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Prevention of Hospital Acquired Infections

A scoping review.

Rashmi Sharma and Jackson Paul

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Author: Jackson Paul and Rashmi Sharma
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Supervisor(s): Nina Vestö

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Abstract/Summary

Hospital-acquired infections (HAIs) constitute a critical and widespread issue in healthcare settings, posing a significant threat to patient safety and well-being. This thesis provides a comprehensive analysis of HAIs, their epidemiology, associated risk factors, and the implications for both patients and healthcare facilities. For this study scoping review of 14 different articles has been performed. Articles were collected from various sources such as scientific databases like (EBSCO host, CINAHL, MEDLINE, GREENFILE, ACADEMIC SEARCH ELITE, websites such as CDC, THL, WHO and journals). The research begins by examining the various types of HAIs, including surgical site infections, urinary tract infections, bloodstream infections, clostridium difficile infections and Ventilator associated Pneumonia. It explores the pathogens responsible for these infections and the modes of transmission within hospital environments. In-depth epidemiological investigations shed light on the prevalence of HAIs and their consequences in terms of patient morbidity and mortality. Furthermore, it explores the impact of infection control practices, surveillance, and the role of healthcare workers in HAI prevention. In the context of prevention and intervention, this research proposes a framework to address HAIs comprehensively. It encompasses strategies for infection control, workers, and patient education along with the importance of prevention. Recommendations are provided for best practices, and future research directions to combat HAIs effectively. This thesis aims to contribute to the ongoing effort to reduce the incidence of HAIs and enhance patient safety in hospital settings.

Language: English Key words: HAI Hospital acquired infection, Nosocomial infection, prevention of Hai, management, control, Nurses, data, health care facility, hospitals, techniques

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1 Introduction

Hospital-acquired infections (HAIs), also known as healthcare-associated infections, are infections acquired during or after hospitalization, typically manifesting 48 hours (about 2 days) post-admission. These infections are closely monitored by agencies like the National Healthcare Safety Network (NHSN) to enhance patient safety and prevent HAIs. Examples include central line-associated bloodstream infections, urinary tract infections, surgical site infections, hospital-acquired pneumonia, ventilator-associated pneumonia, and Clostridium difficile infections.

Hospitals have increasingly prioritized HAI prevention, implementing robust surveillance systems and prevention measures. HAIs not only affect individual patients but can also lead to community-level multidrug-resistant infections. Identifying patients at risk for HAIs and multidrug-resistant infections is vital for prevention. In recent decades, hospitals have placed significant emphasis on addressing hospital-acquired infections. Many have implemented tracking and prevention systems to reduce these infections, which not only affect individual patients but also pose a community-wide threat due to the link with multidrug-resistant infections. Identifying high-risk patients is crucial for prevention efforts. (Monegro AF, 2023) These infections are caused by various pathogens, including bacteria, viruses, and fungal parasites. The World Health Organization (WHO) estimates that approximately 15% of hospitalized patients worldwide suffer from nosocomial infections. Patients are exposed to these pathogens during their hospitalization through various sources, including the hospital environment, healthcare staff, and other infected patients. (Khan, Biag, Mehboob, 2017) Intensive Care Units (ICUs) have the highest incidence of healthcare-associated infections (HAIs), with a significant number linked to invasive medical devices like endotracheal tubes, vascular catheters, and urinary catheters. A substantial portion of these infections can be prevented. Additionally, ICUs face a substantial burden of antimicrobial resistance, primarily due to the severity of patient conditions, frequent antibiotic usage, and inconsistent infection prevention practices. (ECDC, 2018)

In Finland, healthcare-associated infections are closely monitored through the Finnish Hospital Infection Program (SIRO), established in 1999. This initiative involves various hospitals, including university hospitals, and focuses on infections with public health significance. SIRO plays a pivotal role in helping hospitals prevent these infections by enhancing monitoring and collecting data on their occurrence. Hospitals in the program can compare their infection rates

with those of their peers. SIRO comprises a multidisciplinary team responsible for practical infection control, including infection control nurses, communicable disease control physicians, clinical microbiologists, hospital microbiologists, and surgeons. (THL,2020)

2 Background

A total of 100,000 treatment-related infections occurs in Finland each year, half of which occur in hospitals and the other half in long-term care facilities. (THL,2020) In the health care setting infection prevention, control and management is a big challenge for all health care workers especially nurses who encounter different patients with different health problems and diseases. HAI's increases the length of hospital stays that not only affects patient's ill health but also affects financial loss. The patients with critical diseases or in units like ICU are at more risk of developing Nosocomial or hospital related infections. According to Centre for Disease Control and Prevention (CDC 2021) one out of 31 patients admitted in hospital suffers from nosocomial infection, and according to Infection Prevention and Control program (IPC) 1 out of 10 clients get infected while receiving care in health care units. Although many measures have been taken to control HAIs but still a long way ahead. According to (WHO 2011) these infections are often hidden from the attention of the public and usually get public attention when they develop into epidemics. Ventilated associated pneumonia and center line-associated bloodstream infection are the leading cause of death associated with HAIs. (WHO,2011)

