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A scoping review of safety management during clinical placements of undergraduate nursing students

Marina García-Gámez, RN, MSc[a], Jose Miguel Morales-Asencio, RN, BSc, PhD[a,b,*], Silvia García-Mayor, RN, MSc, PhD[a,b], Shakira Kaknani-Uttumchandani, RN, MSc, PhD[a,b], Celia Marti-Garcia, RN, BSc, PhD[a], Inmaculada Lopez-Leiva, RN, MSc, PhD[a,b], Álvaro León-Campos, RN, MSc, PhD[c], Eloisa Fernandez-Ordoñez, RN, MW, MSc[c], Alfonso García-Guerrero, RN, MSc, PhD[a,d], Maria Rosa Iglesias-Parra, RN, MSc, PhD[a]

[a]Universidad de Málaga, Faculty of Health Sciences, Department of Nursing, Spain
[b]Instituto de Investigación Biomédica de Málaga (IBIMA), Spain
[c]Hospital Regional Universitario de Málaga, Spain
[d]Distrito Sanitario Málaga-Valle del Guadalhorce, Spain

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ABSTRACT

Background: The abundant knowledge on nursing students' competencies in clinical safety, and the multiple approaches adopted make it difficult to obtain an overview of the current status of this question.

Purpose: To review the literature on undergraduate nursing students' safety competencies during their clinical placements.

Method: A scoping review was carried out. Searches were executed in PubMed, CINAHL, WOS, MEDES, and websites of relevant organizations. The framework proposed by the Joanna Briggs Institute was adopted.

Findings: A total of 43 studies were selected for the final sample. The review identified four major topics: the presence of adverse events in clinical placements, the acquisition of competencies in clinical safety, student experiences regarding clinical safety, and pedagogical approaches for clinical safety.

Discussion: Nursing students encounter adverse events and clinical safety incidents throughout their clinical training. Faculties should assign the highest priority to this question, due to its importance in the creation of a culture of safety.

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* *Corresponding author:* José Miguel Morales Asencio, Universidad de Málaga, Faculty of Health Sciences, Instituto de Investigación Biomédica de Málaga (IBIMA), Arquitecto Francisco Peñalosa, 3, 29071 Málaga, Spain
E-mail address: jmmasen@uma.es (J.M. Morales-Asencio).

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Introduction

The report "To Err is Human: Building a Safer Health System," published in 1999, represented a turning point in the awareness of clinical safety in health care organizations. This report described a scenario of 98,000 deaths per year resulting from failures in clinical safety and proposed a different approach to the question, switching attention toward prevention and detection, instead of the blame-assigning stance traditionally adopted (Kohn, Corrigan, & Molla, 1999).

In the WHO 2009 conceptual framework for the international classification for patient safety, an incident is defined as "an event or circumstance that could have resulted, or did result, in unnecessary harm to a patient" and an adverse event (AE) is defined as "an incident that results in harm to a patient," thus including illness, injury, suffering, and disability (whether physical, social or psychological) (World Health Organization, 2009).

AEs currently account for 12.7% to 14.2% of all clinical safety incidents, producing 16.8 million injuries every year among hospitalized patients, and representing the loss of up to 22.6 million disability-adjusted years of life, of which 78% to 80% are due to premature death (Jha et al., 2013).

The main AEs identified in health systems are adverse drug reactions, thromboembolism, vascular and urinary catheter infections, decubitus ulcers, nosocomial pneumonia, and falls (Jha et al., 2013).

Care providers play an essential role in ensuring clinical safety. Factors such as the nurse-patient ratio and the level of skill-mix are reported to be closely associated with the prevention of AEs, including mortality. Similarly, there is a well-documented association between greater nursing care time and a lower incidence of AEs such as infections, haemorrhage, and nosocomial pneumonia. Moreover, an association between increased mortality and patient exposure to nursing shifts and patient turnover (hazard ratio per high-turnover shift, 1.04; 95% CI, 1.02 to 1.06) (Needleman et al., 2011). The recently-published results from RN4CAST, one of the largest international studies to be carried out in this field, involving nine countries, confirmed this conclusion, finding that for each patient that increases a nurse's workload, the probability of in-hospital death increases by 7% (Aiken et al., 2014).

