments. In this cluster, students' assessments of the supervisory relationship with their mentor and pedagogical atmosphere on the ward were the highest compared to other clusters. The difference was statistically significant compared to cluster 1 ($p=0.031$) in pedagogical atmosphere. Also mentors were happier to supervise nursing students compared to mentors in other clusters and the difference was statistically significant compared to cluster 4 ($p=0.035$). (Figure 11.)

<p>Cluster 1: 14 student-mentor pairs</p> <ul style="list-style-type: none"> * duration of student's final clinical placement 5.9 weeks (mean) * nurse competence VAS mean 62.5 (students), 34.7 (mentors) * nurse skills VAS mean 73.4 (students), 52.7 (mentors) * pedagogical atmosphere 7.5 (students) * supervisory relationship 7.5 (students) * supervision during the final clinical placement support the development of the competence extremely well (n=3 students) * working at this moment in paid work (n=3 students) * mentors supervising 3.8 (mean) students per year * mentors happy to supervise nursing students 8.2 * mentors' supervising experience 12 years (mean) 	<p>Cluster 2: 17 student-mentor pairs</p> <ul style="list-style-type: none"> * duration of student's final clinical placement 5.5 weeks (mean) * nurse competence VAS mean 73.6 (students), 67.4 (mentors) * nursing skills VAS mean 80.9 (students), 79.4 (mentors) * pedagogical atmosphere 8.6 (students) * supervisory relationship 8.7 (students) * supervision during the final clinical placement support the development of the competence extremely well (n=8 students) * working at this moment in paid work (n=1 student) * mentors supervising 4.1 (mean) students per year * happy to supervise nursing students 8.5 * mentors' supervising experience 12.9 years (mean)
<p>Cluster 3: 4 student-mentor pairs</p> <ul style="list-style-type: none"> * duration of student's final clinical placement 7.3 weeks (mean) * nurse competence VAS mean 52.9 (students), 82.7 (mentors) * nursing skills VAS mean 79.2 (students), 91.1 (mentors) * pedagogical atmosphere 8.9 (students) * supervisory relationship 9.6 (students) * supervision during the final clinical placement support the development of the competence extremely well (n=4 students) * working at this moment in paid work (n=3 students) * mentors supervising 2.5 (mean) students per year * mentors happy to supervise nursing students 9.8 * mentors' supervising experience 8 years (mean) 	<p>Cluster 4: 7 student-mentor pairs</p> <ul style="list-style-type: none"> * duration of student's final clinical placement 3.9 weeks (mean) * nurse competence VAS mean 55.8 (students), 59.8 (mentors) * nursing skills VAS mean 64.0 (students), 82.8 (mentors) * pedagogical atmosphere 7.7 (students) * supervisory relationship 7.6 (students) * supervision during the final clinical placement support the development of the competence extremely well (n=1 student) * working at this moment in paid work (n=1 student) * mentors supervising 5.4 (mean) students per year * mentors happy to supervise nursing students 7.3 * mentors' supervising experience 10.9 years (mean)

Figure 11. Characteristics of student-mentor pairs in clusters 1-4.

In cluster 4 (n=7), the two assessments of students' nurse competence with particular focus on nursing skills were close to each other, mentors' assessments being higher than students'. In this cluster, mentors' happiness to supervise nursing students were the lowest and they were supervising the most nursing students per year. (Figure 11.)

In summary, students self-assessed their nurse competence higher than their mentors, both at group-level and at single student-mentor level. In nursing skills, the assessments were closer to each other. No congruent assessments were found between students and mentors. However, based on cluster analysis, it seems that the long length of the final clinical placement (>5.5 weeks), appropriate annual amount of students per mentor (<4.1 nursing students) and supervision, which supports the development of students' nurse competence, were the characteristics indicating congruence between the two assessments.

6.5. Summary of the results

1) Several nurse competence areas were found in the empirical studies and additional documents. The number of studies (n=10) is low and supported the need to study nurse competence of students further. The 86 competence areas found were classified into nine main competence areas of nursing students in Europe.

2) Students self-assessed their nurse competence with particular focus on nursing skills as good. Compared to mentors' assessments, students overestimated their nurse competence both at group-level and at single student-mentor level. Students, as well as their mentors, assessed their nurse competence to be highest in the category of helping role and the lowest in the category of therapeutic interventions.

3) Several related factors to nurse competence with particular focus on nursing skills were found. The higher students assessed the supervision, learning environment and readiness for practice based on nurse education, the higher was their nurse competence.

4) A long length of the final clinical placement (>5.5 weeks), appropriate annual amount of students per mentor (<4.1 nursing students) and supervision, which supports the development of students' nurse competence were the characteristics indicating congruence between students' and mentors' assessments.

7. DISCUSSION

This chapter discusses the main results of the study and the validity and reliability of the study. In addition, suggestions for further research and implications for nurse education and nursing practice are presented. More detailed discussions are presented in original studies I, II, III and IV. In this section student refers to graduating nursing student.

7.1. Discussion of results

The *first main finding* of the study was the nurse competence areas of nursing students in Europe. Altogether 86 competence areas were identified from studies and other documents and they were classified into nine main categories. The number of studies was low (n=10) indicating a need for more research on nursing competence in Europe. Since the Bologna Declaration in 1999, significant changes in nursing education in Europe have been in progress, but there are still differences between countries in European nurse education (Lahtinen et al. 2014). The contents of the nurse competence areas found in this study are similar to the common competence standards for nursing in Australia (ANMC 2006) and in the United States (ANA 2010) and the modernised Directive on the Recognition of Professional Qualification (European Commission 2013). This adds to the validity of the literature review. Harmonising nurse education has started in Finland. Representatives from all polytechnics have been working together to define minimum competence requirements for general nurse. These competence requirements are not yet reported. The common nurse competence areas in nursing education within the Europe could be one solution to harmonise nurse education and facilitate nurse mobility. The countries with a shortage of nursing staff could recruit nurses from those European countries with a surplus if the nurse competence level of nursing staff from different European countries was documented. Also, common European nursing competence assessment is a key issue for educators and administrators to ensure high-quality nursing care in all countries as nurses should be capable of equally competent nursing practice. Common competence areas in nurse education in the Europe will also benefit researchers. In this study, common nurse competence areas (Figure 4) guided the selection of the instrument. The NCS covered most of these nurse competence areas. As nursing has changed since the development of the NCS and there are now common competence requirements in Europe, it is necessary to revise the instrument to cover common competence areas of the Directive.

In Finland, in the early years of the 2000s, when the first new nurses graduated from polytechnics, it was claimed that nurse education did not provide new nurses with sufficient readiness for practice from the viewpoint of working life (Lauttamäki & Hietanen 2006). The lack of basic nursing skills of new nurses was in particular

subject to a lot of debate (e.g. Jaroma 2000, Ministry of Social Affairs and Health 2002, Räisänen 2002, Kilpiäinen 2003, Salmela 2004, Lauttamäki & Hietanen 2006). After this, the Ministry of Education (2006) published 10 domains for professional competence in nursing and polytechnics had to develop their nursing curricula according to these domains as well as according to the Directive 2005/36/EC. Since then, nurse education has been developed, but the debate if new nurses are ready for practice from the workplace point of view is still ongoing. This is the main reason why nurse competence with particular focus on nursing skills were under investigation in this study.

The *second main finding* was that students self-assessed their nurse competence as good. The result is parallel to earlier studies with newly graduated nurses two to ten months after graduation in Australia and in Norway (Hengstberger-Sims et al. 2008, Wangensteen et al. 2012). However, the assessments of students in this study are higher than reported in a recent study in Australia with graduate nurses starting their graduate nurse program (Lima et al. 2014). The NCS was used in all of the above-mentioned studies to assess nurse competence. Other studies have also reported good self-assessed competence of students at the point of graduation in the UK (Bartlett et al. 2000, Clinton et al. 2005) and competence to be good or strongly developed (Löfmark et al. 2006). However, comparing the results of this study to earlier studies must be done cautiously as Finnish nurse education differs from the nurse education in countries outside the Europe. Also, in earlier studies in the UK (Bartlett et al. 2000, Clinton et al. 2005) the nurse education differs from the nurse education in Finland. In a brand new study conducted in Finland (Talman 2014), students graduated between 2006 and 2009 self-assessed themselves to have moderate competence at the point of graduation. Students in this study considered themselves as competent at the point of graduation as has also been found in earlier studies (Raines 2010, Doody et al. 2012, Takase et al. 2014). This result may indicate that changes made to nurse education due the Bologna Declaration have been successful. However, the results are based on students' self-assessment and research is needed from the viewpoint of nursing practice in the future.

At the category level of the nurse competence, the students' assessments varied from 75.6 (highest: helping role) to 59.4 (lowest: work role, II). In addition, both students and mentors assessed the helping role competence (helping patients to cope and providing ethical and individualized care, IV) to be the highest. Helping role competence has been assessed highest in earlier studies as well with graduating nursing students (Raines 2010), new graduate nurses (Hengstberger-Sims et al. 2008), newly graduated nurses (Wangensteen et al. 2012) and practising nurses (e.g. Salonen et al. 2007, Numminen et al. 2013, Meretoja et al. 2014). Basic nursing (O'Connor et al. 2001) and interventions (Bartlett et al. 2000, Clinton et al. 2005) and clinical nursing (Talman 2014), which are aspects of nursing that might be comparable to the helping role, have also been assessed highest in earlier studies. These findings indicate that nurse education has been successful in terms of preparing the new nurses for the helping role competence. The lowest competence according to students' self-

assessments was in work role (acting collegially, accountably, autonomously and taking care of one's own continuous professional competence). Benner (1982a) has proposed that nurse competence develops along a continuum from novice to expert. These results may indicate, that in some categories, for example in helping role, students are already advanced beginners at the point of graduation. They might have had a lot of real situations during their clinical placements to practice and develop their nurse competence in helping role. In some categories, for example in work role, students are novices, who have had a little of real situations to practice and develop their nurse competence. This indicates that the measurement point of students' nurse competence matters. (Figure 2.)