HAIs are being a concern since the hospital facilities came to existence. The formal understanding and recognition of these infections begin to visible in middle of 19th century. In the mid of 20th century Nosocomial infections or health care associated infections got highlighted when Antibiotic-resistant Staphylococcus aureus was detected which got the attention of all the health care units. To counter the problem and focus on conducting studies on its control and prevention, gave health care providers a clue that hospitals and health care teams can prevent HAIs by their efforts and techniques. Dr Ignaz Semmelweis popularly known for the title 'father of Infection control'. After his observation of the high incidence of childbed fever in the maternity units where handwashing practice wasn't proper, he imposed chlorinated lime water handwashing. This gave a significant result in reducing infection rate. There was an increase in gram-negative bacterial infection mostly led by any bacteria named Escherichia, Pseudomonas and Klebsiella during year 1960s. Staphylococcus aureus was taken over by other different bacteria such as Proteus in terms of cross infections during the year

1991. A public health model was developed during the year 1960 by epidemiologists to know the HAIs more closely. This health care model was built on the grounds of investigation and surveillance of data available of HAIs and investigation found that the group that are at risk are patients, visitors, all health care workers, and other staff (CDC). The decade between 1960-1970 was a time where there was an increased number of infections caused by antibiotic resistance bacteria, for example Methicillin Resistant Aureus (MRSA). This was the biggest problem of the 1970 decade, and it got even worse. (Weston,2013)

Finnish hospital infection program (SIRO): The Nosocomial Infections Program, SIRO, plays a crucial role in assisting hospitals in the prevention of healthcare-associated infections. SIRO is dedicated to enhancing infection monitoring and gathering data regarding their occurrence within hospitals that are part of the program. Hospitals enrolled in this initiative have the opportunity to assess their own infection prevalence rates in comparison to those of other participating healthcare facilities. (THL,2019)

The Healthcare-Associated Infections Surveillance Network, known as HAI-Net, is a European initiative dedicated to monitoring healthcare-associated infections (HAIs). This network is overseen and managed by the European Centre for Disease Prevention and Control (ECDC). HAI-Net focuses on several key priorities, including Coordinating the European Point Prevalence Survey of HAIs and antimicrobial usage within acute care hospitals, conducting surveillance to track surgical site infections, monitoring healthcare-associated infections in intensive care units across Europe. In essence, HAI-Net plays a crucial role in collecting data and facilitating collaborative efforts to enhance the understanding of hospital infections. (ECDC,2023)

2.1 Definition

Nosocomial, Healthcare acquired infections, or HAIs, are the infections that a person gets while receiving care and treatment from health care professionals like doctors and nurses. These infections are not present during the time of patient's admission but are acquired after the patient get admitted, and this infection may be carried by the patient even after discharge and occupational infection among health care workers. (Cardoso & et. al, 2015).

According to THL, A healthcare-associated/acquired infection, often referred to as an infection that takes place in a healthcare facility, such as a hospital or another care setting, and or is linked to a medical procedure performed within these environments. (THL,2022)

2.2 Prevalent forms of Healthcare Associated Infections

There are many types of infection that can be transferred through strains, droplets of infected person, contaminated surroundings and equipment, bedding and from medical and caring procedures. According to CDC 2011, health care in modern world uses many invasive and non-invasive devices during care that acts as a medium between host and infection. For example, Catheters, ventilators, central line, cannula, and other procedures that leads to transmission of infection. The following are some of the most common HAIs.

2.2.1 Central Line-associated Bloodstream infection

The pathogenesis of central line infections is usually triggered by contamination of central line site, healthcare professionals' hand hygiene, or contaminated parts of central line device such as hub or infuscate. It occurs when the contaminated gloves or hands touch the central line, the medication given through the central line is contaminated or the skin area closer to the central line is contaminated. (CDC, 2021) Bloodstream infections trigger major health problems and are responsible for high morbidity and mortality rate and most of the bloodstream infection are caused by central line infection, mostly in Intensive care units. There are other causes also such as through cannula's (venous catheters) or from medical surgeries where infection enters from incision into the blood stream and the colonized bacteria from environment enter the blood stream of the host. (CDC,2021).

In addition to these risk factors, improper aseptic techniques, such as those involved in the insertion of a cannula, may exacerbate them. The choice of the insertion site as well as the overall hygiene of the body play an important role in the success of the introduction of cannulas, injections, or other instruments into the bloodstream. The placement of catheters or cannulas at the femoral site and the duration of the placement need to be considered before

placing them. In addition, there has been some evidence that antiseptic precautions may contribute to the underlying causes of central line infections (CDC,2021).

