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Conflict of interest

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ABSTRACT

Aims

To identify patient safety competencies, and determine the clinical learning environments that facilitate the development of patient safety competencies in nursing students.

Background

Patient safety in nursing education is of key importance for health professional environments, settings, and care systems. To be effective, safe nursing practice requires a good integration between increasing knowledge and the different clinical practice settings. Nurse educators have the responsibility to develop effective learning processes and ensure patient safety.

Design

Rapid Evidence Assessment

Data Sources

MEDLINE, CINAHL, SCOPUS, and ERIC were searched, yielding 500 citations published between 1 January 2004 - 30 September 2014.

Review Methods

Following the Rapid Evidence Assessment process, 17 studies were included in this review. Hawker's (2002) quality assessment tool was used to assess the quality of the selected studies.

Results

Undergraduate nursing students need to develop competencies to ensure patient safety. The quality of the pedagogical atmosphere in the clinical setting has an important impact on the students' overall level of competence. Active student engagement in clinical processes stimulates their critical reasoning, improves interpersonal communication, and facilitates adequate supervision and feedback.

Conclusion.

Few studies describe the nursing students' patient safety competencies and exactly what they need to learn. In addition, studies describe only briefly which clinical learning environments facilitate the development of patient safety competencies in nursing students. Further research is needed to identify additional pedagogical strategies and the specific characteristics of the clinical learning environments that encourage the development of nursing students' patient safety competencies.

Keywords:

patient safety, clinical setting, nursing student, competency, nursing education, clinical learning

Summary Statement

Why is this research or review needed?

- Patient safety is a health issue of international interest, and health care professionals have the moral and ethical responsibility to guarantee the patient safety.
- Nurse educators play an important role in developing evidence about undergraduate pedagogical processes and clinical safety.
- There is a lack of knowledge related to the type of clinical situations that influence the development of a safety conscience from a student perspective.

What are the key findings?

- There is a lack of knowledge and research that describes what characteristics clinical learning environments should have to facilitate the development of patient safety competencies in nursing students.
- When clinical environments actively engage students in clinical processes, students develop better critical reasoning, decision-making skills, and their overall level of competence.
- Mentors and tutors have an important role to support and supervise nursing students during their learning activities,

How should the findings be used to influence policy/practice/research/education?

- Further research is needed to identify additional educational strategies and clinical learning environments features that could develop nursing students' competencies in patient safety.
- A greater integration between theoretical and clinical learning is desirable. Such integration requires a relationship of trust between students and educators, where students are actively involved in the care process.

INTRODUCTION

This paper is a rapid synthesis of the literature on undergraduate nursing students' competencies regarding patient safety and the characteristics of the clinical settings, used as learning environments. This study focuses on the nursing students' acquisition of patient safety competencies and their experience in clinical settings.

Background

Patient safety is a health issue of international interest, and health professionals have the moral and ethical responsibility to ensure patient safety (Earle-Foley *et al.* 2012). Therefore, the global interest about this topic is driving the development of health care policies and educational systems to improve clinical practice, and transform the education of health professionals (Sherwood 2011, WHO 2012). According to Mansour (2015), Schools of nursing and health education organizations are in the position to deliver the required patient safety education. For this reason, patient safety in nursing education is of key importance in all professional environments, settings and care systems (Canadian Nurses Association 2009, Groves *et al.* 2011).

To be effective, safe nursing practice requires a good integration between increasing professional knowledge and different clinical and practical settings (Killam *et al.* 2012). In addition, nurse educators play an important role in developing evidence about undergraduate educational processes and clinical safety (Canadian Patient Safety Institute 2008, Killam *et al.* 2010, Wakefield *et al.* 2005). According to Benner *et al.* (2010) it is necessary to use clinical reasoning, skilled expertise and ethical integrity to improve practice, such as developing patient safety consciousness in nursing students. When students start their experience in clinical environments, they understand what clinical safety is (Killam *et al.* 2012). However, as underlined by Killam *et al.* (2012), there is a lack of knowledge into the kind of clinical situations that influence the development of a safety consciousness from a student perspective.

