INDRĖ BRASAITĖ

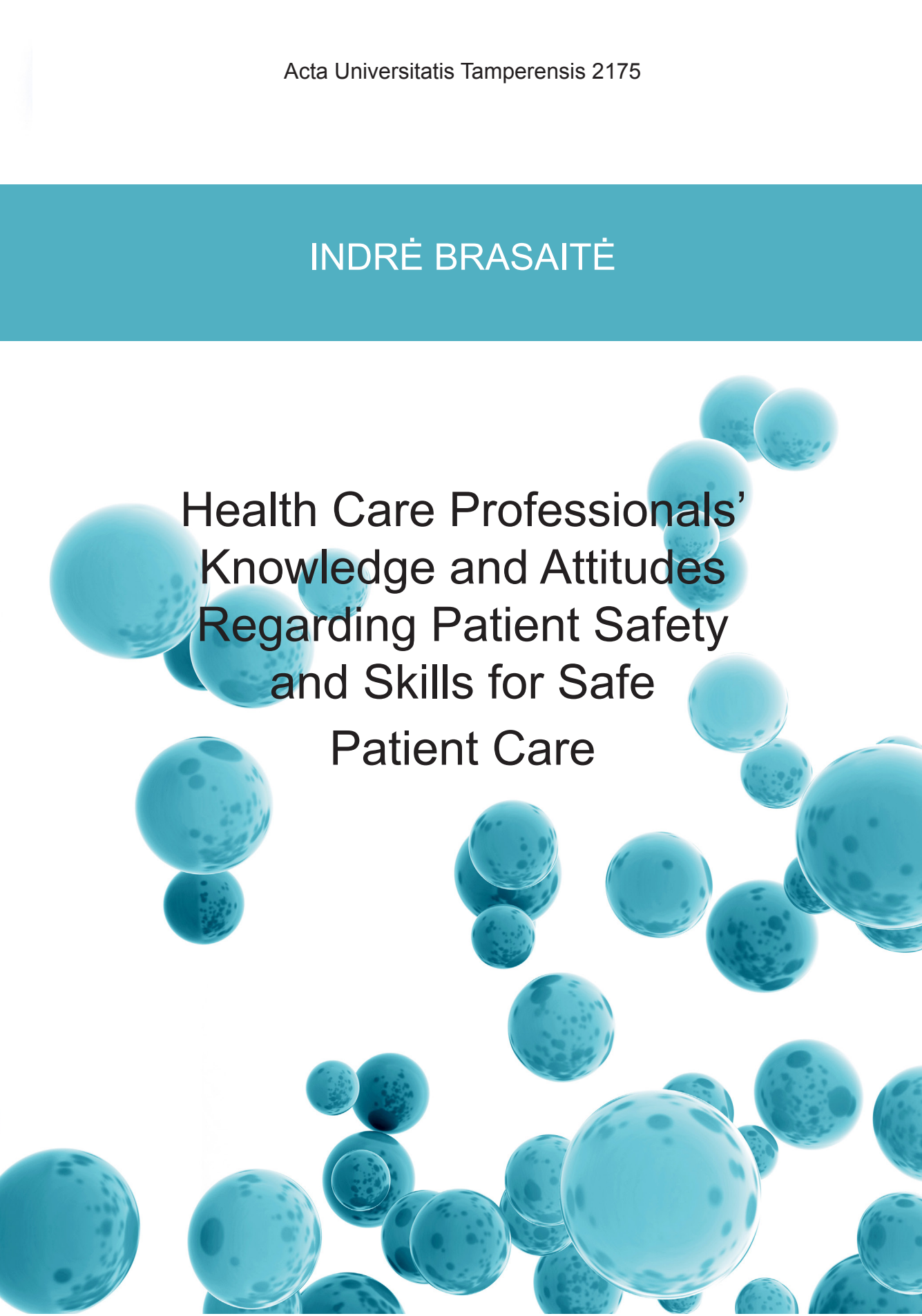# Health Care Professionals' Knowledge and Attitudes Regarding Patient Safety and Skills for Safe Patient Care

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Health Care Professionals'
Knowledge and Attitudes
Regarding Patient Safety
and Skills for Safe
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UNIVERSITY OF TAMPERE

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Health Care Professionals' Knowledge and Attitudes Regarding Patient Safety and Skills for Safe Patient Care

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List of Abbreviations

AHRQ = Agency for Health Care Research and Quality
ANOVA = Analysis of Variance
CINAHL = Cumulative Index to Nursing and Allied Health Literature
GTT = Global Trigger Tool
HSD = Honest significant difference
HSPSC = Hospital Survey on Patient Safety Culture
ICPS = International Classification for Patient Safety
ICU = Intensive Care Unit
IOM = Institute of Medicine
IQR = Interquartile range
N = Population size
n = Number of cases, sample size
NMC = Nursing and Midwifery Council
p = p-value
PS-ASK = Patient Safety Attitudes, Skills and Knowledge scale
PSC = Patient Safety Climate
SAQ = Safety Attitudes Questionnaire
SD = Standard Deviation
SPSS = Statistical Package for the Social Sciences
WHO = World Health Organization

List of original publications

The dissertation is based on the following articles which are specified in the text by their Roman numerals from I to IV.

I   Brasaite, I., Kaunonen, M., Suominen, T. 2015. Healthcare professionals' knowledge, attitudes and skills regarding patient safety: a systematic literature review. Scandinavian Journal of Caring Sciences, 29, 30–50.

II Brasaite, I., Kaunonen, M., Martinkenas, A., Mockiene, V., Suominen, T. 2016. Healthcare professionals' knowledge regarding patient safety. Clinical Nursing Research, 1-16. DOI: 10.1177/1054773816628796.

III Brasaite, I., Kaunonen, M., Martinkenas, A., Suominen, T. 2016. Healthcare professionals' attitudes regarding patient safety: a cross-sectional survey. BMC Research Notes, 9:177. DOI: 10.1186/s13104-016-1977-7.

IV Brasaite, I., Kaunonen, M., Martinkenas, A., Mockiene, V., Suominen, T. Healthcare professionals' skills regarding patient safety. Submitted.

The articles are reprinted with the kind permissions of the copyright holders. Article IV is not included in the electronic version of the summary, as it has not yet been published. The summary contains some unpublished results.

Abstract

The overall purpose of this study was to describe the knowledge, attitudes and skills of health care professionals regarding patient safety, and to explain their relationships. The aim of the study was to uncover knowledge of the present situation and how knowledge, attitudes and skills are related, in order to have an advanced basis on which to improve the knowledge, attitudes and skills of health care professionals regarding patient safety.

The overall study process took place from 2012 to 2015 and was divided into two phases. In Phase 1, a qualitative systematic literature review of 18 articles concerning health care professionals' knowledge, attitudes and skills regarding patient safety was undertaken. In Phase 2, a quantitative descriptive cross-sectional empirical study was conducted in three regional hospitals in Lithuania, involving all of the health care professionals (n=1082) who worked with adult patients.

Overall, it was seen that health care professionals have a low level of safety knowledge, but positive safety attitudes and they are competent regarding safety skills. The health care professionals' safety knowledge, attitudes and skills showed several positive and negative associations with background factors such as their education, length of experience in their primary speciality or work experience in general, and the information they had received about patient safety during their vocational or continuing education. Also, significant differences were found in health care professionals' knowledge, attitudes and skills regarding patient safety when comparing their profession, the results between hospitals and working units, and the incidents which were reported during the last year.

Based on this empirical study, health care professionals' safety knowledge had significant positive associations with all of the safety attitudes and safety skills scales used in the evaluation, thus supporting the offered hypothesis.

This study offers implications for practice, management, education and research. Based on results, it can be seen that some improvements are needed, and that researchers, hospital managers, physicians, nurses and nurse assistants should be involved in developing this important area. Especially, safety skills and knowledge should be improved by way of vocational education, including an evaluation of current curriculums and the incorporation of patient safety issues in education

programmes where needed. In both vocational and continuing education, educators should focus on evidence-based practice and include multi-professional learning in order to develop health care professionals' skills to work as coordinated team to ensure patient safety. Also, in the continuing education setting the topics covered should give more focus to related patient safety issues. In continuing education and management practice, regulations should be considered which promote patient safety. Thus, further research is needed which is focused on specific areas related to health care professionals' knowledge and skills related to patient safety. Based on existing knowledge drawn from previous studies and also the regional evidence offered in this dissertation, this study reveals new important information about health care professionals' general knowledge, attitudes and skills regarding patient safety, and adds valuable information to the current research corpus. Importantly, from a practical perspective it offers a much needed foundation on which hospital managers can develop patient safety improvements. From a learning and informational perspective, all of the health care professional groups in this study had gaps in their knowledge of patient safety issues, and this challenges managers to create opportunities for the staff to update their knowledge and skills regarding patient safety in their working area.

Tiivistelmä

Tämän tutkimuksen kokonaistarkoituksena oli kuvata terveydenhuoltohenkilöstön potilasturvallisuutta koskevaa tietoa, asenteita ja taitoja ja selittää niiden yhteyksiä. Tavoitteena oli tunnistaa tämänhetkinen tieto ja miten tieto, asenteet ja taidot ovat yhteydessä, jotta meillä olisi syvällinen perusta parantaa terveydenhuoltohenkilöstön potilasturvallisuutta koskevia tietoja, asenteita ja taitoja.

Koko tutkimusprosessi kesti 2012 - 2015 ja se oli kaksivaiheinen. Vaiheena I oli laadullinen systemaattinen kirjallisuuskatsaus pohjautuen 18 artikkeliin, joissa tarkasteltiin terveydenhuoltohenkilöstön tietoa, asenteita ja taitoja potilasturvallisuudesta. Vaiheessa II tehtiin määrällinen kuvaileva empiirinen poikkileikkaustutkimus kolmessa alueellisessa sairaalassa Liettuassa. Tutkimus koski koko terveydenhuoltohenkilöstöä (n=1082) joka työskenteli aikuispotilaiden kanssa.

Yleisesti todeten, terveydenhuoltohenkilöstöllä oli matala tiedontaso potilasturvallisuudesta, mutta henkilöillä oli positiiviset asenteet ja he ovat kompetentteja potilasturvallisuutta koskevilta taidoiltaan. Terveydenhuoltohenkilöstön potilasturvallisuutta koskeva tieto, asenteet ja taidot osoittivat olevan positiivisesti tai negatiivisesti yhteydessä taustamuuttujiin, kuten koulutukseen, työskentelyn pituuteen omalla erityisalueella tai työskentelyn pituuteen ylipäätään ja potilasturvallisuutta koskevaan tietoon, mikä oli saatu joko ammatillisen tai täydennyskoulutuksen aikana. Myös tilastollisesti merkitseviä eroja oli terveydenhuoltohenkilöstön tiedoissa, asenteissa ja taidoissa potilasturvallisuudesta ammattiryhmittäin, sairaaloittain ja osastoittain tarkastellen ja myös yhteydessä viimeisen vuoden aikana raportoituihin potilasturvallisuutta koskeviin haittatapahtumiin.

Empiirisen tutkimuksen tulosten mukaan terveydenhuoltohenkilöstön potilasturvallisuutta koskeva tieto oli positiivisesti yhteydessä kaikkiin tässä arvioinnissa olleisiin asenteiden ja taitojen osa-alueisiin, joten tutkimukselle asetettu hypoteesi sai vahvistusta.

Tämän tutkimuksen päätelmät kohdentuvat käytäntöön, johtamiseen, koulutukseen ja tutkimukseen. Tutkimustulosten perusteella on ilmeistä, että jotkut parannukset ovat tarpeen ja tutkijoiden, sairaalan johtajien, lääkäreiden, sairaanhoitajien ja lähihoitajien tulisi kaikkien olla mukana kehittämässä tätä tärkeää

alueta, potilasturvallisuutta. Erityisesti potilasturvallisuutta koskevia taitoja ja tietoja olisi parannettava ammatillisen koulutuksen avulla. Nykyiset opetussuunnitelmat olisi tarpeen arvioida ja sisällyttää potilasturvallisuutta koskevat aiheet tarvittaessa. Sekä ammatillisessa että täydennyskoulutuksessa toimivien opettajien tulisi keskittyä näyttöön pohjautuvaan käytäntöön ja moniammatilliseen opiskeluun, jotta kehitetään terveydenhuoltohenkilöstön taitoja työskennellä koordinoituna tiiminä potilasturvallisuuden varmentamiseksi. Myös täydennyskoulutuksessa käsiteltävien aiheiden tulisi kohdentua enemmän potilasturvallisuusaiheisiin. Täydennyskoulutuksen ja johtamisen säädöksiä tarkasteltaessa olisi kiinnitettävä huomiota niiden edistävän potilasturvallisuutta. Jatkossa tarvitaan tutkimusta kohdentuen terveydenhuoltohenkilöstön spesifisiin potilasturvallisuutta koskeviin tietoihin ja taitoihin. Tässä tutkimuksessa yhdistetään aikaisempaa tutkimustietoa ja empiiristä alueellista tietoa ja siten tutkimus tuo uutta tärkeää tietoa evidenssiin, terveydenhuoltohenkilöstön yleisestä tiedosta, asenteista ja taidoista potilasturvallisuudesta ja lisää arvokasta tietoa tästä tutkimusalueesta. Tärkeää on, että käytännön näkökulmasta tarkastellen tutkimus luo pohjan, jonka avulla sairaaloiden johtajat voivat kehittää potilasturvallisuutta. Oppimisnäkökulmasta tarkastelleen kaikilla tähän tutkimukseen osallistuneilla terveydenhuollon ammattiryhmillä on aukkoja potilasturvallisuutta koskevissa tiedoissa, jolloin tämä haastaa johtajat luomaan henkilökunnalle mahdollisuuksia potilasturvallisuutta omalla työskentelyalueella koskevien tietojensa ja taitojensa päivittämiseen.

1   Introduction

Patient safety has been an increasingly important topic of interest over the last decade, although there are still many fields where further research is needed. Patient safety is a global issue affecting countries at all levels of development (WHO, 2008). The World Health Organization highlighted the importance of patient safety and related issues, and it is therefore essential to have knowledge of the main contributory factors in order to devise appropriate solutions.

Many patients suffer from preventable harm during the health care in hospitals (Bates & Sheikh, 2015) and each year many people die from medical errors (van Doormaal et al., 2009). The most common medical errors such as medication errors, bad communication, infection, falls, pressure ulcers, surgical errors and treatment errors may be preventable by healthcare professionals (Weinstein, 2006; O'Hagan et al., 2009; van Doormaal et al., 2009; van Gaal et al., 2010; Wong et al., 2011; Day et al., 2012; Arora et al., 2012; Robson et al., 2012; Thomas & Taylor, 2012; Ahmed et al., 2013; Thomas & Taylor, 2014).

Sutker (2008) views that expected threats to safety relate to the patient's illness and that unexpected threats arise from professional, organizational and system-level factors. Professional factors such as health care professionals' knowledge, attitudes and skills regarding patient safety have an impact on threats to patient safety, especially when health care professionals have an inadequate level of safety knowledge and skills to provide safe care for their patients, and also when they maintain negative attitudes to patient safety (e.g. reporting safety incidents) (Allen LaPointe et al., 2003; McMullan et al., 2010; El-Sayed et al., 2010; Arora et al., 2012; Flotta et al., 2012; Robson et al., 2012). Another professional factor focuses on unsafe acts or errors and procedural violations. These include issues such as forgetfulness, inattention, poor motivation, carelessness, malpractice, recklessness or a sense of fear, writing procedures (or adding to existing ones), disciplinary measures, the threat of litigation, retraining, and naming, blaming and shaming (Reason, 2000).

A failure to rescue patients from foreseeable harm is strongly linked to nursing personnel, and as the biggest group of health care professionals, nurses are competent to identify treatable complications such as gastrointestinal bleeding or respiratory compromise during patient assessment. Thus, nurses are often the first

line of intervention to rescue a patient from foreseeable harm (Friese & Aiken, 2008). Physicians are another group of health care professionals who have an important role in patient safety. They have the same tasks as nurses and nurse assistants when it comes to practical issues such as hand hygiene, teamwork, communication etc., but they can also take advantage of initiatives which relate to safety, quality and risk management (Sutker, 2008). Nurse assistants are another health care professional group which should create a supportive and safe working environment for patients and nurses. For example, there is evidence that nurse assistants have an important role in reducing the number of patient falls (Spanke & Thomas, 2010), however, an important concern raised by nurses is the lack care-level of staffing and the number of assistive personnel (Kalisch, 2009).

There are patient safety concerns regarding organizational characteristics. For example, an issue such as hospital bed size has an impact on patient falls in hospitals, and hospitals which have a larger bed size and those with Magnet status designation are significantly less likely to be in a group with a high fall rate (Everhart et al., 2014).

Because patient safety is a complex system, it is a big challenge for all health care professionals and hospital managers to maintain patient safety in hospitals. As Friese and Aiken (2008) declare, patient safety is a system involving a wide range of actions in performance improvement, environmental safety and risk management, including infection control, safe use of medicines, equipment safety, safe clinical practice and providing a safe environment of care.

Some authors suggest that at system-level, health-care policymakers should create a model which will suspend the culture of blame, and change thinking that individuals are responsible for errors, not health care systems (Hor et al., 2013). Managers, clinicians and patients should cooperate and implement changes in practice. Notably, it has been suggested that clinicians might encourage patients to contribute to the safety system (Hor et al., 2013), and it has been found that patients are able to recognize adverse events related their own care and could be involved in patient safety (Weissman et al., 2008).

It is very important to create a dialogue between the leaders of health care organizations, in order to support change in health care systems (Douma, 2015). Hospitals face constant change when reacting to health care demands, and the most difficult challenge is to build an infrastructure at organizational level which supports change, and to design quality and safety programs and initiatives for sustainable change and aimed at producing the best possible outcomes for patients (Douma, 2015).

The WHO (2009) stated that one of the examples where further research is needed to reduce patient harm is poor knowledge, skills and competencies. Thus, one of the main structural challenges for health care systems is the inadequacy in numbers and skills allocation of qualified health professionals, and their insufficient knowledge about patient safety and safe practice. Health care professionals need to maintain their competency which is in-turn needed to ensure patient safety and provide safe care. Researchers suggest that providing nurses with positive attitudes, adequate skills and knowledge regarding patient safety, is likely to improve safe practices, to strengthen patient care, and also to decrease morbidity and mortality rates (Schnall et al., 2008).

Only a few studies were found from previous literature connected to health care professionals' knowledge and skills regarding patient safety. More research has been conducted regarding health care professionals' safety attitudes, but there is still a limited amount of related information. Thus, there exists a gap in the available information as to how knowledge, attitudes and skills regarding patient safety are connected.

Competence is generally defined as consisting of knowledge, attitudes and skills, and is thus presented as having different integration processes (Baartman & de Bruijn 2011). Competence development is important not only to acquire, but also integrate knowledge, attitudes and skills to achieve vocational competence. It is also important as a requirement for respective job function and to perform a professional task successfully (e.g. ensuring patient safety). Knowledge, attitudes and skills should therefore be measured together (e.g. at the same time), as they become visible in actions.

The overall purpose of this study is therefore to describe the knowledge, attitudes and skills of health care professionals regarding patient safety, and explain their relationships.

2   Literature review

Three main literature searches were conducted. The first was conducted during study phase 1, in December 2012 using the CINAHL and MEDLINE databases (Article I). The search was repeated using the same methods in October 2014 and October 2015, using the same databases. The latest publications of the renewed literature reviews are cited and referred to in the summary text and articles II-IV. Also, in November 2015 a manual search of public documents and publications on the webpages of leading health organizations like the World Health Organization, World Alliance for Patient Safety, and the Agency for Health Care Research and Quality was conducted using various combinations of the keywords: health care professionals, physician, nurse, nurse assistant, patient safety, patient safety culture, patient safety incidents, knowledge, attitudes and skills. Topical literature describing the international situation and directives regarding health care professionals' knowledge, attitudes and skills related to patient safety is cited and referred to in this summary text.

2.1   Patient safety in healthcare

2.1.1   Patient safety definition

A widely used definition of patient safety is provided by the WHO, in which patient safety is defined as the absence of preventable harm to a patient during the process of health care (WHO, 2009). Vincent (1993) defined patient safety as 'the avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of health care'. Sutker (2008) opines that: 'Patient safety can be defined as freedom from accidental injuries stemming from the processes of health care. In addition to the expected threats to safety that relate to the patient's illness, unexpected threats arise from professional, organizational, and system-level factors'.

The Lithuanian Health Care Ministry view that patient safety comprises of health care structures and processes, the implementation of which reduce the adverse events resulting from the impact of the health care system (Minister of Lithuanian Health Care Order, 2007). The Institute of Medicine defined patient safety as 'freedom from accidental injury; ensuring patient safety involves the establishment of operational systems and processes that minimize the likelihood of errors and maximize the likelihood of intercepting them when they occur.' (IOM, 2000).