At the category level of nursing skills, students' assessments varied from 81.0 (highest: body temperature regulation) to 63.1 (lowest: care of a dying patient, III). Body temperature regulation was also assessed highest and care of a dying patient lowest in a previous study with students from polytechnics using the original HOTOHA (Räisänen 2002). Compared to the previous study with the original HOTOHA in 1999 (Räisänen 2002), students' level of nursing skills based on self-assessments are now higher in every nursing skills category. Also, clinical nursing scored the highest in a previous study (Talman 2014). Based on the students' self-assessments and mentors' assessments, the level of nursing skills is now higher at the point of graduation than assessed before (Räisänen 2002), which is a positive result for Finnish nurse education. In recent years concerns have risen in the UK, US and Sweden concerning new nurses' possible lack of nursing skills proficiency (Berkov et al. 2008, Bradshaw & Merriman 2008, Higgins et al. 2010, Athlin et al. 2012, Ross 2012). According to the results, such concerns are unfounded in this study.

Nursing students seem to trust their nurse competence at the point of graduation, as found in earlier studies (Löfmark et al. 2006, Lauder et al. 2008b, Lakanmaa et al. 2014). These results can be seen as good, and based on these, nurse education has been successful. However, when students' nurse competence was assessed by their mentors, the results concerning nurse competence were clearly poorer. In nursing skills, the two assessments were closer to each other. It is imperative that new nurses are confident with their nurse competence, but overconfidence based on inaccurate assessments may prove destructive to the new nurse, in the shape of stressful reality shock, which may lead to leaving profession and may also pose a threat to patient care.

The differences between the two assessments may due 1) a different understanding of nurse competence, 2) the inexperience of students to assess their nurse competence or 3) critical mentor based on a different reference point in relation to required competence. Nurse competence assessment requires abstract-level thinking and understanding of nurses' work role and responsibilities. According to a previous study (Wangensteen et al. 2008), awareness of nurses' responsibilities has been found to differ between nursing students and RNs (see also Ramritu & Barnard 2001). At the point of graduation, students might not know what they need to know in order to be rated as competent. Mentors' assessments may be based on what is expected in their

particular clinical area, as in university hospitals, nursing care is highly specialized. Mentors' assessments may suggest that a high level of competence is required in these particular wards (Numminen et al. 2013). This leads to the question of whether current nurse education offers sufficient readiness for practice required in specialized health care in university hospitals (see also Paakkonen 2008, Lakanmaa 2012, Lankinen 2013). Although the emphasis of the Finnish nursing curricula, as well as European nursing curricula, is on holistic nursing and general nursing rather than on specific competences or special nursing fields, nurse educators should arrange special education and continuing education after graduation for nursing specialities together with health care organisations. This would ensure a competent workforce of health professionals in the health care system.

The differences between the assessments may also mean that cooperation between nurse education and nursing practice is insufficient, referring to the theory-practice gap (Burns & Poster 2008), and several suggestions have been made to reduce this gap. These include, for example, the following: (i) nurse teachers should spend time in clinical practice; updating their clinical skills and re-experiencing the realities of practice, (ii) clinical practice/education exchange, where two people, one in clinical practice and the other in education, exchange jobs for a fixed period of time, and (iii) the curricula should be developed together with health care practice (Ajani & Moez 2011). Nurses work in the dynamic field of health care, where major changes are taking place around the world. These changes pose challenges to constricting the theory-practice gap. Nursing students and mentors would both benefit from training in nurse competence assessment. Mentors' training could include the nursing curriculum and nurse competence requirements for general nurse in Europe and training in providing critical feedback in a constructive manner. This would ensure that every mentor knows the criteria. Nursing students' training could include the benefits of nurse competence development by using self-assessment and the educational benefits of self-assessment and the difficulties related to it. During the education, nursing students would benefit a plenty of opportunities to practice self-assessment, and instruments used for self-assessing nurse competence could be incorporated into nurse education to develop self-assessment skills. Nurses need self-assessment skills to be self-directed learners during their career (O'Shea 2003, Levett-Jones 2005, Ministry of Education 2009). Nursing students' practice sessions of self-assessment could include critical feedback on the self-assessment from educators and mentors. Also, objective assessment, e.g. knowledge tests and observation (e.g. OSCE), could be used during the practice session. In addition, assessment with the same scale by another person (peer, mentor, educator or patient) could ensure that the self-assessment skills of nursing students are improved and nurse competence can be completed and evaluated critically. In the end, nurses who cannot accurately self-assess themselves may be at greater risk of providing suboptimal care to patients.

The *third main finding* refers to factors related to nurse competence. The higher students assessed the supervisory relationship with their mentors, pedagogical atmosphere on the ward and readiness for practice based on nurse education, the higher

were their self-assessed nurse competence. Pedagogical atmosphere on the ward and supervisory relationship have also been identified as important factors for students' learning and satisfaction in earlier studies (Saarikoski & Leino-Kilpi 2002, Kim 2007, Allan et al. 2008, Johansson et al. 2010, Warne et al. 2010, Houghton et al. 2012). Students value their opportunities to practice nursing skills during the nurse education, as found in a previous study (Johansson et al. 2013). Health care experience prior to nurse education, which was associated with the nurse competence in a previous study (Wangenstein et al. 2012), was not related to nurse competence in this study. In the future, these related factors need to be studied further.

The *fourth main finding* was that mentors having only a few nursing students per year in a long clinical placement were happier to supervise nursing students and assessed their students to have higher nurse competence compared to other mentors. These mentors had also been supervising nursing students for a shorter time (on average 8 years) compared to other mentors. Students having a long clinical placement and founding the supervision developing their competence extremely well, assessed themselves to have higher nurse competence compared to other students. In a previous study (Warne et al. 2010), the duration of the clinical placement had a connection to nursing students' satisfaction of clinical learning environment. Nursing students with longer clinical placements (7 weeks or longer) were more satisfied compared to other students. Learning to become a nurse is a multidimensional process. It requires appropriate amount of time being spent with patients. During short clinical placements nursing students might learn technical skills, but get fewer opportunities to integrate knowledge, skills, attitudes and values to develop their holistic nurse competence. Nurse educators need to reconsider using a short clinical placements as students might achieve the holistic experience of nursing care and better nurse competence during a longer clinical placement. Supervisory relationship between student and mentor could also benefit from students' longer clinical placements and low amount of nursing students to be supervised per mentor annually.

7.2. Validity and reliability of the study

The validity and reliability have been ensured during the study in multiple ways: 1) combining data from different parties as suggested in previous studies, 2) using previously validated instruments in data collection and 3) using diverse data analysis. By this multi-method approach, it is possible to contribute to a broader and deeper description of students' nurse competence.

The literature review (I) showed that previous literature and research concerning nurse competence areas of nursing students in Europe was scarce. This finding supported the need to study nurse competence of students further. Nurse competence is multidimensional concept (Meretoja et al. 2002, Watson et al. 2002, Cowan et al. 2005) and previous studies (e.g. Norman et al. 2002, Lauder et al. 2008a) has recommended a multi-method approach to assessing students' competence. Therefore

the data collection from students and their mentors and more than one data analysis method were used in this study.

In the *description phase*, the search strategy used in both literature reviews (I and summary) contained two databases: the MEDLINE and CINAHL (1999 – 2014). Both these databases have been previously used for performing systematic reviews of literature (e.g. Evans 2001, Flemming & Briggs 2006). The literature searches were performed under the guidance of a library information specialist. Studies and additional documents were searched by using broad search terms in combination. However, it is possible that there are studies and documents which were not included under these search terms. Only studies published in English were included. Therefore, relevant studies in other language that would have met the inclusion criteria may have been overlooked. The quality of studies was evaluated with the criteria described by the Centre for Reviews Dissemination (2009), and the studies met mostly the quality criteria. Reporting of research questions and further research needs could have been reported better. The different definitions of the concept of competence are one validity problem of this study phase. The analysis followed the structure by Aveyard (2007) and working back and forth with the themes and codes gave the confidence that the development of the main nurse competence categories was robust and open to scrutiny. To ensure the validity of the analysis, a second researcher could have made the analysis as well. However, the analysis were confirmed through discussion in the research team during the analysis process.

In the *evaluation phase*, the number of respondents and response rate, the instruments used and the statistical analyses give reason for some reflections with the respect to validity and reliability. A power analysis, in which the sufficient sample size is estimated (Polit & Beck 2008), was carried out by nQuery Advisor (power=0.90, alpha=0.05, effect size=0.1). A minimum of 148 responders among students was needed, thus the sample size, 154 students, was enough. In study 4, the sample size (42 student-mentor pairs) was also enough based on a power analysis (power=0.88, alpha=0.05, effect size=0.5). The response rate was 51% among students and 98% among their mentors. Contact teachers sent two reminders to students; adding a third reminder might have increased the response rate. This is, however, also an ethical question as participation is voluntary. Receiving a third reminder might have been experienced as pressure to reply. Students may have put high value on their time and may not have viewed completion of an on-line survey as “high-priority” use of their time. In addition, students are subject to a lot research and these particular students may have participated in another study and chosen to give this study a pass.