The transmission and application of the principles and values underpinning a culture of clinical safety is inextricably linked to the training of future health professionals. The WHO has called for the integration of these competencies into undergraduate curricula, including Nursing, due to their enormous strategic value and because their full potential has yet to be realized. They developed the Patient Safety Curriculum Guide to provide guidance for patient safety learning as well as a comprehensive curriculum on the main patient safety areas. According to the WHO, focusing on patient safety skills and on appropriate nursing behavior should begin as soon as a student enters a hospital, clinic or health service (World Health Organization, 2011). Additional initiatives such as Quality and Safety Education for Nurses project (QSEN) have been deployed since 2005 to provide the necessary competences to future nurses (patient-centred care, teamwork, and collaboration, evidence-based practice, quality improvement, safety, and informatics) to continuously improve the quality and safety of the health care systems within which they work. Recent results about implementation of QSEN competencies into nursing education have shown its extensive incorporation by nurse educators, although there is a high variability regarding the degree of use throughout the curriculum (Altmiller & Armstrong, 2017).

The relation between nursing students and clinical safety has been approached from various perspectives, and diverse conclusions have been drawn. One study of the occurrence of AEs when students play an active role in clinical settings reported an incidence of 15% to 20% of biological event (exposure to needlestick and sharp injuries, secretions, fluids, etc.), with significant risk of infection or serious injury (García, 2013). Regarding competencies in clinical safety, the mere transmission of knowledge appears to be insufficient. Studies have reported that although students claim to be aware of the standard precautions and realise that they should be applied to all patients, this knowledge is not always put into practice. Thus, according to one report, only 60% of nursing students complied with personal hygiene recommendations, 66% made proper use of protective elements, and 44% correctly handled sharp or penetrating objects (Merino-de la Hoz et al., 2010). Moreover, essential aspects of patient safety such as the notification of incidents are not always addressed as curricular competencies, while in some study programmes the emphasis placed on such questions is unknown, as is the impact of their acquisition on the safety culture put into practice following graduation (Espin & Meikle, 2014).

In short, knowledge about various aspects related to the development of nursing students' competencies in clinical safety is presented in an abundant body of literature, but the multiple approaches adopted and the diversity of study goals make it difficult to obtain an overview of the current status and scope of this question and the consequent implications for educational policies and for the design and management of nursing services in patient safety. Accordingly, the aim of the present review is to map out the literature on clinical safety competencies in undergraduate nursing students, regarding methods used for the development of these competencies, the frequency, notification, and types of AEs and incidents involving students and their perceptions about aspects of clinical safety in their training. In addition, the review tries to identify current gaps in the knowledge on clinical safety competencies in nursing students to guide future research and curriculum development.

Methods

A scoping review was carried out of literature published on patient safety and undergraduate nursing students, following the framework proposed by Peters, the Joanna Briggs Institute, Sirriyeh and Jinks (Fallis, 2013; Peters et al., 2015).

Review Question

Population: Undergraduate nursing students.

Intervention or exposure: Exposure to AEs or incidents during their clinical placement, and educational interventions for the acquisition of competencies in clinical safety. For this review, competency was conceptualized as defined in the WHO Patient Safety Curriculum Guide, that is based on the Miller's pyramid of competence (World Health Organization, 2011).

Comparison: Not applicable.

Outcomes: Knowledge, skills, attitudes regarding clinical safety, perceived self-efficacy in its management, perceptions among students, satisfaction, influence on the development of critical thinking, frequency and notification of AEs in the curriculum, and relationship with the development of clinical judgment.

Setting: Nursing schools with Baccalaureate nursing programs, or clinical environments of nursing students' practice, in real environments (clinical placements).

Inclusion and Exclusion Criteria

The criteria were determined by the review question. Hence, the studies selected were those in which undergraduate nursing students were the main study population analyzed. Articles that included comparisons with other professionals were accepted, when the data were disaggregated for nursing students. To be included in this review, the articles should report any situation related to patient safety, such as exposure to AEs or incidents in the course of clinical training, and the methods and educational interventions employed to promote the acquisition of competencies in clinical safety. The outcome variables should be, for example, knowledge and attitudes in clinical safety, perceived self-efficacy in its management, students' perceptions and satisfaction, the influence on the development of critical thinking, the frequency and notification of AEs in the curriculum, and the development of clinical judgment. Studies exclusively focused on postgraduate nurses and those carried out specifically in simulated learning environments were excluded.

Types of Studies Included

The study designs accepted were: Cross-sectional and correlational, interrupted time series, cohort and case-control, experimental and quasi-experimental, psychometric validation studies, qualitative studies, mixed-methods studies, and reviews on clinical safety in undergraduate nursing students.