However, according to Emanuel et al. (2008), existing patient safety definitions seemed to vary, and one of the questions authors bring up is whether patient safety is a way of doing things, a discipline, or an attribute? Emanuel et al. (2008) studied existing definitions and suggested their own patient safety definition: 'Patient safety is a discipline in the health care sector that applies safety science methods toward the goal of achieving a trustworthy system of health care delivery. Patient safety is also an attribute of health care systems; it minimizes the incidence and impact of, and maximizes recovery from, adverse events'. This definition of patient safety therefore defines both a way of doing things and also an emergent discipline.

Based on this previous literature, the definitions of patient safety could be summarized as meaning the evidence based safe actions of health care professionals in a trustworthy health care system (e.g. institution or unit), and the avoidance of preventable patient harm during the process of health care service provision. Patient safety has been an important topic for over ten years, but it is important for researchers and health care professionals to understand which definition of patient safety they use in their studies or in clinical practice. In this study, patient safety is interpreted as a freedom from patient safety incidents during the services of health care.

2.1.2   Patient safety culture

The most used definition of a safety culture by researchers is it being "the product of individual and group values, attitudes, perceptions, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management" (Gadd & Collins, 2002; Sorra & Nieva, 2004; Sexton et al., 2006; Garrouste-Orgeas et al., 2012; Devriendt et al., 2012; Zimmerman et al., 2013). Safety climate reflects the provider attitudes towards patient safety (Thomas et al., 2005). A meta-analysis of safety culture was generated to find a conceptual safety culture framework, and also developed a linked typology which identified seven subcultures of patient safety culture: (a) leadership, (b)

teamwork, (c) evidence-based, (d) communication, (e) learning, (f) just, and (g) patient-centered (Sammer et al. 2010).

If thinking more broadly of the concepts culture and climate, numerous definitions (e.g. of organizational culture and climate) exist in the literature. Some studies report these concepts to be different, whilst others see them as more or less overlapping (e.g. Parmelli et al. 2011). If seen separately, organizational culture reflects the way things are done in organizations, and organizational climate reflects the way that members of organizations perceive and experience their work environment (James et al. 2008). The previous literature is often confusing because of overlapping and different definitions. Also, some authors (Sexton et al. 2006; Nabhan & Ahmed-Tawfik, 2007; Parmelli et al. 2011; Ginsburg et al., 2014) seem to use different terminology and phrasing in texts on similar topics, which further adds to the confusion. Most works use safety climate or safety culture terms in their studies regarding patient safety. However, the terms 'culture' and 'climate' are often used interchangeably (Sexton et al., 2006; Nabhan & Ahmed-Tawfik, 2007; Ginsburg et al., 2014).

The Agency for Health Care Research and Quality (AHRQ) (2015) has conducted surveys of patient safety culture since 2004, and their on-going efforts look to measure the levels of patient safety knowledge and culture. AHRQ created the Hospital Survey on Patient Safety Culture (HSPSC) to support patient safety culture improvement in hospitals. The HSPSC survey has also been used in several studies (Thomas et al., 2013; Turunen et al., 2013; Perneger et al., 2014; Wang et al., 2014; Khater et al., 2015; Saleh et al., 2015; Vlayen et al., 2015), and measures twelve dimensions of patient safety culture: Teamwork Within Units, Supervisor/Manager Expectations & Actions Promoting Patient Safety, Organizational Learning - Continuous Improvement, Management Support for Patient Safety, Overall Perceptions of Patient Safety, Feedback & Communication About Error, Communication Openness, Frequency of Events Reported, Teamwork Across Units, Staffing, Handoffs & Transitions, and Non-punitive Response to Errors. The other most commonly used instrument by researchers is the Safety Attitudes Questionnaire (SAQ), used to measure patient safety culture e.g. Devriendt et al. (2012), and to measure safety-related attitudes (Modak et al., 2007).

The most commonly used patient safety culture dimensions were suggested by Sexton et al. (2006) and have been used by various researchers (e.g. Sexton et al., 2006; Wisniewski et al., 2007; Garrouste-Orgeas et al., 2012; Schwendimann et al., 2013). They comprise of six dimensions: teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions, and stress recognition. Ginsburg et al. (2014) also used six dimensions of patient safety climate

(PSC) in their study: Organisational leadership support for safety; Incident follow-up; Supervisory leadership for safety; Unit learning culture; Enabling open communication I: Judgement-free environment; Enabling open communication II: Job repercussions of error.

Other authors have described a larger number of patient safety culture dimensions. Twelve dimensions of patient safety culture were used by Liu et al. (2014) and Bagnasco et al. (2011) in their studies, comprising: Frequency of events reporting, Overall perceptions of patient safety, Manager expectations and actions promoting patient safety, Organisational learning, Teamwork within units, Communication openness, Feedback and communication about error, Staffing, Non-punitive response to error, Management support for patient safety, Teamwork across units, Handoffs and transitions. Nine patient safety culture dimensions were presented in a study by Simons et al. (2015): Priority and responsibility to patient safety, Record, evaluate and learn from incidents, Resources regarding patient safety, Communication about safety, Team working, Personnel management and safety issues, Qualified staff and patient safety, Compliance and feedback, and Continuous improvement.

Patient safety culture varies between country, hospital, unit or profession, but mostly it varies between clinical area levels such as hospital departments. Some authors (e.g. Sexton et al., 2006; Schwendimann et al., 2013; Ginsburg et al., 2014) have determined that there are differences among clinical units (e.g. medical unit, surgical unit, intensive care unit (ICU)). In previous studies (e.g. Wisniewski et al., 2007; Schwendimann et al., 2013; Bondevik et al., 2014), health care professionals generally evaluated their patient safety culture as positive, but patient safety culture dimensions such as stress recognition, perceptions of unit management, and safety climate were the lowest evaluated dimensions.

Patient safety culture is not only of interest to researches, but it is also an important issue for hospital managers who may use valuable data from research to improve a specific dimension of patient safety culture (e.g. safety climate, stress recognition, teamwork climate etc.) in their hospital. However, there is a feeling that a non-punitive patient safety culture is absent in hospitals, and health care professionals still feel that there is a culture of blame in their hospitals (Wakefield et al., 2010; Bagnasco et al., 2011; Liu et al., 2014).

2.1.3   Patient safety incidents

The National Patient Safety Agency in the United Kingdom (2011) suggested that: 'A patient safety incident is any unintended or unexpected incident which could have or did lead to harm for one or more patients receiving NHS care'. As was mentioned before, the WHO describes patient safety as the absence of preventable harm to a patient during the process of health care. Problems in clinical practice, products, procedures or systems may lead to adverse events. Various authors (Thomas et al., 2000; Davis et al., 2002; Baker et al., 2004) have defined adverse events as an unintended injury or complication that results in disability at the time of discharge, death or prolonged hospital stay, and that is caused by health care management rather than by the patient's underlying disease process.

The International Classification for Patient Safety (ICPS) (Canadian Patient Safety Institute, 2011) defines a patient safety incident as 'an event or circumstance that could have resulted or did result in unnecessary harm to a patient'. Also, the ICPS suggested three additional terms which may be applied to a patient safety incident: harmful incident, no harm incident, and a near miss. The main idea of the ICPS is that a patient does not necessarily have to be harmed, but it is the potential harm of a patient that should be noticed as a patient safety incident. Harmful and no harm incidents are those patient safety incidents which reach the patient, whereas a near miss does not reach the patient.

It is both inevitable and understandable that all humans make errors, but it is contentious as to whether it is forgivable when it relates to a patients' health. Worldwide we have a human error problem, but it is something which might be explained in two different ways. Reason (2000) suggested to split human error into person approach and a system approach. The person approach is described as health care professionals' (e.g. physicians, nurses, nurse assistants etc.) unsafe acts or errors and procedural violations. Contrary to this, the system approach is described as the organizational processes and working environment which may lead to unsafe practice, errors or adverse events, and within this context it is not important who caused an error, but how and why the patient safety system failed in the organization. The same author previously suggested that an error can be defined as the circumstances in which planned actions fail to achieve the desired outcomes (Reason 1990).

Based on results of a study by Kinnunen-Luovi (2014), it was found that the most common patient safety incidents reported in internal medicine wards were related to medication and infusions, transfusion, contrast agent or markers, information flow

or management, invasive treatment, violence, accident, other treatment or monitoring. In other studies, pressure ulcers (Thomas & Taylor, 2012) and incidents involving medication (Thomas & Taylor, 2014) were the mostly reported patient safety incidents. In the study of Panesar et al., (2014) it was found that the most common causes of reported patient safety incidents regarding shortfalls in the management of cardiac arrests where the patient died were miscommunications involving the cardiac arrest emergency number, shortfalls in staff attending the arrest, equipment deficits, and a poor application of knowledge and skills. The reporting systems are important to learn about the casual chain and consequences of patient safety incidents. Thus this requires of further conceptual and technical developments to conduce reporting also to effective learning (Larizgoitia et al. 2013).

Many authors (Reinertsen, 2000; Beckmann et al., 2003; Furukawa et al., 2003; Cook et al., 2004; Martin et al., 2005) declare that most medical errors are preventable, and usually it would suffice if health care professionals' would follow guidelines or standard procedures. For example, a common but preventable medical error in clinical practice is poor drug administration, such as administering the wrong drug, the wrong dose, treating the wrong patient, giving the drug at the wrong time, of using the wrong route administration (Reinertsen, 2000).

2.2 Health care professionals' knowledge, attitudes and skills regarding patient safety

2.2.1 Health care professionals' knowledge regarding patient safety

Patient safety has been identified as a global priority area where substantial knowledge gaps exist and where further knowledge would significantly contribute to improving patient safety and reducing harm (WHO, 2009). Establishing a clear distinction between errors which result from a misconception of reality and errors resulting from a complete lack of knowledge is considered imperative (Goncalves, 2007; Oguisso & Schmidt, 2010).

Several studies have reported a lack of knowledge. For example, Ndosi & Newell (2008) found that nurses' pharmacological knowledge was quite poor and although a few nurses showed high levels of pharmacological knowledge, the majority had an inadequate knowledge. In the same study the knowledge of drug mechanisms of

action and drug interactions was poor. Alshammari et al. (2015) found similar results that showed both physicians and nurses to have a poor knowledge of pharmacovigilance. Thus, the importance of effective pharmacological knowledge for nurses is important for various reasons. Nurses are the biggest health care professional group who mainly administer medicines. In a typical hospital, thousands of medication doses can be administered daily, yet therapeutic regimes are constantly changing, pharmaceutical companies release new and similarly named drugs, and changes in patient demographics imply an increasingly aged patient population with co-morbidities that require more than one medicine (McMullan et al., 2010). Therefore a consistent update of knowledge in this area is clearly of importance.

Health care professionals should improve their knowledge regarding patient safety culture and also improve the quality of their clinical practice (Bagnasco et al. 2011). For example in critical care settings (as in other specific areas of clinical practice) it is important to ensure a high quality of care and patient safety, and this aim is strongly connected to an individual health care professional's knowledge (Baid & Hargreaves, 2015). Results of the Durani et al. (2013) study showed that junior doctors self-evaluated their knowledge about patient safety concepts as high, but more than two thirds of respondents had a low understanding of high reliability organizations and the concepts of active failures and latent conditions.

The solution to how health care professionals' knowledge regarding patient safety may be improved could lie training courses. For example the results of Ahmed et al., (2013) showed that day courses in patient safety theory, root cause analysis and small-group facilitation, significantly improved senior doctors knowledge about patient safety after the course and this knowledge was sustained at an 8 month interval. Alshammari et al., (2015) also suggest practical training programme related patient safety to enhance pharmacovigilance and a drug safety culture. However, training courses are not a stand-alone solution and knowledge of the current status of the patient and the interventions they receive is also a key element in improving safety (Reason 2000).

Professional peer-modeling behaviors and an individual's beliefs about the value of those behaviors in improving patient safety are important predictors of health care workers' patient safety behavior (Wakefield et al., 2010). These findings may help explain the limitations of current knowledge-based educational approaches to patient safety reform. Use of behavioral models when designing future patient safety improvement initiatives may prove more effective in driving the behavioral change necessary for improved patient safety (Wakefield et al., 2010). One way to improve patient safety has been reported to be The Global Trigger Tool (GTT), which aids

health care professionals to develop e.g. the documentation to improve patient safety (Kivekäs et al., 2015). Also, grand rounds, conferences about morbidity and mortality, professional journals and meetings would prominently feature experts on error reduction, health care process, and system design improvement. However, hospitals and clinics need leaders who can guide and lead the implementation of evidence-based practices in patient safety and error reduction, and so begin to generate the next level of knowledge (Reinertsen, 2000).

2.2.2 Health care professionals' attitudes regarding patient safety

The Cambridge dictionary defines attitude as a feeling or opinion about something or someone, or a way of behaving (Cambridge Dictionaries Online, 2015). Healthcare provider attitudes about organizational factors such as safety climate and morale, work environment factors such as staffing levels and managerial support, team factors such as teamwork and supervision, and staff factors such as overconfidence and being overly self-assured are components of an organization's safety culture (Sexton et al., 2006).

One most commonly used instruments by researchers is the Safety Attitudes Questionnaire (SAQ), used by some authors to measure patient safety culture (Devriendt et al., 2012) and also to measure safety-related attitudes concerning teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions and stress recognition (Modak et al., 2007). Teamwork climate may be described as perceptions about the quality of collaboration. Job satisfaction reflects the positive feelings towards work. Perceptions of management involves issues such as the approval of managerial action Safety climate reflects the perceptions of a strong and proactive organizational commitment to safety. Working conditions offers perceptions about the qualitative and supportive dimensions of the work environment, and stress recognition gives confirmation of how the daily activity of workers is influenced by stressors.

A lot of studies have been conducted in various health care settings using the SAQ instrument (e.g. Kaissi et al.., 2003; Modak et al., 2007; Schnall et al.., 2008; Watts et al.., 2010; Li, 2013; Schwendimann et al., 2013) and it is valued as having good psychometric properties in different countries (Sexton et al.., 2006; Deilkas et al., 2008; Poley et al.., 2011; Devriendt et al., 2012; Zimmerman et al., 2013).

In a survey by Modak et al. (2007) measuring safety attitudes, less than half of all health care provider groups attained positive stress recognition scores (positive scores indicate a greater acknowledgement of the effects of stress). Nearly half of nurses (45%) in the study had significantly higher stress recognition scores than medical assistants (20%). Less than half (39%) of the physicians had positive attitudes towards a safety climate, and only 47% physicians and 45% nurses were satisfied with their jobs. Overall, the health care professionals studied (physicians, nurses, medical assistants) had relatively similar, but low perceptions of their working conditions, and these perceptions were lower compared to managers. All of the health care professionals had similar and favourable teamwork climate scores, and comparing health care professional's groups, medical assistants had the lowest whilst managers the highest scores towards teamwork climate. An understanding of nurses' perceptions and expectations regarding adverse events is essential for the implementation of appropriate strategies to manage nursing care. In this sense, registered nurses' beliefs and values as part of the organizational culture are important aspects to be considered (De Freitas et al., 2011).

Researchers have investigated health care professionals' attitudes regarding patient safety (Li, 2013; Aboshaiqah & Baker, 2013; Abdi et al., 2015) and overall found that safety attitudes were positive, although some safety attitude areas were self-evaluated as lower such as Job satisfaction, Teamwork climate, Communication openness and Hospital handoffs and transitions.

Attitudes have been found to be more positive after training, and similar to the improvements of knowledge reported by Ahmed et al., (2013), the same study showed that after a day training course on patient safety, senior doctors' safety attitudes had significantly improved post course and were sustained based on their own evaluations.

2.2.3   Health care professionals' skills for safe patient care

Health care professionals' skills often linked to a high quality of care and patient safety. Most commonly, these are the 'non-technical skills' defined as the cognitive and interpersonal skills linked to delivery of safe care (White, 2012; Gordon et al., 2012) and include communication, team-working, situation awareness, decision-making and problem-solving (Ahmed et al., 2014). Non-technical skills are often referred to interchangeably with the term 'human factors' (Baid & Hargreaves, 2015).

However, research is lacking regarding the patient safety skills of health care professionals, and based on previous literature it was found that further research is needed to know how non-technical skills education can improve patient safety (Gordon et al., 2012).

Authors have highlighted the importance of nurses' skills in their clinical practice especially in critical care settings, and the main goal for nurses is to ensure high quality and safe nursing (Baid & Hargreaves, 2015). The Code of Ethics for Nurses (International Council of Nurses 2006) determines that all nursing professionals should be responsible for the implementation of safe practice in patient care. The most used tools by nurses to enhance patient safety and quality of care centre upon problem-solving and practice development skills (Milligan & Dennis, 2005). In order to ensure patient safety the UK's Nursing and Midwifery Council (NMC) requires nurses to be accountable for their actions and omissions and to use skills which are strongly linked to nurses competency. An example is numeracy which is an important skill used in daily activities related to medication safety (McMullan, Jones & Lea, 2010). In administering any medication, nurses must make a professional decision and apply their safety skills in the existing situation and acting in the best interests of the patient (Ndosi & Newell, 2008). Based on study of McMullan et al., (2010) it might be stated that nurses had poor numeracy skills, as the results of the study showed that both nursing students (55%, 92%) and registered nurses (45%, 89%) failed the respective numeracy and drug calculation tests. Nurses were significantly more skilled than students in performing basic numerical calculations and calculations for solids, oral liquids and injections, and nursing students and registered nurses were significantly skilled in performing calculations for solids, liquid oral and injections, rather than calculations for drug percentages, and drip and infusion rates. As the largest occupational group in the health care system, nurses have an important role in enhancing quality and patient safety by using their safety skills to identify safety problems and implement solutions to improve patients' care, treatment and their health care environment (Milligan & Dennis, 2005).

To enhance medication safety, nurses should develop and build their documentation and informatics skills, and Lavin et al., (2015) have suggested that this might best be achieved by way of continuing education. In addition to the results of the Ahmed et al., (2013) which showed the benefits in knowledge and attitude development following a day training course regarding patient safety, Gordon (2013) declared that after a full or half-day course regarding patient safety, physicians improved their non-technical skills and were more able to recognize sources of

human error. In this respect it seems that even short training courses may well be beneficial.

Based on the literature review, it can be concluded that it is a big challenge for health care professionals to ensure patient safety in complex health care systems. To perform a professional task in their daily activities health care professionals should have a competence consisting of knowledge, attitudes and skills in order to ensure patient safety.

3   The purpose, aim, hypothesis and research questions of the study

The overall purpose of this study was to describe the knowledge, attitudes and skills of health care professionals regarding patient safety and explain their relationships. The aim of the study was to uncover knowledge of the present situation and how knowledge, attitudes and skills are related, in order to have an advanced basis on which to improve the knowledge, attitudes and skills of health care professionals regarding patient safety.

The hypothesis of the study:

1.   The more knowledge health care professionals have about the patient safety, the more positive attitudes and better skills regarding patient safety they have.

The research questions of the study:

1.   What knowledge about patient safety do health care professionals (physicians, head nurses, nurses and nurse assistants) working in hospitals have? (Articles I and II)

2.   What are the attitudes of health care professionals (physicians, head nurses, nurses and nurse assistants) working in hospitals towards patient safety?
(Articles I and III)

3.   What kinds of skills do health care professionals (physicians, head nurses, nurses and nurse assistants) working in hospitals have relating to patient safety?
(Articles I and IV)

4.   How is knowledge about patient safety related to attitudes and skills of health care professionals (physicians, head nurses, nurses and nurse assistants) working in hospitals?
(Summary)

4   Material and methods

4.1   Study Design

The overall study process took place from 2012 to 2015 and was divided into two phases (Table 1):

In Phase 1, a systematic literature review of 18 articles concerning health care professionals' knowledge, attitudes and skills regarding patient safety was undertaken in December 2012. The purpose of this review was to explore how patient safety was defined in previous studies, to identify the methodological characteristics of previous studies on the topic, and also what specific aspects were explored in available empirical studies. The final results guided the concept selection for the Phase 2 research related to the topic, and to find the most useful instruments for carrying out this research. The results are presented and published in Article I.

In Phase 2, a descriptive cross-sectional empirical study was conducted in three regional hospitals in Lithuania, involving all of the health care professionals (n=1082) who worked with adult patients. All regional data was collected in May 2014. The purpose was to identify health care professionals' (physicians, head nurses, nurses and nurse assistants) knowledge, attitudes and skills regarding patient safety, and what kind of associations health care professionals' background factors had with their safety knowledge, attitudes and skills. The results are presented in Articles II-IV and in this summary text.

Table 1. Phases, purposes, time and articles.

Phases	Purpose	Year	Articles
1 **Literature** **review**	To describe how the patient safety was defined in previous studies. To identify the methodological characteristics of previous studies on the topic. To determine what was explored regarding health care professionals' safety knowledge, safety attitudes and safety skills in previous empirical studies.	2012-2014	I
2 **Empirical** **study**	To obtain the knowledge about patient safety held by physicians, head nurses, nurses and nurse assistants. To explore physicians, head nurses, nurses and nurse assistants' attitudes to patient safety. To explore health care professionals' skills regarding patient safety. To explain the connection between knowledge, attitudes and skills related to patient safety.	2014-2015	II, III, IV Summary

4.2   Settings, sample, participants

In Phase 1 (December 2012), a literature search was conducted to find studies connecting health care professionals' knowledge, attitudes and skills regarding patient safety. Overall, 184 studies were found (114 MEDLINE, 70 CINAHL). In the literature selection process, publications in English with an abstract and full-text available, and published between January 2000 and December 2012 were included (Article 1, Fig. 1). Publications that did not consider patient safety, nurses, physicians and nurse assistants were excluded, along with any duplicated literature. 18 publications were included in the systematic literature review, all of which were

quantitative, with the exception of a single study which was mixed-method. The most commonly used instruments in the studies there were questionnaires, and data was mostly collected from nurses and physicians in hospitals, quite evenly amongst European and non-European countries, but mostly from the U.S.A.

