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Patient Safety Education for Clinical Students: A Systematic Literature Review

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Abstract

BACKGROUND: Patient safety education has been studied from diverse views, from academic to the professional level, yet research on its effective learning methods remain limited.

AIM: This study investigated the implementation of patient safety in the hospital, the significance of patient safety education for students, and the search for effective practical learning methods.

METHODS: It employs a systematic review of articles from 2011 to 2021.

RESULTS: The research result indicates that patient safety implementation in the hospitals and patient safety education are currently significant trends in search of effective learning methods. Several studies denote that E-Learning and videos on patient safety can effectively increase the students' knowledge, skill, and attitude.

CONCLUSION: With the limitations of scientific writing related to patient safety learning in clinical learners, it is expected that this study can contribute to the development of patient safety teaching in the future. Future research may further examine and analyze the effect of instructional videos in detail.

Introduction

Studies indicated an estimated 98,000−44,000 death rate from preventable medical errors, causing it the third-highest mortality cause in the United States [1]. Patient safety is highly significant and it should be reflected in the patient safety culture. Education regarding patient safety among the health-care professional is still limited [2]. Meanwhile, patient safety culture is supposed to be instilled early in the health education and nursing education as the knowledge, skills, and attitudes of medical personnel in the hospital are highly prominent. Clinical learners, such as prospective nurses and future doctors, who are attending medical education in the hospitals should be equipped with a patient safety skill.

The lack of knowledge on patient safety among medical students shows the inefficiency of education. Therefore, the safety of patients in all medical and paramedical students must be prioritized and considered, requiring a better policy to improve patient safety [3]. Integrated education on patient safety at all medical and health education levels can prevent medical errors [4]. Hence, developing a strategy for all hospital employees is necessary to increase patient safety perception [5]. All levels of health-care professionals need to receive patient safety training and education.

Efficient hospital management requires patient safety improvement [6]. It is achievable through informative and collaborative workshops, pursuing education, and creating incident reporting systems. Many studies confirm the importance of patient safety in hospitals through quantitative, qualitative, mixed-method, and meta-analysis methods. They primarily focus on patient safety education in teaching hospitals, from undergraduate students to health professionals. These efforts require a hospital culture designed around patient safety and continuing education programs to provide high-quality service and patient safety [7]. The research recommends identifying interventions to improve the culture and patient safety and reduce side effects. Policies, systems, and cultures that assist patients and health-care professionals should be developed [8]. There is a positive attitude surrounding safety issues among health-care professionals and open discussions about patient safety and adverse events. Therefore, professionals require further knowledge and skills on patient safety to understand the current situation [9]. However, only a few previous studies examined the appropriate learning methods for clinical students. This

systematic literature review explores the significance of patient safety for medical professionals and students. In addition, it also seeks to highlight its implementation through appropriate patient safety education methods. At present, the rapid development of technology requires E-Learning in learning media. Therefore, researchers are also exploring the effectiveness of E-Learning and patient safety videos for students in improving their knowledge, skills, and attitudes.

Table 1: Research questions on the literature review

Serial number	Research question	Motivation
1	What is the role of patient safety in a clinical student's (Medical, nursing, and residents) education?	Identifying the part of patient safety in clinical student education
2	How important is patient safety for clinical students in teaching hospitals and its implementation?	It identifies the importance of patient safety for clinical students in teaching hospitals and its implementation.
3	What are the current trends regarding practical learning methods related to patient safety?	Identifying trends in patient safety learning
4	How effective are E-Learning and patient safety videos for students in increasing knowledge, skills, and attitude?	We identify the effectiveness of E-Learning and video patient safety for clinical students in creating K, S, and A

Methodology

Research design

The study used a method of systematic literature review. According to Kitchenham *et al*., 2007, SLR is carried out following a predetermined search strategy. The search strategy should allow completeness of the search, which is then assessed. When we do SLR, they should do everything they can to identify and report research that does not support their research hypothesis and identify and report research that supports it. Researchers use SLR because its advantages in the form of a well-defined methodology make it less likely that the results from the literature will be biased. SLR can provide information on the effects of some phenomena on empirical methods. When research offers consistent results, SLR can provide strong evidence. If the study provides inconsistent results, the source of variation can be studied.

Researchers conduct data synthesis through the formulation of research questions and literature searches. The source of the article synthesized in this study was searched using Search Engines, namely, PubMed, Google Scholar, and ProQuest.(https://www.proquest.com). A literature search using the keyword Patient Safety* AND Medical and Nursing Student and limited 2011−2020 gets 22.677 articles. Then, with the addition, keyword AND E-learning* AND Health Facilities* generated 4.597 articles, as described in Figure 1.