Tella *et al.*'s (2014) integrative review found that only few studies promote similar patient safety competencies among nursing students. There are educational programs and guidelines, such as 'Quality and Safety Education for Nurses' (QSEN) or the EUNetPaS project, which

were designed to improve the quality and safety of health care systems through nursing student education and their curricula (Mansour 2015, Tella *et al.* 2014). However, there is no homogeneity among patient safety competencies in nursing students across Europe, because there are countries such as Italy, where the nursing education programs differ even from one university to another (Mastrillo *et al.* 2009). In fact, in Italy there is no national strategy that provides a common program and approach for the development of nursing curricula on patient safety. This is a problem also in other countries like Canada (Killam *et al.* 2012), where there are no standards for the development of patient safety courses, skill labs or clinical learning experiences. Therefore, there is no homogeneity in the way nursing students are educated to ensure patient safety in clinical practice. Another important aspect to consider is that there is a little evidence about what kind of clinical situations influence the development of patient safety awareness in nursing students (Killam *et al.* 2012). There is also a lack of knowledge about the influence of organizational and practice culture, professional routine and rituals (Bradley *et al.* 2011) or which educational strategies can make a difference in the students' patient safety culture (Steven *et al.* 2014).

Little is still known about how patient safety is understood and applied in nursing education programs, such as how it can be integrated into health care education programs (Mansour 2012). Therefore, we need to identify which skills should be achieved through the education of future nurses and how to implement them in clinical practice. More knowledge about this will help educators and students to improve patient safety in clinical practice.

AIM

The aim of this review was to identify patient safety competencies, and to determine the clinical learning environments that facilitate the development of patient safety competencies in nursing students. The review considered the following questions:

1. Which competencies do nursing students need to ensure patient safety?
2. Which clinical learning environments facilitate the development of patient safety competencies in nursing students?

DESIGN

The present review was conducted according to the principles of a rapid evidence assessment (REA) (REA toolkit 2011). This is a rigorous method that enables to conduct a balanced assessment of policy or practice issues, by using systematic review methods to search and critically appraise existing research. REA is a faster and less rigorous process than a full systematic review, but more rigorous than an ad hoc search (Grant & Booth 2009). In addition, the REA search process does not include the use of grey literature; therefore, its breadth is more limited than that of a full systematic review. The limitations of this review are discussed below.

SEARCH METHODS

For the purposes of this literature review a clinical question was issued according to the PEO methodology (Population, Exposure, Outcomes) (Bettany-Saltikov 2012). The population was ‘nursing students’; the exposure was ‘the clinical placements in different environments’ (i.e. how the clinical learning environment influenced the development of nursing students’ patient safety competencies); the outcome was ‘the development of nursing students’ patient safety competencies’. The PEO was structured following some discussions between the research team and an external expert researcher in this field, who also supervised this study.

Preliminary studies were undertaken to identify the most relevant terms for the final searches. To identify relevant studies, four databases were systematically searched: MEDLINE, CINAHL, SCOPUS, and ERIC. The search years were limited to the period from 1 January 2004 to 30 September 2014. The researchers used the following key terms: patient safety; learning environment(*); clinical environment(*); clinical setting(*); clinical placement(*); practical placement(*); nursing student(*); competence(*); ability(*); capability(*); skill(*); nursing(*) education; learning; attitude(*). The key terms were exploded if possible in the databases and they were modified as necessary for the various kinds of databases (See Supporting Information Table S1). Six reviewers independently selected the papers according to the titles, keywords and abstracts. Then they analysed the full-texts of all the records they considered relevant for the review. Any discrepancies were discussed and resolved in a consensus meeting. An external researcher experienced in systematic reviews provided an independent quality check of the selection and supervised the whole review and analysis process.

Inclusion and exclusion criteria

After collecting the records, the eligibility criteria were applied to the results and all the identified studies were independently screened by our six reviewers and the review process is presented following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Moher *et al.* 2010). The review included studies that had either a quantitative, a qualitative or a mixed-method design. According to the REA methodology, grey literature and dissertations are excluded and citations or key author searches are not undertaken (Grant & Booth 2009). The search was limited to articles published in English and Italian, in the fields of nursing, education, and healthcare. A dedicated table was designed to record the details of each study and decide their inclusion or

exclusion according to the following criteria (Hawker *et al.* 2002): relevance to the research questions; the context of the material; the source of the data; and the type of study. Studies with very short abstracts or none at all were excluded. At the end of each phase of the review process, we reported the number of excluded studies and the respective reasons for exclusion after reading the full text.

Quality appraisal

Various validated tools for assessing quality of the studies in systematic reviews are described in the literature (Blank *et al.* 2012), although there is an absence of broadly agreed criteria for assessing the quality of studies, and for this reason it is not good practice to use quality as an inclusion criteria (CRD 2009). Although the REA methodology includes a straightforward qualitative appraisal (Grant & Booth 2009), to add more rigour to the present review, we used the original quality assessment tool developed by Hawker *et al.* (2002). However, we are aware that various quality appraisal tools available are methodologically questionable and raise various issues (CRD 2009), and some studies recommend the use of specific checklists for each type of selected paper, especially for those having a qualitative design (Lacey & Gerrish 2010).