For Phase 2, the regional sample was collected in Lithuania in three regional hospitals involving all health care professionals (N=1687) who were working with adult patients. The criteria for including the participants in the research were that they were health care professionals (physicians, head nurses, nurses and nurse assistants), working in health care organizations (hospitals) with adult patients, and would participate voluntarily in the study. The response rate was 64% (n=1082) (Articles II-IV).

The largest group of participants were nurses 69.9% (n=756, including 54 head nurses), the mean participant age was 46.7 (SD=10.9) years, the majority of participants were female 91.4% (n=989), and most common education institutions they had attended were medical school 493 (45.6%), college 130 (12.0%), and a university bachelor programme 118 (10.9%) (Table 2) (Articles II-IV).

Table 2. Characteristics of study participants (n=1082)

Profession, n (%)	
Physician	146 (13.5)
Nurse *	756 (69.9)
Nurse assistant	180 (16.6)
Age, years	
Mean (SD)	46.7 (10.9)
Median age (IQR)	47 (15)
Gender, n (%)	
Male	95 (8.5)
Female	989 (91.4)
Mother tongue, n (%)	
Lithuanian	1018 (94.1)
Russian	62 (5.7)
Other	2 (.2)
Education	
Medical School	493 (45.6)
College	130 (12.0)
University (bachelor)	118 (10.9)
University (master)	84 (7.8)
University (doctoral)	4 (.4)
Other	253 (23.3)

*consisting of nurses and head nurses, later termed collectively as 'nurses'

Most of the health care professionals had many years of work experience (mean= 23.9, SD=11.5), and worked an average of 39.9 hours per week in their working unit (SD=8.2, from 4 to 81 hours). Generally, units had an average of 30.7 (SD=17.3) beds and 24.1 (SD=10.3) staff members. Staff commonly worked variable shifts, with 18.0 (SD=12.03) patients per working shift per health care professional. Of the participants, 62.2% (n=673) had received no information about patient safety during their vocational education, but about half (n=589, 54.4%) had received information during their continuing education. The majority of health care professionals (80% n=866) had reported no patient safety incidents during the last year (Articles II-IV).

4.3   Instruments

In Phase 1, an evaluation of quality was made for all of the selected articles, based on the criteria presented in the Reviewers' Manual produced by the Joanna Briggs Institute (The Joanna Briggs Institute, 2011).

In Phase 2, the data was collected using a questionnaire consisting of four parts: background questions and instruments measuring knowledge, attitudes and skills (Table 3). Twenty-two background questions consisted of the health care professionals' demographic characteristics and work-related background factors (e.g. age, gender, education, work position, place of work, years at work, usual shift, working hours per week, etc.), as well as the information and hours they had spent on patient safety.

Table 3. Instruments for measuring health care professionals' knowledge, attitudes and skills regarding patient safety

	Instrument	Dimensions	Items	Scale
Safety knowledge	Patient Safety Attitudes, Skills and Knowledge (PS-ASK) scale (Schnall et al. 2008)	general knowledge related to patient safety	4	6-point Likert scale (1=Not knowledgeable, 2=A little knowledgeable, 3=Somewhat knowledgeable, 4=Knowledgeable, 5=Very knowledgeable, 6=Not applicable)
	(Robson et al. 2012)	knowledge about the principles of patient safety and about patient safety in the hospital	8	7-point Likert scale (1=Very low level of agreement to 7=Very strong level of agreement)
Safety attitudes	University of Texas Safety Attitudes Questionnaire (SAQ) (Sexton et al. 2006)	teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions, and stress recognition	36	6-point Likert scale (1=Disagree strongly, 2=Disagree slightly, 3=Neutral, 4=Agree slightly, 5=Agree strongly, 6=Not applicable)
Safety skills	Safety Attitudes, Skills and Knowledge (PS-ASK) scale (Schnall et al. 2008)	error analysis, threats to patient safety and decision support technology	13	6-point Likert scale (1=Not competent, 2=Somewhat competent, 3=Competent, 4=Proficient, 5=Expert, 6=Not applicable).

The level of knowledge was investigated using the knowledge scale of the Patient Safety Attitudes, Skills and Knowledge (PS-ASK) instrument developed by Schnall

et al. (2008), consisting of four items measuring health care professionals' general knowledge related to patient safety. An extra eight items taken from the instrument devised by Robson et al. (2012) were used to measure health care professionals' knowledge of the principles of patient safety and their knowledge about patient safety in the hospital setting.

Data used to measure safety attitudes was collected using the University of Texas Safety Attitudes Questionnaire (SAQ) Short Form version, and consists of six scales: Teamwork Climate, Safety Climate, Perceptions of Management, Job Satisfaction, Working Conditions, and Stress Recognition (Sexton et al.., 2006). The SAQ was chosen because of its usability, the good psychometric properties it had shown in previous studies, and its broad scope for implementation (Sexton et al., 2006; Zimmermann et al., 2013).

Skills were investigated using the instrument of Schnall et al. (2008) with thirteen items to measure health care professionals' skills related to patient safety. The scale has three subscales: error analysis, threats to patient safety, and decision support technology.

The instruments were originally developed in the USA and UK, and translated from English into Lithuanian using the back-translation technique described by Burns and Grove (2009). The questionnaire was piloted (N=270) in one regional hospital for the evaluation of the validity of the instruments and their use in a Lithuanian context. The hospital provided outpatient and inpatient health care services, and employed 270 health care professionals. The data for the pilot test was collected from the staff (n=90) in February, 2014. All parts of the questionnaire regarding knowledge, attitudes and skills showed good psychometric properties, thus no changes were needed based on the pilot test. The instruments are not included in the summary as they are copyright protected.

4.4   Data collection

In Phase 1, the literature review search was conducted using MEDLINE and CINAHL databases. Keywords were used in different combinations, including: patient safety, safety, knowledge, attitudes, skills, healthcare professional, healthcare personnel, nurse, nursing staff, physician, head nurse, charge nurse, nursing assistant. The main inclusion criteria was literature which could be classed as peer-reviewed articles and empirical studies, publications in English, published from January 2000

to December 2012, and focused on physicians, head nurses, nurses and nurse assistants (Article I). In all, 18 articles met the selection criteria and were included in the review.

In Phase 2, the data was collected in May, 2014 from three regional hospitals that provided multi-profile, specialized emergency and routine medical care for Western Lithuanian residents. The researcher asked each hospital to nominate one contact person. The researcher took the questionnaires with envelopes directly to the contact person at the beginning of May 2014. The contact person was asked to circulate the questionnaires to all staff. After two weeks, the researcher collected the questionnaires in sealed envelopes from each unit. As not enough responses were received, the researcher left the remind letters for the contact person and asked him/her to circulate them. A further two weeks was given to respond. The researcher then returned to the units to collect the remaining questionnaires. The final response rate was 64% (n=1082).

4.5   Data analysis

In Phase 1, the content of the peer-reviewed articles was analyzed using inductive content analysis. The aim was to analyze the data of previous studies on patient safety connected to health care professionals' knowledge, attitudes and skills. The relevant articles were selected and analyzed in order to increase understanding and existent knowledge regarding patient safety. The purpose of creating categories was to provide a means of describing the phenomenon, to increase understanding and to generate knowledge. At the abstraction stage, subcategories with similarity were grouped together into main categories. Each category was formed and named using content-characteristic words, and in this way a general description of the research topic was formulated (Article I, Table 1).

In Phase 2, data analysis was performed on the empirical data collected, and aimed to explain the connections between health care professionals' knowledge, attitudes and skills regarding patient safety. The hypothesis was tested using the Pearson correlation and significance was achieved at a p value <0.05. Data which related to the characteristics of respondents (physicians, nurses and nurse assistants) and the scale-level results of the three hospitals was analyzed using descriptive statistics. Any negatively worded items in the instruments were reversed before analysis. For data analysis, the units in which the health care professionals worked

were re-grouped as internal medicine (e.g. internal diseases, neurology, cardiology, heart arrhythmia, haemodialysis, nephrology etc.), surgical (e.g. surgery, traumatology), psychiatric (e.g. mental health, treatment of addiction), acute (e.g. resuscitation, anaesthesiology, emergency, operating room, intensive care), and others (e.g. rehabilitation, laboratory, polyclinics etc.) (Articles I-IV).

Data regarding patient safety knowledge, attitudes and skills was analyzed by descriptive statistics (i.e. mean, standard deviation, median, and interquartile range expression), and differences between groups means were estimated using inferential non-parametric statistical tests (i.e. Kruskal–Wallis, Mann-Whitney U test, Cronbach's alpha, Spearman correlation) (Articles II-IV). Additionally, data regarding patient safety attitudes was analyzed by parametric inferential statistics (i.e. one-way analysis of variance (ANOVA), Tukey HSD (honest significant difference) multiple comparison test, or the Tamhane multiple comparison test (when the assumption of equal variances was not correct)) (Article III).

All of the data was analyzed using SPSS (v. 22.0; SPSS Inc., Chicago, IL, USA).

4.6   Ethical considerations

The research was based and carried out in accordance to a multidisciplinary approach to ethics and research in the health sciences. The study design, methods, instruments, ethical considerations, funding, and the researcher's affiliations for both study phases are accurately documented in the summary text and Articles I-IV. All authors, original publications and instruments used in this study are thoroughly cited.

In Phase 1, the systematic review required no special ethics permission. However, the review was carried out in accordance with acknowledged ethical principles: the publications for the study were searched for in the main and official databases used in the University of Tampere, publications were chosen with abstract and full text, only peer-reviewed publications were selected, and only publications with ethical approval to carry out the featured study were included in the review. Ethics consideration was seen as important to ensure the precision and fairness of the publications used in the systematic review analysis (Dickson et al., 2013). The Reviewers' Manual produced by the Joanna Briggs Institute was used to evaluate the quality of selected publications used in the systematic review analysis and to ensure a precise evaluation was conducted, the researcher and two senior nursing professors evaluated the publications (The Joanna Briggs Institute, 2011). All of the selected

publications and supporting sources were accurately referenced in the outputs of the systematic review.

In Phase 2, a statement of ethical approval was requested from the ethical committee of Klaipeda University and was granted (Ethical permission Nr. 46 Sv - SL - 1). Permissions to collect the data from the hospital participating in the pilot phase and the three hospitals participating in the original data collection were also obtained. The ethical considerations related to data collection were focused on the ethical principles for research, confidentiality (related to questionnaires), privacy and voluntary participation in the study, in accordance with the guidelines laid down in the Declaration of Helsinki (2013). Permissions to use the instruments in this study were obtained from the copyright holders of the instruments by the researcher (Brasaite) or the leader of the research group (Suominen), and the instruments had been found to be valid and reliable in previous international studies. Throughout the whole study process, the researcher and co-authors declared that they had no competing interests (Polit & Beck, 2008).

5 Results

5.1 Health care professionals' knowledge regarding patient safety

The literature review in Phase 1 showed that in previous studies, health care professionals' knowledge regarding patient safety had been investigated in the areas of the level of existing knowledge, knowledge deficits and knowledge improvement (Article I). Existing safety knowledge was investigated in three areas: general knowledge related to patient safety, knowledge about the principles of patient safety, and knowledge about patient safety in hospital. Based on previous studies, both good and insufficient safety knowledge level was reported. Deficits of safety knowledge were found in specific issues related to health care professionals' work, and after education/training programmes, their safety knowledge was seen as significantly improved.

Based on the empirical phase (Phase 2), overall, the health care professionals' knowledge regarding patient safety was seen to be at a low level. Safety knowledge was investigated in three areas: general knowledge related to patient safety, knowledge about the principles of patient safety, and knowledge about patient safety in hospital (Article I).

Several background factors were found to be associated with health care professionals' safety knowledge levels. Firstly, nurse assistants had the lowest safety knowledge level compared to physicians and nurses. Health care professionals' general knowledge regarding patient safety and their knowledge about the principles of patient safety correlated negatively with their education, but positive correlations were found with their length of experience in their primary specialty and the length of their work experience in general. Participants of the study who did not receive information about patient safety during their vocational and continuing education had a worse safety knowledge.

There were significant differences (p<0.01) in the knowledge levels between the three hospitals. Health care professionals in Hospital 2 were significantly less knowledgeable than the other two hospitals (Article II).

Overall, health care professionals who reported an incident during the previous year had a slightly higher safety knowledge level than those who did not report.

5.2   Health care professionals' attitudes regarding patient safety

The literature review in Phase 1 showed that based on previous studies, health care professionals' attitudes regarding patient safety were investigated in four main areas: attitudes to patient safety in general, attitudes to contextual issues and procedures, attitudes towards event reporting, and attitudes to an improvement in safety (Article I). In general it was found that health care professionals' had positive attitudes to patient safety. Their attitudes to contextual issues and procedures were found to be positive and health care professionals agreed that clinical protocols and checklists result in better practice, so ensuring patient safety. Health care professionals' attitudes towards event reporting were also positive and they agreed that it was an important part of their job, but were still afraid about punitive consequences. In the area regarding safety attitudes, improvements were found when after health care professionals' had received training they had more positive attitudes to patient safety.

In Phase 2, health care professionals' attitudes regarding patient safety was positive overall. The mean score on all six of the safety attitudes scales was 3.99 (SD=0.84) (scored 1–5, when a score of 5 indicated the most positive safety attitudes). The most positive and very similarly scored safety attitudes related to Job Satisfaction, Teamwork Climate, Safety Climate and Working conditions. Less positive safety attitudes were seen relating to Stress Recognition and Perceptions of Management (Article III).

In the main, positive safety attitudes correlated with most of the background factors analyzed in the study. Attitudes of older aged staff correlated positively with their evaluations of Teamwork Climate, Safety Climate, their Job Satisfaction and their Perceptions of Management. Positive associations were also seen between the length of work experience in general and participants' evaluations regarding their Safety Climate, Job Satisfaction, and their Perceptions of Management. There were significant differences (p<0.001) between health care professionals' safety attitudes scales scores. Furthermore, health care professionals who had received information about patient safety during their vocational and continuing education were negatively associated with their evaluations regarding Teamwork Climate, Safety Climate, Job Satisfaction, Perceptions of Management, and Working Conditions, with the

exception of Teamwork Climate for those who had received information about patient safety in their continuing education. Participants' working regular shifts had negative associations with all safety attitudes areas: Teamwork Climate, Safety Climate, Job Satisfaction, Stress Recognition, Perceptions of Management and Working Conditions. Health care professionals working day shifts had more positive attitudes than those working variable shifts (Article III).

The health care professionals' safety attitudes between working units varied, and they were significantly lower in psychiatric units than internal medicine, surgical, acute or other units. The participants in this study were positive regarding collaboration with physicians and nurses, and also they felt that their suggestions about safety would be acted upon if they expressed them to management (Article III).

There were significant differences (p=0.011) in the safety attitudes among those who had reported or not reported a safety incident during the last year.

5.3   Health care professionals' skills for safe patient care

The literature review in Phase 1 showed that based on previous studies, health care professionals' skills regarding patient safety were investigated in areas of mathematical skills and the achievement of safety skills (Article I). Health care professionals' safety skills that were influenced by their mathematical skills (for example medication administration issues) were found to be poor, compared to their achievement of safety skills. In Phase 2, the health care professionals' skills regarding patient safety were found to be competent overall (mean=2.8, scale from 1 to 5). Based on health care professionals' own evaluations, they were competent in error analysis and had skills to avoid the threats to patient safety, but only somewhat competent in using decision support technology. Some significant differences were found based on the health care professionals' profession and hospital (Article IV).

Safety skills correlated with most of the background factors. The most common correlations were found regarding safety skills scales like error analysis and the avoidance of threats to patient safety. The results showed that health care professionals with a medical school education were more skilled about error analysis and the avoidance of threats to patient safety than those with either a bachelor or college education. Participants with more experience in their primary specialty were more skilled in all of the safety skills scales, but there were negative correlations

found between health care professionals who did not receive information about patient safety in their continuing education, and safety skills such as error analysis and avoiding threats to patient safety (Article IV).

Other background factors such as an increased number of beds per unit and a higher number of patients per working shift negatively correlated with safety skills related to avoiding threats to patient safety, but a positive correlation was found with using decision support technology. According to the analysis, if more personnel work on a night shift, then it makes health care professionals feel more skilled in error analysis and in avoiding threats to patient safety. Some statistically significant differences ($p < 0.05$) were found comparing health care professionals' safety skills and their working units. Differences were found related two safety skills scales relating to error analysis and avoidance of threats to patient safety, and those working in acute units were seen to be more skilled (Article IV).

Comparing health care professionals by the groups who had reported a safety incident during the last year and those who didn't, nurse assistants there were less skilled than physicians and nurses in both groups (Article IV).

5.4   Summary of the results

Health care professionals have both good and insufficient knowledge regarding patient safety (Articles I-II). Safety knowledge deficits are mostly connected with specific issues related to their work, and education or training programmes significantly improved health care professionals' safety knowledge (Article I).

The results of this study confirm results of previous studies, that in general health care professionals have positive attitudes regarding patient safety (Articles I, III). Also they have positive safety attitudes to contextual issues and procedures, to event reporting, and an improvement was found in safety attitudes after health care professionals had received training (Article I). Health care professionals generally evaluated themselves to be competent regarding patient safety (Article IV), and although they had generally poor mathematical skills they evaluated themselves to have achieved a good level of safety skills (Article I).

Several health care professionals' background factors such as their education, length of experience in primary specialty or work experience in general, and the information they had received about patient safety during vocational or continuing education had both positive and negative associations with their knowledge, attitudes

and skills regarding patient safety. Some significant differences were found comparing health care professionals' knowledge, attitudes and skills regarding patient safety by their profession, between hospitals, between working units, and also in relation to whether they had reported safety related incidents during the last year (Articles II-IV).

Based on the empirical phase, health care professionals have a low level of safety knowledge, but positive safety attitudes and they are competent regarding their safety skills. In the study, nurse assistants evaluated themselves to be less knowledgeable and skilled regarding patient safety than physicians and nurses evaluated of themselves (Articles II, IV).

Health care professionals' safety knowledge had significant low and medium associations ($p<0.01$) with all safety attitudes scales i.e. Teamwork Climate, Safety Climate, Job Satisfaction, Stress Recognition, Perceptions of Management and Working Conditions. Areas of general knowledge related to patient safety and knowledge about the principles of patient safety were associated with Teamwork Climate, Safety Climate, Job Satisfaction, Perceptions of Management and Working Conditions. The safety knowledge area regarding patient safety in the hospital was associated with Stress Recognition and Working Conditions (Table 4).

Also, safety knowledge had significant positive associations ($p<0.01$) with all safety skills scales i.e. threats to patient safety, decision support technology and error analysis. Areas of general knowledge related to patient safety and knowledge about the principles of patient safety were associated with threats to patients safety, decision support technology and error analysis. The safety knowledge area regarding knowledge about patient safety in the hospital was associated with threats to patient safety and error analysis (Table 4).

Table 4. Correlations between health care professionals' knowledge and attitudes (beginning with Teamwork Climate and ending with Working Conditions), and skills (beginning with Threats to Patient Safety and ending with Error Analysis), regarding patient safety

	Teamwork Climate	Safety Climate	Job Satisfaction	Stress Recognition	Perceptions of Management	Working Conditions	Threats to patient safety	Decision support	Error analysis
General knowledge of patient safety	.174**	.219**	.120**	-.020	.188**	.156**	.320**	.289**	.368**
Knowledge about principals of patient safety	.243**	.267**	.188**	.003	.141**	.167**	.270**	.160**	.312**
Knowledge about patient safety in hospital	.047	.048	.009	.153**	.015	.079**	.164**	.058	.166**

Pearson Correlations,
** p<0.01.

Safety knowledge had significant positive low and medium correlations with attitudes (beginning with Teamwork Climate and ending with Working Conditions), and skills (beginning with Threats to Patient Safety and ending with Error Analysis), regarding patient safety. Though The Pearson Product-Moment low and medium correlations between the variables indicating statistically significant associations. They note that these are "crude estimates" for interpreting strengths of correlations

using Pearson's Correlation: Medium correlation: .3 to .5 or -0.3 to .5, Low correlation: .1 to .3 or -0.1 to -0.3. [http://www.statisticshowto.com/how-to-compute-pearsons-correlation-coefficients/].

To conclude, the hypothesis of the study with regard to the safety knowledge, attitudes and skills was supported, in that the more knowledge health care professionals have about patient safety, the more positive their attitudes and the better their skills regarding patient safety.

