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The ambulance nurse

Aspects on competence and education

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DEPARTMENT OF HEALTH SCIENCES | FACULTY OF MEDICINE | LUND UNIVERSITY



The ambulance nurse

Aspects on competence and education

Jonas Wihlborg



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*“Yes, my guard stood hard
when abstract threats
too noble to neglect
Deceived me into thinking
I had something to protect
Good and bad, I define these terms
quite clear, no doubt, somehow
Ah, but I was so much older then
I'm younger than that now.”*

Dylan, B.

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Abstract

The knowledge area of ambulance nurses' competence represents a relatively new research area that cannot be regarded as having been fully explored and described by existing research. There is uncertainty regarding the required competence for ambulance nurses as well as the professional role of the ambulance nurse in ambulance care. It is also not clear if the ambulance nurse educational programmes reflect the demands placed on the professional requirements of ambulance nurses. The Swedish specialist education programmes for ambulance nurses could benefit from an adequate and up-to-date description of ambulance nurses' professional competence, which can be used to develop all parts of the curriculum of the specialist nursing programme. The overall aim of this thesis was to explore ambulance nurses' area of knowledge by describing aspects on competence and education in order to provide a comprehensive understanding of ambulance nurses' competence as a basis for the development of the specialist nursing education curriculum.

The results of this thesis are based on four studies. Several methods were used; the Delphi technique, the critical incident technique, the focus group method, facet theory analysis and qualitative content analysis. Data was collected using questionnaires, interviews and observations.

The professional competence of ambulance nurses was found to be made up of multiple separate competences and can be described as complex and multidimensional. The professional demands placed on ambulance nurses' competence are extensive and aspects of importance to their professional practice in the areas of cognitive, functional and personal competence are described. Formal education could be regarded as the foundation of competence development; however, we also found experienced-based learning in workplaces, including feedback and reflection on practice, to be of great importance to competence development. The ambulance nurse curriculum could be developed by including educational content designed in accordance with our findings concerning aspects on competence and through enhanced cooperation between universities and ambulance services.

The results of this thesis can be used as a basis for systematic organisational measures for competence development in ambulance services and for curriculum development, as well as for the development of nationally agreed standards for ambulance nurses' competence.

Abbreviations

ALS	Advanced Life Support
AN	Ambulance Nurse
BLS	Basic Life Support
CIT	Critical Incident Technique
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
RN	Registered Nurse
TLA	Teaching and Learning Activity

Original Papers

The thesis is based on the following papers and these are referred to in the text by their roman numerals stated below:

Paper I

Wihlborg, J. Edgren, G. Johansson, A. Sivberg, B. (2014). The desired competence of the Swedish ambulance nurse according to the professionals - a Delphi study. *International Emergency Nursing*, 22/3, pp 127-33.

Paper II

Wihlborg, J. Edgren, G. Johansson, A. Sivberg, B. (2017). Reflective and collaborative skills enhances Ambulance nurses' competence - A study based on qualitative analysis of professional experiences. *International Emergency Nursing* 32, pp 20–27.

Paper III

Wihlborg, J. Johansson, A. Sivberg, B. Edgren, G. (2017). Professionals' views of teaching and learning in the ambulance nurse specialist education programme – Possibilities and challenges of curriculum development as a shared enterprise. Article in manuscript.

Paper IV

Wihlborg, J. Edgren, G. Johansson, A. Sivberg, B. Gummesson, C. (2017). Using the case method to explore characteristics of the clinical reasoning process among ambulance nurse students and professionals - describing facets of content, process and levels of analytical approach. Submitted to *Nurse Education in Practice* in October 2017.

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Preface

This thesis has its origin in my desire to develop as a nurse, a teacher and a researcher. The first few years of my career were spent working as a registered nurse in intensive care units and emergency departments, where I was constantly seeking new challenges in order to develop my clinical skills and knowledge. My involvement in the development of nursing care and practice eventually put me in a position where I spent increasingly more time teaching in the clinical context. I started working in the ambulance service at the turn of the century and instantly found that the nature of ambulance care suited me well, especially the context-specific features of autonomous work and the great variety of assignments. Sometime after graduating as a specialist ambulance nurse, I was given the opportunity to work as university teacher and my interest in teaching provided me with the incentive to take on a second professional career, as a teacher.

During my initial years as a university teacher, having been immediately given overall responsibility for the ambulance nurse specialist education programme, my energy was directed towards maintaining educational standards of a specialist nursing programme. These early years were also devoted to gaining the formal qualifications required for my position. After some years of practice as a teacher, I had been involved in rewriting the programme's learning outcomes, developing teaching and learning activities, scrutinising educational content and thoroughly changing all parts of the curriculum. During these parallel processes, the need for an academic's view of the area became apparent as my teaching practice raised some questions about educational content, as well as the education's usability for the students in their future profession.

This growing uncertainty led me to start my inquiry of the area and my area of research emerged through the use of a researcher's approach. Almost needless to say, as I gained knowledge of various parts of the area, formulating research questions and scrutinising every personal belief, I came to view the area as even more complex and fragmented than I had before. This thesis is my attempt to provide some pieces of knowledge of the area in order to continue the development of the ambulance nurse's education and profession.

Introduction

The knowledge area of the ambulance nurse, as well as the area of ambulance care and ambulance services, are progressing, but cannot be regarded as having been fully explored and described by existing research. The positioning of the ambulance nurse in the ambulance service has led to opportunities for quality enhancement in ambulance care compared to former organisational systems. However, a description of the required clinical competence and an established view for the educational outcome of the specialist education programme can be considered necessary at a national level. There is some uncertainty regarding the competence required by the ambulance nurse as well as the definition of the professional role of the ambulance nurse in ambulance care. In the professional discourse among universities and in ambulance services, questions of educational validity and quality are discussed. Based on these discussions, there is uncertainty as to whether the ambulance nurse educational programmes reflect the actual demands placed on ambulance nurses. One strategy for approaching this area is to explore and define the competence required by the ambulance nurse in order to use this as a vision for educational outcome, curriculum development and professional development.

Background

In this thesis, the background is divided into two parts that follow the thesis' overall perspectives. The first part includes ambulance care and ambulance services and specifically the prevalent role of the Swedish ambulance nurse. The second part contains a general description of particular aspects of teaching and learning as well as specific sections about Swedish ambulance nurses' competence and education.

Ambulance Care and Services

The overall need among humans following sickness, injury or other health issues has led to the evolution of ambulance services across the world (Sanders, Lewis, Quick, & McKenna, 2012; Suserud, 2016). The ambulance service has its origin in ancient military organisations that transported soldiers from the battlefield to a secure place to have their injuries cared for. During the 20th century, much as an effect of wartime concerns, the specific field of prehospital emergency medicine evolved. The increasing knowledge of the positive effects of rapid caring interventions, early treatment and secure transportation of patients eventually laid the foundation for the organisation of modern ambulance services. Since the 1960s, ambulance services have developed to become an acknowledged part of modern society's healthcare services, even though differently organised in different countries. The World Health Organisation (WHO) regards the emergency medical services (EMS) as a vital integral part of any functional healthcare system (Al-Shaqsi, 2010; Sanders et al., 2012). The ambulance services represent the frontline of a society's healthcare services, typically caring for the acutely sick or injured person in an environment outside of hospitals or other healthcare institutions (Sanders et al., 2012; Suserud, 2016). Ambulance services are often recognised by the ambulance vehicle, rapidly bringing the team of caregivers to the person in need and transporting this person to the appropriate caregiver. Acute care is often regarded as the main focus for ambulance services, but modern ambulance care includes assignments involving various aspects of healthcare (Bigham, Kennedy, Drennan, & Morrison, 2013), promoting a holistic care perspective (Sundstrom & Dahlberg, 2011; Suserud, 2016). The ambulance vehicle has become a symbol for ambulance care, providing the area with a distinctive and particular term to use to define this area of knowledge.

Ambulance care is often referred to in the literature as prehospital emergency care (Suserud, 2016), emergency medical services (EMS) or paramedic care (Sanders et al., 2012). These expressions refer to the contemporary EMS system, national organisation or different standards. A variation of how EMS are organised can be seen globally where the English-speaking, Anglo-American countries implemented the paramedic system (Sanders et al., 2012), frequently adapted world-wide as an organisational benchmark for EMS organisations. The paramedic system is typically separate from other healthcare organisations, acting independently as a part of the public safety organisation and providing emergency healthcare outside of hospital (Al-Shaqsi, 2010; Bigham et al., 2013; Sanders et al., 2012). Other EMS systems have different approaches, linking the EMS system closer to other healthcare providers. The tradition in, for example, German- and French-speaking countries differs from the paramedic system in both organisational affiliation and the increased incidence of physicians taking part in clinical work (Al-Shaqsi, 2010). In some European countries, including Sweden, nurses frequently represent the majority of staff, creating the organisational foundation of ambulance care (Suserud, 2016). Globally, there are a multitude of alternative versions of the EMS system that are often based on national traditions and are under varying degrees of governmental control, which makes the area of ambulance care very diverse and organised differently across the world.

The level of care and quality of care also varies with differences in staffing and organisation. Many countries' ambulance services can only deliver basic life support (BLS) or less, with the view of "scoop-and-run" as the vision for ambulance care being predominant (Al-Shaqsi, 2010; Sanders et al., 2012). Some ambulance services have staff with different levels of education and can therefore include more advanced care interventions, including advanced life support (ALS) (Sanders et al., 2012). Increasing educational level and organisational prerequisites foster the development of even more complex assessments, healthcare interventions and even nursing care (Suserud, 2005; Suserud & Haljamae, 1997, 1999). The goal and vision for ambulance services that hold an ALS level or above often include an intention to "stay-and-play" or the use of more advanced patient triage systems (Sanders et al., 2012; Suserud, 2016) that exceed the more basic systems (Al-Shaqsi, 2010; Suserud, 2016). In Sweden and some other countries where the government has recognised ambulance care as a significant part of the nation's healthcare system, the level of care is regulated by national legislation (SFS 2009:10, SFS 2011:22) in order to ensure an adequate quality of care comparable to other caregivers. The National Board of Health and Welfare governs Swedish ambulance services. Beyond the general regulation that at least one registered nurse (RN) has to staff every Swedish ambulance, the healthcare region or county council has the authority to decree their own rules concerning operations, qualifications and staffing. Some regions have decided that the RNs have to hold a specialist degree in nursing in order to be able to work in the ambulance service. The ambulance nurse

(AN) often works with an emergency medical technician (EMT), with the ANs being responsible for the quality of care (Ahl et al., 2005; Suserud, 2016).

Available research in the area of ambulance care is often conducted by the individuals responsible for providing ambulance services. The nature of the research thus varies accordingly. For instance, in countries that use the paramedic system, paramedics research their own practice. In some countries, paramedic training is an academic education within the higher education system, which promotes ambulance care research (Sanders et al., 2012). Biomedical research has historically dominated the research area of ambulance care, frequently applying a positivistic research perspective (Dainty et al., 2013; Jensen et al., 2012), but the need for a broadened perspective is recognised worldwide (O'Donnell & O'Reilly, 2008; O'Meara, Maguire, Jennings, & Simpson, 2015). Consistent with the organisation of Swedish ambulance services, where nurses are a central part of ambulance care, there is a development towards nursing research in the area of ambulance care. Applying nursing research to the area broadens and deepens specific aspects of ambulance care and ambulance services and Swedish researchers are currently a prominent part of this development internationally. The development of nursing research, often following the naturalistic research paradigm, promotes a more holistic view of the area of ambulance care. Combined with the more positivistic area of biomedicine, which is equally important for the area (Suserud, 2016), nursing research can be considered central to shaping and developing ambulance care.

The Ambulance Nurse

Nursing as a profession is evolving into new fields of healthcare. One of these fields is ambulance care, where the relatively new role of the ambulance nurse is evolving (Suserud, 2005; Suserud & Haljamae, 1997, 1999). In Sweden, the nursing profession is emerging as the standard in ambulance care (Ahl et al., 2005). In 2005, the Swedish National Board of Health and Welfare decreed that, from that point onwards, it would be mandatory to staff ambulances with RNs and some healthcare regions require there to be a nurse who holds a specialist nursing degree. Normally, the ANs represents the highest level of competence in the field of the Swedish ambulance services. Emergency medical technicians (EMTs) are typically paired with ANs as members of the regular ambulance team, with the nurse being responsible for the quality of care. Consequently, the ANs should be able to perform a variety of professional tasks including the work of EMTs as well as all levels of care in the prehospital setting. Swedish ambulance services are changing and developing and consequently, so is the role of the AN. ANs have had a significant role in the development of practice and could be considered vital to the current advancement in the field (Suserud, 2005). Since 2005, at least one RN, often

with a specialist degree, has staffed every Swedish ambulance and nurses are represented at all organisational levels in the EMS, where they have had great influence on development. This short period in which ANs have been involved in ambulance services and the rapid development of the area has led to uncertainties regarding requirements concerning the professional competence of ambulance nurses. National guidelines for the specialist ambulance nurse that were issued by the National Board of Health and Welfare (SOSFS, 1997:18) expired in 2008 and have yet not been replaced (National Board of Health and Welfare, 2008), leaving the profession without legal guidance. The Swedish Higher Education Ordinance (SFS, 1993:100) generally describes the area in terms of learning outcomes for the specialist education programme for ambulance nurses, which leaves out the professional perspective. The Swedish National Association for Ambulance Nurses (RAS), in collaboration with the Swedish Society of Nursing (SSN), published national guidelines for the competence (RAS, 2012) required by an ambulance nurse, but this document has no legal status. Guidelines for ambulance nurses' competence, stating adequate skills, knowledge, levels of knowledge and other professional competences are lacking at the national level.

Teaching and Learning

Teaching and learning in higher education are based on theories of human learning, reflecting different perspectives or paradigms. The more individualistic perspective, where the learner is believed to gain knowledge by acquisition of existing knowledge is known as constructivism (Piaget, 1964). Following the constructivist paradigm, it is thought that knowledge is constructed individually on the basis of prior experience. Learning is thought to be an inherited ability and knowledge development is described as an additive or radical process at an individual level. Another theory of learning that is often referred to, is the socio-cultural learning paradigm (Sfard, 1998). The perspective of learning as participation is central in the socio-cultural theories in which knowledge is created in a community of practice through the participation of the community members (Sfard, 1998; Wenger, 1998, 2000, 2015). Both perspectives can be found in today's educational system and each are reflected by different approaches and pedagogical methods (Sfard, 1998).

A recent trend in higher education has been a change from a view on the teacher as the provider of knowledge to a view on the teacher as a facilitator of learning, i.e. a change from a focus on teaching to a focus on learning (Barr, 1995). The development of teaching practice and learning activities at universities displays this shift towards modern pedagogy, based on modern theories of learning (Biggs, 2003; Illeris, 2009).

In health sciences education, experiential learning (Yardley, Teunissen, & Dornan, 2012b) may be considered a central part and theories of knowledge development

through experiences (Jarvis, 2009; Kolb, 1984) provide educators with a strong incentive for clinical placements. During such placements, students are given the opportunity to apply theoretical knowledge in contextually accurate surroundings. Participating in the specific socio-cultural environment or being part of a community of practice also further enhances learning in a profession (Wenger, 2000, 2015) and forms the basis for transferring theoretical knowledge of holistic care into clinical practice (Henderson, 2002). Learning a new specialist branch of nursing is not only a matter of increasing levels of theoretical knowledge, but also of embracing the role as a professional and incorporating all aspects of the profession (Bowden & Marton, 2004; Dall'Alba & Sandberg, 2006). The theory–practice gap for newly qualified nurses (Monaghan, 2015) is often regarded as less troublesome if accompanied by learning activities that include clinical simulation (Abelsson, Rystedt, Suserud, & Lindwall, 2016), case-based education (Egidius, 1999; Mauffette-Leenders, Erskine, Leenders, & Richard, 2005) or clinical experiences. However, clinical experiences do not automatically lead to adequate learning of a profession (Illeris, 2009; Jarvis, 2010). The student can probably move through clinical placements without learning if the experiences are not accompanied by reflection (Dall'Alba & Sandberg, 2006; Jarvis, 2010). In order to ensure quality of learning from clinical placements and make good use of experiential learning, a clinical placement should be accompanied by proper supervision, meaningful learning activities and participation in reflective practice (Dall'Alba & Sandberg, 2006; Jarvis, 2010; Yardley, Teunissen, & Dornan, 2012a).

Competence

Professional competence is often described as the ability to use knowledge and skills in a certain professional context (Benner, 1982). The transfer of theoretical knowledge and skills into useful competences is influenced by several external and internal factors such as professional environment, personal abilities, confidence, professional possibilities, physical boundaries and other significant factors. Thoroughly defining a professional competence is complex as a competence can be viewed as consisting of a number of separate specific competences required in a professional area (Bowden & Marton, 2004). Each separate competence consists of specific theoretical knowledge, practical skills and reflective abilities, and displays itself in the acts of the professionals in a specific setting. A professional competence can be described as the sum of a combination of several competences, but also includes professional attitudes, approaches and perceptions found within the profession itself (Bowden & Marton, 2004). These parts of a professional competence are harder to explore and describe, but can be considered as central to understanding a professional competence in a specific setting. Professional competence is often defined and developed in the professional community (Wenger, 2000, 2015) and is largely dependent on the interaction between the community and the professional.

Different levels of competence (Benner, 1982) can be observed or found in descriptions of professional development. The development of competences is often described as a process moving through different stages of professional competence towards expertise in the area. The transition from one level to another is largely based on gaining professional experience (Benner, 1982). It is suggested in some research (Dall'Alba & Sandberg, 2006) that professional competence develops as result of a reflective practice, presumably not necessarily stepwise, but instead as a continuous developmental process that follows the individual's reflective ability (Jarvis, 2009), rather than just through gaining experiences. Reflections on a personal and professional level as a prerequisite for the development of professional competence (Dall'Alba & Sandberg, 2006; Jarvis, 2010) are considered central. How professionals act in their profession can be seen as an expression of their level of competence and is demonstrated by their performance. The different levels of competence are not easily identified externally, but a partial description of competence could be obtained by assessing performance. However, to thoroughly assess and describe a professional's competence, including all levels of competence, a holistic or reflective approach should be used (Bowden & Marton, 2004).

