Knowledge and Practice on Infection Control Amongst Students of the International Islamic University Malaysia (IIUM) During Clinical Attachment

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Abstract:

Introduction: Hospital acquired infection (HAIs) has been indicated as the major barrier to patient care as it is contributory to the increase in morbidity, mortality and financial strain. In clinical department such as the Medical Imaging department, there is a high interaction between the patients, staff and even students who are doing their clinical attachment. As such, students can possibly spread HAI through poor knowledge and practices which can then affect the healthcare quality. This study aims in ascertaining the knowledge and practice level of Infection Control Precaution (ICP) amongst the undergraduate Medical Imaging students at International Islamic University Malaysia (IIUM). **Methods:** A survey was carried out on 63 Year Two to Year Four students that were selected randomly. The data was analysed using descriptive analysis and Kruskal Wallis test. **Results:** Poor knowledge and practices of ICP were indicated amongst the respondents. The Kruskal Wallis test indicated no significant difference of ICP practices between the second, third and fourth-year students. The overall knowledge and practice scores of ICP amongst respondents were found to be poor despite it has been taught in the Patient Care course. This could probably due to the method of delivery of the subject matter, workload, forgetfulness and myth of skin allergy that can be combatted with education. **Conclusion:** The insignificance between the practice of ICP and the year of study of the respondents can be addressed by providing the necessary training, monitoring on ICP including the evaluation of ICP to improve the effectiveness of adherence to ICP.

Keywords: Infection control; Infection control precaution; Adherence; Knowledge; Practice

Introduction:

Hospital acquired infections (HAIs) are stumbling blocks to patient care as it contributes to the escalation of morbidity, mortality and financial strain (Rajakaruna et al., 2017; Zhou et al., 2019). Multiple studies have indicated that it is the commonest type of adverse events that affect hospitalized patients (Haque et al., 2018). The main concern of HAIs is that it posed as a health issue challenge due to multidrug-resistant pathogens such as methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococci (Ilyas et al., 2019). Several factors that may cause HAIs include poor hygiene due to poor waste management in the healthcare setting. HAIs can result from prolonged stay in the Intensive Care Unit (ICU) and prolonged antibiotics prescription. Inadequate supply of medical equipment due to financial constrain and lack of awareness on the infection control precaution (ICP) among healthcare workers can result in the escalation of HAIs. However, a survey on ICP that was carried out in a hospital demonstrated that 35 to 55% of HAIs are preventable (Gilbert & Kerridge, 2019).

Healthcare workers are perceived as vectors for HAIs transmission as most cases of HAIs occur due to poor hand hygiene among healthcare workers during medical and nursing care (Collins, 2008). The radiology department in general has been the most frequently visited department for diagnosis and treatment purposes. Significant morbidity, mortality and an annual financial loss of $6 to 7 billion had been reported due to HAIs in the radiology department in North America (Ilyas et al., 2019). Hence, an increase in the number of patients and contact time between patients and healthcare workers from the radiology department has been cited as the main contributor to the increased risk of infection (Ahmed et al., 2017). The ICU, Hematology/Oncology unit and surgical unit are acknowledged as units with the highest risk of spreading HAIs (Habboush & Guzman, 2020). Therefore, adherence to ICP among healthcare workers can indirectly improve patient care.

The World Health Organization (WHO, 2020) defines ICP as an approach and solution in reducing the harm of infection to patients and healthcare workers. ICP has been developed for combating nosocomial infection issues, whether the source of infection has been recognized or not (Nyirenda et al., 2019). As such, radiographers should be educated about ICP, as their responsibilities and tasks require them to have direct and indirect contact with patients (Abdelrahman et al., 2017). Consequently, infection control can be comprehended as an approach in preventing the expansion of infectious diseases and controlling the trend of HAIs (Nyirenda et al., 2019; Abdelrahman et al., 2017).

Studies have indicated that healthcare workers have poor attitude on infection control. Lack of knowledge on infection control may result in this practice to be overlooked (Nwozichi et al., 2018). The poor attitude and lack of knowledge amongst the healthcare workers can influence students' behavioural practices on the adoption of infection control. As such, Medical Imaging students must be equipped with knowledge on ICP and acknowledged infection control as their responsibility when undergoing clinical attachment in the hospitals or clinics. Therefore, this study aims to determine the knowledge and practice of ICP amongst the undergraduate Medical Imaging students at the International Islamic University Malaysia (IIUM) during their clinical attachment.