Search Strategies

Sources: PubMed, Cinahl, WOS, Medes. Additionally, websites from relevant organizations in patient safety were explored, such as WHO, QSEN, Institute of Medicine, and Ministries of Health. Searches were limited to the period 2008 to 2018, as the framework for the international classification for patient safety was developed in the early years of this century. The languages accepted were English, Portuguese, Italian, and Spanish. The search strategies applied are described in Supplementary file 1.

Data Extraction

For each article selected for inclusion, the study aims and design, together with the characteristics of the participants, the study context, the data collection procedure employed, the type of analysis performed, the intervention carried out (in the case of experimental studies), and the main results obtained were recorded. The studies were coded according to the main concepts addressed. This categorization was performed from an inductive perspective by a member of the research team and was later reviewed by another independent researcher, to ensure agreement on the codes assigned. These codes were then grouped into subject areas for a final thematic organization of the results. The geographical distribution of the studies was analyzed, together with the frequency and density of the categories and subjects addressed. Finally, the relationships between the main topics were compared and identified, with respect to the development of competencies in clinical safety in nursing students. Moreover, a bibliometric network was built up by means of text mining, to visualize co-ocurrences of relevant terms included in the selected papers. This analysis was carried out with the software VOS Viewer 1.6.8.

Appraisal of Study Quality

Critical reading and quality evaluation were performed using the criteria proposed by Sirriyeh, Lawton, Gardner, and Armitage (2012) and Jinks, Cotton, and Rylance (2010).

Results

A total of 220 studies were identified, of which 43 were finally selected for analysis. Figure 1 shows the flowchart used in this process. Figure 2 presents the geographical distribution of the studies, showing that most were conducted in the USA or Canada.

Cross-sectional ($n = 21$, 48.83%) was the most frequent research design, followed by qualitative studies ($n = 9$; 20.93%), quantitative retrospective observational studies ($n = 5$; 11.67%), and four reviews (11.62%; both

