

The effectiveness of educational interventions in university training on hospital hygiene: results of action research

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Parole chiave: Infezioni correlate all'assistenza, insegnamento, formazione

Abstract

Background. The Italian Study Group of Hospital Hygiene of the Italian Society of Hygiene, Preventive Medicine and Public Health promoted and conducted a study on teaching hospital hygiene, with particular reference to the prevention and control of healthcare-associated infections, with the aim of developing effective educational material starting from the results collected.

Materials and Methods. First of all, a survey was carried out, targeting lecturers in hospital hygiene, with the purpose of investigating their perceptions regarding this issue. The available scientific literature was also reviewed in order to identify effective educational/teaching strategies for the prevention of healthcare-associated infections, so that valid training interventions could be subsequently developed. Finally, a trial-training intervention was implemented, and specific audio-visual teaching material was also tested.

Results. The overall response rate to the survey was 42%, with good country-wide representativeness. The level of awareness of hospital hygiene issues by students resulted higher among trainee nurses (65%) than among medical students (44%). The teaching staff identified alternative educational methodologies to substitute the classical lecture (e.g.: case discussions) and, in most cases, the alternative solution appeared to be preferable. The teaching of hospital hygiene was better integrated with other disciplines and professional training activities in the degree courses for nurses than in those for doctors; the total number of hours assigned to such teaching was variable. The literature review highlighted that various educational approaches are used. The most common are presentations or lectures, but videos, posters, questionnaires and e-learning

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strategies are also used. Combining different instruments when designing an educational programme has proven to be an effective strategy. The training activity tested was positively evaluated by the participants; the possibility of multidisciplinary exchange of knowledge was particularly appreciated.

Conclusions. *Having considered the issue of teaching hospital hygiene from the points of view of the different protagonists involved (educators and students), this enabled us to develop useful training material and a proposal for a shared educational intervention. The subject of hospital hygiene, in particular the one related to the prevention of healthcare-associated infections, is addressed in various courses and with different modalities; it is, therefore, important to standardize course contents and teaching methods, in order to facilitate multidisciplinary debate, especially starting from case studies.*

Introduction

The European Council issued a recommendation on patients' safety, emphasizing that the prevention and control of healthcare-associated infections (HAIs) should be part of the long-term strategic priorities of healthcare facilities, urging the implementation and/or reinforcement of surveillance systems at regional and national levels, in order to evaluate and guide the policies regarding the prevention and control of HAIs and the investment in the training of healthcare staff (1).

Similar initiatives have been undertaken by both the World Health Organization (WHO) and by the European Centre for Disease Control and Prevention (ECDC), with particular attention to identify the essential skills that healthcare staff involved in the control of infections must possess (2, 3).

The same degree of attention must be paid to the quality of teaching and learning in the setting of basic healthcare education. In this regard, there is a growing emphasis on educational approaches aimed at ensuring the improvement of the skills and abilities of graduates to respond to the future challenges that they will have to face during their professional life (4).

However, analyses conducted in the field have highlighted students' lack of knowledge about the prevention and control of infections. From a survey of 322 medical students in Birmingham (United Kingdom), it emerged that 58% of them did not know

the indications even for the correct use of an alcohol gel for hand hygiene (5).

Similar deficiencies have also been demonstrated by studies conducted in Italy; the most recent of these, based on a self-administered questionnaire in nine universities, highlighted that basic concepts, such as the adoption of standard precautions and hand hygiene, were critical issues (6, 7).

These findings constitute one of the reasons for the growing interest in the evaluation of teaching strategies in order to identify areas of improvement in an educational sector of paramount importance, as demonstrated by epidemiological data.

The Italian Study Group of Hospital Hygiene (GISIO) of the Italian Society of Hygiene, Preventive Medicine and Public Health (SItI) promoted and conducted a study on education for prevention and control of HAIs, with the aim of developing, starting from the results collected, training materials whose use could contribute to raising the current levels of knowledge on this subject.

Materials and methods

The project was divided into various phases, starting from an information-gathering survey regarding the perceptions of hospital hygiene teachers with respect to the objectives of their educational programme and the modalities with which it is carried out. This survey was supported

by the aforementioned survey on the degree of knowledge of students in healthcare professions regarding the prevention of HAIs. On the basis of the results of these surveys, a focus group was created; the group developed a short questionnaire with the aim of investigating the perceptions of hygiene teachers with respect to this issue and of identifying the core skills that education on hospital hygiene must convey within the various degree courses.