A specific competence of importance to ANs is clinical reasoning, which is considered to represent cognitive processes, skills and decision-making aspects of nursing practice and is referred to as an important factor for providing quality care (Higgs, 2008; Levett-Jones et al., 2010). The clinical reasoning process can be described as a reflection of the thought processes in nurses' clinical work and is often used as a tool for quality enhancement and learning within a profession (Levett-Jones et al., 2010). The clinical reasoning process is believed to strengthen professional competence by raising personal awareness of knowledge, skills, actions and attitudes (Higgs, 2008). The clinical reasoning model in nursing was primarily developed for educational purposes to be utilized among students or professionals in order to enhance patient safety and quality of care (Higgs, 2008; Levett-Jones et al., 2010).

How the clinical reasoning process is applied in practice seems to vary individually and clinical experience seems to strongly influence clinical reasoning. More experienced nurses seem to collect more cues than novice nurses (Hoffman, Aitken, & Duffield, 2009) and are able to use this diversity of cues in a holistic analysis of the patient's situation (Banning, 2008). It is suggested that the more experienced professionals act less analytically and use a non-analytical way through the reasoning process (Eva, 2005). ANs experience is used to make clinical judgements and decisions about the care provided and the thought process may differ between a more analytical and cognitive approach or a process that relies on schema, experience and intuition (Banning, 2008). The non-analytical reasoning approach is considered to evolve though further clinical experience (Eva, 2005; Levett-Jones et al., 2010; Marcum, 2012). The ability to switch, when needed, between the more thorough analytical process and the non-analytical

process of reasoning seems to represent an expert level of competence (Durning et al., 2015; Marcum, 2012; Norman et al., 2016).

The clinical reasoning competence can be used for the assessment of cognitive and metacognitive processes among professionals, but the development of adequate research methods to produce useful data to strengthen this has, so far, been challenging (Banning, 2008). To use the clinical reasoning model as a tool for analysing professional reasoning opens up the possibility of standardising the assessment of clinical reasoning skills in order to enhance professional competence among ANs.

Core competencies

The adequate competence of healthcare professionals is often highlighted and discussed as essential in determining quality of care, patient safety and outcome (Olds & Dolansky, 2017; SSN, 2017). These issues are of general interest for healthcare services and the area is getting increasingly more attention from all health professions. In an effort to enhance and assure quality of care and patient safety, core competencies for healthcare professionals were developed and described (Cronenwett et al., 2007; Institute of Medicine, 2003). The core competencies are believed to represent central parts of competence forming a basis for adequate clinical competence of any health profession (Cronenwett et al., 2009; Olds & Dolansky, 2017; Warren & Thompson, 2010). Beyond the use of the framework as a tool for quality assurance and evaluation, the core competencies applied also form the basis for education and research in the area (Olds & Dolansky, 2017; SSN, 2017; Warren & Thompson, 2010). In this thesis, the core competencies framework is used to summarise research findings. A brief summary of the core competencies' contents is presented below. Notably, the competence *person-centred care* has developed from patient-centred to person-centred in later versions of the framework descriptions.

The six core competencies for health professions are: *person-centred care*, *teamwork and collaboration*, *evidence-based practice*, *quality improvement*, *safety* and *informatics* (Cronenwett et al., 2007; Institute of Medicine, 2003; Olds & Dolansky, 2017; SSN, 2017).

Person-centred care is based on the view of the patient as a person who is capable and has individual needs and expectations. Person-centred care is characterised by cooperative planning and utilisation of care, with the person and caregivers together being responsible for the care and having equal rights to influence decisions and actions. Person-centred care is attentive to preserving the person's integrity and dignity.

Teamwork and collaboration forms a basis for competence development, continuity of care and patient safety. The ability to function effectively within professional and inter-

professional teams, to foster open communication, mutual respect and shared decision-making are essential to achieving quality patient care.

Evidence-based practice is based on the systematically gathered and reviewed knowledge of an area. Evidence-based practice integrates the best current evidence with clinical expertise, the patient's/family's preferences and values in order to deliver optimal healthcare. Evidence-based practice utilises care actions that are based on research, which are summarised and implemented in the care organisation. The evidence base of an area consists of systematic analysis of research or experience-based knowledge that is synthesised in care guidelines and work procedures.

Quality improvement is achieved by monitoring the outcomes of care processes and uses improvement methods to design and test changes that aim to continuously improve the quality and safety of healthcare systems.

Safety is based on organisational and professional measures implemented through both system effectiveness and individual performance in order to minimise the risk of harm to patients and providers.

Informatics includes the use of information and technology to communicate, manage knowledge, mitigate error and support decision-making.

Curriculum development

Today, in almost all areas of higher education, a competency-based view of educational organisation is applied (Frank et al., 2010). The use of specific learning outcomes (Biggs, 2003) at every level of education is embraced internationally and forms the basis of every curriculum. Professional educational programmes are supposed to lead the student to a specific professional knowledge or competence and the use of learning outcomes seems to be especially well suited for this purpose. In the Swedish higher education system, learning outcomes are defined in the syllabi for every programme and course under the headings *knowledge and understanding, competence and skills and judgement and approach* (SFS, 1993:100). Every learning outcome shall be assessed and there should be teaching and learning activities (TLAs) in order for the students to achieve the described outcomes (Biggs, 2003).

To form a basis for quality learning in professional education, a curriculum should be designed to meet the specific contextual prerequisites found in the profession. When creating a curriculum (Harden, 1986a, 1986b; McAllister, 2001a), educational providers should engage in a transparent and thorough process that adheres closely to international and national standards. The quality of education and educational outcomes could be enhanced by being grounded in clinical practise and by using comprehensive descriptions of the professional and organisational context (Keogh, Fourie, Watson, & Gay, 2010; McAllister, 2001a, 2001b) as a framework. Curriculum

development should benefit from a cooperative engagement between universities and professional representatives in creating comprehensive descriptions of the area (Gonsalves, Ajjawi, Rodger, & Varpio, 2014). Professional education programmes such as the specialist nursing programmes could benefit from a curriculum designed in close cooperation with professional representatives to make educational outcome useful to the professionals by closing the gap between theoretical education and clinical placements (Harden, 1986a, 1986b; S. Henderson, 2002). Significant attention should also be given to other often overlooked and undefined parts of the curriculum, including students' and teachers' approaches, understandings and perceptions as described in the 3P (presage, process, product) model (Prosser & Trigwell, 1999) in order to develop a high quality curriculum.

The Swedish specialist programme for ambulance nurses is a national one-year second cycle programme (SFS, 1993:100; EHEA, 2005). The programme aims to give the students opportunities to develop professional competence for work in ambulance care settings (Ahl & Nyström, 2012; Sjölin, 2016). There are a number of different specialist nursing programmes in Sweden, for example in intensive care, primary care or paediatric care. The learning outcomes are defined in the Swedish Higher Education Ordinance (SFS, 1993:100). The national learning outcomes are set at a programme level and have to be interpreted and specified in the course syllabus for each specialist nursing programme. This leads to locally created, slightly varying curricula and syllabi, the focus of which differs between each university (Sjölin, Lindstrom, Hult, Ringsted, & Kurland, 2014; Sjölin, 2016). Local differences can be seen in, for example, the learning outcomes, the length of courses and clinical practice, the amount of skills training, the teaching methods and the organization. Some universities have included a degree project in the curriculum, resulting in both a professional and a generic degree for the students. A large proportion of the ambulance nurse programme's curriculum consists of clinical placements, which are carried out in cooperation with the ambulance service. This close connection between the university and the operational service also consolidates the view that creation of learning outcomes is strongly influenced by local prerequisites, which perhaps results in an uneven quality and locally varying curricula (Biggs, 2003; Keogh et al., 2010; Prosser & Trigwell, 1999). The curricula of Swedish specialist nursing education mainly focus on medical competence (Sjölin et al., 2014; Sjölin, 2016), which, historically, was thought to reflect the needs of the profession. What competence ambulance nurses actually need in the profession have yet to be described and this provides researchers with a methodological challenge as the area of professional competence is complex, contextual and changes over time (Benner, 1982; Dall'Alba & Sandberg, 2006).

Rationale

This thesis' rationale is based on the assumption that there are gaps in our knowledge of the anticipated competence of the ambulance nurse. The area of ambulance nurses' competence and ambulance care represents a relatively new research area and the available research is limited. In the Swedish ambulance service system, the role of the nurse is considered central and is legally defined as compulsory. Although legally stated, there is an obvious lack of international and national consensus regarding the adequate professional competence of ambulance nurses and of valid descriptions of the ambulance nurse's competence. The Swedish specialist education programmes for ambulance nurses seem to lack a national consensus as to the adequate educational content and methodology. The area could benefit from an adequate and updated description of the ambulance nurse's professional competence. This would be used to develop and shape all parts of the curriculum and syllabi as a means by which to improve the specialist nursing programme.

Research in the area of ambulance care, professional competence and education could provide the knowledge required by healthcare professionals in the ambulance care setting. The area lacks a definition of professional competence for ambulance nurses, which is needed in order to encourage educational and professional development, ultimately leading to improvements in the quality of care provided by ambulance services.

Aims

The aim of this thesis was to explore ambulance nurses' area of knowledge by describing aspects on competence and education in order to provide a comprehensive understanding of the ambulance nurse's competence constituting a basis for curriculum development associated with the specialist nursing education programme.

Specific aims

Paper I

The aim of the study was to elucidate the desired professional competence of the specialist ambulance nurse, according to the views of the professionals.

Paper II

The aim of the study was to elucidate ambulance nurses' professional experiences and to describe aspects affecting their competence.

Paper III

The aim of the study was to explore and describe ambulance care professional's views on teaching and learning associated with the Swedish ambulance nursing specialist educational program.

Paper IV

The aim of the study was to explore and describe the clinical reasoning processes at different levels of education and clinical experience among ambulance nurse students and professional ambulance nurses.

Perspectives

This thesis was based on aspects of professional competence and education of ambulance nurses in the specific context of ambulance care. The dual perspectives were considered in all parts of the project and were reflected in the project design, the methods, the interpretation of results and the finished thesis.

As this thesis addresses the professional role of the ambulance nurse, a nursing perspective has been of great value. The notion of nursing as a humanistic philosophical perspective on life where the human is considered central (SSN, 2011) in nurses' professional role. Nursing care takes place on a personal level, equally considering both nursing tasks and human relations (SSN, 2011). The education of nurses is considered to have a considerable impact on nursing care and quality through its direct influence on the development of the nursing profession (SSN, 2011). This notion of nursing education as a significant part of nursing (Henderson, 1991; SSN, 2011) and how nursing education consequently constructs prerequisites for nursing care forms the perspective on nursing used in this thesis.

Subsequently, this thesis required a perspective on human learning to form a basis for understanding how knowledge is created and developed. The notion of human learning as a construction of knowledge in a continuing individual process is well established in Piaget's theory of learning (Piaget, 1964). Human learning as an generic ability is assumed in both the constructivist and socio-cultural learning paradigms (Sfard, 1998). The perspective of learning as acquisition of knowledge was considered as equally valid as the socio-cultural perspective (Sfard, 1998; Wenger, 1998) in which participation is considered to be the base for learning. These perspectives are needed in order to truly explain and understand key aspects of adult learning; the goals of learning, students' perspectives, teaching, concepts, knowledge and knowing (Sfard, 1998). In this thesis, the acquisition and participation perspectives are both complemented by the theory of experience-based learning (Jarvis, 2009; Kolb, 1984). The author embraces the notion that learning is a result of how lived experiences are adapted and incorporated in a person, possibly leading to increased knowledge or understanding. These perspectives of human learning formed a foundation for the project and were used in the project design and the interpretation of results.

Pre-understanding

A researcher's pre-understanding of an area or phenomenon can prove to be of great importance in all parts of the research process (Nystrom & Dahlberg, 2001). A certain pre-understanding could influence the creation and interpretation of research results. The researcher's standpoint is affected by multiple factors such as origin, culture, educational level, personal beliefs or professional practice experiences. Therefore, a standardized way of judging how researchers' pre-understanding affects research is not applicable (Nystrom & Dahlberg, 2001). In order to counteract investigator bias (Guba, 1981), several measures can be applied, such as systematically scrutinizing the researchers' notions of their pre-understanding. Actively raising researcher awareness through reflection, discussion or documentation could discourage bias due to a certain pre-understanding, although this cannot be avoided entirely (Nystrom & Dahlberg, 2001). Thoroughly and openly reporting pre-understanding in research publications can be considered a reasonable means by which to enhance research trustworthiness (Guba, 1981). The author and co-authors of each paper have had recurring discussions about pre-understanding during the research process for each paper. The author has a background as an ambulance nurse and university teacher and the co-authors' have similar contextual backgrounds as university teachers, but with varied professional affiliations. One co-author is a registered nurse with clinical experience of ambulance care, while the others lack contextual experience of ambulance care. All authors are involved in pedagogical development and qualitative research, which has almost certainly had an effect on research design and the interpretation of the possible implications of the results. Discussions have encouraged the author's reflections on how pre-understanding can affect research and the presented papers in particular. The author's professional background as a nurse and a teacher is of course influential to the research design and the construction of project aims. The risks of investigator bias increase with knowledge and presumptions about an area, especially during the interpretation of qualitative data. However, pre-understanding can also be considered an asset (Nystrom & Dahlberg, 2001) in terms of allowing the production of initiated research questions or the definition of the implications of research. In this thesis, as a product of consensus among co-authors and author reflections, pre-understanding was considered to be implicit. This constantly scrutiny of the authors' background and opinions about the area were believed to raise awareness and reduce investigator bias.

Methods

Overview of methods

To explore aspects of the ambulance nurse's competence and education several perspectives and thus several methods are required. In this thesis, the application of research methods was decided close to the research questions of the studies and the character of research data. Since the research area is fairly new, a methodological flexibility is needed, as stated by Denzin and Lincoln (2005). Onwuegbuzie and Leech (2005) also claim that the process of knowledge creation in an area is enriched by the use of both quantitative and qualitative research methods. Using research-based descriptions of professional competence could provide researchers with a basis for curriculum development (Dent & Harden, 2013; Harden, 1986a), especially in terms of establishing learning outcomes in a competency-based curriculum. Identifying formerly unknown aspects of professional competence in research should preferably be carried out using varied methods and approaches (Dunn, Hamilton, & Harden, 1985) such as the Delphi technique, the critical incident technique or behavioural events interviews (Dunn et al., 1985).

The methods applied in this thesis are mainly qualitative in character, but some are quantitative. Design and methods can be regarded as falling into a continuum of rigorous structure to less well-structured (Denzin & Lincoln, 2005, p 376). Although qualitative researchers design their studies in beforehand, their designs have a built-in flexibility to handle unexpected empirical material. The resulting data cannot be predicted as would be the case for the data obtained by a survey, for example. In Paper I, a combination of the strict structure of the Delphi technique and a qualitative content analysis places the method used in the middle of the continuum. In Paper II, we used the critical incident technique in the data sampling of telephone interviews, but unexpectedly, the reflective depth in these interviews made it difficult to just sort them into different types of critical incidents. The data were very heterogeneous due to the varied characteristics of the critical incidents and the associated reflections. At that stage of analysis, we decided to apply a content analysis containing both a manifest content presentation and a latent meaning interpreting analysis. Paper II can thus be regarded as less structured than Paper I on the continuum. Paper IV, however, is more structured than Papers I and II as it uses a mapping sentence in the facet theory tradition of a

highly structured order of analysis. In the continuum of structure, Paper III lies between Papers I and II on the one side and Paper IV on the other as it applies both interpretations (focus group interview and qualitative analysis) and numeric presentations (Delphi study). An overview of the methods used is presented in Table 1.

Table 1. Overview of methods

Paper	Study participants	Data collection	Methods for analysis
I	Ambulance care professionals (n=39)	The Delphi technique, questionnaires.	Qualitative content analysis and descriptive statistics.
II	Ambulance nurses (n=32)	Individual interviews based on the critical incident technique (CIT).	Qualitative content analysis.
III	Ambulance care professionals (n=39; 7)	The Delphi technique, questionnaires and the focus group interview method.	Qualitative content analysis, descriptive statistics and qualitative focus group analysis.
IV	Students and ambulance nurses (n=49)	Observations of group discussions.	Facet theory analysis.

Paper I and III

Paper I and the first part of Paper III shared the Delphi technique design. Participant recruitment, data collection and analysis were completed simultaneously for both papers with the same participants. Due to differences in the studies' aims, elucidating desired competence in Paper I and exploring professional views in Paper III, the results were then presented differently.

Paper I and the first part of Paper III were thus carried out using a modified Delphi technique (Keeney, Hasson, & McKenna, 2001; Williams & Webb, 1994). The Delphi technique was developed in the 1950s and uses a group of experts who respond anonymously to questionnaires and subsequently receive feedback in the form of a statistical representation of group responses, after which the process repeats itself (Dalkey, Brown, & Cochran, 1969; Hasson & Keeney, 2011). The goal is to reduce the range of responses and arrive at something close to consensus. The Delphi technique has been widely adopted as a means by which to achieve consensus (Dalkey et al., 1969; Foth et al., 2016) but is also used to explore and describe an area or phenomenon (Hasson & Keeney, 2011; Keeney, Hasson, & McKenna, 2006;

Kennedy, 2004). The identities of the panel members are not revealed so as to ensure that results are not affected by the members' backgrounds, politics or relationships (Hasson & Keeney, 2011; Powell, 2003). The Delphi technique was chosen for its applicability in curriculum development (Dunn et al., 1985; Foth et al., 2016) to be used in a specific setting in order to meet the project aim. Furthermore, the Delphi technique specifically encourages participants to express their honest opinions, free from peer and group pressure (Keeney et al., 2001).

After analysing the Delphi part of Paper III, the authors decided to explore the results further using an additional data collection method as a means of methodological triangulation (Begley, 1996; Creswell, 2003). Methodological triangulation is used to confirm and complete data (Begley, 1996) in complex settings, using an additional method to collect and analyse study data. As the second part of Paper III, a focus group design (Barbour, 2007) was used to further explore participants' views on content and meaning in accordance with the study's aim. Accordingly, this study's findings were considered to explore the participants' opinions further, beyond the relative consensus obtained using the Delphi technique. In this paper, the focus group method (Barbour, 2007) was considered a beneficial means by which to explore the views on specified content found among a group in the Delphi part. This is because it allows expanded and clarified views to be detected in the group discussion (Barbour, 2007).