However, there are a few limitations concerning the sample size. The first limitation is that the target population of students graduating annually is difficult to specify. Approximately 2,200 student graduate every year in Finland (Ministry of Education and Culture 2012); approximately 400 of them have their final clinical placement in university hospitals. But there is no statistical data on how many students had their final clinical placement in university hospitals in 2011. Based on the information of the

contact teachers, 302 students had their final clinical placement in four university hospital and all these students were invited to participate the study. The dropout analysis cannot performed during the evaluation phase; it is therefore possible that students who were confident with their nurse competence participated the study voluntarily. Information on the number of students and their mentors in four university hospitals was used as an aid in defining sampling and sample sizes. Based on the statistical report of the Finnish Institute for Educational Research, the sample of students was representative of the population of Finnish nursing students by the age and gender of students (Stenström et al. 2012). The students represented 9 polytechnics (out of 21 with Finnish language) from the wide geographical location. The response rate among graduating nursing students is in line with other recent studies among graduating nursing students in Finland (Lankinen 2013, Lakanmaa et al. 2014). Nevertheless, it can be concluded that the sample was selected and quite small and brings therefore some limitations to generalizing the empirical findings. To enhance the generalizability of the results, a description of the context, selection of participants (students and mentors), demographics of participants, data collection and data analysis process was provided in every study (II, III and IV) in order to enable the reader to determine whether the results of this study are generalized to another context.

In this study, the NCS was used for the first time with nursing students. The NCS was originally developed for practising nurses to assess nurse competence in Finland (Meretoja et al. 2004a), and it has also been used with new nurses after graduation (Hengsberger-Sims et al. 2008, Wangenstein et al. 2012, Lima et al 2014). When planning the study, there were not reported instrument with psychometric properties tested to assess nurse competence of nursing students. Only one instrument was found (NCQ; Bartlett et al. 1998), but it was already suggested that this instrument should be replaced with a more conceptually sophisticated and psychometrically validated instrument (Clinton et al. 2005). The generic NCS has been tested with a wide range of work experience and clinical care contexts in different countries, where it has been shown to be valid, reliable and sensitive (e.g. Meretoja et al. 2004a,b, Salonen et al. 2007, Dellai et al. 2009, Bahreini 2011, Istomina et al. 2011, Stobinski 2011, Hamström et al. 2012, Meretoja & Koponen 2012, O'Leary 2012, Numminen et al. 2013, Meretoja et al. 2014). The choice to use the NCS in this study was discussed in the research team. Although the NCS was developed for practising nurses, it was chosen for the study because nurse competence can be required of nursing students at the point of graduation. In addition, the NCS covered most of the nurse competence areas found in study 1. A pilot study was conducted before the actual data collection in December 2010 with students (n=17) in one polytechnic. Students answered to the NCS and separate questions concerning understanding of the items, time used for answering and functionality of the on-line survey. Based on the results, the content validity was satisfactory and all items were relevant for students. The findings of this study indicate that the NCS can be used to assess the nurse competence of students. Although, the sample size was for students and student-mentor pairs was enough based on the power analysis, it was quite small and therefore further studies and analysis is needed.

The mHOTOHA was modified for this study from the validated Finnish HOTOHA instrument, which is based on the literature of psychosocial and physiological basis for nursing practice and the analysis of the aims of nursing curricula in Finland. The educational transition in Finland resulting from the Bologna Declaration has caused increasing tension between employers and educators, and it was claimed that nurse education did not provide candidates with sufficient readiness for practice from the viewpoint of working life (Lauttamäki & Hietanen 2006). Especially the lack of basic nursing skills of new nurses was subject to a lot of debate in the early years of the 2000s (e.g. Jaroma 2000, Ministry of Social Affairs and Health 2002, Räisänen 2002, Kilpiäinen 2003, Salmela 2004, Lauttamäki & Hietanen 2006). The HOTOHA was chosen because it was validated in Finland and the content of the instrument was nursing skills. The content of nurse education has changed since the development of HOTOHA (in the late 1990s), and it was therefore necessary to update the terminology, and because of the use of the NCS, to remove overlapping items (for example items related to patient education). The content of mHOTOHA was discussed in great depth in the research team and with nurse educators (n=7) to ensure its content validity. In addition, a pilot study was conducted before the actual data collection in one polytechnic in December 2010. Students answered to the mHOTOHA and separate questions concerning understanding of the items, time used for answering and functionality of the on-line survey. Based on the results, the content validity was satisfactory and all items were relevant for students. In this study, the construct validity for the mHOTOHA was tested by three methods: Pearson correlation test, Principal Component Analysis (PCA) and Structural Equation Model (LISREL). The Pearson correlation coefficients between the sum variables and total instrument (range 0.679 to 0.930) supported the construct validity. A nine principal components model explained 64.9% of the total variance of individual mHOTOHA items and supported the construct validity. In addition, construct validity was also supported by the LISREL model (NFI 0.97, CFI 0.98, IFI 0.98, SRMR 0.037 and GFI 0.90). (III)

Internal consistency, i.e., reliability, was examined during the study (*evaluation phase*) with Cronbach's alpha coefficient for both instruments. The evaluation of the reliability should be measured in each study as it is only an estimation (Connelly 2011). In Paper II, the Cronbach's alpha values were calculated for the whole NCS and for each subscale. The overall Cronbach's alpha value for the NCS was 0.98; for seven subscales it ranged from 0.84 (helping role) to 0.93 (teaching – coaching) with the study sample (n=154). The values were in line with previous studies with NCS (e.g. Hengstberger-Sims et al. 2008, Wangenstein et al. 2012). In Paper IV, the Cronbach's alpha values for the NCS subscales ranged among students from 0.81 (helping role) to 0.93 (teaching – coaching) and among mentors from 0.87 (helping role) to 0.97 (teaching – coaching).

The overall Cronbach's alpha value for the mHOTOHA was 0.98, and for the nine subscales it ranged from 0.87 (body temperature regulation) to 0.94 (cardiovascular circulation) in Paper III. In Paper IV, the Cronbach's alpha values for the mHOTOHA subscales ranged among students from 0.85 (body temperature regulation) to 0.93

(cardiovascular circulation) and among mentors from 0.92 (body temperature regulation) to 0.97 (2 subscales: infection prevention, control and patient hygiene and fluid balance, urinary and bowel elimination and nutrition). In spite of the modification, the internal consistency among nursing skills categories remained high (see Räsänen 2002).

In data analysis, this study applied a variety of different statistical analysis methods (Table 9). In addition to the traditional statistical analysis, such as the t-tests (independent samples t-test and paired samples t-test) and correlation coefficient (Pearson/ Spearman), the advanced statistical analysis were also utilized. These included PCA, LISREL model, Multifactor Analysis of Covariance and Cluster analysis. All statistical analysis methods were appropriate and supported obtaining a greater understanding of nurse competence of students.

Self-assessment as a method of evaluation of nurse competence also has its limitations: overestimation as discussed earlier, underestimation, the person does not know what to assess, the person is not familiar with the assessment process, the effect of individual experiences and context etc. In this study, self-assessments of students were compared with the assessments of their mentors. The data showed fairly large dissimilarities between the two assessments, and no corresponding assessments were found in the analysis at group level or at single student-mentor level. In addition, the assessments did not correlate in this study. However, based on the results it is difficult to draw any conclusions of whether students overestimated or underestimated their assessments, as assessments are always of subjective nature and there can also be problems in mentors' assessments (Duffy 2003, Cassidy 2009).

In this study, the aim was close collaboration and information exchange between nurse education, nursing research and statistician. The results of both parts of the study have been evaluated in a multiprofessional research group and the results of analysis have always been based on the opinions of several researchers. The challenges of validity and reliability are also discussed in detail in the sub-studies (I-IV)

7.3. Suggestions for further research

According to the results of the study, the following suggestions for further nursing research are proposed:

- 1) The nurse competence of students should be studied further. In the future, several instruments to cover common nurse competence requirements of the European Commission Directive could be used in a cross-cultural study with cohorts of students from different European countries. This would add a more comprehensive understanding of the nurse competence of graduating nursing students and related factors.

2) The development of nurse competence during nurse education and during the transition process should be studied with cohorts of students from different European countries. Longitudinal research is needed to understand critical points of the development of nurse competence during the nurse education and the transition process. Especially how nurse competence develops during clinical practice in different practice placements should be studied to understand in what kind of clinical placements each nurse competence areas develop. In addition, the effect of orientation and mentoring programmes on nurse competence development could be studied in European level.

3) A multi-method approach to assessing students' nurse competence is recommended. Comparing self-assessments with observation by peers (during simulation), mentors (during clinical placements) or educators (during nurse education by using for example OSCE) or patients (during clinical placements) or with knowledge tests could give a more comprehensive picture of the nurse competence. It could also contribute to the development of nursing students' self-assessment skills.