6   Discussion

The overall purpose of this study was to describe the knowledge, attitudes and skills of health care professionals regarding patient safety and to explain their relationships. The aim of the study was to obtain knowledge of the present situation and the relationship of involved issues in order to have an advanced basis on which to improve the knowledge, attitudes and skills of health care professionals regarding patient safety.

6.1   Validity and reliability of the study

In Phase 1, the purpose of the systematic literature review was to study and discuss what is known about health care professionals' knowledge, attitudes and skills regarding patient safety, and to identify any existing gaps of knowledge. In the systematic review, reliability was ensured by conducting the search based on focused research questions (Burns & Grove, 2009). The validity of the study was ensured by adopting a structured search strategy for publications, using inclusion and exclusion criteria, and assessing the quality of the original publication (i.e. its study design, sample, instrument etc.) (Polit & Beck, 2008; The Joanna Briggs Institute, 2014). Publications were systematically selected and analyzed using content analysis as a valid method to ensure specific analysis of the text (Burns & Grove, 2009) (Article I).

In Phase 2, the study was carried out in one region of Lithuania, in three regional hospitals. All of the hospitals' units were included in the study, with the exception of those that specialized in the care of children. The study was performed during the normal working hours of the health care professionals involved. Data was collected in a one month period in all three hospitals, and using all of the instruments simultaneously (Articles II-IV).

The researcher collaborated with a contact person who was designated by the hospitals which participated in this study. The contact person delivered the questionnaires to the study participants, and later collected them in sealed envelopes

and ensured that the researcher had no direct contact with respondents, so as to avoid any undue influence on the investigative process.

The instruments were translated from English into Lithuanian using the back-translation technique (Burns & Grove, 2009). The questionnaire was piloted for the evaluation of the validity of the instruments and their use in a Lithuanian context. All parts of the questionnaire regarding knowledge, attitudes and skills showed good psychometric properties. All of the instruments used in this study have precise scales, which ensured that objective information about health care professionals' attitudes, knowledge and skills regarding patient safety in Lithuania was able to be obtained. However, the contents of the questions regarding safety knowledge and safety skills was quite limited and offered just a general view related to patient safety issues. All of the statistical methods used related to analysis of the study results are presented in Articles II-IV.

The instruments used in this study have showed good psychometric properties in previous studies (Sexton et al., 2006; Schnall et al., 2008; Robson et al., 2012) and all of them were used for the first time in Lithuania, with the exception of the SAQ (Table 3) which was used earlier by the State Health Care Accreditation Agency under the Ministry of Health, but from which no official data was published.

The smallest group of health care professionals which participated in this study were physicians (Table 2), but the response rate was good, and representative of professional groups in descending order - nursing assistants, nurses, and physicians (Article II). The high response rate may be explained by health care professionals' interest in patient safety as a topic, and also that only a few PhD students are conducting studies in nursing in Lithuanian hospitals. However, it is possible that some potential respondents dropped out thinking that their name would be disclosed to hospital management, some may not have been so used to participating in nursing research, and some may not have felt they had enough time to complete the questionnaire.

The reliability of the study instrument may be tested with Cronbach's alpha for both the pilot and main study (Burns & Grove, 2009). The internal consistency of the safety knowledge, safety attitudes and safety skills scales was measured by calculating the Cronbach's alpha for each area (Articles II-IV, Table 3). Safety knowledge scales were assessed with a total Cronbach's alpha of 0.81, corrected by inter-item correlation from -0.137 to 0.749. Safety attitudes scales were assessed with a total Cronbach's alpha of 0.78, corrected by inter-item correlation from 0.05 to 0.69. Safety skills scales were assessed with a total Cronbach's alpha of 0.91, corrected by inter-item correlation from 0.13 to 0.84. The Cronbach's alpha values

were good for the (pilot) and main study for all scales of the instrument, with respective values for general knowledge related to patient safety 0.82 (0.80); knowledge about principles of patient safety 0.80 (0.73); knowledge about patient safety in hospital 0.74 (0.73); Teamwork Climate 0.62 (0.66); Safety Climate 0.74 (0.78); Job Satisfaction 0.87 (0.86); Stress Recognition 0.79 (0.88); Perceptions of Management 0.90 (0.92); Working Conditions 0.74 (0.78); Error Analysis 0.90 (0.82); Threats to Patient Safety 0.66 (0.53); and Decision Support Technology 0.92 (0.91). For both pilot and main studies, the psychometric properties of the study instruments with all scales in a Lithuanian context were good (Articles II-IV).

The amount of questions in an instrument may influence the reliability of the results of the study (Burns & Grove, 2009). The instrument used in this study consisted of 83 questions in total. It could be that the amount of questions and the fatigue of study participants have influenced the reliability of their responses. Also, some of the questions were quite difficult, especially regarding safety knowledge and required participants to read them several times. However, despite the amount and difficulty of the questions, the response rate was good (64%, n=1082).

6.2   Comparison of the research findings with earlier studies

The results showed that there are positive correlations between health care professionals' knowledge, attitudes and skills regarding patient safety. This means that it is important to engage healthcare professionals in all of these fields to ensure patient safety. This finding is also confirmed by other researchers (Allen LaPointe et al., 2003; McMullan et al., 2010; El-Sayed et al., 2010; Arora et al., 2012; Flotta et al., 2012; Robson et al., 2012), in the overall view that with health care professionals, a lack of knowledge, attitudes and skills regarding patient safety have an impact on threats to safety.

The results of the presented empirical study showed that health care professionals had a low level of knowledge regarding patient safety (Article II). This lack of safety knowledge in health care professionals has also been found in previous studies (Allen La Pointe et al., 2003; Ndosi & Newell 2008; Hsaio et al. 2010; El-Sayed et al., 2010; van Gaal 2010; Flotta et al., 2012; Robson et al., 2012; Cicolini et al. 2014; Ullman et al. 2014). In these previous studies, the researchers investigated health care professionals' knowledge regarding patient safety in specific working areas, and separately for either physicians and nurses or both in the same study. However, data

is missing which considers the safety knowledge of nurse assistants. Thus, the present study was focused on the general patient safety knowledge of all health care professionals - physicians, nurses and nurse assistants. Despite the variation in patient safety areas which have been investigated, researchers still detect gaps in health care professionals' knowledge regarding patient safety. The results show that health care policymakers and hospital managers should be aware about gaps in health care professionals' patient safety knowledge and involve and engage them in related continuing education. Educators should be more focused on study curricula and continuing education courses regarding patient safety, so as to ensure that the quality of courses/education and practical training is focused on evidence-based practice.

Health care professionals' attitudes to patient safety were found to be positive in the present study (Article III). Similar results have been found by other researchers (e.g. Nilsson et al., 2010; Robson et al., 2012; Uddin et al., 2012). However, in the present study and in previous studies (Wisniewski et al., 2007; Schwendimann et al., 2013; Bondevik et al., 2014), despite positive safety attitudes being reported, there are variations in how health care professionals evaluated their attitudes in different dimensions regarding patient safety, and safety attitudes towards stress recognition and perceptions of management were the lowest evaluated, based on health care professionals self-evaluations. In the present study health care professionals' safety attitudes relating to job satisfaction were evaluated as highest, and participants were satisfied with their job, but at the same time still experiencing stress. This might be connected to their perceptions of management which were the lowest evaluated dimension in this study. Despite health care professionals liking their job, they feel stress because they perceive they are lacking support from their hospital or unit management. Schwendimann et al. (2013) found the same results regarding health care professionals' safety attitudes towards their perception of management and explained that study participants think that their unit management does not have enough ability to lead their unit effectively and that management do not have much concern for the well-being of their workers and patients.

While the attitudes were positive, we may think that at least to some extent everybody is aware of safety issues. But when health care professionals do not actually report or do not report enough it means something wrong is with the system. It is a reflection how the system is working. Conclusions are hard to make while global data of reports is not available.

All the studies mentioned above were focused on physicians' and nurses' attitudes regarding patient safety, but in the present study nurse assistants were included and their attitudes towards patient safety were also evaluated as positive.

In this study, health care professionals were found to be competent regarding patient safety (Article IV). Based on their evaluations, a minority of health care professionals' evaluated that they had very good safety skills and they were proficient or expert. There is the lack of studies regarding health care professionals' safety skills, and also there are no studies about the skills of nurse assistants. It might be that investigating safety skills is a big challenge for researchers, hospital managers and health care professionals. Studies like this are very costly, time consuming, and present difficulties in providing robust evidence. The results of the present study showed that there are still areas regarding patient safety to explore, and if such data is to be recorded and analyzed, it should be noted that health care professionals in the present study demonstrated only a somewhat competent level of safety skills relating to decision support technology. So, educators should focus more on continuing education courses regarding patient safety, ensure that the quality of these courses/education is of a suitable level, and also include not only theoretical, but also practical training. Researchers studies have suggested to improve health care professionals' safety skills by way of continuing education and they have presented evidence that short one-day courses may significantly improve health care professionals' skills regarding patient safety (Ahmed et al., 2013; Lavin et al., 2015). Compared to many other European countries, in the current Lithuanian health care system there is a lack of possibility for health care professionals to use computer-based technologies in daily practice. Especially, there is still a lot of paper documentation used in hospitals which is time consuming for the health care professionals', and means less time for the patient, and less time for patient safety. Lavin et al. (2015) have expressed that nurses should pay more attention to their documentation and informatics skills, and that it is an important factor involved in enhancing medication safety.

In the study, it was seen that the more knowledge that health care professionals working in hospitals had about the patient safety, the more positive attitudes and better skills regarding patient safety they had. It seems that interventions in knowledge areas regarding patient safety would compel health care professionals to perform better in practice, and also to understand that to act successfully in their job they should have a competence which is derived from their knowledge, attitudes and skills. With enough safety knowledge, health care professionals may strive to develop positive safety attitudes and skills, because they have sufficient knowledge of how they should act in practice and how they should act to ensure patient safety. A previous study (Ahmed et al., 2013) also investigated health care professionals' safety knowledge, attitudes and skills, these were assessed pre and post course. The results

showed that even a short, half-day training course in patient safety significantly improved senior doctors' safety knowledge, and also their self-reported skills and attitudes.

As it was expected health care professionals with more knowledge about patient safety, the more positive their attitudes and the better their skills regarding patient safety they had, thus confirming a hypothesis. These results support the evidence that in order to ensure patient safety, health care professionals should have good knowledge, positive attitudes and good skills regarding patient safety. Also it confirms that it is important to investigate safety knowledge, attitudes and skills together.

6.3   Conclusions

This study was the first research undertaken to describe the knowledge, attitudes and skills of health care professionals regarding patient safety in a Lithuanian context, and more broadly in the Baltic Sea Region. A systematic review of the main literature on the existing knowledge regarding health care professionals' knowledge, attitudes and skills in patient safety has also been conducted. Based on this existing knowledge and the regional evidence, this study offers new important information about health care professionals' general knowledge, attitudes and skills regarding patient safety. As such, it adds valuable information to the current research corpus, and builds a much needed foundation on which hospital managers may develop their strategies for patient safety improvement.

Attitudes related to patient safety issues were seen as positive among health care professionals. It thus opens the door for open discussion of how to further develop the knowledge and skills of health care professionals, and which differ based on several background factors. Overall, health care professionals who reported an incident during the previous year and those who did not, had a variation in their knowledge, attitudes or skills related to patient safety issues, and so this particular area may warrant further attention.

6.4 Implications for practice, management, education and research

This study offers the following implications for practice, management, education and future research.

Implications for practice and management:
- While all health care professional groups had gaps in their knowledge of patient safety issues, this challenges managers to create opportunities for staff to update their knowledge and skills regarding patient safety in their working area.
- Nursing assistants should be supported in becoming more familiar with patient safety issues, especially as their role requires them be near patients in daily clinical practice.
- Differences between regional hospitals of the same level area urges managers to develop patient safety issues with an aim of guaranteeing equally safe health care services.
- It is important to focus on creating a working climate which supports incident reporting.

Implications for education:
- Health care professionals should have opportunities for continuing education, especially training which is evidence-based.
- Health care professionals should have opportunities to participate in multi-professional training during their vocational education, in order to achieve a common basic understanding of patient safety issues.

Implications for research:
- While this study gives a general view of patient safety related knowledge, attitudes and skills, more specific information of these areas is needed.
- Studies are required that focus on the specific safety knowledge and skills areas required by different professional groups like physicians, head nurses, nurses, and nurse assistants.
- For future research may also investigate which kind of work-place cultures, management and e-health solutions can enhance the patient safety competence of health care staff.

- For future research it is important to study more the incident reporting system in terms catching incident and safety concerns.

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Klaipeda, 12.05.2016

Indre Brasaite

9   Original publications

Healthcare professionals' knowledge, attitudes and skills regarding patient safety: a systematic literature review

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Healthcare professionals' knowledge, attitudes and skills regarding patient safety: a systematic literature review

The purpose of this literature review was to determine the extent of existing knowledge about healthcare professionals' knowledge, attitudes and skills related to patient safety. A systematic review was performed using two electronic databases: MEDLINE (Ovid) and CINAHL (EBSCO) for the period 2000–2012. The inclusion criteria were peer-reviewed articles or empirical studies, published in English. The focus groups of the study were physicians, head nurses, nurses and nurse assistants. Altogether, 18 studies met the criteria and were included. Inductive content analysis was carried out to analyse and categorise the data. The investigated themes regarding healthcare professionals' knowledge of patient safety were their existing knowledge level, knowledge deficits and knowledge improvement. Results considered the target groups' overall attitudes to patient safety, attitudes to event reporting and safety attitude improvement. The investigations into healthcare professionals' skills included mathematical skills and those related to achieving patient safety. From this review, it is concluded that further research should be conducted into the investigation of healthcare professionals' knowledge and skills in patient safety.

Keywords: patient safety, knowledge, attitudes, skills, literature review.

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Introduction

Patient safety is one of the most prominent healthcare challenges worldwide. For improving health care it is important to share the responsibility for patient safety between patients, healthcare providers and those researching the area (1, 2). Evidence suggests that patients are often unintentionally injured as a consequence of their treatment (3). Patients arrive in the healthcare system trusting that the system will not harm them, but this may not always be true (4). Studies worldwide have shown that approximately 10% of hospital admissions involve an adverse incident in acute hospital settings, and around one-third of these lead to disability or death (5). However, at least half of these adverse incidents are judged as preventable when ordinary standards of care are followed (3).

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The World Health Organization (WHO) defines patient safety as "the absence of preventable harm to a patient during the process of health care" (6), while others have similarly defined patient safety as being the freedom from accidental injury caused by medical care, which further translates to medical error (7). Patient safety is the reduction in the risk of unnecessary harm associated with health care, to an acceptable minimum (8). Healthcare-associated harm is harm arising from or associated with plans or actions taken during the provision of health care, rather than that associated with an underlying disease or injury (8). Patient safety is also often referred to as a safety climate or safety culture (9).

Ensuring patient safety is a constant concern of Registered Nurses (RNs) and other healthcare professionals (10). Measuring and improving safety attitudes among providers is an important strategy for promoting a safe environment for patients (11). For example, nursing care is seen as vital in the delivery of safe care (12). Properly prepared nurses with their knowledge, attitudes and skills are needed to improve patient safety and to ensure quality of patient care and decrease morbidity and mortality

rates (13). Increasingly, as the WHO recommendations for patient safety (6) are implemented, newly qualified physicians will enter the workplace with a grounding in patient safety concepts and most health service providers will attempt to reinforce this within their programmes.

The growing need to equip clinicians with the knowledge, attitudes and skills to improve patient safety has stimulated research efforts to develop training interventions both for medical students (14, 15) and healthcare professionals (16, 17). In response to the growing recognition of the importance of patient safety, there is an increase in researchers who are interested in nursing students' knowledge, attitudes and skills, related to the area (13). Some schools of nursing have initiated a set of curricular innovations to increase patient safety competencies and the inclusion of patient safety modules in medical school curricula has also been advocated (18). Simultaneously, validated tools have been developed to assess levels of knowledge, attitudes and skills within the student body, for example (19, 20). Lesser focus has, however, been given to evaluating the level of safety knowledge, attitudes and skills of qualified healthcare professionals.

The purpose of this literature review was to determine the scope and extent of existent knowledge regarding patient safety, specifically related to healthcare professionals' knowledge, attitudes and skills in patient safety, and aimed to provide a focus for future patient safety studies. The review focused on the following research questions:

1 How has the concept of patient safety been defined in studies focusing on healthcare professionals' knowledge, attitudes and skills pertaining to the area?
2 What were the methodological characteristics of previous empirical studies on the topic?
3 What areas have been investigated in relation to:
  3.1 Professionals' safety knowledge.
  3.2 Professionals' safety attitudes.
  3.3 Professionals' safety skills.

Materials and methods

This systematic review focused on healthcare professionals, namely physicians, head nurses, nurses, nurse assistants. It specifically looked to evaluate empirical research on healthcare professionals' patient safety knowledge, attitudes and skills.

Database searches

A systematic literature search was conducted using MEDLINE (Ovid) and CINAHL (EBSCO) electronic databases for the period 2000–2012. Literature from 2000 onwards was chosen because of the need to review recent and contemporary empirical research connected to healthcare

professionals' knowledge, attitudes and skills related patient safety, available in the nursing literature corpus. The search was performed using the following key words in various combinations: patient safety, safety, knowledge, attitudes, skills, healthcare professional, healthcare personnel, nurse, nursing staff, physician, head nurse, charge nurse, nursing assistant. The inclusion criteria were peer-reviewed articles and empirical studies, published in English between January 2000 and December 2012, and focused on physicians, head nurses, nurses and nurse assistants. Exclusion criteria were nonempirical studies (editorials, letters, conceptual papers); duplicate texts; material published in a language other than English; and studies connected to nursing students, medical students and other nonmedical specialties. In total, 184 studies were identified through the initial search. After reviewing 107 abstracts and a further review of 37 full-text articles, a total of 18 studies were identified that met the inclusion criteria (Fig. 1).

Retrieval and analysis

Firstly, the titles of the articles were read and titles that corresponded to the research questions, and search terms were retrieved. The abstracts were studied according to the inclusion criteria with regard to patient safety research, participants and results. Those abstracts considered relevant to the research questions were retained, and the full-text papers retrieved for further review. After proper examination of the full texts, a list of included and excluded studies was compiled.

The evaluation of quality for all selected articles (n = 18) was made by the first author, based on the criteria presented in the Reviewers' Manual produced by the Joanna Briggs Institute (21). Two senior nursing scholars (professors) independently re-evaluated the quality of the articles and the evaluations were compared. In case of disagreement, a new evaluation was conducted, and based on discussions, a consensus was achieved. Nine evaluation criteria were used for descriptive quantitative and qualitative studies, and ten used for randomised control trials. The scale used was as follows: *yes*, *no*, *unclear* and *not applicable*, to questions such as "Were the criteria for inclusion in the sample clearly defined?" The articles met the criteria with possible total scores ranging from 1 to 8 (the total number of "yes" responses), and the median for the evaluated articles was 5. Based on the specified criteria, however, the evaluation might not be applicable if the criteria were not relevant. This was, for example, the case regarding the criterion: "Was follow-up carried out over a sufficient time period?" – here, the criterion was deemed not applicable if no follow-up study was reported in the study under evaluation (21). Though only 18 relevant texts were found, all were accepted for this analysis
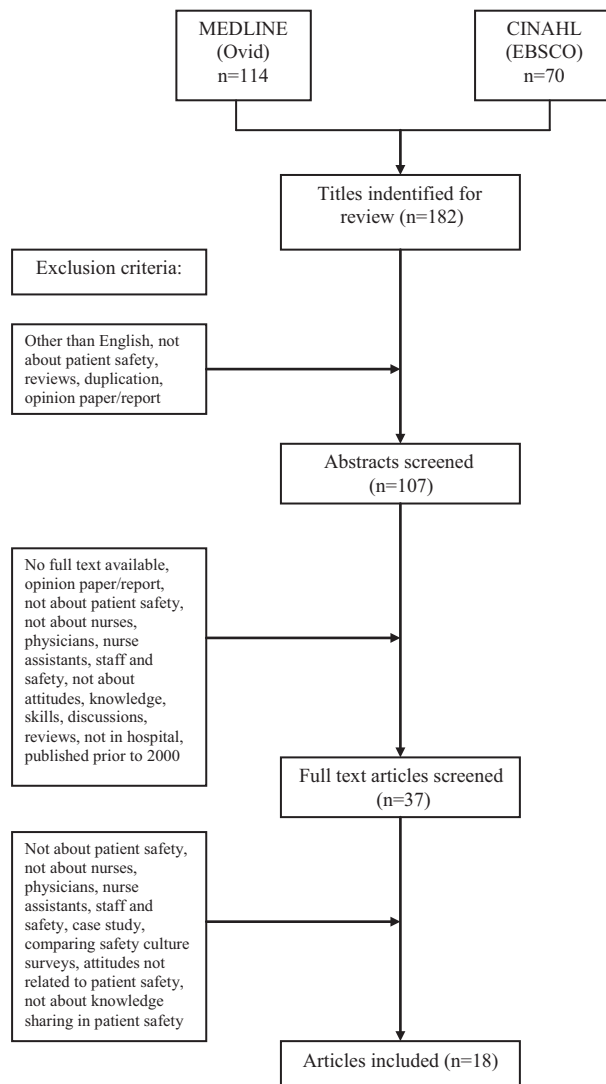
Figure 1 Publication selection process.

which aimed to establish the direction of previous studies.