Materials and Methods:

Research design and population

This cross-sectional study was conducted among the second, third and fourth year undergraduate IIUM Medical Imaging students. The inclusion criteria were Medical Imaging students who had undergone clinical attachment at the government hospital in Pahang and Sultan Ahmad Shah Medical Center (SASMEC). All other respondents that did not fulfilled the inclusion criteria were excluded. The duration of the survey was three months, between February to April 2020. As infection control lectures were covered during the first year of study for Medical Imaging, as such it is assumed that all respondents have been exposed to infection control measures and guidelines. Using Yamane's formula, at 95% confidence interval (CI) at 5% error, the sample size for this study was 63 respondents.

Research instrumentation

A self-developed questionnaire in English were distributed randomly to the respondents using Google form. The questionnaire was divided into three sections and comprised of 44 questions. The time required to answer the questions was approximately 20 minutes. The respondents were required to read the research information sheet before proceeding with the survey. The purpose and justification for the survey to be conducted was explicitly mentioned at the beginning of the questionnaire. Before answering the survey questionnaire, the consent was given when the respondent pressed the 'Next' button. The

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questionnaire's content validity was checked by an academician from the department and the sentence structure and grammar of the questions were corrected by the research supervisor.

Ethical consideration

The questionnaire together with the research proposal and research information sheet were submitted to the Kulliyyah Postgraduate and Research Committee (KPGRC) for approval. After that, the application was submitted to the IIUM Research Ethics Committee (IREC) for the ethical approval. The IREC approval reference number IIUM/504/14/11/2/IREC2020-KAHS (DDIR) was obtained before the study was conducted.

Pilot study

After obtaining the ethical approval from IREC, a pilot study was conducted on 60 year three and four students from the Kulliyyah of Nursing (KON). These respondents from KON were chosen as they have the same inclusion and exclusion criteria as the intended study population (In, 2017). The questionnaire was distributed using Google form. The data obtained was analysed for internal consistency using the Statistical Package for Social Sciences (SPSS) version 22. The initial result of the Cronbach's alpha was 0.686. Five questions were removed due to zero variance. Seven low-inter correlation questions were deleted to improve the Cronbach's alpha value. The ideal range of average inter-item correlation is 0.15 to 0.50. Anything less than this value is considered not well correlated (Trochim, n.d.). A final Cronbach's alpha value of 0.723 was obtained with the deletion of 12 questions.

Data analysis

A normality test was conducted using Shapiro-Wilk test to verify the data assumption of normality. Descriptive analysis was carried out for socio-demographic characteristics of the respondents, knowledge and practice of ICP. All categorical variables such as gender, year of study and clinical practice experiences were presented as frequency and percentages whilst the overall knowledge and practice were presented as the mean scores. Depending on the results of the normality test, one-way ANOVA or Kruskal-Wallis test were used to analyse the data.

Result:

Demographic profile of the respondents

A total of 51 respondents were female and 12 were male. The respondents comprised of 18 respondents (28.6%) from year 2, 21 respondents (33.3%) from year 3 and 24 respondents (38.1%) from year 4. Year 2 respondents (28.6%) have the least experience of less than five weeks in the clinical area. Meanwhile, year 3 respondents (33.3%) have a total of six to ten weeks in the clinical field. Year 4 students (38.1%) had the highest clinical practice of more than sixteen weeks. The demographic information of the respondents is shown in Table 1.

Table 1: Demographic information of the respondents

Independent Variable	Category	Frequency N	Percentage %
Gender	Female	51	19.0
	Male	12	81.0
Year of study	Year 2	18	28.6
	Year 3	21	33.3
	Year 4	24	38.1
Total experience in clinical practice	Less than 5 weeks	18	28.6
	Between 6 to 10 weeks	21	33.3
	More than 16 weeks	24	38.1

Level of knowledge of ICP

The best-answered question (100% correct) was on hand hygiene whether healthcare providers should wash their hands before and after contact with patients. The poorest-answered question was on the use of PPE when conducting a radiological procedure. Details of correct and incorrect responses for each question are shown in Table 2. The level of knowledge of ICP amongst respondents is reflected in Table 3. The overall mean knowledge score was 56.57. Thirty-five respondents (55.6%) indicated poor knowledge level of ICP, 28 respondents (44.5%) had moderate knowledge level whilst no respondent had good knowledge level of ICP.