2.2.2 Ventilator Associated Pneumonia (VAP)

When the patient is on ventilator support and the pneumonia is detected after the period of 48-72 hours (about 3 days) or within 4 days, it is considered as ventilator associated Pneumonia. It ranks second in the most common HAIs of intensive care units. Nearly half of Antibiotics are only used to treat VAP. Factors responsible for pathogenesis are immunity of the patient, bacteria invasion, environment, equipment, surroundings, and hygiene. The pathogens can gain respiratory access directly through intubation, which further leads to gram negative and fungus development in the ET tube. This growth of bacteria is pulled towards the cuff around and enters the airways with the gravitational pull inside the respiratory tract. The positive pressure of ventilator also pushes the mucus inside the tract and to the lungs thus causes Pneumonia. Individuals who have undergone prior surgical procedures and have a history of antibiotic usage are at a heightened risk of becoming hosts for infections. In cases where an endotracheal tube is inserted and not handled with proper medical asepsis, there is a potential for contamination. This can lead to the colonization of bacteria or microorganisms, which may then be aspirated into the lungs, resulting in the development of Ventilator-Associated Pneumonia (VAP). VAP can exacerbate existing infections and lead to increased respiratory complications (Sedwick et al., 2012).

2.2.3 Surgical site infections (SSIs)

The infection caused or spread during surgical procedure, usually when hands are not disinfected properly, proper gloves are not worn, or surgical gloving procedure is not performed, surface or environment is contaminated, use of unsterile or contaminated equipment, skin near the incision or surgery is unclean, wounded area or surgical site is not disinfected and wound dressing is not made aseptically or properly. (Berríos-Torres et al,2017) SSI involves the infection of organs, tissues, or implanted things in the body through any type of Surgery. There are certain factors that are responsible for increasing the risk of SSIs. These

include diet, cigarette smoking or other tobacco use, prolonged usage of antibiotics and poor aseptic techniques used during operation. Different physical sign and symptoms such as redness and pain and swelling at the site of wound, high fever, oedema, formation of pus, abscess at the site of infection may predict SSIs. (WHO,2018)

2.2.4 Catheter associated urinary tract infection (CAUTI)

If Urinary tract infection (UTI) is detected within two days of catheterization it is classified as CAUTI. The UTI caused by catheter are grouped as complicated that occurs in clients with urinary retention or obstruction, during pregnancy or stone along with catheter. Whereas uncomplicated urinary tract infections occur in patients with no foreign bodies like stone or without any neurological problems and urinary retention. Mechanism and invasion of microbes is same as UTIs but here the catheter acts as a medium to colonize the infections causing bacteria, into the urinary tract and bladder. Bacteria can be transferred from the surface of host, or rectal flora, from the contaminated environment or catheter into the ureteral opening and pushed inside the urinary tract. Bacteria form a covering called biofilms which multiplies and leads to epithelial damage. The prevalence of CAUTI or its prevention depends on nurses or health care workers techniques of insertion and drainage consideration for example if the insertion tube is placed under or over the level of drainage bag then there is an increased risk of bacterial infection. Change of catheter at a regular interval is crucial because if it stays for longer interval, it may increase the bacterial growth rate. It should be changed every four weeks at least. Washout or catheter irrigation is also important to prevent bacterial growth. (Werneburg, 2022)

2.2.5 Clostridium difficile infections

The hospital is the most common ground where the bacteria spread easily. The patients suffering from clostridium difficile can leave the immense number of spores in the environment or their surroundings like bed, room, or area close to their reach. (McDonald, & et al., 2017). These spores or strains are toxic and non-toxic, the non-toxins C.difficile doesn’t cause any

harm or disease but the toxic one's travel into the intestine of the host and causes diarrhoea and colitis. The individuals with previous antibacterial therapy are at the most risk of getting Clostridium difficile infections as because antibacterial therapy changes the intestinal flora of the host. These are most likely to be spread by hands from one host to another. (THL,2020)

2.3 Challenges faced by Nurses in Hospitals

Infection control nurses face challenges everyday where they must be diplomatic, emphasized, humorous, skilled, resourceful, and well organized as they work under pressure, and in multiple tasks. There are certain areas where nurses need to be competent such as in performing procedures, for example urinary catheter insertion, endoscope decontamination, insertion of cannula. Examples of daily challenges are surgical scrubbing that takes full attention, time, and patience. Hand washing is required before and after every procedure to prevent the spread of infection. Use of PPE kit was a challenge for many nurses. Disease like ESBL is to be controlled closely and requires use of special equipment, collecting specimen from different sites, administering medications especially antibiotics, these are some of challenges that nurses need to be skilled to prevent infection within the hospital. (Weston, 2013)

Although nurses are professionally trained still, they face many challenges daily. Nurses have close contact with patients, patient's relatives and other health care workers and can carry and spread many infections and these infections can transfer from patient to patient, patient to nurse and from patient to other health care workers. They have a close encounter with various diseases and diagnosis. It is a challenge for nurses to adopt new techniques and to follow updated procedures as well. Many infections are ignored and while performing the procedure proper asepsis is not maintained that leads to various challenging situations. Since many years it's been a great task to overcome these problems. Maintaining one's own health and safety is very important as nurses not just interact with patients only but also with family members, friends, neighbors, and the public as their interactions can cause cross infections. (Fox & et al, 2015).