7.4. Practical implications

Based on the results, the following practical implications for nurse education and nursing practice can be presented:

Nurse education

1) Nurse education can be developed with the aid of the determining the level of competence at which a nursing student should be deemed competent. This competence level should be the same across Europe as the nurse competence is based on a European Commission Directive. Without it, the assessment can never become safe or trustworthy as different parties could have different understanding what constitutes a sufficient level of nurse competence. The development of a common classification of the levels of competence required of nursing students will also constitute an important step for nursing student mobility and for clinical training and learning environment quality and research.

2) Nursing students need opportunities for practising their self-assessment skills and receive constructive feedback on it from educators and mentors. Objective assessment, e.g. knowledge tests and observation (e.g. OSCE), could be used during the practice session.

3) Nursing students would benefit from training in assessment of nurse competence. This training could include the benefits of competence development by using self-assessment and the educational benefit/ difficulties of self-assessment.

4) Although nurse competence was assessed as high, there were topics where students were not competent based on their self-assessments. When developing the content of nursing curricula, these topics should be taken into account.

- 5) Using a short clinical placement as final clinical placement ought to be reconsidered to support students to gain understanding of the role of nurse and required nurse competence.
- 6) To ensure competent nurses in the future, a close collaboration between nursing practice and nurse education in the development the nursing curricula is needed.

Nursing practice

- 1) Students' assessments of their nurse competence should be taken into account when planning orientation and mentorship programs to nursing practice. This could ease the transition process from nursing student to an independent practitioner.
- 2) Nurse competence ought to be assessed regularly to explore nurses' learning needs for lifelong learning and continuing education.
- 3) The amount of nursing student to be supervised annually per mentor ought to be optimal. Mentors need support to ensure a positive pedagogical atmosphere on the ward and a good supervisory relationship with the student.
- 4) Mentors could benefit from training in assessment of nursing students' nurse competence, especially when they have only few students per year to be supervised. This training could include the nursing curriculum and competence requirements for general nurse in Europe and training in providing critical feedback in a constructive manner.

8. CONCLUSIONS

The conclusions of this study can be presented as consisting of four items. This study produced 1) new knowledge of the nurse competence areas of nursing students in Europe, 2) knowledge of the nurse competence of graduating nursing students in Finland and factors related to it, and 3) new knowledge in the field of nursing student assessment in clinical practice. In addition, this study provided 4) important knowledge about using the NCS instrument with nursing students.

- 1) The nurse competence of nursing students in Europe has nine main nurse competence areas. The classification is based on studies and additional documents from the Europe.
- 2) Based on their self-assessments, graduating nursing students seem to trust their nurse competence at the point of graduation. However, when comparing students' self-assessments to assessments by their mentors, the results were poorer. Pedagogical atmosphere on the ward, supervisory relationship between student and mentor and readiness for practice based on nurse education were significant factors related to the nurse competence.
- 3) Nurses need self-assessment skills to ensure current and safe practice in ever-changing health care, and nursing students need training in self-assessment during nurse education. Mentors would also benefit from training in assessing students' nurse competence.
- 4) This study produced knowledge of using the NCS with graduating nursing students. The NCS is a valid and reliable instrument for graduating nursing students, but there are items in therapeutic interventions and in work role that nursing students cannot practice independently.

In summary, this study produced new knowledge for nurse education research: nurse competence of graduating nursing students has been little studied in Europe. The study met well the presented aims of the study. However, in the future, nurse competence could be evaluated in a cross-cultural study with cohorts of students from different European countries and by developing other evaluation methods for use alongside with the self-assessment.

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Satu Kajander-Unkuri

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APPENDICES

Appendix 1. (1/4) Empirical studies of the nurse competence of nursing students during the transition process (n=13)

Author, year, country	The purpose of the study	Participants and methods	Results
Bartlett et al., 2000, UK	To compare the outcomes of two different pre-registration nurse education programmes.	Diplomates (n=28) Graduates (n=51) Mentors of Diplomates (n=17) Mentors of Graduates (n=40) Nursing Competencies Questionnaire (NCQ) Statistical analyses	Based on self-assessments: Students were the most competent in carrying out nursing actions effectively and with flexibility and in evaluating nursing actions accurately and objectively (intervention). The lowest competence was in participation and concern in social affairs (social participation). Based on mentors' assessments: Students were the most competent in the category of intervention and the least competent in social participation. No statistically significant differences between graduates and diplomates in agreement between mentors' and students' assessments.
O'Connor et al., 2001, UK	To compare the expectations of senior nurses regarding the level of competence of newly qualified nurses with that of the actual level of competence as assessed by the preceptors after 8 weeks in post.	Senior nurses (n=139) Preceptors (n=36) A specially designed instrument Statistical analyses	Newly qualified nurses performed at a higher level of competence than that expected by senior nurses. Newly qualified nurses were the most competent in promoting personal hygiene and the least competent in quality assurance and evaluation of care.
Clinton et al., 2005, UK	To investigate the competencies of qualifiers from three-year degree and three-year diploma courses in England	Diplomates (n=93) Graduates (n=107) Line-managers (n=111) Nursing Competencies Questionnaire Statistical analyses	Based on self-assessments: Students were the most competent in the category of intervention and the least competent in social participation. Based on nursing managers' assessments: Students were the most competent in the category of intervention and the least competent in social participation. No statistically significant differences between graduates and diplomates regarding the level of competence. Line-managers' assessments supported the self-assessments.

Appendix 1. (2/4) Empirical studies of the nurse competence of nursing students during the transition process (n=13)

Author, year, country	The purpose of the study	Participants and methods	Results
Löfmark et al., 2006, Sweden	To compare final year student nurses' views of their competence with qualified nurses' perceptions of newly-graduated nurses' competence	Nursing students (n=106) Nurses (n=136) A questionnaire Statistical analyses	<p>Based on self-assessments: Final-year nursing students assessed their competence to be the highest in ethical awareness, accuracy, reliability and self-knowledge (personal characteristics) and the least competent in using of theoretical knowledge and the use of research and developmental work (knowledge utilization).</p> <p>Based on nurses' assessments: Final-year nursing students were the most competent in personal characteristics and the least competent in communication, interaction, information and teaching (communication) and in patient care-related issues which concerned the phases of the nursing process, assistance with and performance of medical treatments and investigations and management of nursing care (patient care).</p>
Berkov et al., 2008, USA	To assess new graduate nurses performance	Nurse leaders (n>5700) New Graduate Nurse Performance Survey	<p>Nurse leaders were not satisfied with clinical or nonclinical skills: only about 25% of nurse leaders were fully satisfied with new graduate nurses' performance.</p> <p>New graduate nurses met the performance expectations of their unit leaders on only 2 competencies: utilization of information technologies and rapport with patients and families.</p> <p>Management of responsibilities was the lowest ranked subset.</p>
Hengstberger-Sims et al., 2008, Australia	To test the relationship between perceived competence and self-assessed frequency of use	New graduate nurses (n=116) Nurse Competence Scale Statistical analyses	<p>Based on self-assessments: Overall level of competence was 59.5 (VAS 0-100). New graduate nurses were the most competent in helping the patient to cope and in providing ethical and individualized care (helping role; VAS 69.0) and the least competent in planning and making decisions concerning patient care according to clinical situation and consulting other team members (therapeutic interventions; VAS 52.5).</p> <p>Competence was positively related with the frequency of use: competence ratings were higher with higher frequency of use in each category and in overall competence.</p>

Appendix 1. (3/4) Empirical studies of the nurse competence of nursing students during the transition process (n=13)

Author, year, country	The purpose of the study	Participants and methods	Results
Hickey, 2009, USA	To identify preceptors' views of new graduate nurse's readiness for practice	Preceptors (n=62) Clinical Instructional Experience Questionnaire Statistical and qualitative analyses	New graduate nurses were the most competent in being able to perform basic technical skills: vital signs, hygiene, safety positioning, independently and completely most of the time. Psychomotor skills, assessments skills, critical thinking, time management, communication and teamwork were the weakness areas of new graduate nurses.
Raines, 2010, USA	To examine the students' perceived level of nursing practice competency at the beginning and at the end of an accelerated second-degree BSN program.	Nursing students (n=22) Nurse experts (n=22) An investigator-developed survey instrument Statistical analyses	Based on self-assessments: Overall level of competence was 3.84 (scale 1-7; 4=competent) indicating not to be competent. When asked about their competence to begin practice as a professional nurse, the nursing students assessed themselves as competent (mean 4.55). Students were the most competent in helping role of the nurse (mean 4.9) and the least competent in effective management of rapidly changing situations (mean 3.27). Based on nurse experts' assessments: Overall level of competence was 4.4. Students were the most competent in helping role of the nurse and the least competent in monitoring and ensuring quality of health care practice.
Doody et al., 2012, Ireland	To explore final-year student nurses' perceptions and expectations of role transition.	Final-year nursing students (n=116) A questionnaire Statistical analyses	Based on self-assessments: Final-year nursing students assessed themselves to be the most competent in having effective interpersonal skills and the least competent in educating clients/ patients and families regarding health issues.
Wangensteen et al., 2012, Norway	To describe newly graduated nurses' perception of competence and to identify possible predictors influencing their competence	Newly graduated nurses (n=620) Nurse Competence Scale Statistical analyses	Based on self-assessments: Overall level of competence was 62.5 (VAS 0-100). Newly graduated nurses were the most competent in the category of helping role (VAS 70.0) and the least competent in planning and making decisions concerning patient care according to clinical situation and also consulting other team members (ensuring quality; VAS 53.8). Critical thinking was the strongest predictor for newly graduated nurses' competence. Also, health care experience prior to nursing education was found to be a significant, but minor predictor.