The questionnaire, for which the Survey Monkey® platform was used, was structured into six sections related to various aspects of hospital hygiene teaching:

1. its relevance on the basis of the attribution of relative training credits;
2. the required level of integration with other disciplines and training activities;
3. the objectives to be developed;
4. the methods to be used;
5. the time allocated to the subject within the curriculum;
6. the number of hours allocated to teaching.

A preliminary trial of the survey was carried out to verify its effectiveness and usability via the web. To this end, the access link to the questionnaire was sent to teachers in member institutes of the GISIO network in Milan, Rome, Catania, Verona, Parma, Sassari and Palermo.

Subsequently, a total of 214 names of hygiene educators (Full Professors, Associate Professors and Researchers) who teach hospital hygiene within the sector “General and applied Hygiene” (MED/42 “Igiene generale e applicata”) were identified through the website of the not-for-profit Consortium that supports Italian universities’ administrations and bodies of government with information systems for their main administrative area (CINECA, www.cineca.it) (search carried out on 24/05/2012).

The names of those actually teaching hospital hygiene were verified and validated on the basis of information gathered from the

various University portals, through which the e-mail addresses were also retrieved, as well as from details coming from the survey recipients themselves.

The invitation to complete the questionnaire was sent for the first time on September 3, 2012; this invitation was followed by another four reminders sent to all identified non-respondents and by three reminders to those who had provided partial responses to the survey. The educators were invited to reply to the questionnaire or, should they have no teaching duties, to report this through a special link.

At the same time, a review of the available scientific literature was completed, to identify effective educational/teaching strategies for the prevention of HAIs, in order to provide an adequate background to the considerations about the development of suitable training instruments.

The process was concluded with a workshop devoted to evaluate training curricula on HAIs, which was attended by all those responsible for operational units involved in the research project. During the workshop, the document “WHO’s Patient Safety Curriculum Guide Multi-professional Edition” and other international training experiences were analysed. On this basis, the following themes were identified as being of foremost importance for the purpose of creating an educational video library to be made available to all the institutions and training agencies interested:

- hand hygiene;
- management of invasive procedures;
- role of surfaces in the transmission of HAIs;
- management of perioperative prophylaxis;
- correct management of biological samples within laboratories.

A guide was prepared for each of the videos produced, in order to support the educators. These guides proposed different activities to be carried out in groups with

the purpose of highlighting the fundamental aspects related to the prevention and control of the HAIs in the setting of the specific procedure being analysed.

Finally, a multiple trial, using the audio-visual material produced, was carried out within the State University of Milan, where the same training course on HAIs was implemented in several Post-graduate Schools, targeting all the Residents in Orthopaedics, Obstetrics and Gynaecology, Hygiene and Preventive Medicine, Forensic Medicine and Occupational Medicine. This trial took place during three academic years (2012/2013, 2013/2014, 2014/2015).

During the first year the training course was structured in three parts, starting with 8 hours in the classroom, aimed at illustrating the problem of HAIs, followed by 17 hours of education based on clinical cases, carried out autonomously by the specialization students in small mixed groups with the supervision of a remote tutor, and a concluding meeting in the classroom to share the group work and evaluate the proposed training.

At the end of the first year of the trial, the students rated their satisfaction at three different times and with different instruments:

- a) evaluation, through an on-line questionnaire, of the seminars at completion of the 8 hours in the classroom;

- b) evaluation, through a focus group, of the education based on clinical cases, at the end of the group sessions;

- c) overall assessment of the experience, by means of a paper questionnaire, after the examination.

In the second year of the trial, the proposed training was modified by reducing the lecture component to 4 hours and allocating the time gained in this way to sharing and evaluating material and to role-playing, during which the students were invited to identify all the key figures within a hospital who must cooperate in dealing with the prevention of HAIs.

During the third year the proposed training was enriched by the use of one of the videos produced during the project “Risk analysis concerning the control of HAIs in intensive care and surgery units and evaluation of the efficacy of preventive strategies in clinical practice” funded by the Ministry of Health through the CCM 2012 Programme (CUP E41J12000320001).

To begin, the educational intervention was modified by projecting the video in the classroom. This was followed by a guided discussion and a seminar on the theme of HAIs and then, after the presentation of the group work, by a role-playing session that simulated a meeting of the Hospital Infection Control Committee. In each year of the trial, at the end of each training module, a questionnaire was administered to the Residents, asking them to express their satisfaction with the module in general, using a five-point Likert scale, where 1 means “not at all satisfied” and 5 means “very satisfied”.

