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## **Healthcare-associated infections in Kenya**

**An interview study about nurses' experience**

## **Vårdrelaterade infektioner i Kenya**

**En intervjustudie om sjuksköterskans erfarenheter**

## **Abstract**

**Background:** Healthcare associated infection (HCAI) is a global issue and one of the most frequent adverse events in healthcare. HCAI is a major burden for patients' and leads to added pain and higher cost for the society. The most important measure to prevent the transmission of HCAI is hand hygiene. In developing countries can insufficient equipment and supplies, lack of financial support and understaffed hospital units have a negative effect for the patients safety and makes it difficult to reduce HCAI.

**Aim:** The aim of the study was to get knowledge about Kenyan nurses' experiences of healthcare-associated infections.

**Method:** The author used a qualitative method. Individual semi-structured interviews were made with four nurses at a government financial hospital in Eldoret, Kenya. The interviews were analyzed with a manifest analysis.

**Result:** The analysis of the transcribed text made five categories, Education for healthcare workers, students and patients, Lack of equipment and supplies, The issues with cross-contamination, Prevention of HCAI and Understaffed hospital. The results were discussed with Dorothea Orem's Self-care Theory with a focus on the Theory of Nursing system and other studies relating to the results.

**Conclusion:** Knowledge about HCAI is one of the first steps to be able to reduce infections. Cross-contamination is the main risk factor for HCAI and multiple interventions are an effective strategy to successfully increase hand hygiene.

**Keywords:** Healthcare associated infection, qualitative method, nurses' experience, Kenya.

## Abstrakt

**Bakgrund:** Vårdrelaterade infektioner (VRI) är ett globalt problem och är en av de vanligaste biverkningar i vården. VRI är en stor börda för patienter och leder till extra smärta och högre kostnader för samhället. Den viktigaste åtgärden för att förhindra överföring av VRI är handhygien. I utvecklingsländer kan otillräcklig utrustning och leveranser, brist på ekonomiskt stöd och underbemanning sjukhusenheter ha en negativ effekt för patientsäkerheten och gör det svårt att minska VRI.

**Syfte:** Syftet med studien var att få kunskap om Kenyanska sjuksköterskors erfarenheter om vårdrelaterade infektioner.

**Metod:** Författaren använde en kvalitativ metod. Individuella semi-strukturerade intervjuer gjordes med fyra sjuksköterskor på ett statligt finansiellt sjukhus i Eldoret, Kenya. Intervjuerna analyserades med en manifest analys.

**Resultat:** Analysen av de transkriberade texterna utgav fem kategorier, Utbildning för sjukvårdspersonal, studenter och patienter, Brist på utrustning och leveranser, Problem med korskontaminering, Förebyggande av VRI och Underbemannade sjukhus. Resultatet diskuterades med Dorothea Orems egenvårdsteori med inriktning på teorin om vårdsystemet och andra studier relaterade till resultatet.

**Slutsats:** Kunskap om VRI är ett första steg för att kunna minska antalet VRI. Korskontaminering är den största riskfaktorn för VRI och flera påminnelser om VRI är en effektiv strategi för att framgångsrikt öka handhygien.

**Nyckelord:** Vårdrelaterade infektioner, kvalitativ metod, sjuksköterskors erfarenheter, Kenya.



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## **Introduction**

Healthcare-associated infection (HCAI) is a global issue and a problem for both patients and healthcare workers but it is also an economic issue. It leads to a longer hospital stay and increased pain, suffering, and sometimes fear for the patients' and their families. Therefore, I think this is an important issue to get more knowledge about and what we can do to reduce HCAI.

In Sweden is HCAI a common subject in hospital environments. During my education I have learnt a lot about HCAI, both in school and during my internships. I had heard about Moi Teaching and Referral Hospital (MTRH) in Eldoret from friends that have been there previously. This evoked my interest in going to Eldoret and get knowledge about the nurses' experience about HCAI and what they can do there to prevent it. In Sweden for example, healthcare workers use aprons, gloves, hand sanitizer, wash their hands often and do not share items between patients if it is possible to prevent the risk for HCAI. Developed countries often have more resources and space than in many developing countries. Therefore, I want to get knowledge about the nurses' experience of HCAI and how they work to prevent infections in Kenya, where they often have overcrowded wards and might have limited resources.

## **Background**

### **Healthcare-associated infections**

The definition of healthcare-associated infection (HCAI) is an infection that a patient suffers from during or after the hospital stay, which was not present or incubates at the time of admission. It includes infections patient gets while receiving treatment from a medical or surgical condition, occupational infections among staff, and thus, many of the HCAI can be prevented (Allegranzi, 2011). A common cause of infection is cross-contamination and transmission of micro-organism through the healthcare workers hands (Ojo & Ojo, 2017).

HCAI is one of the most frequent adverse events in healthcare. However, the true burden is unknown because it is difficult to gather reliable data. Most countries have a lack of a surveillance system for HCAI. Countries that have them struggle with the complexity and the lack of uniformity of criteria of diagnosing it. Surveillance defined as the ongoing systematic collection, analysis, and interpretation of health data is essential to the planning, evaluation, and implementation of healthcare. Surveillance is the heart of infection prevention and control

and is an essential tool to reduce HCAI. The first step is to identify problems and priorities. The surveillance of HCAI that appears after discharge is inexistent or poorly developed. Many patients probably acquire respiratory infections while seeking care for other diseases, especially in developing countries where the settings often are overcrowded. It is almost impossible to identify the occurrence of the infection when the patient returns to the community (Allegranzi, 2011).

HCAI can occur in many ways, such as direct and indirect contact, by tearing of tissues, air-pollen, and ingestion. Patients' age, malnutrition, immunological deficiency, general diseases and comorbidity can also increase the risk of HCAI (Twardowska & Jexczak, 2017).