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Table 2: Summary of responses for ICP knowledge

Knowledge	Percentage (%)	
	Correct responses	Wrong responses
Practices of Standard Infection Control Precaution (SICP) is crucial in ensuring infection control effectiveness in a healthcare system.	90.5	9.5
Standard Precaution Practices are always applicable to all patients.	77.8	22.2
A healthcare provider should wash his/her hands before and after a contact with a patient.	100.0	0.0
Hands should be washed instantly after removing the gloves.	88.9	11.1
Antimicrobial hand washing agents are more effective than alcohol hand rub in eliminating transient microorganisms.	68.3	31.7
Hand washing is indicated only when the hands are visibly dirty.	44.6	52.3
A healthcare personnel must wear gloves for each procedure.	60.3	39.7
A healthcare personnel must wear surgical mask for each procedure.	34.9	65.1
Disposable apron needs to be removed before leaving the patient care area or examination room.	85.7	14.3
When handling MDRO (Multidrug resistance organism), a healthcare personnel should wear surgical mask.	30.2	69.8
When handling MDRO (Multidrug resistance organism), a healthcare personnel should wear apron.	58.7	41.3
Surgical mask is enough to protect one-self when handling primary Tuberculosis patient.	42.9	57.1
Wearing jewelry during a medical procedure does not induce microorganisms.	92.1	7.9
It is crucial to clean, wash and disinfect the medical tool and positioning aid for patient once a week.	63.5	36.5
Regarding cough etiquette: b) Wipe hand using the inside of the white coat after sneezing and coughing.	87.3	12.7
Regarding cough etiquette: d) If napkin or tissue is unavailable, cough and sneeze into the upper sleeve instead of the hand.	73.0	27.0
The non-touch technique is used to maintain the sterility of medical instrument in a procedure.	71.4	28.6

Table 3: Level of ICP knowledge amongst respondents

Knowledge	Mean = 56.57	SD = 12.08
	Min = 33.0	Max = 78.0
knowledge level	Frequency (N)	Percentage (%)
Good	0	0.0
Moderate	28	44.5
Poor	35	55.6

Level of practice of ICP

The level of practice of ICP amongst the respondents is depicted in Table 4. The lowest correct response (28.6%) was on the question of whether respondents practiced the six-step hand washing technique.

Another question that was poorly answered was on the droplet precaution practice of wearing an N95 mask while attending to patients with primary Tuberculosis. Approximately 35% of the respondents alleged non-adherence to the recommended practices. Most respondents (82.5%) correctly answered that they wore surgical masks if they were ill (coughing).

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Table 4: Summary of responses for ICP practice

Practices	Percentage (%)		
	Always	Sometimes	Never
I used the 6-step technique when washing my hands.	28.6	71.4	0.0
I wash my hand immediately after removing the gloves.	73.0	27.0	0.0
I used antimicrobial hand wash every time I did hand washing.	66.7	30.2	3.2
I do hand rub before attending each patient.	38.1	57.1	4.8
I wear disposable gown when handling patient with MRSA or have body fluid secretion.	54.0	28.6	17.5
I wear N95 when attending tuberculosis patient.	39.7	25.4	34.9
I remove my jewelry (ring and bracelet) during clinical practice.	69.8	20.6	9.5
I disinfect examination room after each procedure that involve patient contact and body fluid.	81.0	17.5	1.6
I wear mask if I suffered from cough when attending to the patient.	82.5	15.9	1.6
I always make sure I cover any open wound on my hand.	81.0	15.9	3.2
I cover my mouth using disposable tissue during coughing and sneezing.	46.0	50.8	3.2
I do hand washing after coughing and sneezing.	52.4	42.9	4.8
I cough and sneeze into my upper sleeve if there is no tissue or napkin.	46.0	44.4	9.5
I follow the steps on how to don and remove the personal protective equipment (PPE).	39.7	42.9	17.5
I always alert on my role if the medical procedure involved non-touched technique.	60.3	33.3	6.3

The level of ICP practice amongst respondents is shown in Table 5. The mean practice score amongst the respondents was 74.85. Seven respondents (11.2%) reflected that they have good ICP practice, followed by 26 respondents (41.2%) who have moderate levels of ICP practice while 30 respondents (47.6%) have poor ICP practices.

Table 5: Level of ICP practice amongst respondents

Practice score	Mean = 74.85	SD = 12.19
	Min = 47.0	Max = 97.0
Practice level	Frequency (N)	Percentage (%)
Good	7	11.2
Moderate	26	41.2
Poor	30	47.6

Table 6: Test of normality of knowledge and practice of ICP amongst respondents

Variables	Shapiro-Wilk Test		
	Statistics	Df	Sig.
Knowledge	0.943	93	0.006
Practice	0.962	93	0.048

Normality test

The Shapiro-Wilk test was used to test the normality distribution of knowledge and practice of infection control amongst respondents. The test results are shown in Table 6.

