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REVIEW

Patient safety and infection control: bases for curricular integration

Segurança do paciente e controle de infecção: bases para a integração curricular

Seguridad del paciente y control de infección: bases para la integración curricular

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ABSTRACT

Objective: To analyze curricular integration between teaching of patient safety and good infection prevention and control practices. **Method**: Integrative review, designed to answer the question: "How does curricular integration of content about 'patient safety teaching' and content about 'infection prevention and control practices' occur in undergraduate courses in the health field?". The following databases were searched for primary studies: CINAHL, LILACS, ScienceDirect, Web of Science, Scopus, Europe PMC and MEDLINE. **Results**: The final sample consisted of 13 studies. After content analysis, primary studies were grouped into two subject categories: "Innovative teaching practices" and "Curricular evaluation. **Conclusion**: Patient safety related to infection prevention and control practices is present in the curriculum of health undergraduate courses, but is not coordinated with other themes, is taught sporadically, and focuses mainly on hand hygiene.
Descriptors: Patient Safety; Teaching; Infection; Curriculum; Higher Education.

RESUMO

Objetivo: Analisar, a partir da literatura, a integração curricular entre o ensino da segurança do paciente e as boas práticas de prevenção e o controle de infecção. **Método**: Revisão integrativa, com vistas à responder a seguinte questão: "Como ocorre a integração curricular entre os conteúdos 'ensino da segurança do paciente' e 'práticas de prevenção e controle de infecção' nos cursos de graduação em saúde?". Utilizou-se as bases CINAHL, LILACS, *Science direct*, *Web of Science*, *SCOPUS, Europe PMC,* e *Medline* para recuperar os estudos primários. **Resultados**: 13 estudos compuseram a amostra. Após uma análise de conteúdo, os estudos primários foram subdivididos em duas categorias temáticas: "Práticas de ensino inovadoras" e "Avaliação Curricular". **Conclusão**: A segurança do paciente, relacionada às práticas de prevenção e controle da infecção, embora contemplada nos currículos de ensino de graduação em saúde, é ensinada de forma pontual, diluída e desarticulada, focadas predominantemente na higiene das mãos.
Descritores: Segurança do Paciente; Ensino; Infecção; Currículo; Educação Superior.

RESUMEN

Objetivo: Analizar, partiendo de la literatura, la integración curricular entre enseñanza sobre seguridad del paciente y buenas prácticas de prevención y control de infección. **Método**: Revisión integrativa orientada a responder la pregunta: "¿Cómo sucede la integración curricular entre los contenidos 'enseñanza sobre seguridad del paciente' y 'prácticas de prevención y control de infección' en cursos de grado en salud?". Se utilizaron las bases CINAHL, LILACS, *Science Direct*, *Web of Science*, SCOPUS, Europe PMC y *Medline* para recuperar estudios primarios. **Resultados**: Muestra compuesta por trece estudios. Luego de análisis de contenido, los estudios primarios fueron subdivididos en dos categorías temáticas: "Prácticas de enseñanza innovadoras" y "Evaluación Curricular". **Conclusión**: La seguridad del paciente respecto de prácticas de prevención y control de infección, a pesar de contemplarse en los currículos de cursos de grado en salud, es enseñada de modo puntual, diluido y desarticulado, con foco predominante en la higiene de las manos.
Descriptores: Seguridad del Paciente; Enseñanza; Infección; Curriculum; Educación Superior.

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INTRODUCTION

Patient safety is a widely discussed subject worldwide, especially because of the high incidence of adverse events in health institutions. Its implementation involves a set of strategies and interventions capable of preventing and/or minimizing risks and harm to patients and keeping them at acceptable minimum levels[1-2].

Healthcare-associated infections (HAIs) stand out among the factors that represent threats to patient safety, both because of their high frequency and the high morbimortality that they cause. This problem has challenged scientific and technological advances and prompted professionals, researchers and organizations to propose effective prevention and control measures[3-4].

Faced with this issue, the Brazilian Ministry of Health instituted the National Patient Safety Program in 2013, based on international guidelines, to prevent and/or reduce the incidence of adverse effects related to healthcare services. This program ensured the inclusion of the topic of 'patient safety' in the curriculum of health undergraduate courses[5], but did not specify the mechanisms that should be used to evaluate the insertion of this subject.