### **The issue with HCAI**

HCAI may lead to bladder infections, bloodstream infections, gastroenteritis, infection in dialysis, infections from healthcare staff, pneumonia and postoperative infections (Ericson & Ericson 2009). It leads to added pain, psychological and financial burden for the patients and higher cost for the society. Another problem with HCAI is that the throughput of patients reduces because the treatment period is longer. It is difficult to generalize how much longer the treatment period gets (Anonymous, 2017b). In developing countries can the increased length of stay associated with HCAI be between 5-29 days (Allegranzi, 2011). It is also common that patients affected with a HCAI get treated with antibiotics. Therefore, it is important to reduce HCAI from the viewpoint of antibiotic resistance (Anonymous, 2017b).

The five most common bacteria that cause HCAI are coagulase-negative staphylococci, *E. coli*, enterococci, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. HCAI is divided into endogenous and exogenous infections (Anonymous, 2017b). Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal tract or vagina that are caused by microorganisms from the patient's own normal flora (Allegranzi, 2011). Exogenous infections are caused by microorganisms transmitted to patients from a source of infection in the environment. The majorities of HCAI are endogenous and occur in single cases without a common risk factor, for example, surgery, catheter use, and intensive care. To observe these risks and to be careful with the hygiene is therefore important (Anonymous, 2017b).

### **How to prevent HCAI**

There is a range of recommendations to avoid HCAI. Evidence has shown that hand hygiene is the single most important measure to prevent the transmission of HCAI (Park & Seale,

2017). Guizhen (2016) concludes that to menace HCAI different strategies such as hand washing, and the use of hand sanitizer must be employed. But this can only be effective if all healthcare workers are involved and have a good understanding of HCAI, this should include knowledge of hand decontamination (Guizhen, 2016). Furthermore, it is important to have knowledge about microbiological factors that are associated with HCAI such as Methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (C.diff). They are a major source of morbidity and mortality in hospitals and a significant cost (Ojo & Ojo, 2017).

The World Health Organization (WHO) and other agencies have suggested that patients must be an active participant in the infection prevention process. It is more likely that patients that are actively engaged in the care can identify and mitigate potential risk by asking healthcare workers about their hand hygiene practice. To inform the patients of HCAI could positively influence their engagement in infections control strategies. Previous research concludes that patients who receive information about HCAI have a better understanding about the risk and are more actively engaged in infection control and prevention measures, compared to those who had not received any information. However, it is important to provide information in the right way. Previously research has shown that to only provide verbal information to the patients is ineffective as this information may be easy to forget, written information is thought to be more beneficial (Park & Seale, 2017).

Ali & Wilson (2017) also concluded that healthcare workers hand hygiene is the most effective way to prevent HCAI. It is the healthcare workers responsibility to estimate when and what kind of equipment to use to prevent HCAI. The use of aprons and gloves decrease HCAI (Dingwall, 2014). Gloves are an essential part of healthcare worker protective equipment but are not a substitute for hand hygiene. The use of gloves during a treatment of a patient is recommended as a barrier to infectious bacteria where the risk of contact with bodily fluids, mucous membranes or damaged skin is likely. However, hands should decontaminate before and after using gloves. Inappropriate use of gloves can implicate cross-contamination between healthcare workers, patient, and environment (Ali & Wilson, 2017).

Another factor to consider in reducing HCAI is the environment. Thus, cleaning all surfaces that patients share carefully with disinfectant is an important step to reduce infections. It is also important to remember to clean noninvasive portable clinical items (NPI) also known as non-critical items that patients are sharing after use, for example, sphygmomanometers and thermometers. NPI is likely to cause cross-transmission between

patients and should be prevented whenever possible. Unfortunately, NPI is more referred to as non-critical items to describe items and instrument that do not require high-level disinfection. NPI is likely to be a low priority for cleaning and decontamination if healthcare worker referred NPI as non-critical items (Livshiz-Riven, Borer, Nativ, Eskari & Larson 2014).

HCAI is more likely to appear in larger spaces, therefore, it is important to consider how the department is used to reduce the risks associated with infections. The first step to promote hand hygiene is that the basin is easy to access. Another factor to consider is that patients with known infections should stay in private rooms if possible. Finally, the environment at the hospital must be clean and free of dust and dirt (Fraiser & Bradley, 2009).

Furthermore, healthcare workers insufficient knowledge about HCAI and their transmission hinder the effective implementation of HCAI prevention and control measures. Collaboration with all healthcare workers is required to change and take responsibility for the operational process, organizational structure and people's behaviors, which may lead to a change of culture in the workplace. It may also increase team effectiveness, risk-management ability and embrace healthcare workers values. Healthcare workers may be more open and positive in suggesting changes and communicating different opinions. Furthermore, it saves hospitals significant costs, but most importantly by providing high-quality care it promotes patients' safety. (Guizhen, 2016). It may be difficult to prevent HCAI from an organizational perspective, but if it begins at an individual level can it be possible to achieve an organization-wide collaboration to improve patients' care, protecting patients and saving lives (Wright, 2017).

### **The importance of education of HCAI**

There is evidence that high standards of infection control and prevention, and education are important methods to reduce the number of patients infected with a HCAI (Guizhen, 2016). Wright (2017) concludes that nurses' have heard of HCAI, but they usually think of infections that are caused by medical equipment or invasive instruments that have been contaminated by microorganisms.

The main priority should be to prevent HCAI. It is, therefore, important that the quality of the basic medical and nursing education provides knowledge and competence in hygienic practices (D'Alessandro et al., 2013). D'Alessandro et al (2013) conclude that nurse student has more knowledge about HCAI than medical student even though the knowledge level was low. Most of the student thought that the environment was the most important source of

bacteria transmission. However, previously researches conclude that hands are the main sources of bacteria. It is a need for collaborative efforts to improve the quality of education by practical training and of lectures.

Furthermore, Cruz, Cruz and Al-Otaibi (2015) conclude that nurse students had low levels of knowledge of which type of hand hygiene procedure they should be using. However, a significant percentage of the nurse students knew that damaged skin increases the risk of colonization by harmful bacteria. As future providers of healthcare, students should learn how to practice safe care. They should also be able to have a critical view on the care provided and be committed to finding ways to improve care and safety (Christiansen, Prescott & Ball, 2013). Lack of knowledge can lead to poor hygiene and increase the risk of developing HCAI. Previously studies have shown in many studies that increased knowledge of HCAI can reduce the spread of diseases. Furthermore, it is also important to learn about the occurrence of the different HCAI in both community and secondary care setting. Increase knowledge of the transmission pathways by which people become infected by infectious organisms may be an affective strategy to reduce HCAI (Ojo & Ojo, 2017).

