# PERCEPTIONS AND PREVENTIONS OF HEALTHCARE-ASSOCIATED INFECTIONS AMONG NURSES

– an Interview Study in an Intensive Care Unit in Kampala, Uganda

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# Abstract

**Background.** Healthcare associated infections (HAIs) is an extensive problem and the most frequent adverse health event in healthcare worldwide. The prevalence is higher in low-income countries and in intensive care units (ICU) where outbreaks often originate. Hygiene actions are common precautions to reduce HAIs and with nurses being the main healthcare providers of physical care, they have a critical role in reducing HAIs. **Aim.** The aim of this study is to describe how registered nurses perceive and prevent healthcare associated infections in an ICU in Mulago Hospital, Uganda. **Method.** The study has used a qualitative design with semi-structured interviews. The data was collected by interviewing ten nurses working at the ICU in Mulago Hospital. A thematic analysis was used to find out the nurses' perception on working with HAIs. The principles of autonomy, confidentiality and privacy were greatly observed as the data was collected. **Result.** Three themes were found in the result: perception on working with HAIs, strategies to prevent HAIs and reasons for not following routines. The nurses' empathy for patients and their families due to the additional cost that an HAI brings was found. Barrier nursing was a slightly more emphasised strategy than hand hygiene for preventing HAIs. Shortage of staff and lack of equipment were the two major reasons for not being able to follow precautions against HAIs. **Conclusion.** When focusing on precautions it is interesting that barrier nursing is considered to be a more common strategy than hand washing. This goes against earlier studies and indicates a need for further research on the matter. This study elucidates an extensive problem which is common in low-income countries where little or no previous research of the perceptions among nurses has been carried out.

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# 1. Introduction

The subject was chosen as it affects an extensive problem in the healthcare regardless of where in the world you are. It exists in Sweden as well as in Uganda. Even though it is a big problem there are precautions the nurses can do to prevent and minimise the prevalence of HAIs. The authors chose to perform the study at the ICU to get a greater insight in one unit and since HAIs are a major problem in the ICU. As the authors have experience of working on hospital wards where HAIs are a problem there was an interest in studying how nurses in Uganda perceive the problem.

# 2. Background

## 2.1 Uganda

Located in East Africa just next to Lake Victoria, Uganda spans over 241 square kilometres, about half the size of Sweden. Uganda is on the equator and has a tropical savannah climate with no major difference in temperature during the year but has two drought periods. It is the world's second most populous landlocked country with its 38 million inhabitants. There is a mix of more than 40 ethnic groups in Uganda, partly due to the large number of refugees from Sudan and Rwanda. About 18% of the population are living in cities (NE, 2017). It has one of the youngest and most rapidly growing populations in the world; its total fertility rate is among the world's highest at 5.8 children per woman. With a population growth of 3.22% it's one of the five highest in the world (The World Factbook, 2017).

Uganda has one of the world's lowest GDP per capita and 2 out of 3 Ugandans are living in poverty (less than 2 USD/day) and about the same portion have access to clean water (NE, 2017).

On several areas Uganda is a more equal country than the neighbouring countries, for example as many girls as boys are able to go to school and in the parliament 32% of the representatives are female which is the highest number in Africa (NE, 2017).

Uganda is one of Africa's fastest growing economies. After years of stagnation the economic growth increased with larger export of mainly coffee, Uganda is now the 8th largest exporter of coffee in the world (Worldatlas, 2017). Uganda also exports gold, fish, oil re-exports, sugar, metals, cocoa beans, tea, maize, tobacco, hides & skins, cement and other products (Bank of Uganda, 2016). Most of the industry is related to agriculture thanks to its favourable soil conditions and abundance of rain although long dry periods can affect the agriculture. About 3/4 of the population are involved in the agricultural industry (NE, 2017).

Uganda was hit very hard by the outbreak of the HIV epidemic and in 2015, an estimated 1.5 million people in Uganda were infected with HIV and the HIV prevalence rate in the country was 7,1% (UNAIDS, 2016).

## 2.2 Healthcare in Uganda

The aim of healthcare in Uganda is to "provide the highest possible level of health services to all people in Uganda through delivery of promotive, preventive, curative, palliative and rehabilitative health services at all levels" (Ministry of Health, 2010). On average around 70% of the health facilities in Uganda do not have a constant supply of medicines and health supplies

throughout the year. Inadequate financial and human resources, capital investment and management issues have resulted in the public sector being unable to fulfil its mandate of providing medicines to meet the requirements of universal access to healthcare. This increases the dependency on the private sector but when referred to a private facility with a prescription, patients often find the medicines too costly (Ministry of Health, 2010).

The social security network in Uganda is weak and like many other developing countries people are depending on the family when sick or elderly. The number of health facilities is growing but inadequate transport, most facilities and equipment in a state of disrepair are major limitations. Forty percent of the women in Uganda reported that their husbands make decisions about their own healthcare (Ministry of Health, 2010). The access for healthcare is poor in the rural areas and the lack of medical staff is a major problem. A lot of the public health service is provided by Non-Governmental Organisations (Landguiden, 2017).

## 2.3 Healthcare associated infections

In recent years, Healthcare associated infections (HAIs) have become more prominent due to the greater complexity of patients' conditions and to developments in healthcare, which in some institutions have led to patients becoming more vulnerable to infections (Salem, El Mhamdi, Letaief, Bchir & Soltani, 2011). HAIs are the most frequent adverse event in healthcare delivery worldwide (WHO, 2016b).

Infections are the primary cause of death in the intensive care unit with mortality rates as high as 60% and even higher in those patients with HAIs (Vincent et al., 2009). In line with the above findings, they are the most common complications affecting hospitalised patients and are more frequent in the ICU where outbreaks often originate (Hällgren et al., 2001). However they can also appear once the patient has left the health facility (Vincent, 2003).