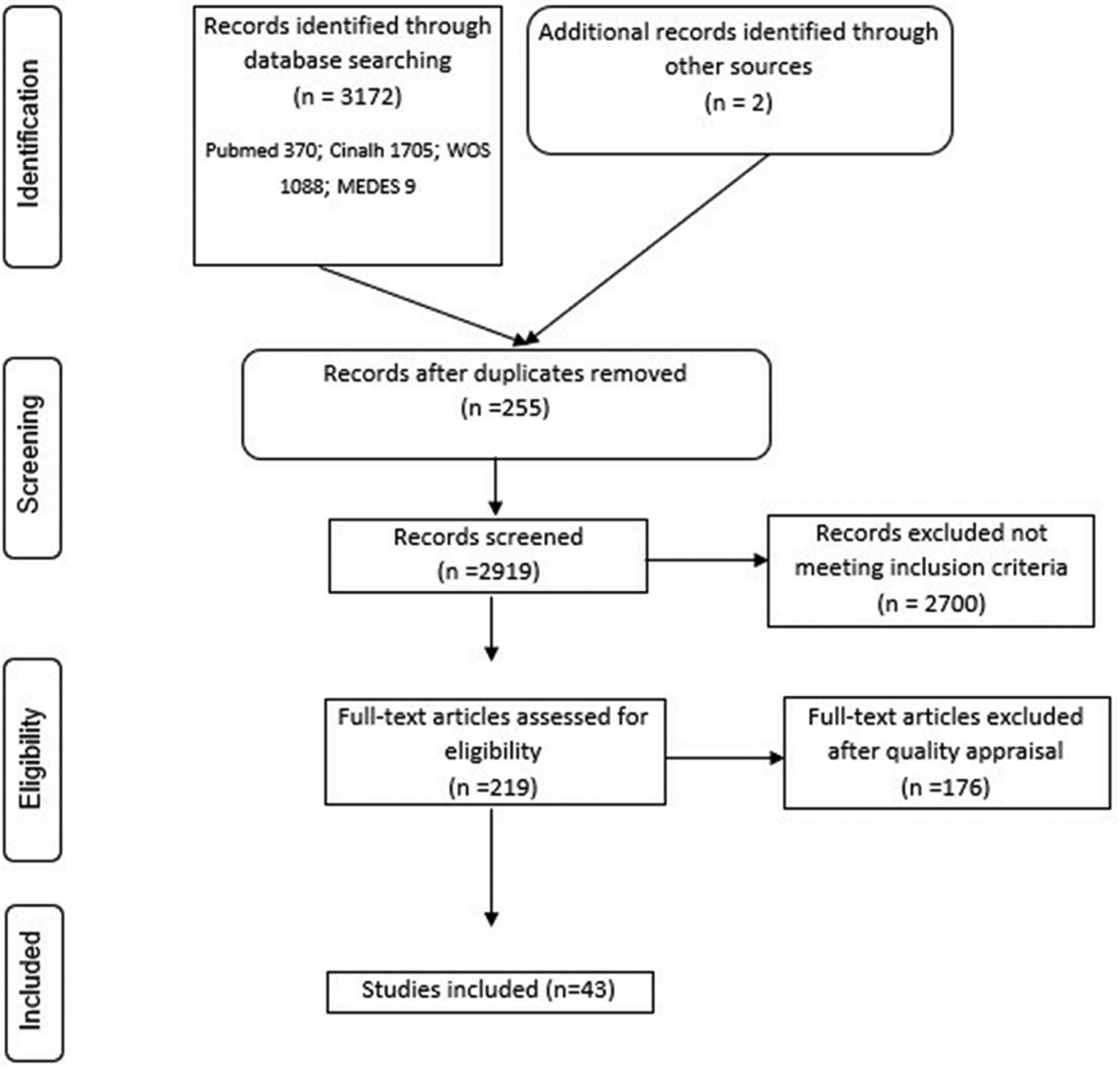

Figure 1 – Flowchart of screening process.

systematic, $n = 1$; and integrative $n = 3$). Three experimental studies (6.97%) with nonrandomized design were included, and one psychometric validation study (2.32%). Most of the primary studies included used self-reported questionnaires, or retrospective review of reporting systems, or semistructured interviews in the case of qualitative designs.

The approach proposed by Sirriyeh et al. (2012) was used to evaluate study quality, producing an average score of 25 (range: 0–42, and 0–46 for mixed-methods studies). The poorest quality was observed concerning the representativeness of the sample, the match between the research question and the data collection methods employed (in quantitative studies), the reliability of the analytical process, the participation of users in the design of the study and the limitations identified by the authors. The highest-scoring aspects were the description of the theoretical framework, the study goals, and the match between the research question and the data collection methods (in the qualitative studies). A detailed description of each study included in our analysis is available as a supplementary file.

The review identified the following four major themes in the studies considered: AEs, clinical safety competencies, student experiences regarding clinical safety, and teaching-learning approaches, methods and contents in this area. The thematic conceptual structure is shown in Figure 3.

The most recurrent themes in the literature on clinical safety and nursing students are the occurrence of AEs (with special emphasis on needlestick and sharp injuries and medication errors), followed by pedagogical strategies to promote clinical safety competencies.

Figure 2 – Geographical distribution of the studies.

Figure 3 sets out in detail the distribution of themes and categories found in the literature.

Additionally, the co-occurrence analysis showed how some patient safety concepts emerged in the network, such as needlestick injuries, drug therapy, infection control, medication errors, risk management. Furthermore, cross-sectional term was the prevailing item in the network regarding methodological aspects. Finally, clinical competence, attitude of health personnel and fear, pointed out the individual components of patient safety education in nursing students (Figure 4).

Adverse Events

In general, the topic most often addressed in these studies is that of biological events. However, papers have reported that after such events, the students experience emotions such as fear, anger, insecurity and anxiety, together with worries about the risk of infection or lasting injury. The main causes of these accidents, according to the students surveyed, are distraction, omission, stress, and overload (Petrucci, Alvaro, Cicolini, Cerone & Lancia, 2009; Orozco, 2013; Hambridge, Nichols, & Endacott, 2016; Harding & Petrick, 2008; Musa, Peek-Asa, Young, & Jovanovic, 2014).

Approximately 17% to 18% of nursing students suffer a needlestick/sharps injury (although values of up to 32% were reported by Merino-de la Hoz et al., 2010). Students' vulnerability to such accidents is aggravated by their lack of skills and experience. The majority of biological hazards are caused by needle punctures or cuts, spatter in urinary catheter removal, or during the collection of samples (glucose, blood, urine, or stool). Blood is the main biological source of contamination, and the most common route of exposure is via the skin (Canli & Aydin, 2013; Gómez & Mercedes, 2013; Massaro et al., 2007; Orozco, 2013; Small, 2011; Stefanati et al, 2015).