Undergraduate courses in the health field play an important role in the promotion of knowledge, skills and attitudes associated with patient safety and contribute to safe practices and actions to deal with situations of risk. Nevertheless, health training oriented to patient safety is a variable that is difficult to assess, and the absence of systematic evaluation models that guide the teaching of this topic makes this task even more hard to carry out[6-8].

Taking into account these difficulties, the World Health Organization proposed an evaluation tool based on the examination of the topics in the curricula of health undergraduate courses; however, there is no multicenter research providing a worldwide overview of this aspect.

OBJECTIVE

To examine the curricular integration of content about patient safety and content about infection prevention and control practices by analyzing the literature.

METHOD

The present paper is an integrative literature review, one of the main documentation resources of evidence-based practice. This type of publication summarizes the empirical literature about a specific topic and provides a comprehensive understanding of the phenomenon under discussion[10].

The execution of the study encompassed the following steps: formulation of the guiding question; sampling; definition of the study characteristics by determining inclusion and exclusion criteria; analysis of the publications included in the sample; interpretation of results; and presentation of the review or synthesis of knowledge.

The guiding research question was: "How does curricular integration of content about 'patient safety' and content about 'infection prevention and control practices' occur in undergraduate courses in the health field?"

The search for primary studies was carried out in the following databases: the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin America and Caribbean Center on Health Sciences Information (LILACS), ScienceDirect, Web of Science, Scopus, Europe PMC and MEDLINE (accessed through the National Library of Medicine's PubMed website).

Chart 1 – Search procedure and number of papers obtained in each database, 2016

Database (total)	Cruzamento – Descritores	Number of papers
CINAHL (8)	"Patient Safety" AND "Education, Graduate" AND Curriculum AND "Nosocomial Infection"	-
	"Patient Safety" AND "Education, Graduate" AND Curriculum	-
	"Patient Safety" AND "Education, Graduate" AND "Nosocomial Infection"	-
	"Patient Safety" AND "Education, Graduate"	7
	"Patient Safety" AND Curriculum AND "Nosocomial Infection"	1
LILACS (3)	"Segurança do Paciente" [Palavras] AND "Educação Superior" [Palavras]	-
	"Segurança do Paciente" [Palavras] AND "currículo" [Palavras]	3
PubMed (19)	"Patient Safety" AND "Education, Graduate" AND Curriculum AND "Nosocomial Infection"	-
	"Patient Safety" AND "Education, Graduate" AND "Nosocomial Infection"	-
	"Patient Safety" AND "Education, Graduate" AND Curriculum"	-
	"Patient Safety" AND Curriculum AND "Nosocomial Infection"	19
Web of Science (129)	"Patient Safety" AND "Education, Graduate" AND "Curriculum" AND "Nosocomial Infection"	-
	Patient Safety * Education, Graduate * Nosocomial Infection	-
	"Patient Safety" AND Curriculum AND "Nosocomial Infection"	1
	Patient Safety * Education, Graduate * Curriculum	128
Scopus (76)	"Patient Safety" AND "Education, Graduate" AND Curriculum AND "Nosocomial Infection"	1

To be continued

Chart 1 (concluded)

Database (total)	Cruzamento – Descritores	Number of papers
Scopus (76)	"Patient Safety" AND "Education, Graduate" AND "Nosocomial Infection"	2
	"Patient Safety" AND "Education, Graduate" AND curriculum	30
	"Patient Safety" AND Curriculum AND "Nosocomial Infection"	43
Europe PMC (167)	"Patient Safety" AND ("Education, Graduate" OR Curriculum) AND "Nosocomial Infection"	10
	"Patient Safety" AND Curriculum AND "Nosocomial Infection"	123
	"Patient Safety" AND "Education, Graduate" AND Curriculum" "Patient Safety" AND "Education, Graduate" AND "Nosocomial Infection" Patient Safety" AND "Nosocomial Infection" AND ("Education, Graduate" OR Higher Education" OR Curriculum)	21 1 12
Science Direct (3)	("Patient Safety"[Mesh]) AND "Education, Graduate"[Mesh]) AND "Curriculum"[Mesh]) AND "Nosocomial Infection"[Mesh]	1
	("Patient Safety"[Mesh]) AND "Education, Graduate"[Mesh]) AND "Nosocomial Infection"[Mesh]	-
	("Curriculum"[Mesh]) AND "Patient Safety"[Mesh]) AND "Nosocomial Infection"[Mesh]	2
Total		405

Inclusion criteria were papers about the topic published in Portuguese, English or Spanish, with an available abstract, and no restriction regarding the publishing year. The search was carried out by crossing the descriptors "Patient Safety," "Education, Graduate," "Curriculum" and "Nosocomial Infection." In LILACS, the expressions were written in Portuguese, English and Spanish; in the other databases, only the English terms were used.