Hawker *et al.* designed a tool that could methodologically appraise various types of studies, by analysing the title and abstract, introduction and objectives, method and data, sampling, data analysis, ethical aspects of the research process, the results, transferability or generalizability of the information that emerged, and the implications and usefulness of the study. These parts of the articles were rated using a four-point Likert scale ranging from 1 (very poor) - 4 (very good). The review included the studies selected according to these criteria and then assessed them with a total score that ranged from a minimum score of 9

(very poor) to a maximum score of 36 (very good). Studies with a poor or very poor quality score, quantitative studies lacking good validity and/or reliability, and qualitative studies lacking credibility and transferability were initially appraised and then excluded, since not relevant for the present rapid evidence assessment inclusion and exclusion criteria (Higgins & Green 2011). We decided to use this assessment tool because it could be easily adapted to the range of designs of the papers included. However, some of its appraisal criteria could be better developed to increase the robustness of the review process, such as logical consistency or methodological aspects (Coughlan *et al.* 2007)

Data abstraction and synthesis

The search of the four databases yielded the potential relevant studies. Two of our researchers identified and removed the duplicates, and six of our researchers screened the titles and abstracts of the remaining records. The same researchers then independently screened the full texts of the remaining papers to check that they met the inclusion criteria, and then they all met to discuss their findings. Disagreements were resolved through discussions and by reviewing the papers together with the rest of the research team to reach a consensus on their inclusion or exclusion. An external expert resolved any persisting disagreement among the researchers. The selected studies were analysed for their characteristics and methodology, and findings were summarized. A data extraction sheet was developed to extract the relevant data from the included reviews, according to the guidelines provided by the Institute of Medicine (2011) and Long and Godfrey (2004). The following data were collected: study design/methodology, purpose/objectives, research questions/hypothesis, sample description, results, conclusion, comments and issues raised, quality score, notes, themes and designation.

To identify the methods used in the selected papers, we created summary tables and the respective contents were condensed in the subheadings of the data extraction sheet (Sandelowski *et al.* 2013). Data extraction and synthesis included rereading, discussion, categorisation, and identification of the significant data. Due to their heterogeneity, the papers were also grouped according to their search and study methodology, as well as to their aims and findings. To synthesize qualitative and quantitative data separately, a narrative methodology was undertaken using the results based on the emerging themes to explore the relationships within and between the selected studies (Pope *et al.* 2007). Mixed-methods study data were analysed using the same methods separately.

RESULTS

Search outcomes

Results relating to the search and selection of the studies are summarized in the PRISMA flow diagram of the literature review process (Figure 1). Our database searches yielded 500 potential relevant studies (304 PUBMED, 127 CINAL, 31 SCOPUS, 38 ERIC) of which 155 were duplicates, and 270 studies were excluded because they did not meet the inclusion criteria. The full texts of the 75 remaining papers were then independently screened and at the end of this process a total 17 studies were included.

Due to the heterogeneity of the included studies and their small number, the findings of each study were summarized using a narrative methodology and all the meaningful data were classified and categorized into three dimensions: a) ‘competencies’; b) ‘pedagogical strategies’; and c) ‘clinical learning environment’. Of the 17 included studies, eight were quantitative, seven were qualitative (one study was divided in two articles) and two had a mixed-method design. The included studies were conducted in the following countries: five

in the USA (Gonzales 2014, Jones 2013, Abbot *et al.* 2012, Debourgh 2012, Chenot & Larry 2009), three in Canada (Duhn *et al.* 2012, Killam *et al.* 2012, Gregory *et al.* 2009), three in the UK (Christiansen *et al.* 2014, Steven *et al.* 2014, Kneafsey & Haigh 2007), four in Australia (Reid-Searl *et al.* 2013, Reid-Searl & Happell 2012, Reid-Searl *et al.* 2009, Reid-Searl *et al.* 2008), one in Iran (Vaismoradi *et al.* 2014), and one in Sweden (Johansson *et al.* 2012). The mean quality assessment scores of the studies did not differ much among the three types of studies (quantitative studies = 29.37; qualitative studies = 28.14; mixed methods studies = 31.50). The quality assessment scores for each quality domain for each study are shown in Supporting Information Table S2.

Description of the included studies

Quantitative studies

The eight quantitative studies included in the present review used different types of questionnaires to evaluate/examine nursing students' patient safety competencies, experiences, skills and attitudes in clinical settings. The principle data of the papers are shown in Table 1, whereas more detailed additional data are available in Supporting Information Table S3. Two studies administered the Healthcare Professionals' Patient Safety Assessment Curriculum Survey (HPPSACS) (Jones 2013, Chenot & Daniel 2010). In Chenot and Daniel's (2010) study the aim was to examine patient safety education in a sample of 400 scholarly professional nurses and to deliver recommendations to improve patient safety education in their academic curricula. The same survey was used in the study conducted by Jones (2013), where the aim was to measure the level of safety awareness and the learning outcomes in a sample of 84 associate degree nursing students.