Medication errors by students are the second major block of AEs reported, accounting for around 38% of the total. Tutors detect and correct about 25% of these errors. Anxiety, fear, inexperience, distractions, and mathematical incompetence are identified as the main causes of error (Reid-Searl, Moxham, & Happell, 2010; Cebeci et al., 2015; Harding & Petrick, 2008; Lin, Wu, Lin, & Lee, 2014; Reid-searl, Moxham, Walker, & Happell, 2008; Simonsen, Daehlin, Johansson, & Farup, 2014).

About 25% of students report having suffered an accident, while 33% recognize having made (or almost having made) an error in medication. It is noteworthy that 55% of accidents took place in the absence of the tutor (Reid-Searl et al., 2010; Reid-searl et al., 2008; Small, 2011; Stevanin et al., 2015). Such accidents tend to be reported by second and third year students than those in their first academic year (Bellefontaine, 2009; Cheung et al., 2010; Gómez & Mercedes, 2013; Koohestani, Baghcheghi, & Sciences, 2009; Stevanin et al., 2015).

The areas or services involved in the majority of AEs affecting students are paediatric medicine, operating theatres, and medical care. The patient was exposed to physical risk in 34% of the AEs declared, such as the administration of medication, falls, and during sample collection (Gómez & Mercedes, 2013; Stevanin et al., 2015).

In general, nursing students fail to adhere to precautionary measures regarding isolation, avoiding environmental or equipment contamination, errors in gloving, and occupational hazards (Geller, Bakken, Currie, & Schnall, 2009; Gould & Ma, 2013; Stefanati et al, 2015).

In some studies, the students reported predictors of biological accidents such as the perception of not