WHO defines HAIs as infections acquired by a patient during care in some form of healthcare facility that was not present on admission. This includes infections that may appear even after discharge (WHO, 2016a). The Centers for Disease Control and Prevention (CDC) defines an HAI as a localised or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) when there is no evidence that the infection was present or incubating at the time of admission to the acute care setting (Horan, Andrus & Dudeck, 2008).

HAIs may be caused by infectious agents from endogenous sources such as the skin, mouth or other body sites or from exogenous sources that are external to the patient such as visitors or equipment (Horan et al., 2008).

Several studies have shown that HAI prevalence varies from 3.8% to 18.6% depending on the population surveyed and the definitions used. However according to a study done in the ICU in Morocco, the prevalence of HAI was 50% (Jroundi et al., 2007) which is further backed up by Nejad, Allegranzi, Syed, Ellis & Pittet (2011). Ogwang et al. (2013) found the prevalence of HAI in 2011 in Lacor Hospital, Uganda was 17% compared to 4% in the US.

A study done by Trilla (1994) revealed that the three types of infections that together account for more than 60% of all HAIs are: pneumonia (usually ventilator-associated), urinary tract infection (usually catheter associated) and primary bloodstream infection (usually associated with the use of an intravascular device). Eggiman & Pittet (2001) shows that the three most common HAIs in the ICU are pneumonia related to mechanical ventilation, intra-abdominal infections following trauma or surgery, and bacteremia derived from intravascular devices. From a third perspective a recent survey made by the CDC states that the five most common

HAIs were pneumonia and surgical-site infection (tied at 22%), followed by gastrointestinal infection (18%), urinary tract infection (13%) and primary bloodstream infection (10%) (Magill et al., 2014).

A study by Hassan, Tuckman, Patrick, Kountz & Kohn (2010) in an American hospital estimated that an HAI increases the hospital care cost of a patient and increases the length of stay by several days. This is further increased by antibiotic resistant bacteria including Staphylococci, a wide variety of Enterobacteriaceae, Pseudomonas species, Acinetobacter species accounting for up to 70% of all the HAIs in the ICU in Uganda (Agaba, Tumukunde, Tindimwebwa & Kwizera, 2017). Furthermore they often remain hidden and underestimated because they are hard to diagnose and require expertise and resources to find (Nejad et al., 2011).

The burden of HAIs in Sub-Saharan Africa is high, significantly contributing to patient morbidity and mortality (Rothe, Schlaich & Thompson, 2013). Even though they can be avoided HAI's are everywhere and cause unnecessary deaths, human and economic burden, prolong hospital stays, create long-term disabilities and increase the burden of antimicrobial resistance (WHO, 2016a).

Despite the highly specialised interventions offered to the critically ill patients at the ICU, the mortality and morbidity is still high. This is partly attributed to HAIs, which are the most likely complications in hospitalised patients with the rates being highest among ICU patients (Agaba et al., 2017).

## 2.4 How to reduce healthcare associated infections

Various surveillance systems exist in some developed countries and provide regular reports on national trends of endemic HAIs. Some of these are the National Healthcare Safety Network of the United States of America or the German hospital infection surveillance system. This is not the case in most developing countries because of social and healthcare system deficiencies that are aggravated by economic problems. Additionally, overcrowding and understaffing in hospitals result in inadequate infection control practices. A lack of infection control policies, guidelines and trained professionals also add to the extent of the problem (Nejad et al., 2011).

Although there is a high prevalence of HAIs, they are often avoidable (WHO, 2016a). For example, after implementing an infection control programme at Lacor Hospital in 2010 the results were positive, with as much as 50% reduction in the prevalence of HAI. The strong association between HAIs and risk factors supports this evidence (Ogwang et al., 2013).

Though infectious diseases provide a sizeable piece of the public healthcare there is no evidence that HAIs are a priority in Uganda. No guidelines are provided to control HAIs in the reports and publications from the Ministry of Health (2010). Neither in the Uganda Demographic and Health Survey is there a mention of HAIs (UBOS, 2016).

The mission according to WHO is to reduce dissemination of infections associated with healthcare, by assisting with the assessment, planning, implementation and evaluation of national infection control policies. This will be achieved by providing support to help prevent the spread of infectious diseases through evidence-based infection control measures and by providing support for infection control preparedness and response to public health emergencies of potential international concern (WHO, 2016a).

Within infection prevention and control in healthcare, WHO has a vision to develop a crosscutting coordinated strategy for infection control in healthcare to harmonise and strengthen

infection prevention in healthcare for preparedness and response to outbreaks of HAIs. A coordinated strategy would provide a powerful tool to help promote prevention and control of HAIs across Member States (WHO, 2017).

## 2.5 Nurses' role in reducing healthcare associated infections

According to the International Council of Nurses (2012) nurses have four fundamental responsibilities: to promote health, to prevent illness, to restore health and to alleviate suffering. The ICN also states that nurses have a personal responsibility for nursing practice and for maintaining competence.

Since nurses are the main healthcare providers of physical care, responsible for hygiene to reduce and prevent HAIs for patients, they have a critical role when it comes to reducing HAIs (Fox et al., 2015). According to Kim, Jeong, & Thanju (2016), far from every nurse has been trained specifically to reduce HAIs. Some of the reasons for not following the guidelines provided about HAIs are lack of knowledge, lack of time, lack of means and forgetting.

In another study Rothe et al. (2013) show that HAIs are a widespread burden in sub-Saharan Africa and that the consequences are particularly felt in resource-poor countries. They also show that compliance of hand hygiene is highly variable within the region.

### 2.5.1 Hand hygiene

That hand hygiene is important in the hospital and especially for the nurses is something that has been know for a long time in modern nursing. As early as in 1859 Florence Nightingale wrote "Every nurse ought to be careful to wash her hands very frequently during the day" (Nightingale, 1859).