2.4 Vulnerability indicators in Hospital settings.

HAIs often result from a complex interplay of risk factors within healthcare settings. Invasive medical procedures, like catheter or medical device insertions, create potential entry points for pathogens. The inadequate hand hygiene practices of healthcare workers contribute to microbe transmission, and poorly cleaned and disinfected surfaces can become reservoirs for harmful microorganisms. The misuse of antibiotics promotes the development of drug-resistant bacteria, increasing the risk of HAIs. Patients with compromised immune systems are more vulnerable, and longer hospital stays mean prolonged exposure. Understaffing and the absence of strict infection control practices, as well as shared facilities and equipment, can facilitate pathogen spread. Failure to isolate contagious patients and inadequate sterilization of surgical instruments further compound the intricate network of risk factors that can lead to HAIs. Inadequate staffing levels, reduced attention, and limited time allocated to each patient can significantly increase the likelihood of errors in healthcare settings. When healthcare facilities are understaffed, healthcare providers often find themselves stretched thin, trying to meet the demands of a larger patient load. This increased workload can result in rushed assessments, hasty decision-making, and diminished overall quality of care. (WHO,2011)

2.5 Developmental needs of infection control in Hospital

From the mid 19's till now many techniques and strategies have been developed to control infections in the health care sector. Different steps have been taken to improve the quality of care such as training nurses and health care workers, updating ward protocols, establishing, and upgrading medical procedures, adopting safety gears, and managing waste. (Fox, Wavra, et al., 2015). During covid-19 many nurses were trained to wear PPE and personal safety equipment by trained professionals that helped to develop their safety skills. (Murphy, K., 2021) Hand washing techniques and development in hand washing technique helped all the health care units universally to reduce large number cases of HAI's. Waste Management protocols in all the hospital and wards helped to minimize an enormous number of HAI's cases, one time use of equipment is considered to best for patient's and health care workers health safety. Disinfection and use of various disinfectants reduces the risk of developing infections from patient's bodily fluids. Infection Prevention and Control (IPC) works as a universal guide that saves millions of lives every year. WHO developed IPC infection prevention and control

program that aims to prevent infection among patients and health care workers and to reduce harm that can occur from avoidable infections. (WHO,2011)

2.6 Research projects for Infection prevention and Control

The first public health research was conducted by Centre for Disease Control (CDC) in the volunteer National hospital where National level surveillance of data was used by the CDC model of surveillance. National Nosocomial infection Surveillance program reports data every month to CDC. This program is changed to the National Healthcare Safety Network which keeps a record and provides information regarding the change in HAIs pattern. The other Research project held by CDC aimed at conducting research over community hospitals. The Comprehensive Hospital Infections Project (CHIP) was held amongst eight different community hospitals that begun in 1965. There were much Research conducted by doctors, nurses, epidemiologists, Biologists which was funded by CDC to get good knowledge about HAI's and learn about them. These studies helped in differentiation of HAI's and raised the knowledge of different HAI identification. These close interactions in the local hospitals made things practical to understand. (CDC,2023)

3 Aim and research question.

The aim of this research is to enhance the knowledge of nurses, nursing students and health professionals towards infection control to enhance patient safety by reducing mortality rate caused by HAIs. At the same time encouraging nurses and students in nursing profession to follow up to Date caring procedures and aseptic techniques and raise their competent and management skills while dealing with various infections in different ward settings

Questions-

What is the importance of infection control in nursing care practice?

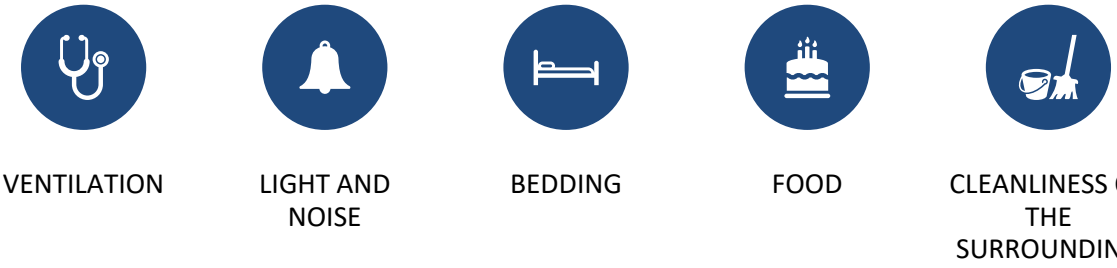
What are the different measures that can be taken to prevent the HAIs?