Participants

A panel of Swedish ambulance care professionals was invited to express their views on the desired competence of the ambulance nurse (Paper I) and their views on teaching and learning associated with the Swedish ambulance nursing specialist educational programme (Paper III). The participants were mainly ambulance nurses with varying amounts of professional experience. Other panel members were physicians, medical managers, researchers, university teachers and representatives of unions or national associations. The participants were strategically recruited in order to obtain multiple perspectives that represent a variety of organisational, educational and professional contexts from different regions of Sweden. Recruitment of the first line of panel members was based on official records of affiliation and publicly registered contact information. Further enrolment of study participants involved some of the panel members recommending other possible participants to be included on the panel. Initially, 42 presumptive participants were invited to participate in the Delphi panel and three declined due to excessive work load. The final 39 panel members were all contacted personally by the first author, who asked if they wished to be included and provided information about the study. Due to one dropout after the first questionnaire, a total of 38 participants finished all of the Delphi questionnaires (Figure 1).

Fourteen of the original Delphi panel members were invited to take part in a focus group interview for the second part of Paper III. Recruitment was based on geographical domicile in order to make it feasible for participants to take part in the

interview. Seven accepted and the seven who declined were not able to attend on the specific date and time of the interview. The seven focus group participants who accepted were considered to be a representative, cross-sectional selection of the panel members.

Data collection

For Paper I and the first part of Paper III, the Delphi panel participants answered three consecutive questionnaires (Figure 1) using a web-based electronic questionnaire system (TeleForm® v10). The panel members received an e-mail link to the active questionnaire, directing them to the web server where the questionnaire was available for completion. The participants submitted their responses by saving them on the server.

The first questionnaire contained two open questions, with the informants being asked to write their answers in their own words. The first question was formulated to enable the participants to describe their views on the desired competence of a newly graduated ambulance nurse, specifying what they should be able to handle, analyse and perform in their profession from the perspective of the immediate future. The second question was an open question about teaching and learning in the specialist nursing programme, intended as a follow-up to the first question. The participants had unlimited space for their written response in the first questionnaire.

The second questionnaire consisted of two sets of statements, one for each of the questions in the first questionnaire. There were 46 statements for the first question and 43 statements for the second. The Delphi panel was instructed to specify their level of agreement with each of the statements using a four-graded Likert scale (1–4). The rating scale's lower end-point was "totally disagree" and the higher end-point "totally agree".

The third questionnaire was sent to the panel a few weeks after the second questionnaire. This contained the same two sets of statements, accompanied by a summary of the results from the second questionnaire that presented all the other panel members' ratings as numeric values and bar diagrams. Again, the participants were asked to rate their level of agreement with the given statements. The results of the third questionnaire were then used for analysis in Paper I and III.

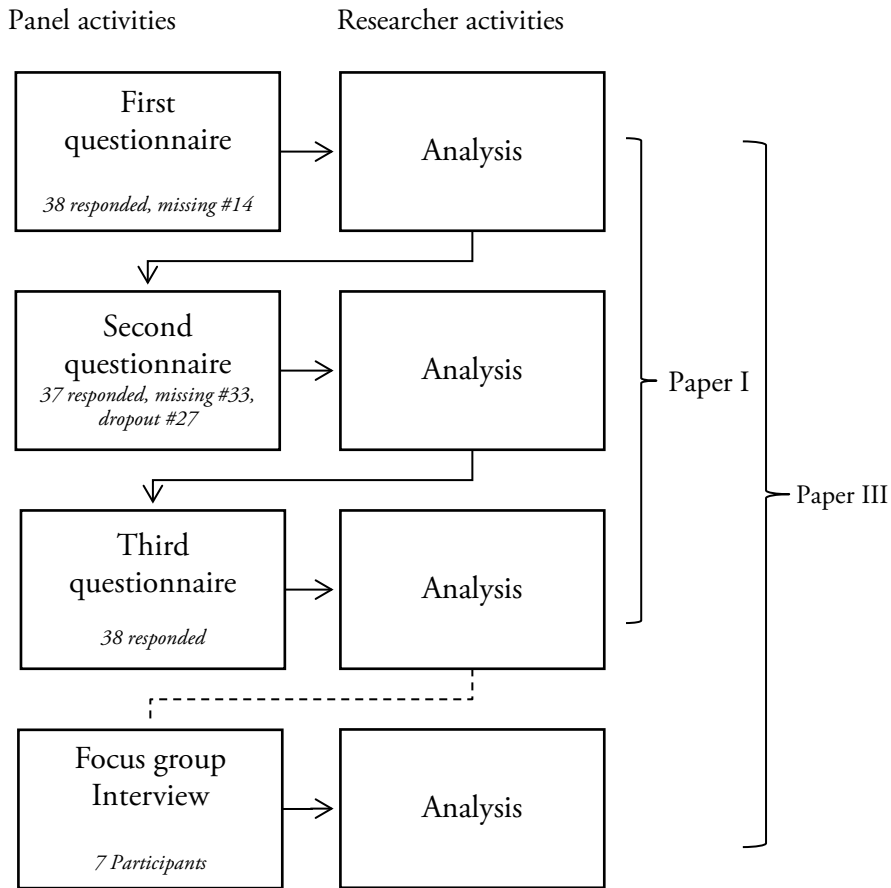


Figure 1. Overview of procedures Paper I and III.

Panel (left) and researcher (right) activities, response rates, missing responses, study dropout and focus group interview.

A focus group interview for the second part of Paper III was carried out in a single session where the third author (BS) of Paper III led the discussion. The focus group discussion, or interview, is typically led by a researcher who facilitates participant interaction and pays attention to both the participants' opinions and content matters (Barbour, 2007). A semi-structured interview guide was developed using the results from Paper I, II and the Delphi part of Paper III. The fourth author (GE) acted as an observer and took notes concerning group engagement and dynamics, verbal and non-verbal communication and group interactivity during the group session. The group discussion was audio recorded, timed in minutes and transcribed verbatim to be used for analysis.

Analysis

In Paper I and the first part of Paper III, analysis of the responses to the first questionnaire was conducted using qualitative content analysis (Burnard, 1991). Initially, a naive reading of all data as a whole unit of text resulted in summarized notes on the whole material. The author (JW) then extracted meaning units by reading the data thoroughly. Similar meaning units from the transcripts were coded and placed in subcategories and then grammatically transformed into statements that were used in the second and third questionnaires. The statements were carefully worded in order to state a clear opinion, which helped the panel members to adopt a decisive stance that expressed their personal views. During the creation of statements, the data were thoroughly reassessed by all authors in order to ensure that no specific content was left out due to the condensation of meaning units into codes. During the analysis process, 46 and 43 statements, respectively, were created for the two questions in the first questionnaire. The statements were used in the second and third questionnaires.

The second and third questionnaires' rating scores were analysed statistically in Paper I and III and qualitatively in Paper III. The responses were analysed with descriptive statistics using the Statistic Package for Social Sciences software (IBM® SPSS® Statistics, version 21). The ratings were then presented in a table format as mean values (M) and standard deviation (SD).

In Paper III, an additional qualitative analysis of the 43 statements was carried out as a deductive content analysis (Elo & Kyngas, 2008). Statements were grouped and gathered into abstract preformed categories in order to form a conceptual model inspired by the 3P model (Prosser & Trigwell, 1999). This model sorts and displays the panel's views both chronologically and relationally within a curriculum by visualizing categories and their interconnectivity.

In Paper III, the focus group discussion was analysed, with the focus on both the content and the meaning of the group discussion (Barbour, 2007) in accordance with the study's aim. First, a provisional coding framework was created. This framework was used to sort the content units found in the interview data. The content was scrutinised for meaning and the framework was then revised to retain both the content and the meaning emphasis (Barbour, 2007).

An illustration of the focus group output was constructed in order to visually display estimates of the relative discussion time and a table listing the qualitative emphasis of the focus group analysis.

Paper II

In Paper II, we used a qualitative approach in which the critical incident technique (CIT) (Flanagan, 1954; Schluter, Seaton, & Chaboyer, 2008) was applied in order to gather data containing professional experiences and behaviour. The study data consisted of the reflected professional experiences shared by thirty-two ambulance nurses. This method is often used for gathering data about human behaviour through descriptions of experiences of critical incidents (Flanagan, 1954) and is recommended for curriculum planning (Harden, 1986a, 1986b). A critical incident is an experience that has a certain significance to the informant, the events and actions of which can be easily recalled by the informant in an interview situation (Schluter et al., 2008). The data found by using the CIT typically reflect the informants' views of their profession and also include reflections on a more personal level (Dunn & Hamilton, 1986). The method was chosen for its ability to provide rich qualitative content through reflections on situations and actions in the profession (Schluter et al., 2008). Due to the richness and excessive amount of reflected content, well beyond the critical incidents themselves, the data collected was then analysed according to the guidelines for qualitative content analysis (Graneheim & Lundman, 2004).

Participants

The study participants consisted of 32 ambulance nurses, all of whom have a specialist ambulance nursing degree, strategically recruited in order to ensure variation in level of experience. The participants were employed in the ambulance services of three different healthcare regions in the south of Sweden, providing a variation of context that is representative of the ambulance nursing profession at a national level. In each of the regions, there are universities that offer specialist nursing education, which reduces the influence of a single education provider. Recruitment of the informants was undertaken through contact with regional ambulance service operations managers who appointed local coordinators who identified presumptive informants in accordance with the study's inclusion criteria, as stated above. The first author of Paper II then approached the informants, providing them with information about the study and obtaining their written consent to participate in the study.

Data collection

Qualitative interviews were conducted by telephone by the first author (JW) using two open-ended questions with prompts in accordance with the CIT tradition (Flanagan, 1954). The interview questions were: (Q1) – Describe a positive event from your practice as you remember where you experienced that your competence was adequate to deal with the situation and (Q2) – Describe a negative event from your practice as you remember where you experienced that your competence was insufficient for dealing with the situation. Audio recordings of the interviews were transcribed verbatim and

analysed during the same time period as the interviews were conducted in order to evaluate the need for additional data collection.

Analysis

The interviews were initially read thoroughly by the first (JW) and the last author (BS) of Paper II. They noticed that the 69 critical incidents consisted of not only the incidents themselves, but also several related reflected experiences. The informative and varied content and the heterogenous data within each critical incident called for a slightly different approach than the traditional CIT analysis. A qualitative content analysis method was therefore chosen (Graneheim & Lundman, 2004) for further analyses. Each interview was analysed separately and the authors identified a number of meaning units, with 512 meaning units being chosen as they reflected the participants' experiences in accordance with the study's aim.

The meaning units were sorted into seven content areas representing phases of the AN's clinical work. The content areas were labelled *presage*, *encounter*, *assessment*, *actions*, *cooperation*, *evaluation* and *influence*. The content area *presage* included meaning units that describe professional prerequisites for clinical work such as individual, educational or organizational prerequisites. The areas *encounter* and *assessment* contained content related to the patient meeting, the communicative process and the ambulance nurse's assessment of patients and situations. The content area *actions* included content related to problem solving, clinical decision-making and performance. The content area *collaboration* included cooperative and collaborative units and the area *evaluation* contained content concerning notions pertaining to competence. Meaning units representing effects at the personal and professional level were collected in the content area *influence*.

The meaning units in each content area were then condensed and grouped into 66 individual codes representing related content. A continuous comparison of the separate analyses of each of the authors resulted in a mutual consensus on grouping the codes to form subcategories. To prevent misinterpretation due to author pre-understanding and to enhance credibility, all authors were included in discussions leading to the grouping of codes and the formation of subcategories and categories.

At this manifest level of analysis, categories were formed by the abstraction and summarization of subcategories. The results of the analysis at the manifest level were presented in a table as subcategories and categories.

The data as a whole was then used to capture the latent meaning of the content. The first author (JW) read the material in search of expressions of meaning that cross over categories, subcategories, codes and meaning units. The analysis resulted in interpretations of meaning, which were used to form preliminary themes. The preliminary themes were then reflected upon, discussed and revised by all authors to end up with the final themes. The themes were formed by interpreting data from

all levels of the analysis representing the heterogenic data of the study. Since the themes were formed by condensation of content found in one or more, but not all, categories, they were presented as a table with reference to categories displaying their category origin.

Paper IV

In Paper IV, a mapping sentence originating in facet theory analysis (Dancer, 1990; Hackett, 2014, 2016) was used to explore and describe the clinical reasoning process among groups of students and professionals. The mapping sentence is an independent tool originating from facet theory analysis (Dancer, 1990; Guttman & Greenbaum, 1998; Hackett, 2014, 2016; Shye, Elizur, & Hoffman, 1994) and it offers a means by which to analyse qualitative data, such as complex human behaviour, by identifying and structuring content and relationships. The mapping sentence makes it possible for the researcher to define a theory-based framework for the analysis of empirical observations (Dancer, 1990; Hackett, 2014, 2016). The use of a mapping sentence allows researchers to produce data by applying a systematic fragmentation process (Guttman & Greenbaum, 1998; Hackett, 2014). A specific mapping sentence (Hackett, 2014; Shye et al., 1994) was used as a tool for deriving quantitative content from qualitative data in order to provide the basis for analysis. The variety of possibilities for analysis and interpretation of data (Hackett, 2014, 2016; Shye et al., 1994) increases the method's adaptability in studies of professional behaviour and strengthens the method's usefulness in this project. In this paper, a mapping sentence was chosen for because it makes it possible to provide a three-dimensional, theory-based, conceptual framework for the analysis and reporting of findings.

Participants

All participants attended, or had previously attended, the ambulance specialist nursing programme at Lund University, Sweden. The students were RNs with a variety of professional experiences prior to their admission to this programme. The participants were invited by the first author and nineteen students and thirteen specialist ANs agreed to participate. The students were split into four groups (Figure 2). The same students were invited to participate at the final week of the programme. Two of the students could not participate and the remaining seventeen were divided into three groups (Group S2).

The specialist ANs were recruited in order to represent experienced professionals with a specialist nursing degree and current employment as ambulance nurses, (Group P) and formed tree discussion groups.

Each group of participants was split into case discussion groups (Cdg) with 4–7 participants in each group. Group S1 were students at the beginning of the programme. Group S2 were students in their final week of the programme. Group P were specialist nurses.

Data collection

Groups of participants (Figure 2) were presented with a written case to discuss. The case scenarios, written as narrative stories, used in the study followed the pedagogical principles of the Harvard case method (Kim et al., 2006; Mauffette-Leenders et al., 2005). All participants were familiar with the method as it is used in the nursing programmes at Lund University to integrate theory and practice (Crang-Svalenius & Stjernquist, 2005; Egidius, 1999). Two case scenarios representing clinical work in ambulance care were created by the first author. To avoid replicating the discussions among the student groups, one case was used in the first session at the beginning of the programme (Group S1) and the second case in the second session at the end of the programme (Group S2). Group P discussed both cases (Figure 2). Both cases were designed to incorporate a wide array of content, allowing for a variety of foci and multiple dimensions in the group discussions (Kim et al., 2006). A case method template was used to facilitate and scaffold the discussions and included the following headings: *facts, problems, analysis, action, predictions* and *outcome*. Each session was facilitated by the last author in order to ensure that the discussion was related to the case and they intervened only if the group asked for assistance. An observer was present during each session. Neither the facilitator nor the observer had met the participants ahead of the discussions and neither of them was involved in the specialist nursing programme. A protocol was used to summarise session observations for each group, including group engagement and dynamics, verbal and non-verbal communication and Group interactivity. The group discussion sessions were audio recorded, timed in minutes and transcribed verbatim to be used for analysis.

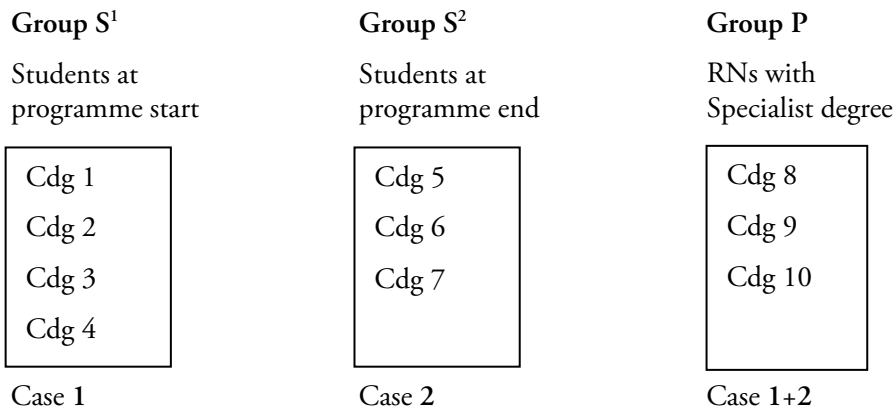


Figure 2. Study overview, Paper III.

Each group of participants was split into case discussion groups (Cdg) with 4-7 participants in each group. Group S1 were students at the beginning of the program. Group S2 were students during their final week of education. Group P were specialist nurses.

Analysis

The analysis was based on the transcribed texts from the discussion group sessions and used a mapping sentence (Figure 5). The mapping sentence reflected the research design and was used to process the content of the research findings (Hackett, 2014, 2016), in accordance with the study aim. A mapping sentence consists of a number of facets created both theoretically and empirically in order to give a multidimensional representation of the qualitative content. Passing a subject through the mapping sentence transforms the study's qualitative content items into numerical values called structuples. The structuples are then summarised and displayed as frequencies, forming the basis of the qualitative interpretation part of the analysis (Hackett, 2014, 2016; Shye et al., 1994).

The texts were scrutinised thoroughly in order to identify units representing expressions of group reasoning. Each unit that demonstrated clarity of content and characteristics was defined as usable. The units typically contained spoken reasoning from two or more participants. The identification of units was discussed, negotiated and defined within the research group in order to provide a reasonable interpretation of unit formation. Each unit (x) was used as subject in the mapping sentence (Figure 5) which included two facets and a range divider (Hackett, 2014) in order to sort the material into a specific set of structuples (Shye et al., 1994) for each group. Both facets used in this study are modular facets that reflect the participants' understanding, knowledge and the focus of their reasoning.

