Original Article

Ugandan medical and health sciences interns' infection control knowledge and practices

Adriane Kamulegeya[1,2], Alex Nninda Kizito[2], Hannington Balidawa[2]

[1]*School of Health Sciences Makerere University College of Health Sciences, Uganda*
[2]*Mulago Hospital, Kampala, Uganda*

Abstract

Background: We assessed the level of knowledge, attitudes, and practices of recent graduates of clinical health sciences who started their one-year internship in Uganda.

Methodology: This was a cross-sectional survey responded to by 209 (response rate of 70%) new interns who started their internships in August 2011 in different Ugandan hospitals. Validated self-administered questionnaires with knowledge, attitude, and practices questions were distributed to the participants during a two-day internship orientation organized by the national internship committee.

Results: Out of 299 subjects approached, the survey was completed and returned by 209 (70%). More nurses (51.4%) failed the questions on odds of HIV transmission after a needle stick injury compared to 23.0% and 36.4% of medical and dental graduates ,respectively($\chi^2 = 24.06$ p = 0.001). There was no difference in proportions of those who re-sheath needles. Respondents who had an encounter with positive tuberculosis history when taking clinical notes while unprotected were not more motivated to use masks ($\chi^2 = 7.06$; p = 0.07). Nurses and dentists reported more regular hand washing before and after patient contact compared to medical doctors.

Conclusion: Overall, the knowledge of infection control was not impressive and the attitudes and practices appeared to be heavily influenced by the lack of an enabling environment in training hospitals and internship hospitals. There is little likelihood of change due to internship experience except for those who go to missionary hospitals that have stricter infection control protocols. More effort must be made in teaching hospitals to encourage better infection control.

Key words: infection control; transmissible disease; health occupational risks

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Introduction

Infection control is a very pertinent issue within clinical circles, public health, and among health service consumers. A number of reports on poor hospital hygiene have been published, including reports about patients' fears about safety in hospitals [1,4]. A few patients have sued health care facilities and providers for perceived infection stemming from treatment received at these centers. This should raise concerns among health care personnel, both qualified and in training, and among administrators and educators [5]. Infection control is necessary to reduce the high levels of healthcare-associated infections (HAI) and to curb the proliferation of antibiotic-resistant bacteria [6].

Hand hygiene by healthcare staff has been reported to be of vital importance in the control of infection. Other protective measures such as masks, gloves, and vaccinations are useful in ensuring that the health care personnel do not get exposed unnecessarily to occupational-related infections or pass them on to patients [7,8].

In order to benefit from these available protective measures, it is recommended that a strong emphasis be placed on infection control in the undergraduate and postgraduate curricula of medical and other healthcare programs [9]. Infection control and aseptic techniques are taught to many Ugandan undergraduate medical and health science students by tutors and theatre nurses during surgical rotation exposures. However, we did not find any study that evaluated the level of knowledge, attitude, and behavior change following the training. Additionally, the universities attended by the graduates have different modes of teaching, ranging from problem-based learning at Makerere University to traditional lecture-based methods at other institutions such as Mbarara and Gulu University medical schools [10]. All these institutions have different student burdens and thus mainly rely on infection control techniques taught to the students in

hospitals as part of the clinical skills training. However, the level of standardization of these exposures and their efficacy are rarely formally evaluated.

Several authors have reported the fact that non-adherence to infection control behaviors such as putting on and changing gloves for every patient is typically multifaceted and extends beyond a lack of knowledge or forgetfulness [3,11-14]. Therefore, it is important to promote an educational approach that emphasizes behavior change and maximizes the personal freedom of health care workers (HCW) to choose to adhere, yet maximizes the potential healthcare and social costs. This is especially pertinent in Uganda due to a high infectious disease burden and very limited resources allocated to health care provision.

There are controversial reports that have shown doctors as being more complacent than nurses about infection control [14-17]. Unfortunately, this seems to stem from medical training. In fact, a study on hand hygiene among final-year medical students suggested that poor compliance may have its roots in a failure to learn this behavior at medical school. This was attributed to the negative influence of consultants and other role models [18]. Reasons for poor compliance vary from time pressures, lack of sinks, poor knowledge regarding clinical effectiveness of hand hygiene in reducing the spread of infection, and a negative influence of senior doctors as role models [18].

Better education, using a multifaceted approach, and institutional policy are required if knowledge, attitudes, and behavior towards infection control practices are to be improved and maintained [19]. However, no clear evidence exists about the best way to teach or assess the effectiveness of infection control teaching, despite recommendations that it should be included in the formal medical and health sciences curriculum [20].

