

## Teaching of infection control in undergraduate courses in health sciences: opinion of experts

*Ensino do controle de infecções na graduação em saúde: opinião de experts*  
*Enseñanza del control de infecciones en la graduación en salud: la opinión de expertos*

Aline Massaroli<sup>1</sup>, Jussara Gue Martini<sup>1</sup>, José Luis Medina Moya<sup>11</sup>,  
Julia Valéria de Oliveira Vargas Bitencourt<sup>1</sup>, Kenya Schmidt Reibnitz<sup>1</sup>, Mariely Carmelina Bernardi<sup>1</sup>

<sup>1</sup> Universidade Federal de Santa Catarina, Research Laboratory and Technologies in Nursing Education and Health.  
Florianópolis, Santa Catarina, Brazil.

<sup>11</sup> Universidad de Barcelona, Faculty of Pedagogy. Barcelona, Spain.

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### ABSTRACT

**Objective:** To know the perception of expert professionals in infection control and prevention on the teaching of skills for the prevention and control of infections related to health care in undergraduate courses in Health Sciences. **Method:** We used the Delphi technique, developed in four sequential rounds. Thirty-one nurses and eight physicians participated in the study. Qualitative data were analyzed through content analysis; the quantitative ones, from the descriptive statistics. **Results:** The importance of the courses has had teachers with expertise in infection control and prevention added to arguments about the development of the subject in the curricula by means of a specific subject or as a transversal theme. **Conclusions:** In order to cover the complexity of the elements that are interconnected for professional training, teaching must be based on pedagogical strategies that provoke reflection in students, encouraging them to develop critical thinking about their experiences.

**Descriptors:** Health; Education; Infection Control; Higher Education; Curriculum.

### RESUMO

**Objetivo:** Conhecer a percepção dos profissionais com expertise em prevenção e controle de infecção sobre o ensino das competências para a prevenção e o controle de infecções relacionadas à assistência à saúde nos cursos de graduação da área da saúde. **Método:** Utilizou-se a técnica Delphi, desenvolvida em quatro rodadas sequenciais. Participaram do estudo 31 enfermeiros e oito médicos. Os dados qualitativos foram analisados por meio da análise de conteúdo; os quantitativos, a partir da estatística descritiva. **Resultados:** Emergiu a importância de os cursos contarem com docentes com expertise em prevenção e controle de infecções. Somada a argumentações sobre o desenvolvimento do tema nos currículos por meio de uma disciplina específica ou como tema transversal. **Conclusões:** Para abranger a complexidade dos elementos que se interligam para a formação profissional, o ensino deve pautar-se em estratégias pedagógicas que instiguem a reflexão no estudante, estimulando-o a desenvolver o pensamento crítico sobre suas vivências. **Descritores:** Saúde; Educação; Controle de Infecções; Ensino Superior; Currículo.

### RESUMEN

**Objetivo:** Conocer la percepción de los profesionales con experiencia en prevención y control de infección sobre la enseñanza de las competencias para la prevención y control de infecciones relacionadas a la asistencia a la salud en los cursos de graduación del área de la salud. **Método:** Se utilizó la técnica Delphi, desarrollada en cuatro rondas secuenciales. Participaron del estudio 31 enfermeros y 8 médicos. Los datos cualitativos fueron analizados por medio del análisis de contenido y los cuantitativos, a partir de la estadística descriptiva. **Resultados:** Ha surgido la importancia de que los cursos tengan docentes con experiencia en prevención y control de infecciones. Sumada a las argumentaciones sobre el desarrollo del tema en los

currículos por medio de una disciplina específica o como tema transversal. **Conclusiones:** Para abarcar la complejidad de los elementos que se interconectan para la formación profesional, la enseñanza debe guiarse en estrategias pedagógicas que instiguen la reflexión en el estudiante, estimulándolo a desarrollar el pensamiento crítico sobre sus vivencias.