The selected articles were subjected to further analysis. The analysis of the methodological characteristics of the empirical studies included the country of origin, purpose, sample, study design (Table 1) and the instrument used (Table 2). The content of the articles was analysed using inductive content analysis (22), and full texts of the selected articles were read to organise the qualitative data. This process included open coding, the creation of categories and abstraction. At the open coding stage, notes and headings were written in the text to describe all aspects of content which related to a healthcare professional's knowledge, attitudes and skills which related to patient safety. After open coding, lists of categories were grouped under higher order headings. The purpose of creating categories was to provide a means of

describing the phenomenon, to increase understanding and to generate knowledge. At the abstraction stage, sub-categories with similar events and incidents were grouped together into main categories. Each category was named using content-characteristic words and in this way, a general description of the research topic was formulated.

Results

Defining patient safety

All except two of the scientific articles lacked any specific definition of the concept of patient safety. In these papers, the definition of patient safety was presented and defined differently, either as a safety climate or culture of safety (23) or descriptively, where patients in healthcare settings achieve their intended outcomes (24) (Table 1).

Methodological characteristics

The majority of the studies on patient safety identified by this review were conducted in the USA (n = 6), the UK (n = 3), the Netherlands (n = 3) and Taiwan (n = 2). Single studies had also been conducted in other countries (Table 1).

The majority of the studies explicitly aimed to identify attitudes (n = 9) and knowledge (n = 4), whilst only two aimed to identify skills (n = 2) connected to patient safety. Some studies (n = 3) aimed to identify both knowledge and attitudes (25–27) (Table 1). All of the studies were quantitative; however, one study (28) also had a qualitative dimension. The sample size of the studies ranged from 9 subjects (28) to 1361 (29). Mostly, participants were nurses (anaesthetic nurses, operating room nurses, nurse assistants, Registered Nurses, home nurses and certified nurse midwives) and physicians (surgeons, anaesthesiologists, respiratory therapists and registrars). Managers, pharmacists, technicians, employees in blood transfusion services, quality assurance staff, supervisors, managers and directors of transfusion medicine (or equivalent) also participated in the studies (Table 1).

Patient safety connected with knowledge, attitudes and skills has been investigated using different study designs. The majority of studies (n = 11) had a quantitative cross-sectional design, and some (n = 6) had a longitudinal design. One study was a cluster randomised trial (30), and one study included both a quantitative and qualitative approach (28). Various questionnaires, scales, tests and interviews were used. Eighteen studies measured patient safety-related knowledge, attitudes and skills by means of various instruments (Table 2). Safety knowledge was measured in different ways (n = 6), including existing questionnaires and instruments created using

Table 1 Summary of studies researching healthcare professionals' knowledge, attitudes and skills of patient safety

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
1. Allen LaPointe et al. (40), U.S.A.	To assess healthcare practitioners' knowledge of the QT interval and medications that may prolong it	From a total of N = 334 survey respondents, N = 157 (47%) were physicians; N = 271 (81%) stated that cardiology was their area of specialisation	Cross-sectional descriptive study	Not defined	Most (86%) said they would check an electrocardiogram (ECG) before and after starting QT-prolonging medications, less than half (42%) of all and 60% of physicians were able to accurately measure a sample QT interval. Less than two-thirds (63%) of all were able to accurately identify possible QT-prolonging medications, while half (51%) could accurately identify medication combinations that might prolong the QT interval. Significant knowledge deficits regarding the QT interval and QT-prolonging medications were identified	3
2. Kaissi et al. (31), U.S.A.	To measure teamwork and patient safety attitudes	N = 261 nurses, N = 89 from operating room (OR), N = 42 from emergency department (ED), N = 103 from intensive care unit (ICU), N = 27 neglected to identify their department	Cross-sectional descriptive study	Not defined	Respondents valued teamwork as an important competency with respect to patient safety. However, respondents reported 'reservations about raising patient safety issues with team leaders', confusion around team leadership roles, little emphasis placed on teamwork, too little input into patient care decisions, and dispute resolution that was not focused on patient interests	5
3. Nabhan & Ahmed-Tawfik (23), Egypt	To measure attitudes of health personnel towards patient safety, and to determine how the concept of patient safety varies between maternal health centres and types of healthcare personnel	35 primary health centres in three governorates in Egypt. The subjects comprised all managers n = 37, physicians n = 189, nurses n = 234, pharmacists n = 68, and technicians n = 72	Cross-sectional descriptive study	The concept of patient safety, sometimes referred to as the 'safety climate' or the 'culture of safety'	The overall mean for all questions and respondents was 3.89 ± 0.59 (scale 1–5). The safety climate mean was 3.64 ± 0.67. The percentage of respondents viewing the safety climate as positive was 36%. Only 7% of respondents had received feedback after the referral of a case of severe pre-eclampsia	5

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
4. Sorra et al. (34), U.S.A.	To assess transfusion service staff attitudes about how they view issues pertaining to event reporting and patient safety	N = 945 transfusion service staff (line staff, quality assurance staff, supervisors, managers, directors of transfusion medicine) from 43 hospital transfusion services in the US and 10 in Canada. The overall response rate was 73% (645 out of 945)	Cross-sectional descriptive study	Not defined	While events resulting in patient harm are reported (91%) as well as mistakes not corrected that could cause harm (79%), less than one-third of respondents reported deviations from procedures with no apparent potential to harm (31%) and mistakes that staff catch and correct on their own (27%). Staff indicated that the main reasons mistakes happen are interruptions (51%) and staff in other departments not knowing or understanding proper procedures (49%). Staff had overall positive attitudes about event reporting, but a significant minority were afraid of punitive consequences. Most were positive about their supervisor's safety actions and believed that their transfusion service tried to identify the causes of mistakes. Only 31% however, agreed that nursing staff would work with the transfusion service to reduce mistakes	2
5. Nilsson et al. (35), Sweden	To evaluate personnel attitudes within operating departments towards preoperative checklist 'time out', 1 year after its implementation. Also the attitudes of the staff towards the World Health organisation (WHO) checklist, 'sign-out,' were assessed	N = 331 in total. 147 surgeons, 30 anaesthetists, 63 anaesthetic nurses, 44 operation nurses and 47 nurse assistants. (Operating departments)	Cross-sectional descriptive study	Not defined	93% responded that 'time out' contributes to increased patient safety. 86% respondents thought that 'time out' gave an opportunity to identify and solve problems. Confirmation of patient identity, correct procedure, correct side and checking of allergies or contagious diseases were considered 'very important' by 78–84% of respondents. Attitudes to the checking of patient positioning, allergies and a review of potential critical moments were positive but differed significantly between professions. Attitudes to a similar checklist at the end of surgery were positive and 72–99% agreed to the different elements	4

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
6. Jeffs et al. (28), Canada	To provide a description of the design, implementation, and evaluation of a research capacity strategy designed for clinical nurses and the lessons learned	11 (N = 21) Nursing Research Advancing Practice (Nursing RAP) teams, N = 9 Nursing RAP participants	Longitudinal survey	Not defined	Nursing RAP participants described newfound confidence in their ability to bridge the gap between research and clinical practice to provide safer care to their patients. A key finding around the pivotal role of the supportive network identified by the Nursing RAP participants, adds to a smaller body of literature on research capacity strategies in patient safety. Another outcome of the Nursing RAP was the development of a critical mass of nurses who were viewed as role models by their nursing colleagues	1
7. McMullan et al. (38), UK	To report a correlational study of the relations of age, status, experience and drug calculation ability to the numerical ability of nursing students and Registered Nurses.	Second year nursing students (N = 229) and Registered Nurses (RN) (N = 44)	Cross-sectional descriptive study	Not defined	The numeracy test was failed by 55% of students and 45% of RNs. 92% of students and 89% of nurses failed the drug calculation test. Independent of status or experience, older participants (≥35 years) were statistically significantly more able to perform numerical calculations. Nurses were statistically significantly more able than students to perform basic numerical calculations and calculations for solids, oral liquids and injections. Both nursing students and RNs were statistically significantly more able to perform calculations for solids, liquid oral and injections than calculations for drug percentages, drip and infusion rates	6

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Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
8. El-Sayed et al. (41), U.S.A.	To evaluate the knowledge base of hospital staff regarding emergent airway management of tracheotomy and laryngectomy patients, and the impact of the introduction of a bedside airway form	A total of N = 200 physicians, nurses, and respiratory therapists. Participated in the first survey, while a fewer number of caregivers (N = 144) participated in the postintervention survey	Prospective longitudinal survey	Not defined	Pre- and postintervention surveys revealed several knowledge deficits. Preintervention, 37% of medical internists and 19% overall did not know that laryngectomy patients cannot be orally ventilated, and 67% of internists could not identify the purpose of stay sutures in recently created tracheotomies. Postintervention, these numbers improved for all groups. 80% of respiratory therapists reported encountering the Emergency Airway Access (EAA) form in an emergent situation and found it useful	5
9. van Gaal et al. (30), The Netherlands	To describe the effect of interactive and tailored education on the knowledge levels of nurses	In hospitals, nurses (N = 503, 72%) and in nursing homes (N = 234, 63%) nurses returned the knowledge test	Cluster randomised trial	Not defined	The mean difference between the intervention and the control group in hospital nurses' knowledge on the prevention of three adverse events was 0.19 points on a zero to ten scale (95% CI: 0.03–0.42), in favour of the intervention group. There was a statistically significant effect on knowledge of pressure ulcers, with an improved mean mark of 0.45 points (95% CI: 0.10–0.81). For the other two topics there was no statistically significant effect. Nursing home nurses' knowledge likewise did not improve (0 points, CI: −0.35–0.35) overall, nor for the separate subjects	7
10. Watts et al. (29), U.S.A.	To report an attempt to use the Safety Attitude Questionnaire as an outcome measure for a patient safety implementation project	N = 674 Registered Nurses (RNs) before and n = 503 after training, N = 687 physicians before and n = 213 after training	Longitudinal survey	Not defined	Of the 63 Veterans Affairs (VA) hospitals that received medical team training, 26 showed changes in the staff 's attitude as measured by the Safety Attitudes Questionnaire. Improvement was most common in the perceptions of management" domain. There was no correlation between survey response rate and measured improvement	5

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
11. Jansma et al. (37), The Netherlands	To examine the effect of a two-day patient safety course on the attitudes, intentions and behaviour concerning the voluntary reporting of incidents	Specialty registrars (N = 33)	Longitudinal survey	Not defined	The response rate at all three points in time assessed was 100% (n = 33). There were significant changes in incident reporting attitudes and intentions immediately after the course, as well as during follow-up. However, no significant changes were found in incident reporting behaviour.	3
12. Poley et al. (32), The Netherlands	To measure the safety climate in own unit, compare it with benchmarking data, and identify potential deficiencies.	In 2006, 89 staff members were asked to complete the Safety Attitude Questionnaire (SAQ): 71% (n = 63) were nurses and 20% (n = 18) were physicians. In 2007, these numbers were 76% (n = 73) and 15% (n = 14), respectively	Prospective longitudinal survey	Not defined	Mixed findings regarding the difference between physicians and nurses: on three scales (teamwork climate, safety climate, stress recognition), physicians scored better than nurses at both times. On another two scales (perceptions of management and working conditions), nurses consistently had higher mean scale scores. Probably due to the small number of physicians, only some of these differences between physicians and nurses were statistically significant. Compared to benchmarking data, scores on the perceptions of management were higher than expected (p < 0.01), whereas scores on stress recognition were low (p < 0.001). The scores on the other scales were somewhat above (job satisfaction), close to (teamwork climate, safety climate), or somewhat below (working conditions) what was expected on the basis of benchmarking data, but no persistent significant differences were observed on these scales	6

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
13. Uddin et al. (36), U.S.A.	To compare obstetrical providers' attitudes towards clinical protocols and the Johns Hopkins Oxytocin Protocol (JHOP)	Registered nurses (RNs, N = 57), physicians in training (PITs, N = 28), including both residency and fellowship trainees, attending physicians and certified nurse midwives (Aps/CNMs, N = 30) (labour and delivery unit)	Cross-sectional descriptive survey	Not defined	Agreement by RNs, physicians in training (PIT), attending physicians (APs) and certified nurse midwives (CNMs) was assessed with each of 4 attitudinal statements regarding whether clinical protocol and JHOP use result in better practice and are important to ensure patient safety. Odds of agreement with the JHOP being important to ensure patient safety were lower for the AP/CNM group compared with the RN group. Clinical protocol use is generally well received by obstetrical providers; however, differences exist in provider attitudes towards the use of an institutional oxytocin protocol. Fewer PIT and AP/CNM groups agreed with this statement compared with the RNs'	5
14. Arora et al. (27), UK	To develop and evaluate comprehensive but pragmatic safety skills course for surgical trainees to include safety awareness skills, safety analysis skills, safety improvement skills, alongside a robust package for its evaluation	Surgeons (N = 27)	Longitudinal survey	Not defined	Knowledge of safety improved significantly after the course (mean pre = 45.26% vs mean post = 70.59%, $p < 0.01$) as did attitudes to error analysis and improving safety (mean pre 3.50 vs mean post 3.97, $p < 0.001$) and ability to influence safety (mean pre 3.22 vs mean post 3.49, $p < 0.01$). After the course, participants reported richer, detailed sets of observations demonstrating enhanced understanding, recognition, and analysis of patient safety issues in their workplace	4

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
15. Robson et al. (25), UK	To develop, content validate and pilot test an online questionnaire survey to elicit foundation doctors' knowledge and experience of patient safety and incident reporting, and assess related attitudes and behaviours	FY1 doctors (N = 27) and FY2 doctors (N = 46) (foundation year 1 (FY1) and 2 (FY2) doctors)	Cross-sectional descriptive survey	Not defined	The majority responded positively (scored ≥4 on a 7-point semantic differential rating scale) to questions measuring knowledge about patient safety. All felt that reporting patient safety incidents is worthwhile, and the majority indicated that it is an important part of their job. All admitted to previously being involved in some type of medication incident or error. A prescribing error was cited as the most common type of medication incident among both groups of foundation doctors. A minority (29%) indicated that this incident had been formally reported. A range of communication errors was reported, of which 12% had been formally notified using local systems	5
16. Flotta et al. (26), Italy	To investigate physicians' knowledge about evidence-based patient safety practices, their attitudes on preventing and managing medical errors and to explore physicians' behaviour when facing medical errors	Physicians (N = 696)	Cross-sectional descriptive survey	Not defined	Physicians' knowledge of evidence-based safety practices was inconsistent. More than counting surgical items during an invasive surgical procedure represented a patient safety practice. Positive attitudes about patient safety were revealed by responses, but 44.5 and 44.1% respectively agreed with or were uncertain about the disclosure of errors to the patients. The pattern of behaviour showed that 7.6% of physicians reported to having never been involved in medical errors. Among system failures, overwork, stress or fatigue of health professionals" was the most highly rated item	5

Table 1 (Continued)

Author(s), country	Purpose of the study	Sample	Study design	Definition of patient safety	Main results	Evaluation
17. Chang et al. (24), Taiwan	To report a study that empirically examined the influence of social capital on knowledge sharing, and the impact of knowledge sharing on patient safety.	RNs (N = 919)	Cross-sectional study	Patient safety refers to the concept that patients in healthcare settings are achieving intended outcomes Berland et al. (45)	Based on a large-scale survey, empirical results indicate that RNs' perceptions of trust and shared vision have statistically significant and direct effects on knowledge sharing. In addition, knowledge sharing is significantly and positively associated with patient safety	4
18. Li (33), Taiwan	To use the structural equation model (SEM) to delineate the complex interrelationships among teamwork climate and safety attitudes among the nurses in a local county hospital in Taiwan	Nurses (n = 407) and physicians (n = 76) 58 of them physicians, 11 – residents and 7 interns.	Cross-sectional survey	Not defined	Nurses had lower scores on Team Structure, Communication, and Situation Monitoring than physicians. A structural equation model demonstrated a positive association between teamwork climate and safety attitudes (β = 0.78, p < 0.01). Teamwork climate is the most important determinant for patient safety attitudes among nurses	5

Table 2 Instruments used in the studies on patient safety regarding knowledge, attitudes and skills

Article	Instrument	Author and year	N of items	Sub-concepts, content
1.	Questionnaire developed for this study	By authors 2003	3 general information questions, 7 questions on the QT interval. The remaining questions were multiple choice questions	To identify knowledge deficits related to the QT interval.
2.	Teamwork and Safety Attitudes Questionnaire (SAQ),	Sexton et al. (46)	14 items 4-point Likert scale	Nurses' opinions regarding the anaesthetist team (nurse, primary physician, surgeon, anaesthesiologist, resident, healthcare technician, pharmacist, health unit coordinator (HUC), etc.) are defined as all the personnel necessary to successfully and safely care for the patient during his/her stay
3.	Trainee Entry Questionnaire for the Geriatric Interdisciplinary Team Training Program	The John A. Hartford Foundation (47)	10 items 5-point Likert scale	Personal perception of the quality of collaboration and communication.
	Safety Climate Survey	Sexton et al. (48)	19 items 5-point Likert scale	Perceptions of primary health centres (PHCs) commitment to patient safety. Error reporting and understanding of systems as the cause of errors
	Second part of the questionnaire developed for this study	By authors 2007	Frequency and percentage	Data regarding to adherence to management guidelines for pre-eclampsia
4.	Questionnaire developed for this study	By authors 2008	79 items assessed 13 dimensions pertaining to event reporting and safety culture 6-point Likert scale or frequency	Measurement of transfusion safety and event reporting dimensions.
5.	Questionnaire developed for this study to assess the 'time out' preoperation checklist	By authors 2009	8 questions A numerical value: very important = 4, important to some degree = 3, probably not important = 2, of no importance = 1	Personnel attitudes towards 'time out' and the different aspects of preoperative checklist ('time out') in order of their importance in contributing to an increased patient safety

Table 2 (Continued)

Article	Instrument	Author and year	N of items	Sub-concepts, content
6.	BARRIERS to Research Utilization Scale Focus group interviews	Funk et al. (49)	29-item scale, 1–5 (1 no barrier to 4 great extent a barrier and 5 no opinion) The content analysis by Ryan and Bernard	Measuring barriers to participating in research both pre- and post-Nursing Research Advancing Practice (RAP) intervention. Experiences and perceptions of participating nurses associated with Nursing RAP
7.	Numerical ability test	McMullan et al. (38)	Test: 15 questions with various marks per question. The total score ranges 0–22.	Covers the main key calculation skills (addition, subtraction, multiplication, division, fractions, decimals, percentages and conversions)
	Drug calculation ability test		Test: 20 questions. Scores 0–20 points. For analysis, the scores were converted into percentages, range 0% to 100%.	Covering the main types of drug calculations: calculating doses for solid and liquid oral medications and injections, percentage solutions and intravenous fluids
8.	Preintervention Survey	By authors 2004	6 questions	Assessing knowledge of emergency airway access
	Postintervention Survey		New survey included all previous 6 airway related questions and 4 additional	Twenty-four months after the implementation of the airway form
9.	Questionnaire-knowledge test	Based on existing knowledge tests Defloor & Dehoucke (50), Van der Kolk & Schuurmans (51), Schoonhoven et al. (52), Geriatric Nursing Association (53) and tests on 3 adverse events	20 statements per topic. With each statement, nurses could answer 'correct', 'incorrect', or 'do not know'	Addressing causes of adverse events, risk assessment and preventive care
10.	Safety Attitudes Questionnaire (SAQ)	Sexton et al. (9)	The SAQ measures 6 specific patient safety domains: teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions, and stress recognition	To identify potential areas of improvement and to monitor possible improvement in the culture

Table 2 (Continued)

Article	Instrument	Author and year	N of items	Sub-concepts, content
11.	Questionnaire	Developed by Wagner & Bijnenbased on the questionnaire of Coyle et al. (54)	6 so-called vignette questions	These vignettes were intended to gain insight into the registrars' attitudes towards incident reporting in specific situations
			5 items	Focused on attitudes, intentions and behaviour in reporting incidents
12.	Safety Attitudes Questionnaire (SAQ Intensive care (ICU) version)	Sexton et al. (9)	6 scales: teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions, stress recognition. ICU version with 64 items, 5-point Likert scale: disagree strongly (0), disagree slightly (25), neutral (50), agree slightly (75), agree strongly (100)	Was used to measure the safety climate, a term that generally refers to the measurable components of the safety culture
13.	The Johns Hopkins Oxytocin Protocol (JHOP) Survey	Developed by the authors in 2007	36-item tool 2 statements about clinical protocols broadly: "I believe that following clinical protocols can result in better clinical practice", "I believe that following clinical protocols is important to ensure patient safety", 2 statements about the JHOP Protocol: "I believe that using the Oxytocin Administration Protocol will result in better practice", "I believe that having the Oxytocin Administration Protocol is important to ensure patient safety. For analyses the scale dichotomous (agree and strongly agree vs. strongly disagree, disagree, and neutral)	To assess labour and delivery clinicians' attitudes towards the use of clinical protocols, protocol use in their unit, and the JHOP. To compare obstetrical providers' attitudes towards clinical protocols and the JHOP
14.	Safety knowledge (MCQs)	Developed by safety experts from Imperial Centre for Patient Safety and Service Quality (CPSSQ)	10 questions	To assess knowledge
	Attitudes to safety questionnaire (modified version of a validated questionnaire)	Patey et al. (55), Flin et al. (20)	5-point scale, 1 strongly disagree to 5 strongly agree for items in each category	To assess attitudes to and awareness of patient safety improvement after safety skill training for surgeons

