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Prevention of healthcare associated infections: Medical and nursing students' knowledge in Italy

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SUMMARY

Background: The training of health workers is a key issue for the prevention of healthcare associated infections.
Objectives: To evaluate knowledge of nursing and medical students concerning the prevention of healthcare associated infections.
Design: A cross-sectional study.
Setting: University hospitals in nine Italian cities.
Participants: One thousand four hundred sixty one healthcare students (607 medical students and 854 nursing students).
Methods: The study was performed using a questionnaire investigating 3 areas, each having different possible points: standard precautions = 12; hand hygiene = 8; healthcare associated infections = 5, for an overall perfect score of 25. Scores that met a cutoff ≥17.5 were considered to be indicative of an acceptable level of knowledge. Factors associated with an acceptable level of knowledge were analyzed using a logistic regression model.
Results: Mean overall score (±SD) was 18.1 ± 3.2. Nursing students (18.6 ± 2.9) obtained a higher overall score than medical students (17.4 ± 3.5) ($p < 0.001$). Weighed scores (±SD) by area were: 10.3 (±2.0) for standard precautions, 5.0 (±1.3) for hand hygiene and 2.8 (±1.1) for healthcare associated infections. Knowledge level concerning the three areas was different between medical and nursing students ($p < 0.001$). The probability of finding acceptable knowledge was smaller for medical students (OR: 0.54 $p < 0.0001$) and for students aged ≥24 years (OR: 0.39 $p < 0.0001$).
Conclusion: The overall score showed an acceptable level of knowledge for the whole sample; but, considering separately the two curricula, only nursing students reached the minimum acceptable score. It seems important to investigate what is working better in nursing than in medical education in order to implement and validate new teaching approaches.

Introduction

Healthcare associated infections have long been recognized as crucial factors bedeviling the quality and outcomes of healthcare delivery (Bello et al., 2011; Pittet, 2005). As a matter of fact, it is well known that healthcare associated infections can prolong duration of hospitalization, increase the costs of healthcare, and place a serious economic burden on patients and their families (Bello et al., 2011; Pittet, 2005; Robert, 2001).

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Moreover, healthcare workers and medical students are routinely exposed to this risk too.

Although these complications are potentially preventable and recommendations and scientific evidence for their control have been made available (CDC, 1988; Siegel et al., 2007), published literature reveals poor compliance with standard precautions among healthcare workers and students worldwide (Richards et al., 1997; Gammon and Gould, 2005; Bamigboye and Adesanya, 2006; Sadoh et al., 2006; Motamed et al., 2006; Karim et al., 2012).

A variety of factors influence the compliance with healthcare associated infections prevention procedures, the most important being the quality of the basic medical/nursing education. For instance, Kelcíkova et al. (2012) reported that significant deficits in the quality of hand hygiene related information in basic nursing educational programs correlate directly with the reported insufficient levels of hand hygiene knowledge and the associated poor hand hygiene compliance by students during their training in clinical settings.

Knowledge and competence in hygienic practices should be strongly established from the start of both a nursing or a physician career (Helder and Latour, 2010); moreover, some authors underline the necessity of a continued infection control education proposing that such training at the beginning of each academic year would be worthwhile (Alavian et al., 2011).

The evaluation of knowledge among medical and nursing student plays a key role in any process aimed at improving the educational strategies and consequently the compliance with healthcare associated infections prevention. In this regard, many surveys were conducted to assess infection control and hand hygiene knowledge among nursing and medical undergraduate students by administration of anonymous questionnaires (Mann and Wood, 2006; Tavolacci et al., 2008; van de Mortel et al., 2010; Bello et al., 2011).

Tavolacci et al. (2008) enrolled three hundred fifty healthcare students, the mean scores for the three investigated sections (on an overall perfect score of 10 for each section) were 8.5 for standard precautions, 7.4 for hand hygiene, and 5.7 for healthcare associated infections. Nursing students had a better mean overall score (23.2) than did medical students (21.1). Medical students surveyed by Mann and Wood (2006) scored 52% on their hand hygiene items and students lacked knowledge on the indications for alcohol-based hand rubs. In another cross-disciplinary study, the researchers examined Greek nursing and medical students' hand hygiene knowledge, beliefs and practices (van de Mortel et al., 2010) using a questionnaire and found that nursing students had significantly higher knowledge, and reported more positive beliefs and practices than medical students. Nursing students' average score on the items was 73.7%, while medical students' score was 51.2%. On the contrary, Bello et al. (2011) in a survey comparing the knowledge of healthcare associated infections among healthcare students at the University of Ghana, reported for medical and nursing students mean percentage scores of 70.58 and 61.31, respectively. In this study there was no significant association between course of study and knowledge of students. Notably, the main source of information about the prevention of healthcare associated infections was their routine formal training in class.