**Descriptores:** Salud; Educación; Control de Infecciones; Enseñanza Superior; Plan de Estudios.

CORRESPONDING AUTHOR Aline Massaroli E-mail: alinemassaroli@gmail.com

## INTRODUCTION

Healthcare-Associated Infections (HCAI) refers to cases of infection developed by a person who has received care from a health service (hospital, outpatient clinic, primary care unit, dialysis centers, etc.) and the infection may be related with the procedures to which the subject was submitted<sup>(1)</sup>.

Studies conducted worldwide identify HCAI as the main adverse event related to health care, being one of the leading causes of morbidity and mortality among patients, generating significant costs for the health services to care for patients who develop some infection<sup>(2-4)</sup>.

Considering that several studies emphasize the weaknesses of knowledge and actions of health professionals regarding infection prevention and control measures, emphasizing that one of the influences for this to occur is the lack of theory and practice in the initial training of these professionals<sup>(5-6)</sup>, it is necessary to discuss the teaching of skills for the prevention and control of HCAI in undergraduate courses in Health Sciences. Therefore, the present research was proposed.

## OBJECTIVE

To know the perception of experts in infection control and prevention on the teaching of skills for the prevention and control of infections related to health care in undergraduate courses in Health Sciences.

## METHOD

### Ethical aspects

The ethical aspects established by Ordinance 466/2012 were respected. To present the results the participants are identified with randomly assigned alphanumeric codenames (P1, P2 ... P38, P39).

### Design, place of study and period

The Delphi technique, which has the characteristics of the possibility of generating agreement on a theme, through a systematic communication structure, controlled by the researcher, allows the experts in this area to receive feedback about the opinions expressed, to reassert their opinions and respond to the entries of the other participants. This favors that, at the end of the rounds, the agreement on the solutions to the problem discussed is reached<sup>(7)</sup>.

The research was developed from electronic contact by e-mail with the participants, contributing to ensuring the anonymity of opinions, favoring the free debate of the propositions. The process of data collection took place from August 2015 to February 2016.

## Population and sampling

To participate in the research we invited graduated expert professionals in the area of infection prevention and control, who worked with the subject in health services, educational institutions and research. To define the participants, two steps were taken.

Initially a list of possible participants, identified from the list of speakers of the Brazilian Congresses of Infection Control and Hospital Epidemiology in the years 2010, 2012 and 2014, researchers of the Research Groups Registered in the Directory of Research Groups of Brazil (CNPq- National Research Council) who worked on the issue of infection control, members of the board of directors of the Brazilian Association of Infection Control and Hospital Epidemiology Professionals of the 2011/2012, 2013/2014, 2015/2016 and *lato sensu* graduation courses in the area of infection control.

Next, a consultation was made to the *Curriculum Lattes* of all the professionals who composed the list of possible participants, applying the criteria of inclusion that follows: being a nurse, physician or pharmacist (professionals mentioned as essential members in infection control commissions according to Ordinance 1296/1998), have published an article on the subject in a scientific journal in the last 10 years, have published an abstract on the subject in a national or international event in the last 10 years, teaching *lato sensu* graduation course in the area of infection control for more than 5 years, have a broad professional experience in commissions or infection control services for more than 10 years.

With the application of the procedure of selection of the participants a list of 175 professionals was obtained. As the contact was carried out by electronic mail, through the contact of the *Curriculum Lattes*, it was decided to send the invitation to all. Initially, 61 professionals showed interest in participating in the study, however, only 39 (31 nurses and 8 physicians) confirmed signing the Informed Consent Form and responding to the first round of the study.

The participants had between 8 and 39 years of undergraduate education and all had graduation degrees: specialization (1), master's degree (14) and doctorate (24). Professionals from the South, Southeast, Midwest and Northeast Regions were counted. The few professionals identified in the North Region, who met the criteria for inclusion in the research, did not return contact attempts.