Four studies adopted an ad hoc instrument (Reid-Searl *et al.* 2013, Debourgh, 2012, Johansson *et al.* 2012, Kneafsey & Haigh 2007). Johansson *et al.* (2012) used an ad hoc questionnaire to explore the nursing students' and registered nurses' experience with using a mobile device. The questionnaire was administered twice, before and after using a mobile device in a sample of 14 registered nurses and 7 nursing students. In their study, Reid-Searl *et al.* (2013) used a questionnaire designed to explore the experience of supervision in 45 nursing students during drug administration. To measure the 25 undergraduate nursing students' knowledge about broad safety quality topics and patient safety, Debourgh (2012) conducted a survey. With the same survey the author also investigated the students' perceptions of team behaviours and communication effectiveness in planning and delivering patient care. In this study, the same survey was repeated to assess changes in students during their learning experience.

Kneafsey and Haigh (2007) administered a 34 open and closed item questionnaire to a sample of 432 undergraduate student nurses to check their perceptions of safe patient handling skills in academic and clinical settings. To investigate the relationship between risk propensity and safe medication administration in a sample of 170 nursing students, Gonzales (2014) administered two instruments: the revised Domain-Specific Risk-Taking and Risk Perception (DOSPERT) Scale (to measure risk propensity) and the Self Administration of Medication (SAM) Scale (to measure knowledge and performance of safe medication administration). This study included a convenience sample of 80 fourth-year and 90 second-year undergraduate nursing students. The author used the data of this study also to examine the SAM Scale's construct validity, internal consistency reliability, and content validity.

The Health Professional Education in Patient Safety Survey (H-PEPSS) was used by Duhn *et al.* (2012). In a sample of 238 students, the authors demonstrated the importance of introducing safety principles in students' curricula as soon as possible and during all their health care programs.

With regard to the quality appraisal of the selected studies, they all scored quite well, ranging between 25 (the study by Gonzales *et al.* 2004) to 35 (the study by Chenot & Daniel 2010). Overall, the only aspects that obtained lower scores were related to the sampling methods. In fact, three papers (Debourgh 2012; Gonzales 2014; and Johansson *et al.* 2013) scored two, and one study (Duhn *et al.* 2012) scored three. These lower scores were due to the lack of detail and accuracy in the way the sample was described, and for their small size, as in the case of Debourgh (2012).

An aspect that was common to all the included papers was the lack of information or exhaustive statistical data to support their most significant data.

Qualitative studies

The seven included studies used different kinds of qualitative research methods. The main data are shown in Table 1, whereas additional detailed information is available in Supporting Information Table S4). Christiansen *et al.* (2014) used an interpretive research approach to investigate nursing students' experiences of participation in Action Learning (Revans 1982). This strategy was adopted to develop patient safety improvement and leadership competencies. A total of 52 nursing students were involved in focus groups and individual interviews, while data were analysed using thematic analysis. The findings were categorized into the following three dimensions: 'creating an enabling environment'; 'learning through action and reflection'; and, 'the emergence of safety improvement and leadership practices'.

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Gregory *et al.* (2009) used content analysis to analyse unsafe patient care events reported in clinical learning contracts started in 2nd, 3rd, and 4th year students of the undergraduate nursing program. The authors categorized 154 unsafe patient care events as errors, near misses, and potentially adverse and adverse events. Reid-Searl and Happell (2012) used qualitative exploratory methods to investigate registered nurses' attitudes, experiences and opinions about the supervision of undergraduate nursing students during the administration of medications in the clinical setting. The authors conducted focus group interviews with 13 registered nurses and the data were categorized into the following themes: 'standard of supervision', 'a beneficial experience' and 'preparation'. Reid-Searl *et al.* conducted other qualitative studies using Grounded Theory to investigate the undergraduate nursing students' experiences in administering medications. Twenty-eight last-year nursing students were interviewed, and the themes that emerged were divided into two separate papers (Reid-Searl *et al.* 2009, Reid-Searl *et al.* 2008). In the first paper (Reid-Searl *et al.* 2008), the 'shifting levels of supervision' was described as the main category, while the second paper (Reid-Searl *et al.* 2009) focused on the theme of 'internal conflict caused by the theory-practice gap'.