The search was performed in February and March 2016, and the seven databases were consulted simultaneously. The papers were analyzed by three researchers; two were experts on the subject and the investigation method. Paper selection was carried out in pairs to avoid selection bias. Chart 1 shows the search procedure used in each database and the number of papers found.

Of the 405 papers found in the databases, the following were excluded: 227 because they did not address the topic directly; 96 because they did not fully meet the inclusion criteria; and 37 because they were duplicates. Subsequently, 45 papers were fully read by two researchers, who selected 13 publications to make up the sample of the present review.

Paper selection was carried out through careful reading of title and abstract to check the adequacy of the guiding questions. Analysis of the material was performed descriptively.

RESULTS

Most of the 13 studies examined in the review originated from higher education institutions; five (35.7%) were from the United States and two (14.2%) from Brazil. Seven articles (53.8%) were published over five years ago, and most were published between 2005 and 2015.

After a thorough analysis of the studies, the material was grouped into two subject categories: innovative teaching practices (nine papers or 64.3%); and curricular evaluation (four papers, 35.7%). Chart 2 lists the studies included in the review sample and their characteristics.

Chart 2 – Distribution of the selected studies according to title, subject category, database, year, design, intervention and outcomes, 2016

Title/Subject category	Database/ year	Design	Interventions	Outcomes
Innovative teaching practices				
Compliance of nursing students with infection prevention precautions: effectiveness of a teaching program[11]	Scopus 2013	Clinical trial	To test the efficacy of an educational program to teach nursing students about infection prevention.	The program was effective, given that the experimental group presented a significant improvement in scores related to knowledge and attitude. The program was a promising tool for infection prevention and control.
Limited knowledge and practice of Chinese medical students regarding healthcare-associated infections[12]	Scopus 2013	Descriptive study	To examine if the clinical skills and performance of the students were influenced by teaching resources used to instruct them about infection control in the healthcare field.	Significant deficiencies in teaching resources may limit the knowledge and performance of students in important infection prevention and control practices, especially hand hygiene, the use of personal protective equipment, and the identification of pathogenic microorganisms. It is recommended that the content be spread out over the course and the teaching strategies be reviewed to focus on more inclusive and dynamic classes.