Healthcare workers should be engaged with the patients, understand the system and managing risks, understand the role of human factor and safety, learn from mistakes and use improvement methods to improve care and be an effective team player (Christiansen, Prescott & Ball, 2013). This may lead to improving methods, newer processes of infection control. (Ojo & Ojo, 2013).

### **HCAI in developing countries**

The effect of HCAI on healthcare systems and patients is severe and greatly underestimated in developing countries. 5 – 15 percent of the patients are affected by HCAI in regular wards and 50 percent or more in intensive care units (Nejad et al., 2011). Only 23 of 147 developing countries have a functioning national surveillance system (Allegranzi, 2011). The main reason for this may be an absence of expertise and dedicate human and financial resources as well as to the existence of other important healthcare priorities (Nejad et al., 2011). The increased burden of HCAI in developing countries affects especially high-risk population, such as age over 65, admission as an emergency or intensive care unit, hospital stay longer than seven days, placement of central venous catheter, indwelling urinary catheter or an endotracheal tube, undergoing surgery, trauma-included immunosuppression, neutropenia, a rapidly or

ultimately fatal disease, and impaired functional or coma status. Furthermore, lack of basic hygiene and limited resources, including malnutrition, age under one-year-old, low birth weight, parenteral nutrition or two or more underlying diseases also increase the burden of HCAI. Inadequate numbers of trained personnel working in infections control, insufficient equipment and supplies, lack of financial support and understaffed hospital units are general barriers to optimal infections control practices even if not demonstrated as independent risk factors (Allegranzi, 2011). For nurses' to prevent, diagnose, monitor and treat diseases are medical equipment an important component. It can create difficulties if there it is a lack of equipment and has a negative influence on the patients' safety (Moyimane, Matlala & Kekana, 2017).

Nejad et al. (2011) conclude that HCAI is a major burden and a safety issue for patients' in developing countries, with a higher epidemiological relevance than in developed countries. Furthermore, it was shown that surgical-site infection is both the most frequently studied and the leading HCAI at hospitals in developing countries. It is an avoidable complication resulting from unsafe surgery.

The literature regarding HCAI in Kenya is scarce. However, Bedoya et al. (2016) conclude that an association between compliance and the availability of supplies, healthcare workers knowledge, training in infections prevention and control, and the improvements in behavioral change will require a broader focus to prevent cross-contamination and HCAI.

## **Kenya**

Kenya is a country in East Africa and lies on the equator with a population of 45, 892, 000 people. The Swahili culture developed during the Medieval Period when trades with Arabs started. The British colonization established in the 19th century, they took over the most fertile landscape which led to the mau-mau-uprising in the 1950s. In 1964 was the independent Republic of Kenya formed by Jomo Kenyatta who ruled the country until his death in 1978 (Karlsson, 2016).

Compare to the neighboring countries has Kenya a relatively diverse economy. An important contribution to Kenya's economy is the large number of tourists that are drawn for the scenic landscape and rich wildlife (Ominde, Ntarangwi & Ingham, 2018). However, the resources are unevenly distributed and almost half of the population lives in poverty. The richest ten percent of the populations control around 40 percent of the assets (Karlsson, 2016). Towns and villages did only exist around the coastline before the British colonization but

today are the major of the populations living in scattered settlements in rural areas (Ominde, Ntarangwi & Ingham, 2018).

The President of Kenya is both the head of the state and the government and Kenya has a multiparty democratic system. However, corruption is a major problem and affect Kenya's economic and political credibility (Karlsson, 2016). The election in 2007 was one of the closest in Kenya's history with a record-high voter turnout. When the result was released after a delay did violence protests ensued throughout the country involving some of Kenya's many ethnic groups and over 1000 people were killed. A referendum on a new constitution that limited the power of the presidency passed in August 2010. The new constitution is rewritten to deactivate long-standing politician, decrease corruption and give more control to the local governments in the country (Ominde, Ntarangwi & Ingham, 2018).

### **Eldoret**

Eldoret is the fifth biggest town in western Kenya, 2090 meters above sea level. The estimated population is around 200,000 and is one of the fastest growing towns in Kenya. Eldoret has a warm climate with a lot of rainfall even during the driest months. It got its name from the Maasai word "eldore" meaning stony river because the Sosiana River that is nearby is very stony. In 1910 was Eldoret an official town with only a Post Office but have now grown until a town with a large market, Moi University, and Eldoret International Airport. Eldoret has also a number of factories and industries such as corn, farming, textiles, wheat, and pyrethrum. Because Eldoret climate and is surrounded by agricultural area is it a home for many farmers (Anonymous, 2017a).

### **Moi Teaching and Referral Hospital**

Moi Teaching and Referral Hospital (MTRH) started in 1916 and had a bed capacity of 60 beds. Today is the hospital the second National Referral Hospital in Kenya and has a bed capacity of approximated 1000 beds. MTRH receives patients from Western Kenya, parts of Eastern Uganda and Southern Sudan with a population of 24 million. The hospital provides 22 satellite sites across Western Kenya. MTRH are partners with Moi University College of Health Sciences and Regional Blood Transfusion Centre. The hospital has also collaboration with University from countries such as Canada, Egypt, Netherlands, Sweden and USA (Anonymous, 2018a).

MTRH operates a Training school that offering a range of different courses, for example, Higher Diplomas programs in Critical Care Nursing, Peri-operative Nursing, Oncology Nursing, Clinical Medicine and Surgery, and more. The hospital's mission is to provide cost-effective and patient-centred specialized healthcare. MTRH is growing and learning through training and research. The hospital continuous improving and participate in National Health Planning. Their vision is to be the leading Multi-specialty hospital for healthcare, training, and research in Africa (Anonymous, 2018a).