## Study protocol

The Delphi technique was developed over four sequential rounds, with a loss of participants recorded each round, as expected in this study, according to Table 1.

**Table 1** – Duration and number of participants in each round, Brazil, 2016

Round	Duration	Initial participants	Participants who answered	Participants who gave up*
1 <sup>st</sup> Round	54 days	61	39	36%
2 <sup>nd</sup> Round	51 days	39	35	10%
3 <sup>rd</sup> Round	69 days	35	30	14%
4 <sup>th</sup> Round	Return of results for all active participants in the first round.			

Note: \* The percentage of participants who gave up was calculated in relation to the previous round.

To begin the discussion, participants were asked to provide an individual e-mail with their opinions on the statement “the practice of infection control will only be effective in health services when professionals develop these skills since undergraduate education”.

In order to continue the discussion, participants were encouraged to describe what they thought was the best way to teach this subject in undergraduate courses in Health Sciences, bringing to the wheel the discussions found in the literature about the need for the theme to be worked in a transversal way or in a specific subject.

The answers from the first round were analyzed and the main findings were organized into items and returned in the second round, allowing everyone to have access to the proposals and opinions of all the participants, requesting that the items be assessed according to the degree of agreement.

The items that did not reach agreement nor had a high variation in the answers were presented to the participants in the third round, together with a brief exposition of the arguments that generated such variation, allowing the different opinions to be assessed again, presenting new value for agreement and justification of your response to the new item.

The fourth round was structured to carry out the return of the data to the participants, presenting findings that were related to the general aspects of the teaching of this subject in the undergraduate courses in Health Sciences and to the proposals of teaching strategies that must be observed and adopted for its consolidation, presenting jointly fragments of participants’ responses.

### Data analysis and statistics

The qualitative data, which corresponded to the answers of the first round, were analyzed from the content analysis<sup>(8)</sup>; the quantitative, which corresponded to the answers of the second and third rounds, were analyzed using descriptive statistical analysis, median and coefficient of variation. The items that reached median 5, with coefficient of variation lower than 20%.

## RESULTS

### General aspects of teaching prevention and control of Healthcare-Associated Infections in undergraduate courses in Health Sciences

The approach on HCAI in undergraduate courses in Health Sciences was considered essential for students to develop skills for infection control during their training, making it possible

to approach the subject in the curricula to ensure the students’ awareness of HCAI problems.

This item obtained median 5 and coefficient of variation 12%.

[...] graduate education must prepare all students to carry out the HCAI control measures, regardless of the area of activity. (P3)

[...] there is a strong possibility of improving practices for infection control as future health professionals are sensitized and informed about risks and practices, since their basic training, since learning implies changes in behaviors, and learning is consisting of successive approaches with the object of study. (P12)

As in other areas of knowledge, the specialty related to the HCAI control theme is a fact. However, this specialty is indispensable and “general”, that is, knowledge to be acquired and practiced by all. (P23)

It should be emphasized that, during undergraduate education, the skills for infection control that correspond to the general practitioner are worked on and it is not intended to address the themes that integrate the functions of the specialist professional in this area. The development of these skills in undergraduate education is the initial part of the process that will be developed and applied in health services and will have consequences and implications from the reality of each health service.

The view of the student is still very immature in the face of the complexity of HCAI prevention and control measures that must be demanded of a general practitioner already incorporated in their functions ... it is the responsibility of the professor to develop the skills of the future controller of infections, since many of them form and migrate to the care area and are likely to be leading teams in face of the various technical procedures related to patient care, not necessarily a specialist in infection control, but a knowledge multiplier in partnership with infection control unit of the health institution where you work. (P34)

Health services are considered as fundamental points in the training process of future health professionals, since they are the places where the students experience the practical activities and integrate the process of consolidation of this knowledge. This item obtained median 5 and coefficient of variation 13%.