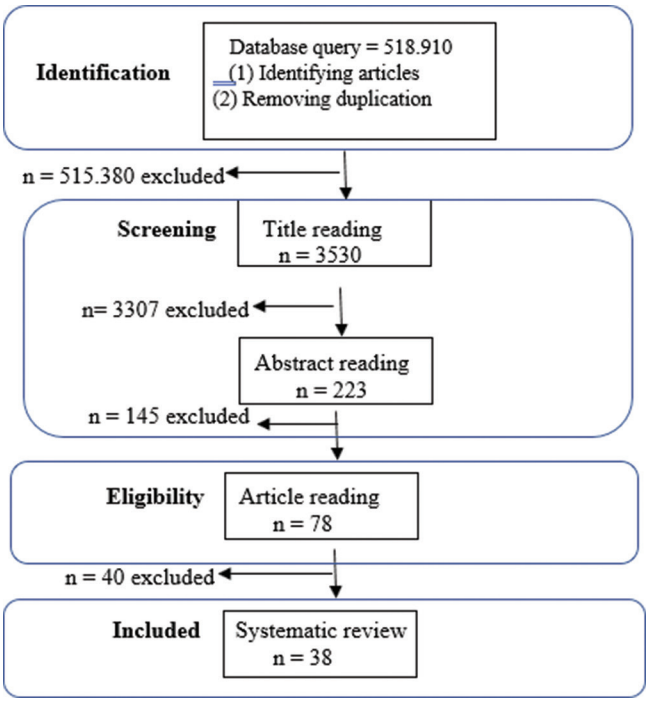

Figure 1: PRISMA flowchart of inclusion criteria

Research question

The research questions (RQ) were determined under PICOC (Population, Intervention, Comparison, Outcomes, and Context) criteria [10].

The research questions (RQ) and motivation are shown in Table 1.

Table 2: Inclusion and exclusion criteria

Criteria	Selecting Criteria
Inclusion criteria	English articles published from 2011 to 2020
	Containing the results of quantitative, qualitative research, or mixed methods
	Constituting the results of the study in education or patient safety education
	Articles with participants of professional and resident clinical students.
	Articles that include patient safety learning techniques in the form of conventional models, E-Learning, or videos
Exclusion criteria	Written in languages other than English
	Proceedings
	Containing research results in fields other than education or patient safety or teaching materials

The inclusion and exclusion criteria were used for selecting the articles, as provided in Table 2:

Results and Discussion

Thirty-eight articles match the inclusion criteria. Based on the year of publication, these articles can be classified as follows (Figures 3-5):

Table 3: Summary of population, intervention, comparison, outcomes and context

Criteria	Structure
Population	Clinical Student (Medical and Nursing Student) at the professional level and resident
Intervention	Patient safety education tools (E-Learning, Video, Conventional method, etc.)
Comparison	Between clinical students, between patient safety education tools
Outcomes	Knowledge, skill, and attitude of patient safety
Context	Hospital

Table 4: Articles based on the object of study

Year	Total	References
2011	4	Davis *et al*., 2011; de Feijter *et al*., 2011; Jansma *et al*., 2011; Maeda *et al*., 2011
2012	2	Roland *et al*., 2012; Abbott *et al*., 2012
2013	3	Teigland *et al*., 2013; Hayden, 2013; Pinto *et al*., 2013
2014	1	Liao *et al*., 2014
2015	2	Nabilou *et al*., 2015; Kirkman *et al*., 2015
2016	4	Laal *et al*., 2016; Brasaite *et al*., 2016; Gaupp *et al*., 2016; Kandler *et al*., 2016
2017	4	Dasić *et al*., 2017; Salvador *et al*., 2017; Dankbaar *et al*., 2017
2018	5	Oates *et al*., 2018; Spraker *et al*., 2018; Noviyanti *et al*., 2018; Titlestad *et al*., 2018
2019	7	Beekman *et al*., 2019; Park *et al*., 019; Lim *et al*., 2019; Gleason *et al*., 2019; Gaupp *et al*., 2019; Bäwert and Holzinger, 2019
2020	9	E. Lee and Kim., 2020; Y. Kim and Lee, 2020; Han *et al*., 2020; Levine *et al*., 2020; Solomon and Gudayu, 2020; S.E. Lee *et al*., 2020; Razzani *et al*., 2020
Total	38	

Patient safety in clinical student education

Clinical learners ranging from clinical clerkship students to residents in teaching hospitals need education about patient safety. It is mandatory for clinical learners who become prospective medical personnel in the future. Patient safety education that may only be taught in the past and only in general on campus should be accompanied by clinical education that includes knowledge, skills, and attitudes with the hope of forming an attitude culture when clinical learners become doctors later. Many studies have studied patient safety education starting from the academic level on campus. However, there is a little research on patient safety education in teaching hospitals, especially at a pandemic like today, learning a lot with online systems. This section will discuss patient safety education in clinical clerkship students to residents in various studies in many countries.