Table 2 (Continued)

Article	Instrument	Author and year	N of items	Sub-concepts, content
15.	Questionnaire developed for this study	By authors 2012	21 items Agreement with attitudinal statements using a 7-point scale, 1 = very low, 4 = moderate, and 7 = very strong.	Knowledge of the principles of patient safety and incidents in National Health Service (NHS) hospitals; attitudes to local reporting of patient safety incidents; experience of reporting patient safety incidents; level of involvement in, and reporting of, medication and communication incidents.
16.	Questionnaire developed for this study	Agency for Healthcare Research and Quality (AHRQ) report Shojania et al. (56) and reported interventions of proven effectiveness Rosen et al. (57) and reported interventions of unproven effectiveness Wu et al. (58) Vincent et al. (59)	3 items (physicians knowledge regarding interventions) 2 items 6 items (attitudes), 3-point scale 'agree/uncertain/disagree'. Medical errors 4-point Likert scale, never to frequently. Outcomes 5-point Likert scale, never to always, perceived cause of error in a list of 10 and the subsequent behaviour to medical error in a list of 6.	Knowledge of patient safety practices. Knowledge of patient safety practices. Questions on attitudes towards management and reporting of medical errors. Practices towards the prevention of medical errors.
17.	Questionnaire developed for this study	Social interaction measured on a modified version of a 2-item scale developed by Smith et al. (60) . Measures of trust among RNs adapted from Leana & Pil (61) , 4 items. Shared vision measured using a modified version of the 4-item scale by Leana & Pil (61) Knowledge sharing measured using scale adapted from Van den Hooff & Van Weenen (62) The indicators proposed by JCAHO (Joint Commission: Accreditation, Health Care medical centre)	10-item scale 5-point Likert scale, ranging 1 (strongly disagree) to 5 (strongly agree). 3-item scale 5-point Likert scale, ranging 1 (strongly disagree) to 5 (strongly agree). 8-item scale 5-point Likert scale, ranging 1 (very low) to 5 (very high)	Measurement of social capital. Measurement of knowledge sharing. Measurement of patient safety

Table 2 (Continued)

Article	Instrument	Author and year	N of items	Sub-concepts, content
18.	The Team STEPPS Teamwork Attitudes Questionnaire (T-TAQ) Safety Attitudes Questionnaire (SAQ)	By the Agency for Healthcare Research and Quality in 2006. Sexton et al. (9)	Pilot: 48 items in 5 dimensions. Final: 6 items in each 5 dimensions: Team Structure, Leadership, Mutual Support, Communication, Situation Monitoring. The Chinese version contained 6–12 items in each dimension. Each item was answered on a 7-point Likert scale. The Teamwork Climate dimension of SAQ was replaced by T-TAQ. 4 dimensions of SAQ were applied to the Chinese version. 7 items in Safety Climate, 5 in Job Satisfaction, 4 in Perception of Management, and 4 for Working Conditions. 5-point Likert scale	To measure individual attitudes related to the core components of teamwork towards team structure, leadership, mutual support, situation monitoring, and communication. Measures 6 safety attitude constructs. Originally, the 6-factor model of provider attitudes (Teamwork Climate, Safety Climate, Perceptions of Management, Job Satisfaction, Working Conditions, and Stress Recognition)

existing tests which were either further developed or adapted for the use in question.

The most common (n = 4) valid instrument for measuring patient safety used in the studies was the Safety Attitudes Questionnaire (SAQ) (29, 31–33). It consists of six safety attitude dimensions: teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions and stress recognition. Some authors (29, 33) used other questionnaires in their studies, in addition to the SAQ. Some authors measured attitudes with questionnaires developed specifically for their studies (25, 34–36), and one author (37) employed a modified version of an earlier questionnaire. Many of the instruments used to measure related attitudes used Likert-type scales from 3 to 7 points but most (n = 7) implemented a 5-point scale. Safety-related skills were measured in only two studies. These were measured by validated numerical and drug calculation tests (38) and focus group interviews (28).

Findings on patient safety knowledge, attitudes and skills were mainly based on descriptive statistics (i.e. frequency, means, standard deviations), correlation, mean accuracy scores, parametric statistical analyses (e.g. the differences in mean rating scale scores, Fisher's exact test, t-tests), nonparametric statistical analyses (e.g. Kruskal–Wallis analysis of variance, Mann–Whitney U-test, chi-square tests), partial least squares (PLS), percentages, the proportion of respondents scoring, baseline values and also the content analysis approach outlined by Bernard and Ryan (39) (Table 1).

Content areas investigated

Healthcare professionals' knowledge of patient safety. The content areas investigated concerning the healthcare professionals' knowledge of patient safety were the level of existing knowledge, knowledge deficits and knowledge improvement. Knowledge levels were measured in one study, with the outcome that the target sample (doctors) demonstrated a good level of patient safety knowledge (25). However, the results of another study indicated that physicians' knowledge of evidence-based safety practices was inconsistent (26).

Knowledge deficits were related to specific issues of the functioning of heart or lung, or to a general knowledge of safety. Studies addressed QT intervals, ventilation, tracheostomy or evidence-based safety practice (Tables 1, 2). Significant knowledge deficits were highlighted in physicians regarding the QT interval and QT-prolonging medications, in which less than two-thirds (63%) of respondents were able to accurately identify possible QT-prolonging medications, and only about half (51%) could accurately identify medication combinations that might prolong the QT interval (40). Medical internists and nurses were also highlighted as not knowing

that laryngectomy patients cannot be orally ventilated, and internists could not identify the purpose of stay sutures in recently created tracheostomies (41).

Knowledge improvements were found in the contexts of the prevention of either specific issues or the general improvement of patient safety. The specifically investigated areas were adverse events, pressure ulcers, ventilation and tracheostomy (Tables 1, 2). An improvement of nurses' knowledge in the context of the prevention of adverse events was found to be in favour of an intervention group which participated in an interactive and tailored education programme on the knowledge topic in question. Statistically significant effects on nurses' knowledge of pressure ulcers were also reported (30). Following the implementation of an airway form, the postintervention knowledge of all participants concerning the ventilation of laryngectomy patients was also improved (41). Internists improved their knowledge by identifying the purpose of stay sutures in recently created tracheostomies (41), and surgeons showed a significant improvement in their knowledge of patient safety, following a half-day training programme (mean pre = 45.26% vs mean post = 70.59%, p < 0.01) (27).

Healthcare professionals' attitudes towards patient safety. The investigated areas highlighted in this review of healthcare professionals' attitudes to patient safety were connected either to patient safety in general, to contextual issues and procedures, to attitudes towards event reporting or to an improvement in safety attitudes. Generally, positive attitudes to patient safety were given by respondents. The content areas investigated were teamwork climate, safety climate, stress recognition, perception of management and working conditions. Teamwork climate was valued by nurses as an important competency with respect to patient safety (31). Teamwork climate was also the most important determinant for patient safety attitudes among nurses (33). Less than half of the healthcare providers in the studies viewed the safety climate in primary healthcare centres as positive (23). Safety climate was evaluated to be better by physicians than by nurses. Physicians also gave a more positive response towards the teamwork climate, safety climate and stress recognition. Nurses consistently attributed higher mean scores regarding their perceptions of management and working conditions (32).

Attitudes towards patient safety were investigated in the context of responses towards the use of clinical protocols and a 'time out' preoperation checklist. Clinical protocols and use of the Johns Hopkins Oxytocin Protocol (JHOP) were found to result in better practice and judged as being important in ensuring patient safety (36). In another study, almost all of the healthcare professionals responded that a 'time out' preoperation checklist contributed to better patient safety and thought that it

presented an opportunity to identify and solve problems (35).

Attitudes to event reporting were investigated and connected to medication incidents or errors, patient harm and voluntary reporting. Medication errors among doctors were the most common type of reported incident. In the associated study, all respondents felt that reporting patient safety incidents was worthwhile, and the majority indicated that it was an important part of their job (25). Transfusion service staff showed overall positive attitudes (88%) to event reporting related to patient harm, but a significant minority was afraid of punitive consequences (34). Significant changes were noted in the voluntary incident reporting attitudes and intentions among registrars, immediately following a patient safety course (p < 0.001) (37).

An improvement in safety attitudes was found in relation to the perceptions of management (29) and to patient safety in general. In another study, after a safety skill training course for surgical trainees, their attitudes to patient safety generally improved, specifically in their attitudes towards error analysis and their ability to influence and improve safety (27).

Healthcare professionals' skills in patient safety. The skills areas investigated in the highlighted studies concerned either mathematical skills or the achievement of safety skills. In one study, mathematical skills were investigated in the context of numerical skills and drug calculation. About half the Registered Nurses failed the test and older (≥35 years) participants were more able to perform numerical calculations, in terms of statistical significance (p = 0.028). Registered Nurses were statistically more able to perform the drug calculation skills required for the administration/preparation of solids, liquid oral and injections (p < 0.001), than those calculations required for drug percentages, drip and infusion rates (38). An achievement of safety skills in nursing was found among the participants of a nursing Research Advancing Practice (RAP) programme, in which they described a new-found confidence in their ability to bridge the gap between research and clinical practice, in order to provide safer care to their patients (28).

Discussion

To the best of our knowledge, this is the first systematic review to document and combine the empirical studies of healthcare professionals' knowledge, attitudes and skills relating to patient safety in the same paper. However, there exist some reviews on safety issues [such as that by Sammer et al. (2)] who conducted a meta-analysis of patient safety culture and identified several subcultures of patient safety. However, this study did not specifically look into what is known in regard to

patient safety and the related attitudes and skills of staff.

The purpose of the present study was to conduct research into patient safety, related to healthcare professionals' knowledge, attitudes and skills, so as to provide focus for the conduct of future research. Most of the studies encountered in this review were conducted in the United States, and the majority explicitly aimed to identify attitudes relating to patient safety. Some aimed to identify knowledge and only two looked to identify skills connected to patient safety. Differences in sample size, research designs, quality of articles investigated content areas, and also the variety of questionnaires, scales, tests and interviews makes it difficult to present direct comparisons between studies.

The studies on healthcare professionals' knowledge levels yielded contradictory results. Some studies reported a good knowledge level (25), yet others identified knowledge deficits (26, 40, 41). Research indicates, however, that healthcare systems face a big challenge to ensure safe care for patients and prevent harm. Thus, it is important to identify the weakest areas in the knowledge of healthcare professionals (13–16). By doing so, we may create the best strategy to increase the level of knowledge, in order to achieve safer clinical practice.

Most of the studies analysed investigated healthcare professionals' attitudes related to patient safety. An interesting outcome is that although their results mainly report positively on healthcare professionals' attitudes related to patient safety for example (25, 35, 36), the healthcare professionals' knowledge of patient safety is still deficient (26, 40, 41). However, it has also been demonstrated that there are ways to add to healthcare professionals' knowledge related to patient safety, and to make improvements by means of a safety training course (30). Furthermore, by ensuring knowledge sharing, we may avoid undesirable patient outcomes if we promote the free reporting of events related to patient harm. To enact this, however, there is a need to highlight the requirement of a nonpunitive culture in healthcare systems.

Only two articles were found concerning healthcare professionals' safety skills. It is quite difficult to evaluate this field because of the scarce amount of knowledge available and the limited occupation of study participants (nurses) in the studies. The results of these studies state that about half of the nurses failed a test in mathematical skills, and parallel results were also found in studies investigating medication skills. These findings are of great importance, when most of the problems in patient safety are due to medication errors. Thus, without proper mathematical skills, there will be uncertainty in the preparation and administration of a patients' medication. Although our review searching professionals' safety skills generally did not capture more articles, several studies and reviews have been conducted which concentrate on limited issues of safety such as nurses' medication skills (42), the individual and system factors that contribute to medication errors in nursing practice (43) and also singular studies that investigate nurses' pharmacological knowledge (44).

In our review, limited results were found relating to nurses' achievement of safety skills. It also seems that healthcare professionals' safety skills have been of limited interest among the topics investigated in the area of patient safety. More research is therefore needed in this field and training programmes in practice would benefit from a multiprofessional approach, in order for healthcare professionals to implement evidence-based practice that addresses the delivery of safe care in a comprehensive manner.

There has been some progress in the field of patient safety over the past few years, but much more needs to be done to improve patient safety for the future. According to the sources highlighted in this literature review, multiprofessional research and development work (for example, into the reporting systems of safety issues) is seen as an important means by which to improve the quality of health care and positive patient outcomes.

Limitations of this review

Some limitations of this study must be conceded. Only those scientific articles which were written in English, with an abstract and full-text available, were included in the evaluation. Because of this, it could be that some articles relevant to this systematic review were missed. However, two major databases – MEDLINE (Ovid) and CINAHL (EBSCO) – were used. We wanted to search for literature in which researchers have studied patient safety issues, and the results of the literature search are presented in this article. Our goal was not to make review of certain skills such as how well nurses can calculate medications, as these are plentiful. Our purpose was to analyse precisely what has been studied in those situations where researchers claim to have investigated patient safety issues.

As a second issue, several articles have been written about the content area of patient safety, but the keywords used in this systematic review may have narrowed the number of articles retrieved, as only 18 scientific articles were eligible for inclusion, based on the selection criteria employed for the study purpose. Of these 18 studies, only three (30, 32, 38) showed the strongest levels of quality used in the evaluation, which may suggest limited evidence.

Conclusions

Only a few definitions of patient safety were evident in the articles reviewed; thus, it was not possible to

conclude to what extent a common definition exists. Some methodological weaknesses and differences in quality level were also found in the evaluation of the selected articles, which subsequently lead to a restriction in the evidence retrieved.

To ensure patient safety, one of the main requirements is to develop and retain professionals' safety knowledge. This review showed that with regard to patient safety, researchers should devote more interest to the levels and deficits of healthcare professionals' knowledge, as to date, most of the studies highlighted have focused upon healthcare professionals' attitudes. Overall, healthcare professionals have quite positive attitudes to patient safety and event reporting, but some are still afraid of punitive consequences. Relevant courses may, however, influence these attitudes because findings showed an improvement in healthcare professionals' attitudes to patient safety after undergoing training.

Both positive and negative examples of healthcare professionals' skills were presented in the reviewed literature. Investing in skills (clinical and professional) should be highlighted because in the literature reviewed, it was shown that good safety skills were linked to positive patient outcomes and quality of health care. Therefore, further work could focus more on the expansion of both knowledge and skills (both professional and clinical) in patient safety. The identification of these main factors is thus important for the success of healthcare professionals' initiatives to improve patient safety.

Author contributions

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Health Care Professionals' Knowledge Regarding Patient Safety

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Abstract

This study looks to describe health care professionals' knowledge regarding patient safety. A quantitative study using questionnaires was conducted in three multi-disciplinary hospitals in Western Lithuania. Data were collected in 2014 from physicians, nurses, and nurse assistants. The overall results indicated quite a low level of safety knowledge, especially in regard to knowledge concerning general patient safety. The health care professionals' background factors such as their profession, education, the information about patient safety they were given during their vocational and continuing education, as well as their experience in their primary speciality seemed to be associated with several patient safety knowledge areas. Despite a wide variation in background factors, the knowledge level of respondents was generally found to be low. This requires that further research into health care professionals' safety knowledge related to specific issues such as medication, infection, falls, and pressure sore prevention should be undertaken in Lithuania.

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Introduction

Patient safety is globally seen as an area with several knowledge gaps, and it has been expressed that more knowledge is needed to improve patient safety and to reduce harm (World Health Organization [WHO], 2009). An error can be defined as circumstances in which planned actions fail to achieve the desired outcomes (Reason, 1990). A clear distinction between errors resulting from a misconception of reality and errors resulting from a complete lack of knowledge is considered essential (Gonçalves, 2007; Oguisso & Schmidt, 2010).

In the health care setting, it is important to consider what health care professionals know of patient safety. A study of five professional groups (directors/coordinators, physicians, nurses/midwifes, physiotherapists, and technicians) by Bagnasco et al. (2011) showed that health professionals should improve their knowledge of the culture surrounding patient safety and that as a consequence, the quality of their clinical practice would be likely to improve. Furthermore, a recent literature review by Brasaite, Kaunonen, and Suominen (2015) revealed areas which have been previously been investigated concerning patient safety knowledge, in regard to levels of existing knowledge, knowledge deficits, and knowledge improvement. The results of these studies are contradictory, showing good knowledge levels, but also knowledge deficits.

If we look at a more specific knowledge area such as that related to pharmacology, Ndosi and Newell (2008) found that nurses have inadequate knowledge of pharmacology and that their mean pharmacological knowledge score was 6 on a scale of 1 to 10. The majority ($n = 24$, 57%) of the nurses knowledge scores were below 7, indicating an inadequate level of knowledge. The importance of pharmacology knowledge for nurses should be highlighted, as nurses are mainly responsible for the administration of medicines. Medications are administered every day, yet treatments are constantly changing, and this may involve new drugs, in addition to a wide range of similar drug names and labels that are currently in use. An aging patient population with co-morbidities often requires more than one medication to be administered (McMullan, Jones, & Lea, 2010), making pharmacological knowledge an important issue. Hsaio et al. (2010) argued that in the registered nurses' role related to medication administration, errors were caused by performance deficit and insufficient knowledge. One third of the nurses in their study did not have an adequate knowledge about potassium chloride administration, and this lack of knowledge is seen as the main reason behind fatal events related to this drug (Hsaio et al., 2010). Previous

studies have indicated connections between knowledge and background factors. Nurses with postgraduate qualifications were found to be more knowledgeable compared with those nurses with an undergraduate education, and a nurse's knowledge of pharmacology has been seen to increase with experience (Ndosi & Newell, 2008). Also, a nurse's age, education, position, and nursing experience in years were found to make a statistically significant contribution to their knowledge scores (Hsaio et al., 2010).

It has been noticed that learning from mistakes is one of the most important things to prevent patient safety incidents across all health care settings (Graham, Brinson, Magtibay, Regan, & Lazar, 2009). As Waring, Currie, Crompton, and Bishop (2013) stated, organizational learning is premised on clinicians sharing their experiential knowledge of clinical risk so that organizational leaders can determine the latent factors and introduce system-wide improvements. Thus, several health care organizations have introduced formal knowledge management procedures which include incident reporting procedures that allow health care professionals to both document and share their experiences of unsafe care. These reports are then analyzed and used to develop safety-enhancing interventions.

Clinicians may improve their patient safety knowledge with training. This includes training that enables them to identify differences between errors, near misses, and hazards, how to report patient safety incidents, to use recommended practices for patient treatment, and how to strive for good collaboration and enhance communication in a multi-professional team (Aboumatar et al., 2012). In this study, the top five error-related factors identified were workload, poor skills, interruptions, lack of concentration, and insufficient knowledge (Brasaite et al., 2015). Researchers have found that the most common reason for medication errors was a lack of knowledge, and it is strongly connected with nurses because they are at the front line of medicines administration; they are expected to prevent their own drug administration errors and also to identify physicians' errors regarding issues such as wrong medication doses or dispensing (Ndosi & Newell, 2008).

This research describes health care professionals' knowledge regarding patient safety and investigates whether differences exist based on the background factors of study participants.

Method

Data Collection

Data were collected in three regional hospitals in Western Lithuania. Study participants were health care professionals designated as physicians, head nurses, nurses, and nurse assistants. The inclusion criteria for the study were

that participants were health care professionals working in multi-disciplinary hospitals for adult patients and that they participated voluntarily in the study.

An ethical approval statement was obtained for the study (Nr. 46 Sv - SL - 1), and permission to collect data were granted by the hospitals participating in both the pilot and main phases of the study. The ethical considerations related to the data collection focused on the ethical principles for research, confidentiality (related to questionnaires), privacy, and voluntary participation in the study and were in accordance with the guidelines of the World Medical Association Declaration of Helsinki (2013). Permission to use the instrument employed in this study was obtained from the copyright holder by the first author.

The study questionnaire consisted of two parts: background questions and an instrument measuring respondents' knowledge regarding patient safety. Nineteen background questions examined the health care professionals' basic demographic characteristics (e.g., their work position, age, gender, education, years at work, and their usual shift).