Also Vaismoradi *et al.* (2014) used a qualitative methodology by connecting three focus groups with a purposive sample of 18 nursing students. The aim of this study was to explore Iranian nursing students' perspectives and suggestions about developing patient safety in their academic curriculum. The data were collected with semi-structured interviews and analysed through content analysis and two main themes and four subthemes emerged: 1) 'involving students fully in patient care', with subthemes 'building a trusting relationship between education and practice', and 'promoting inter-dependence between health-care providers'; 2) 'structuring patient safety education', with subthemes 'transforming nursing routines to evidence-based care', and 'connecting care to patient safety issues' (Vaismoradi *et al.* 2014).

With a multi-method approach chosen to make an ‘illuminative evaluation’ Steven *et al.* (2014) investigated how undergraduate medical, nursing, pharmacy, and physiotherapy students learned about patient safety. To collect the data, the authors used different methods: focus groups with a sample of 24 students, 12 registered nurses, and six service users; observation of four practice placement episodes, and interviews of four health service managers. From a qualitative point of view, all the selected studies obtained high scores, except for the part regarding the generalizability of the results. However, this is considered to be one of the critical aspects of qualitative research (Polit & Beck, 2014), but in the case of the present review, this did not negatively influence the overall appraisal of the studies.

Mixed-methods studies

The two selected studies used mixed methods. The main data are shown in Table 1, whereas additional detailed information is available in Supporting Information Table S5. Killam *et al.* (2012) adopted the Q methodology to describe the senior undergraduate nursing students’ viewpoints about ‘unsafety’ in the clinical learning environment. A sample of 59 students in their last year edited 43 theoretical statement cards divided into site A and B. From the data analysis of site A, a discrete viewpoint emerged about ‘endorsement of uncritical knowledge transfer’; ‘non-student centred programs’ and ‘overt patterns of unsatisfactory clinical performance’. For the same site, a consensus viewpoint about contravening practices emerged. The site B discrete viewpoint was represented by a ‘premature and inappropriate clinical progression’; ‘non-patient centred practice’ and ‘negating purposeful interactions for experiential learning’; while the consensus viewpoint was about eroding conventions.

Abbot *et al.* (2012), instead, conducted an exploratory mixed-methods study using a questionnaire and semi-structured interviews in a sample of six students. The aim of the study was to explore nursing students’ attitudes about the value of an inter-professional patient

safety education course. From the analysis of the qualitative data emerged the themes of awareness, ownership, and action, which were then triangulated with the descriptive quantitative data derived from the students' course evaluations and performance.

With regard to the quality of the included studies, they both obtained high score: Abbot *et al.* (2012) = 27, and Killam *et al.* (2013) = 36. However, in the case of Abbot *et al.* (2012), it is important to underline that the sample was not described in detail, and this reduced the quality of this study.

DISCUSSION

From the analysis of the 17 papers included in this review emerged that only four studies describe the nursing students' patient safety competencies and what they have to learn during their university curricula (Chenot 2010; Duhn *et al.* 2012; Debourgh 2012; Jones 2013). The aim of this review was to identify patient safety competencies and to determine the clinical learning environments that facilitate development of patient safety competencies in nursing students, however the selected literature showed a lack of knowledge and research about clinical learning environments. These topics are not thoroughly explored, but according to Benner *et al.* (2010), clinical learning environments are crucial for the development of clinical reasoning, which is essential to improve patient safety competencies in nursing students.

Regarding the quantitative studies, only two (Chenot 2010, Gonzalez 2014) referred to a model called 'Quality and Safety Education for Nurses' (QSEN), which aimed to develop students' knowledge, skills, and attitudes in six areas: patient-centred care, collaboration and teamwork, evidence based practice, promotion of quality and safety, and information technology. In addition, the studies included in the present review mainly focused on