### **Nursing programs in Kenya**

In 1968 was the Department of Nursing Science established to train students for Diploma in Advanced Nursing. The students that graduated could work as nurses in privet and public hospitals, teachers, and nursing managers both in Kenya and abroad. The Bachelor of Science in Nursing started in 1992. There is no higher degree then a Master of Science in Nursing in Kenya and there are only a few institutions in Africa (Anonymous, 2018c). There are 83 nurse training institutions (NTI) in Kenya and the institutions have to be approved by the nursing council of Kenya. To get a better understanding of the active nursing workforce must the nurses renew their licenses every three years. 53 percent of the NTI are public, 32,5 percent are faith-based, and 14,5 percent are privet institutions. There are 17 counties namely in North East and South West Kenya that do not have any NTI and most of them are located in Nairobi (Segor, 2012).

The NTI in Kenya offers programs at three different levels, certificate, diploma and degree and are between 12 – 48 months (Anonymous, 2018b). The certificate program creates enrolled nurses whereas the Bachelor of Science in Nursing and diploma creates registered nurses. In the past ten years has the certificate programs decreased in favour of diploma programs. After graduating from the degree program are students required to complete one-year internship compare to students in certificate and diploma programs that complete their training during their education. The nursing council of Kenya recommends one tutor to ten students in the classroom, one clinical tutor to six students in long-term care, one tutor to four students in general wards and one tutor to two students in intensive care. However, the actual ratios may not be the same (Segor, 2012).

## **Problem statement**

HCAI is a world-wide problem and is a burden for the transmitted patients and their families', as well as for healthcare workers and society. HCAI results in longer hospital stay, long-term disability, pain and suffering for the patients', higher cost for the society and increased resistance of microorganisms to antibiotic use. It is a risk to acquire a HCAI in every healthcare facility. Many people have heard about HCAI and associate it with infections that are caused by medical equipment, but cross-contamination by the healthcare workers is the main risk factor. Therefore, it is important to educate healthcare workers about the problem. As a means toward this end, the first step is to gain insights about their experience and knowledge about HCAI.

## **The Aim**

The aim of the study was to get knowledge about Kenyan nurses' experiences of healthcare-associated infections.

## **Theory**

Dorothea Orem began to develop the self-care deficit theory of nursing in the 1950s (Orem, 2003). The nursing education programs were then based on medicine, psychology, and sociology. Orem research was to know nursing in a way that would enlarge and deepen its meaning and to identify a proper nursing focus (Fawcett, 2001). Orem (2001) described healthcare as a form of art through which the practitioner of nursing gives specialize assistance to a person with disabilities, the nurses' should create good conditions for the patients' to meet their own need for self-care. Nursing has a range of practice from the simple to the complex (Orem, 2003). Orem means that the medical knowledge is a compliment of nursing. Nurses should know how to use their knowledge to be able to help the patients' change their situation and educate them about the care. It should be an awareness of the relationship between what the nurses do and what they know. The knowledge should be able to show through conscious and thoughtful actions. It is essential that healthcare workers can see the patients as knowledgeable and can reevaluate their situation. Orem addresses the importance of patients' self-care (Wiklund-Gustin & Lindwall, 2012) and stated the human limitation of self-care associated with healthcare rise an obligation for nurses (Fawcett, 2001).

To retain health and prevent disease is self-care a prerequisite. When a patient cannot up fill the requirement for self-care needs the support of nursing. The nurses' role is first to support patients to retain or regain their health with the help of the nurses' professional knowledge (Wiklund-Gustin & Lindwall, 2012). Nursing involves both a mode of communication and a mode of thinking (Fawcett, 2001).

Orem wrote that to understand problems both from the perspective of practice and of education that confront nurses it is necessary to apply two different concepts of nursing. The first concept is nursing as a health service and the second concept is that nurses have knowledge that can continuously develop through practice and research (Orem, 2003). Nursing is considered a field of knowledge and a field of practice (Fawcett, 2001). To be able to improve nursing as health service need a progress with the education be made (Orem, 2003).

By using this theory about the importance of self-care, the nurses' role in supporting and promoting patients' ability to meet their own needs, and the need of education, can the importance of informing both healthcare workers and the patients about HCAI be lifted and may positively influences their engagement in infection control and reduce HCAI.

## **Methods**

This is a qualitative study with individual interviews.

### **Selection of participants**

The subjects were nurses from Moi Teaching and Referral Hospital (MTRH) in Eldoret, Kenya. Inclusion criteria for the participants were that they could communicate in English, they were nurses, and were willing to share and discuss their experiences and opinions on HCAI. Swahili is the national language in Kenya. However, English is the second official language which made it possible for the author to have the interviews without an interpreter.

### **Data collection**

This study is about nurses' experience about HCAI. Thus, the author used a qualitative method as it provides a deeper understanding and allows the nurses' to talk about their own experience and opinions.

Through a Swedish doctor at Linköpings University hospital that has worked at MTRH Eldoret, Kenya the author got in contact with a nurse at the hospital. This nurse got

information about the study and agreed to be a contact nurse for the present study. The author went together with the nurse to four different wards, intensive care unit (ICU), general surgery, orthopedic surgery and the neonatal intensive care unit (NICU). At the wards the author got introduced to the manager at the respectively ward and asked if the author could stay with them for three days. All the managers approved. At the morning meetings at each ward the author introduced herself and gave oral and written information about the present study. To achieve the aim of the study the author asked one nurse, with different ages, work experience and different gender at each ward if they would like to participate in the study. All the nurses approved. The participants' were between 23 and 45 years old with a median value of 33 years. The work experience was between 1 and 23 years with a median value of 8,5 years. The author gave once again oral and written information about the study, including that the participation was voluntary, the data would be handled confidential, and that they could end their participation at any time without leaving any explanation.