To be continued

Chart 2

Title/Subject category	Database/ year	Design	Interventions	Outcomes
An interdisciplinary infection control education intervention: necessary but not sufficient[13]	Europe PMC 2011	Prospective cohort study	To evaluate the efficacy of a module to teach infection control to nursing and medical students.	The use of the module was an effective and useful learning experience for developing attitudes and skills in clinical practices oriented to infection control. The tool was well accepted and contributed to knowledge retention during the monitoring of the participants, which lasted five months.
Creating a common patient safety denominator: the interns' course[14]	Europe PMC 2009	Prospective cohort study	To develop a "simulation scenario" for the evaluation of the performance of medical students in prevention of mistakes related to communication, teamwork and adherence to hand hygiene through the application of specific indicators.	The study reported serious inconsistencies in the students' performance regarding observation of hand hygiene, teamwork and, mainly, communication during shift changes. Participants said that the use of simulation scenarios allowed the identification of individual limitations and curriculum deficiencies that might compromise their clinical practice.
Educational interventions to improve knowledge and skills of interns about prevention and control of hospital-associated infections[15]	Europe PMC 2015	Prospective cohort study	To identify the educational deficit in the curriculum of medical undergraduate courses regarding prevention and control of healthcare-related infections.	In the current medical curriculum, the topic is taught by didactic lectures about facts related to etiology, pathogenesis and control measures. There is no module dedicated to the practical training of students to teach them hand washing skills and waste elimination, nor is there any method to assess those skills. The evaluation of knowledge of HAIs is a matter of chance, and practical skills are not assessed. The study revealed improvement in the knowledge and skills of the participants.
Comprehension of undergraduate students in nursing and medicine on patient safety.[16]	Web of Science 2013	Descriptive study	To evaluate the perspectives of undergraduate nursing and medical students about the human error and patient safety.	Sixty-four percent of the students agreed that, faced with an error, people involved in the situation must discuss its occurrence and establish effective prevention strategies, such as working more carefully, mentioned by 78% of the participants. Eight-four percent of the students said that professionals should not agree to work in places that do not offer proper conditions. Although 87.2% of the students answered that they communicated with their professor about the presence of conditions in training centers that favored errors, 33.9% did not want to tell patients and families about it if it did not cause harm to patients. Most students (91.7%) believed that error notification systems contributed to reducing the occurrence of mistakes.
Patient safety attitudes and behaviors of graduating medical students[17]	Web of Science 2011	Descriptive study	To describe the current behaviors and attitudes of medical students regarding patient safety and identify the areas that must be focused on in the design of curricula oriented to this subject.	Although most students had the desired attitudes about patient safety education, more space in the curriculum should be devoted to the causes of errors and effects of long working hours on safety. Students' skills, confidence about reporting errors, and disclosure were insufficient. Behavioral and teamwork aspects must be formally included in the curriculum.
Health professionals and hand hygiene: a question of pediatric patient safety [18]	CINAHL 2014	Descriptive study	To analyze how academic training on hand hygiene contributes to pediatric patient safety.	There were gaps in the hand hygiene training process. Academic training had very little effect on creating a patient safety culture, and the subject was not taught in enough depth in the course.
Human error and patient safety: an interdisciplinary course[19]	CINAHL 2012	Descriptive study	To describe an interdisciplinary program oriented to approaches to human error and patient safety in the curriculum of nursing courses.	Nursing undergraduates obtained higher scores in each evaluated category (errors and patient safety). All the students classified the program as satisfactory, pointing to an increased ability to work in interprofessional environments. They also presented improved knowledge and skills regarding patient safety and human error.

To be continued

Chart 2 (concluded)

Title/Subject category	Database/ year	Design	Interventions	Outcomes
Curricular evaluation				
A patient safety curriculum for graduate medical education: results from a needs assessment by educators and patient safety experts[20]	Web of Science 2009	Descriptive study	To evaluate the needs in the development of a patient safety curriculum in medical courses.	The interviewees suggested 21 patient safety topics that they considered necessary to their curriculum, related to cultural, cognitive and technical content. The items included communication and shift changes, sentinel reports, event management, hand hygiene, universal protocols, fatigue, and safety culture. Structured clinical exams and experience-based learning, including simulations, stood out among the most effective methods to teach and evaluate patient safety.
Targeting improvements in patient safety at a large academic center: an institutional handoff curriculum for graduate medical education[21]	Web of Science 2014	Descriptive study	To evaluate the development and implementation of a handoff shift change curriculum for medical students.	The designed curriculum included sessions of simulated experience of shift changes, with small and large groups. After the training, medical students were capable of recognizing the time dedicated to oral communication during shift changes and information recorded as important for effective communication and interaction with patients.
Web-based reporting of hazards and near-misses as part of a patient safety curriculum[22]	Europe PMC 2009	Descriptive study	To test a communication system that included didactic content focused on error identification and the innovative use of information technologies, contributing to the implementation of a curriculum oriented to patient safety.	The communication system identified that, among the most common error reports, the following stood out: infections, medications, environment, falls and equipment. It is necessary to design a better curricular approach for the integration of patient safety concepts and the need to report adverse events.
Teaching patient safety in the medical undergraduate program at the Federal University of São Paulo[23]	PubMed 2015	Descriptive-documentary study	To analyze the pedagogical projects of a medical course to verify that the content taught related to patient safety and inspired reflections about educational practice.	The teaching of patient safety was fragmented and focused on clinical skills, such as disease diagnosis and treatment, post-treatment, surgical procedures and follow-up. It confronts educational proposals based on traditional structures, centered on subjects and specific training, and is little valued.

DISCUSSION

The topic of infection-related patient safety is spread out over many subjects and addressed superficially in the curricula of health courses. Although infection one of the factors that have the highest risk of harm to patients, the content associated with the topic focuses excessively on hand washing, with a simplistic approach based on repetition of techniques. Studies have revealed that the conceptual basis requires a theoretical foundation and objectivity to establish a connection with nursing and medical practice, and that insufficient in-depth teaching on the theme does not allow its retention by students.