students' own perception towards patient safety or the specific competencies to be acquired, and very little is reported about the type of characteristics clinical learning environments should have. Only three studies showed the importance of the mentor's role in supporting and supervising students during their learning activities (Canadian Patient Safety Institute 2008, Killam *et al.* 2010, Wakefield *et al.* 2005). Jones (2013), however, underlined that the pedagogical atmosphere during the final clinical placement in students had a statistically significant positive correlation with the overall level of patient safety competency. In the study, after analysing the results of the same questionnaire administered during various clinical placements, found that for students errors are not unavoidable ($\alpha = 0.01$; t test = 2.619; p = 0.004), health professional do not tolerate uncertainty when caring for patients ($\alpha = 0.01$; t test = -2.95; p = 0.001), and that during their clinical placements the concept of safety is always highlighted ($\alpha = 0.01$; t test = -2.714; p = 0.003) This showed the important role played by clinical environments for the students' learning experience by involving them actively in clinical processes, effective interpersonal communication (Debourgh 2012), and adequate supervision and feedback (Kneafsey & Haigh 2007, Reid-Searl *et al.* 2013). In fact, in the study by Reid-Searl *et al.* (2013), 88% of the students reported that they had been directly supervised during all the drug administration procedures. In clinical settings, also the role and the quality of the relationship between students and nurse instructors are important (Debourgh 2012, Kneafsey & Haigh, 2007, Reid-Searl *et al.* 2013), as well as the opportunity for students to observe positive professional models (and not negative ones, such as power disparities between different health professionals) (Duhn *et al.* 2012, Kneafsey & Haigh 2007, Reid-Searl *et al.* 2013, Debourgh 2012). In clinical educational settings, problems may arise from specific contextual factors, such as lack of time for teaching, discordant relationships within the team, and the consolidated practice of inadequate procedures (Killam 2012). Killam *et al.* (2013) reported that there are four discrete viewpoints of unsafe clinical

situations for first year nursing students: overwhelming sense of inner discomfort, practicing contrary to conventions, lacking in professional integrity and disharmonizing relations. At the same time, Abbott *et al.* (2012) showed that students expressed positive views regarding content, knowledge gained, ability to apply knowledge, and their interactions with classmates and instructors, when there is a good clinical learning environment. Another significant aspect that emerged from this study was the importance of having clinical environments that encourage students' critical reasoning (Debourgh 2012), so that they may recognize their mistakes and implement decision-making skills (Kneafsey & Haigh 2007).

When analysing the studies, students' perceptions emerged as another meaningful aspect. Participants' perceptions usually reflected the level of sensitivity of their own role, as well as a general range of opinions about other matters related to patient safety (Chenot & Daniel 2010). In Debourgh's (2012) study, students reported that in their clinical learning setting, they perceived their impact on patient care outcomes. Furthermore, risk-inclined nursing students did not identify any medication errors and were less safe in medication administration, confirming the patient risk detection theory (Gonzalez, 2014). The study found a relationship between scores assessing personal risk taking in the area of health/safety and safe medication administration, although no relationship was found between personal risk perception and safe medication administration (Pearson = - 0.55; P = 0.04).

With regard to the qualitative studies, three different dimensions were identified: supervision characteristics, theory-practice gap, and educational strategies. The first dimension described the levels of supervision while students administered medications. Four levels were identified: 'being with, over, near, and absent' (Reid-Searl *et al.* 2008). Serious concerns emerged about the adequacy of the supervision provided to nursing students, highlighting the need for a more concerted approach to theoretical and clinical education. With regard to the second dimension, Reid-Searl *et al.* (2009) underlined the existence of a theory-practice gap

for medication administration and Steven *et al.* (2014) reinforced this theme with the tension emerged between creating a culture of ‘no blame’ and performance management. Finally, with regard to educational strategies, Vaismoradi *et al.* (2014) highlighted the importance of including patient safety aspects in the students’ curriculum as well as interdisciplinary education to ensure compliance with patient safety policies. An adequate theoretical background is essential to facilitate clinical experience and enable students to gain more confidence with the knowledge and skills they are developing (Debourgh 2012, Reid-Searl *et al.* 2012).

The qualitative analysis yielded three main categories: ‘creating an enabling environment’, ‘learning through action and reflection’ and ‘the emergence of patient safety practices’. Through action learning students can cultivate the leadership qualities considered essential for ensuring patient safety, and develop a greater sensitivity of the patient’s perspective, which has been identified as central to enhancing patient safety. Findings suggest that ‘Action Learning Sets’ can achieve this by enabling students to develop their own strategies to resolve real workplace issues and deal with the uncertainties and challenges associated with practice improvement (Christiansen *et al.* 2014). Unsafe patient care events are noted on the contracts as errors, near misses, potential adverse events, and adverse events. A student can learn from a mistake by being placed on a clinical learning contract. Given the possible limitations associated with the clinical instructor model, the realities of the practice context and recent changes in the student applicant pool, suggest that nursing programs ought to be moving in new directions, and in fact some have hired full-time clinical instructors as a first step (Gregory *et al.* 2009). In the mixed-methods studies, other themes are highlighted, such as the role of Academic Institutions in patient safety education, the students’ perceptions about unsafe clinical situations, and the importance of technology in increasing safe care.