Results

In response to the survey of educators, 72/170 questionnaires were returned from staff teaching in the courses of Medicine and Surgery (42,3%) and 70/167 questionnaires from those teaching in Nursing courses (41,9%). Although these percentages of survey return are less than 50%, the range of universities was well represented at national level (Figure 1).

According to 60% of the respondents from Nursing degrees and 51% of those from Medicine and Surgery degrees, education on hygiene is taken sufficiently into account in the curricula, based on the criteria for the allocation of training credits.

With regards to the level of awareness of the issues of hospital hygiene by the students this is greater among nursing students (65%) than among medical students (44%).



Figure 1 - Representativeness of the responses: geographical location of respondents.

The teaching of hospital hygiene is better integrated with other disciplines and professional training activities in the Nursing degree courses than in the Medicine and Surgery courses (Figure 2).

As an alternative to lectures, the educators who responded to the survey agreed on the potential benefit of introducing new teaching methodologies, such as case discussions, which are considered feasible.

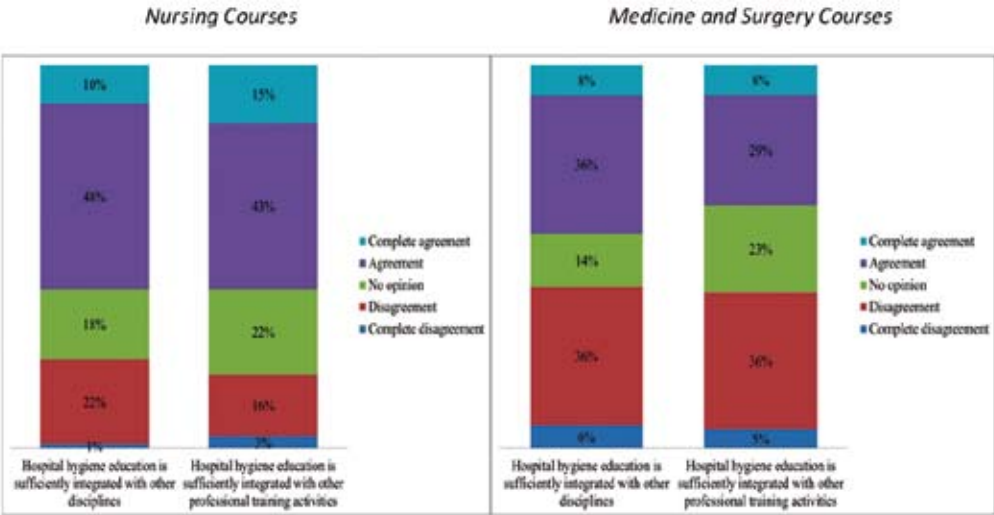


Figure 2 - Comparison of the integration of hospital hygiene teaching with other disciplines and professional training activities during the Nursing and Medical and Surgery degree courses.

The educators also agreed that hospital hygiene should be taught in the third year of medical courses, while for nursing courses, 45% believed that it should be positioned in the first semester of the first year; 42% did not share this opinion.

The total number of hours currently dedicated to teaching hospital hygiene and the total number considered necessary varied very greatly. In particular, the average number of hours deemed necessary for teaching hospital hygiene in Medicine and Surgery courses was 18 hours compared to a total current average of 25.

For nursing courses, the average number of hours considered necessary for teaching hospital hygiene was 25 hours, compared to a total current average of 26.

The literature review highlighted how various educational tools are used for teaching. However, most of the works analysed at the time of starting this process referred to interventions aimed at training healthcare staff in their work setting. In the context of basic training for nursing students, Mikkelsen highlighted the success of methods using scenario-based simulations (8), while O'Neill developed an intervention based on e-learning modules, whose use significantly modified the levels of knowledge among medical students (9).

Based on the results of the information-gathering survey and the analysis of the literature, the educators who participated in the workshop created nine educational videos in Italian and English, which constitute the first section of a potential video library for educational purposes. Each video was produced on the basis of a story line evidencing both correct and incorrect performance of the procedures identified and is supported by a user manual for the educators.

The videos are divided into two sections: the first one presents a scenario in which the healthcare workers involved do not respect good practices to ensure patients' safety and prevention of HAIs, while the

latter highlights the correct procedures to be implemented (10).