4 Theoretical Framework

Theoretical framework is a set of theories or guidelines that is used by the researchers to support and study their topic of research. The theory used for this study is Florence Nightingale's environmental theory. The founder of modern nursing, Nightingale's environmental theory relates to the topic of this thesis and is thereby selected.

4.1 Environmental Theory

The nightingale's environmental theory defines the importance of a clean and healthy environment aids to the recovery of the patients. The major concept of the environmental theory revolves around four variables that are pure air, pure water, light, cleanliness, and efficient drainage. (Alligood, 2014). Nightingale believed that these variables affect the conditions of an organism and thus contribute to sickness and its recovery. (Nery, 2015) Furthermore as the theory developed with time, factors like proper and healthy diet, odours, were also considered as key elements in building a healthy and sanitary environment for the patients. (Gilbert, 2020)



Nightingale put her theory in practice by following good hand washing techniques, providing good and healthy food to the patients, properly cleaning the beddings and clothes of the patients on a regular basis, regular disposal of human waste, disinfecting the walls and floors with lime to purify the environment of the patient. She believed in healing the mind, body, and spirit of the patient as an essence of nursing. The lady with the lamp stated that the diseases born in the hospitals through bad hygiene and unsanitary environment could be life threatening to the patients and thus its prevention is an integral part of nursing and healthcare. Nightingale's theories and strategies formed a strong baseline for contemporary nursing. (Gilbert,2020)

5 Method

The method used for this study is qualitative approach with a scoping review. All the data is collected from the databases such as eBook central, EBSCO Host, CINAHL Full text, MEDLINE, Centre for Disease Control and Prevention (CDC) etc and the data were analysed.

5.1 Qualitative method

The main motive of the qualitative method is to provide a better understanding of the people, data, and human behaviour available in the form of articles, books, interviews, and other publications. This research method helps us to discover the feelings, experiences and

behavioural patterns of the people and their lives. The main characteristics of qualitative approach are the research is flexible, progressive as it keeps on reflecting on the data while studying, a specific type of data is analysed and described, and the theoretical framework used in this type of approach is determined by the type of data being analysed. The focus of the researcher is to analyse the inner perspective and experiences of the people through the data and provide an understanding of the whole data. (Polit & Beck,2009)

Steps used in the qualitative method research are:

I. Selection of a theoretical framework which is a basis of the dissertation. For this research we have used Environmental theory of Nursing.

II. Collection of the relevant data from different scientific sources.

III. Selecting and analysing relevant data to produce the outcome.

There is different framework for use of qualitative method in nursing research, but this dissertation will be using the scoping review to analyse all the data. (Polit & Beck, 2009)

5.1.1 Scoping review

The scoping review is a method which can be defined as a process which aims at calibrating, exhibiting, and identifying proofs related to the data of the chosen topic available in the form of primary research, methodology, non-empirical evidence etc. that are related to the topic of review and developing an overview of all the evidence related to the topic. *Scoping reviews systematically identify and chart relevant literature that meet predetermined inclusion criteria available on a given topic to address specified objective(s) and review question(s) in relation to key concepts, theories, data, and evidence gaps* (Peters & et al, 2021).

Scoping review gives us a better understanding of the research topic, motives, pros, and cons and provides highlights on the knowledge gaps and need of further research in a selected topic. The PRISMA-ScRchart is the best available approach for presenting scoping reviews and hence is used in this dissertation. With the help of scoping review method, we will try to

identify, relate, and provide an overview of the different methods available to prevent HAIs and its importance in the health care sector. (Pham et. al, 2014)

5.2 Data Collection and sampling

There are different ways in which the data can be collected in qualitative approach such as through observing the participants, interviews, gathering information from participants through questionnaires or feedback, vignettes, reviewing the existing data for need for further studies, etc. All the data in this dissertation is acquired from the research articles available in the databases. All the data and information used in this thesis is collected from library databases such as CINAHL Full text, EBSCO Host, MEDLINE etc. All the data in the qualitative approach with scoping review is identified through PRISMA-ScR flow chart. (Polit & Beck,2009).