Hand hygiene is discussed in a study made by Allegranzi et al. (2010) where they claim hand hygiene is the cornerstone when it comes to preventing HAIs. After an intervention in Mali, which consisted of introducing an alcohol-based handrub and monitoring hospital staff to find out the compliance of hand hygiene, they concluded that access to handrub was critical for success and how multimodal hand hygiene was effective in a low-income country.

A finding that shows how big a part nurses are when it comes to reducing HAIs is found by Berland, Berentesen & Gundersen (2009). From their study we can learn that HAIs and a decrease in patient safety can be a result from when hygiene protocols become reduced over time. They state that poor hand hygiene and a busy and stressful environment also add to a decrease in patient safety due to HAIs. Berland et al. (2009) also pointed out the consequences of poor role models since it was everyone's responsibility to adhere to hygiene protocols.

A number of factors may influence adherence to infection control. A healthcare worker was more likely to be compliant if he or she had more experience on the job, was more knowledgeable about transmission of bloodborne pathogens and was strongly committed to a positive occupational safety climate (Wasswa, Nalwadda, Buregyeya, Gitta, Anguzu & Nuwaha, 2015).

## 2.6 Healthcare related suffering

As early as the 19 century, Florence Nightingale started to describe care related suffering. By doing so she showed that suffering is not only derived from disease but also from insufficient

care by for example nurses. Hence the fact that insufficient hand hygiene can lead to greater patient suffering, in this case by HAIs (Nightingale, 1859).

By becoming a patient, you are all of a sudden more vulnerable and left in the hands of others, and therefore immediately exposed to care related suffering (Dahlberg, 2002). This could be if the nurses are careless, the routines of the ward are not followed or by lack of knowledge (Berland et al., 2009). According to Eriksson (1994), suffering related to care occurs when a patients' dignity and human value are violated in caregiving situations.

When the nurses perform their hand hygiene routines, the patient has little to no influence over the nurses' work and an increase of the patients' care related suffering can occur (Eriksson 1994). Care related suffering is an unnecessary suffering that should be avoided through the healthcare workers acting and reflections on how it affects the patients (Dahlberg & Segersten, 2010). The nurses have a responsibility towards the patient to counteract and eliminate care related suffering (Wiklund, 2009).

## 2.7 Perception

According to the Oxford Dictionary perception is defined as "the way in which something is regarded, understood or interpreted" (Oxford Dictionaries, 2017).

## 2.8 Problem statement

HAIs are a problem causing patient suffering worldwide, especially in Uganda where the prevalence of HAIs has been found to be high (Ogwang et al., 2013). The primary cause of death in the ICU are infections with mortality rates as high as 60% and even higher in patients with HAIs (Vincent et al., 2009). Being the main healthcare providers of physical care and responsible for hygiene, nurses have a critical role when it comes to reducing HAIs. Studying nurses' perception of HAIs would lead to a deeper understanding on the subject and could benefit future research. Nurses strategies for preventing HAIs are interesting and important to study since their actions could determine patient suffering and huge costs for hospitals and patients.

# 3. Aim

The aim of this study is to describe how registered nurses perceive and prevent healthcare associated infections in an ICU in Mulago Hospital, Uganda.

# 4. Method

## 4.1 Study design

The study has used a qualitative design with semi-structured interviews.

A thematic analysis approach was used to find out the perception of nurses on HAIs in the ICU at Mulago Hospital, in Kampala, Uganda. The basic idea of a thematic analysis is to first acquaint oneself with the data by first listening through the recordings and later transcribing it

to text. Once the data is written down, codes are generated which later will be organised in themes. The themes are then reviewed and defined before the report is produced. The choice to use a thematic analytic method was made since it offers a theoretically flexible and accessible approach to analysing qualitative data (Braun & Clarke, 2006).

## 4.2 Study site

This study was conducted at the Mulago national referral hospital ICU at the acute care unit. The ICU can provide mechanical ventilation, postoperative care, intermittent haemodialysis, peritoneal dialysis and basic neurocritical care. The ICU serves Mulago Hospital and patients from all over the country. The unit was started in the late 1990s with a foreign donation and was initially run by a UK trained anaesthesiologist who has since retired.

## 4.3 Study population and interviews

Nurses working at the ICU at the Mulago Hospital in Kampala, Uganda were interviewed for the study. The inclusion criteria was that each nurse had to have a minimum of three years of nursing education. All nurses had to work at the ICU and speak English. No exclusions regarding gender, age, religious beliefs or origins were made. A total of ten nurses were interviewed, including the pilot interview which was not used in the data collection. Two informants were excluded, one for being an enrolled/assistant nurse with two and a half years of education and the other one due to too low quality of the recording to enable transcription. Seven interviews were used in the data collection.

The informants that were included in the study had 3 to 39 years of total work experience as a nurse and from 3 months to 28 years of work experience from the ICU.

## 4.4 Data collection procedures

The interviewers introduced the study verbally and by presenting a document of informed consent to the participant and sought written consent. If the participant gave his or her consent the interview started. The interviews were digitally recorded and later transcribed. The interviews were held in a separate room at the ICU with no risk of disturbance or distraction and lasted from 6 to 29 minutes. The authors divided the workload during the interviews. One led the interview and the other author observed. After each interview the authors changed roles.

## 4.5 Quality control measures

A quality control was taken into account by pre-testing the designed tools of data collection in a pilot interview to ascertain whether the tools would be appropriate for the actual data collection. The investigators administered the interviews themselves to ensure accurate data was collected. The study was done in English as it is the official language spoken at the ICU and the only language both informants and the authors could communicate in.