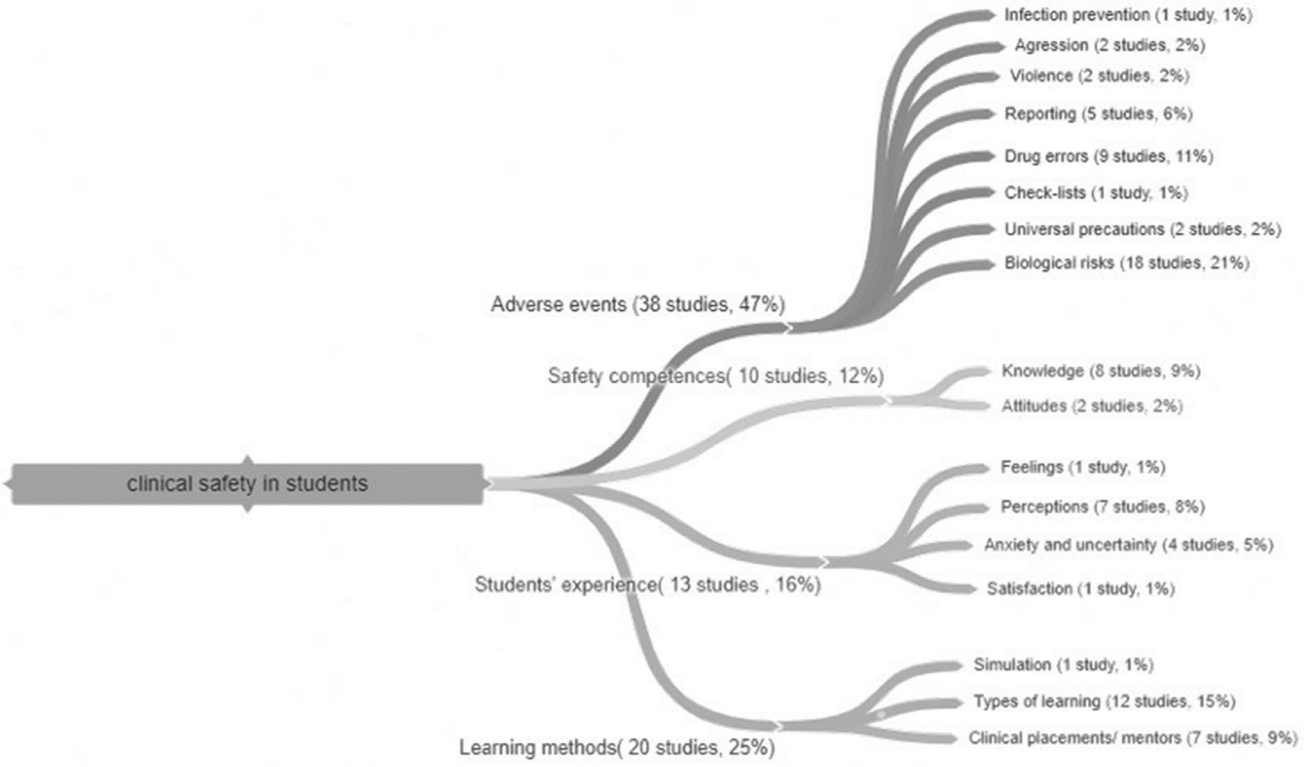

Figure 3 – Thematic conceptual structure.

receiving preventive training, failing to use the container for used needles and sharps, or the immediate disposal of needles and syringes. Paradoxically, students claimed to have a high level of awareness (85%–96%) of universal security measures (Al-rawajfah & Tubaishat, 2015; Merino-de la Hoz et al., 2010; Spence, Goodwin, Enns, & Dean, 2011; Westphal, Lancaster, & Park, 2014).

Very few events related to episodes of violence were reported, most of these were in the context of mental health care (Bilgin et al., 2016; Magnavita & Heponiemi, 2011).

Competencies in Patient Safety

The issue of nursing students' competencies in clinical safety highlights the division between the knowledge acquired and the attitudes shown towards learning, which some authors consider essential for the acquisition of knowledge (Killam, Luhanga, & Bakker, 2011). In this respect, studies have shown that the possession of practical skills and a good knowledge of nursing competencies can reduce or eliminate the fear of failure that affects some students in their clinical practice (Killam et al., 2011, 2012; Simonsen et al., 2014).

Students' Experiences

It is reported that students often experience fear of reprisals for reporting their mistakes and have little confidence in their ability to manage risks. Some authors have highlighted the importance in teaching students to focus on hazard identification and error avoidance (Raymond, Medves, & Godfrey, 2017). However, others have observed that nursing students are not comfortable talking about safety issues and are subject to anxiety when required to administer paediatric medication and to calculate the doses required (Lin et al., 2014; Lukewich et al., 2015; Raymond, Medves, & Godfrey, 2016; Tiwaken, Caranto, & David, 2015).

A study conducted to compare the perceptions of students from different countries emphasised the importance of the clinical learning environment and of systems-based approaches for the acquisition of knowledge and competencies (Tella, Smith, Partanen, Jamookeeah, & Lamidi, 2015).

Regarding perceptions of safety, four major factors have been distinguished: willingness to disclose errors; recognition, and management of medical errors; the perceived interprofessional context of patient safety; and perceived support and understanding for improving patient safety (Mansour, 2014).

With respect to the pedagogical approach, nursing students often have difficulties in mathematical competencies and in the formulation and calculation of medication. These problems impact on their clinical practices, provoking anxiety, and uncertainty when such competencies must be applied. The online reinforcement of skills in medication calculation has proven beneficial (Bagnasco et al., 2016; Coyne, Needham, & Rands, 2013; Lin et al., 2014).

Nursing students witness situations of aggression and violence, both physical and verbal, yet they

remain under-reported. It is of fundamental importance that nursing training programs should offer students guidance and strategies on how to prevent, avoid or cope with situations of violence and/or harassment (Magnavita & Heponiemi, 2011).

The supervision and teaching provided by tutors in clinical practices for nursing students is another central aspect. Relevant factors in this respect are the students' relationship with their tutors, whether the teaching method is based on demonstrating a professional approach, appropriate for the learning process, the supervision is more or less direct or whether innovative teaching strategies are applied (Reid-Searl et al., 2010; Bellefontaine, 2009; Killam et al., 2011, 2012; Reid-searl et al., 2008; Tella et al., 2014; Tiwaken et al., 2015).

The thematic areas identified in this review overlap in certain respects, such as between the development of nursing student competencies and the occurrence of AEs. Thus, most studies analyzing the development of competencies are oriented towards those involving coping with biological hazards, under the premise that enhancing skills in this area will decrease the fear of error (Killam et al., 2011, 2012; Simonsen et al., 2014).

The development of competencies is also affected by elements identified in other areas of student experience, such as the fear of reprisals for reporting errors, which leads to an under-reporting of AEs (Bellefontaine, 2009; Cheung et al., 2010; Gómez & Mercedes, 2013; Raymond et al., 2017).