Data were collected through an individual interview. The longest interview lasted for 29 minutes and the shortest for 22 minutes, the median value was 25 minutes with a range of seven minutes. All the interviews were held during the participants' breaks. The reason for this was the participants' lack of time during and after work. It was difficult to find a privet room for the interviews. Two of the interviews were held in a privet room, and two were held in a privet area of the ward where the other staff members could not hear the interviews. The intention was to make the participants' to feel safe and comfortable to answer the questions. Before the interview began the author went through the aim of the study again for the participant. Furthermore, the author told the participant that the interview was confidential, that they could stop at any time without any questions asked or any negative effect, and asked if the participant had any questions before the interview. The author used a semi structured interview guide including open-ending questions that allowed the participants to share their own experience and opinions of HCAI (*Appendix 1*). The interview guide included questions about the nurses' experience of HCAI, if it is common at their work place and what they do to prevent HCAI. Furthermore, questions were asked about their education regarding HCAI. By using this method, the author adapted the interview for the participant and got a better dialogue as it gave the author the opportunity to ask supplementary questions. The author started all the interviews with asking the participants how long they had been a nurse, if they liked working as a nurse and their age. Furthermore, the author asked if the participants could

describe what they knew about HCAI. Depending on what the participants responded the author asked the rest of the questions in different orders to make a better dialogue and with different supplementary questions, for example, “Could you tell me a little bit more about that?”, “You bring up ... could you talk a little bit more about that?”, “How long have you been using this method?” and “Have you seen an improvement since you started with sterilization?”. The author asked all the participants if they wanted to add anything before ending the interviews.

The interviews were recorded on a mobile phone with the participants’ permission, saved on a USB-memory and transcribed verbatim.

## **Data analysis**

The transcribed texts from the interviews were analyzed with a manifest analysis. Content analysis is a method of analyzing verbal, visual or written communication message (Elo & Kyngäs, 2007). The author listened through the interviews several times and transcribed the interviews verbatim into written text the same day or the day after the interviews were held. Furthermore, the author listened through the recorded interviews again while reading the transcribed text to make sure the transcription was correct.

The aim in a qualitative content analyze is to systematically transform the transcribed text into a highly organized and concise summary of key results. To form the data from verbatim transcribed interviews to categories is a process of abstract data further each step of the analysis. The first step is to read and re-read the interviews to get an understanding of what the participants are talking about (Erlingsson & Brysiewicz, 2017). Graneheim & Lundman (2003) concluded the most basic decision is selecting the unit of analysis. Furthermore, they suggest that the most appropriate unit of analysis is whole interviews that are small enough to keep the context for meaning units, during the analysis process and large enough to be consider a whole. To get a better understanding of what the participants’ were mentioned in the interviews the author re-read the transcribed text while looking at the aim of the study and made notes.

The author divided the text into smaller parts. The smaller parts can be sentences or paragraphs that answer the aim, also known as meaning units (Graneheim & Lundman, 2003). Furthermore, the author condensed the meaning units further, while remaining the essential meaning. The condensed meaning units are shortened versions of the same text (Erlingsson & Brysiewicz, 2017). The condensed meaning units were then labeled by formulating codes. A

code is understood in the relationship of the context and can for example, be a discrete object, event, or other phenomena (Granehiem & Lundman, 2003). The aim is to compare codes which seem to belong together, thereby forming a category (Erlingsson & Brysiewicz, 2017). Finally, the codes were grouped into five different categories based on similarities.

Furthermore, no codes should fit into more than one category or fall between two categories. However, it is not always possible to create equally exclusive categories when dealing with human experience (Granehiem & Lundman, 2003). It is important that the author maintain an awareness of ones' previous knowledge, so that this does not influence the analyze and/or the result. This may be a difficult balancing task of keeping a firm grip on one's personal beliefs, and opinions, and not letting them unconsciously steer the analyze process (Erlingsson & Brysiewicz, 2017). The author kept going back to the original text of the interviews while working with meaning units, codes and categories and re-read it until the author was satisfied. The analysis is a flexible reflective process of working and re-working the data (Erlingsson & Brysiewicz, 2017).

## **Ethical aspects**

Ethical consideration is important to not harm any of the participants in a study. Ethical approval to conduct the study was obtained from ethics committee at the Department of Health Care Sciences at Ersta Sköndal Bräcke University College, Stockholm, Sweden (Dnr. 1703/A). In this study ethical consideration is important because the selection is small, and the participants shared personal experiences that may be recognized by the colleagues and managers. Therefore, it is important that the participants cannot be identified in the result. It is significant that all participation is voluntary and that the participant gives their permission after careful consideration. Furthermore, it is important that the participants are given written information about the study (Hedin, 2011). The information letter contained the aim of the study, how the results will be analyzed, that all the participation is voluntary, confidential and can be stopped at any time without any negative effect. Furthermore, the participants' got information about how the result was reported.

## Result

The analysis resulted in five categories, Education for healthcare workers, students and patients, Lack of equipment and supplies, The issues with cross-contamination, Prevention of HCAI and Understaffed hospital.

### **Education for healthcare workers, students and patients**

The participants described that education for students, healthcare workers, and the patients' is essential to be able to decrease HCAI. Knowledge about HCAI is an important step to reduce infections. The participants' stressed that education is an important part in reducing HCAI. They conclude that the nurses need further education about HCAI to understand what it is, how it spreads and how to prevent it. The participants brought up that students at the wards need qualified nurses to help them with their education in order to prevent HCAI.

The fact that the wards receive several students each day was described as a risk factor for HCAI, *"We also have students, we need to teach them. We accept a lot of student and sometimes it is hard for us to control them and how they work"*. The participants also described the importance to educate the students about HCAI, *"We have students here almost every day, so we need to teach them about it. Like they have to use gloves and hand sanitizer after touching a patient before they go to the next one"*. The participants expressed that students that do not have a lot of clinical experience need to have qualified nurses that can help and educate them to reduce HCAI. *"This is a teaching hospital we have student like you and then they come here, and some are very junior just from class and they come to this ward and in that case, we ensure that qualified nurses teach them and guide them in the right way so that we can avoid these infections"*.

The hospital needs qualified nurses that have knowledge about HCAI and the participants were talking about that even the healthcare worker need further education and the importance of having meetings about HCAI. To be able to find solutions of what they can improve and how to prevent HCAI is it important to discuss the matter. *"The manager nurse sometimes has meetings of what we can improve ... so we can help the patients"*. Another participant was talking about that it is important to discuss HCAI and how to prevent it every day. *"Yeah, daily. We talk about it but the way of controlling it is a challenge"*.

One participant brought up the importance of educating the patients, so they can get involved in the care and get a better understanding of HCAI. *"We help educate patients also and even the doctors too they educate"*.