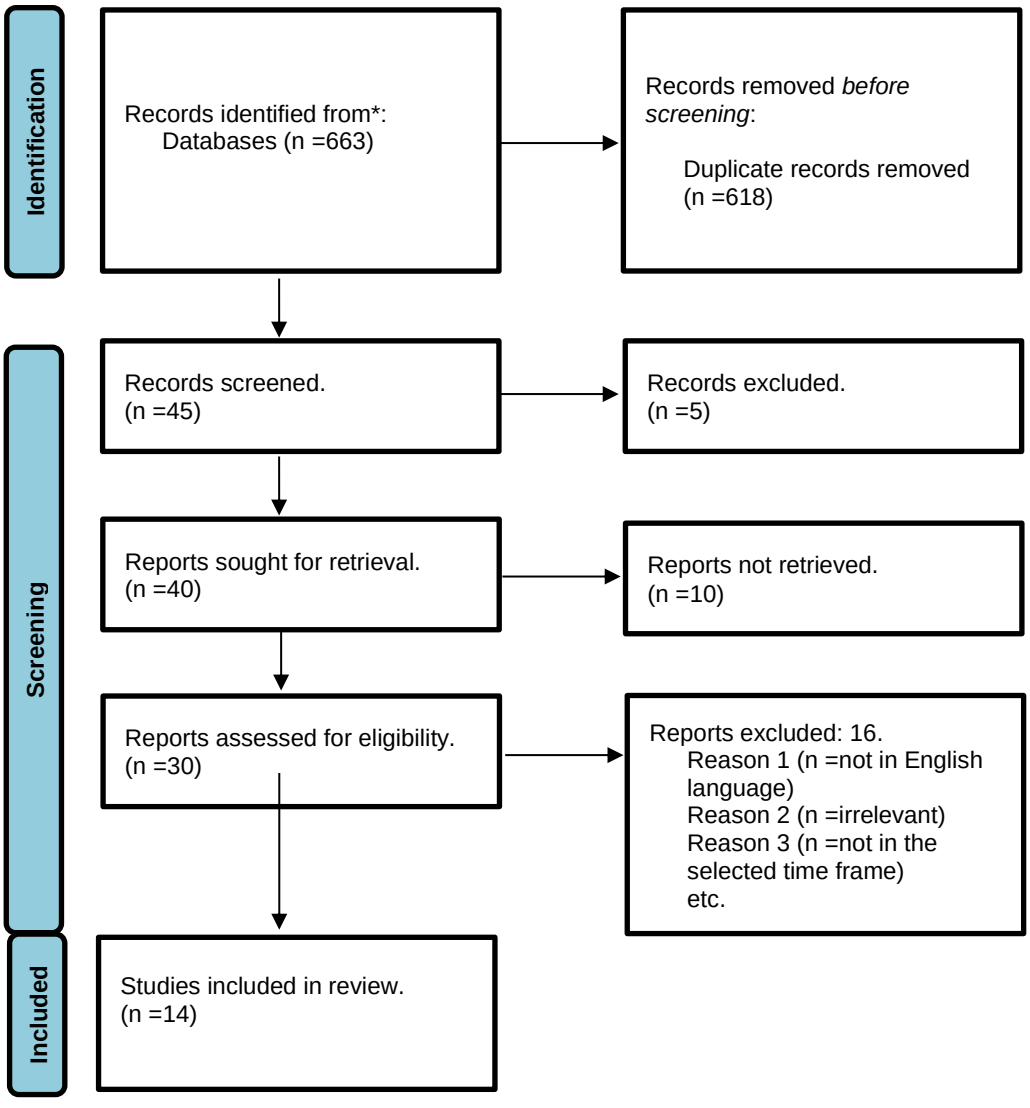
Eligibility Criterion for the selection of articles: The language of the selected articles was set to be English, and all the other language articles were excluded. The time frame used was for the data was set from 2012-2023. All the articles were peer reviewed, available in full text in PDF format, and with citations. All the reference lists in the articles were also analysed to gain further data. All the irrelevant articles were excluded from the analysis. A total number of 14 articles were selected and analysed at the last.

Database used	Search keywords	Total number of articles found	Total number of articles selected
Academic search elite	Types of infection transmission, infectious diseases	216	4
Green file	HAIs, infection control	11	3
CINAHL	Nosocomial infections	279	5

MEDLINE	HAIs, hand hygiene	157	2
		Total-663	Total-14

5.3 Analysis of Data

The objective of data analysis is to consolidate, assemble and describe the meaning of the collected data in the review. In the content analysis, analysis of the data is done to determine the themes using template or editing analysis style. The key words were used to search the articles. All the articles were selected after applying the inclusion and exclusion criteria which were further categorized by importance and measures to prevent HAIs.



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n7

6 Ethical Considerations

The term research ethics means a concept which includes all the research values, opinions, rules, and regulations that are related to the field of research. The Research Integrity defines honesty and a sense of responsibility that all the research should possess in the research field. (TENK,2012)

The Finnish Advisory Board on Research Integrity (TENK), earlier known as The Advisory Board, provides guidelines for synthesis of responsible research and to manage the violations of the conduct with equality and neutralism. All the researchers irrespective of their field make a commitment to follow the guidelines and spread awareness of the principles of research.

The main goal of these guidelines is to stimulate the proper supervision of research and prevent any wrongdoing in research in all fields. These guidelines are followed in national and international level partnerships.