To do so, services need to secure infrastructure for the application of HCAI control practices. These include materials, physical structure, staffing, and ongoing and continuing education programs for the improvement of health professionals.

The responsibility for teaching HCAI prevention should not be attributed only to a particular subject, but should be addressed in all cases involving patient care. [...] However, this is not enough. The importance and investment given by health services to the subject and the dimensioning of staff in the services also affect the adoption of preventive practices, and, in turn, the quality of care. (P24)

[...]in the daily routine so that the knowledge of the academy is applied, positive deviance is needed mainly of the professional that coordinates the team, as well as facilitating

*structure of the adequate processes regarding materials, supplies and equipment in number suitable for quality care. (P1)*

There was also a need to develop a culture of safety by the health services, and their commitment to safe practices will have a great influence on the construction and consolidation of the skills to control HCAI of the students who have contact, through the practical activities and internships, with health services. This item obtained median 5 and coefficient of variation 18%.

*It is necessary to recognize that the safety culture must be delineated in the institutions for this skill to be effective. In this way, it is not enough to learn in the undergraduate degree, it is important that security policies are institutionally implemented involving the entire professional hierarchy. (P23)*

It is emphasized that the example or model that the students experience from the observation of the attitudes of health professionals during their care work will play an essential role in the development and consolidation of these skills.

Likewise, the example or model that the student experiences in the laboratories and practice scenarios from the observation of the attitudes and practices of the professor/tutor/mentor will also influence the training.

*[...] I believe that the development of these skills does not depend only on undergraduate training. Added to this is the model that the student experiences in services, that is, one thing feeds the other. The student must develop skills to carry out the control practice when he or she is a professional, but what he or she does in the services reinforces the need to develop such skills. (P9)*

*[...] none of this will result in a solid training, in my view, if the models followed by the academic do not practice their theories. (P31)*

The commitment of the faculty to the approach and the development of the discussions on the related theme are decisive in the success of this process and in the consolidation of these skills by the student. This item obtained median 5 and coefficient of variation 11%.

*The skills to practice prevention and control of HCAI will never be effective by future professionals if professors do not incorporate this demand into their discussions and reinforce the presentation/discussion in clinical practice. (P36)*

*[...] to achieve "knowledge" and "abilities" it is necessary that all professors work in the transformation of these skills and attitudes. (P31)*

### **On the teaching strategies of infection control in undergraduate courses in Health Sciences**

The strategies that should be used to teach this subject at undergraduate education were another line of discussion among experts in infection control. It was agreed that skills to control HCAI should be emphasized before students, before entering the fields of practical activities, seeking to reinforce the importance

of these skills and the influence that the assistance given by the students can impact the dynamics of the health service. This item obtained median 5 and coefficient of variation 12%.

*[...] the concept of HCAI prevention should be presented throughout the course, but with greater emphasis when beginning the care activities. (P1)*

The need to prioritize teaching strategies that boost reflection and critical thinking of the student, favoring the dialogue with active methodologies and assessments based on the training principles, was also agreement among the participants. This item obtained median 5 and coefficient of variation 13%.

It is believed that the development of critical and reflective thinking makes it possible to teach the subject and the development of student skills to control HCAI, even in health care settings where practices for the prevention and control of infections are not employed applied in the manner recommended by the laws or directives.

*The role of the professor is to encourage the student to seek new alternatives, to be creative, to think about practices in a reflexive way. We can no longer be mere repeaters of theories. We need the new! (P30)*

*The teaching-learning process for HCAI must take place in a dialogue with active methodologies, the student co-responsible for critical and reflective teaching, and the student as the core of this process. (P35)*

The need for undergraduate courses in Health Sciences to have a professor, who has expertise in the HCAI control area that can provide a theoretical/practical support to the entire faculty of the course, was another item that obtained agreement, with a median 5 and coefficient of variation 21%.