The participants were also talking about what they learn in school about HCAI, for example, that cross-contamination is a risk factor, but it difficult to bring what they learn to practice thus lack of equipment and overcrowded wards. *“We did talk a lot about cross contamination from one patient to another, especially from us nurses that are working. For example, if we touch one patient we need to change gloves when we touch the other patient. But also, as you can see here we need to take so many patients that it is not possible to do everything we learnt in school”*.

The participants had got education about HCAI and were familiar with the concept and knew that it is a big issue that needs to be handled. They thought it was a challenge to prevent HCAI because they have patients with different diagnoses, many student and, limited recourse.

### **Lack of equipment and supplies**

One of the biggest problem the participants brought up to prevent HCAI was the lack of the equipment and supplies. At the wards patients had to share beds and equipment's' needed to be reused, such as needles and infusion catheters. The participants thought this was a risk of HCAI and was something they wanted to change. *“Probably the equipment's and supplies so we do not need to reuse them”*. One of the participants that worked with critical patients described, *“We do not reuse needles that I do not know if you have been in a different place then here but where I worked before we had to reuse the needles because we did not have enough but here no the patients are too sensitive. Like we have most things here but we have to reuse the drips”*.

The participants brought up the issue that a patient has to share beds contributed the risk of HCAI. *“But maybe like the bed like the patients has to share the bed, and like sometimes we do not have enough beds, so we have to put them on the floor yeah that is common, so we should change that”*. However, the participants' explained up that patients with wound infection should have their own bed to reduce the risk of spreading infections but it is not always possible. *“If a patient has a wound that is infected we try to have him alone in the bed. But you see we do not have so many beds, so patients have to stay in the same”*.

It is important that the patients are not sharing items if not necessary and the participants were discussing that it can be a risk factor for HCAI. *“We also learn that patient should have their own equipment like not share with another patient. But here it is impossible as you see*

*patient has to share the bed”.*

An additional problem related to lack of equipment described was that the hospital did not have enough supplies for wound care. One of the participants described. *“Like maybe a patient have a bed sore it is common here, so we want to do something before it gets too bad, but we do not have enough equipment, so we have to save it for the patient that have a big one. Or for example if a patient have sepsis we need to use it for him instead”.*

Thus, the lack of equipment and that patient must share equipment were considered risk factors for cross-contamination that can lead to HCAI.

### **The issue with cross-contamination**

The participants expressed that cross-contamination was the most common factor for HCAI. They described that healthcare workers should be careful when treating a patient, so they do not give a patient an HCAI by cross-contamination. *“Most I would say ourselves, we move from one patient to another. We carry infections from this patient to another. Again, that is common because you might find this patient that has some infections and then next time the patient comes without then he acquired the infection from this hospital. So, I think is from us healthcare workers which carry infection from one patient to another”.*

Another participant expressed, *“Transfer infections from one patient to another and that is not ideally for the patients. We should handle our patients alone or use one thing to handle one patient”.* Thus, overcrowded wards where patients must share beds contributes to cross-contamination. *“And then in our setup let me add, we as you might see that patients are sharing bed. So, maybe even that condition contribute. Because what this patient are suffering from might not be what the other patient have. So, in that way might also be source of infections”.*

The participants described the importance of hand hygiene and that they must be careful with cross-contamination. *“I would say contamination, that is why we need to use hand sanitizer after touching a patient, so we do not spread an infection from one patient to the other”.* However, was it common to use gloves as a substitute for hand washing and hand sanitizer. *“We have hand sanitizer but most we use gloves and gowns. We also have the mask to protect ourselves”.* The participants brought up that lack of hand sanitizer are an issue for HCAI and it is an important part to prevent cross-contamination. *“If it comes to the term of hand washing and gloves and wearing gowns we should still empathize that and the hand*

*sanitizer should be at the place of work like every cube should have their own hand sanitizer available at every given time ... ideally sometimes we miss it but they try to bring new”.*

Another issue the participants described was that staying at the hospital for a long period of time was a risk factor for HCAI and that it is important that the patients get the right care to reduce the hospital stay. *“Patient can get infection for staying here very long time, in the ward or in the hospital”.* One of the participants expressed, *“We have a lot of patients here and not so many nurses. So, we take care of a lot of babies every day and if we are not careful with the hygiene it could be a contamination from one patient to another”.*

The participants thought that more equipment, nurses and space need to be provided for them to give the patients the right care, but this may be difficult because government hospital do not get enough financial support.

### **Prevention of HCAI**

The participants were discussing how to reduce HCAI, education and carefulness regarding cross-contamination was brought up as central methods. To be able to prevent HCAI the participants described that it is important that the patients get qualitative care to reduce HCAI. *“Basically, patient should get the right care they need. For a case the patient need quality care for example, dressing or cleaning of the wound it would be in the right way”.*

The participants were reasoning about the problems with the use of antibiotics. It is important that the patients get the right antibiotics, so they do not get resistance to it, and that antibiotics not get treated as preventively. *“Another thing is the use of antibiotics a proper way of using it. In the end of the day we get infections that are resistance we do not start with the lower, we start with the high. By the time the patient come in for a treatment we do not have anything else to give them because they were not treated well. They are already resistance to the drugs”.*

The participants and brought also up that patients with a high risk of infections thus the patient conditions and may get antibiotics even if the patient does not have an infection as a preventively. *“Here after surgery they fear of infections. So, they get antibiotics even before. Because the probability of the patients gets an infection is high”.*

The participants described that it is important to change the patients’ beddings every day to prevent HCAI. One of the participants expressed, *“That should always be change of linens*

*daily and patients need to patients should also be helped with that when they do not when they cannot do the bedding for themselves”.*

It was also mentioned that the participants were using sterilize equipment when they were cleaning wounds to reduce the risk of HCAI. One of the participants said the following, *“What we also do is if we need for example, dress a wound we use two gloves and the second one is a special sterilized glove and the dressing equipment are sterilized before we use it”.* The participants were talking about that they had started with sterilizing the intubating tubes in January 2018 and saw that the HCAI had been reducing. *“We used to clean the tube but not sterilize and since it has been reduced”.*

The participants brought up the importance of cleaning the beds and the environment around the patient bed after they get discharged. However, the participants thought this was a challenge thus lack of time with overcrowded wards and shortness of staff.