Regarding the role of academic institutions, patient safety information and the wide range of clinical learning settings are considered essential to promote the nursing students' internalization of these concepts, major student awareness by learning from different clinical situations (Abbot *et al.* 2012), as well as their ability to work having an interdisciplinary perspective. The development of students' knowledge and skills about theoretical frameworks takes place through the use of simulation, standardized patient interviews, and case discussions (Abbot *et al.* 2012) and through the use of technology. Johansson *et al.* (2013) showed how a Personal Digital Assistant (PDA) can help to increase the quality of care, and patient safety, facilitate the handling of students' notes, improve drug calculations, and provide access to accurate information, leaving students with more time for their clinical practice.

According to the results of the current review a greater integration between theoretical and clinical learning is desirable. This type of integration requires clinical settings that foster a relationship of trust between students and mentors, where supervised students become an active part of the care process. These environments should enhance learning from mistakes by analysing what happened to gain a full understanding of the phenomenon without triggering a judgmental behaviour. Proper student integration in the clinical setting, should take into account the pedagogical sensitivity of the learning environment.

Limitations

The main limit of this review was the small number of papers found to be relevant to this topic. One reason could be that the rapid review methodology does not include grey literature, contacting authors, and unpublished material. Another limit is the heterogeneity of the studies included in this review due to their different designs, findings and methodologies.

In some studies, the sample is very small and findings are not generalizable. Furthermore, included studies were conducted in various countries (USA, Canada, Australia, Iran, Sweden and the UK) that have very different cultural and professional backgrounds. Moreover, these countries have their own cultural, professional, and academic curricula, therefore they are not easily comparable with those of other countries. The lack of experimental studies, the small sample sizes and the quality of the data analysis in some studies, may bias their conclusions and raise doubts about the generalizability of their findings. Another limitation could be the instrument used for quality assessment. Due to the way it is structured, it misses some important aspects such as 'risk of bias'. According to Cochrane, rather than providing a summary score, an assessment instrument offers a structure to explore under which domains the risk of bias may occur; thereby obtaining a general judgement of the level of 'risk of bias' (Higgins & Green 2011).

CONCLUSIONS

The purpose of this review was to analyse studies focusing on the characteristics of the clinical learning environments that facilitate the development of patient safety competencies in nursing students and to synthesize the findings. These studies show that nursing students need to develop complex skills to ensure patient safety. Some of these skills, such as communication and working in a multidisciplinary team, seem to be more difficult to acquire than other technical skills. Although selected studies did not directly analyse the characteristics of the learning environments, the quality of the pedagogical atmosphere of the clinical setting is considered to be very important because it can impact on the students' overall level of competency. Environments that actively engage students in clinical processes, stimulate their critical reasoning, produce good levels of interpersonal communication, offer

adequate supervision and feedback, therefore enabling them to reflect and learn from mistakes without generating feelings of guilt or blame.

Another important aspect of clinical learning settings is the role and the quality of the relationship between students and mentors, as well as the opportunity for students to observe positive nursing care models. An adequate theoretical background is essential to facilitate effective clinical experience and it makes students feel more confident about their patient safety knowledge and skills. After analysing the included studies, we found that it is important to ensure that students gain a deeper knowledge about patient safety also in the academic context. In fact, various studies stress the importance of a major interaction between the academic and clinical experts, because this can improve students' patient safety competencies. Patient safety must be dealt as a complex problem that requires various interventions with the support of a multidisciplinary team.

Two studies focused on identifying skills needed by nursing students that would enable them to ensure patient safety, leaving this field mostly unexplored (Abbot *et al.* 2012; Jones 2013). Therefore, further research is needed to identify new educational strategies and features that could improve the effectiveness of clinical learning environments in terms of developing nursing students' competencies in patient safety.

Author Contributions:

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*):

- 1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;

2) drafting the article or revising it critically for important intellectual content.

* <http://www.icmje.org/recommendations/>

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Table 1. Characteristics and key results of included studies