Students would better receive patient safety education and quality improvement through clinical education instead of preclinical courses or independent computer modules. Students understand the necessity of this topic for their careers as prospective doctors regardless of their intended specialization [11]. A study denotes that 3rd-year medical students identifying irregularities in patient safety understand problem-solving per the objective of the Association of American Medical Colleges (AAMC) of Trustworthy Professional Activity (EPA) [12]. It suggests that they intend to extend the curriculum to other 3rd-year core employees.

Health-care students reported that their knowledge level was low. While students generally hold a favorable view of patient safety culture, they have no exposure to a formal curriculum on patient safety. Policymakers must fulfill the varying needs across schools and groups in establishing a suitable curriculum [13]. They also prioritize real-life teaching methods and PBL (Problem-based learning) approaches [14].

Table 5: Review of articles related to E-Learning and patient safety learning videos in clinical learners

Serial number	Author	Subject	Research design	Results
1	Salvador PTCO, Costa TD, Gomes ATL, Assis YMS, 2017	Video	Quantitative	Videos containing information and high quality can improve the training process of learners and health professionals. The use of video can also increase individual awareness about the importance of their participation in patient safety
2	Anna Pinto, Charles Vincent, Ara Darzi, Rachel Davis, 2013	Video	Qualitative	As one of the educational videos, PINK has the important potential to empower patient safety and quality of service. However, in applying the educational video to practice, it is necessary to consider the needs and characteristics of different groups of patients
3	Andjela Bäwert, Anita Holzinger, 2019	Medical Student	Quantitative	A mix of teaching and learning formats, videos on online platforms with textbooks or lecture notes, is perfect for improving effectiveness and efficiency in learning
4	Rainer Gaupp, Julia Dinius, Ivana Drazic, Mirjam Ko¨rne, 2019	Medical Student	Quantitative	E-Learning may produce significant long-term effects on patient safety knowledge, but this study does not show any long-term effects on attitudes. E-Learning can be combined with face-to-face or more intensive E-Learning sessions, increasing the frequency and duration to achieve lasting attitude changes
5	Mary E. W. Dankbaar, Olivier Richters, Cor J. Kalkman , Gerrie Prins , Olle T. J. ten Cate , Jeroen J. G. van Merrienboer6 and Stephanie C. E. Schuit, 2017	Medical Student	Quantitative	Video-learning (in-game) and text-based lectures (in e-modules) have the same practical effect of developing knowledge on a particular topic. Serious games are very attractive for learners and interesting to learn longer and more but do not always result in better performance in patient safety issues
6	Rainer Gaupp, Mirjam Körner and Götz Fabry, 2016	Medical Student	Quantitative	Students' attitudes toward patient safety are increasing in several dimensions Knowledge of PS increases after E-Learning ($p < 0.001$)
7	Lukas Kandler, David W. Tscholl, Michaela Kolbe, Burkhardt Seifert4, Donat R. Spahn1 and Christoph B. Noethiger, 2016	Video		This study shows empirical evidence in video education during complex medical procedures
8	Johis Ortega, Maria Cristina Cometto, Rosa A. Zárate Grajales, Silvina Malvárez, Silvia Cassiani, Carmen Falconi, Daniel Friedeberg, and Nilda Peragallo-Montano, 2020	Nursing Student	Quantitative	ODL has contributed to improving patient safety cases internationally, especially in developing countries The availability of courses in three languages means nurses can take it in different countries, and its ease of access and free availability has contributed to its global reach
9	Shaw TJ, Pernar LIM, Peyre SE, Helfrick JF, Vogelgesang K, Graydon-Baker E, Chretien Y, Brown EJ, Nicholson J, Heit JJ, Co JP, and Gandhi TK, 2012	Medical and Surgical Specialties	Quantitative/ Randomized Controlled Trial	While both online methodologies enhance knowledge around NPSG, SE is more contextually relevant to trainees and engaging
10	Benedict Gross, Leonie Rusin , Jan Kiesewetter , Jan M. Zottmann , Martin R. Fischer , Stephan Pru¨ ckner , Alexandra Zech, 2019	Medical Student	Quantitative/ Experimental	CRM training in relatively short and highly standard interventions seems feasible. Research shows that didactic presentations show differences in the success of studies between groups. Instructional videos that show practical examples are better than traditional lectures
11	Predrag Dašić1, Jovan Dašić, Bojan Crvenković, 2017	Cloud		Patient safety is a growing problem that can be improved with high centralized surveillance systems that allow staff to focus more on health-care issues rather than keeping an eye on potential incidents
12	Kieran Walsh, 2018	Health-care Professional	Qualitative	Lack of evidence regarding health-care professionals sees E-Learning as a means of education to achieve safer health services. They have a tangible impact when the organizational culture does not change. Health-care professionals want to apply their E-Learning to learn how to follow guidelines that will help them in their efforts to achieve safer healthcare-some opinions regarding the difficulty of their learning