This study aimed to highlighting the shortcomings in knowledge, attitudes, and practices so as to recommend areas in which infection control training could be improved.

Methodology

The study was conducted using a questionnaire that asked questions on various aspects of routine infection control procedures. The focus was on the six key principles of infection control, including questions about knowledge, attitude, and behavior. The intern doctors and nurses were also asked to provide information about the infection control teaching offered at their training institutions. Since a standard method for assessing interns' infection control knowledge, attitudes, and behavior was missing, comparisons between different groups were done using simple proportions based on the responses. The questions included those aimed at washing hands or the use of alcohol gels, the use of gloves and masks, correct procedure for disposal of contaminated sharps, needle stick injuries, and exposure to highly infectious patients.

The questionnaire was pretested on a random sample of fifth-year medical students to ensure practicability, validity, and correct interpretation of responses.

The study population consisted of intern doctors and nurses attending the 2011 interns' induction course sponsored by the national interns committee of the Ministry of Health of Uganda. The course was conducted on the 3rd and 4th of August 2011 at Mulago National Referral Hospital Kampala, Uganda. The interns were from Makerere, Mbarara, Gulu, and Kampala International Universities. The respondents were requested to complete the survey without discussing it with each other. The induction course contained no infection control lecture. The questionnaires were handed out at the beginning of the session, completed during breaks, and returned to the authors when completed. The responses were coded and entered into an Excel (Microsoft Office 2007) master data sheet. The four knowledge questions were graded right or wrong; a score out of the total of four was expressed, and then expressed as a percentage. Knowledge questions asked about resumption of ward duties following diarrhea and vomiting bouts, disinfection, the odds of HIV infection, and the most effective hand hygiene regimen.

The data was analyzed using SPSS 15 (SPSS INC Chicago, Illinois, USA). The chi-square test was used to test for associations in nominal data. A p value of $\leq$ 0.05 was considered significant for all statistical analyses. Missing data was left out on a case-by-case basis..

Results

The response rate, adjusted for non-delivery of questionnaires, was 70%.

Of the 209 respondents, 137 (65.6%) were male and 71 (34.0%) were female; for the remaining

Table 1. Gender distribution of respondents

		University attended					Total
		Makerere	Mbarara	Gulu	KIU	USSR	
Gender	Male	77	33	23	4	0	137
	Female	36	30	4	0	1	71
Total		113	63	27	4	1	208

One participant did not specify their gender

Table 2. Significant differences between the groups that had more than two responses

Feel precautionary measures interfere with work	Strongly agree/Agree	Strongly disagree/Disagree	χ^2 and P
Makerere	56 (49.1)	58 (50.8)	9.679, 0.04
Mbarara*	19 (30.6)	43 (69.4)	
Gulu	16 (61.5)	10 (38.4)	
KIU	2 (50.0)	2 (50.0)	
USSR	0	1(100)	

Use of masks when seeing patients	Always	Often	Rarely	Never	χ^2 and P
Makerere	5 (4.3)	12 (10.5)	68 (59.6)	29 (25.4)	22.26, 0.035
Mbarara	2 (3.2)	4 (6.4)	38 (60.3)	19 (30.2)	
Gulu	0 (0)	0 (0)	11 (40.7)	16 (59.3)	
KIU*	1 (25)	1 (25)	2 (50.0)	0 (0)	
USSR	0 (0)	0 (0)	1 (100)	0 (0)	

Hand washing before and after seeing patients	Always	Often	Rarely	Never	χ^2 and P
MBCHB	19 (13.6)	55 (39.7)	51 (36.7)	14 (10.1)	18.07, 0.034
BDS*	3 (27.7)	7 (63.6)	1 (9.0)	0 (0)	
Nursing*	14 (37.8)	13 (35.1)	9 (24.3)	1 (2.7)	
Undisclosed	6 (27.7)	8 (36.4)	7 (31.8)	1 (4.5)	

Use of masks when interacting with patients	Always	Often	Rarely	Never	χ^2 and P
MBCHB	2 (1.4)	10 (7.1)	83 (59.7)	44 (31.6)	46.17, 0.01
BDS*	3 (27.3)	5 (45.5)	3 (27.3)	0 (0)	
Nursing	1 (2.7)	1 (2.7)	23 (62.1)	12 (32.4)	
Undisclosed	2 (9.1)	1 (4.5)	11 (50.0)	8 (36.4)	