Based on the Table 6, the p-value of knowledge and practice of ICP among respondents is less than 0.05. As such, this indicates that the data is not normally distributed. Therefore, Kruskal-Wallis test was used to analyse the data.

Comparison test

The Kruskal-Wallis test was conducted to compare the differences in the ICP practices between the second, third and fourth-year respondents. The test results are shown in Table 7. The significance level was set at less than 0.05. Hence, it can be concluded that there was no significant difference in ICP practices between the second, third and fourth-year students.

Table 7: Output of the Kruskal-Wallis test

Year of study	Practice score mean rank	p-value
Year 2	32.42	
Year 3	28.67	0.549
Year 4	34.60	

Discussion:

The overall ICP knowledge score amongst IIUM Medical Imaging undergraduate students was found to be poor despite being taught in the Patient Care course. This could probably due to the method of delivery of the subject matter. Currently, the lack of

theory and practice in the training of healthcare professionals could lead to a lack of observational awareness of ICP (Massaroli et al., 2018), which in turn affects the practice of ICP (Alharbi et al., 2019). Conversely, most studies (Majidipour et al., 2019; Mitchel et al., 2014) reported adequate levels of ICP knowledge among nursing students. The difference in ICP knowledge between nursing and radiography students may be due to the weightage of the subject matter in their respective curriculums (Nasiri et al., 2019). As such, it is recommended that ICP to be taught through demonstrations with hands-on practice in healthcare institutions to increase the knowledge on ICP (Sarani et al., 2015).

This study indicated that the level of ICP practice amongst the respondents, particularly in hand washing techniques is low. This finding is critical because hand hygiene has been acknowledged as a crucial component in preventing infectious diseases. The finding could be due to tremendous workload, forgetfulness and fear of skin allergies amongst respondents that may limit the practice of proper hand washing techniques (Labrague et al, 2017). In addition, more than half of the respondents reflected the incorrect practice of donning and removing PPE. This incorrect practice could be attributed to the influence of senior radiographers' practices. This is because mimicry is often triggered due to lack of knowledge on the donning and doffing technique of PPE and the attitudinal unconcern of the consequences of their action (Kavanagh & Winkielman, 2016). The poor PPE donning and doffing technique practices may indicate insufficient knowledge or attitudinal behaviour amongst the respondents although PPE is a key technique in preventing the transmission of infectious diseases (Phan et al., 2019).

Furthermore, this study found no significant relationship between ICP practice and the year of study of the respondents. This may be due to the wrong practices utilized by the respondents during their clinical attachment which may be due to lack of emphasis on the importance of ICP during the study block at the university. Demonstration on how to carry out ICP practices with training sessions could help in emphasizing the correct ICP techniques. The fore-mentioned suggestions would activate the three human senses of sight, hearing and touch (Aja et al., 2017) in improving understanding of the subject matter. Additionally, ICP practice might not be emphasized during student engagement in the clinical area (Rajeswaran, 2017). As such, it is suggested that lecturers or local preceptor should provide necessary training and monitoring on ICP to address the incorrect ICP concepts and techniques. It is suggested that the practical assessment rubric should also include assessment on ICP (Burgess & Mellis, 2015).

Conclusion:

Since the Medical Imaging course is a skills-based discipline, a Medical Imaging student during clinical attachment may spread the infection if he/she does not have the knowledge in practicing ICP. Hence, the knowledge and practice of ICP is crucial amongst Medical Imaging students in controlling and reducing the rate of HAIs transmission in healthcare facilities. Therefore, improvements can be made to the curriculum on patient care delivery pertaining to the method of teaching and learning of infection control.

Limitations:

There are some limitations in this study. Firstly, the answers given by the respondents may not reflect the actual scenario of their knowledge and practices of ICP as the responses given may be biased. This could possibly be that the respondents wish to appear better than they are. Another possible reason could be that respondents desire to provide socially desirable answers or make up responses based on their belief. Secondly, as this was a quantitative survey, the respondents' feelings and actions cannot be known. Finally, this study may not be reflective of the entire knowledge and practice of ICP amongst Medical Imaging students as this survey only focused on IIUM Medical Imaging undergraduate students.

Acknowledgement:

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