Appendix 1. (4/4) Empirical studies of the nurse competence of nursing students during the transition process (n=13)

Author, year, country	The purpose of the study	Participants and methods	Results
Lima et al., 2014, Australia	To determine the self-assessed level of competence of graduate nurses at the start of a graduate nurse programme (GNP)	Graduate nurses (n=47) Nurse Competence Scale Statistical analyses	Based on self-assessments: Overall level of competence was 40.1 (VAS 0-100). Graduate nurses were the most competent in ensuring quality (VAS 47.5) and the least competent in identifying educational needs of patients and their family and enlarging possibilities to self-care and coaching other team members (teaching-coaching; VAS 35.0)
Numminen et al., 2014, Finland	To explore the correspondence between nurse educators' and nurse managers' assessments of the level of novice nurses' professional competence, in order to evaluate whether educational outcomes correspond with the requirements of nursing practice.	Nurse educators (n=86) Nursing managers (n=141) Nurse Competence Scale Statistical analyses	Based on nurse educators' assessments: Overall level of competence of novice nurses was 60.1 (VAS 0-100). Novice nurses were the most competent in helping role (VAS 64.5) and the least competent in therapeutic interventions (55.6). Based on nurse managers' assessments: Overall level of competence of novice nurses was 43.7 (VAS 0-100). Novice nurses were the most competent in helping role (VAS 55.0) and the least competent in therapeutic interventions (35.4).
Takase et al., 2014, Japan	To identify graduates' perceptions of their competence and its developmental pattern during the first year of their employment and to compare the competence levels of graduates with different educational backgrounds (BN and non-BN graduates)	Graduates (n=122) the Holistic Nursing Competence Scale Statistical analyses	Based on self-assessments: Overall level of competence was 3.68 (non-BN graduates) and 4.04 (BN graduates) (scale 1-7; 4= reasonably competent). Non-BN graduates rated their competence statistically significantly higher than BN graduates. The graduates assessed their competence to be rapidly growing during the first half of the graduate year, and slowly later

Appendix 2. (1/4) Studies selected for analysis of nurse competence areas in Europe (n=10) (Centre for Reviews and Dissemination 2009).

Authors, year, country	The purpose of the study	Participants and methods	Research background, purpose and theoretical framework (the contemporaneity of the background/ description of study purpose/ definition of concepts/ research questions)	Research design (the description of the method/ sampling /data collection / analysis methods)	Research validity and ethics (reporting on validity and reliability/ research ethics)	Results (research questions were answered/ the results are compared with previous research/ limitations of the study described/ conclusions are logical/ further research needs are described)
Bartlett et al., 2000, United Kingdom	To compare the outcomes of two different pre-registration nurse education programmes by examining competencies	Degree students (n=52) and diploma students (n=28)	+/-/+/-	+/+/>+/>+	+/>+/>+	-/>+/>+/>+/>+
O'Connor et al., 2001, United Kingdom	To compare the expectations of senior nurses regarding the level of competence of newly qualified nurses with that of the actual level of competency	Senior nurses (n=137) and matched pairs of nurse preceptors and newly qualified nurses (n=37) Statistical analyses	+/>+/>+/>-	+/>+/>+/>+	-/>-/>-	-/>-/>+/>-/>-
Norman et al., 2002, United Kingdom	To describe the methods of measuring progress in achieving competence of diploma-level pre-registration nursing and midwifery students	Nursing students (n=257) at time 1 Nursing students (n=233) at time 2 Statistical analyses	+/>+/>+/>+	+/>+/>+/>+	+/>+/>+	+/>+/>-/>+/>+

Appendix 2. (2/4) Studies selected for analysis of nurse competence areas in Europe (n=10) (Centre for Reviews and Dissemination 2009).

Authors, year, country	The purpose of the study	Participants and methods	Research background, purpose and theoretical framework (the contemporaneity of the background/ description of study purpose/ definition of concepts/ research questions)	Research design (the description of the method/ sampling /data collection / analysis methods)	Research validity and ethics (reporting on validity and reliability/ research ethics)	Results (research questions were answered/ the results are compared with previous research/ limitations of the study described/ conclusions are logical/ further research needs are described)
Clinton et al., 2005, United Kingdom	To investigate the competencies of qualifiers from three-year degree and three-year diploma courses in England	Graduates (n=166) Diplomates (n=188) Statistical analyses	+/+/-	+/+/+	+/-	-/-/-
Löfmark et al., 2006, Sweden	To compare final year student nurses' views of their competence with qualified nurses' perceptions of newly-graduated nurses' competence	Nursing students (n=106) Nurses (n=136) Statistical analyses	+/-/-	+/+/+	+/+	-/+/+/-
O'Connor et al., 2009, Ireland	To implement and evaluate a competence assessment tool for use by nursing students and their assessors while on clinical placements	Nursing students (n=29) Nurses (n=27) Statistical analyses	+/+/-	+/+/+	-/-+	-/+/+/+

Appendix 2. (3/4) Studies selected for analysis of nurse competence areas in Europe (n=10) (Centre for Reviews and Dissemination 2009).

Authors, year, country	The purpose of the study	Participants and methods	Research background, purpose and theoretical framework (the contemporaneity of the background/description of study purpose/definition of concepts/research questions)	Research design (the description of the method/sampling/data collection/analysis methods)	Research validity and ethics (reporting on validity and reliability/research ethics)	Results (research questions were answered/ the results are compared with previous research/ limitations of the study described/ conclusions are logical/ further research needs are described)
Hartigan et al., 2010, Ireland	To describe the aspect of competence that new graduate nurses require to manage challenging acute nursing episodes effectively	Nurses (n=28) Thematic analyses	+/+/+/-	+/+/+/+	+/+/+	-/+/-/+/+
Ulfvarson & Oxelmark, 2012, Sweden	To develop and test an assessment tool for clinical practice	Nurse educators (n=5) Preceptors (n=6) Students (n=6) Nurses (n=80) Expert panel, focus groups interview	+/+/+/-	+/+/+/-	+/-/+	+/+/+/-
Wangensten et al., 2012, Norway	To describe newly graduated nurses' perception of competence	Newly graduated nurses (n=620) Statistical analyses	+/+/+/-	+/+/+/+	+/+/+	-/+/+/+/-

Appendix 2. (4/4) Studies selected for analysis of nurse competence areas in Europe (n=10) (Centre for Reviews and Dissemination 2009).

Authors, year, country	The purpose of the study	Participants and methods	Research background, purpose and theoretical framework (the contemporaneity of the background/ description of study purpose/ definition of concepts/ research questions)	Research design (the description of the method/ sampling /data collection / analysis methods)	Research validity and ethics (reporting on validity and reliability/ research ethics)	Results (research questions were answered/ the results are compared with previous research/ limitations of the study described/ conclusions are logical/ further research needs are described)
Nilsson et al., 2014, Sweden	To develop and validate a new tool intended for measuring self-reported professional competence among both nurse students prior to graduation and among practising nurses	Newly graduated nurse students (n=1086)	+ / + / + / -	+ / + / + / +	+ / + / +	- / + / - / + / -

Appendix 3. (1/3) The level of nurse competence by items

Nurse competence category (NCS)	Item	Mean	SD
Very good (VAS > 75.0-100)			
Helping role	Decision-making guided by ethical values	86.8	12.3
	Modifying the care plan according to individual needs	80.5	14.1
	Supporting patients' coping strategies	80.2	11.5
	Planning patient care according to individual needs	78.1	14.7
Teaching-coaching	Providing individualized patient education	83.1	12.2
	Taking active steps to maintain and improve my professional skills	82.5	16.4
	Finding optimal timing for patient education	77.7	14.2
	Mastering the content of patient education	75.3	14.2
Diagnostic functions	Analyzing patient's well-being from many perspectives	84.7	11.8
	Arranging expert help for patient when needed	80.1	16.4
	Able to identify patient's need for emotional support	80.1	14.4
	Able to identify family members' need for emotional support	75.8	15.6
Managing situations	Prioritizing my activities flexibly according to changing situations	77.4	16.3
	Acting appropriately in life-threatening situations	77.2	17.6
Therapeutic interventions	Planning own activities flexibly according to clinical situation	78.7	14.4
	Making decisions concerning patient care taking the particular situation into account	78.4	16.1
Ensuring quality	Commitment to my organization's care philosophy	75.7	20.2
Work role	Utilizing information technology in my work	85.0	15.1
	Acting autonomously	78.1	19.8
	Able to recognize colleagues' need for support and help	78.0	16.1
	Professional identity serves as resource in nursing	77.4	18.9
	Aware of the limits of my own resources	77.1	19.6
	Taking care of myself in terms of not depleting my mental and physical resources	76.5	18.6