The manual is intended to provide a guide for educators who use the videos; it highlights the key messages that the videos intend to convey and provide ideas for discussion and suggestions for activities. An example is given in appendix 1.

With regards to the trial of educational process, from the first year the proposed system was perceived as useful and the supervised work with a distance tutoring system was considered effective; however, a need to rethink some organizational aspects emerged, especially when the different Schools of Specialization were located at very distant sites. In this case, the students, often burdened with clinical duties, struggled to find space and time for case discussions in small groups. Following the initial experience, the teaching was reorganized and the educational activities were positively evaluated by the participants. The possibility of starting an interdisciplinary exchange of views was appreciated and the attention, given to the organizational aspects, allowed enough time to be dedicated to group work in the classroom.

The reported levels of satisfaction are shown in Figure 3. The degree of satisfaction was highest for the third model tested, with 66% of respondents giving this model a rating of "4" or "5".

Discussion and conclusions

Aspects of hospital hygiene are considered fundamental for both doctors and nurses, albeit with some differences. Although the complexity of medical care has increased dramatically over the past few decades, medical teaching methods have not undergone major changes. Medical education and training do, however, require continuous improvements to meet the changing needs of clinical practice. The educators interviewed

APPENDIX 1

EXAMPLE FROM THE USER MANUAL**VIDEO: Insertion of a bladder catheter**

Specific aim	Training in the prevention of urinary tract infections: how to avoid complications of bladder catheter insertion in patients requiring placement of this medical device
Place	Operating theatre (O.T.)
Characters	Newly employed nurse, head nurse of the O.T., anaesthetic nurse, patient 1, patient 2, nurse responsible for the control of healthcare associated infections
Subject of the script	Insertion of a bladder catheter by a newly employed nurse
Total duration of the video	20 minutes

The individual scenes composing the video are described below, comparing the incorrect scene with the correct one. One or more subjects for discussion can be drawn from each scene.

SCENE 1

	Story	Description of scene
Scene 1: Entry into the O.T.	It is Paolo's first day of work at G. Pini hospital as an O.T. nurse. Following the instructions that he had been given a few days earlier, he manages to find the O.T. and starts to look for the head nurse.	It is 7:00 a.m. Paolo, a newly employed nurse, arrives at the G. Pini hospital. He is wearing a white uniform for the outside; he reads the instructions that he has been given and takes the lift to the changing rooms of the O.T. He comes out of the changing rooms wearing the correct uniform (green) and reaches the head nurse of the O.T.

Discussion: Clean pathways

The Operating Department must be divided into progressively less contaminated areas, starting from entry into the Department until reaching the operating theatres themselves; appropriate signs must clearly indicate the required clothing. Different pathways for contaminated and clean materials and persons must be guaranteed within the Operating Department through organizational/functional and/or structural interventions that allow the collection and safe transport of materials (Guidelines).

Activities

Create rules for access to the Operating Department, taking into account the accreditation requisites.

Annex 1: Accreditation requisites.

SCENE 2

	Story	Description of the incorrect scene	Description of the correct scene
Scene 2: Behavioural rules	Paolo must support Marisa in various activities in preparing the theatre.	Marisa is wearing some jewellery and has forgotten to remove her nail-varnish. Paolo will work alongside Marisa.	It is pointed out that Marisa is not wearing any jewellery. Paolo will work alongside Marisa.

Discussion: hand-washing

In the context of the Global Patient Safety Challenge (GPSC), the WHO has promoted the "Clean Care is Safer Care" project, which focuses attention on hand-washing as the most important and effective measure to prevent the transmission of infections.

Activities

Referring to your hospital, we invite you to complete the WHO's Hand Hygiene Self-Assessment Framework 2010 instrument as a method of evaluating the promotion and practice of hand hygiene in the healthcare facility in which you work.

The compilation of the document enables you to identify critical issues that need attention and improvement. Based on the results obtained, we invite you to prepare an action plan for improvement.