The presence of a professor with expertise in this area would strengthen the approach of this subject in the various subjects and practical activities, based on a transversal and interdisciplinary approach of the theme.

*As the HCAI control area is very comprehensive it is important to have a key professional to serve as support to the body professor. But anyway the professor from any area should have a basic knowledge to pass to the students. (P7)*

*I believe that the professor body needs people of reference, be they theoretical, practical or knowledge producers in certain subjects, especially when it proposes operationalization and transversality of knowledge related to HCAI control. (P10)*

*[...] without the expert the contents are not ensured [...] the great difficulty is to make preventive measures as "Principles for practice" that are led to care by the professional who exercises it. (P31)*

*Working on HCAI content separately in a number of subjects throughout the course and often by professionals without the necessary training facilitates students' lack of interest and at the same time can fragment content that is fundamental to a global understanding of the subject. (P18)*

One of the points debated by the study participants, which had a wide variation in the answers, was with regard to how this theme will be incorporated and present in the undergraduate curriculum. The debate took place around two points:

- a) The need for a specific subject that addresses the main aspects related to the control of HCAI, thus providing a theoretical basis that will be later taken up by other professors in the different areas, deepening these aspects related to HCAI control from the particularities involved in each area. The specific subject is the basis for the transversal approach of the theme throughout the undergraduate course.

*Since prevention and control of HCAI involves the steps of care planning and implementation, this topic should present a specific subject because there is more time to make the student reflect more broadly on the details that this topic presents [...]. (P34)*

*This subject is fundamental and it is necessary to observe its insertion in the college grid at a time when it is most effective, taking advantage of some already established basic knowledge and providing grounds for clinical practice. (P20)*

*[...] this is a topic that has interface with all the subjects of the courses of the health area, therefore it must have numerous approaches in the different levels so that the student and future professional can develop this skill. (P17)*

- b) The need to teach HCAI control to be an exclusively transversal subject in the curriculum of the present course in all its phases aiming to understand the amplitude and complexity of the subject by the student.

*Offering this topic to one subject may cause a forgetfulness of the importance and necessity of the theme throughout the other subjects, in fact there should be discussions about the topic in the subject, in modules (P29)*

*The presence of a specific subject does not guarantee the assimilation of the content, besides giving the right that all the topics covered should have a specific subject, inflating the curricula (P9)*

*It is fundamental to approach the subject of control of HCAI in the subjects in a general way re-approaching the subjects of care, as well as administrative subjects. (P12)*

*I agree with transversality as a way of giving sustainability and reinforcement to the teaching of the subject, but done only transversely it can be very fragile. (P20)*

Even with the return of these questions in more than one round, there was great variation in the participants' responses, and there was no agreement among the group. There were constant positive and negative affirmations that raised doubts about what would be the best possibility for the development of this topic in undergraduate courses in Health Sciences.

*Teaching HCAI control is part of patient care. This subject permeates all others. But there is nothing to prevent a specific subject from approaching the subject in more detail. (P7)*

*A specific basic subject may be the beginning of transversality. (P8)*

*Transversal teaching is important for each subject, but given the diversity and quantity of content required for each subject, the HCAI control theme ends up being diluted and its significance falls short of necessity. I still believe in the need to add, to the transversal discussion, a specific subject for teaching HCAI control in undergraduate courses, giving greater emphasis to the subject and the role of the professional. (P15)*

*[...] transversal teaching is an interesting strategy, but in practice I perceive it to be ineffective, since the student hardly recognizes this learning and several professors do not engage in transversal teaching of content in which they do not have depth. For these reasons, I think it is necessary to maintain a subject with the specific content of HCAI. (P3)*

## DISCUSSION

This study, developed using the Delphi technique, had great participation among participants in all rounds, and the percentage of abstention was below that estimated by other studies, which predicts a loss of up to 50% of participants in the first round and of 30 % in each subsequent round<sup>(9)</sup>.