Facet a – *the clinical reasoning process* – was created from the principle of the clinical reasoning process (Levett-Jones et al., 2010). The elements of the facet were derived

directly from the clinical reasoning process model in order to sort reasoning units in relation to an accurate clinical process, revealing what part of the process the group mainly reasoned about. Facet b – *case content* – sorted the reasoning units in accordance with reasoning content. All five facet elements represented aspects of nursing care in clinical settings. The nursing facet element (b1) represented central aspects of nursing (Ekman et al., 2011; Henderson, 1991) such as communication, relationships and environmental considerations representing a holistic nursing approach. Element b2 content represented physical status, pathophysiology, pharmaceutical treatment or diagnoses. Elements b3–b5 represented ethics, legislation and organisation, respectively. The range allocated each unit of reasoning into analytical or non-analytical reasoning based on the depth and use of recalled knowledge or experiences in the groups' discussions. The definition of range was based on descriptions of clinical reasoning (Durning et al., 2015; Eva, 2005; Marcum, 2012). By analysing each group's reasoning using the mapping sentence, a specific set of structuples emerged. The structuples within each main group (S1, S2 and P) were then explored using three-dimensional descriptive statistics.

To illustrate the findings, a three-dimensional figure was created in which the number in a cell represents the frequency of occurrence of each combination of facets a and b, and the colour represents the frequency difference within the range (Figure 6). The blue colour represents a positive range difference and orange a negative range difference, indicating whether an analytical (positive range difference) or non-analytical reasoning (negative range difference) occurred most frequently. Three levels of colour intensity were used to categorize the range difference into small (level 1), moderate (level 2) or pronounced (level 3). To adjust for the different total number of reasoning units (where group P had approximately a double amount of reasoning units since that group discussed both cases), the group P increments were doubled compared to those of groups S1 and S2. Groups S1 and S2's levels were set to: small: 1–5 reasoning units; moderate: 6–10; pronounced: >11 units above (i.e. analytical) or below (i.e. non-analytical) 0 since they discussed both cases. Group P's levels were set to: small: 1–10 reasoning units; moderate: 11–20; pronounced: >21 units below or above 0. Uncoloured cells represent no difference (0) in frequency of range units. The final step of the analysis was an interpretation of group characteristics, similarities and differences.

Ethical considerations

The projects included in this thesis have been carried out in accordance with the Swedish Ethical Review Act (SFS 2003:460) and the Declaration of Helsinki (World Medical Association, 2013). The Ethical Review Act stipulates that all research on humans preserve human dignity. Special consideration is given by the Act to the protection of the individual and their health, safety and integrity. The Act also regulates how personal information, confidentiality and informed consent are to be handled by the researcher in order to prevent any harm or the risk of harm. Good research practice (Swedish Research Council, 2011) encourages the researcher to consider and constantly review ethical matters in all parts of the research project. The equal importance of the individual perspectives involved, as well as those of the researchers, including the general need for knowledge creation, should be taken into account in a research project. Research can be carried out in accordance with good research practice by ensuring that appropriate steps are taken to ensure that the research project does not cause harm to anyone, in any way (Swedish Research Council, 2011).

Papers I, III and IV have not been subject to ethical review by the Regional Ethical Review Board pursuant to the Swedish Ethical Review Act (SFS 2003:460). This was assumed to be consistent with good research practice because the research studies were considered by the authors not to be harmful or to involve any risk to the participants' health, safety or integrity.

In Papers I and III, confidentiality was preserved on several levels. Contact information was available to the first author only and was used only during data collection. The panel members received information about the study orally, including information about withdrawing from the study, and provided their informed consent by submitting their written answers to the first questionnaire. All collected data were stored on a secure computer server that was only accessible to the research team. The participants' responses to the three questionnaires were logged in order to issue reminders when necessary, but responses could not be linked to any individual participant.

The third and last author, who had no prior relationships with the participants or involvement in the programme, carried out data collection for the second part of Paper III. All collected data was stored on a secure computer server that was only accessible to the research team. The transcriptions were coded by the first author prior to analysis and the responses could not be linked to any participant or group during the analysis.

In Paper II, the researchers identified that potentially harmful or stressful clinical experiences could emerge during the research interview. The participants' personal reflections could impose psychological strain connected to their professional experiences, eventually leading to a negative impact on their health. As a consequence of this, ethical approval was obtained from the Regional Ethical Review Board (Ref. No. 2014/248), Lund, Sweden. Study participants were given written and oral information about the study and signed a written consent form. Contact information and study data was stored and handled in a way that ensured confidentiality for the participants. The interviewer was attentive toward signs of psychological strain among the participants and was ready to offer extended psychological care if necessary. As the public were potentially familiar with the character of the data associated with each critical incident via the media or the profession itself, results were presented at levels above citation level, intentionally leaving out anything that would potentially identify the events or the individuals involved.

In accordance with the Ethical Review Act (SFS 2003:460), Paper IV was not subject to ethical review by the Regional Ethical Review Board. The participants received written and oral information about the study, including information about withdrawing from the study, and provided their informed consent. Confidentiality was preserved in the study on several levels. Contact information was available to the first author only and was used only during data collection. Data collection was carried out by the second and last author, who had no prior relationships with the participants or involvement in the educational programme. All collected data was stored on a secure server that was only accessible to the research team. The transcriptions were coded by the first author prior to analysis and statements could not be linked to any participant.

Results

The results are based on the findings from Papers I–IV and these are presented individually under a heading for each paper. A summary of the results was created by gathering and sorting the results and this is presented under two main headings that reflect their association with aspects on competence and education.

Paper I

In Paper I, the results were based on the written responses of 39 panel members that were collected in the three Delphi questionnaires. The result of the first questionnaire was based on a qualitative content analysis of the free-text responses that involved the content of the responses being gathered into codes and then grammatically transformed into questionnaire statements. The 46 statements formed the questionnaire items used in the second and third questionnaires.

The analysis of the responses to the second questionnaire showed mean values (M) for the rated competences that varied from 2.21 to 3.92. All but one competence, namely “the ambulance nurse shall be able to diagnose patients”, were rated at $M > 3.08$ (Appendix 1).

The analysis of the responses to the third questionnaire showed mean values that varied from 2.11 to 4.0. The competence “the ambulance nurse shall be able to master systems for radio communication and telephone” was rated 4.0, showing a 100% level of agreement on its importance among the panel experts. In the third questionnaire, the majority of competences (96%) were rated at $M > 3.24$. The mean rating value of the competences was increased in 46% ($n = 21$), unaltered in 13% ($n = 6$) and decreased in 41% ($n = 19$) of instances, compared with the values from the second questionnaire (Appendix 1). For 30 of the 46 competences, the SD decreased from the second to the third questionnaire, indicating an increased level of agreement on their degree of importance. The SD increased in 12 of the remaining 16 competences, leaving 4 with an unaltered SD. In total, 46 competences were identified in this study. Two of the competences, “the ambulance nurse shall be able to work with prevention and health-promoting work” and “the ambulance nurse shall be able to diagnose patients” showed mean values of 2.70 and 2.11, respectively, indicating a comparatively low rating of

their importance. The agreed desired competences of the specialist ambulance nurse (Appendix 1), demonstrated a high level of agreement in the rating of the 46 competences.

This study's findings described the desired competence of the specialist ambulance nurse as consisting of ten areas of competence: execute leadership, generic abilities, interpersonal communication, institutional collaboration, pedagogic skills, possession of relevant knowledge, professional judgement, professional skills, research activities, and technical skills. Each of the areas contained two or more separate competences.

Paper II

The results of Paper II are based on a qualitative content analysis of the 32 interviews with ANs. The analysis resulted in the formation of 26 categories built from 49 subcategories that are presented in a results table (Appendix 2). The latent meaning of the content formed 10 themes, which are summarised and described below (Table 2).

Table 2. Themes (Paper II)

1	The competence of AN's is developed and defined in cooperation with the team colleague
2	The AN's perceptions of their own competence is affected by the situation and patient outcome
3	The competence of the AN's is made visible and challenged in situations including ethical dilemmas, care of children and psychological care
4	The ability to reflect on profession, person and work procedures are important when developing AN's' competence
5	The ability to communicate and cooperate is an essential part of the AN's' competence
6	The mental health and personal wellbeing of the AN's are strongly affected by situations of psychological strain in their profession
7	Regular feedback on professional outcome is of high value in developing AN's' competence
8	The AN's' competence is challenged in situations demanding a high pace of actions
9	The utilisation of AN's' competence is restricted by poor functionality of operations and organization.
10	The competence of the AN's is strongly dependent on formal education, clinical skills, theoretical and experience based knowledge

Theme 1: *the competence of ANs is developed and defined in cooperation with the team colleague.* The ANs described how their colleague has a powerful influence on their own competence. This influence could be positive as well as negative. Examples of positive effects were feelings of increased self-efficacy and personal development of competence. The negative influences mentioned were lack of competence or unprofessional behaviour on the part of the colleague and a non-functional relationship that caused difficulties in terms of cooperation. The ANs described how their personal competence seemed to depend on the competence of their colleague.

Theme 2: *the ANs' perceptions of their own competence is affected by the situation and patient outcome.* The outcome for the patients strongly influenced the ANs' perception of their own competence. In particular, a negative patient outcome resulted in feelings of lack of competence. These feelings also occurred when the ANs had little opportunity to change the outcome. The positive effect of these feelings was a desire to develop personal competence.

Theme 3: *the competence of the ANs is made visible and challenged in situations including ethical dilemmas, care of children and psychological care.* These extremely challenging situations strongly affected the ANs. Negative outcomes of these situations had strongly influenced the ANs and left them with feelings of a lack of competence. Positive outcomes had equally strong effects on their feelings of competence. The ANs expressed a desire for support for debriefing and competence development with respect to such situations.

Theme 4: *the ability to reflect on profession, person and work procedures are important when developing the ANs' competence.* The ANs described reflection on their experiences as being of great importance to the development of their professional competence. In their descriptions of their own and their colleagues' competence, they also described a lack of reflective ability as having a negative influence on competence development.

Theme 5: *the ability to communicate and cooperate is an essential part of the ANs' competence.* Communication and cooperation were described as very important parts of the ANs' competence. All situations demanded communication and cooperation with their colleague, and certain situations also called for communication and cooperation in larger teams or with other organisations. Lack of such abilities was perceived as increasing the risk of negative outcomes for patients.

Theme 6: *the mental health and personal wellbeing of the ANs are strongly affected by situations of psychological strain in their profession.* ANs experienced situations with a negative patient outcome that were at times extreme or even shocking. They described a lack of strategies and competence to deal with psychological matters. The ANs also described experiences of poor psychological health and a lack of organisational support when needed. Such situations affected the ANs' ability to use personal competence and to develop competence.

Theme 7: *regular feedback on professional outcome is of high value in developing the ANs' competence.* There was a lack of formalized and regular feedback for the ANs. Feedback was needed following challenging experiences and that lack of feedback had negative emotional effects. Constructive, formalised and regular feedback was also seen as essential to the development of competence.

Theme 8: *the ANs' competence is challenged in situations demanding a high pace of actions.* When ANs perceived themselves to be in situations that demanded a high pace of work, they also felt that the stress could negatively affect their utilization of personal competence. However, when such situations had positive outcomes, the ANs' coping was regarded as positive to the maintenance and development of competence.

Theme 9: *the utilisation of ANs' competence is restricted by poor functionality of operations and organisation.* Deficits in management and organizations as well as a lack of resources were considered by ANs to have a negative impact on their opportunities to utilise their competence in full. Professional guidelines could be perceived as limiting when they were of poor quality, but as useful in stressful situations that demand fast action and when properly designed.

Theme 10: *the competence of the ANs is strongly dependent on formal education, clinical skills, theoretical and experience-based knowledge.* Formal education at university level was expressed as being of the utmost importance to the ANs' competence. Education was important to providing a knowledge base and clinical skills. Certain skills were seen as demanding particular attention. However, formal education could only form a basis for further development of competence using work-based experiences. Reflection was considered as an important prerequisite for learning from experiences and ANs described colleagues who were not able to learn despite many years of experience.

Paper III

The results of Paper III are based on three Delphi questionnaires and a focus group interview. Analysis of the free-text responses to the first questionnaire resulted in the creation of 43 statements that were used in the second and third questionnaires.

The mean rating of agreement among the panel members in the second questionnaire varied from 2.41 to 3.89 (Appendix 3). Analysis of the third questionnaire showed mean values that varied from 2.03 to 3.89. The participants increased their rating for 50% (n=21) of the statements and decreased their rating for 40% (n=17) between questionnaires two and three. Ten percent (n=4) of the statements showed an unaltered rating between the questionnaires. An increased overall level of agreement on the relative importance of the statements could be seen between the second and third questionnaires as a decreased rating for the statements initially rated lower and an

increased rating for those that were initially rated highly. This polarization in rating can be interpreted as indicating consensus among the panel members because the standard deviation (SD) values also became lower. In total, 62% (n=26) of the statements were rated above 3.0, displaying a high level (77–94%) of total agreement among the participants about the importance of these statements. The four highest rated statements were: “The curriculum should have clear learning outcomes” (3.89), “The curriculum should be based on current research in the area” (3.89), “The students should receive structured feedback” (3.86) and “The curriculum should encourage students’ personal development and self-awareness” (3.86). At the lower end, five of the statements were rated below 2.5 (2.03–2.47). The four lowest rated statements were: “Major accident exercises should be coordinated with other educational programmes” (2.43), “Teaching should be carried out by fellow students” (2.22), “Role play should be used as a teaching method” (2.03) and “The programme should be organised as distance education” (1.49).

The deductive qualitative analysis of the statements created seven categories which were aligned under the pre-set subject headings: *presage*, *process* and *product* (Figure 3). Each of the model’s headings contained two or three categories. The figure displayed an overall chronological order corresponding to the processes in the curriculum: *presage*, *process* and *product*. The categorization of statements under each heading also displayed the relationship between statements and categories according to content. Most of the statements were found under the categories *learning activities* and *characteristics of teaching* which contained 12 and 10 statements, respectively (51%). The views of the panel members covered the practical, or hands-on, perspective of teaching and learning, as well as approaches and theoretical perspectives. The heading *presage* contained the categories *students*, *teachers* and *context*, with the majority of the statements being concerned with the necessities of didactic and pedagogical planning in advance of the start of the programme. Under *product*, the categories *assessment* and *outcome* contained the fewest statements, but these represented a specific and distinct part of the panel’s views.

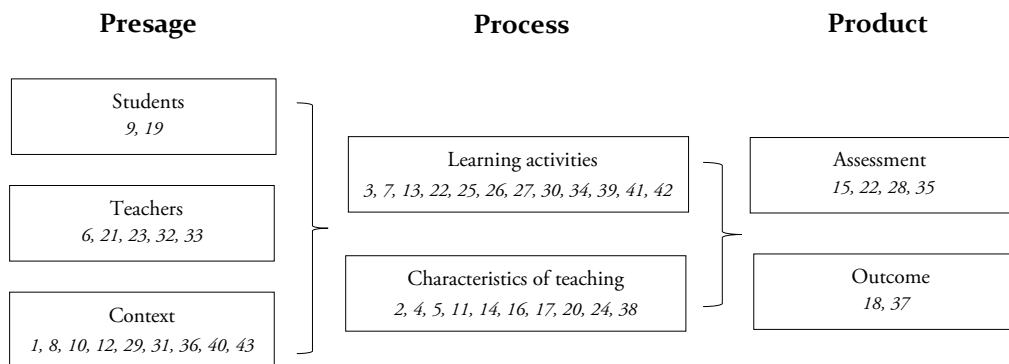


Figure 3. Results of the deductive categorisation of statements: the seven categories presented in a 3P model displaying chronological and relational order. Numbers representing statements used in the second and third questionnaires (Appendix 3).

Analysis of the focus group interview revealed three main content areas: *professional context*, *curriculum design* and *student characteristics* (Appendix 4). Analysing the relative time spent on each of these and the relative emphasis of the discussion showed a focus on the professional context and its influence on teaching and learning (Figure 4). The curriculum design and student characteristics were discussed and emphasised to a somewhat lesser extent than the professional context. The discussion content was largely similar to the Delphi part of the study, but expanded on and provided nuance to the views of the professionals in some areas. The overall tendency of the discussion focused on the importance of clinical prerequisites and their importance in learning a profession. In the content area *professional context*, the participants emphasised the significance of the clinical supervisors and their impact on the students' learning, discussing their role, formal education, organisational needs and personal motivational issues. A few other content aspects were stressed as being crucial to student learning; teamwork, reflective practice and professional culture and climate. The group also pointed out the importance of professional ethics in both the professional context and the theoretical courses. Discussions about professional ethics covered the development of knowledge and approaches as well as organisational prerequisites. To some extent, the students' and professionals' ability and opportunities for personal and professional reflection were considered as vital to competence development in all three content areas.

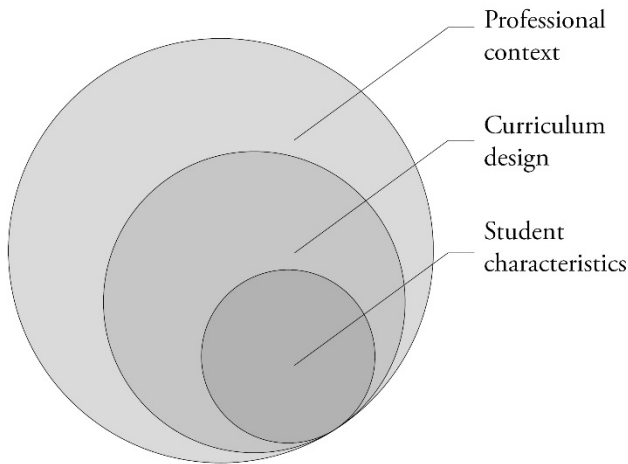


Figure 4. Paper IV focus group content output; circle sizes represent relative discussion time spent on each content area.

There was an overall tendency in the group’s discussion to focus on the necessity of universities and professionals working together to create good conditions for high-quality learning at this level of education (Appendix 4). Observations showed that the group displayed an open climate of discussion, characterised by active listening and no interruptions. All participants were found to be active in the discussion. The observations and the analysis showed conformity of views, without any disagreements on content. There was a tendency among the participants to deepen and strengthen each other’s views, rather than discussing differences or arguing over opposing opinions.