Table 3: Significant differences between groups that had more than two responses

Best hand hygiene agent	Incorrect	Correct	χ^2 and P
MBCHB*	34 (24.5)	105 (75.5)	10.12, 0.01
BDS*	3 (27.3)	8 (72.7)	
Nursing	19 (51.4)	18 (48.6)	
Undisclosed	7 (31.8)	15 (68.2)	
Finding +ve TB history when clerking with no mask	Yes	No	χ^2 and P
MBCHB*	106 (76.3)	33 (23.7)	20.94, 0.01
BDS	2 (18.2)	9 (81.2)	
Nursing*	27 (72.9)	10 (27.0)	
Undisclosed	11 (50.0)	11 (50.0)	
Have you or a close friend taken PEP for HIV	Yes	No	χ^2 and P
Male	49 (76.3)	88 (23.7)	7.04, 0.01
Female*	13 (18.2)	58 (81.2)	
Needle re-sheathing after use	Yes	No	χ^2 and P
Makerere	65 (57.0)	49 (42.9)	7.92, 0.05
Mbarara*	16 (25.4)	47 (74.6)	
Gulu*	8 (29.6)	19 (70.4)	
KIU	3 (75.0)	1 (25.0)	
Exposure to blood based pathogen in last 12 month	Yes	No	χ^2 and P
MBCHB	34 (24.5)	105 (75.5)	7.92, 0.04
BDS*	5 (45.5)	6 (54.5)	
Nursing	11 (29.7)	26 (70.3)	
Undisclosed	1 (4.5)	21 (95.5)	

*Indicates the group that was statistically significantly different

respondents, gender was not specified. Overall, males outnumbered females, but Mbarara University had an equal distribution (Table 1). One hundred thirty nine questionnaires were completed by medical doctors, 37 by nurses, and 11 by dentists; 22 respondents did not specify their training background.

Through the information available from the graduate lists of the training institutions, this sample was estimated to represent 54.6% doctors, 40.2% nurses, and 91.7% dentists who finished and/or started their internships that year. There were a fair number of trainees from neighboring countries who tend to go back home for their internships, while many nurses who are in service rarely do the internship. Makerere contributed the bulk of the respondents, followed by Mbarara, Gulu, and Kampala International University (KIU) representing 54.3%, 30%, 12%, and 1.9% of respondents, respectively.

Knowledge

Those surveyed were asked what the chances of HIV acquisition were after a needle stick injury. Sixty-six percent of the respondents correctly identified the risk level; however, KIU and Mbarara University graduates did not respond correctly; 75.0% and 44.0%, respectively answered incorrectly, compared to Makerere's 28.1% ($\chi^2 = 24.05$; df = 3; p = 0.001). The difference between the different professions was statistically significant (χ^2=24.06; p = 0.001), with more nurses (51.4%) failing the questions about the

odds of HIV transmission after a needle stick injury compared to 23.0% and 36.4% of medical and dental graduates, respectively.

Sixty (28.7%) of the 209 surveyed stated that following a bout of diarrhea they would wait 48 hours after symptoms seized; the rest chose the wrong option. However, when probed as to whether they followed the chosen time frame, males were significantly more likely to act on the above knowledge than females, 60.0% against 38.0%, respectively (χ^2 = 6.68; df = 1; p = 0.01). Although 84.2% (n = 176) of all respondents felt they had sufficient knowledge about infection control, KIU graduates were split halfway; in fact, all the KIU graduates reported that they had never been taught hand hygiene protocols during their training. The knowledge questions, including the odds of catching HIV and hepatitis, the role of disinfection, the period of time before returning to wards after a bout of diarrhea, and the most efficient hand hygiene method were graded; there was no significant difference in mean scores between universities, gender, or courses. Interestingly, there was no difference in knowledge about the best hand hygiene practice between those who reported having had some form of hand washing training and those who had not.

Attitudes, experiences, practices, and compliance with infection control measures

Respondents were asked about how important they thought certain aspects of infection control were and about their compliance with selected procedures. The responses with significant differences are shown in Tables 2 and 3.

The most common reasons provided for not washing hands before and after patient contact were no need since gloves are used (14.4%), a lack of facilities (12.2%), few and inconveniently located sinks (9.1%), and forgetfulness (6.2%); 26% of respondents did not answer this question. The respondents pointed out convenient location of a wash basin (37.3%), provision of non-irritating hand hygiene agents (12.4%), performance feedback (11.0%), and a reminder before patient contact (10.5%) as the factors that would most likely improve their hand hygiene .