Annex 2: Hand hygiene self-assessment framework

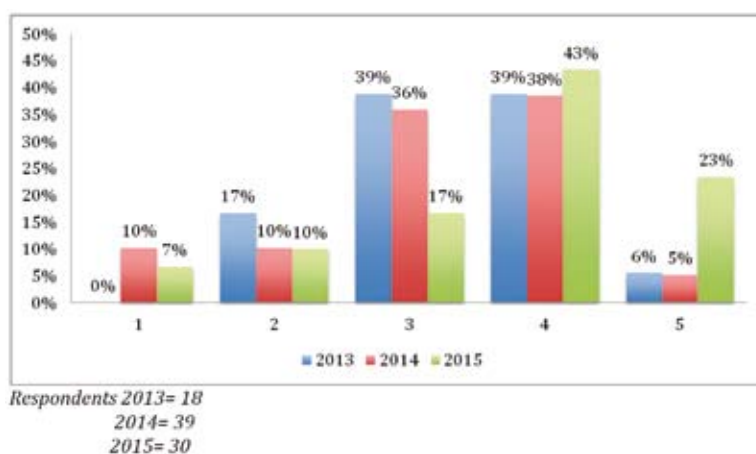


Figure 3 - Satisfaction with the educational module in the 3 years of the trial according to the results of the survey.

during the survey identified the discussion of clinical cases as a valid method for teaching hospital hygiene.

The “Patient Safety Curriculum Guide” manual, produced by the WHO, contains a whole section dedicated to health educators, providing them with support for the planning of training activities on the topic of patients’ safety and indications on the different teaching methods. Eleven educational programmes are proposed, one of which is dedicated to the prevention and control of infections. For each package, different teaching methods are illustrated, including the discussion of clinical cases, group work, etc. In a survey conducted in England and Ireland, lectures, case discussions and practical demonstrations were considered useful by most respondents (5).

Although there are numerous guidelines in the literature on best practices to be adopted for the prevention of HAIs, these practices are often disregarded. The factors motivating the adoption of a given behaviour are complex, so the interventions implemented must be multidisciplinary and exploit different strategies that allow comparison and discussion. Many of the interventions analysed use training packages based on

e-learning for the prevention of HAIs. One of the main advantages of e-learning packages is that they can be used at any time, the system can be made accessible in all areas of the hospital and it can also be used in other places at any time of the day. E-learning modules have been implemented to train doctors and students before their access to hospital. The modules allowed the trainees to become familiar with the protocols for antibiotic prophylaxis and measures to prevent HAIs (11).

The e-learning method does, however, have some disadvantages. For example, it does not allow staff to ask questions to clarify any doubts and there is no possibility of peer discussion. Demonstration videos are often included in e-learning modules to enable users to deal with some practical procedures. O’Neil *et al.* evaluated the benefits and impact of an e-learning programme for the prevention and control of infections among students, noting that this approach increased the students’ knowledge and understanding of hospital hygiene issues, improving attitudes and practices regarding the prevention and control of infections. The systematic application of educational interventions can lead to a decrease in HAIs,

however, it is difficult to determine which particular educational intervention is the most effective because different approaches are often used simultaneously.

The investigation of perceptions regarding the teaching of hospital hygiene was a first step towards the development of a shared educational curriculum.

The subject of hospital hygiene and, in particular, the prevention of HAIs is addressed in different courses and in different ways. It was therefore necessary to think of strategies for an effective integration, trying to develop educational material suitable for this purpose and useful for standardizing the content and teaching methods, while enabling verification of the teaching delivered.

HAIs represent an issue of interest shared by different specialties. It was found that students of different Specialization schools appreciated the implementation of a training course in common on this issue, because this gave them the possibility of establishing interdisciplinary debate, particularly starting from clinical cases. However, attention must be paid to organizational aspects, while the availability of multimedia resources that allow remote discussion of clinical cases should be evaluated. Finally, the production of educational videos and related manuals is an opportunity for the teaching community because such material can be adapted to any training model considered worthy of promotion.

Riassunto

Efficacia degli interventi educativi nella formazione universitaria in ambito di igiene ospedaliera: risultati di una ricerca-intervento

Introduzione. Il Gruppo Italiano di Studio di Igiene Ospedaliera della Società Italiana di Igiene, Medicina Preventiva e Sanità Pubblica ha promosso e condotto uno studio relativo alla formazione in merito alla prevenzione e controllo delle infezioni correlate all'assistenza, con l'obiettivo di sviluppare materiale formativo efficace a partire dai risultati raccolti.

Materiali e Metodi. Dapprima è stata condotta un'indagine rivolta ai docenti di igiene ospedaliera, con l'obiettivo di indagare le percezioni degli stessi rispetto a tale tematica. È stata inoltre effettuata una revisione della letteratura scientifica disponibile per individuare efficaci strategie di educazione/insegnamento per la prevenzione delle infezioni correlate all'assistenza, al fine di poter in seguito sviluppare validi interventi formativi e sviluppato e testato un percorso formativo, all'interno del quale è stato anche utilizzato materiale didattico audiovisivo originale.