Paper IV

The results of Paper IV are based on applying facet theory to the analysis of observations of group discussions, using a specific mapping sentence (Figure 5) to process content and form study data. All groups reasoned about the case scenarios in ways that could be mapped using the mapping sentence, resulting in the identification of various patterns. Data from the observations showed that all groups displayed an open climate of discussion, characterised by active listening and no interruptions. All participants were active in the discussions. The groups only interacted with the facilitator on very few occasions, mainly to clarify session settings. The group discussions varied in length

between 25 and 79 minutes per case, although they each contained approximately the same number of structuples. Group S1 spent an average of 66 minutes on each case, which was longer than the average for both Group S2 (mean=42min) and Group P (mean=37min).

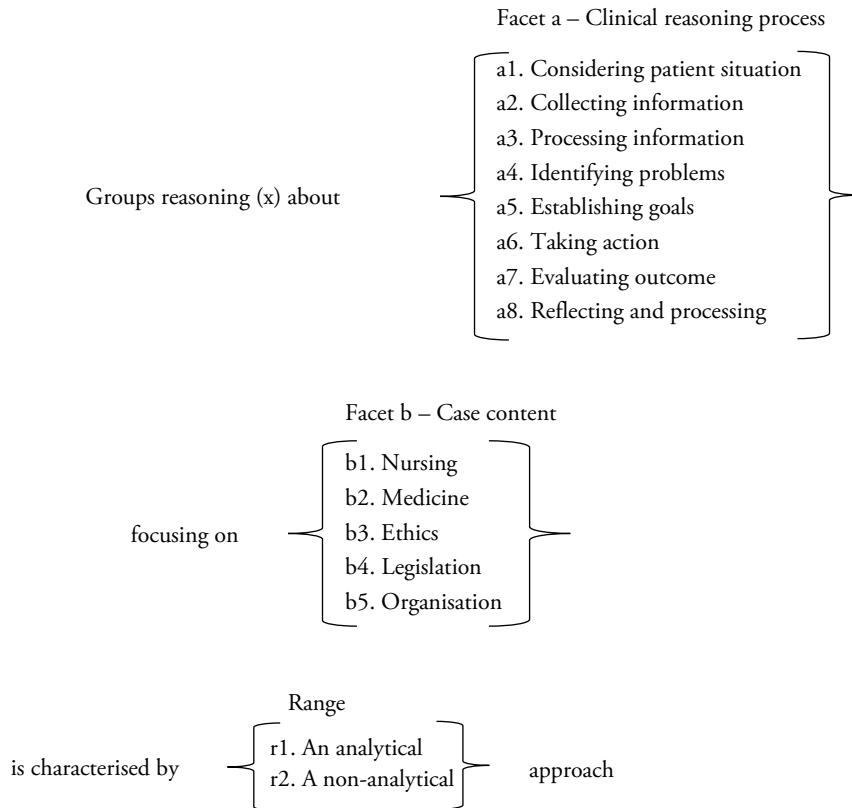


Figure 5. The mapping sentence used to explore the characteristics of the clinical reasoning process, Paper IV

Group S1 altered between analytical and non-analytical reasoning, regardless of content or process, throughout their reasoning process (Figure 6), as indicated by the small variation in range levels. A moderate shift to an analytical approach was found when reasoning about nursing and medicine (facets b1 and b2), which also represented a major part of their reasoning. The focus was observed as being more on medicine and nursing (facets b1 and b2) and less on ethics and legislation (facets b3 and b4). The frequency of the group's reasoning was about collecting information (facet a2) was low and almost no reflection and processing (facet a8) units were found. A pattern of both analytical and non-analytical reasoning was also found in Group S2. This variation of analytical and non-analytical reasoning was seen in nursing (facet b1), which also accounted for the majority of the group's content reasoning frequency. The group reasoned to a large extent about organisation (facet b5) and medicine (facet b2), but only to a small extent about legislation (facet b4). The group reasoned about all elements (facet a), but very low frequencies of reasoning about collecting information (facet a2), reflecting and processing (facet a8) were found.

Group P seemed to predominantly use a non-analytical approach during their reasoning. However, the mostly small range differences indicate that analytical reasoning was also present within each facet. The group's non-analytical approach was especially pronounced when reasoning about evaluation of nursing (facets a7 and b1). A majority of the group's reasoning about nursing (facet b1) was non-analytical. Ethics and legislation (facets b3 and b4) were the least discussed content. Collecting information (facet a2) showed a low frequency compared to the other parts of the reasoning process (facet a), where evaluation (facet a7), reflecting and processing (facet a8) showed high frequencies.

Groups S1 and S2 both displayed a pattern of variation between analytical and non-analytical reasoning while Group P predominantly used a non-analytical approach. In term of the clinical reasoning process, all three groups focussed least on collecting information (facet a2) and most on evaluation (facet a7). Group P was the only group to reason substantially about the reflecting and processing parts of the process (facet a8). The student groups processed information (facet a3) to a larger extent than Group P, mainly applying analytical reasoning. A large part of the content of all the groups' reasoning was about nursing (facet b1) and less about ethics and legislation (facets b3 and b4). Group S1 focussed more on medical content (facet b2) than the other groups. Group P focussed a majority of their reasoning on nursing and less on medicine, in a consistently non-analytical way. Group P covered more facet combinations than the other groups, covering almost all parts of content and process (facets a and b).

Gr S ¹	a1	a2	a3	a4	a5	a6	a7	a8	
b1	3.5	0.8	5.5	5.9	3.1	5.5	6.6	1.6	32%
b2	2.7	3.9	9.4	5.9	1.6	4.7	5.9		34%
b3	0.4		2.3	2.7	0.4	1.2	2.0	1.2	10%
b4			2.0	0.8	1.2	0.8	2.3		7%
b5	1.6	0.4	2.3	0.4	1.6	4.3	5.5	0.4	16%
	8%	5%	21%	16%	8%	16%	22%	3%	
Gr S ²	a1	a2	a3	a4	a5	a6	a7	a8	
b1	7.6	1.5	6.5	6.5	5.0	4.6	9.5	3.1	44%
b2	1.5	0.4	6.5	1.9	1.5	1.1	3.8		17%
b3	0.8		0.4		0.8	0.8	3.4	1.5	8%
b4			0.4	1.5	4.6	1.1	2.7	1.9	12%
b5	2.7		4.6	1.9	1.5	3.8	4.2	0.4	19%
	13%	2%	18%	12%	13%	11%	24%	7%	
Gr P	a1	a2	a3	a4	a5	a6	a7	a8	
b1	7.3	0.8	4.8	5.2	8.2	7.1	14.2	10.5	58%
b2	1.9	0.8	4.0	1.7	0.6	1.0	3.8	0.6	14%
b3	0.2		0.2	1.3	0.8	0.4	2.5	2.5	8%
b4		0.2	0.4	0.2	0.8	0.6	1.9	2.1	6%
b5	1.5		0.2	1.3	2.5	1.3	2.5	4.0	13%
	11%	2%	10%	10%	13%	10%	25%	20%	

Figure 6. Mapping results, Paper IV.

The distribution of frequencies of reasoning units (%) for Groups S1, S2 and P are shown. Facet elements a1-a8 and b1-b5 were derived from the mapping sentence (Figure 5) to form the grid outline. Absence of reasoning units appears as cells with a grey cross.

The total percentage for each facet element appears in bold at the bottom (facets a) and to the right of each group's grid (facets b).

The blue colour represents a positive range difference and orange a negative range difference, indicating if an analytical (positive range difference) or non-analytical reasoning (negative range difference) occurred most frequently. Three levels of colour intensity were used to categorize the range difference into small (level 1), moderate (level 2) or pronounced (level 3). Uncoloured cells represent no difference (0) between r1-r2 reasoning units.

Summary of results

Aspects on competence

In the results, the ambulance nurses' competence is described as complex and multidimensional. The ANs' professional competence can be seen as made up of multiple competences and results based on the professionals' views and professional experiences show that the AN's competence includes context specific knowledge, clinical skills and attitudes as well as several generic competences. The great number of desired competences identified in Paper I reflects the high demands placed on the ambulance nurse by the professionals themselves. The development, use and perceptions of the ANs' competence are affected in various ways by professional experiences. In Paper II, the results show that the development of competence is strongly affected by the ability and opportunity to reflect on practice on a professional and personal level, particularly in cooperation with colleagues. Experiences and communication skills are regarded by the ambulance nurses as decisive in challenging clinical situations. Paper IV explored a specific professional competence, clinical reasoning, where professional experiences seemed to influence both the content and the process of clinical reasoning. The less experienced participants tended to use a more analytical approach through the clinical reasoning process, while the more experienced ANs mainly used a non-analytical approach.

A summary of results associated with aspects of competence is shown in Table 3, where the results from Paper I and II are grouped according to the core competencies (Cronenwett et al., 2007; Cronenwett et al., 2009; Institute of Medicine, 2003; Olds & Dolansky, 2017; SSN, 2017). Due to the varied nature of the results, a descriptive framework based on the 'Dublin descriptors' (EHEA, 2005) was used to sort data under the five headings: *knowledge and understanding*, *applying knowledge and understanding*, *making judgements*, *communication* and *lifelong learning skills*. Paper I contains results based on professionals' views on desired professional competence and Paper II's results are based on professional experiences.

The summarisation of results, using the core competencies as a framework, shows the complexity and multidimensional characteristics of professional competence found in Papers I and II. Results were found to cover each core competence, capturing the variable nature of the data.

Table 3. Aspects of competence found in the results of Papers I and II, summarised and grouped by association with the core competencies.

Core competence / Descriptions	Aspects on competence
Person-centred care	
Knowledge and understanding	Communication strategies Professional ethics Strategies for challenging situations Person-centred care
Applying knowledge and understanding	Communication skills Handling challenging situations Performing holistic assessment Person-centred care Reflective practice Health-promoting prevention work
Making judgements	Ethical reflections Professional reflections
Communication	Use communication skills and strategies Person-centred care
Lifelong learning skills	Personal reflections Professional reflections Ethical reflections Reflections on patient outcome
Teamwork and collaboration	
Knowledge and understanding	Strategies for collaboration Organisational knowledge Professional knowledge Personal knowledge Stress handling strategies
Applying knowledge and understanding	Use of collaborative strategies Professional skills Pedagogical skills Handling of stressful situations Working in teams Problem-solving and flexibility Execute leadership Organisational adaptation
Making judgements	Problem-solving and flexibility Using professional judgement and behaviour Reflections on actions

Communication	Collaboration skills Colleague characteristics Working in teams
Lifelong learning skills	Professional feedback Personal knowledge Reflections on patient outcome
Evidence-based practice	
Knowledge and understanding	Theoretical knowledge and formal education Research-based knowledge Professional guidelines knowledge Experienced-based knowledge Pharmacology
Applying knowledge and understanding	Structured and accurate assessment Adequate triage Working autonomously Adaptation to work pace Use of professional guidelines Use of theoretical knowledge Use of experienced-based knowledge
Making judgements	Adequate triage
Lifelong learning skills	Personal preparedness Reflecting on professional experiences Evaluating patient outcome Evaluating personal behaviour and characteristics Evaluating professional experiences Collaborative evaluation
Quality improvement	
Knowledge and understanding	Quality improvement Systematic quality improvement evaluation strategies Skills training Professional research
Applying knowledge and understanding	Initiateing and participating in quality improvement Initiating and participating in research activities Personal well-being activities
Lifelong learning skills	Professional research Using strategies for lifelong learning Professional reflections Personal reflections Long-term professional, personal and lifelong learning evaluation

Safety

Knowledge and understanding	Strategies for assessment and handling threatening and violent situations Safe driving Technical education Ergonomics
Applying knowledge and understanding	Handling threatening and violent situations Safe driving Working ergonomically Safely use technical equipment Initiating measures for enhanced patient safety
Lifelong learning skills	Maintaining good personal physical capacity Evaluating experiences of threatening and violent situations
Informatics	
Knowledge and understanding	Technical communications systems
Applying knowledge and understanding	Using technical communications systems Using navigation systems Using systems for documentation
Communication	Using technical communications systems Hand-over reports

Aspects on education

Results comprising educational content, process and methods can be found in all four papers. Table 3 not only displays aspects on competence, but can also form a basis for results that point towards specific educational content and curriculum development. The professionals' views on educational process, pedagogical methods, curriculum and organisational prerequisites are specifically described in Paper III. In Paper IV, an example of content and pedagogical methods was used to form results that include educational aspects of the area.

Paper III reports that the professionals' views on teaching and learning covered multiple aspects of the ambulance nursing curriculum. The participants seemed to have knowledge of current teaching methods and learning processes represented in the higher education area. The participants pointed out specific aspects of clinical education, organisational prerequisites and professional ethics (Appendix 3 and 4) that were considered important parts of specialist nursing education. These insights formed a basis of their views of the importance of clinical education, organisational prerequisites and professional ethics. The results promote curriculum development as a shared enterprise to be undertaken by universities and ambulance healthcare services working in close cooperation. Papers II and III also illuminate the importance

of contextual prerequisites in learning among both students and professionals. The dominant part of the focus group discussion (Figure 4) in Paper III included reasoning about the professional context and aspects of learning with which it is associated. The role of clinical supervisors, professional ethics, teamwork and guidelines in ambulance services were considered as having a crucial impact on learning in practice (Appendix 4).

Paper IV's results describe how professional experiences and knowledge influenced both the content and the process of the specific competence of clinical reasoning when using the case method. The case method used in Paper IV was found to be useful for practicing clinical reasoning skills and can be seen as an example of a pedagogical tool that can be of use in the specific curriculum. Professional experiences and reflectivity seemed to influence both the content and the process of clinical reasoning. The less experienced students tended to use a more analytical approach to navigate the clinical reasoning process, while the specialist nurses mainly used a non-analytical approach.

Discussion

This thesis set out to explore the rather undescribed area of ambulance nurses' competence. Any attempts to describe a professional competence or to define a professional area undergoes the risk of being superficial, fragmented or too complex and abstract to comprehend in all parts (Bowden & Marton, 2004). A further comprehensive description of a professional competence should preferably include descriptions of nurses' attitudes, perceptions and approaches (Bowden & Marton, 2004) from a social-cultural learning perspective of the profession (Wenger, 2015). The number of possibilities for scientific inquiry within the scope of this PhD project has been affected by time constraints and educational prerequisites, which has resulted in certain aspects of competence and education being highlighted. The results of this thesis cannot therefore be interpreted as a definitive description of ambulance nurses' competence and education, but should be regarded as a contribution to this area of knowledge.

The overall lack of research in the area of ambulance nurses' competence and education is probably due, at least in part, to international differences in the education and organisation of ambulance care and services (Jensen et al., 2012; O'Donnell & O'Reilly, 2008; O'Meara et al., 2015). However, the overall potential to view the results from this thesis as useful from multiple professional perspectives should increase the transferability of the findings. By applying this open approach, the aspects could be regarded as valuable in other healthcare professions involved in ambulance care, such as physicians or paramedics. By summarising the results in line with the core competencies framework (Cronenwett et al., 2007; Cronenwett et al., 2009), it has become clear that study results are found in all six areas of the core competencies. The results reflect the multidimensional and complex reality of ambulance nurses' profession. The emphasised content contains competences of a generic character, which indicates the usefulness of a more holistic perspective on competence in ambulance care. The findings under the headings of person-centred care and evidence-based practice strengthen the notion that there is a complexity to the more generic knowledge needed in the specific context of ambulance care. A shift from the more skills- and knowledge-orientated approach can also be seen under the teamwork and collaboration headings because specific generic competencies are emphasised by the results. The relatively low amount of content found in the areas of quality improvement, safety and

informatics could be interpreted as reflecting the absence of these in the current everyday clinical context of the ambulance nurses.

The varied aspects of the findings in this thesis are discussed under five headings: *cognitive competence*, *functional competence*, *personal competence*, *competence development* and *curriculum development*. Each of the headings represents a specific aspect of the ambulance nurse's competence and education found in the results. The formation and vocabulary of the headings was inspired by descriptions of competence found in the literature (Cheetham & Chivers, 1996; EHEA, 2005; Weeks, Coben, Lum, & Pontin, 2017).

Cognitive competence

Cognitive competence represents the knowledge and understanding that forms the basis of ambulance nurses' competence. The results indicate that ambulance nurses should have knowledge and understanding of a large number of areas, preferably covering a variety of content and subjects (Papers I and II). The areas traditionally emphasised as a basis for ambulance nurses' clinical competence, e.g. medicine and pharmacology, are still highly valued, but the results of this thesis display a focus on the necessity of other competences of a more generic character. The results stress the importance of knowledge and understanding of some context-specific competences such as communicative, collaborative and stress-handling strategies found in all core competencies areas. This represents a shift in focus towards a more holistic view of ambulance care, which is rarely seen in current descriptions of competence (SFS, 1993:100; RAS, 2012; Sjölin, 2016), but is emphasised in research in the areas of ambulance care (Elmqvist, Fridlund, & Ekebergh, 2008; Holmberg, 2015; Sundstrom & Dahlberg, 2011) and person-centred care (Rantala, Ekwall, & Forsberg, 2016).

The professional demands placed on the cognitive competence of ambulance nurses, as identified in this thesis, can be regarded as extremely high and, in some ways, unrealistic. It is difficult, or perhaps impossible, for the individual ambulance nurse to cover all possible areas of knowledge in ambulance care at a deeper level. However, a broad knowledge and understanding of the content should be regarded, to a certain extent, as a central part of ambulance nurses' competence, to be recognised as being as complex and multi-dimensional as the context of ambulance care itself (RAS, 2012; Sjölin, 2016; Suserud, 2016). Results also indicate that this broad knowledge base is a distinctive feature of ambulance nurses' professional competence.

Beyond knowledge and understanding of the clinically associated ambulance nurse competence, the results show the importance of some more comprehensive or generic competences. Competences including of knowledge and understanding of the research process, interpreting research results, quality improvement, safety and informatics can be found as representatives of the clinically indirect competences in the core

competencies framework (Table 3). Further examples of this are the requirement for ambulance nurses to have knowledge of the ambulance organisation, leadership theory, pedagogy, technology and physics. The complexity and multidimensional appearance of competences that are directly related to clinical work can also be found in the aforementioned areas of a more generic character within the ambulance care context.