Lack of gloves (53.2%) and glove use not being a common practice on the ward (28.7%) were the most commonly cited reasons for not wearing gloves. Of the respondents, 18.2% reported a needle stick injury within the last twelve months; there was no statistical difference based on training background or gender. Up to 25.5% reported re-sheathing of needles using a single hand since they felt it was safer, while the 6.2% who used both hands felt they did it carefully enough so they were not at risk. Of those who rarely use masks when interacting with patients, over 60% reported a lack of masks, and indicated that mask use not a common practice. Up to 50.2% of respondents had had an exposure to potentially infectious agents in the last 12 months. Of these, most did not specify the infectious agents, but blood was the most common agent.

There was no significant difference in proper needle exposure between those who had had a needle stick injury and those who had not (χ^2 = 0.97; p = 0.32). Likewise, there was no difference in proper needle disposal between those who had had post-exposure prophylaxis for HIV and those who had never had such an experience (χ^2 = 1.79; p = 0.18). Respondents who had had an encounter with patients with a positive tuberculosis history during the course of taking clinical notes while unprotected did not report more frequent use of masks compared to those who had never had such an experience (χ^2=7.06; p = 0.07).

Discussion

The sample was taken by convenient sampling and the response rate was 70%; therefore, much information could have been missed from those who did not return questionnaires or from those who opted out of the research. This was the most feasible approach because the interns' induction course is compulsory for all interns in the health care field before they disperse to their respective hospitals. The questionnaires were answered over a two-day period. All the respondents were from within the same area, so an exchange of responses could have happened, despite the clear request not to do so on the questionnaire. Although we could have reinforced the request with a verbal announcement, we opted not to, since we felt it could have encouraged discussion. We anticipated that the anonymity arrangements gave confidence to participants to give truthful responses. We could not get each participant to answer the questionnaire in isolation due to logistics limitations, which was a drawback to our findings.

We believe that the results of the study may be generalized to medical, dental, and nursing degree graduates who start internships in different designated hospitals in the country, as well as those who graduate yearly from Ugandan clinical degree programs. We are not oblivious to the fact that practices are better observed than self reported as an effective way of

measuring compliance [21]; thus, what was reported may not be as factual as what might have been observed. However, the effect of being monitored (the Hawthorne effect) has also been reported to improve compliance [22].

The study did not demonstrate considerable differences in knowledge, except for some specific aspects shown in Tables 2 and 3. The failure of over 50% of nurses to answer the odds of HIV infection following a needle stick injury was worrisome. Since nurses hold degrees, they are expected to be at the forefront of the training and administration of their comprehensive nursing colleagues; therefore, it is essential that they are more knowledgeable. Fortunately, the nurses were on par with the doctors in terms of the other knowledge questions. Overall, the level of knowledge must be improved, since only 30% of the respondents scored more than 50% in the knowledge section. Other studies have reported similar deficiencies in knowledge among experienced health-care workers in both developing and developed countries despite the existence of continuing professional development programs [23,24]. Since our study involved recent graduates, extra efforts must be made to impart this knowledge. Incorporating infection control training during the internship induction period could help stress its long-term importance, similar to what is done in ethics training.

The respondents who graduated from Mbarara University (Table 2) had better attitudes towards infection control processes; a higher proportion of them felt infection control processes did not interfere with their work. This attitude of feeling that infection control measures are an inconvenience must be challenged if an improvement is to be achieved. Interestingly, a report from Uganda identified infection control as one of the areas that hospital heads felt could be improved within the resources allocated [25]. It is therefore possible that attitudinal and policy change regarding infection control can easily be improved among Ugandan health-care workers.