It is believed that the low number of abstentions of the participants, from the time they participated in the study with the responses of the first round, is related to the interest and importance they attribute to this subject.

Research that addresses the adherence of practitioners to HCAI prevention and control practices or investigating the causes of rates of infection incidence in health services often underscores the weaknesses in the initial training of health professionals as one of the contributing factors the difficulties in consolidating such practices, emphasizing the need to review the teaching of these professionals to this theme<sup>(6,10-11)</sup>.

These results confirm the participants' understanding of this research, which considered as essential the development of the skills of the general practitioner for the prevention and control of HCAI during their initial training, ensuring that students are sensitized to the problems of HCAI.

Some studies that sought to know about undergraduate students' adherence to infection prevention and control practices and their knowledge about them emphasize that the teaching of HCAI control is a fragility of the courses, because what has been approached is presented as insufficient for the development of students' knowledge and attitudes. They also stressed that only addressing the theme during the course and ensuring that the student has the knowledge on the subject is not enough to change practice<sup>(12)</sup>.

A study that investigated how the topic of prevention and control of HCAI was addressed over the four years of an undergraduate nursing course found that, in the first year of the course, no reference was made to HCAI; in the second, third and fourth years, there was mention in the documents<sup>(11)</sup>.

However, the references indicated in the teaching plans were insufficient and outdated to support the study, or to answer doubts and difficulties. In addition, several national and international references of materials considered essential for the prevention and control of infections were not included in any

of the documents. The assessment instruments of the modules also did not address this theme<sup>(11)</sup>.

In addition to the reality found in undergraduate courses, professionals with expertise in infection control highlight the importance and influence of health services in this training process, since students develop theoretical-practical activities and supervised graduate internships in these environments, living with professionals which often neglect measures of HCAI prevention and control<sup>(11)</sup>.

The influence that the practices and attitudes of the health teams of the places that are fields of internships exert on the training of the students in relation to the prevention and control of HCAI is similarly described in other studies that even emphasize that professionals who work in the services that constitute the scenarios of theoretical-practical activities and internships are one of the main influences to the students<sup>(5-6)</sup>.

In addition to the attitudes of practitioners who frequently disagree with the recommendations for HCAI prevention and control, health services often lack the infrastructure necessary to implement best practices. As students are in the process of training, they are influenced by how health care is developed, understanding that inadequate practices are justified by the need for the service, without being able to reflect on this reality and its impact on the safety of patients and professionals.

Thus, there is a need to integrate health and education institutions with a view to integrated work, thus favoring the training of future professionals who, when leaving academy, will join as health care workers.

The development of a culture of patient safety adopted in the health services is another important point that would bring positive impacts to the training, since the student would experience these safe practices, applied and constantly promoted in health care services, characterizing this model of practice as a professional reference.

The maintenance of permanent education programs in health institutions is fundamental so that day-to-day practice is consistent with the recommendations for worker and patient safety, allowing students to have an experience of theory as a reality of the environment of health care.

Among the professional models that students glimpse during their training, the actions developed by professors are one of the main sources of influence in this training process, because they understand that their professors are examples that must be followed.

A study that investigated the main factors that influence the development of students' knowledge and attitudes toward prevention and control measures during training identified the impact related to the coexistence with their mentors<sup>(6)</sup>.

The indication that undergraduate students do not verify the majority of professors and monitors develop the measures of prevention and control of infections in clinical practice is present in other studies<sup>(11)</sup>, which negatively influences the students' perception of the importance of application of these.

These findings allow us to understand the reasons why students, even with access to information, are sometimes not aware of HCAI prevention and control practices.

A study that verified students' adherence to HCAI control measures and their intent for future use after the academy

demonstrated that students had a good theoretical knowledge of the measures but that the intention of future use of such measures was not proportional the level of knowledge identified. Neither was the reflection of this learning reflected in students' attitudes during their performances in college clinics<sup>(13)</sup>.