Functional competence

The results of Papers I and II show the necessity of specific clinical skills and hands-on ability to act in clinical situations that represent the functional competence of ambulance nurses. The ability to act in emergency situations, adhering to professional guidelines, including physical assessment, performing complex caring interventions and rapid actions still forms the basis of ambulance nurses' functional competence and is considered to be a central aspect of ambulance nurses' competence (Sjölin, 2016; Suserud, 2016). Nonetheless, ambulance care is, to some extent, more frequently of a non-urgent character, which calls for competences other than the more traditionally sought after emergency care-associated competences (Holmberg, Fagerberg, & Wahlberg, 2017).

In a clinical situation, demands for a high pace of action are regarded as challenging for the usage of competence. In addition, as found in Paper II, in stressful situations and challenging situations, the transfer (Monaghan, 2015) of cognitive competence into functional competence can be restrained. Regardless of the clinical demands for a certain pace of action, the results indicate that a number of competences are central to functionality (Bohstrom, Carlstrom, & Sjostrom, 2017). A certain level of collaborative ability as well as communication skills appear to be of great importance to ambulance nurses' ability to make use of their cognitive competence. In Paper II, the colleague is pointed out as either supporting or limiting the functional competence. The fundamental role of the colleague has previously been partly described in research (Horberg, Lindstrom, Kalen, Scheja, & Vicente, 2017; Svensson & Fridlund, 2008), but is emphasised in Paper II as decisive for functional competence.

Results of Paper II also indicate several factors that positively affect the adequate application of knowledge and understanding by the ambulance nurse. Team-work abilities, especially concerning the team colleague, seem to be of great importance to ambulance nurses (Ahl et al., 2005; Horberg, Lindstrom, et al., 2017). Different team constellations exist in the ambulance services and ambulance nurses' ability to work in the team is described as either restricting or developing functional competence, but still remains crucial for functional competence (Cronenwett et al., 2009). Being part of a reflective team, regardless of its size or constellation, which systematically reflects in and of practice enhances the functionality of ambulance nurses' competence.

To incorporate a cognitive thinking process such as the clinical reasoning model seems to enhance the functional competence among nurses (Banning, 2008). Levett-Jones (2008) describes how knowledge of a particular competence, clinical reasoning, positively affects nurses functional competence. The results of Paper IV indicate this as we can see differences in clinical reasoning following increased clinical experience, possibly affecting ANs' functional competence positively.

The use of professional guidelines for clinical work for ambulance nurses seems to be an appropriate way to incorporate evidence-based knowledge into functional competence (Hagiwara, Suserud, Jonsson, & Henricson, 2013; Olds & Dolansky, 2017), in an effort to enhance patient safety. Professional guidelines can be of great value, especially for the inexperienced nurse, but are also described as restricting the functional competence of the more experienced nurse (Paper II). More experienced nurses could benefit from a differentiated guideline system in which experienced-based knowledge can be used regularly in nursing practice. This idea of fewer guidelines to follow with increasing experience, thus using the full functional competence of ambulance nurses, is supported by previous research in this area (Cooper & Grant, 2009; Melby, 2000).

Personal competence

The personal competence of ambulance nurses consists of several parts related to their understanding of their own personal role in the profession and of the profession itself. Understanding of the profession at a meta level seems to be a prerequisite for the usage of competence (Banning, 2008; Dall'Alba & Sandberg, 2006). Consciously reflecting on and managing personal and professional experiences develops these abilities and is the basis for deploying competence in the profession (Dall'Alba & Sandberg, 2006; Jarvis, 2010). Previous research has shown the necessity of understanding practice at a conscious level in order to develop personal competence (Ahl et al., 2005; Sundström & Dahlberg, 2012). The results of Papers II and III point out the importance of contextual and organisational understanding as an important part of the ambulance nurses' competence. Adequate personal perception of competence, in and of the profession itself, also seems to affect how competence is used by ambulance nurses in clinical situations (Dall'Alba & Sandberg, 2006). As there appears to be a lack of systems for regular feedback in the daily clinical setting of ambulance nurses, their perception of competence seems to be affected by personal beliefs and experiences rather than adequate feedback. This can lead to great differences in self-belief and role perceptions, especially when using patient outcome as the only feedback of quality. Perceptions of competence can affect how competence can be used (Bowden & Marton, 2004) in an restrictive or developmental way (Dall'Alba & Sandberg, 2006).

Knowledge and understanding of professional ethics also seems to be of great importance to ambulance nurses' competence (Bremer, Dahlberg, & Sandman, 2012), which is consistent with experiences from other areas (Benner, 1982; Wenger, 2015). In Papers II and III, the informants describe the need for a professional ethics discourse to enable them to use their competence in the clinical setting. Paper IV gives an example of how varying experience of the profession affects the clinical reasoning process. This can be viewed as an endorsement of the opportunity to enhance professional competence through a meta level of discussion that is continuously present within ambulance services.

All of the papers in this thesis support the notion that personal and professional reflections are of importance to ambulance nurses' personal competence. This understanding of how a reflective practice affects cognitive and functional competence in the context of ambulance care elucidates a way to develop into a reflective practitioner (Benner, 1982).

Competence development

Formal education could be considered the foundation for developing professional competence. Gaining theoretical knowledge and understanding, as well as clinical skills, within an educational programme is often the first step towards developing professional competence. Experienced-based learning is supposedly a central part of learning and developing professional competence. Developing clinical competence is considered to be a process that is based on reflections on experience (Dall'Alba & Sandberg, 2006; Jarvis, 2010; Yardley et al., 2012b). Regardless of whether the experiences are gained as a student or a professional, the way in which an individual reflects on themselves and their profession can affect their competence development (Benner, 1982; Bowden & Marton, 2004; Kolb, 1984) In Paper II, we identified that feedback is important to competence development. This is consistent with results showing that feedback is a central part of competence development (Biggs, 2003; Bowden & Marton, 2004; Hattie & Timperley, 2007; Horberg, Lindstrom, et al., 2017). Obtaining regular feedback about professional and personal performance can form a basis of competence development, leaving this field open for improvement as the informants of Paper II describe the lack of systematic feedback in their daily clinical work, which was also found in other research in this area (Horberg, Jirwe, Kalen, Vicente, & Lindstrom, 2017; Horberg, Lindstrom, et al., 2017).

Ambulance nurses are part of a community of practice that contributes to learning within the profession (Wenger, 2000, 2015). Participation in a community of practice is seen as important to learning, which we found in all papers in this thesis to be a central part of understanding ambulance nurses' competence development. Using understanding of communities of practice and the individual's role in these

communities forms a basis for understanding competence development (Cruess, Cruess, & Steinert, 2017). For instance, the core competence *teamwork and collaboration* (Cronenwett et al., 2007) highlights team participation, regardless of team size or composition. The development of competence follows the functionality and reflectiveness of the team at hand, the crucial role of the team colleague, as described in Paper II and in other research (Horberg, Lindstrom, et al., 2017; Svensson & Fridlund, 2008), thus either restricts or supports competence development. Organisational guidelines for teamwork could potentially affect competence development.

Our results show that reflections on patient outcome and professional performance can be of great value to the individual nurse's competence development. By using pedagogical models or methods for professional reflection (Jarvis, 2010; Yardley et al., 2012b), the everyday clinical work could enhance competence development when applied in ambulance services. Organisational prerequisites for reflective practice could be important to the creation of a well-functioning healthcare service in the perspective of lifelong learning (Illeris, 2009; Jarvis, 2010). Papers II and III call for a professional ethics discourse. The use of structured professional group supervision (Brink, Back-Pettersson, & Sernert, 2012) could be a way to incorporate a professional ethics discourse into ambulance services, potentially enhancing ambulance nurses' competence development.

Skills training or simulation of clinical work could also be used to develop the competence of ambulance nurses (Abelsson, Rystedt, Suserud, & Lindwall, 2014; Abelsson et al., 2016). The use of clinical training under supervision, including reflections on practice, could be an effective way of developing competence. As an inexperienced practitioner, the transition into the ambulance nursing profession (Horberg, Lindstrom, et al., 2017) involves acquiring the body of professional knowledge and understanding over a period of time. This period is often described as marked by problems relating to knowledge transfer (Henderson, 2002; Norman, 2009). The transfer of knowledge could be addressed by using problem-based pedagogical methods such as the case method or the clinical reasoning framework (Mauffette-Leenders et al., 2005; Orban et al., 2017) on a regular basis.

Curriculum development

The aspects of education found in this thesis are discussed as suggestions for curriculum development for the Swedish specialist nursing programme for ambulance nurses. By applying a more generic view of curriculum development, the results of this thesis can be transferred to any health profession education within the area. The more generally applicable competences can be considered when creating a basis for a competency-based education (Frank et al., 2010), while the more detailed descriptions of knowledge, skills and approaches must be viewed as context or profession specific. Nursing education

should be based on a multi-disciplinary foundation and the deliberate incorporation of nursing core values (Goudreau et al., 2015; SSN, 2011) in nursing education provides an adequate foundation for nurses' ability to provide quality nursing care.

The results of this thesis promote curriculum development as being a shared enterprise between universities and ambulance services. Designing the curriculum of a professional education programme should always take into account the views of the profession, their needs and thoughts on what constitutes adequate competence for the professional (Bowden & Marton, 2004). However, a university education programme in a healthcare profession could not be designed solely for clinical work (McAllister, 2001a, 2001b). In Paper III, the items with a relatively low rating are pedagogical methods or teaching and learning activities. Even though the first step is to involve the profession in curriculum planning, educational experts with teaching experience could be tasked with developing those parts of the curriculum that do not directly involve clinical work. In the process of designing a curriculum for the ambulance nurse education programme as a shared enterprise, it is probably of great importance to clarify the different roles and areas of expertise among the stakeholders in order to achieve the quality enhancing benefits of cooperation (Gonsalves et al., 2014). In Paper III, the professionals' themselves described the need for expanded cooperation in curriculum design and whilst cooperation between universities and ambulance services on curriculum development and design is stipulated in the Swedish Higher Education Ordinance (SFS 1993:100), this has not always been implemented. Involving stakeholders other than the educational providers in curriculum planning can also prove to be of great importance to how the educational programme is perceived by the professionals and to the extent to which it is considered valid in the professional community (Keogh et al., 2010).

The summary of results of this thesis indicate that the core competencies framework (Cronenwett et al., 2009; Institute of Medicine, 2003; Olds & Dolansky, 2017) should be considered as a basis of curriculum design, also supported by national guidelines (SSN, 2017). As the area of ambulance care becomes more complex, covering all aspects of the ambulance nurse's competence becomes challenging (Sjölin, 2016). Trying to cover all possible aspects is probably not a good way to design a curriculum (Biggs, 2003). Rather than focusing on trying to cover a vast variety of content, a contextually modified version the core competencies framework could form the basis of curriculum content. A certain focus on the core competencies *evidence-based practice* and *person-centred care* can be found in our results, which underlines the need to use current research in the area (Elmqvist et al., 2008; Holmberg, 2015; Rantala et al., 2016) as a basis of educational content. This thesis has argued in favour of making use of experience-based learning during the educational programme as well as in a lifelong learning perspective. Developing strategies for self-directed learning (Horberg, Lindstrom, et al., 2017) could be as considered important to making students well prepared for practice.

When it comes to the notion of bringing theoretical education closer to professional practice, designing an educational programme's teaching and learning activities the results of this thesis promotes the use of problem-based learning activities, with the case method (Egidius, 1999; Mauffette-Leenders et al., 2005), which appears to be particularly suited to learning within a profession (Orban et al., 2017). Providing students with a tool that spans the theory-practice gap (Yardley et al., 2012b) is most certainly a suitable way of creating a basis for lifelong learning (Jarvis, 2010). All papers in this thesis point towards reflection and reflective practice as being crucial to ambulance nurses' competence and enhancing the use of metacognitive activities such as clinical reasoning (Higgs, 2008; Hoffman et al., 2009; Levett-Jones et al., 2010) or reflective writing (Wireklint Sundström & Ekebergh, 2013) develops students' abilities to reflect on a meta level of understanding.

When developing clinical parts of the curriculum, it is surely beneficial to use aspects of communities of practice theory as a map for learning (Cruess et al., 2017; Wenger, 2000, 2015). Our results (Paper III) stress the need for students to actively participate in actual ambulance care under adequate supervision during clinical placements. Participating in their future profession in the ambulance care context could be considered central to learning the profession of ambulance nurses (Axelsson, Herrera, & Bång, 2016). The quality of learning in the clinical setting is dependent on a learning environment that benefits the student's learning, including organisational structure and commitment (Axelsson et al., 2016; Nilsson & Lindstrom, 2017; Wallin, Fridlund, & Thoren, 2013). In Paper III, the informants emphasise the role of the clinical supervisor. It is probably hard to underestimate how useful it is for clinical teachers to be involved in students' education and for clinical supervisors to be given adequate pedagogical training. Creating an organisational structure for clinical placements could have a positive effect on quality of learning during clinical placements, as could ensuring that clinical supervisors are motivated and dedicated (Wallin et al., 2013). In the process of designing and organising the clinical placement parts of the curriculum, an integrative approach is supposedly advantageous for bridging the theory-practice gap and increasing the participation of students in the ambulance community of practice. Clinical placements are often organised as separate courses or parts of courses that are preceded by theoretical education (Sjolin et al., 2014). An integrated model of clinical education (Dent & Harden, 2013; Harden, 1986a) that situates learning in the clinical context during the educational programme could be suggested as an alternative. Combining clinical practice sessions with problem-based learning activities such as the case method (Orban et al., 2017) could prove to be a suitable step in terms of curriculum development. A totally integrated curriculum (Dent & Harden, 2013) could be challenging in comparison to today's standards, but, if addressed properly by all stakeholders as a shared enterprise, it could eventually prove to be a successful way to enhance students' learning.

Discussion of methods

The method of each paper was purposefully chosen on the basis of the aim of the PhD project as well as each paper's aims. The pragmatic approach (Onwuegbuzie & Leech, 2005) has ensured openness in the process of choosing methods in order to find a purposeful methodological approach for the doctoral project. Alternative methods have been discussed and considered, but, as a part of a PhD project, the appropriateness and achievability were in focus. The use of a combination of multiple methods is believed to be appropriate when adapted to research into competence and education (Dunn et al., 1985). Specific methodological aspects of each paper are discussed below and the thesis' issues of methodological trustworthiness and the research quality of the doctoral project as a whole will be addressed.

The Delphi method was chosen as it allows the researcher to explore a previously unknown area of research and achieve consensus among study participants. Although the method is most commonly used for its ability to create consensus, it is also used in explorative research in medicine and nursing (Dunn et al., 1985; Foth et al., 2016; Hasson & Keeney, 2011; Keeney et al., 2006). Reporting results as tables of frequencies, including level of consensus, seems to be an appropriate way of exploring a multifaceted area of knowledge and enhances rigour following the Delphi tradition (Hasson & Keeney, 2011; Keeney et al., 2006).

The Delphi method was used in Papers I and III by simultaneously distributing questionnaires to the same group of participants. In accordance to the Delphi tradition (Keeney et al., 2001), results of the Delphi process led to a certain level of consensus among participants. Since the data in Paper III was considered by the authors to be multifaceted and varied in nature, questions of potential misinterpretation and methodological limitation arose. After analysing the Delphi part of the Paper III, the authors decided to explore the results further using methodological triangulation (Polit & Beck, 2012). Methodological triangulation is used to explore and clarify data (Begley, 1996) in complex settings and was applied here by using an additional method to analyse the study data. In Paper III, a Focus group interview (Barbour, 2007) was chosen as an additional method of exploring the meaning and gaining a more detailed understanding of the participants, beyond consensus, in line with the aim of the paper. The results of the focus group discussion added a considerable complexity, depth and emphasis to the original Delphi data and were regarded as strengthening further the study results.

In Paper II, the critical incident technique (Flanagan, 1954; Schluter et al., 2008) was used in order to explore human behaviour, in accordance with methodological tradition. As the interviews were initiated using the two open-ended questions, the data found in the interviews were of a qualitatively different character than the short narratives often used in critical incident studies (Dunn & Hamilton, 1986; Schluter et al., 2008). The rich nature of the data, including the informants' detailed reflected experiences, led the authors to use qualitative content analysis (Graneheim & Lundman, 2004) in an inductive way in order to make adequate use of the data. Analysis resulted in ten themes corresponding to the heterogeneity of the material. The number of themes was discussed among the authors, perhaps pointing towards an unfinished analytical process (Graneheim, Lindgren, & Lundman, 2017). However, further qualitative abstraction or interpretation of the content could lead to a useless result that does not reflect the diversity of the content (Graneheim et al., 2017). Citations quoting participants' narratives were intentionally left out of the finished paper because these could potentially be used to identify situations, professionals or patients. The general public were familiar with some of the critical incidents as these had been reported in the news media and discussed within the ambulance services involved, which reinforced the decision not to include any detailed information in the form of participants' citations.

In Paper IV, the use of the mapping sentence (Hackett, 2014, 2016) made it possible for the authors to perform a three-dimensional analysis of the data as an alternative to conventional qualitative content analysis. The mapping sentence (Hackett, 2014, 2016) has been shown to be an appropriate tool for visualising data in a useful way through the application of theories of deductive analysis. Facet theory analysis, especially the mapping sentence, is widely used for research in psychology and the social sciences, but is seen less frequently in nursing, despite appearing to be an efficient way of analysing qualitative data (Guttman & Greenbaum, 1998; Hackett, 2014; Limor & Levy, 1992; Shye et al., 1994). Although the facet theory tradition (Guttman & Greenbaum, 1998; Shye et al., 1994) is associated with advanced statistical methods of analysis and visualisation such as multi-dimensional scaling (MDS) or smallest space analysis (SSA), various methods of reporting results have developed over time (Hackett, 2014), including the use of the mapping sentence as a stand-alone tool (Hackett, 2016). In this study, the use of the mapping sentence was followed by the development of a purposeful descriptive analysis in order to visualise the complex data, with all three dimensions of data being made visible for interpretation.

Trustworthiness of methods

A qualitative approach can be found in all papers, although the Delphi method (Keeney et al., 2001), used in Papers I and III, and facet theory (Hackett, 2014), Paper IV, are traditionally not described as qualitative methods. These two methods share the initial qualitative part, upon which the quantitative parts are based and they are thus considered in this thesis to be mainly qualitative. The focus group method (Barbour, 2007) used in the second part of Paper III and the qualitative content analysis (Graneheim & Lundman, 2004) used in Paper II are traditionally qualitative. The methodological considerations of this thesis are based on Lincoln & Guba's recommendations (Guba, 1981) concerning research quality. Any good research project (Swedish Research Council, 2011) is characterized by evidence that it is trustworthy, applicable, consistent and neutral. In qualitative research, these principles are referred to by the specific terms credibility, transferability, dependability and confirmability (Guba, 1981). In an attempt to address issues of research quality, arguments concerning how these are met in this project are provided along with an overview of each criterion.

