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Major Article

Improving knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan

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Professional practice
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Introduction: The recent emergence and reemergence of infectious diseases have made the knowledge and practice of standard infection control precautions in developing countries more important than ever. However, schools of nursing in Jordan do not have a prescribed curriculum in Standard Precautions.

Purpose: To test the effectiveness of using an online education module and a learning contract on knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan.

Methods: A sample of 256 undergraduate nursing students participated in an online education module in infection control Standard Precautions. A pretest–posttest design tested effectiveness using an online questionnaire (Questionnaires for Knowledge and Compliance with Standard Precautions) before and after the online instruction.

Results: Initially, subjects reported low levels of knowledge and compliance with Standard Precaution practices and relatively few (15.2%) had high scores. Compliance with Standard Precautions was somewhat better (27%). Significant differences in the mean scores of knowledge and compliance between pretest and posttest were found.

Conclusion: Online instruction offers a consistent and effective method to include Standard Precautions into nursing education. Organizations that oversee nursing in Jordan have the option to strengthen all nursing curricula by mandating a standardized infection control curricula across all schools of nursing.

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It has been estimated that the risk of health care-associated infection (HAI) is 2–20 times higher in developing countries compared with developed countries.¹ HAI refers to infections acquired in hospitals, clinics, and where health care providers are susceptible to infections.² HAIs cost thousands of lives each year, yet most infections can be prevented with inexpensive Standard Precaution (SP) practices such as hand hygiene and wearing gloves.³ According to the World Health Organization, the practice of SPs includes the basic principles of infection control such as handwashing and using personal protective equipment such as gloves, masks, gowns, and eyewear to prevent contact with potentially infectious materials, as well as safe handling of sharps.⁴

Experts at the Centers for Disease Control and Prevention have reported that the recent occurrence of highly infectious diseases like severe acute respiratory syndrome, Middle-East respiratory

syndrome, and Ebola virus disease have made the knowledge, practice, and enforcement of SPs more important than ever.⁵ For example, the rapid spread of severe acute respiratory syndrome and Ebola virus disease transmitted by travelers illustrated how quickly diseases can enter health care systems and communities.⁶

Exposure to infectious material can be minimized by strict compliance with SPs.⁷ Strict compliance with safety rules must be taught and reinforced as the educational cornerstone of providing basic care and preventing the spread of disease. Thus, nursing students must be prepared to demonstrate professional accountability in infection control and adhere to standards of safe practice.^{8,9}

Nurses represent the largest labor group in health care and they have the greatest degree of contact with patients.¹⁰ In addition, nursing students are at even greater risk of contamination and sharps injuries during clinical training precisely because they are inexperienced. Especially during early clinical training, nursing students commonly have contact with body fluids such as saliva, sputum, urine, feces, and blood as they learn to provide basic patient care and obtain laboratory specimens.¹¹ The issue of undergraduate education in shaping attitudes and teaching infection control

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knowledge among health care professionals in developing countries is important.

The adherence to SPs in most developing countries remains either ineffective or nonexistent. Research has shown the obvious: lack of knowledge is the major reason for nonadherence to SPs.¹² Developing countries yield some alarming statistics: 39.3% of injections are given with syringes or needles that were reused without sterilization. Conversely, others have found good levels of knowledge and compliance with hand hygiene, a centerpiece of SPs, among nursing students who received various types of hand hygiene instruction and were reassessed frequently.¹³ Among nursing students in Hong Kong, predictors for SPs compliance included knowledge of SPs, perceived barriers, adequacy of training, management support, and influence of nursing staff.¹⁴

In Jordanian nursing schools, infection control and SPs in a coherent instructional form are missing from the curriculum.¹⁵ For example, Jordanian nursing students were found to have insufficient knowledge regarding SPs.¹⁶ Although the students who were surveyed reported positive attitudes and compliance regarding infection control practices, the level of knowledge was under 50%.¹⁶

Although Jordan has a population of only 9.46 million,¹⁷ it has a robust university system that graduates approximately 1,651 nursing students per year.¹⁸ The scientific, medical, and nursing programs in Jordan provide instruction in English using English-language textbooks and journals. The Jordanian medical system is modeled after the Western medical system and operates using a primary care framework. Jordan's major export is its university graduates in nursing, medicine, and the sciences. Nursing graduates can easily emigrate for work due to the acute imbalance between the large numbers of nursing graduates and underemployment nationally. Nursing graduates become expatriate workers, mostly in Middle Eastern countries, but also in the United Kingdom and the United States. Thus, insufficient and ineffective instruction in infection control and SPs has international implications.