Healthcare-associated infections are widely occurring phenomena that compromise health safety in addition to patient safety, and affect patients, professionals and the entire health system. Their direct consequences include increases in morbimortality, longer hospital stays, higher healthcare costs, higher antimicrobial resistance, and higher risks to the professionals who provide care[24].

Consequently, unsafe care increases the chances of mistakes, given that safety pervades all health quality dimensions. Patient safety interventions focused on prevention of negative situations and monitoring of potentially harmful procedures reduce the possibility of iatrogenesis and other adverse events.

Healthcare-associated infections, including their principles, pathogenesis and transmission mechanisms, are part of the curriculum of health-related courses worldwide. Nevertheless, prevention and control of this type of infections as an indicator of quality and safety is little explored, even in medical school in developed countries[18-23,25]. This is a consequence of overvaluing content that helps develop clinical skills, such as diagnosis, treatment, post-treatment and follow-up, to the detriment of actions oriented to quality and safety in processes related to patient care[24].

One of the biggest obstacles to maintaining care quality relates to training of professionals[2]. The present review showed that higher education institutions have made efforts to create innovative curricula that are capable of incorporating patient safety and focused on prevention of mistakes that cause harm to patients, especially those related to HAIs[11-19]. To achieve this objective, institutions have resorted to instruments that facilitate the learning and retention of this topic, given that the traditional teaching method based on the "see one, do one, teach one" strategy is considered out-of-date, ineffective,

unstructured and unattractive to students, which hinders knowledge retention[26].

The literature emphasizes that students' clinical skills and performance are directly influenced by the available teaching resources and the innovations that they represent[11-19]. Among the most-explored technological tools in the studies, the use of software[11-12], on-line modules[13,15,17] and simulated scenarios[14,18-19] stood out. These methods are more versatile, and make initial interactions with patients safer, because professors can control and manipulate the conditions they are interested in. For instance, simulations allow the reproduction of rare, complex or high-risk scenarios for patients and students. In addition, they are a proper setting for developing skills related to sociocultural aspects, such as teamwork, risk management and safety culture, pointed to by students as "those about which they feel less confident in their practice"[27-28].

Knowledge is consolidated through the experiences that students establish with their study object. As a consequence, investing in innovative teaching strategies is a feasible alternative for teaching patient safety and its aspects as they relate to prevention and control of HAIs[20-23].

The outcomes of the present review show that, as a method of promoting patient safety, the study of HAIs is restricted to the teaching of hand hygiene[12,14-15,18,20]. Even though the World Health Organization has established hand hygiene as an international patient safety goal, limiting good practices to a single set of procedures expresses a positivist line of thought, and is based on practical and utilitarian indicators that value procedures and technique.

The selected studies reveal that little is taught about human fallibility. Although failures and misconceptions are present in medical practice, they remain poorly understood, because of the potential harm associated with errors. They are commonly denied because they are feared. Medical errors not only occur, but are also considered unavoidable[23,29].

The main recommendations of the studies include that the teaching of patient safety must draw upon two principles: interdisciplinarity and innovation. The potential approaching the topic in all subjects, especially those whose aim is to develop theoretical-technical skills, must be a transverse axis in the training of healthcare professionals. Encouraging evaluation and the practice of self-criticism must also be part of pedagogical routines, since they should occur in all subjects[30].

Study limitations

Because the present review was integrative, the results depict only the investigated reality. In addition, the low number of randomized clinical trials in the sample prevents comparison of interventions.

Contributions to the Nursing, health or public policy areas

The increasing occurrence of adverse events in care processes evidences training deficiencies. The present study is an important contribution to the design of undergraduate courses in the health field. It provides an overview of the recent context in health education worldwide, along with tools to be used to tackle and resolve issues in the teaching of patient safety. The review shows that the teaching techniques that are currently in use are out-of-date and uncoordinated, and points to the use of new didactic tools, such as clinical simulation and information technology.

FINAL CONSIDERATIONS

Patient safety related to infection prevention and control practices is included in the curriculum of health undergraduate courses sporadically and in an uncoordinated way. The current superficial approach includes simpler aspects, such as hand hygiene. Few studies focused on biopsychosocial aspects (safety culture, communication and teamwork).

The authors believe that more in-depth approaches throughout healthcare courses that go beyond the teaching of isolated practices can contribute to the training of professionals and make them aware of patient safety issues. This will have a direct impact on the quality of the care delivered.

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