Credibility

Confidence in the truthfulness of the research is referred to by the term credibility (Guba, 1981). Credibility is assumed to reflect the extent to which the study's findings are considered trustworthy and believable by others. The credibility of qualitative inquiry is typically enhanced by the use of multiple data sources, researcher or methodological triangulation, prolonged data collection and participant feedback on interpretations (Frambach, van der Vleuten, & Durning, 2013).

In this thesis, the credibility of the project as a whole is largely dependent on the methodology and procedures of the individual papers. As the data in each paper were created through the participants' participation, the project as whole can refer to the use of multiple data sources by different methods. Papers I and III shared the same group of participants, who were carefully chosen to provide varied views on the area. The Delphi method (Keeney et al., 2006; Williams & Webb, 1994) and the recurring rounds of data collection, including elements of prolonged data collection and participant feedback measures, can also be regarded as strengthening the project's credibility. In the second part of Paper III, data were fed back to a representative group of the original participants in order to create a foundation for the focus group interview. The focus group method (Barbour, 2007) was used in this paper as triangulation method in order to further explore the views of the participants found in the original data of the first part. In Paper II, the critical incident technique (CIT) (Flanagan, 1954) was used in the creation of data. The large number of individual reflections of a diverse

character provided data from different situations, reflecting the participants' varied clinical experiences. Data analysis was performed in accordance with the qualitative content analysis process (Graneheim & Lundman, 2004), but credibility could have been strengthened inserting a round of feedback on the results to be considered by the participants. However, using the chosen method of analysis (Graneheim & Lundman, 2004), the credibility was enhanced by all the authors agreeing on the analysis. In Paper IV, credibility was linked to the assumption that the data collected through observations in a theoretical setting of group discussions in some way reflects the actual practice of the participants. The professional practice reflected in this setting included the roles of the participants as students and ANs. The group discussions included interactive feedback between the participants, which strengthens the credibility of the results.

Dependability

The term dependability is used to describe consistency of findings, often referred to as reliability in quantitative research (Guba, 1981). Dependability can be described as the extent to which findings are consistent in relation to the context in which they are found (Frambach et al., 2013). Depending on the specific method chosen, dependability can be enhanced by consistent data collection until data saturation occurs, performing continuous data analysis during data collection, iterative data analysis or a flexible emergent research design (Guba, 1981).

In all parts of the thesis' papers that contain any form of qualitative analysis, dependability was enhanced by the continuous re-examination of data during the creation of results. Two or more authors had detailed insight at all levels of data and interpretation and analysis have been characterised by constant negotiation of findings. Data saturation has not been systematically assessed and applied in any of the papers; instead, a flexible research design (Guba, 1981) was applied in which the amount and content of data has been evaluated and assessed by the authors during the data collection phases. In Papers I and III, the method contains a significant portion of continuous analysis, which enhances the dependability of the results. The second part of Paper III, the focus group interview, is based on an assessment of the results from the previous part of the paper. A flexible research design made it possible to increase the dependability by enhancing and expanding the results via a focus group methodology (Barbour, 2007). In Paper II, dependability was enhanced by the iterative data analysis process, e.g. the continuous re-examination of data among the authors following all steps of the qualitative content analysis process (Graneheim & Lundman, 2004). As in Papers I and III, this paper also included a flexible research design, the methodology of which was altered after the first stage of data collection. As the CIT (Flanagan, 1954) used in data collection produced data of a more complex nature than

first anticipated, mirroring the participants reflected experiences on a deep level, a qualitative content analysis (Graneheim & Lundman, 2004) method was applied in order to enhance the dependability of the results. The dependability of the results in Paper IV was affected by the method chosen. Since the mapping sentence (Hackett, 2014) and its facets were contextually created, this could be interpreted as strengthening the dependability of the results. As important were the authors' selection and negation of the units of analysis. The units used in analysis were a product of the authors' collective work and continuous re-examination of data and methodology. Since the facet theory analysis (Dancer, 1990; Shye et al., 1994) is contextually flexible, dependability increases when using this methodology.

Confirmability

Neutrality of research evidence, or the extent to which the findings are shaped by participants and contextual findings, rather than the researchers' biases, is referred to as confirmability (Frambach et al., 2013; Guba, 1981) in qualitative research. Researcher reflectivity and peer debriefing is thought to enhance the confirmability of research. Measures implemented in order to thoroughly document the research and the researchers' decisions during the process are also regarded as enhancing confirmability (Guba, 1981).

Considering the qualitative approach of the project as a whole as a point of departure, the authors of the papers all had different prior experiences and educational backgrounds. The authors' pre-understanding of the area was considered and discussed at all stages of the research project in order to reduce its influence on the results, which enhanced the confirmability of the thesis as a whole. Differences in the authors' backgrounds varied from no experience at all of nursing or ambulance care to being an experienced AN. All authors had teaching experience, but to a different extent and content, due to their academic careers. These differences in author background and experiences were scrutinized, discussed and considered in relation to all parts of the project in an attempt to reduce investigator bias (Guba, 1981). The research procedures in all of the papers were accompanied by an intentional cooperative process in which the authors regularly reflected on their role and influence in every part of the papers' processes. Researcher bias was kept to a minimum by the authors of the papers meeting regularly to exchange information and discuss findings, methods and processes (Guba, 1981). An audit trail was created for each paper by the first author in an attempt to enhance project confirmability. The authors' differences in terms of pre-understanding and experiences were also used as an affirmation of background literature, collected data and paper findings, which enhanced each paper's and the project's confirmability.

Transferability

In qualitative research, transferability is used to determine the applicability of findings (Guba, 1981). The term transferability is used to make presumptions about the extent to which research findings can be transferred or applied in different settings. The transferability of findings is strengthened by providing thorough descriptions of research findings and the context in which they were found (Frambach et al., 2013). Other ways to enhance transferability include providing detailed descriptions of the sampling strategies used.

The transferability of the results of the PhD project as whole is increased by providing detailed descriptions of the procedures, methodology and results in each paper. Recruitment of participants and descriptions of context are included in all papers. In Papers I and III, the Delphi panel participants were recruited from different regions in Sweden. The views of the professionals can be considered as valid on a national level. Following project aim, the transferability of the results was deemed to be satisfactory on a national level. The Delphi method (Powell, 2003) also provided the participants with feedback in the form of results after each round, which involves each participant and encourages the participants to thoroughly understand the methodology through first-hand experience. The clinical experiences found in Paper II were linked to the AN's profession and the professional reality of ambulance care, and were considered to be representative of the ambulance service context at the national level, where results could be transferred to similar contexts. In Paper IV, the transferability is apparent in both the clinical and educational context, giving the results meaning in any similar context. The participants also held different levels of clinical experience and theoretical knowledge, which were described in the paper. Transferability is in a way elusive and subjective (Guba, 1981) in that the descriptions of context and the creation of results are focused in all the papers in this thesis. Despite these measures, transferability of results can only be assessed by the external reader who is familiar with the context to which results are to be transferred.

Conclusion

In this thesis, aspects on competence and education for ambulance nurses were explored and described in order to form a basis for curriculum development in the specialist nursing education programme. In conclusion, the results of this thesis state that the knowledge area of the ambulance nurse is still rather undescribed and that the results of our studies contributed with a further understanding of competence and education.

The professional competence of ambulance nurses is made up of multiple separate competences and ambulance nurses' competence can be described as complex and multidimensional. The professional demands on ambulance nurses' competence are extensive and the results highlighted certain aspects of importance to professional practice in the areas of cognitive, functional and personal competence. We found that the cognitive competences directly related to clinical practice within the ambulance care context include context-specific theoretical knowledge and skills. Furthermore, our results show the importance in practice of certain generic abilities such as communication skills, collaboration skills and stress-management skills. The functional competence of ambulance nurses is either strengthened or restricted by the functionality of the ambulance services' organisations, professional guidelines, the team colleague and the nurse's contextual knowledge. The personal competence of ambulance nurses consist of several parts that are related to their understanding of their own role in the profession and of the profession itself. Consciously reflecting on and managing personal and professional experiences and perceptions of competence, in and of the profession itself, also seems to be a central part of the ambulance nurse's competence. Systems for regular feedback and a professional ethics discourse seem to strengthen competence. Formal education, including adequate skills training, could be considered the foundation for developing competence, but we also found experienced-based learning in workplaces, including feedback and reflection on practice, to be of great importance to competence development. The results clearly state that the development of ambulance nurses' competence is strongly affected by the ability and opportunities they have to reflect on their practice on a professional and personal level, particularly in team cooperation.

Curriculum development findings include the introduction of educational content designed in accordance with our findings concerning aspects on competence. The results promote the use of the core competencies model as a basis for curriculum design. The design of teaching and learning activities should preferably be directed towards

bringing theoretical education closer to professional practice within the educational programme, with pedagogical methods that incorporate problem-based learning, such as the case method or the clinical reasoning model, which appears to be particularly suited for teaching the ambulance nursing profession. The results of this thesis promote curriculum development as a shared enterprise between universities and ambulance services with the proposal of an integrated clinical education to be incorporated in the specialist education programme.

The results of this thesis can be used as a foundation for systematic organisational measures for competence development in ambulance services, curriculum development and as a knowledge base for the development of nationally agreed standards for ambulance nurses' competence.

Implications and further research

Multiple stakeholders and other interested parties can use the results of this thesis in several ways. The established knowledge and understanding of the ambulance nurse's competence and education can be used in a number of different contexts, for example:

- As a means of stimulating the introduction of systematic organisational measures for competence development in ambulance services
- As a foundation for curriculum development in ambulance nurses' specialist education
- As a knowledge base for the development of nationally agreed standards for ambulance nurses' competence
- As a means of encouraging enhanced cooperation between universities and ambulance services

Future research in this area is necessary in order to further explore the knowledge area of ambulance nurses' competence and education. Since the area is relatively undescribed, there are multiple possibilities for further research, of which we have highlighted some that naturally follow the results of this thesis. Suggested further research in this area could include:

- Generating an international comparison of results on competence to bridge international organisational and educational differences
- Describing aspects of work-based learning in the ambulance care context, focusing on aspects of team-work functionality
- Describing interprofessional learning aspects of communication and cooperation that are specific to the ambulance care environment
- Forming an evidence-based foundation on which to define the content and boundaries of ambulance care

Swedish summary – Sammanfattning

Ambulanssjukvård bedrivs över hela världen och beskrivs ofta som en självständig organisation som kan genomföra vårdinsatser utanför sjukhus vid akut skada, sjukdom eller katastrofer. Ambulanssjukvård är internationellt organiserad på en mängd olika sätt och det är endast i ett fåtal länder som sjuksköterskor är verksamma inom ambulanssjukvården. I Sverige, och några andra europeiska länder, är sjuksköterskor den yrkesgrupp som anses vara bäst lämpad att bemanna ambulanser, men även i Sverige finns en variation i hur ambulanssjukvården är organiserad av de olika landstingen eller sjukvårdsregionerna. Det som är gemensamt är att sedan 2005 ska varje ambulans vara bemannad med en sjuksköterska, enligt Socialstyrelsens föreskrifter, men utöver detta saknas nationell styrning kring hur ambulanssjukvården ska vara organiserad och vilken kompetens medarbetarna ska ha. I vissa landsting eller sjukvårdsregioner har man infört krav på att ambulanserna ska vara bemannade med specialistsjuksköterskor men det saknas även här nationell styrning som beskriver vad ambulanssjuksköterskor ska kunna utföra i sitt yrke, vilket har lett till att varje landsting eller sjukvårdsregion har format sin egen uppfattning om ambulanssjukvårdens uppdrag och innehåll. Till detta skall läggas att ambulanssjuksköterskans kunskapsområde är relativt nytt och utvecklingen av ambulanssjuksköterskans roll inom ambulanssjukvården har öppnat möjligheter för kvalitetsutveckling inom ambulanssjukvården jämfört med tidigare organisation.

Sedan slutet av 1990-talet har det funnits en specialistutbildning för ambulanssjuksköterskor vid flera svenska lärosäten. Specialistsjuksköterskeprogrammet inriktning ambulanssjukvård omfattar ett års heltidsstudier. Då programmet är ett av de senast tillkomna specialistsjuksköterskeprogrammen och specialområdet, ambulanssjukvård, är relativt nytt och utforskat har ett omfattande arbete genomförts för att utveckla programmet i syfte för studenterna att uppnå den kliniska kompetens som krävs för arbete inom ambulanssjukvården. Det finns en osäkerhet kring om utbildningarna verkligen ger studenterna den kompetens som är adekvat för yrkesverksamma ambulanssjuksköterskor och huruvida ambulanssjuksköterskeutbildningarna är likvärdiga på de olika lärosätena. Utöver detta saknas även här adekvata styrdokument på nationell nivå. Socialstyrelsen har dragit tillbaka sin tidigare yrkesbeskrivning för ambulanssjuksköterskor och högskoleförordningen, som utbildningarna baserar sig på, innehåller endast kortfattade och generella mål avseende programmets yrkesexamen men inga riktlinjer på detaljnivå. Till följd av detta har varje lärosäte fått utforma

kursplaner med stor frihet vilket har lett till en variation av innehåll och pedagogik. Denna utveckling har sammantaget medfört att universiteten fått en viktig roll i arbetet med att definiera ambulanssjuksköterskornas kompetensområde och inte minst med att utforma dess innehåll och säkerställa utbildningens kvalitet. En möjlig strategi för att öka kunskap och förståelse för kunskapsområdet skulle vara att utforska och beskriva ambulanssjuksköterskors kompetens, för att bilda ett underlag att användas för utveckling av specialistsjuksköterskeutbildningen och som ett underlag för professionell kompetensutveckling för ambulanssjuksköterskor. Syftet med avhandlingen var därför att utforska och beskriva aspekter av ambulanssjuksköterskors kompetens och utbildning för att kunna användas som underlag för utbildningsplanering i ambulanssjuksköterskeutbildningen.

Avhandlingen grundar sig på fyra delarbeten som alla använder sig av olika vetenskapliga metoder för att undersöka aspekter av kompetens och utbildning för ambulanssjuksköterskor. I delstudie 1 tillfrågades en nationell panel av experter inom ambulanssjukvård om önskvärda kompetenser för nyutbildade ambulanssjuksköterskor. För att sammanfatta deras uppfattningar om vilka kompetenser som är viktigast skapades en enkät där panelens medlemmar fick gradera graden av viktighet. Studiens resultat visade att den önskade kompetensen för ambulanssjuksköterskor bestod av 44 olika delkompetenser och att nästan samtliga kompetenser graderades som väldigt viktiga enligt de professionella själva.

I delstudie 2 intervjuades yrkesverksamma ambulanssjuksköterskor om deras upplevelser av särskilda händelser i deras arbete. Informanterna fick ange vad som var avgörande för utfallet vid särskilda händelser som de uppfattade att ha antingen ett positivt eller negativt utfall. Studiens resultat belyser hur professionell kompetens utvecklas, används och uppfattas av ambulanssjuksköterskor. Sammantaget visade studien att reflektionsförmåga och kommunikationsförmåga var avgörande för hur ambulanssjuksköterskornas kompetens utvecklas och används.

Datainsamlingen i delstudie 3 baserades på en fråga till samma panel som deltog i delstudie 1. I denna studie fick panelens medlemmar ange sin syn på hur ambulanssjuksköterskeutbildningen skall vara utformad och vad den ska innehålla för att studenterna ska uppnå de önskade kompetenserna som angavs i delstudie 1. Även i denna studie skapades en enkät där panelen kunde gradera hur viktigt ett visst påstående var. För att fördjupa resultaten från studiens enkät genomfördes en fokusgruppsintervju med ett urval av informanter från panelen där enkätens resultat utgjorde grunden för en vidare diskussion. Studiens resultat visade på vikten av klinisk utbildning där fokus bör ligga på erfarenhetsbaserat lärande. Studien gav även ett underlag för universiteten och ambulansverksamheten att gemensamt utforma ambulanssjuksköterskeutbildningen för att säkerställa utbildningens kvalitet och validitet.

Delstudie 4 genomfördes som en observationsstudie där grupper av studenter och yrkesverksamma ambulanssjuksköterskor resonerade kring teoretiska fall, motsvarande

kliniska fall inom ambulanssjukvården. Observationer av hur grupperna resonerade och vad de resonerade om låg till grund för studiens resultat. Studien visade att professionella erfarenheter påverkade hur man resonerade kring ett patientfall. Studentgrupperna, med begränsad klinisk erfarenhet, var mer analytiska i sina resonemang än de erfarna ambulanssjuksköterskorna som i sin tur använde mer varierat innehåll och kontextuell information som bas för sitt beslutsfattande.

Sammantaget visar avhandlingens resultat att ambulanssjuksköterskans kunskapsområde fortfarande kan betraktas som ofullständigt beskrivet men att våra studier bidragit med ny och fördjupad kunskap och förståelse inom området. Avhandlingen visar att ambulanssjuksköterskans kompetens består av ett flertal delkompetenser och att man kan beskriva den som komplex och multidimensionell. Kraven på ambulanssjuksköterskors kliniska kompetens är omfattande och avhandlingen fokuserar på några viktiga aspekter om kompetens som kan tänkas påverka kvaliteten i professionsutövandet.