Finally, learning methods are mainly aimed to the development of competencies to strengthen learning based on error analysis (Tella et al., 2014; Westphal et al., 2014 Krautscheid, Orton, Chorpenning, & Ryerson, 2011).

Discussion

The aim of this review is to identify and map the literature between clinical safety and undergraduate nursing students concerning the methods employed in developing these competencies, the frequency, notification and types of events and incidents, students' perceptions of aspects of clinical safety in their training, and gaps in awareness in this area, to guide future research and curricular development.

The main study finding is that 17% to 18% of nursing students experience AEs, especially those involving biological hazards (needlestick and sharp injuries, exposure to biological fluids and secretions, etc.), followed by medication errors. This scenario may be latent or not rendered sufficiently visible in many universities. Prioritizing clinical safety should be an indispensable element in the planning and organisation of clinical placements for nursing students, to generate a culture of safety in their current practice and as future professionals (World Health Organization, 2009). In this sense, the QSEN Institute RN-BSN Task Force proposes a three-level competency system as a key to improving patient outcomes, and to create a seamless transition between experience levels: for

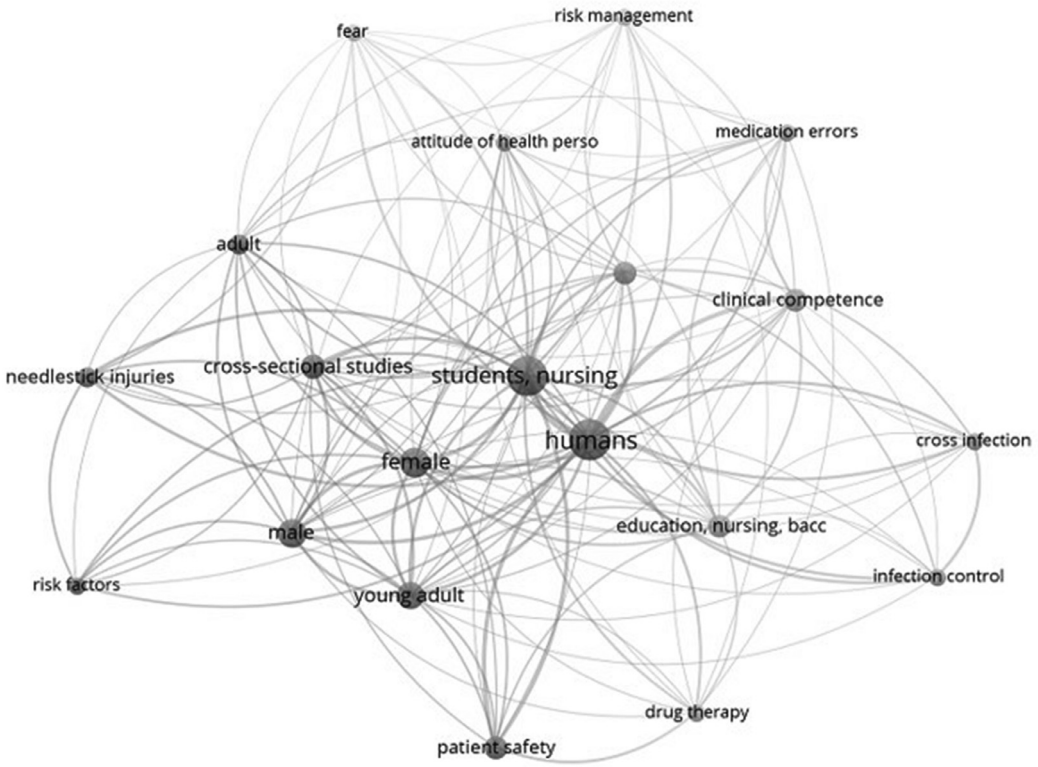

Figure 4 – Co-ocurrence of patient safety concepts in the review.

undergraduate nurses, for experienced nurses; and for advanced practice nurses (Stalter, Phillips, & Dolansky, 2017).

Tutors play a crucial role in ensuring clinical safety, and rates of incidents and AEs are higher when this supervision is absent. This question is closely related to the organization of clinical rotations and the availability of resources, as the tutor-student ratio is not always optimal (Scott et al., 2017). Other relevant factors include the tutoring styles employed (Moked & Drach-Zahavy, 2016) and the type of professional guidance imparted (Jochemsen-Van Der Leeuw, Van Dijk, Van Etten-Jamaludin, & Wieringa-De Waard, 2013).