In light of this scientific background, the Italian Study Group on Hospital Hygiene (GISIO) of the Italian Society of Hygiene and Public Health (SItI) promoted a multicenter project aimed at reviewing the curricula of healthcare students with regard to healthcare associated infections prevention, in order to harmonize and improve the educational content among schools of medicine and nursing on the national territory. The first phase of the project (cognitive part) is aimed at investigating how much Italian undergraduate nursing and medical students know about healthcare associated infections prevention, and if differences exists between the students of the two courses. Firstly, a pilot study was conducted in the largest university of Rome, the Sapienza University; it showed a lack of students' knowledge, in particular with regard to hand hygiene; the study underlined the need to improve the specific contents of healthcare university courses (Colosi et al., 2011). Therefore a national study was promoted. Herein the results are reported of the survey carried among medical and nursing students in nine Italian cities.

Methods

The study consisted of a prevalence survey addressed to medical and nursing students in order to investigate their knowledge about three specific areas: healthcare associated infections, standard precautions and hand hygiene. To this aim, an anonymous questionnaire modified from a previous French study (Tavolacci et al., 2008) and prepared according to international guidelines on standard practices of isolation, precautions and hand hygiene, was adopted. The questionnaire had been previously used in a pilot-study performed in a large university of Rome (Colosi et al., 2011). The reliability index was assessed using Cronbach's alpha (internal consistency coefficient) (Kline, 1999; Nunnally, 1978). The alpha values achieved were 0.78 and 0.84 for the pilot study and for the multicentre study, respectively.

The questionnaire, in addition to collecting information about students' age, sex, curriculum and location of the university, includes 6 questions with multiple choice answers (total = 25 answers) concerning the three areas previously mentioned. The questions, with correct responses, are published in the paper by Tavolacci et al. (2008).

For each area it is possible to obtain points for an overall perfect score of 25. In particular, the healthcare associated infections area consists of one question with five true/false statements referred to a single area of concern. Therefore, an overall score of 5 is obtained if all answers are correct. Similarly, the standard precautions area consists of three questions for twelve true/false statements and the hand hygiene area consists of two questions with 8 possible true/false statements. According to Tavolacci et al. (2008), acceptable knowledge for each specific area was arbitrarily considered to be 70% or more of the right answers. Following this cutoff, the minimum acceptable number of right answers was assumed to be 3.5 (on a total of 5) for healthcare associated infections; 8.4 (on a total of 12) for standard precautions; 5.6 (on a total of 8) for hand hygiene and 17.5 overall (on a total of 25). Scores that met these cutoff were considered to be indicative of acceptable level of knowledge.

This anonymous questionnaire was handed to healthcare students at the end of a lesson in a lecture room, during the last week of attendance, in nine Italian Universities.

The study involved penultimate or last year medical students (fifth or sixth-year) and final year for nursing students (third-year); so that these students had attended at least one hygiene course and/or other courses concerning the prevention of healthcare infections, which should have given them all information required to answer properly.

Before the questionnaire administration, the researchers explained the aims of the survey, information was also given on how to complete

Table 1
Sample characteristics.

Features	Total		Medical students		Nursing students	
	#	%	#	%	#	%
Provenance:						
North	748	51.2	260	42.8	488	52.5
Center	157	10.7	88	14.5	69	8.1
South	556	38.1	259	42.7	297	34.8
Sex:						
Female	980	67.1	386	63.6	594	68.6
Male	481	32.9	221	36.4	260	30.4
Age:						
<24 years	562	38.5	96	15.8	466	54.6
≥24 years	899	61.5	511	84.2	388	45.4
Total	1461	100.0	607	41.5	854	58.5