Appendix 3. (2/3) The level of nurse competence by items

Nurse competence	Item	Mean	SD
category (NCS)			
Good (VAS > 50-75)			
Helping role	Evaluating critically own philosophy in nursing	74.5	19.7
	Utilising nursing research findings in relationships with patients	67.8	19.0
	Developing the treatment culture of my unit	61.4	20.1
Teaching-coaching	Mapping out patient education needs carefully	74.0	15.7
	Acting autonomously in guiding family members	73.1	20.2
	Supporting student nurses in attaining goals	73.1	22.1
	Able to recognise family members' needs for guidance	71.3	17.3
	Evaluating patient education outcome together with patient	69.1	19.8
	Taking student nurse's level of skill acquisition into account in mentoring	67.9	21.7
	Evaluating patient education outcome with care team	67.3	21.2
	Evaluating patient education outcomes with family	62.3	21.8
	Co-ordinating patient education	61.2	20.9
	Coaching other in duties within my responsibility area	58.7	28.3
	Developing patient education in my unit	54.2	25.9
Diagnostic functions	Developing documentation of patient care	62.3	24.8
	Coaching other staff members in patient observation skills	61.3	24.1
	Coaching other staff members in use of diagnostic equipment	60.6	25.9
Managing situations	Able to recognise situations posing a threat to life early	73.9	16.9
	Planning care consistently with resources available	69.5	22.4
	Keeping nursing care equipment in good condition	66.2	25.8
	Promoting flexible team co-operation in rapidly changing situations	65.2	23.1
	Arranging debriefing sessions for the care team when needed	54.3	28.3
	Coaching other team members in mastering rapidly changing situations	52.6	27.2

Appendix 3. (3/3) The level of nurse competence by items

Nurse competence	Item	Mean	SD
category (NCS)			
Good (VAS > 50-75)			
Therapeutic interventions	Utilising research findings in nursing interventions	64.2	22.3
	Evaluating systematically patient care outcomes	63.9	24.1
	Co-ordinating multidisciplinary team's nursing activities	63.4	23.4
	Coaching the care team in performance of nursing interventions	59.6	23.9
	Incorporating relevant knowledge to provide optimal care	53.1	25.1
Ensuring quality	Able to identify areas in patient care needing further development and research	72.5	20.3
	Evaluating critically my unit's care philosophy	67.8	22.7
	Utilising research findings in further development of patient care	61.6	23.0
	Evaluating systematically patients' satisfaction with care	60.8	23.8
Work role	Familiar with my organisation's policy concerning division of labour and co-ordination of duties	65.3	24.0
	Incorporating new knowledge to optimize patient care	63.1	24.8
	Co-ordinating patient's overall care	62.9	24.2
	Acting responsibly in terms of limited financial resources	60.8	25.4
	Giving feedback to colleagues in a constructive way	60.6	24.2
	Developing work environment	57.9	24.4
	Developing patient care in multidisciplinary teams	51.6	27.5
Rather good (VAS > 25-50)			
Therapeutic interventions	Contributing to further development of multidisciplinary clinical paths	47.2	27.0
	Providing consultation for the care team	44.8	28.3
	Updating written guidelines for care	43.4	27.7
Ensuring quality	Making proposals concerning further development and research	48.6	27.9
Work role	Ensuring smooth flow of care in the unit by delegating tasks	48.2	29.1
	Orchestrating the whole situation when needed	46.5	31.6
	Guiding staff members to duties corresponding to their skill levels	41.4	31.8
	Providing expertise for the care team	37.9	32.1
	Mentoring novices and advanced beginners	30.8	33.6
	Co-ordinating student nurse mentoring in the unit	29.9	33.7

Appendix 4. (1/4) The level of nursing skills by items

Nursing skills	Item	Mean	SD
category (mHOTOHA) Very good (VAS > 76.2–100)			
Infection prevention, control and patient hygiene	Aseptic work technique and safe handling of sharp instruments	89.9	9.5
	Hand hygiene and use of personal protective equipment	88.4	10.7
	Care of bed patient	84.0	12.9
	Infection prevention	81.7	12.8
	Prevention and care of decubitus	81.2	13.5
	Turning and moving skills	78.5	14.7
Body temperature control	Assessing body temperature	93.4	8.3
	Taking care of body temperature	81.7	13.5
	Care of patient with a fever	80.5	14.3
	Observation of body temperature and recognizing problem: in body temperature	79.4	14.1
Oxygenation and respiration	Administration of oxygen	85.0	12.7
	Secure clean and fresh air	82.4	13.5
	Observation of respiration and recognizing problems in respiration and ventilation	80.5	14.7
	Suctioning the airway (tracheal and nose)	79.3	16.5
	Secure open airway	79.1	15.9
Cardiovascular circulation	Assessing blood pressure	92.2	9.0
	Assessing pulse	92.1	8.9
	Performing basic cardiopulmonary resuscitation	79.7	18.4
	Observation of circulation and recognizing problems in circulation	77.9	14.9
	Taking blood samples (vein and capillaries)	76.7	21.1
Fluid balance, urinary and bowel elimination and nutrition	Assisting with nutrition	88.6	9.7
	Administering an enema	81.4	17.8
	Inserting a Foley Catheter	78.9	18.9
	Nursing skills related to urinary elimination	77.9	14.8
	IV fluid administration (preparing IV solutions, use of electronic infusion device) and observation of patient during IV fluid therapy	76.9	18.6

Appendix 4. (2/4) The level of nursing skills by items

Nursing skills	Item	Mean	SD
category (mHOTOHA)			
Very good (VAS > 76.2–100)			
Medication administration	Medication administration per os	86.7	10.7
	Preparing and administering intramuscular, intracutaneous and subcutaneous injections	83.0	13.2
	Medication calculation	82.7	15.3
	Implement of safe medication therapy	81.9	11.6
	Medication administration via inhalant route	80.5	14.8
	Medication administration rectally	80.3	16.0
	Medication administration intravenously	79.7	14.7
	Assessment of the effect and impressiveness of medication therapy	14.9	
Pain management	Presence and mental support	81.9	12.8
	Pain assessment	81.2	12.5
	Drug therapy	80.3	12.3
	Assessment of the effect of pain management	79.7	13.6
	Maintaining good posture	78.4	13.0
	Assure peaceful environment	77.5	15.4
Sleep, rest and exercise	Raising and transferring the patient	80.3	13.1
	Assure peaceful environment and promote rest	78.2	15.2
	Observation of changes in consciousness and recognizing problems	77.2	15.9
	Observation of mobility and recognizing problems	76.8	14.6
Good (VAS > 66.8–76.2)			
Infection prevention, control and patient hygiene	Prevention and care of skin problems	76.1	15.6
	Care of patient in isolation	75.1	17.5
	Different wound care and observation of healing	74.5	17.7
	Oral and denture care	73.1	20.1
Body temperature control	Care of hypothermia patient	70.1	18.8

Appendix 4. (3/4) The level of nursing skills by items

Nursing skills	Item	Mean	SD
category (mHOTOHA)			
Good (VAS > 66.8–76.2)			
Oxygenation and respiration	Assessing changes and interpretation of breathing in acute problem situation	75.9	16.8
	Assessing oxygenation (need and use)	72.8	18.6
	Breathing techniques and positioning	70.1	19.4
Cardiovascular circulation	Nursing skills related to promoting circulation	76.0	16.1
	Stopping the bleeding and bandaging	74.4	17.6
	Taking ECG	73.4	23.2
	Assessing changes and interpretation of circulation in acute problem situation	72.7	17.7
	Assessing the need of first aid	72.0	17.7
	Performing cardiopulmonary resuscitation with defibrillato and medication	68.4	22.9
Fluid balance, urinary and bowel elimination and nutrition	Nursing skills related to bowel elimination	75.9	18.0
	Secure diverse nutriment	74.3	15.9
	Observation of fluid balance and recognizing problems in fluid balance	74.0	16.7
	IV cannulation and care of the cannula	73.0	20.5
	Preventing and care of malnutrition	72.9	14.9
	Urine specimen and assessing the results	72.8	18.4
	Observation of nutrition and recognizing problems in nutrition	72.3	15.0
	Administrating tube feeding	71.6	24.3
	Taking care of special diet	70.3	17.8
Preventing and care of obesity	68.8	17.3	
Medication administration	Preventing immoderate use of medication	71.4	16.6
	Preparing blood transfusion and observation of patient duri blood transfusion	71.2	21.5
Pain management	Distraction	72.6	17.2
	Cold and maintaining good posture	71.2	18.1
	Relaxation	69.8	18.0
	Breathing techniques and positioning	67.5	19.4

Appendix 4. (4/4) The level of nursing skills by items

Nursing skills	Item	Mean	SD
category (mHOTOHA)			
Good (VAS > 66.8–76.2)			
Sleep, rest and exercise	Observation of sleep and rest and recognizing problems	75.6	15.0
	Promoting and activating exercise	75.3	15.6
	Support patient with immobility	71.1	17.8
	Prevention and care of sleep disorders	68.3	18.3
Care of a dying patient	Assure environment promoting comfort	72.5	19.3
	Physical care related to dying	69.2	22.9
	Mental support	67.8	19.6
	Make observations of the signs of approaching death	67.3	21.1
Moderate (VAS > 57–66.8)			
Cardio-vascular circulation	Preventing and taking care of circulatory shock	63.3	20.5
	Recognizing arrhythmias and actions in the situation of arrhythmia	63.1	22.4
	Observation of internal bleeding	59.2	22.2
Fluid balance, urinary and bowel elimination and nutrition	Inserting a nasogastric tube	64.7	25.4
	Diagnostic examinations of faeces	60.6	23.3
Medication administration	Supporting drug abusers	60.8	21.0
Sleep, rest and exercise	Passive exercises	63.4	20.4
Care of a dying patient	Supporting the family of a dying patient	56.9	24.9
	Spiritual support	56.8	23.8
	Informing the family about a patient's death	51.4	26.7