Jordanian nursing students have been found to have insufficient knowledge regarding SPs.¹⁶ To improve compliance, it is important to recognize undergraduate nursing students' level of knowledge and compliance with SPs and to identify the strengths and weaknesses of their education. Many studies have been performed in relation to professional health care workers' knowledge of and compliance with SPs, yet few studies have involved undergraduate nursing students. Findings from this study will provide input for universities developing curricula and the clinical placement facilities where students obtain their experience.

METHODS

To address infection control, it is important to recognize an undergraduate nursing students' level of knowledge and compliance with SPs and to identify the strengths and weaknesses of their education. This study was designed to assess knowledge and compliance with SPs and to test the efficacy of online instruction in SP training among university nursing students. The online teaching method allowed participants opportunities to save, exit, and re-enter the program at will and to engage in multiple self-assessment activities. Findings from this study will provide baseline and instructional effectiveness data regarding infection control and SPs to advocate for systematically adding these curricula in national nursing programs in Jordan.

Research objectives

1. Describe the demographic characteristics of the sample (ie, gender, prior attendance in an infection control course, and year of study).

2. Identify and compare the subjects' knowledge levels (ie, high, moderate, or inadequate) of SPs before and after online instruction.
3. Assess the effectiveness of online instruction on the levels of knowledge of SPs of undergraduate nursing students.
4. Identify the undergraduate nursing students' level of self-reported compliance with SPs (ie, high, average, low, and very low).
5. Assess the effectiveness of a one-time exposure to online instruction to increase compliance with SPs.

Design and sample

The research design was a pretest–posttest educational intervention method (Fig 1). This design provided baseline and instructional effectiveness data of an online intervention. In preparation for sampling, we selected an α of 0.05 and a medium effect size, yielding a minimum sample size of 256 participants for data analyses with a power equal to 0.80.¹⁹ Subjects included undergraduate nursing students in Jordan who were aged at least 18 years. Students were recruited via e-mail; they were in years 2, 3, and 4 of their 4-year bachelor's degree in nursing program. These groups were selected because they would have sufficient clinical experience to be able to report on SPs. Students from other universities and graduate nursing students were excluded from the study.

Ethical considerations

Before executing the study, the design was reviewed and approved by the Protection of Human Subjects Committee at the investigator's university. Participants were informed that they could choose to refuse to participate or could withdraw from the study at any time before completion of the study. They were also assured that participation or nonparticipation in the study would in no way jeopardize their academic record and were informed that the findings would be reported in the form of aggregate data. Confidentiality of all information was maintained throughout the study using coded identifiers. For security purposes, the survey data were maintained on a password-protected computer and any hard copies of data were kept in a locked cabinet in a locked office. Only the investigator had access to the data or data files.

Instruments

The survey used in this study was an adapted version of the Questionnaires for Knowledge and Compliance with Standard Precautions instrument. The survey items ask about the knowledge of and compliance with the use of personal protective equipment, disposal of sharp objects and other biological wastes, decontamination of spills and used articles, and prevention of cross-infection. The instrument validity was been estimated at 0.98, reliability = 0.87, and Cronbach's α = 0.93. The instrument was scored according to the guidelines provided by Lou et al.²⁰

This questionnaire was converted to an online survey.²¹ The first section addressed subject demographics, including gender, year in the nursing program, and prior attendance at infection control seminars. The balance of the survey addressed knowledge of SPs and compliance with SPs using the questionnaire mentioned above. To assess the participants' knowledge, the survey included 20 items, with possible responses of "yes," "no," or "unknown." "Yes" answers were given a value of 1 point, and "no" or "unknown" received 0 points; the maximum possible score was 20. The higher the subject's score, the greater his or her knowledge about SPs. For example: "The main goal to implement Standard Precautions is to protect the medical staff" the correct "Standard Precaution is only applicable

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