### **Understaffed hospital**

The participants were discussing the issue of working at a public hospital where they are often understaffed and have overcrowded wards, which contributes the risk for HCAI. The participants brought up the lack of time to sterilize equipment thus stressful environments. *“But again, sometimes we do not have enough time to sterilize everything and that can be a problem, but we have long ques so sometimes it is impossible”.* They were also describing that is a risk for cross-contamination when the nurses have a lot of patients and student to take care of and educate. *“And I think as you see we have so many patients here and sometimes it is difficult to find the space for them, and again we need more nurses. Like today I have 25 patients and that can be very challenging to take care of that many, like it is sometimes very stressful”.* Another participant expressed, *“But you know, today we are only three nurses and have 61 patients, so we have a lot to do and we have student ... but we do not have time to check on them”.* The participants discussed that they try to stay with their own patients to prevent cross-contamination, but it can be challenging thus, they are understaffed, and the wards are overcrowded. *“We try to limit maybe something like barrier. So, the nurses are not on both sides. So, if you working on this side we try not to go to the other side, we try to stick to our own patients. But sometimes you know, we have to help each other and even not sanitize because we have to rush like if the patients gets really sick or something”.* It was also expressed that it needs collaboration to be able to reduce HCAI and one participant said the following, *“It is a big institution and to instituted something alone is impossible”.*

Even though the participants thought it could be stressful to be a nurse and they did not always have the time to do everything they need to do to prevent HCAI, the participants liked working as a nurse and thought MTRH was a good hospital to work at. *“I have a call to be a nurse and I like it, so I have to cope with it”*. Another participant said the following, *“It is a good place to work at ... we do the best we can”*.

The participants agreed on that it needs more qualified nurses to be able to give the patients the right care at the right time and that it is a need for collaboration to be able to change the way they are working now.

## **Discussion**

### **Method discussion**

To get knowledge about the nurses' experience individual interviews were chosen as a method. In a qualitative study the data should be collected from the viewpoint of those with experience of the phenomenon of interest (Birks, Chapman & Francis, 2007). The method gave the author opportunities to ask the participants about their experiences and opinions about HCAI. However, Birks, Chapman & Francis (2007) also stress the importance that a trained interviewer collects the data. It is recommended that some practice of conducting interviews is performed before entering the research settings. Practicing the interview questions may highlight weakness in interview skills and identify downsides in the interview strategy. The author was a beginner of this type of research which may have influenced the performed interviews and subsequently the result.

All participants had a lot of experiences to share about HCAI even though there were only four interviews. The author spent three days at each ward which might have decreased the problem that the author was a guest at the hospital and could choose participants with different experience, age and gender. It made it possible for the author to talk to the nurses before the interview and create a relationship with them. That might have led to the participants felt more comfortable during the interviews. However, it is also important to consider that the participants might not have answered the questions truthfully to make their work environment seems better (Bengtsson, 2016). Nevertheless, the participants described different factors they thought should be improved. It also gave the author the opportunity to observe how the nurses were working and get an inside perspective of their workplace.

Furthermore, Birks, Chapman & Francis (2007) concluded that it is important to ensure that the interview strategies are appropriate, for the author undertaking a study involving participants from a different culture to understand at least the basic of the relevant culture and their environment. To get a broader view of Kenyan nurses' experience of HCAI a larger sample need be used.

Neither the author and nor the participants had English as a mother tongue which could have been a limit in the study. In addition, the interviews were held during the nurses breaks as they were busy during and after work. The fact that the interviews were held during the participant's breaks might have affected their concentrations on the interview which might have had an influence on the results. The author's intention was to have the interviews in a quiet room where the participants could feel safe and comfortable to answer the questions. However, it was not always possible which might have affected what was said in the interviews.

Content analysis has both advantages and disadvantages however it is an easily understood method that can be used by researchers who are new to the area. The author chose a manifest analysis which makes it possible to stay closer to the original text because the author needs to refer back to the original text (Bengtsson, 2016). In contrast, in a latent analysis the author analyze the underlying meaning of the text (Graneheim & Lundman, 2003). During the analysis the author condensed the transcribed text to meaning units while remaining the importance of the original text and the aim of the study. However, maintaining the richness of the original data can become lost if the data are compressed too much which could have affected the result (Elo & Kyngäs, 2007). It is also important to consider that the author's previous knowledge might influence the analysis (Erlingsson & Brysiewicz, 2017). The author made five categories during the analysis. It was a challenge to make the condensed meaning units to not fit in more than one category. However, the analysis was discussed with the supervisor. Graneheim & Lundman (2003) concludes that it can be difficult when dealing with human experience. However, it is important that the author do not include too many different things in one category which can be signs of an incomplete analysis process (Elo & Kyngäs, 2007).

## **Result discussion**

The result of this study gives an insight of Kenyan nurses' experience of HCAI in a government financial supported hospital in Kenya. The result confirms that the nurses have

knowledge about HCAI, but it also shows that further education and supplies need be provided. The results are discussed in relation to Dorothea Orem's Self-care Theory with a focus on the Theory of Nursing system and other studies related to the results.

HCAI is a major global patient safety concern and it is estimated that 1.4 million people suffer from HCAI at any given time worldwide. Previous research has estimated that 20 – 40 percent of all HCAI can be prevented (Pincock, Bernstein, Warthman & Holst, 2012). HCAI is an economic burden on healthcare system and leads to significant mortality. It is expected that the economic burden of HCAI in developing countries has a significant impact even though the cost is currently unknown (Phan et al., 2018).

The result concludes that students have a need for education about HCAI and require qualified nurse supervisors to teach them. According to Dorothea Orem (2003) the education needs to be developed to be able to improve nursing as a healthcare service. As a means towards this end communication between and among healthcare workers, and coordination of the actions of the nurses continuously need to be maintained. Nurses should have knowledge about HCAI to be able to provide deliberately selected actions to prevent infections, and to help patients to uphold or change conditions in themselves or the environment to maintain a state of health (Orem, 2003).