Nurses and dentists reported more regular hand washing before and after patient contact compared to medical doctors (Table 2). This was discouraging, given the fact that all professions equally reported having been taught hand hygiene measures. Interestingly, the medical doctors performed far better when it came to choosing the best hand hygiene approach compared to nurses, as shown in Table 3. It is possible, therefore, that the doctors just had an attitudinal issue with hand hygiene practice, something not unique to the study's respondents [14,23]. Unlike a British study that reported time constraint as the main reason for non compliance [23], in this study, gloves obviating the need to wash hands and a lack of hand washing facilities were the most common excuses provided. This shows the need for both attitudinal change and behavioral promotion requirements if better hand hygiene is to be attained. In fact, most of the respondents suggested a convenient location of hand-washing facilities and the provision of non-irritating agents as the best ways to improve hand hygiene. This finding is similar to a Ghanaian study that identified a lack of facilities as a key factor in failure to follow hand hygiene practices [26]. Uganda and Ghana, unlike Britain, are poor and do not invest enough resources in the provision of such facilities, hence the difference in reasons for non compliance. It is worth noting that, similar to the respondents in the British study, wearing gloves was one of the reasons for hand washing non compliance, yet it is known that gloves only reduce the amount of contamination on the hands due to micro pore leakages [27]. Additionally, poor handling of gloves has been shown to actually enhance infection spread; in countries such as Uganda, with scarcity being the norm, it is important to discourage this reasoning among new clinicians [28].

Glove use when drawing blood or placing cannulas was reported as being done always and often by 83.25% and 14.8% of respondents, respectively. There was no difference between the courses or universities and gender. The use was better than what was reported by a British study [23]. This may be due to the high prevalence of infectious disease such as HIV/AIDS in Uganda. However, since the respondents were recent graduates, they may be more inclined to use gloves; however, this may wane with time. There are reports showing that experienced clinicians do not use gloves as frequently as recent graduates do[29]. In fact, one of the most common reasons given for not always using gloves was the fact that glove use was not a common practice on the ward. This is a sign that more experienced clinicians regularly do not use gloves.

Up to 44% of respondents reported needle re-sheathing, but there was no significant difference between the professions; however, there was significant difference among universities. Makerere university graduates performed the worst, with over half re-sheathing (Table 2). It is difficult to determine if this was due to differences in clinical training

settings or to the failure to impart the risks of re-sheathing.

In our study, 18.2% of respondents stated that they had had a needle stick injury within the last 12 months. This rate of injury is similar to what has been reported from Uganda previously [30], and re-sheathing may be one of the major culprits. Unfortunately, we did not get the details around the circumstances that caused the injury. However, most of the respondents, in a prior knowledge question, had indicated reporting to infection control as one of the necessary measures after needle stick. Interestingly, there was no difference in needle stick injuries, though likely because we restricted the time period to within one year.

Fifty percent of our respondents reported having been exposed to some infective agent during their training, with blood, amniotic fluid, and peritoneal fluid being the most common agents. The dental students were significantly more exposed to blood-based pathogens (Table 2). All involved pointed out HBV and HIV as the pathogens they were exposed to. The fact that more dental students reported exposures is not surprising, since the nature of dentistry is more invasive, especially during manual scaling and extraction using elevators not to forget the air rotary systems with their aerosols can potentially puncture gloves thus exposing the operator to infectious material.

Additionally, nearly 70% of the respondents had had an experience of finding out a patient's tuberculosis history after treating the patient without using a mask. Medicine and nursing graduates had significantly more encounters than dentists (Table 3). However, in terms of using masks, the dental graduates performed better than both medicine and nursing graduates (Table 3). Whether the aerosols that dental trainees encountered made them more compliant compared to the others who may not have seen the immediate danger is something we cannot determine in our study. However, 27.8% did not use masks because masks were not available,; as their reasons for not using masks, 28.7% of respondents indicated that mask use was not a common practice, and 25.4% indicated that they rarely interacted with infectious patients. Given the nature of ailments in the country, we would be very surprised that some respondents, during their training, did not interact with infectious patients; but, on the other hand, senior role models would be of great help if they could make mask use routine in practice. Senior clinicians as role models have been reported to enhance infection control compliance [31]; thus, it is possible that this would apply to mask use as well. Other than for tuberculosis, neither behavior nor attitudes were significantly affected by exposure and post-exposure prophylaxis experiences. Perhaps the effect of these experiences wears off a short time after the exposure and the clinician involved becomes complacent again.

Creating an enabling environment that includes wash basins, good hand hygiene agents, masks, and frequent monitoring and feedback in addition to knowledge updates must be emphasized to enable recent health care workers to use infection control recommendations consistently. In fact, it has been shown that many reasons for non compliance are given, but vigilant in-house infection control teams can facilitate compliance [11,32].

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Corresponding author

Adriane Kamulegeya
School of Health Sciences
Makerere University College of Health Sciences
2nd floor, Clinical Research Building
Mulago hospital complex
Kampala, Uganda
Email: adrianek55@gmail.com

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