Risultati. La rispondenza all'indagine presso i docenti è stata pari al 42% con un buon livello di rappresentatività geografica. Il grado di consapevolezza della tematica è stata superiore tra gli studenti dei corsi di Infermieristica (65%) rispetto a quella rilevata tra gli studenti dei corsi di Medicina (44%). I docenti in alternativa alla lezione frontale individuano nuove metodologie d'insegnamento (es: discussione di casi) che sono ritenute per la maggior parte realizzabili. L'insegnamento dell'Igiene Ospedaliera risulta meglio integrato con le altre discipline e attività professionalizzanti nel corso di laurea di Infermieristica rispetto a Medicina, tuttavia, il monte ore assegnato all'insegnamento risulta variabile. La revisione della letteratura ha evidenziato che vengono utilizzati diversi strumenti educativi. I più comuni sono presentazioni o lezioni, ma non mancano video, poster, questionari ed esperienze di e-learning. Combinare diversi strumenti nello strutturare una proposta formativa, si è rivelata una strategia efficace. L'attività formativa testata è stata valutata positivamente dai partecipanti, in particolare è stata apprezzata la possibilità di avviare un confronto interprofessionale.

Conclusioni. L'aver affrontato il tema dell'insegnamento dell'Igiene Ospedaliera considerando i punti di vista dei diversi attori coinvolti (docenti e studenti) ha permesso di sviluppare materiale didattico utile e una proposta di curriculum formativo condiviso. Il tema dell'Igiene Ospedaliera, ed in particolare quello relativo alla prevenzione delle infezioni correlate all'assistenza, viene affrontato in diversi insegnamenti e con modalità differenti, è quindi importante standardizzare contenuti e metodologie di insegnamento che favoriscano un confronto interprofessionale, soprattutto a partire da casi clinici.

References

1. REPORT on the report from the Commission to the Council on the basis of Member States' reports on the implementation of the Council Recommendation (2009/C 151/01) on patient safety, including the prevention and control of healthcare

- associated infections (2013/2022(INI). Available on: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A7-2013-0320+0+DOC+XML+V0//EN> [Last accessed: 2018, Aug 18].
2. World Health Organization (WHO). Patient safety curriculum guide: multi-professional edition. 2011.
 3. European Centre for Disease Prevention and Control (ECDC). Core competencies for infection control and hospital hygiene professionals in the European Union. Stockholm: ECDC, 2013.
 4. Saleh AM, Al-Tawil NG, Al-Hadithi T. Teaching methods in Hawler College of Medicine in Iraq: a qualitative assessment from teachers' perspectives. *BMC Med Educ* 2012; **12**: 59-65.
 5. O'Brien D, Richards J, Walton KE, et al. Survey of teaching/learning of healthcare-associated infections in UK and Irish medical schools. *J Hosp Infect* 2009; **73**(2): 171-5.
 6. Colosi A, Ergasti G, Murzilli G, et al. Healthcare students and their knowledge of healthcare-associated infections. *Ann Ig* 2011; **23**(3): 203-8.
 7. D'Alessandro D, Agodi A, Auxilia F, et al.; GISIO. Prevention of healthcare associated infections: medical and nursing students' knowledge in Italy. *Nurse Educ Today* 2014; **34**: 191-5.
 8. Mikkelsen J, Hegg M, Harris AK. Nursing students' learning of managing cross-infections – scenario-based simulation training versus study groups. *Nurse Educ Today* 2008; **28**(6): 664-71.
 9. O'Neill E, Stevens NT, Clarke E, et al. Use of e-learning to enhance medical students' understanding and knowledge of healthcare-associated infection prevention and control. *J Hosp Infect* 2011; **79**(4): 368-70.
 10. Gruppo Italiano di Studio di Igiene Ospedaliera (GISIO). 25° Anniversario. Available on: <http://www.societaitalianaigiene.org/site/new/index.php/risorsericass/25-anniversario-gisio> [Last accessed: 2018, Aug 18].
 11. Dawson SJ, Bennett H, Ongley V. E-learning module for delivering infection prevention and control training. *J Hosp Infect* 2010; **76**(1): 89-90.

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