Appendix 5. (1/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 1		Pair 2		Pair 3		Pair 4		Pair 5		Pair 6		Pair 7		Pair 8	
	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.
Nurse competence categories:																
Helping role	75.7	54.3	85.7	78.6	82.9	78.6	88.6	72.9	78.6	90.0	92.9	82.9	75.7	47.1	87.1	46.7
Diagnostic functions	77.1	35.7	64.3	44.3	70.0	81.4	90.0	45.7	57.1	88.6	80.0	61.4	78.6	20.0	80.0	47.1
Teaching-coaching	67.5	46.9	72.5	65.6	85.0	81.9	78.1	63.8	66.3	88.1	53.1	72.5	76.9	38.1	66.3	20.6
Ensuring quality	68.3	5.0	58.3	23.3	51.7	76.0	85.0	65.0	33.3	78.3	86.7	66.7	71.7	30.0	73.3	42.0
Managing situations	61.3	32.5	50.0	31.3	56.3	82.9	75.0	51.3	55.0	81.3	31.3	48.8	82.5	43.8	73.8	28.8
Work role	71.6	25.8	55.3	38.4	54.2	66.8	76.8	76.9	58.4	77.9	55.8	66.3	73.2	35.6	57.4	44.7
Therapeutic interventions	64.0	18.0	52.0	15.0	57.0	74.4	82.0	50.0	67.0	55.0	36.0	55.0	75.0	43.0	65.0	27.8
Total	69.4	31.2	62.6	42.3	65.3	77.4	82.2	54.9	59.4	79.9	62.3	64.8	76.2	36.8	71.8	36.8
Nursing skills categories:																
Infection prevention, control and patient hygiene	75.0	67.0	84.0	88.0	91.0	92.0	83.0	81.0	80.0	86.0	73.0	100.0	86.0	73.0	80.0	77.0
Body temperature regulation	84.0	70.0	88.0	82.0	98.0	100.0	82.0	88.0	84.0	86.0	60.0	100.0	84.0	52.5	82.0	70.0
Pain management	81.0	70.0	78.0	60.0	91.0	83.0	86.0	76.7	83.0	87.0	63.0	93.0	81.0	51.1	78.0	60.0
Medication administration	74.5	72.7	80.0	61.0	90.9	94.5	82.7	82.5	79.1	84.5	72.7	93.6	80.9	51.1	70.9	72.2
Oxygenation and respiration	77.5	66.3	71.3	67.5	97.5	88.8	81.3	85.7	78.8	85.0	58.8	95.0	86.3	40.0	76.3	70.0
Sleep, rest and exercise	78.9	60.0	67.8	47.8	92.2	87.8	78.9	82.0	85.6	88.9	61.1	90.0	77.8	57.8	73.3	72.2
Fluid balance, urinary and bowel elimination and nutrition	74.7	32.9	68.2	50.0	90.0	90.0	77.6	75.8	79.4	85.9	58.8	94.7	80.6	52.4	71.2	71.3
Cardiovascular circulation	72.1	46.7	67.9	52.1	90.7	90.9	77.9	82.5	77.1	87.9	63.6	92.1	80.0	60.0	78.6	62.7
Care of a dying patient	67.1	70.0	24.3	52.9	88.6	66.7	75.7	70.0	74.3	85.7	47.1	87.1	75.7	40.0	64.3	47.1
Total	76.1	61.7	69.9	62.4	92.2	88.2	80.6	80.5	80.1	86.3	62.0	93.9	81.4	53.1	75.0	66.9

Appendix 5. (2/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 9		Pair 10		Pair 11		Pair 12		Pair 13		Pair 14		Pair 15		Pair 16	
	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.
Nurse competence categories:																
Helping role	72.9	34.3	60.0	98.6	70.0	32.9	71.4	40.0	88.6	62.9	81.4	64.0	75.7	67.1	78.6	85.7
Diagnostic functions	65.7	14.3	50.0	95.7	31.4	25.7	72.9	31.4	77.1	58.6	84.3	35.0	61.4	85.0	52.9	80.0
Teaching-coaching	52.5	23.8	35.0	96.9	43.8	21.3	70.6	40.7	86.3	61.9	71.3	58.5	51.9	67.3	68.1	81.3
Ensuring quality	65.0	15.0	33.3	98.3	50.0	23.3	56.7	38.3	68.3	73.3	78.3	72.5	60.0	80.0	60.0	86.7
Managing situations	53.8	10.0	65.0	96.3	35.0	32.5	62.5	37.1	57.5	73.3	67.5	80.0	58.8	40.0	67.5	83.8
Work role	64.2	22.6	44.2	100.0	26.8	24.7	64.2	46.7	76.8	74.7	53.7	73.6	36.8	70.0	44.2	84.7
Therapeutic interventions	67.0	16.0	23.0	93.0	24.0	12.0	62.0	31.3	63.0	76.0	61.0	80.0	43.0	78.0	41.0	77.0
Total	63.0	19.4	44.4	97.0	40.1	24.6	65.8	37.9	73.9	68.7	71.5	66.2	55.4	69.6	58.9	82.7
Nursing skills categories:																
Infection prevention, control and patient hygiene	86.0	83.0	82.0	97.0	79.0	63.0	78.0	59.0	90.0	76.0	82.0	87.0	76.0	100.0	79.0	94.0
Body temperature regulation	84.0	70.0	90.0	100.0	82.0	40.0	82.0	52.0	90.0	80.0	76.0	82.5	80.0	100.0	74.0	94.0
Pain management	82.0	57.0	79.0	98.9	72.0	51.0	73.0	42.0	88.0	81.0	74.0	83.8	79.0	85.0	72.0	85.0
Medication administration	70.9	74.5	90.0	100.0	60.0	47.3	72.7	46.4	84.5	86.4	72.7	77.8	84.5	97.3	75.5	83.6
Oxygenation and respiration	80.0	70.0	90.0	100.0	61.3	32.5	81.3	45.0	82.5	77.1	76.3	90.0	76.3	100.0	71.3	93.8
Sleep, rest and exercise	80.0	57.8	90.0	100.0	66.7	52.2	73.3	46.7	82.2	81.1	71.1	82.2	68.9	94.4	78.9	86.7
Fluid balance, urinary and bowel elimination and nutrition	76.5	40.6	90.0	98.2	62.4	42.9	76.5	50.0	78.8	77.3	67.1	68.2	82.4	87.1	75.3	90.6
Cardiovascular circulation	76.4	36.9	90.0	98.3	52.9	28.6	87.9	45.0	64.3	75.5	65.7	75.7	68.6	67.8	72.9	89.3
Care of a dying patient	55.7	44.3	67.1	95.0	48.6	34.3	57.1	40.0	87.1	80.0	55.7	70.0	70.0	97.5	68.6	82.9
Total	76.8	59.7	85.3	98.6	65.0	43.5	75.8	47.3	83.0	79.4	71.2	79.7	76.2	92.2	74.2	88.9

Appendix 5. (3/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 17		Pair 18		Pair 19		Pair 20		Pair 21		Pair 22		Pair 23		Pair 24	
	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.
Nurse competence categories:																
Helping role	84.3	58.6	82.9	60.0	58.6	24.3	72.9	61.4	70.0	75.7	70.0	52.9	67.1	67.1	81.4	74.3
Diagnostic functions	77.1	-	68.6	52.5	65.7	24.3	72.9	64.3	60.0	52.9	74.3	48.3	78.6	91.4	75.7	77.1
Teaching-coaching	74.4	56.9	85.6	50.0	56.3	25.6	70.0	62.3	51.3	61.9	64.4	48.6	59.4	78.8	78.1	74.3
Ensuring quality	88.3	55.0	86.7	50.0	65.0	20.0	65.0	55.0	56.7	35.0	71.7	56.0	58.3	58.3	73.3	78.3
Managing situations	60.0	55.0	78.8	68.0	53.8	20.0	75.0	61.3	48.8	60.0	67.5	56.0	57.5	86.3	73.8	80.0
Work role	52.6	63.2	74.7	60.0	79.5	23.7	59.5	62.6	43.7	33.2	58.4	56.7	41.1	72.6	61.1	78.8
Therapeutic interventions	64.0	60.0	69.0	53.3	55.0	22.0	69.0	57.0	50.0	30.0	48.0	57.0	61.0	61.0	73.0	73.0
Total	71.5	-	78.0	56.3	62.0	22.8	69.2	60.6	54.4	49.8	64.9	53.6	60.4	73.6	74.2	76.4
Nursing skills categories:																
Infection prevention, control and patient hygiene	89.0	65.0	94.0	52.0	84.0	61.0	82.0	74.0	69.0	92.2	76.0	94.0	71.0	87.0	84.0	87.0
Body temperature regulation	78.0	70.0	94.0	72.5	86.0	62.0	84.0	84.0	62.0	100.0	76.0	92.0	82.0	54.0	82.0	66.0
Pain management	79.0	73.0	84.0	75.0	75.0	57.5	81.0	78.0	61.0	90.0	63.0	90.0	71.0	52.0	80.0	46.0
Medication administration	78.2	69.1	88.2	86.7	80.9	83.8	80.0	81.8	56.4	91.1	64.5	90.0	70.9	63.6	71.8	63.6
Oxygenation and respiration	80.0	70.0	90.0	78.3	81.3	50.0	78.8	78.8	56.3	98.0	63.8	97.5	71.3	58.8	80.0	60.0
Sleep, rest and exercise	75.6	67.8	91.1	45.0	77.8	46.3	77.8	76.7	60.0	80.0	67.8	85.7	71.1	86.7	78.9	62.2
Fluid balance, urinary and bowel elimination and nutrition	79.4	68.8	87.6	67.1	74.1	50.6	80.0	73.5	54.1	78.6	72.4	89.2	69.4	67.1	73.5	72.9
Cardiovascular circulation	71.4	67.1	84.3	76.7	75.0	58.0	76.4	69.3	50.7	87.1	62.9	96.3	68.6	68.6	66.4	71.3
Care of a dying patient	60.0	64.3	74.3	65.0	70.0	70.0	72.9	67.1	47.1	86.7	44.3	85.0	65.7	32.9	67.1	54.3
Total	76.7	68.3	87.3	68.7	78.2	59.9	79.2	75.9	57.4	89.3	65.6	91.1	71.2	63.4	76.0	64.8