A control question was asked early in the interview to ensure that the informant knew what an HAI actually was. Privacy and confidentiality was highly regarded to eliminate bias during the data collection.

## 4.6 Data management and analysis

Interviews were recorded on a digital device and later transferred to a password-protected computer. The audio was transcribed with a computer. All the data was saved in a cloud service to ensure that no data was lost due to breakage.

The data was then analysed according to a thematic analytic method. Analysis was done by listening and becoming familiarised with the data. The interviews were then transcribed from audio to text. The authors transcribed each interview individually and then compared each other's texts to finally combine them and create one transcription per interview. Once readable, codes were found in the text and organised into themes. These themes were defined and later presented in the report. Throughout the report the word "nurses" is used. This refers to registered nurses unless otherwise is stated.

## 4.7 Ethical considerations

The authors were given an institutional permission from the Institutional Review Board, IRB of Mulago Hospital. The principles of autonomy, confidentiality and privacy was greatly observed by keeping the interviews in a separate room, anonymising the data, seeking written consent and informing the participants of the option to withdraw from the study immediately if they decided to do so. Each informant was given a random number to further preserve confidentiality. Each participant was paid a compensation sum of 15 000 UGX (~ 35 SEK) as the interview took place during the participants unpaid time during a break, before or after a work shift. Every participant gave written consent.

The principles of the Helsinki Declaration was adhered to throughout the study (World Medical Association, 2013). The authors ensured that the data was used and preserved in an ethically correct way by considering guidelines set by the European Commision (2013).

# 5. Results

85% of the informants had 5 or more years experience of working as a nurse. 71% of the informants had 3 or more years experience from working in the ICU. Table 1 illustrates the range and average experience of the informants.

Table 1. Demography of the informants.

|  | Range | Average | Median |
|---|---|---|---|
| **Years working as a registered nurse** | 3 - 39 years | 13.7 years | 8 years |
| **Years working at the ICU** | 3 months - 28 years | 10.2 years | 5 years |

The result is presented as two themes. The two themes that emerged during the analysis were: perception on working with HAIs and nurses' prevention of HAIs. The second theme contains two sub-themes, strategies to prevent HAIs and reasons for not following routines.

## 5.1 Perception on working with HAIs

The first theme, perception on working with HAIs, is a summary of the nurses' general view on working closely with HAIs. Perceptions like empathy for the patient and its family due to additional costs, view on mortality rate and the belief that the infections can be better controlled was found.

Due to the critical condition of the patients at the ICU HAIs were regarded as a common problem that has increased the mortality rate. Usually the patients are critically ill and there's a lot of different factors that increase the risk of acquiring an HAI.

> *"They first of all they're bedridden, they can't help themselves. Most of them are unconscious. Most of them are ventilated" (IP1).*

Although the problem was extensive some of the nurses' mentioned that it can be controlled.

> *"I think we need to control that cross infections and it's the health worker who has to consider it most in case they put it in action. I think it can be controlled at a high percentage at least" (IP5).*

When it comes to controlling the HAIs the health workers were seen as the keystone to the solution.

> *"So the health workers matter at most. Because they are also the ones who are well equipped with the skills they trying to speak to the attendance and the patient they go out they can get that" (IP5).*

One nurse stated that the staff is there for the patient and that the work they do is for the patients' best.

> *"And the end of the day it's the patient who gets the what? The benefits! Not the person who is providing" (IP7).*

One of the perceptions that were common among the nurses was the sympathy for patients and their relatives when it comes to the additional costs that come with an HAI. According to most of the nurses it is very rare that the hospital can afford to buy the necessary drugs which forces them to ask the patient and his or hers relatives to buy the drugs.

> *"Because in the end you will find that the patient long overstay patient is very expensive because you are forced to buy very expensive drugs. In most cases the hospital are not able to buy these drugs… so you ask the caretakers to buy them but some of them are too poor they cannot afford" (IP6).*

One informant described the extreme consequences that can come from a situation where the patients' relatives can't afford the drugs to fight the new infection.

> *"Dangerous organisms they are hard to manage. Most of the patients are poor. (…) In case you don't put the hospitals strategies you don't follow them you will find you free the organisms everywhere. And then you will get them in other patients and they are very hard to manage. You may find that you have to use like 300 USD a day to buy drugs. And it's hard to buy drugs, even if it's just 10 dollars some patients cannot afford so it's deadly in case the patient cannot afford the drug. The patient will have to die. So it's good to put the hospitals in action to prevent the mortality" (IP5).*

When describing what an HAI can lead to, one of the nurses made it very clear that additional finances and prolonged stay in the hospital will become a problem for the patient.

>"It can lead to the burden of prolonged stay in hospital. You come with one infection then you acquire another one. Bad financially, prolonged stay. It will never be the same because you will have additional finances. To add to the other ones" (IP2).*

## 5.2 Nurses' prevention on HAIs

### 5.2.1 Strategies to prevent HAIs

The informants mentioned several strategies they use on the ward to prevent and minimise the prevalence of HAIs. Awareness of practical strategies that the individual nurse could do like barrier nursing, changing clothes and various hygiene routines were described. Some strategies were more organisational like peer learning and teaching other.

Of all the strategies, the one that almost every informant mentioned was the act of barrier nursing. This means creating a barrier between yourself and the patient and making it harder for organisms to travel while giving nursing care.

>"It can be barrier nursing, if we are treating a wound, we use barrier nursing. As ourselves, we put on protecting gear. Protecting we must. We put on gloves. We put on aprons. To prevent transformed infection" (IP1).*

It is also learned that it is not always possible to perform barrier nursing. When it's not possible the informants find themselves cheating at performing care at high standards by for example using the same gloves over and over again.