Results such as those associated with constant warnings that the knowledge of health students is insufficient and inconsistent for HCAI prevention and control<sup>(6,10,14-15)</sup> reinforce the need to transform teaching during undergraduate education, seeking new pedagogical strategies that can sensitize students to this problem and develop skills for the prevention and control of HCAI during training. We should understand the triad knowledge-ability-attitude as a skill.

These results show that there are several elements in the constitution of the initial training process of health professionals, and these elements are in constant interaction, generating a complex network of relationships that influence and modify each other.

In this dynamic, it is possible to observe that there are several parties involved in the professional training process, among them: the characteristics of the school, how professors approach teaching the subject and their attitudes towards this knowledge in practice scenarios, attitudes of the health teams, as well as the institutional policy of the health service for the prevention and control of HCAI and patient safety. They carry within themselves and between them principles of autonomy and dependence, which end up driving characteristics of the whole in each part, but also leaving characteristics of each part in the constitution of the whole.

It is necessary to consolidate the understanding of responsibility of schools and services with the training of new health professionals, while the responsibility for teaching these future professionals should be shared by professors and professionals working in the health services to achieve effectiveness and quality of care.

It is necessary to seek and implement strategies that boost students' reflection, favoring the development of critical and creative thinking with the analysis of the different realities of assistance that are presented in the course of the training process. Preparing these students to have discernment to assess the situations they experience, detecting actions that are positive or negative and, thus, to be able to select the best practices and experiences that they will take for themselves.

This is essential and urgent, since university education has an important influence on the training of health students in relation to HCAI prevention and control practices. Nevertheless, the influence exerted by the coexistence with their mentors and other health professionals in the fields of activities has a significantly greater intensity on the training of students<sup>(6)</sup>.

Another possibility, or necessity, would be to allow students to carefully and critically analyze their own performance during clinical practice<sup>(12)</sup>, thus recognizing the weaknesses and potentialities of their actions during the care. It is believed that this reflexive action could influence positively and strongly in the training of these students, also developing the skills of critical thinking<sup>(16)</sup>.

From the understanding and recognition that the student training process takes place through successive retroactive and recursive circuits, it is necessary to find mechanisms to effect the principle of the reintroduction of knowledge in all knowledge, leading the student to a continuous process of reflection and

need to search for knowledge that encapsulates their professional, initial and future training.

Participants in this study also emphasized the need to work intensively with students prior to entry into the field of practical activities and supervised internships, seeking to return to the critical points of HCAI prevention and control, as well as emphasize the importance of students in the care and safety of patients, themselves and other health professionals.

This need is justified and strengthened when we verify the intensity of the influence that the experiences of the fields of practical activities exert on the training of the student from the coexistence with professors and health professionals<sup>(6,11)</sup>.

Thus, it is essential that the student receives a personalized follow-up before and during the stays in the health services for the practical activities or internships, seeking to substantiate him on the main recommendations for the prevention and control of HCAI and for the safety of the patients and professionals.

Thus, it turns to the need to strengthen and prioritize teaching strategies that boost student's reflection and operate it for a constant process of analysis of the situations that will experience during its training, transposing this knowledge to its attitudes in the future professional career.

It is highlighted in this process the importance of the professors of the course being prepared for the integral approach of this theme during the theoretical and practical activities. In addition, the participants emphasized the need to have an expert professor in infection control in the faculty of the course, with the intention of being a support to help other teaching colleagues in the development of the teaching of this subject in the different subjects of the course.

This professor would develop the role of motivating the teaching of this theme during the course and would also assist in the process of integrating knowledge among various subjects, seeking more effective results through the relation theory and practice<sup>(17)</sup>.

The way in which the teaching of prevention and control of HCAI needs to be addressed in the undergraduate course was a cause of impasse among the participants of this study. The discussion is based on the possibility of approaching the theme through a specific subject or through a transversal axis in undergraduate curricula.