Authors/ Studies	Aim	Study Design Methodology	Sample Description	Results
Jones (2013) Quantitative	Evaluate student understanding of safety before & after their clinical experience.	Pretest–posttest design, and using HPPSACS modified	84 UNSs.	Results suggest a strong correlation between didactic and clinical instruction of QSEN safety competency teaching strategies to enhance knowledge about PS.
Kneafsey & Haigh (2007) Quantitative	Examine students' experiences of moving and handling education in academic and clinical settings.	Survey	432 UNSs.	Many students undertook unsafe patient handling practices and explained why. This study indicated a scope for improving safe M&H.
Chenot & Daniel (2010) Quantitative	Examine current PS education for UNSs and investigate their awareness, skills, and attitudes.	Exploratory quantitative study	Phase 1: 400 RNs Phase 2: 318 UNSs	The findings from the current study provide a clear understanding of the current status of patient safety awareness among pre-licensure nursing students.
Reid-Searl <i>et al.</i> (2013) Quantitative	To investigate student nurses' experiences of supervision while administering medications.	Survey	45 nursing students	88% of the students agreed that they had been directly supervised during drug administration procedures. Quality of supervision depended on ward busyness.
Duhn <i>et al.</i> (2012) Quantitative	Examine the perspectives of UNSs regarding confidence in what they were learning about patient safety.	Cross-sectional study/H-PEPSS questionnaire	238 UNSs	Students expressed high levels of confidence about hand hygiene, infection control, safe medication practices, and safe clinical practice in general, in all learning settings.
Debourgh (2012) Quantitative	Increase and measure awareness and knowledge among UNSs about PS and quality standards.	Descriptive pilot study design	24 Students	Dramatic increase in UNSs' awareness of safety goals, better prepared for each shift, better communication with health care team, perceived own impact on outcomes.
Gonzales (2014) Quantitative	Examine relationship between risk propensity and safe MA.	Non-experimental design/revised DOSPERT, SAM	170 UNSs	Risk inclined UNSs did not identify medication errors and were less safe in MA. Found a relationship between personal risk taking and safe MA.

Johansson <i>et al.</i> (2013) Quantitative	Explore nursing students' experience of using a mobile device in nursing practice.	Intervention study (mix method)	67 nursing students	Mobile devices increase quality of care, and PS, facilitate note handling, drug calculations, and save time for clinical practice, an access to accurate information.
Reid-Searl <i>et al.</i> (2009) Qualitative	To examine the emergent theme of internal conflict /gap between the theory and practice.	Grounded theory approach using semi-structured individual interviews.	28 nursing students	Themes: internal conflict; the theory- practice gap; meeting university requirements; meeting RNs' expectations; compromised patient safety
Reid- Searl <i>et al.</i> (2008) Qualitative	Explore the process of MA for nursing students when in the off-campus clinical setting.	Grounded theory approach using In-depth interviews	28 UNSs	The central categories were identified as 'shifting levels of supervision', describing the process of supervision students received while administering medication.
Steven <i>et al.</i> (2014) Qualitative	Explore ways medical, nursing, pharmacy, and physiotherapy students learn about PS.	Case study - Qualitative approach	24 undergraduate students, 12 nurses, 6 service users	In organisations PS was conceptualised as a complicated problem. Tension emerged between creating a "no blame" culture and performance management.
Vaismoradi <i>et al.</i> (2014) Qualitative	Explore UNSs' perspectives and suggestions on developing PS aspects of the nursing curriculum.	Qualitative methodology- Focus groups and semi-structured interviews	18 nursing students	Themes: 'involving students in patient care; 'structuring PS education'. Subthemes: 'turning nursing routine into evidence-based care', and 'connecting care to PS issues'
Reid-Searl & Happell (2012) Qualitative	Explore attitudes, opinions & experiences of RNs related to supervision of UNSs during MA.	Exploratory qualitative methodology. Focus group and interviews.	13 registered nurses	Themes: standard of supervision, a beneficial experience, preparation.
Christiansen <i>et al.</i> (2014) Qualitative	Explore UNSs' experience of participation in AL as a strategy for developing PS & leadership skills.	Qualitative, interpretive research approach using individual and focus group interviews	52 UNSs	Categories: 'creating an enabling environment', 'learning through action and reflection', 'emergence of PS practices'.
Gregory <i>et al.</i> (2009) Qualitative	Explore unsafe patient care events in clinical learning contracts for baccalaureate students.	Qualitative research	37 UNSs	Error (E); Near miss (NM); Potential adverse event (PAE); Adverse event (AE)
Killam <i>et al.</i> (2013)	Explore undergraduate baccalaureate nursing students'	Q-methodology	59 undergraduate nursing students	4 viewpoints of unsafe clinical situations: sense of inner discomfort, practicing contrary to conventions, lacking

Mix understanding of clinical safety. professional integrity and disharmonizing relations.

Abbott <i>et al.</i> (2012) Mix	Explore UNSs' attitudes about the value of an interprofessional patient safety education course.	Exploratory, mixed methods and embedded design study	14 nursing students, 1 law student, 19 pharmacy.	Three themes emerged from the qualitative data analysis of interviews: awareness, ownership, and action.
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Note: PS = Patient Safety; UNS = undergraduate nursing students; MA = medication administration; QSEN = Quality and Safety Education for Nurses; HPPSACS = Healthcare Professionals Patient Safety Assessment Curriculum Survey; H-PEPSS = Health Professional Education in Patient Safety Survey; DOSPRT = Domain-Specific Risk-Taking and Risk Perception; SAM = Self Administration of Medication.

Figure 1. Flow diagram of the literature review process (PRISMA 2009)