>"We have to use the little we have so we end up using the same gloves over. You may think that the moment they touch the patient. Sometimes we cheat when it comes to changing gloves so you see then we are transferring infections. If we do that barrier nursing then we stock up provisions that will prevent that" (IP1).*

It is clear that barrier nursing was the first and most emphasised strategy mentioned by the informants.

>"We do barrier nursing in case we identify organisms in patients" (IP5).*

When talking about hygiene, the informants view hand washing as a given way of preventing HAIs. One informant meant that hand washing was the most common and most important action when working in close proximity with HAIs.

>"One of which is supposed to be proper hygiene, particularly hand washing which is commonest thing to reduce and minimise infection those are not 100 % but at least we reduce some. That is the most important thing which we do" (IP7).*

When asked about strategies to prevent HAIs one of the informants answered hand washing, not just only for the staff but also for the visitors.

>"Hand wash, the people who come here we emphasize before and after the procedure. Go to the sick – wash hands. It may not be accepted but at least on bedside we have mounted bottles of alcohol or hand rubbing. That is already working in place" (IP4).*

The use and access of alcohol was frequently discussed as the informants perceive it as an essential tool for preventing HAIs at their workplace. The multiple use of hygiene actions is enlightened.

>*"We have alcohol around the corridor we have to disinfect them when you finish working on this one. Even if you're not going to another patient you still have to disinfect yourself before and after. We also do disinfect the equipment used after (IP5).*

It is also mentioned by several informants that better access to alcohol at their workplace facilitates the use of alcohol. Some informants mentioned that they have bottles of alcohol on several locations on the ward.

>*"When the nurse comes in .. you have seen .. some dispensers for alcohol" (...) "I shouldn't use the same wear, I should remove that, wash hands or use alcohol" (IP6)*

Some of the strategies mention were organisational strategies that were implemented on the unit. Working as a team at the ward was a strategy several informants mentioned. To learn together and improve the way they work to prevent HAIs was crucial.

>*"Much of them are not trained critical care nurses. They learn from the job. We teach each other" (IP6).*

Several informants thought it important to stay updated to constantly do what is best for preventing HAIs.

>*"Much resources might be available but someone can easily miss so the person needs to be updated" (IP7).*

The registered nurses have a role of teaching others at the ward, various healthcare workers like enrolled nurses as well as patients and visitors. Since the ICU at Mulago Hospital receives a large number of students the informants thought it of high importance to teach the students the way they work to prevent HAIs.

>*"So if there is that routine teaching you know, routine teaching over sometime. So if they come in with their knowledge here they know but they're not very sure about what is happening and this being a critical unit we are supposed to prevent some of the things" (IP1).*

Some informants mentioned that they gave advice to the visitors about preventing HAIs and encouraged everyone to often disinfect their hands.

>*"And we tell them don't lean on the walls. Don't touch our patient. Don't touch the bed and everything. (...) we give them gloves if they must touching the patient. So they remove direct contact between the attendance and the patient (IP2)".*

>*"Every person who comes in even visitors we tell them don't touch the patient you have to disinfect yourself before coming in and even after" (IP5).*

Some informants thought it of importance to practically train to get the theoretical knowledge into practical knowledge to better prevent HAIs.

>*"If I come to you when I am trained and have all this at my fingertips that I have come from another area I have been put to work in the ICU. (...) I think training is a key factor in the creating awareness. Training and knowledge gap is one of the things why adherence may not even be appreciated (IP4)".*

One informant mentioned that training in infection control was important for the prevention of HAIs. CME (Continuing medical education) was a tool one of the informants used to keep updated on infection control.

> *"And again they are trying to take people to training in infection control. They start doing the people so that they are going down to train nursing in infection control" (IP6).*

> *"Best working strategies I think are acquire knowledge or CME or continuous studies within the unit. And training" (IP1).*

Another strategy to minimise HAIs was to change clothes and shoes on the ward. Before every shift the nurses change from their private clothes and shoes into their professional clothes and shoes that they only use on the ward.

> *"And also change of clothes. You see me how I am dressed. Because work in the ward I care. This is also to reduce the nosocomial within the unit" (IP4).*

> *"And we have change of shoes here because we clean them and we know they are but if you're outside you come inside so they have to get shoes" (IP2).*

According to several informants one of the major ways of spread of infections was through the patients' relatives. By restricting the visit by relatives they limited HAIs.

> *"Because if you look at the factors that bring the between us and the attendance. So if we minimise the number of attendance frequency of the coming inside you know they coming inside you they contacting the patient we don't know what happens out there. We try to reducing the number of attendance to come inside actually to see our patient" (IP2).*

> *"I would also like to talk about the relatives. (...) They are not allowed to touch the patient" (IP1).*

## 5.2.2 Reasons for not following strategies

Even though the nurses are well educated and have a lot of knowledge in infection control the strategies that have been put in place are not always followed. Some of the reasons were due to economical limitations such as shortage of equipment and understaffing while some others were connected to making mistakes.

When describing why the nurses at the ICU sometimes fail to follow the routines almost every informant talked about shortage or lack of something. Many expressed shortage of staff that it leads to as a key factor. This leads to over workload for the nurses that can prevent them from following the wards routines.

> *"And we're understaffed sometimes you find yourself busy you just put off gloves and go to another patient but in your mind you know what to do" (IP5).*

One informant describes a possible consequence of the shortage of staff as to paint a picture of what serious problems that understaffing and over workload can lead to.

> *"One of them is over workload. For example if you are working on a patient and another patient is calling and you can see that he or she is suffocating. Due to the panic that you don't want the patient to die in your hands, you may find yourself running with the gloves that you are already wearing to the patient on the other side and then you have done it.*

> *But if another nurse could have been there with gloves already the patient would have been saved [from the infection]. Over workload" (IP2).*

The fact that one nurse can be treating more than three patients at the same time and still need to treat even more is revealed by one of the informants. There is not only a shortage of nurses overall but also of nurses that are specially trained within critical care.