Students are a risk factor for HCAI and there is evidence that high standard of education is an important method to reduce the number of those who are infected with HCAI (Ojo & Ojo, 2017). Orem (2003) describe that nurses need an education that is evidence of developed capabilities and experimental knowledge specific to the provisions of nursing. With help of the nurses' professional knowledge about HCAI students can get an understanding of how to prevent infections (Orem, 2003). Education about HCAI contributes towards a culture of patient safety. A combination of both experience and theory-based knowledge for the students to understand the importance of practice supported by theory are needed. However, inappropriate practice may have a negative effect on the students. The need to fit into the culture may lead to some students are following the practice of healthcare workers even if it is incorrect, making it hard to change poor behavior. The absence of appropriate education among healthcare workers could have an impact on students (Hinkin & Cutter, 2014). Therefore, strategies are essential for the control and management of HCAI. This should include evaluating the students' knowledge about HCAI, who may themselves be a risk factor of contracting these diseases (Ojo & Ojo, 2017). The change is a challenge given the

difficulty of changing behavior and the complexities of healthcare environment (Pincock et al., 2012). Orem (2001) concludes that the nurses need complex knowledge from theory and experience that form the professional nursing to be able to give the right care. With the knowledge about HCAI and what methods need to be used to help the patients to increase their self-care the nurses can work forward to prevent and reduce HCAI.

Dorothea Orem's (2003) theory about self-care explains that health is related to self-care and what state the person is in to achieve self-care. It is therefore, important that healthcare workers educate patients about the care to help them get an understanding of HCAI. This can influence the prevention of HCAI. Orem (2003) concludes that patients must understand self-care demands to be able to meet their demands for care. The properties are attributes both to the healthcare workers and to the person who is seeking care. Nurses need to assist patients and create conditions that help them meet their own needs for self-care (Orem, 2001). Orem (2001) stresses the importance of educate patients about their care to fulfil health by self-care. Therefore, nurses should strive to help and support patients by careful and deliberate actions (Orem, 2001). Park and Seale (2017) suggested that the patient should be an active participant in the process of preventing infections. Patients that understand HCAI are more engaged in infections control and preventions compare to those who had not received any information. Therefore, it is important to engage and inform patients about HCAI. However, it can be difficult for the patients to remind healthcare workers about their hand hygiene.

The result shows that lack of equipment may have a negative effect on the nurses' job in reducing HCAI. In developing countries, the lack of financial support and insufficient equipment are risk factors for HCAI. Medical equipment is essential for healthcare workers to prevent HCAI and deliver healthcare service to the patients. WHO estimate that 50 – 80 percent of medical equipment in developing countries are not working, which create a barrier for the healthcare worker to provide good healthcare to the patients and prevent HCAI. Shortage of equipment's either due to unviability or non-functional has a negative impact on patients, nursing profession and the hospital (Moyimane, Matlala & Kekana, 2017). Therefore, continuous promoting strategies for hand hygiene are the single most important element to prevent HCAI (Sax et al., 2009). To improve infection prevention is it important to perform hand hygiene in the right way at the right time (Pincock et al., 2012). Different strategies such as hand sanitizer and hand washing should be employed. One of the first steps is knowledge about hand hygiene and cross-contamination (Ojo & Ojo, 2017). Observations make it possible to identify the need for hand hygiene but are a demanding and requiring

training, skills and experience (Sax et al., 2009). Evidence has shown that educational intervention about hand hygiene successfully increased hand hygiene (Phan et al., 2018). Pincock et al (2012) conclude that multiple interventions are an effective strategy for behavioral change. Posting hand hygiene reminders and providing training significantly improved hand hygiene compliance. The aim of educational hand hygiene intervention should be to measure hand hygiene compliance and therefore described infections. This strategy could be used in developing countries where resources are limited (Phan et al., 2018).

## **Clinical implications**

The result in this study may lead to an inspiration of the importance for education about HCAI, how it spread and what healthcare workers can do to prevent it. The study provides an insight and an understanding of how nurses in Eldoret, Kenya experience HCAI and may give inspiration to further research about HCAI in developing countries. The result can provide an awareness of what needs to be improved to be able to prevent and reduce HCAI. It may lead to help improve the healthcare workers methods and reflect on how they work to prevent HCAI. The study may also lead to the healthcare workers get the patients' and their family more involved with the care and educate them about HCAI.

## **Further research**

There is a need for further research about nurses' experience of HCAI in developing countries, as it is a problem in all healthcare environments and has still not been resolved. It is, therefore, important to get an insight of how healthcare workers experience HCAI to get a better understanding of what needs to be improved to prevent and reduce HCAI. Further research should involve a larger sample to get a broader view of the nurses' experience. This could be a first step to decrease HCAI and help other healthcare workers, patients and students to get an awareness of HCAI.

## **Conclusion**

Knowledge and education about HCAI are essential to be able to reduce the number of people that acquire an HCAI. It is important to get knowledge about what experience healthcare workers have to understand what needs to be improved to decrease HCAI. However, it is

important to have the right equipment and supplies to give safe care to the patients. An overcrowded ward that has shortness of staff is a big risk factor for cross-contamination. It makes it difficult and stressful for the healthcare workers to find the time and motivation to provide the right care. In developing countries is it a need for more financial support to be able to reduce HCAI. This study concludes that healthcare workers has knowledge about HCAI is but need reminders of how to prevent infections and that hand hygiene is the main source for cross-contaminations. Multiple educational interventions about hand hygiene may be an effective method to decrease HCAI in developing countries where equipment and supplies are limited.

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## Appendix 1.

### Interview questions

- For how long have you worked as a nurse?
- Have you worked in a different ward before?
- What do you think about being a nurse?
- Why did you want to become a nurse?
- Could you tell me a little bit of what you know about healthcare-associated infections (HCAI)?
- What did you learn about HCAI in school?
- How is the education of HCAI in this ward?
- What experiences of HCAI do you have?
- How often does HCAI happen here?
- What can you do to prevent HCAI?
- What do you think is the most common factor for HCAI?
- What do you think can be improved?
- Is it something else you would like to bring up?