PINK: Participate Inform Notice Know, ODL: Online Distance Learning, SE: Spaced education, CRM: Crew Resource Management

Students go into different views on patient safety education, especially during the training transition, by which they gain practical learning opportunities to exercise their knowledge. Understanding the complexity of patient safety can improve education in medicine [15], and it profoundly impacts behavioral decisions in medical settings. Thus, education should emphasize the appropriate attitudes [16].

It is essential for nursing learners in teaching hospitals to learn patient safety, considering that nurses are health servants who must have the knowledge, attitudes, and patient safety attitudes. For now, patient safety learning for nursing learners at the campus level is very little, even in some non-existent countries. However, in hospitals, education has begun to be considered because it is essential. To educate nursing students about patient safety requires best thinking and determining effective learning methods and lesson hours.

Nurses should understand patient safety and patient safety cultural competencies to provide safe care. Research reports that patient safety and cultural competence are not discussed in laboratories and simulation rooms instead of classrooms [17], and some lecturers even omit patient safety topics. From those facts, we can conclude that there is less discussion on patient safety and learning content related to cultural competence. Nursing faculties need to ensure that their curriculum covers all essential cultural competencies and patient safety. However, patient safety aspects tend to have more discussions in all learning settings.

Supervisor-level nurses need to be concerned about the perceptions of patient safety management under particular work environments, such as collaboration and ratio between nurses and patient ratio. Nursing teachers may develop an integrated curriculum to successfully lead them to professional practice while increasing compliance with existing standards in health-care settings [18].

Abbott *et al*. collected qualitative and quantitative data through the measures of formative course performance, interviews, and assessments [19]. Nursing students give the course high marks and the significant nature of patient safety. They suggested insight into the students' awareness, actions, ownership, and the students' performance along with course assessment. The results promote the initial acts for integrating interpersonal patient safety with the nursing curriculum and meeting the visions of the Institute of Medicine for a professional plan.

High-quality service is significant for patient safety. Therefore, quality circles are highly recommended to solve the practical problem and optimize patient safety [20]. Continuing education and understanding of current diabetes guidelines were associated with adequate evaluation in essential areas [21]. Most nursing schools in Japan include patient safety [22]. However, insufficient learning hours were allocated, and teaching methods are less optimal, even though national patient safety education is had a great act.

The importance of patient safety for clinical students in the teaching hospitals and its implementation

There is a rapid increase in promoting interventions in patient safety among residents and medical students in terms of education. Nonetheless, a significant methodological weakness prevails that additional evidence on the educational outcomes is required. While there is some evidence of the increased efforts to increase the interventions, adoption and outreach are further tasks [23].

Patient safety focuses on clinical level education, providing meaningful opportunities for students to practice safe patient care [24]. After completing instruction, 12 months of positive and constant learning in patient safety can establish teaching patient safety in medical schools [25].

Patient safety education may bring long-term positive effects on students' knowledge, skills, attitudes, and behavior. After patient safety training, students expressed various intentions to improve patient safety. However, despite the actions taken, there is still a difference between preference and actual behavior. The measurement would have to complement educational efforts in removing barriers within social and organizational contexts to increase the contribution of health-care students in improving patient safety [26]. According to the program director of radiation oncology, the residents perceive patient safety and service quality improvement as an integral part of resident education [27]. They gain sufficient experience in patient safety and quality improvement and are also prepared to meet the medical practice's quality and patient safety improvement expectations.

A series of research results on patient safety education in medical-level clinical learners (clinical clerkship students to residents) illustrate that patient safety education greatly influences learners' knowledge, skills, and attitudes. Learners also showed interest in playing a role in the safety of these patients. Although patient safety is not explicitly taught during on-campus lectures (academically), many studies show tremendous benefits on patient safety education in clinical learners in-hospital education.