> *"And the inadequate staffing. Number of staff available per patient. Our nurse patient ratio is not good. You can find that you are treating more than three patients and in a situation where you need to arrive to treat another patient" (IP4).*

> *"Shortage of staff (...) because there is very few trained nurses for ICU" (IP6).*

Another shortage that is frequently mentioned is the lack of equipment, something that is talked about just as much as shortage of staff. One of the informants talked about how the most basic pieces of equipment can be missing. One informant's perspective shows how big the amounts of equipment need to be for them to last a long time. It's also revealed once again that the relatives are the last way out of the situation but that is not always reliable.

> *"Sometimes we run out of stock of the disinfectant, they're expensive and the patients cannot buy them ... on the ward. Alcohol sometimes can be missing" (IP5).*

> *"Sometimes we have a good stock of gloves, aprons and so on and then ten minutes later they are gone. So sometimes when the relatives are passing by we ask if they can help us out. But also the relatives can't always buy stuff" (IP1).*

One of the reasons for not upholding the standards and strategies was lack of knowledge which means that the nurses won't be able to follow the wards routines adequately. One informant mentioned that very few of the nurses on the ward are trained critical care nurses but every nurse should nevertheless work actively with prevention of HAIs.

> *"If you have limited knowledge on infection control. It means you will not be able to do it so those are the barriers that you can have" (IP2).*

> *"When it comes to infection control all nurses are supposed to know, not only intensive care nurses" (IP6).*

Since Mulago Hospital is the national hospital in Uganda they receive a lot of students from different universities and colleges. Students don't always have the adequate knowledge and training in infection control and can therefore make mistakes.

> *"But the nurses for example in the ICU know of these things. Except maybe the visitors because we have so many students from different places coming in here. One student may do something before you see it they done it but the nurses who are located here they know" (IP6).*

Some informants found it hard to find the time to train them properly in infection prevention and control and therefore students made unnecessary mistakes.

> *"Others come and they don't know what to do. Like there are visitors there are students and sometimes we don't have time to tell them. Often we tell them after the mistake is already made" (IP5).*

Some informants talked about the attitude and how it affects the work at the ICU. Without a good attitude it doesn't matter how much you know.

> *"The motivation of the health workers is so alarming"* (IP7).

> *"Then also the attitude, your attitude as the nurse. You may have knowledge but if you have poor attitude towards doing something you aren't gonna do it and really require the best of my knowledge is what limits us"* (IP2).

Some informants mentioned forgetting as a reason for not following the strategies, often because having a high workload.

> *"You are admitting another patient so during that time you can find even forgetting to remove the gloves you have been using on this one"* (IP3).

One informant mentioned that when the nurses work under stress they are not thinking straight and forget things they usually know.

> *"And they end up working under stress. Though they might know, they might be aware of some things but because we bring in stress they part with a lot of things in thinking"* (IP7).

# 6. Discussion

## 6.1 Method Discussion

The interviews were made on site at the hospital by the authors themselves. The reason being that the authors would be able to not only hear the informants speak but also that the informants usually say more when meeting face-to-face. This strengthens the choice of method since another method, i.e. a telephone interview or a questionnaire would not have captured this. This also gave the authors an insight into the local culture of the ICU and the hospital environment, which could have been beneficial for the understanding of the data.

Throughout the report both the terms nurses and registered nurses are mentioned. To avoid confusion about the term nurse it was written as "enrolled nurse" when not talking about "registered nurse". This was deemed to eliminate any misunderstanding.

First a pilot interview was made to assess the quality of the question guide and later nine nurses were interviewed. Two of the interviews were discarded. The authors are aware that the slim number of interviews can have affected the quality of the study (Graneheim & Lundman, 2014). This is however within Kvale's (1996) recommendations of 15 (±10) participants in a qualitative study. On the other hand Guest, Bunce and Johnson (2006) propose that data saturation is reached after around 12 participants. We can therefore not rule out that more data could have been collected if there were a larger amount of participants in the study, which could potentially have affected the result. The authors are also aware of the various amounts of data collected from each interview. This negatively affects the quality of the study as it can not be suggested that saturation was reached due to the low number of participants in the study (Guest, Bunce and Johnson, 2006). This is one of the reasons for arguing for the need of further research on the subject.

The first question of the interview was a control-question to see if the informants had knowledge about HAIs. The authors would also assure themselves of the informants understanding of the word perception by describing it when needed. All of the informants showed relevant knowledge about HAIs and the meaning of the word perception, which strengthens the quality of the study. The authors sometimes had to repeat the questions and rephrase them, this however was not deemed to be a problem or to affect the result.

The interviews were semi-structured meaning that open questions were asked and there was room for the informant to talk freely or for the authors to ask follow up questions. To make the informants more comfortable and not experience the interview as an interrogation the authors let the informants speak undisturbed and listened actively with interest (Danielson, 2012).

The informants had much experience in general from working as a nurse and working at the ICU. This strengthens the results of the study.

The length of the interviews ranged from 6 minutes to 29 minutes. This could be because some informants felt more comfortable being interviewed than others. However there was no correlation between the amount of data collected and the length of the interviews. It was therefore not deemed to affect the result.

The interviews were made in a separate room on the ward. Doing the interviews at the ward could mean that what was being said could have been overheard. However the authors judged this risk as minimal and due to practical convenience, patient safety and little choice of rooms left no other option. Since some of the interviews took place during the informant's break and with the overhanging risk of an emergency situation at the ward it was not viable to have the interviews further away from the ward. It could have affected the informants in a positive way to be comfortable in the setting of the interview (Doody & Noonan, 2013). The interviews were made under or just after the informants' shift. This might affect the quality in a negative way since the informants could be tired after working or stressed about leaving the ward during their shift. However it could also be positive since the informants were in the mindset of working with HAIs.