Appendix 5. (4/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 25		Pair 26		Pair 27		Pair 28		Pair 29		Pair 30		Pair 31		Pair 32	
	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.
Nurse competence categories:																
Helping role	78.6	44.3	75.7	67.1	71.4	62.9	57.1	65.0	78.6	74.3	58.6	80.0	88.6	57.1	78.6	50.0
Diagnostic functions	85.7	15.7	72.9	41.4	74.3	45.7	42.9	66.7	72.9	71.4	62.9	62.9	85.7	47.1	81.4	45.7
Teaching-coaching	79.4	32.5	69.4	58.8	73.1	63.1	51.9	53.3	75.0	67.5	48.1	80.0	86.3	55.0	76.9	44.0
Ensuring quality	55.0	31.7	68.3	53.3	76.7	56.7	43.3	66.7	73.3	63.3	48.3	60.0	80.0	50.0	73.3	58.3
Managing situations	72.5	10.0	66.3	30.0	71.3	61.3	33.8	62.5	77.5	68.8	48.8	72.5	86.3	47.5	57.5	27.5
Work role	50.5	26.8	63.2	50.5	69.5	64.7	47.9	60.0	67.9	59.5	49.5	44.2	81.1	44.7	73.7	43.1
Therapeutic interventions	74.0	29.0	54.0	38.0	69.0	48.0	39.0	42.5	60.0	56.0	46.0	37.0	82.0	46.0	61.0	44.0
Total	70.8	27.1	67.1	48.4	72.2	57.5	45.1	59.5	67.9	65.8	51.7	62.4	84.3	49.6	71.8	44.7
Nursing skills categories:																
Infection prevention, control and patient hygiene	79.0	32.0	85.0	60.0	72.0	72.0	77.0	85.0	77.0	94.0	71.0	83.0	86.0	53.0	77.0	60.0
Body temperature regulation	78.0	36.0	78.0	62.0	78.0	80.0	68.0	80.0	88.0	88.0	70.0	92.0	80.0	53.3	78.0	74.0
Pain management	80.0	24.0	83.0	70.0	75.0	89.0	60.0	75.6	76.0	83.0	64.0	92.0	76.0	56.3	66.0	60.0
Medication administration	78.2	31.1	85.5	52.7	72.7	82.7	61.8	84.3	77.3	92.7	54.5	95.6	80.0	49.0	77.3	62.7
Oxygenation and respiration	78.8	28.8	81.3	28.8	75.0	75.0	65.0	73.3	80.0	91.3	68.8	77.5	72.5	50.0	61.3	68.8
Sleep, rest and exercise	73.3	24.4	80.0	61.1	74.4	81.1	62.2	75.6	73.3	86.7	63.3	90.0	73.3	53.8	61.1	65.6
Fluid balance, urinary and bowel elimination and nutrition	66.5	27.6	78.2	45.9	72.9	75.3	68.2	79.1	78.2	72.9	65.3	85.0	75.3	43.8	59.4	63.5
Cardiovascular circulation	60.7	20.0	76.4	30.0	67.1	68.6	68.6	74.3	70.0	67.1	52.1	65.0	63.6	48.8	60.0	60.0
Care of a dying patient	78.6	20.0	71.4	34.3	62.9	78.6	50.0	72.5	67.1	57.1	40.0	90.0	58.6	50.0	67.1	55.7
Total	74.8	27.1	78.8	49.4	72.2	78.0	64.5	77.7	76.3	81.4	61.0	85.6	73.9	50.9	67.5	63.4

Appendix 5. (5/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 33		Pair 34		Pair 35		Pair 36		Pair 37		Pair 38		Pair 39		Pair 40	
	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.	S.	M.
Nurse competence categories:																
Helping role	81.4	78.6	75.7	52.9	67.1	61.4	80.0	32.9	84.3	80.0	75.7	78.6	75.7	55.7	92.9	67.1
Diagnostic functions	85.7	90.0	50.0	40.0	75.7	55.7	57.1	11.4	62.9	85.7	85.7	52.9	71.4	58.6	90.0	58.6
Teaching-coaching	78.1	80.6	35.6	50.0	75.0	53.8	55.0	32.7	78.1	61.3	73.8	68.1	65.0	68.0	86.9	73.1
Ensuring quality	73.3	71.7	40.0	21.7	70.0	63.3	30.0	10.0	71.7	92.5	81.7	66.7	71.7	55.0	91.7	68.3
Managing situations	80.0	76.3	25.0	37.5	76.3	81.3	32.5	17.5	67.5	84.3	78.8	60.0	43.8	75.0	81.3	62.5
Work role	52.1	85.3	31.1	38.4	70.5	58.4	28.4	21.1	63.2	95.0	58.4	52.6	64.2	53.2	92.6	73.7
Therapeutic interventions	73.0	75.0	18.0	23.0	74.0	78.8	32.0	15.0	66.0	34.4	64.0	44.0	57.0	46.7	86.0	68.0
Total	74.8	79.6	39.3	37.6	72.7	64.7	45.0	20.1	70.5	76.2	74.0	60.4	64.1	58.9	88.8	67.3
Nursing skills categories:																
Infection prevention, control and patient hygiene	95.0	91.0	69.0	56.0	84.0	85.0	85.0	80.0	97.0	100.0	80.0	87.0	71.0	85.0	95.0	85.0
Body temperature regulation	90.0	78.0	66.0	76.0	82.0	85.0	84.0	90.0	92.0	96.0	86.0	76.0	62.0	88.0	100.0	80.0
Pain management	91.0	87.8	73.0	69.0	75.0	83.0	81.0	65.0	82.0	98.6	83.0	69.0	71.0	68.0	95.0	85.0
Medication administration	90.0	88.9	77.3	60.0	81.8	90.9	75.5	20.9	87.3	100.0	85.5	80.0	69.1	90.9	83.6	82.9
Oxygenation and respiration	91.3	78.8	55.0	46.7	81.3	-	85.0	52.5	87.5	100.0	78.8	58.8	63.8	78.8	96.3	75.0
Sleep, rest and exercise	87.8	87.8	66.7	54.4	78.9	86.7	77.8	81.1	84.4	94.0	72.2	70.0	57.8	85.6	94.4	77.5
Fluid balance, urinary and bowel elimination and nutrition	84.7	79.4	53.5	45.9	80.6	87.6	62.9	50.0	88.2	95.0	70.6	64.7	64.1	83.5	92.4	77.9
Cardiovascular circulation	87.1	74.5	51.4	44.0	78.6	87.5	77.9	47.9	83.6	92.5	83.6	63.6	62.9	67.1	83.6	82.5
Care of a dying patient	84.3	84.3	55.7	42.9	67.1	83.3	51.4	14.3	75.7	100.0	74.3	58.6	67.1	78.3	91.4	76.0
Total	89.0	83.4	63.1	55.0	78.8	-	75.6	55.7	86.4	97.3	79.3	69.7	65.4	80.6	92.4	80.2

Appendix 5. (6/6) Student-mentor assessments of nurse competence with particular focus on nursing skills at single-level

	Pair 41		Pair 42	
	S.	M.	S.	M.
Nurse competence categories:				
Helping role	81.4	81.4	87.1	64.3
Diagnostic functions	78.6	85.7	81.4	74.3
Teaching-coaching	80.6	86.3	84.4	62.5
Ensuring quality	80.0	83.3	80.0	70.0
Managing situations	87.5	83.8	72.5	61.3
Work role	79.5	92.6	80.0	72.5
Therapeutic interventions	76.0	80.0	66.0	66.0
Total	80.5	84.7	78.7	67.3
Nursing skills categories:				
Infection prevention, control and patient hygiene	81.0	88.0	86.0	68.0
Body temperature regulation	84.0	94.0	82.0	80.0
Pain management	85.0	89.0	81.0	80.0
Medication administration	85.5	95.0	85.5	96.7
Oxygenation and respiration	76.3	88.6	77.5	83.3
Sleep, rest and exercise	85.6	87.5	81.1	81.4
Fluid balance, urinary and bowel elimination and nutrition	84.1	87.6	82.4	78.2
Cardiovascular circulation	86.4	86.7	70.7	88.6
Care of a dying patient	24.3	95.0	77.1	73.3
Total	76.9	90.2	80.4	81.1