Education about ethical principles affects positive perceptions among the nurses toward patient safety culture. Therefore, a valuable and compelling method is recommended to raise their perceptions that health-care quality and patient safety are successfully improved [28].

The program is expected to improve patient safety and the learning systems among the students. It can be a model for the quality and safety principle integration with the curriculum for medical workers [29].

A curriculum and educational program are also needed to teach and practice fundamental ethical values. In addition, implementing a legal safety net and fostering a patient safety culture will require efforts from healthcare institutions and the government. Furthermore, public safety is essential in ensuring a truthful disclosure of patient safety incidents [8].

Trends in patient safety learning

Patient safety learning in medical students has changed drastically before COVID-19. Based on the study findings, medical students rated patients' role in error very low due to reduced clinical practice. Learning can continue to be provided and learned while maintaining student satisfaction through non-face-to-face teaching. Still, essentially, the attitudes that must be learned through experiential learning in the relationship of interaction with patients, professors, and their colleagues must be continually maintained from before the pandemic COVID-19 [30].

There is an increase in the use of online systems in tertiary education. Clinical psychomotor skills offered effectively in an E-Learning format are necessary to support integrated health programs and efforts. Students can learn these clinical psychomotor skills online with initial abilities. A paired t-test by Hayden shows a marked increase in cognitive knowledge [31]. Most students prefer at least one in-class session in a learning survey where immediate feedback and interaction with classmates are required to confirm safe and effective clinical techniques.

Roland *et al*. suggest that the previous research has yet to classify further training aspects or educational outcomes that the study wants to explore and has poor internal and construct validity [32]. Researchers hope that the future papers can validate specific measures by reproducing previous works instead of adopting new methods. The enhancement of specific cognitive processes, demonstrated in many studies of medical students, should be examined at a higher level of education (postgraduate). It is also essential to consider that E-Learning is the best supplement and method and is suitable for visual and auditory learners instead of the kinesthetics of those who read and write [33].

The effectiveness of E-Learning and video patient safety for clinical students in creating knowledge, skill, and attitude

E-Learning yields a significant long-term impact on patient safety knowledge, yet, it does not show a long-term effect on attitudes. A study by Gaupp *et al*. indicates two potential aspects for further researches [34]. First, the educator can combine the offline or E-Learning sessions with more intensive frequency and duration. It will help achieve attitude change, while E-Learning can be used for patient safety. Safety attitudes can be improved on several dimensions. In addition, specially designed E-Learning programs can encourage conceptual frameworks. It includes systems thinking and facilitating knowledge of complex socio-technical systems in health-care organizations [35]. There is also room for improving the growing issue of patient safety with high-end centralized surveillance. It allows staff to focus more on managing health problems than monitoring potential incidents [36].

The use of videos containing high-quality information can improve the training process of students and health professionals. It also increases the awareness of individuals about the importance of their participation in safety issues [37]. In this research, the presentation of didactic structures led to differences in learning success rates between groups divided between traditional lectures and instructional videos containing practical examples [38].

Here is the review literature related to E-Learning and Video learning in clinical learners related to patient safety.

According to Bäwert and Holzinger, there has been no significant increase in OSCE from the use of videos [39]. Their research reveals that instilling students' competence on medical and hygiene standards is still important before the first secretariat in ensuring patient safety. Exploring more on creative teachings, such as video making or sharing, can foster the efficiency and effectiveness of learning. The researchers suggest the need for subsequent studies on the effects of instructional videos because they significantly improve patient safety. Kandler *et al*. provide empirical evidence on the effectiveness of videos to raise the students' awareness on the standard protocols during complicated medical practices [40]. They even can minimize failures in patient safety. They recommend introducing video to improve protocol compliance.

Games or video games are perceived to balance the students' burden once they face hard times during the complex materials. Nevertheless, diverse characteristics of patients need to be considered [41]. Besides videos, teachers may also employ a game to raise their learning motivation, even though they do not always have a better result on the students' patient safety competence [42].

Conclusion

Patient safety is the most prominent aspect to concern in the hospitals as health-care facilities.

Considering the worldwide patient safety incidents, education system needs to be developed to increase clinical students' and residents' knowledge, skills, and attitudes. Meanwhile, patient safety education for clinical students is essential, and it needs practical learning. E-Learning and videos on patient safety can be a suitable learning method for the clinical student. In the past decade, especially in the 4.0 era, where almost all learning practices turn online, E-Learning has been much discussed, covering learning videos. In sum, E-Learning and practical videos on patient safety are very much recommended to provide within patient safety education to effectively improve students' knowledge, skill, and attitude. Future researches may further examine and analyze the effect of instructional videos in detail.

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