The basis of these RCR guidelines is that the Advisory Board (now TENK) is responsible for the responsible conduct of research and handling and prevention of any violations. Also, the Advisory Board forms and publishes the guidelines with various research organizations. (TENK, 2012) The responsible conduct of research helps to maintain the quality of the research organizations, the research conduct should be responsible. Research is said to be ethically accepted and reliable, it should be conducted in accordance with the responsible conduct of research.

The base for the responsible conduct of research with research integrity point are, Integrity, scrupulousness, and preciseness are the principles followed by the researchers in conducting research, in recording, exhibiting, and appraising results of the research. The methods used for

the collection of data in research and evaluation adhere to the scientific and ethical rules. The results are published in a manner that is essential to and responsible for the spread of scientific knowledge. When using the research work of fellow researchers, importance and respect to the work should be given by citating the work. The researcher follows the rules and regulations made for scientific knowledge while planning and conducting the research, also during recording and publishing the results. Commitments, statements, and financing of the research must be published at the end of the research. (TENK,2012)

Students in universities and universities of applied sciences and staff of the research organizations should be well acquainted with the research integrity and standards for responsible conduct of research. The teachers, head of research, experts, and supervisors should be well educated and skilled with the standards of responsible conduct of research. (TENK,2012)

7 Result

In this research, a comprehensive examination was conducted on fourteen articles. The objective was to ascertain the significance of HAIs and identify necessary measures and intervention taken for the prevention and containment of their transmission.

It is very important for the health care workers and other organizational staff to understand the root causes of HAI's and improve the care by implementing better ideas and safer services. for example, C. difficle bacteria can stay for longer periods on hospital surfaces and people getting antibiotic treatment are at risk of developing HAI's. HAIs are believed to be the major risk and a remarked threat to Health care organizations. It's increasing morbidity and mortality, lifts the burden of financial loss and the estimate cost of Nosocomial infection caused by C. difficile, catheters and central line was estimated to be 1,440,352 dollars in 2015 and 1,384,000 dollars in 2016 by the data released by CDC's National Health Safety Network (NHSN) in U.S. This is a global threat for the organizations, public and health care workers like nurses that are in very close contact with the patients, to prevent this the limitation of antibiotics is very important, the patients with C. difficle need to be kept in isolation, PPE personalized protective equipment kit, use of spore killing cleaner, Proper handwashing and equipment cleaning between the patient's examination or procedure prevents cross infection. (Johnson, S. 2018). Although many healthcare professionals have good skills and experience at work, they need up-to-date knowledge regarding new curative methods, technology, and procedures. C. difficile can easily be transmitted to immunocompromised patients. Bioburden can be reduced if there are frequent checks made on high-touch areas, for example bedrails, side table, call remote, television, telephone, iv-infusion pump, pole, cords, other monitors, surface, and the surrounding of the patients. These areas are very important to be cleaned on regular basis, marking the contaminated or high-touch areas with ultraviolet markers and black light is one of the best methods to assess the contaminated part and provide concentration while cleaning. Closed monitoring also improves understanding of different cleaning requirements and raises the real-time education of nurses and other health care staff. (Nielsen, et.al 2019) Reasons for spread of HAIs can be poor hygiene in the hospitals, patients lack personal hygiene, aseptic techniques not properly followed by the staff members, poor implementation of safety and health guidelines by the hospital management, longer stays in hospitals. Microorganisms becoming resistant to sterilization and disinfectant is an increasing cause concern. Children and old people are at a higher risk for developing HAIs as they have suppressed or underdeveloped immune systems thus making them prone to infections, therefore, the prevention and reduction of HAIs is crucial. (Raoofi et al., 2023) Prevention of HAIs is important as HAIs may lead to longer stays in the hospital, ineffective or delays in treatment, higher morbidity rate in immunosuppressed patients. Wearing nail polish by the nurses in patient care may lead to an increase in chances of patients getting an HAIs as the nails hosts more bacteria. Guidelines

were given to all the nurses to not only remove artificial nails but also to not wear any nail polish and following a good hand hygiene. (Blackburn et al., 2020)

Different measures and interventions for prevention of HAIs has been established after the analysis of different studies in this dissertation. Chlorhexidine bathing in bloodstream infections is considered to be effective as it reduces the risk of blood stream infections. Chlorhexidine (CHG) is beneficial in countering gram-positive, gram-negative bacteria. CHG bathing could be an effective strategy that can be adopted by health care institutes. (Musuuza et al.,2019). The study shows how nurses play a vital role in preventing HAIs in patients that are particularly immunocompromised. The study held in southern Denmark's hospitals was aimed to do a surveillance on hospital acquired UTI's that acquires almost 20-30 percent of HAI's and to monitor multi-resistant Urinary tract pathogens. The person's most likely to get UTI's are people with urinary catheter, stroke, hypertension, female sex, and low immunity patients. The best way to overcome this problem is individualized early prevention and keep a real-time record in electronic medical records. This study on HA-UTI shows an entry model where a study was performed on the patients that provides understanding on the duration after which the patient developed UTI after a particular interval of time in the hospital. It differentiated the community acquired infections and HAI. This entry model helped to calculate individual risk after checking the history, previous disease, immunocompromised and other community infections for example the person who previously acquired couple of community infections in his early 70's is in 6 times high risk to get a UTI. And this estimate model study was found helpful as it aids the health care professionals to identify early risk of UTI in individual by risk score and take early precautions and preventive measures to lower the cases of HA-UTI's. (Møller JK, Sørensen M, Hardahl C, 2021)