There is a generalized finding that students are often reluctant to notify of risk situations encountered, for fear of retaliation, a problem that has also been detected in professional contexts and is not easy to overcome (Vrbnjak, Denieffe, O'Gorman, & Pajnkihar, 2016). In our opinion, learning environments should be created to foster a culture of safety, with a nonpunitive approach, in which the notification of incidents and events is viewed as an element of improvement, one that is performed by students from the outset and which will not detract from, and may even enhance, the consideration of their performance. Studies should be undertaken to assess the impact of modifying the learning environment to place more emphasis on achieving a culture of safety, and especially on encouraging nursing students to notify events in this area.

Although students are usually aware of the safety measures prescribed, they do not always put them into clinical practice. One reason for this is that teaching methods may be too narrowly focused on the acquisition of knowledge; if so, teaching-learning strategies should be modified to encourage students to make systematic use of safety measures. In this respect, Lin et al. (2014) indicated where such strategies could be oriented, such as making greater use of online courses to reinforce and extend the knowledge acquired from classroom teaching. Other studies have emphasised the need to enhance competencies in areas such as mathematics and the calculation of medication, in both theoretical and practical terms (Bagnasco et al., 2016; Coyne et al., 2013; Lin et al., 2014). Moreover, creating an appropriate, supervised environment with good student-tutor communication would improve the learning experience in clinical practice (Reid-Searl et al., 2008). Tutors and teaching staff in general, should strive to create an environment in which students are at ease and where the assurance of constructive, positive feedback eliminates their fear of reprisals in the declaration and analysis of errors or accidents (Bellefontaine, 2009; Cheung et al., 2010; Gómez & Mercedes, 2013; Raymond et al., 2017).

Most of the studies considered in this review remark on the urgent need for innovative measures in nursing study programs, although few specific suggestions are made in this area.

This review presents certain limitations. Firstly, we did exclude those studies carried out specifically in simulated learning environments. Nonetheless, one point mentioned by many authors is that theoretical learning in clinical safety should be combined with clinical placements, and that simulation practice should be incorporated as an intermediate learning space (Krautscheid et al., 2011; Tella et al., 2014; Westphal et al., 2014). However, the impact of such clinical simulation on nursing students' competencies in clinical safety remains uncertain (Blum & Parcells, 2012; Shearer, 2012). Therefore, further research based on rigorous study designs, is needed to determine the efficacy of these methods as a complement to those currently employed for the acquisition of competencies in clinical safety by nursing students (Cant & Cooper, 2017).

An additional limitation is that in most of the studies considered, the methodological quality is open to improvement. Moreover, a significant number of studies do not focus specifically on nursing students but include them among other study populations.

Another consideration is that studies tend to be concentrated in the Anglo-Saxon context, although our literature search included languages other than English. Possibly the culture of clinical safety is under-represented in academic settings in other geographical regions, or research in this area may not be a priority.

On the other hand, more high-quality evaluation studies are needed to estimate the impact of international initiatives deployed to improve clinical safety competencies of nursing students, such as WHO Patient Safety Curriculum Guide or QSEN. In many cases, studies were carried out locally, or with descriptive designs, or merely focused on the process of implementation, but with no outcome evaluation with robust methods.

Finally, the heterogeneity of nursing study programmes in different countries could be related to some of the study findings considered. However, this factor is beyond the scope of the present review.

Conclusions

Adverse events and incidents are not occasional or isolated occurrences in the experience of nursing students, but are encountered with some frequency, throughout their training. Accordingly, teaching institutions should grant the utmost priority to this question, to reflect its importance in the construction of a culture of clinical safety. Our findings show that the learning environment does not always favour the notification of such events, despite its importance as an element of improvement and learning. Nursing Faculties should implement systematic recording of clinical safety incidents among undergraduate students, and clinical safety should be a compulsory content of the undergraduate curriculum.

Teaching methods and approaches should promote not only theoretical learning but should also seek to modify professional behaviour to instil a culture of safety among nursing students, both during their

instruction and in subsequent clinical placements. The inclusion of preclinical and clinical workshops and seminars intended to promote culture of safety would be considered as a complement to theoretical learning and clinical placements.

Finally, higher-quality studies are needed in this field, with adequate sampling methods, bias control, and follow-up to establish solid conclusions and to address the research gaps that persist about the impact of different types of teaching methods.

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