The level of knowledge was investigated using the knowledge scale of the Patient Safety Attitudes, Skills and Knowledge (PS-ASK) instrument developed by Schnall (see Schnall et al., 2008), consisting of four items measuring health care professionals' general knowledge related to patient safety. An additional eight items by Robson (see Robson, de Wet, McKay, & Bowie, 2012) measured health care professionals' knowledge about the principles of patient safety and knowledge about patient safety in the hospital setting. The items measured health care professionals' general knowledge related to patient safety (including items such as distinguishing among errors, adverse events, near misses and hazards), defining the characteristics of a high reliability organization (i.e., an organization that is able to manage and sustain an almost error-free performance), defining the key dimensions of a patient safety culture, and also in summarizing the published evidence about the relationship between nurse staffing and overall hospital morbidity and mortality (Schnall et al., 2008). The items were rated on a 6-point Likert-type scale (1 = *not knowledgeable*, 2 = *a little knowledgeable*, 3 = *somewhat knowledgeable*, 4 = *knowledgeable*, 5 = *very knowledgeable*, 6 = *not applicable*), with interpretations of <3 meaning a low knowledge level, and >4 meaning a moderate to high knowledge level. Items measured health care professionals' knowledge about principles of patient safety by responses to statements such as "I have good knowledge of the factors contributing to human error"; "If I become aware that a patient safety incident has occurred, I know how this should be formally reported"; "Hospital patients are rarely harmed as a result of their clinical care"; and "I know how to report a patient safety incident in my unit." Knowledge about patient safety in hospital was

measured with responses to statements such as "All hospital doctors make medical errors"; "At least one in 10 hospital patients will experience some kind of avoidable harm"; "Patient safety incidents are uncommon"; and "Many patient safety incidents in acute hospitals are preventable" (Robson et al., 2012) and were measured on an indicated level of agreement with a 7-point Likert-type scale (1 = *very low level of agreement* to 7 = *very strong level of agreement*), with later interpretation being <4 meaning a low knowledge level and >5 meaning moderate to high knowledge level.

The instruments of Schnall and Robson were originally developed in the United States and United Kingdom, respectively. The instruments were translated from English into Lithuanian using the back-translation technique described by Burns and Grove (2009). The pilot study was conducted in a regional hospital in Western Lithuania for the evaluation of the validity of the instrument and its use in a Lithuanian context. The hospital was chosen because of the multi-disciplinary services it provided for adult patients. The data collection for the pilot test was undertaken in February 2014 from all health care professionals (*n* = 90). No changes were made as in a Lithuanian context; the instruments of Schnall et al. (2008) and Robson et al. (2012) have been shown to have good psychometric properties. The reliability of the scales was assessed, with a total Cronbach's alpha of .81, corrected by inter-item correlation from −.137 to .749. The Cronbach's alpha values were good for all scales for both the pilot and main study: with respective values for general knowledge related to patient safety .80 and .82; knowledge about principles of patient safety .73 and .80; and knowledge about patient safety in hospital .73 and .74 (Table 1).

The main study data were collected in three regional hospitals in May 2014. Each hospital granted the permission to conduct the study and provided one contact person who circulated questionnaires with envelopes to all of the staff (*N* = 1,687). After 2 weeks, the researcher collected the completed questionnaires in sealed envelopes from each unit. An additional 2 weeks were given to respond to improve the response rate. The total response rate was 64% (*n* = 1,082).

Statistical Analyses

Descriptive statistics were used to describe the characteristics of respondents (physicians, nurses, and nurse assistants), the safety knowledge items, and the scale-level results of the three hospitals. Differences in sample characteristics between hospitals and professional groups were tested using the Kruskal–Wallis test. Differences in sample characteristics between hospitals were tested using the Mann–Whitney *U* test. Data were presented using mean

Table 1. Safety Knowledge Scales and Psychometric Properties.

Safety knowledge scales	Scale items	Cronbach's α from pilot study	Cronbach's α from main study
General knowledge related to patient safety	4	.80	.82
Knowledge about principles of patient safety	4	.73	.80
Knowledge about patient safety in hospital	4	.73	.74

(standard deviation) or median interquartile range (IQR, the distance between the first and third quartile) expression. Any negatively worded items in the instruments were reversed before analysis. The internal consistency of the safety knowledge instruments and the scales of general knowledge related to patient safety, knowledge about the principles of patient safety, and knowledge about patient safety in hospital were measured by calculating the Cronbach's alpha for each area. The associations between variables were calculated by means of Spearman correlations. A p value of $<.05$ was considered to be statistically significant (Burns & Grove, 2009).

Results

Participants

In total, the questionnaire was answered by 1,082 health care professionals (64%). Participants were nurses ($n = 756$, 70%, including 54 head nurses), nurse assistants ($n = 180$, 16.6%), and physicians ($n = 146$, 13.5%). Respondents stemmed from three regional hospitals: 301 (27.8%) from Hospital 1; 411 (38.0%) from Hospital 2; and 370 (34.2%) from Hospital 3. The mean age of the participants was 46.7 ($SD = 10.9$) years. Most of them were female ($n = 989$, 91.4%), had a permanent position at the hospital ($n = 1,047$, 96.8%), had many years of work experience ($M = 23.9$), and worked an average of 39.9 hr per week in their unit. The most common education institutions of the study participants were medical school ($n = 493$, 45.6%), college ($n = 130$, 12.0%), and a university bachelor program ($n = 118$, 10.9%). Most of the health care professionals ($n = 659$, 60.9%) worked variable shifts, in units with an average of 30.7 beds and 24.9 staff members. Usually, one health care professional had 18.0 patients per working shift. More than half of the participants ($n = 673$,

62.2%) of this study had received no information about patient safety during their vocational education, but about half (*n* = 589, 54.4%) had received information during their continuing education (education received after vocational education or after entry into working life); 80% (*n* = 866) of respondents had reported no patient safety incidents during the last year.

Safety Knowledge

Overall, the results of this study showed that health care professionals had low levels of safety knowledge. They had a low knowledge level about general knowledge related to patient safety (*M* = 2.86), a moderate knowledge about the principles of patient safety (*M* = 4.53), but a low knowledge level about patient safety in hospital (*M* = 3.77). Nurse assistants had lower levels of safety knowledge when compared with physicians and nurses. Nurse assistants had a lower general knowledge related to patient safety than physicians (*p* < .01) and nurses (*p* < .01), and also a lower knowledge of the principles of patient safety compared with physicians (*p* < .05) and nurses (*p* < .01). Nurse assistants also had a lower knowledge level about patient safety in hospital compared with physicians (*p* < .001) and nurses (*p* < .01; Table 2).

In regard to the general knowledge related to patient safety, health care professionals in Hospital 2 were significantly less knowledgeable (*p* < .01) than the other two hospitals. In knowledge about principles of patient safety, there were differences (*p* < .01) between the three hospitals. Those in Hospital 2 had a significantly higher safety knowledge level related to knowledge about patient safety in hospital than the other two hospitals (*p* < .05; Table 3).

Regarding the background factors of the professionals' education, the information about patient safety they received during their vocational and continuing education, as well as the amount of years of experience in their primary speciality, seemed to be associated with several patient safety knowledge areas (Table 4). Several background factors also seem to be correlated with their knowledge about the principles of patient safety.

The health care professionals' safety knowledge was associated with most background factors, in regard to their general knowledge related to patient safety, knowledge about the principles of patient safety, and their knowledge about patient safety in hospital. Respondents' general knowledge related to patient safety was associated with their education (−.127, *p* < .01), their length of experience in primary speciality (.087, *p* < .01), and the length of their work experience in general (.079, *p* < .05). Health care professionals' knowledge about the principles of patient safety was associated with their education (−.086, *p* < .01), length of experience in primary speciality (.077, *p* < .05), and length of their work experience in general (.082, *p* < .01).

Table 2. Patient Safety Knowledge by Participant (*n* = 1,082) Groups.

Safety knowledge scales	*M (SD)*	Median (IQR-Interquartile range)	χ^2	*p* value
General knowledge related to patient safety				
Physicians	2.81 (.99)	3.00 (1.50)**	29. 90	<.001
Nurses	2.96 (1.00)	3.00 (1.50)###		
Nurse assistants	2.49 (1.12)	2.38 (2.00)**.###		
Total	2.86 (1.03)	3.00 (1.75)		
Knowledge about principles of patient safety				
Physicians	4.51 (1.18)	4.50 (1.75)*	18.80	<.001
Nurses	4.63 (1.06)	4.75 (1.50)###		
Nurse assistants	4.13 (.1.38)	4.25 (1.50)*.###		
Total	4.53 (1.15)	4.50 (1.50)		
Knowledge about patient safety in hospital				
Physicians	4.03 (1.29)	4.00 (1.75)***	19.07	<.001
Nurses	3.82 (1.19)	4.00 (1.50)###		
Nurse assistants	3.37 (1.26)	3.75 (1.50)***.###		
Total	3.77 (1.23)	4.00 (1.00)		

Note. The mean difference between participants groups estimated by chi-square (Kruskal–Wallis test). The mean difference between Physicians/Nurses, Physicians/Nurse assistants and Nurses/Nurse assistants estimated by rank sum test (Mann–Whitney test).
*p < .05 between physicians and nurse assistants. ***p* < .01 between physicians and nurse assistants. ****p* < .001 between physicians and nurse assistants.
###*p* < .01 between nurses and nurse assistants.

    Information about patient safety received during vocational and continuing education was associated with almost all of the safety knowledge scales. Health care professionals who had received no information about patient safety during their vocational education had a worse general knowledge related to patient safety (−.179, *p* < .01), a worse knowledge about the principles of patient safety (−.142, *p* < .01), and a worse knowledge about patient safety in hospital (−.097, *p* < .01). Those who did not receive information about patient safety in their continuing education had a worse general knowledge related to patient safety (−.203, *p* < .01) and a worse knowledge about the principles of patient safety (−.176, *p* < .01).

    Nurse assistants had significantly lower safety knowledge (*p* < .001) than physicians and nurses in the group of respondents who did not report a safety incident during the previous year. In the group who had reported a safety incident during the previous year, no significant differences were found. Overall, health care professionals who reported an incident during the

Table 3. Patient Safety Knowledge by Hospitals.

Safety knowledge scales	M (SD)	Median Interquartile range (IQR)	χ²	p value
General knowledge related to patient safety				
Hospital 1	2.97 (.96)	3.00 (1.50)**	12.73	.002
Hospital 2	2.71 (1.04)	2.75 (1.50)**,##		
Hospital 3	2.94 (1.07)	3.00 (1.75)##		
Total	2.86 (1.03)	3.00 (1.75)		
Knowledge about principles of patient safety				
Hospital 1	4.37 (1.59)	4.25 (1.25)**	13.37	.001
Hospital 2	4.54 (1.21)	4.75 (1.50)**		
Hospital 3	4.65 (1.14)	4.75 (1.50)**		
Total	4.53 (1.15)	4.5 (1.50)		
Knowledge about patient safety in hospital				
Hospital 1	3.67 (1.24)	3.75 (1.63)*	8.72	.013
Hospital 2	3.90 (1.21)	4.00 (1.50)*,#		
Hospital 3	3.72 (1.24)	3.75 (1.25)#		
Total	3.77 (1.23)	4.00 (1.50)		

Note. The mean difference between three hospitals estimated by chi-square (Kruskal–Wallis test). The mean difference between hospital 1/hospital 2, hospital 1/hospital 3 and hospital 2/hospital 3 estimated by rank sum test (Mann–Whitney test).
*$p < .05$ between Hospital 1 and Hospital 2. **$p < .01$ between Hospital 1 and Hospital 2, Hospital 3.
#$p < .05$ between Hospital 2 and Hospital 3. ##$p < .01$ between Hospital 2 and Hospital 3.

previous year had a slightly higher safety knowledge level than those who did not report.

Some significant differences were found when comparing safety knowledge between health care professionals by working unit. Those working in internal medicine and psychiatric units had significantly higher safety knowledge levels relating to knowledge about the principles of patient safety ($p < .05$), compared with those working in surgical, acute, and other units. Health care professionals working in surgical and other units had significantly lower safety knowledge relating to knowledge about patient safety in hospital ($p < .01$) than those working in internal medicine, psychiatric, and acute units.

Discussion

In general, the safety knowledge level of health care professionals was low, and this supports the findings of previous studies which found insufficient

Table 4. Correlations Between Respondents' Background Factors and Their Patient Safety Knowledge.

Demographic characteristics	General knowledge related to patient safety	Knowledge about principles of patient safety	Knowledge about patient safety in hospital
Age	.033	.033	−.084**
Gender	.013	−.005	−.080**
Education (e.g., medical school, college, university)	−.127**	−.086**	.030
Years of experience in primary speciality	.087**	.077*	−.048
Years of work experience in general	.079*	.082**	−.060
Information about patient safety during initial education	−.179**	−.142**	−.097**
Information about patient safety in continuing education	−.203**	−.176**	−.042
Usual shift	−.016	−.062*	−.054
Working hours per week in this unit	.048	.061*	.052
Extra job	.005	.036	−.109**
Received hours regarding extra job	.216*	.035	−.052
Total number of staff working in unit	.021	.065*	.019
Number of nurses working in unit on night shifts	.070*	−.057	−.013
Number of patients health care professionals usually have per working shift	.035	.083*	−.037

Note. Spearman rank correlations.
*$p < .05$. **$p < .01$.

knowledge, a lack of knowledge, or deficits in knowledge related to patient safety (Allen La Pointe, Pharm, Al-Khatib, Kramer, & Califf, 2003; Cicolini et al., 2014; Flotta, Rizza, Bianco, Pileggi, & Pavia, 2012; Hsaio et al., 2010; Ndosi & Newell, 2008; Robson et al., 2012; Ullman, Long, & Rickard, 2014;

van Gaal et al., 2010). It is noted, however, that in these previous studies, the researchers investigated more specific knowledge areas, whereas in our study, we investigated only general knowledge about patient safety.

Length of experience in the primary speciality and length of work experience in general were associated with two safety knowledge scales: general knowledge related to patient safety and knowledge about the principles of patient safety. In a previous study, Flotta et al. (2012) reported that the number of years since graduation was significantly associated with the respondent's knowledge of evidence-based patient safety practices. They also reported that more experienced physicians were more knowledgeable and more aware that failures in patient safety may be the consequence of system and organizational flaws, rather than the failure of individuals (Flotta et al., 2012).

In a study by Hsaio et al. (2010), it was found that increased nursing experience correlated with increased knowledge ($p < .01$). In this study, safety knowledge was found to be higher in those who were more experienced in their primary speciality and who had more years of work experience in general. Thus, it may be considered that health care professionals who have many years of work experience have acquired knowledge during their clinical practice and continuing education and thus are more knowledgeable than their younger colleagues.

The results of this study showed that health care professionals who received their education in medical school had a higher safety knowledge than those who were non-university or university bachelor level educated. This is contrary to a previous study where nurses with a university bachelor degree were shown to have a higher knowledge score ($M = 61.4$) than nurses with a non-university bachelor ($M = 54.2$, $p < .01$; Hsaio et al., 2010). A higher level of education and the area of work were both associated with better test scores in a study which examined nurses' knowledge of guidelines for preventing infections associated with peripheral venous catheters (Cicolini et al., 2014). Overall, in this study, health care professionals had many years of work experience ($M = 23.9$), so this may also have had a positive impact on safety knowledge levels (i.e., not only the respondents' education, but also their work experience influences their knowledge).

Although the respondents' general knowledge related to patient safety was found to be negatively associated with their education level and education length, it can be asked whether those who are more educated are perhaps more critical of what they actually know of these issues. Another explanation of this negative association may be that those respondents with less professional education, in fact, had many years of work experience ($M = 23.9$). When understood as two areas where knowledge can be acquired, then it might help explain why the most common education institution of the study participants was medical

school (n = 493; 45.6%); despite a lack of subsequent formal education, a long work history may have led these respondents to have a better knowledge of safety issues in clinical practice (based on their own evaluations). In our study, we found that health care professionals who did not receive information about patient safety during their vocational and continuing education had worse safety knowledge. The results of the study by Hsaio et al. (2010) shown earlier also provide evidence of nurses' insufficient knowledge of high-alert medications. This was found with less experienced clinical nurses and those who would like to have more continuing education about drug administration and to update their pharmacology knowledge (Hsaio et al., 2010). Thus, there may be deficits in health care professionals' knowledge of general safety issues, as well as with special issues like medication. So, in this context, the results of both studies suggest that more attention is given to vocational and continuing education as a means of preventing low safety knowledge levels.

The results of this study have shown some differences between health care professionals' position at work, and compared with physicians and nurses, nurse assistants had lower levels of safety knowledge. A lower position may link with lower responsibility and less safety knowledge. Other studies have also shown differences in a health care professional's position at work, but within the same professional group (like nurses), research has found that a nurses' age, education, position, and nursing experience has a statistically significant association with their knowledge level (Hsaio et al., 2010). In addition, in those hospitals where higher proportions of nurses were educated at a baccalaureate level or higher, surgical patients were seen to have lower mortality and failure-to-rescue rates (Aiken, Clarke, Cheung, Sloane, & Silber, 2003).

We found some differences between the working units of health care professionals related to safety knowledge. In particular, the management of the unit and the vocational and continuing education of health care professionals may affect differences among units. However, when compared with another study that investigated differences between working units among physicians related to the knowledge of evidence-based patient safety practices (Flotta et al., 2012), no significant differences were found which related to the respondents' working areas.

Implications of the Study

Health care managers may support employees to regularly update and share their knowledge regarding patient safety and also their specific knowledge connected to their working unit/place. In matters of patient safety, all health care professionals are responsible. Therefore, it might be a good idea to organize more inter-professional courses (nurses, physicians, and nurse assistants

learning together) and focus upon the benefits of working as coordinated team to ensure the safety of patients in their care.

Strengths and Limitations

There are several strengths in this study. This study is the first to investigate health care professionals' general knowledge of patient safety in Lithuania. Among the research group, the response rate was good (64%) and comprised good samples of the representative professional groups—nursing assistants 87%, nurses 66%, and physicians 43%. Most importantly, due to the large sample size, the results may not only be seen as representative of the situation in regional hospitals in Western Lithuania but may also be generalized to other regional hospitals in the country. Given that the results correlate with previously reported studies that show safety knowledge levels of health care professionals to be low, this study highlights an international need to investigate the situation in individual countries, to form a base knowledge for work improvement.

A limitation of this study is related to the limited amount of information on patient safety issues that the instruments covered. As such, they took into account neither the knowledge requirements of different professions, nor the specific knowledge areas needed in different clinical areas. However, the instruments had been previously validated and piloted in the research context, so this is not seen as posing a compromise to the results that the study obtained. Another limitation of this study is related to the respondents' education. The biggest group of respondents had a medical school education (n = 493, 45.6%). This may impact on the results, in that health care professionals who received their education in a medical school had a higher safety knowledge than those with either college level education, or a university bachelor and master. Nurses who were educated during the era of the Soviet Union received their education in medical school. When Lithuania regained its independence, nurses had the possibility to choose to undertake their studies at college to get a non-university bachelor degree, or at a university to get a university bachelor degree. Physicians receive their education at university. Therefore, the uniqueness of the education system in each country should be highlighted when transferring these results to other national contexts.

Conclusion

This study offers a contribution to the general knowledge of health care professionals concerning patient safety. However, their knowledge of specific safety issues like medication, infection, falls, and pressure sores should be further investigated. In utilizing the results of this study, we suggest that head

nurses and physicians pay more attention to the continued education of health care professionals. Although it is important for all health care professional groups to have a current and effective knowledge of patient safety issues, this research especially highlights a need to support nurse assistants, as it showed that they had a lower level of safety knowledge when compared with the other groups in this study.

Declaration of Conflicting Interests

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BMC Research Notes

RESEARCH ARTICLE

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Health care professionals' attitudes regarding patient safety: cross-sectional survey

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Abstract

Background: Patient safety is being seen as an increasingly important topic in the healthcare fields, and the rise in numbers of patient safety incidents poses a challenge for hospital management. In order to deal with the situation, it is important to know more about health care professionals' attitudes regarding patient safety. This study looks to describe health care professionals' attitudes regarding patient safety, and whether differences exist based on the background factors of study participants.

Methods: A quantitative study using a questionnaire was conducted in three multi-disciplinary hospitals in Western Lithuania. Data was collected in 2014 from physicians, nurses and nurse assistants.

Results: The results showed positive safety attitudes, and these were especially related to the respondents' levels of job satisfaction. A respondent's older age was associated with how they evaluated their teamwork climate, safety climate, job satisfaction, and perception of management. Profession, working unit, length of work experience, information received about patient safety during education, further education, and working shifts were all associated with several safety attitude areas.

Conclusions: The safety attitudes of respondents were generally found to be positive. Attitudes related to patient safety issues were positive among health care professionals and opens the door for the open discussion of patient safety and adverse events. However, in future we also need to investigate the knowledge and skills professionals have in relation to patient safety, in order to gain a deeper understanding of the present situation.