A similar debate can be found in the publications that approach the subject, without being able to advance to an agreement on which would be the best option<sup>(18)</sup>. Both possibilities have positive and negative points, as the study participants themselves argued. However, the obstacles related to the development of this theme in the curricula do not reach agreement with effective arguments for any of these approaches.

A study that investigated the teaching of HCAI control in a nursing undergraduate curriculum suggests that the topic should be developed transversally in the curriculum since the first semester of the course, being worked by all professors based on the particularity of each teaching moment and may have a specific moment for its systematization in the course<sup>(4,11)</sup>.

The concept of transversal theme refers to teaching and learning contents that are present in most of the activities that students will develop during their training, and that due to the relevance of the subject cannot be restricted to only one subject or graduate area, to be the subject of a majority of those<sup>(19)</sup>.

However, for the development of transversal themes, it is necessary for professors to be prepared and supported by educational institutions for their improvement in this area, so that they can effectively achieve the objectives that are expected in the cross-sectional approach<sup>(19)</sup>.

Faced with the reality of the teaching of HCAI prevention and control in health courses, characterized by a weakened development for many decades, it is necessary a long work of professor training and improvement so that the transversal development of this theme is effective.

In the reality of the education and training of professors, both possibilities presented, disciplinary or transversal approach are insufficient to develop during the initial formation of health professionals the skills for the prevention and control of HCAI.

Thus, the feasibility of new teaching proposals for this subject in the undergraduate degree is necessary, seeking to expand the possibilities and to develop new paths for the consolidation of the teaching of HCAI prevention and control in the training of health professionals.

### Study limitations

The number of participants can be considered a limitation of this study, also associated with the absence of professionals from the North Region of the country, as well as other professional categories such as dentistry, physiotherapy, pharmacy among others.

### Contributions to the area of nursing, health or public policy

Promoting the debate about the teaching of infection control in undergraduate courses in Health Sciences contributes to professionals with expertise in this area to analyze the current reality and glimpses new ways to strengthen this theme in the training of health professionals. It is worth noting that the teaching of this subject is recognized as an area of great weaknesses in professional training, which contributes to the scenario of high incidence of HCAI-related adverse events and, consequently, to the increase of microbial resistance. The use of the Delphi technique to promote this debate favored all participants to present and oppose their opinions, enriching the process of developing agreement.

### CONCLUSION

The professionals with expertise in infection prevention and control who participated in this study emphasized the importance of teaching prevention and control of HCAI in undergraduate courses in Health Sciences, so that future professionals develop skills related to the topic.

It is also recognized that the training of professionals is strongly influenced by the experiences of these students in the scenarios of theoretical-practical activities and supervised graduate internships, as well as by the examples of their professors, mentors and health professionals with whom they coexist in the various spaces in which they circulate during their training.

In order to cover the complexity of the elements that are interconnected for the training of health professionals, the results of this study show the need for the teaching process to be based on pedagogical strategies that instigate student reflection, encouraging it to develop critical thinking about their experiences.

It is important to intensify and resume HCAI prevention and control practices with students, especially before and during their insertion in health services for graduate activities, seeking to emphasize the impact of their actions on the safety of patients and workers.

To promote the development of this theme throughout the undergraduate courses in Health Sciences, it is interesting that there is the possibility that the undergraduate courses will have professors with expertise in the HCAI area.

In addition, it is necessary to think of new possibilities to approach this subject in undergraduate curricula, since the two possibilities envisaged today by professionals and professors who work with this theme, this specific subject or this transversal theme, are accompanied by important shortcomings which

maintain the fragility that exists today in teaching prevention and control of HCAI.

It is recommended to carry out studies to know the perception about this topic from the perspective of professors and students, generating more subsidies that may contribute to rethinking and improving the teaching of prevention and control of HCAI in undergraduate courses in Health Sciences.

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