Since the study examined subjective experiences it was important to have an ethical consideration. The authors had to ask for the informants' consent and inform them that participation was voluntary and that they could quit the study at any time, as well as that everything they said would be confidential and anonymised. This could have created a feeling of security and contributed to genuine and honest answers.

The authors were granted an approval to conduct the study by "The Mulago Hospital Research and Ethics Committee". One of the conditions from "The Mulago Hospital Research and Ethics Committee" was that every participant would receive a compensation for their time, effort and inconvenience. This could maybe have affected the reason why some of the informants chose to participate in the study, however it was not believed to affect the results. Having received the approval from "The Mulago Hospital Research and Ethics Committee", the authors were reassured that the study was being performed in an ethically correct way.

The interviews were carried out in English as this is the official language spoken within the hospitals in Uganda as well as in the nursing education. Therefore the authors saw no need for a translator. Even though English is one of the official languages in Uganda all of the informants, as well as the authors, have English as second language. This could have influenced the result of the study. There could have been misunderstandings and misinterpretations between the authors and the informants. However by not using a translator the authors were able to get a personal communication with the informants. This also eliminates the risk that the information changes or that a translator put their own values into the information. Since the study report was written in English this would eliminate loss of information through translation and therefore decrease the trustworthiness.

Before the study the authors had certain knowledge about the field of interest. The authors didn't know what kind of data that would come up in the data collection and tried to put aside any prejudice to not affect the result. However the authors are aware that it is never possible to

disregard one's prejudice completely and this might have affected the result of the study (Henricson, 2012).

The authors of this study are two nurse students from Sweden who had not done any qualitative research earlier and this could affect the quality of the study. The authors worked both individually and together to strengthen the reliability of the study. During the process of the study the authors maintained contact with a supervisor with experience of studies to make sure that everything was done correctly and to strengthen the trustworthiness (Henricson, 2012).

The authors believe that the purpose of the study has been investigated with the chosen method. However considering that this study contains seven interviews it is hard to generalize the results. Since the interviews are made in an ICU in Uganda the results are not applicable in a greater context, however this study can be of interest and value to get an insight on how Ugandan nurses on the ICU view HAIs.

## 6.2 Result discussion

Our first theme, perception on working with HAIs, includes the informants view on additional costs for patients and their relatives. The fact that an HAI means additional costs is widely acknowledged (Pappas, 2008; Mauldin, Salgado, Hansen, Durup & Bosso, 2009; Hassan et. al. 2010). However all of those studies are made in high-income countries and the additional costs are described as additional hospital costs. The informants in this study on the other hand, express empathy for the patient and the relatives of the patient due to the additional costs brought upon them, not the hospital itself. However this study investigates the informants' perceptions on this, and not the actual consequence for patients who acquire an HAI.

Of all the strategies used by the informants in this study to prevent HAIs, the one talked about the most was barrier nursing. This is against the findings of Joshi, Joshi, Park & Aryal (2013) who showed that almost all of their study population prefer hand washing as the number one strategy to prevent HAIs. Another study that argues against the finding of this study is one by Chan et al. (2000) saying nurses' compliance of hand washing was high. However the use of protective wear such as masks and goggles was uncommon. Perhaps that could be due to the fact that the overall understanding and compliance to universal precautions was low.

It is interesting that barrier nursing is a more popular precaution than hand washing when the existing evidence show otherwise (Allegranzi et al. 2010; Rothe et al. 2013). No evidence was found showing that barrier nursing is a more popular precaution than hand hygiene which makes this study unique.

Despite barrier nursing being the most common precaution against HAIs, the informants of this study still mentioned hand hygiene as a widely used strategy. Many of the informants described the advantages of adequate hand hygiene. Rothe et al. (2013) suggest likewise, that hand washing is a basic yet effective way to reduce the spread of HAIs. Allegranzi et al. (2010) and Musu et al. (2017) also say that hand hygiene is the cornerstone when it comes to preventing HAIs.

As stated in the result, several informants mentioned the importance of good access to alcohol, since that would facilitate the use of it. This is also one of the main findings of Allegranzi et al. (2010) who claim that access to handrub is critical for better compliance of hand hygiene.

Several informants stated that shortage of equipment was the major reason for not following infection prevention strategies. This is in line with Linden, Sekidde, Galukande, Knowlton, Chackungal & McQueen (2012) who showed that essential equipment is missing in all

government hospitals in Uganda. Without the relevant means it's impossible for the nurses to put adequate hand hygiene in use. Also Kim et al. (2016) mean that lack of supplies is one of the main contributing factors to low compliance in infection control, which is further backed up by Sax, Perneger, Hugonnet, Herrault, Chraïti & Pittet (2005).

A common problem was also shortage of staff. Several informants said that they were understaffed and had an abundant workload, which affected the infection prevention strategies. Oulton (2006) states that there is a shortage of nurses worldwide. Another study narrows it down to the nursing situation in Kampala, Uganda and presents high levels of occupational stress found among nurses in public hospitals in Kampala, which affects job satisfaction thus placing patients at risk (Nabirye, Brown, Pryor & Maples, 2011). This is related to the perception of understaffing experienced by the informants in this study. Shortage of staff is further described by Nejad et al. (2011) adding to the extension of the problem of HAIs.

A large part of the informants talked about teaching as a strategy. Teaching each other was important for following adequate strategies. This is further backed up by Vandijck, Labeau, Vogelaers & Blot (2010) who states that knowledge is a primary condition for compliance to infection prevention.

The informants also thought it crucial to teach the students about infection control since one of the reasons for infection control strategies not being followed was that students made mistakes and did not always know about the current strategies. This is similar to what Ojulong, Mitonga & Iipinge (2013) found at the University of Namibia, out of 114 nursing students only 66% had overall knowledge about infection control and prevention.