Keywords: Attitude, Health care professionals, Nurses, Patient safety, Physicians, Nurse assistants

Background

Attitudes regarding safety-related issues are an important part of what is often called a hospital's safety culture [1, 2]. An organization's safety culture consists of components concerning healthcare provider attitudes about organizational factors such as safety climate and morale, work environment factors such as staffing levels and managerial support, team factors such as teamwork and supervision, and staff factors such as overconfidence and being overly self-assured [3]. Some authors [4–6] have noticed that a safety culture is a part of the wider organisational culture, and may be defined as the attitudes, beliefs, perceptions, competencies and values

that determine an organisation's health and safety management, and are held in common by employees in relation to safety. An understanding of nurses' perceptions and expectations regarding adverse events is therefore essential for the implementation of appropriate strategies to manage nursing care. In this sense, the beliefs, values and organizational culture of registered nurses (RNs) are important aspects to be considered [7].

Ethical issues are integral to the topic of patient safety because it is known that millions of patients worldwide suffer injury or death every year as a result of unsafe medical practices and care, and patients are mostly harmed due to preventable causes that they receive during health care in hospital settings [8]. Health care professionals may know that their role is important in the delivery of safe care and that they should have positive safety attitudes. However, the results of a safety culture

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study [9] showed that both RNs and nurse managers were critical of the state of patient safety in acute care hospitals, with RNs being the more critical group. That said, generally positive attitudes to patient safety have been reported among health care professionals [10], and the safety climate within healthcare has been evaluated more positively by physicians than nurses [11].

Previous literature has shown some differences in attitudes regarding patient safety, based on profession, age, gender and working area. In one study, the connection of safety attitudes to profession was measured by researchers [12]. The results showed that only 39 % of physicians had a positive attitude towards safety climate, and less than half of the physicians and nurses surveyed were satisfied with their jobs (47 and 45 %, respectively). Physicians, nurses, and medical assistants had relatively similar but low perceptions of their working conditions when compared to managers (29, 36, and 35 %, respectively). Researchers have explored professional differences in patient safety attitudes among operating room (OR) care givers in nine medical centres [13]. Of the six patient safety domains covered in the study, stress recognition and working conditions showed significant differences by univariate analysis of profession. Regression analysis revealed that differences for job satisfaction and working conditions were seen among the professions studied. In intensive care units, surgeons have expressed more favourable perceptions of working conditions than nurses [14], and surgeons have also been seen to have a more favourable perception of management than OR nurses [13].

In a study conducted in the field of obstetrics, the highest positive safety attitudes score (48.3 %) was reported by the 30–35 years age group of health care professionals [15]. Associations between gender differences and patient safety attitudes are also to be found in the literature. Gender differences in patient safety attitudes were explored among OR care givers, and of the six patient safety scales, four showed significant differences in univariate analysis (teamwork climate, job satisfaction, perceptions of management, and working conditions). Women were found to have less favourable perceptions of teamwork [69, versus (vs) 76 for men], job satisfaction (74, vs 80 for men), management (60, vs 69 for men), and working conditions (57, vs 72 for men) [13].

Work area and discipline have also been reported to be associated with attitudes [4]. One of the key findings was that emergency department (ED) personnel, particularly ED nurses, perceived substantially lower levels of safety climate than workers in other areas. This suggests that the higher levels of risk and complexity, and the faster pace associated with work performed in emergency departments continue to require relatively more attention to be paid to safety issues than other areas.

To maintain a safe patient environment and safe practices, it is very important to promote the measurement and improvement of safety attitudes among health care professionals [16]. The research presented in this paper looks to describe health care professionals' attitudes regarding patient safety, and whether differences exist based on the background factors of the study participants.

Methods

Data collection

The study was carried out in three hospitals in one region of Lithuania, and involved all of the health care professionals (physicians, head nurses, nurses and nurse assistants) who worked with adult patients. The hospitals involved are of similar size and provide multi-profile care for Western Lithuanian residents. The criteria for inclusion in the research were that participants were health care professionals, working in health care organizations (hospitals) with adult patients, and would participate voluntarily in the study.

Data was collected using a questionnaire consisting of background questions based on existing literature, and an instrument measuring patient safety attitudes. Twenty background questions investigated the basic demographic characteristics of participants (e.g. work position, place of work, age, gender, education, years at work, usual shift, working hours per week), as well as information concerning the type and hours of training they had received regarding patient safety. Finally, participants were asked how many adverse events they had reported during the previous year. They were also asked what kind of patient safety related events they had faced, and whether they had reported them.

The data for measuring safety attitudes was collected using the University of Texas safety attitudes questionnaire (SAQ) [3] (short form version) that consists of six scales: teamwork climate, safety climate, perceptions of management, job satisfaction, working conditions, and stress recognition. Additional to the SAQ, five further statements examining safety attitudes were included, such as the health care professionals' perceptions of whether safety issues would be acted upon if they expressed them to management, and whether they experienced good collaboration with other nurses, staff physicians and pharmacists in their clinical area. A final statement examined if communication breakdowns that lead to delays in the delivery of care were common. The SAQ (short form version) used in this study comprised of 36 items, each answered using a six-point Likert scale: 1 = disagree strongly, 2 = disagree slightly, 3 = neutral, 4 = agree slightly, 5 = agree strongly, and 6 = not applicable. Negatively worded items were reverse scored so that their valence matched the positively worded items.

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The SAQ (short form version) was used because of its usability, the good psychometric properties it has shown in previous studies, and its broad potential for implementation [3, 17]. The instrument was originally developed in the United States of America and was translated from English into Lithuanian using the back-translation technique [18]. Permission to use the instrument in this study was obtained from the copyright holder of the instrument by the one of the authors. The questionnaire was piloted in one regional hospital with health care professionals to evaluate the validity of the instrument, and also its use in the Lithuanian context. The pilot data collection took place in February 2014, and included the hospital staff (n = 90). The pilot study hospital was not included in the main study. The SAQ showed good psychometric properties. The scales reliability was assessed with a total Cronbach's alpha of .78, corrected by inter-item correlation from .05 to .69. The Cronbach's alpha values were good for all scales for the main (and pilot) study: for teamwork climate .62 (.66), safety climate .74 (.78), job satisfaction .87 (.86), stress recognition .79 (.88), perceptions of management .90 (.92), and Working Conditions .74 (.78).

Ethical approval for the study was obtained from the Ethics Committee of Klaipeda University, Faculty of Health Sciences (Nr. 46 Sv-SL-1), and permission to collect data was also obtained from the hospitals participating in the pilot and main phases of the study. The ethical considerations related to the data collection were focused on the ethical principles for research, namely confidentiality (related to questionnaires), privacy, and the voluntary nature of participation in the study [19].

The main study data was collected in May 2014 in three regional hospitals. In each hospital, questionnaires with return envelopes were delivered to established contact persons. The contact persons circulated the questionnaires to all staff (n = 1687). After 2 weeks, the researcher collected the returned questionnaires in sealed envelopes from each unit. Because of a low response rate [46 % (n = 774)], reminder letters were left for the contact persons who were asked to circulate them. An additional 2 weeks were given to respond, and the final response rate was 64 % (n = 1082).

Statistical analyses

Descriptive statistics were used to describe the characteristics of respondents (physicians, head nurses, nurses and nurse assistants), the SAQ items, and the scale-level results of the three hospitals. Differences in sample characteristics between hospitals and professional groups were tested using one-way analysis of variance (ANOVA) and the Tukey HSD (honest significant difference) multiple comparison test, or the Tamhane multiple comparison test (when the assumption of equal variances was not correct). Non-normally distributed characteristics were analysed using the Kruskal–Wallis test. Data was presented using mean [standard deviation (SD)] or median [interquartile range (IQR)] expression. Any negatively worded items of the SAQ were reversed before analysis. The internal consistency of the SAQ and its scales of safety climate, job satisfaction, perception of management, and working conditions (for SAQ) was measured by calculating the Cronbach's alpha for each area. Associations between variables were calculated by means of Spearman correlations.

For further analysis, the units in which the respondents worked were re-grouped as internal medicine (e.g. internal diseases, neurology, cardiology, heart arrhythmia, haemodialysis, nephrology etc.), surgical (e.g. surgery, traumatology), psychiatric (e.g. mental health, treatment of addiction), acute (e.g. resuscitation, anaesthesiology, emergency, operating room, intensive care), and others (e.g. rehabilitation, laboratory, polyclinics etc.). Head nurses and nurses were also combined into one group (756 nurses including 54 head nurses). All of the data was analyzed using SPSS (Statistical package for social sciences) (version 22.0; SPSS Inc., Chicago, Illinois, USA). A *p* value of <.05 was considered to be statistically significant.

Results

Participants

The questionnaire was answered by 1082 (64 %) of the health care professionals surveyed. Participants were nurses (n = 756, 70 %), nurse assistants (n = 180, 16.6 %) and physicians (n = 146, 13.5 %). Most participants were female 989 (91.4 %) and their mother tongue was Lithuanian 1018 (94.1 %). The most common education institutions of the study participants were medical school 493 (45.6 %), college 130 (12.0 %), and a university bachelor programme 118 (10.9 %). Respondents stemmed from three regional hospitals: 301 (27.8 %) from hospital 1, 411 (38.0 %) from hospital 2, and 370 (34.2 %) from hospital 3. The mean age of the participants was 46.7 years (SD = 10.9). Most had a permanent position at their hospital (n = 1047, 96.8 %), the mean work experience was more than 20 years (mean = 23.9), and they worked an average of 39.9 h per week in their unit. Some health care professionals (n = 140, 12.9 %) had an extra job and worked an average of 18.6 h per week in this setting. Most of the health care professionals (n = 659, 60.9 %) worked variable shifts, and in units with averages of 30.7 beds and 24.9 staff members. Usually, one health care professional had 18 patients per working shift. Almost two thirds of the participants (n = 673, 62.2 %) had received no information about patient safety during their initial

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professional education, but about half (n = 589, 54.4 %) had received some in their further education (Table 1). 80 % of respondents (n = 866) had not reported any patient safety incidents during the last year.

Safety attitudes

The results of this study show positive safety attitudes overall, in regard to job satisfaction (mean = 4.14), teamwork and safety climate (mean = 4.10 in each domain), and working conditions (mean = 4.09) (Table 2). Only in the area of perceptions of management there were differences (p < .001) to be seen between the three hospitals participating in the study.

The most positive safety attitudes represented in the SAQ scales tended to correlate with the most background factors, namely safety climate, job satisfaction, perceptions of management and working conditions. Older health care professionals were associated with how they evaluated teamwork climate (.061), safety climate (.078), their job satisfaction (.150) and their perceptions of management (.140). The length of work experience in general was associated with how participants evaluated their safety climate (.082), job satisfaction (.155) and their perceptions of management (.193). Respondents who had received information about patient safety during their education were associated with how they reported their teamwork climate (−.090), safety climate (−.093), job satisfaction (−.076), perceptions of management (−.093) and working conditions (−.072). Those who had received information about patient safety in continuing education reported the same associations, with the exception of teamwork climate. Whether the health care professional worked day shifts or variable shifts was associated with her/his safety attitudes in all of the investigated safety areas: teamwork climate (−.108), safety climate (−.089), job satisfaction (−.137), stress recognition (−.088), perceptions of management (−.188) and working conditions (−.154) (Table 3).

Physicians had significantly higher safety attitudes related to teamwork climate (p = .014) and Stress Recognition (p < .001) than nurses and nurse assistants in the group of health care professionals who did not report a safety incident during the last year, but the attitudes towards the Perceptions of Management (p < .001) in the same group were significantly higher for physicians and nurse assistants than nurses. In the health care professional group who had reported a safety incident during last year, physicians had significantly higher safety attitudes related to their teamwork climate than nurses and nurse assistants (p = .011). Those who didn't report any safety incidents during the last year had more positive attitudes towards Stress Recognition than those who had reported such incidents.

Table 1 Work related background factors (n = 1082)

	Mean (SD)	Median (IQR)
Years of experience in primary speciality	21.61 (12.04)	22.00 (17)
Years of work experience in general	23.88 (11.52)	25.00 (15)
Years worked in this unit	14.32 (11.80)	12.00 (15)
Working hours per week in this unit	39.86 (8.23)	38.00 (2)
Hours per week in extra job	18.61 (14.63)	16.50 (16)
Number of beds per unit	30.72 (17.27)	30.00 (20)
Total number of staff working in unit	24.09 (10.33)	23.00 (10)
Number of patients health care professionals usually have per working shift	18.00 (12.03)	15.00 (12)
Health care professionals working in unit		
Day shift		
Physicians	4.28 (3.15)	3.00 (4)
Nurses	4.72 (4.82)	3.00 (3)
Nurse assistants	2.48 (2.14)	2.00 (2)
Evening shift		
Physicians	1.69 (1.47)	1.00 (1)
Nurses	2.34 (1.81)	2.00 (1)
Nurse assistants	1.62 (1.08)	1.00 (1)
Night shift		
Physicians	1.19 (.82)	1.00 (0)
Nurses	1.90 (1.15)	2.00 (1)
Nurse assistants	1.28 (.67)	1.00 (0)
Usual shift	N (%)	
Day	398 (36.8)	
Evening	2 (.2)	
Night	7 (.7)	
Variable shifts	659 (60.9)	
Other	14 (1.3)	
Extra job		
Yes	140 (12.9)	
No	939 (86.8)	
Information about patient safety during initial education		
Yes	408 (37.7)	
No	673 (62.2)	
If yes, hours [mean (SD), median (IQR)]	37.14 (58.49)	20.00 (30)
Information about patient safety in continuing education		
Yes	589 (54.4)	
No	492 (45.5)	
If yes, hours [mean (SD), median (IQR)]	24.22 (32.02)	14.00 (30)

When comparing safety attitudes between health care professionals by working unit, some significance differences were noted. Health care professionals working in psychiatric units had significantly lower safety attitudes relating to job satisfaction (p = .004), perceptions of management (p < .001) and working conditions (p < .001) than those working in internal medicine, surgical, acute or other units.

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Table 2 Patient safety attitudes

SAQ Short form scales/hospitals	Mean (SD)	Median (IQR)	Chi square	p value
Teamwork climate				
Hospital 1	4.07 (.64)*	4.07 (.64)*		
Hospital 2	4.08 (.72)	4.08 (.72)		
Hospital 3	4.16 (.67)*	4.16 (.67)*		
Total	4.10 (.68)	4.10 (.68)	3.84	.147
Safety climate				
Hospital 1	4.07 (.67)	4.07 (.67)*		
Hospital 2	4.05 (.72)‡	4.05 (.72)‡		
Hospital 3	4.17 (.67)‡	4.17 (.67)*, ‡		
Total	4.10 (.69)	4.10 (.69)	7.86	.020
Job satisfaction				
Hospital 1	4.21 (.84)*	4.21 (.84)*		
Hospital 2	4.05 (.90)*	4.05 (.90)*, ‡		
Hospital 3	4.19 (.84)	4.19 (.84)‡		
Total	4.14 (.87)	4.14 (.87)	6.35	.042
Stress recognition				
Hospital 1	3.86 (.88)	3.86 (.88)		
Hospital 2	3.79 (.94)	3.79 (.94)		
Hospital 3	3.75 (1.01)	3.75 (1.01)		
Total	3.80 (.95)	3.80 (.95)	1.12	.572
Perceptions of management				
Hospital 1	3.75 (.83)*	3.75 (.83)*		
Hospital 2	3.58 (.89)*, ‡	3.58 (.89)*, ‡		
Hospital 3	3.83 (.88)‡	3.83 (.88)‡		
Total	3.71 (.88)	3.71 (.88)	20.76	<.001
Working conditions				
Hospital 1	4.05 (.97)	4.05 (.97)		
Hospital 2	4.04 (.98)	4.04 (.98)‡		
Hospital 3	4.18 (.96)	4.18 (.96)‡		
Total	4.09 (.97)	4.09 (.97)	5.54	.063

For Means: ANOVA + Tukey HSD multiple comparison test

For Ranks: Kruskal–Wallis Test + Mann–Whitney U comparison test

* p < .05—differences between Hospital 1 and Hospital 2 or Hospital 3

‡ p < .05—differences between Hospital 2 and Hospital 3

Nearly two thirds of health care professionals (n = 638, 59 %) felt that their suggestions about safety would be acted upon if they expressed them to management, whilst 20.1 % (n = 218) were neutral and 18.1 % (n = 195) disagreed. Most of the respondents experienced good collaboration with nurses (n = 914, 84.5 %), with staff physicians (n = 859, 79.4 %), but less with pharmacists (n = 248, 22.9 %) in their clinical area. Only 18.7 % (n = 203) of health care professionals felt that communication breakdowns that lead to delays in the delivery of care were common.

Discussion

Our goal was to assess the general situation regarding the safety attitudes of health care professionals, because no national-level data had been reported in either Lithuania or any of the other Baltic Countries. Overall, the safety attitudes of health care professionals were positive and in-line with previous studies (e.g. [10, 20–22]). However, whilst the results of this study were partly in-line with earlier results, there were also contradictory elements. As such, further study is needed to establish links between these areas, and the attitudes and background factors of individual respondents, and this may prove important in developing our clinical practices. Age seemed to be associated with many safety attitudes scales, and it has previously been reported [15] that the highest positive safety score when comparing younger and older age groups was to be found to be in the 30–35 year age group. In our study however, safety attitudes were found to be higher in older age groups. This may be explained by the linked years of work experience (mean = 23.9) which indicates that health care professionals who know their job very well, may also hold enhanced safety attitudes.

Gender was only associated with stress recognition, although a previous study [13] has shown gender to be associated with several safety attitudes such as teamwork climate, job satisfaction, perceptions of management, and working conditions. In our study, only about 10 % of the respondents were male, which may have had an effect on the results.

It was interesting to find that physicians had higher safety attitudes towards teamwork climate than nurses and nurse assistants. this may indicate that physicians tend to value teamwork more when adverse events happen, and perhaps consider the issue to be faced as more of a common responsibility than other health care professional groups. Our result is similar to previous positive physician safety attitudes reported by other researchers, for example where physicians had more positive attitudes in perceptions of their working conditions [14], and in their perceptions of management [13] than nurses.

In comparing safety attitudes between health care professionals by work area, it was found that respondents in psychiatric units had significantly lower safety attitudes than those working in internal medicine, surgical, acute and other units. This might be linked to their working environment, as health care professionals may be more stressed when working with patients with mental illnesses, and sometimes be subjected to physical or psychological violence from their patients. Another explanation may be that health care professionals think

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Table 3 Correlations between respondents' background factors and their patient safety attitudes

Demographic characteristics	Teamwork climate	Safety climate	Job satisfaction	Stress recognition	Perceptions of management	Working conditions
Age	.061*	.078*	.150*	−.013	.140*	.053
Gender	−.041	.013	−.017	−.083*	−.029	.039
Education	.101**	.024	.003	.059	.090**	.044
Years of experience in primary speciality	.007	.041	.086**	−.003	.036	.046
Years of work experience in general	.053	.082**	.155**	−.033	.093**	.053
Information about patient safety during initial education	−.090**	−.093**	−.076*	−.007	−.093**	−.072*
Information about patient safety in continuing education	−.058	−.111**	−.100**	.018	−.099**	−.063*
Received hours regarding information about patient safety in continuing education	−.052	.005	−.017	−.039	.015	−.146*
Usual shift	−.108**	−.089**	−.137**	−.088**	−.188**	−.154**
Working hours per week in this unit	−.040	−.026	−.054	.067*	−.059	−.049
Extra job	.027	.081**	.047	−.046	.014	.025
Number of beds per unit	−.038	−.074*	−.066	.056	−.039	.003
Total number of staff working in unit	−.040	−.006	−.009	.079*	−.092**	−.057
Number of physicians working in unit on day shifts	−.024	.042	.046	.039	.056	.110**
Number of nurses working in unit on day shifts	.036	.034	.091**	.005	.046	.081*
Number of patients health care professionals usually have per working shift	−.020	−.033	−.095**	−.012	−.053	−.078*

Spearman correlations, * p < .05, ** p < .01

of safety issues differently depending upon the type of treatment involved (e.g. operations, infections, or patient falls), and some of these issues may not be seen to be so relevant in psychiatric units.

Other researchers [4] have also highlighted differences in attitudes between work areas, with the main finding that ED personnel perceived substantially lower levels of safety climate than workers in other clinical areas.

Health care professionals who received no information about patient safety during their initial professional education had more negative attitudes to teamwork climate, safety climate, job satisfaction, perceptions of management and working conditions than those who had. Also, health care professionals who received no information about patient safety during their further/continued education had lower ranked attitudes to safety climate, job satisfaction, perceptions of management and working conditions than whose who had. Drawing from this, we may consider that education about patient safety impacts upon the safety attitudes of health care professionals.

Methodological considerations

There are several strengths in this study. Especially, the response rate was good (64 %) and we were able to reach both nurses and physicians in the same study. A limitation may be noted in that the data was purposefully collected from one region. However, we consider these results to present a fairly representative view of patient safety attitudes that may be predicted in similar size multi-profile hospitals across Lithuania, as the country is divided into 10 similar size regions where health care services are organized using the same structure, and serve similar sized populations. Thus the results may readily transpose to a wider setting within Lithuania, but they may not be representative of other national settings.

Conclusions

Attitudes related to patient safety issues are positive among health care professionals in Lithuania, which helps to open the door for the open discussion of patient safety and adverse events. However, in future we also need to investigate the knowledge and skills professionals have in relation to patient safety, in order to gain a deeper understanding of the present situation.

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