Den kognitiva kompetens som ambulanssjuksköterskor bör inneha omfattar kontextspecifika teoretiska och praktiska kunskaper. Kunskap och förståelse om vissa s.k. generiska förmågor som kommunikationsförmåga, samarbetsförmåga och stresshantering var av stor vikt för ambulanssjuksköterskors kompetens. Ambulanssjuksköterskornas funktionella kompetens visade sig vara beroende av en väl fungerande ambulanssjukvårdsorganisation och adekvata professionella riktlinjer. Dessutom visade avhandlingens resultat att den funktionella kompetensen antingen stärks eller begränsas av kollegan i ambulansen och ambulanssjuksköterskans uppfattningar av ambulanssjukvårdens uppdrag. Ambulanssjuksköterskors personliga kompetens består av flera delar relaterade till förståelsen av ambulanssjuksköterskans roll i ambulanssjukvården. Att medvetet reflektera över personliga och professionella erfarenheter, inom och om professionen, verkar vara centralt för ambulanssjuksköterskors personliga kompetens. Formell utbildning, så som specialistutbildningen för ambulanssjuksköterskor, kan anses vara grunden för kompetensutveckling för ambulanssjuksköterskor då den innefattar adekvata teoretiska och praktiska kunskaper och färdigheter. Avhandlingens resultat beskriver att ambulanssjuksköterskors kompetens påverkas starkt av förmågan och möjligheten att reflektera över deras professionella roll med särskilt fokus på teamsamverkan.

Avhandlingens resultat visar att specialistsjuksköterskeutbildningen med inriktning ambulanssjukvård kan utvecklas på flera sätt. Utbildningsprogrammets innehåll skulle med fördel kunna utformas i enlighet med de resultat rörande kompetens som beskrivs i avhandlingen. För att kunna överblicka det väsentligaste innehållet för professionen skulle en modell innehållande s.k. kärnkompetenser kunna användas för att utforma en helhet för programmet. Läraaktiviteter som syftar till att överbrygga avståndet mellan teori och praktik, som exempelvis casemetodik och modeller för kliniska resonemang verkar var lämpade för ambulanskontexten och kan med fördel implementeras.

Avhandlingens resultat talar för att utbildningen skall utformas i nära samarbete med ambulanssjukvården och att en modell för integrerad klinisk utbildning kan vara värdefull för att utforma en adekvat utbildning för ambulanssjuksköterskor.

Avhandlingens resultat kan användas på ett flertal sätt; vid utbildningsplanering inom specialistsjuksköterskeutbildningen, som underlag för utformande av åtgärder för kompetensutveckling inom ambulanssjukvården, som grund för en samlad nationell beskrivning av ambulanssjuksköterskans kompetensområde eller som en inspiration för ett utökat samarbete mellan universitetet och ambulanssjukvården.

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Appendix 1



Ambulance nurse's competences: According to, and graded by, the expert panel. Presented as mean values and standard deviations comparing the second and third questionnaires. (Table 4 in Paper I)

The Ambulance nurse shall be able to ...	QNR 3 M	SD	QNR 2 M	SD
master systems for radio communication and telephone	4.00	0.28	3.92	0.23
collaborate with other organizational representatives e.g. the police department, fire department or social services	3.97	0.23	3.95	0.37
operate the ambulance's medical technical equipment	3.97	0.00	3.95	0.27
display good judgment in the professional field	3.97	0.32	3.95	0.44
navigate the ambulance vehicle to the designated address using maps or navigation system	3.95	0.23	3.84	0.23
operate the ambulance's technical equipment	3.95	0.17	3.95	0.23
use good communication skills when meeting the patients and their relatives	3.95	0.32	3.94	0.32
register the patient's records in current systems for documentation and report when handing over the patient	3.95	0.36	3.89	0.42
collaborate with other healthcare organizations e.g. primary care, emergency department or other hospital clinics	3.94	0.48	3.87	0.54
perform work duties in a problem-solving way	3.92	0.28	3.79	0.58
display deep theoretical knowledge of nursing, emergency care and medicine	3.92	0.56	3.95	0.65
correctly assess and handle threatening and violent situations	3.89	0.17	3.89	0.23
apply good skills when performing patient interviews	3.89	0.55	3.81	0.66
work in a team	3.89	0.35	3.97	0.59
safely drive the ambulance vehicle	3.89	0.32	3.84	0.46
perform duties in a stressful situation displaying a unstressed manor	3.86	0.23	3.76	0.23
use a structured technique when performing medical assessment	3.86	0.35	3.81	0.52
make an accurate assessment of the patient's condition after analyzing the situation, vital stats and patient history	3.86	0.42	3.89	0.39
work for enhanced patient safety	3.86	0.67	3.87	0.84
perform patient transport, considering ergonomic principles	3.86	0.40	3.86	0.46
meet relatives with respect, regarding their special needs in the given caring situation	3.83	0.66	3.89	0.76
work according to local, regional or national guidelines	3.81	0.62	3.84	0.51
manage and supervise a team of co-workers	3.81	0.46	3.70	0.52
assess and direct patients to an adequate level of care using a triage system	3.81	0.38	3.82	0.31
display the ability of professional learning in a lifelong perspective	3.78	0.44	3.76	0.44
be flexible and adaptive in their profession	3.78	0.16	3.68	0.23
possess capacity for the profession's every situation	3.78	0.23	3.79	0.41
manage and supervise larger accidents or disasters	3.76	0.48	3.76	0.54
tutor students, new employees or colleagues	3.76	0.48	3.68	0.51
autonomously initiate, perform and evaluate nursing care	3.70	0.42	3.82	0.34
perform conventional nursing care	3.70	0.76	3.70	0.65
perform work procedures in a reflective and thoughtful way	3.70	0.59	3.62	0.59
act educationally towards patients, relatives and coworkers	3.68	0.62	3.73	0.72
possess a good personal physical capacity	3.65	0.63	3.65	0.68
reflect upon the profession itself	3.65	0.46	3.61	0.37
assess the patient's situation, considering ethical principles	3.62	0.80	3.63	0.90
use experience-based knowledge when performing duties	3.59	0.39	3.70	0.16
present knowledge of pre-hospital emergency care organization and aims	3.56	0.69	3.58	0.72
initiate and participate in research and quality-enhancing work	3.54	0.61	3.53	0.73
autonomously initiate, perform and evaluate medical treatment	3.50	0.23	3.50	0.31
evaluate scientific research and apply new knowledge in the profession	3.46	0.94	3.55	0.52
assess the patient's condition in a holistic manner, considering the patients current life situation as a whole	3.41	0.53	3.54	0.70
work for personal well-being in the profession	3.38	0.86	3.57	0.80
work autonomously	3.24	0.74	3.29	0.80
work with prevention and health-promoting work	2.70	0.58	3.08	0.58
diagnose patients	2.11	0.50	2.21	0.66

Appendix 2



Content areas, categories and subcategories. (Table 3 in Paper II)

Content area PRESAGE

Category	1 Individual knowledge variations, skills and experiences have a strong impact on how an RN applies their competence	2 The way in which an RN applies their competence is strongly affected by the function of the organisation and activities	3 Perceptions regarding RN competence are strongly tied to formal education
Subcategory	1 Knowledge and experience of ethical dilemmas and meetings with close relatives are essential for an RN's competence	3 The way in which an RN can utilise their competence is strongly dependent upon a well-functioning ambulance organisation and operation	5 Perceptions regarding RN competence are strongly tied to formal education
	2 RN's competence is strongly influenced by personal characteristics, knowledge, experience and proficiency as well as how these are put into practice	4 The way in which an RN applies their competence is strongly affected by the resources and supplies available	

Content area ENCOUNTER

Category	4 RNs' ability to manage psychologically trying situations and ethical dilemmas is dependent on education and experience	5 The use of communication and treatment strategies strengthens RNs' competence	6 Conflicts in healthcare encounters are influenced by differences in the RNs' and patients' understanding of the situation
Subcategory	6 Experience affects how RNs manage and experience threatening and violent situations	8 RNs' competence is affected by communication abilities and use of communication strategies	10 Conflicts in healthcare encounters are influenced by differences in the RNs' and patients' understanding of the situation
	7 Education and experience are crucial to the outcome of situations regarding psychological care or ethical dilemmas	9 The use of treatment strategies strengthens the relationship between the RN, patient and close relatives	

Content area ASSESSMENT

Category	7 RN assessment are strongly affected by knowledge, experience and access to decision making	8 RN ability for (reasonable) evaluations is strengthened by reflective working methods	9 The RNs' assessment ability is negatively affected by a fast pace of care
Subcategory	11 The RNs' assessment ability builds upon adequate interpretations of observations and decision making	13 A working method that is reflective and ethically motivated strengthens the RNs' assessment ability	14 The RNs' assessment ability is negatively affected by a fast pace of care
	12 The RNs' theoretical knowledge and professional experiences are decisive for evaluating a situation		

Content area ACTIONS

Category	10 The RNs' competence is heavily dependent on medical knowledge and clinical proficiency	11 The RNs' abilities for problem solving and adequate decision making are strongly influenced by the pace of the care and the organisations' work guidelines	12 The RNs' competence depends upon knowledge and experience within the fields of psychological care and ethics	13 A reflective way of working strengthens the RNs' competence
Subcategory	15 The RNs' knowledge and experience of pharmacological treatment is of great importance in the choice of actions and outcomes	18 Guidelines for assessment and actions influence how RNs apply their competence	21 RNs are strongly affected by ethically challenging situations and situations involving psychological care	22 On-going evaluation of actions strengthens the RNs' evaluation of their personal competence
	16 RNs see gaps in proficiency and the ability to carry out measures as something negative	19 The RNs' ability to make adequate decisions is strongly influenced by interpretation of templates and care tempo		
	17 An RN's perception of their own competence is affected by the outcome of medical actions	20 The ability to solve problems is affected by the care tempo and organisational resources		

Content area COOPERATION

Category	14 Mutual knowledge base and trusting cooperation with other organisations influence how RNs apply their competence	15 Cooperation within ambulance care affects how the RNs apply their competence	16 The professional competence of a colleague is crucial for how an RN applies their competence
Subcategory	23 Communication problems with cooperating organisations affects how RNs' competence is utilised	27 Communication within their own organisation affects the RNs' chances of utilising their competence	29 Well-functioning communication with a colleague is crucial for the RN to be able to apply their competence.
	24 Mutual knowledge of each other's organisation affects the RNs' chances of applying their competence in cooperation with other organisations	28 Professional competence and well-functioning cooperation within ambulance health care results in RNs being able to functionally apply their competence	30 Professional competence of a colleague is crucial for the RN to be able to utilise their competence.
	25 The RNs' faith in the competence of the cooperating organisations affects how the RNs utilise their competence		31 A colleague's behaviour and attitude affects how the RNs utilise their competence
	26 Communication with the emergency service centre affects the RNs' chances of applying their competence		

Content area EVALUATION

Category	17 RNs' competence is strongly affected by the characteristics of the health care situation and the outcome for the patient	18 The way the RNs view their competence is affected, to a great extent, by communication and relationships	19 The RNs' competence is strongly influenced by education	20 The RNs' competence is strongly influenced by feedback	21 RNs' competence is strongly influenced by personal characteristics and personal reactions related to the situation	22 The way in which RNs apply their competence depends on the level of knowledge, extent of experience and ability for reflection
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Subcategory	32 The RNs' competence is strongly influenced by the understanding of the situation that has arisen and the need for a fast pace of care	34 The RNs' view of their own competence is, to a great extent, influenced by the inter-professional communication process	36 The quality of the theoretical education is decisive to the RNs' competence	36 The quality of the theoretical education is decisive to the RNs' competence	39 The way in which an RN utilises their competence is affected by personal characteristics and experiences	41 RNs' competence is influenced by personal characteristics, knowledge, experience and proficiency as well as how these are put into practice
	33 The outcome for the patient has a strong influence on how the RNs view their competence	35 The RNs' communication ability affects both the outcome for the patient and the evaluation of their own efforts	37 Recurring proficiency training has a positive effect on the RNs' competence		37 Recurring proficiency training has a positive effect on the RNs' competence	42 A reflective way of working has a positive influence on the RNs' competence

Content area INFLUENCE

Category	23 The development of RN competence is heavily dependent on experience and the ability for reflection	24 Challenging situations leading to negative outcomes can lead to negative personal reactions or effects on the mental health of the RN	25 RNs evaluate their competence based on patient outcome	26 Formal education develops the RNs' competence	
Subcategory	43 Experience-based knowledge develops the RNs' competence	46 Situations leading to negative outcomes can lead to negative personal reactions or effects on the mental health of the RN	48 RNs evaluate their competence based on patient outcome	49 Formal education develops the RNs' competence	
	44 RNs' competence develops via experience and reflection, in cooperation with others	47 Situations involving children and psychological care are challenging to the RN in terms of both competence and personality			
	45 The way in which the RN utilises their competence is affected by reflections upon their own safety in threatening and violent situations				

Appendix 3



The panel member's views of teaching and learning. Grading of agreement from the second and third questionnaire presented as mean values (M) and Standard deviation (SD). (Table 3 in Paper III)

		Q3		Q2	
		M	SD	M	SD
1	The curriculum should have clear learning outcomes	3.89	0.32	3.89	0.32
2	The curriculum should be based on current research of the area	3.89	0.39	3.86	0.42
3	The students should receive structured feedback	3.86	0.35	3.82	0.39
4	The curriculum should encourage students' personal development and self-awareness	3.86	0.42	3.82	0.46
5	The curriculum design should encourage active learning	3.78	0.48	3.70	0.66
6	Students should be supervised by supervisors with adequate content knowledge during clinical placement	3.76	0.55	3.69	0.79
7	A variation of learning activities should be used	3.73	0.51	3.66	0.48
8	The curriculum should be based on national agreed standards	3.70	0.46	3.59	0.69
9	Students should have a few years of work experience prior to admission	3.65	0.54	3.59	0.64
10	The university should have a clinical training center	3.65	0.63	3.50	0.60
11	Theoretical learning activities should be integrated during clinical placement periods	3.57	0.73	3.47	0.65
12	The university should use a web-based learning management system	3.57	0.65	3.43	0.69
13	Advanced manikins should be used in skills training, simulating authentic cases	3.54	0.65	3.37	0.63
14	The curriculum should be based mainly on the perspectives of caring sciences	3.43	0.60	3.37	0.68
15	University teachers should assess student's clinical skills	3.41	0.69	3.34	0.71
16	The curriculum should be formed in collaboration with the ambulance service	3.38	0.72	3.32	0.71
17	Learning activities should be based mainly on cases	3.35	0.59	3.30	0.85
18	The education programme should result in a master's degree	3.35	0.86	3.27	0.77
19	In addition to academic qualifications, admission should be based on national agreed standard prerequisites	3.35	0.86	3.26	0.95
20	The majority of clinical placements should be in the ambulance services	3.24	0.55	3.24	0.80
21	Clinical placement should be planned and supervised by clinical teachers	3.24	0.64	3.18	0.83
22	A training ambulance should be used in teaching and assessment	3.22	0.63	3.16	0.69
23	Physicians should be responsible for teaching medicine	3.11	0.61	3.13	0.78
24	Clinical skills training should be carried out in other specialist areas	3.11	0.66	3.11	0.86
25	Skills training exercises should be used regularly	3.08	0.49	3.11	0.97
26	Major accident exercises should be carried out in collaboration with other organisations	3.08	0.80	3.08	0.75
27	Group learning techniques should be used in the theoretical parts of the curriculum	2.97	0.55	3.03	0.79
28	Assessment of students should be organized as partial and frequent assessment occasions	2.97	0.69	3.00	0.82
29	The curriculum should be campus-based	2.95	0.74	3.00	1.04
30	Seminars should be used as a learning activity	2.92	0.55	2.95	0.77
31	The curriculum should be extended by one semester	2.86	1.23	2.94	0.89
32	The theoretical part of the curriculum should include a system of mentorship	2.84	0.65	2.92	0.78
33	Teaching should be carried out by trained ambulance nurses	2.83	0.70	2.86	0.89
34	Lectures should be the main teaching activity	2.81	0.62	2.81	0.85
35	Written tests should be used in assessment	2.81	0.70	2.78	0.90
36	Clinical skills training should be given more time	2.81	0.70	2.66	0.75
37	The programme should be followed by a trainee period in ambulance services after graduation	2.62	0.89	2.62	1.04
38	Clinical skills training should only be carried out at ambulance services	2.51	0.61	2.58	1.18
39	Self-directed learning should be used	2.47	0.61	2.55	0.92
40	Major accident exercises should be coordinated with other educational programmes	2.43	0.73	2.41	0.96
41	Teaching should be carried out by student peers	2.22	0.75	2.41	1.01
42	Role play should be used as a teaching method	2.03	0.76	2.32	0.85
43	The programme should be organized as distance education	1.49	0.77	1.84	0.95

Appendix 4



Focus group results, content and emphasis. (Table 4 in Paper III)

Content	Emphasis
Professional context	
Clinical supervisors	Are extremely important for developing clinical competence Benefits from reflective skills Need a formal pedagogical education Motivation and dedication are considered essential for quality in supervision Organizational support increases quality of supervision
Reflective practice	Develops the individual and the organization
Teamwork	Each member of the team is important for student learning The team colleague is central in providing sufficient learning prerequisites Groupthink should be actively avoided
Professional ethics	Should be emphasized more by the profession An active professional discourse and related learning activities increases learning possibilities
Professional guidelines	Effectively regulates medical issues, leaving out communicative and reflective challenges
Climate	A open climate is considered crucial for learning
Cultural socialization	Has a strong impact on student behavior and outcome
Research	Understanding research and the research process is central
Ambulance health care	Should benefit from being regarded as any other health care services, including research and professional development Professionals need a very broad competence Holds both challenges and possibilities for the professional Organisational prerequisites can be altered to increase learning possibilities
Curriculum design	
Pedagogical methods	Variation is considered as a key aspect
Lectures	Should be held by lecturers with clinical competence
Mix of theory and practice	To systematically turn theoretical knowledge into clinical competences
Clinical placements	Should be a larger proportion of the curriculum
Learning outcomes	Should be aligned with actual professional demands
Distance education	Increases demands on clinical supervisors
Reflection	Is vital for competence development Should be a larger part of the curriculum
Professional ethics	Should be incorporated in all parts of the curriculum Important but hard to assess
Teamwork	An emphasis on theory and skills increases learning
Perspective	A holistic nursing perspective could increase professional competence The curriculum should hold more personal reflections and less medicine
Feedback	Should be applied at all levels, regularly, to increase competence development
Master thesis	Is important but does not always lead to increased clinical competence
Assessment	Should be carried out by clinical supervisors Preferably more clinically oriented
Cooperation	The usability of university education is increased by a shared enterprise
Student characteristics	
Prior experience	Nursing experience is a desirable prerequisite for learning of the area
Expectations	Should be held at a realistic level, as a student and a professional
Lifelong learning	Reflective capacity is vital to form a foundation for lifelong learning



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