Some informants stated that it was of importance to keep oneself updated on infection prevention which is backed up by Berland et al. (2009) who shone light on the risks with nurses not updating their education. Lack of knowledge and training leads to a less effective infection prevention control which is similar to what Kim et al. (2016) have found. Wasswa et al. (2015) argues similarly by claiming that the more education and training on infection control a healthcare worker has the more likely he or she is to be compliant of hand washing.

According to Lau, Tang, Mak & Leung (2014) forgetfulness is one of the most common reasons for low compliance to hand washing for nurses. Forgetfulness can be an unconscious exercise of power from the nurses towards the patients, who are in a position they can't affect (Eriksson, 1994). This behaviour can result in an increased healthcare related suffering for the patients.

# 7. Conclusion

The purpose of this study was to describe how nurses perceive working with HAIs. Three main themes were found: perception on working with HAIs, strategies to prevent HAIs and reasons for not following strategies. All informants showed sufficient knowledge on HAIs.

The study revealed that the informants were troubled by the additional cost of HAIs since it affects the patients' economy, which differs from earlier studies focussing on the cost for the hospital. The most effective ways to prevent HAIs were barrier nursing and hand hygiene, with barrier nursing being more commonly referred to which makes this study different from other studies. Other strategies to prevent HAIs included use of disinfectant, keeping updated with knowledge and training, change of clothes and restricting visitors. However these strategies could not always be followed mostly due to lack of resources, knowledge and understaffing.

The results in this study are unique in the sense that the informants mentioned barrier nursing more than hand hygiene as a strategy to prevent HAIs. However several things that the informants mentioned were similar to current evidence.

This study might be of interest since it highlights an extensive problem especially in low-income countries where little to no previous research on the nurses' perception has been carried out. There is a need for more research in this field partially since barrier nursing was preferred over hand hygiene as a strategy to prevent HAIs as this goes against current evidence. Further studies on barrier nursing as viewed by nurses would be beneficial for better understanding of healthcare in Uganda.

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# Appendix 1 - Informed consent

**Title of the proposed study:** The nurses' perceptions on hospital-acquired infections and how to prevent them, a study in two Ugandan Intensive care units

**Investigators: Hannes Baker, Fredrik Jungnelius**

**Background and rationale for the study:**
Health-care-associated infections (HAIs) are a major global safety concern for both patients and health-care professionals. It is the most frequent adverse event in healthcare delivery worldwide (WHO, 2016b). HAIs are a big problem, especially in developing countries where they affect 5% to 15% of hospitalised patients in regular wards and as many as 50% or more of patients in intensive care units (ICU). The long stay of patients at the ICU, coupled with their reduced immunity to infections make them more likely to be affected than those receiving care in regular wards (Vincent, 2003).
This study aims to assess nurses' perceptions on HAIs and identify problems with available prevention strategies at two Ugandan ICUs.

**Purpose:**
This is a very minimal risk study and the participants will be asked to answer a few questions to find out their perceptions on HAIs.
If perceptions are clearly understood then we can tailor more interventions to reducing the prevalence of HAIs.

**Procedures**:
The interviewers will introduce the study to the participant and seek consent. If participant consent the interview will start. The interview will be digitally recorded and later transcribed. The data from all interviews will be analysed using a thematic analysis method. The data will later be presented in a study report. The participant is not obliged to answer any questions they are not comfortable with.

**Who will participate in the study?**
This study aims to interview nurses working at the ICUs.

**Risks/Discomforts:**
This is a minimal risk study.

**Benefits:**
The participants will be verbally thanked for giving the required information that will be used to present the true perceptions of nurses on HAIs at the ICU and also given a small reimbursement.

**Alternatives:**
You are informed that participation in the study is not mandatory and you can choose to leave the study at any time of the interview.

**Cost:**
Being a minimal risk study there is no expected risk to be incurred by the participant. You will however give us about 15 to 20 minutes of your time for the interview and this will not be paid for as this is a students' study.

**Compensation for participation in the study:**
The participants will be accessed from their workplace at the ICU and so there will be no reimbursement for transport. However a compensation will be given for the participations time, effort and inconvenience.

**Questions:**
In case of any questions you are free to ask and they will be answered during the interview.

**Questions about participants rights:**
Participants will contact the Mulago hospital IRB in case of any questions about their rights in the participation in this study.

**Statement of voluntariness:**
Participation in the proposed study is voluntary and participants may join on your own free will. Participants also have a right to withdraw from the study at any time without penalty.

**Confidentiality:**
The results of this study will be kept strictly confidential, and used only for research purposes. My identity will be concealed in as far as the law allows. My name will not appear anywhere on the coded forms with the information. Paper and computer records will be kept under lock and key and with password protection respectively.

The interviewer has discussed this information with me and offered to answer my questions.

**STATEMENT OF CONSENT/ASSENT**

.......................................................... has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. I understand that my decision to participate in this study will not alter my usual medical care. In the use of this information, my identity will be concealed. I am aware that I may withdraw at anytime. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

Name…………………………………………………….
Signature of participant……………………………….
Age..…………….…………………………………………….
Date (DD/MM/YY)…………………………………..

Name of Witness…………………………………………...
Signature of Witness………………………………………..
Date (DD/MM/YY)…………………………………………...

Name of interviewer…………………………………………
Signature of Interviewer …………………………. …….
Date (DD/MM/YY)……………………………………………

# Appendix 2 - Question guide

1. Tell us about yourself.
   a. What education do you have?
   b. How long have you worked as a nurse?
   c. How long have you worked at the ICU?
2. What do you know about HAIs?
3. What is your perception on working with HAIs?
4. What are you current strategies to prevent HAIs?
5. Which strategies have you found to be the best and most effective?