Insertion of indwelling catheter requires 2-professionals to maintain proper asepsis. The need of continuation, assessment and change of catheter days must of handoff nurse to nurse as a role and a duty. There is a need for participation in rounds to discuss the conditions and changes needed in each and every catheter. There must be a track by every unit in charge or identifier that tracks and maintains a record for maintenance, changeovers, UTI rates, catheter days and make sure the guidelines are being followed. The longer the catheterization the more is the risk of developing UTI. So, checking the need of catheter is the most important indication before putting indwelling catheter it can be done through bladder scanning. During the procedure of catheterization, the size of catheter should not be bigger, the bigger the size the more chance

of developing infection, the use of other supplies and devices such as penis pouches for males, incontinence products and condoms catheters are also better choice in patients with urinary retention and incontinence. Catheter maintenance by keeping tubing below the bladder level to prevent obstruction in the flow of urine, emptying the urine bag regularly, avoiding the use of sliver and antibiotic coating catheters, disinfecting the catheter and surrounding region. Cleaning the catheter with chlorhexidine gluconate helps lower the Catheter associated UTI's. (Elpern, E.,2016).

The comparison studies show different ways of patients transfers those aids in spread of HAIs. It shows that university hospitals, acute care settings and cancers wards are more susceptible to spread of HAIs. Reducing the transfers of MRSA patients may help in minimising HAIs. Screening of the patients before the admission may also help in reducing spread of HAIs. Other measure which can be taken to help solve the spread of HAIs can be increasing the number of specialized services at all the local levels, so the patient transfer is minimised. (Nekkab, 2017)The Real Time Nosocomial Infections surveillance system (RT NISS) is an effective intelligent practical tool that helps physicians to detect HAIs at an early stage and then thus take proper measures to prevent them. tool detects the probability of getting HAIs and selects them so the effective measures can be taken to prevent and cure the patients. It does so by collecting information regarding the patients from laboratory tests, pharmacies drugs, hospital information, operation information, anesthesia and radiology information and analyzing everything and thus giving new infection alerts. The clinicians make their diagnosis on the basis on alerts given by RT-NISS. The RT-NISS were proved to be better in reporting and improving the HAI cases rather than the traditional surveillance system, which was manual, expensive, time consuming and required daily assessment by physicians. The traditional surveillance system was ineffective as there were many false positive infection reports, lack of knowledge of clinicians, high workloads, a smaller number of workers, and lack of time to report serious infections. All these things lead to spread of HAIs due to untreated HAIs patients that were not reported, treatment of false positive HAIs patients, unmonitored HAI outbreaks. RT-NISS helps in detection of risk factors for development of HAIs and thus the control and minimization of these risk factors helped in controlling the spread of HAIs. The installation of RT-NISS in the hospitals is a crucial step in prevention of infections. (Wen et.al, 2022). In most of the health care areas ventilator-associated pneumonia and central line catheter associated blood stream infections are more common in critical care units like ICU. The collaboration of Nurse-physician gives more confidence and satisfaction to nurses working in

the ICU. It was one of the most noted key factors in meta-analysis prediction for job satisfaction and coping up stress. If there is a communication gap between doctors and nurses there are more cases of mortality observed, especially in critical care conditions and vice versa, better understanding and communication lessens the mortality rate. (Boev, C., & Yinglin Xia. ,2015). SSI depend on certain factors like patients own characteristics such as obesity, age, diabetes, low immunity, malnourished person they are called patient centered characteristics. Then comes the length and classification of wound, time taken during surgical procedure, experience and skills of doctors and nurses in surgery, wrong antibiotics or their prophylaxis and there are further environment factors like operation theatre's, temperature, and ventilation inside the OT. The strategy of using pre bath with chlorhexidine gluconate and other antimicrobial, antiseptic soap recommended by CDC and AORN (Association of Perioperative Registered Nurses) helps to reduce the risk of getting SSI. (Allen, G. 2015). Insertion of any device inside the body and preventing the incidence of infection especially related to the blood streams such as central line and intravenous catheter is one of the biggest challenges faced by nurses as there is always a risk of infection transmission through the blood stream. The education of the health care team about I.V therapy techniques, patient's encouragement and education regarding insertion and removal are key components in prevention of infections. There is a complexity in preventing these infections as it depends upon individual behavior not only staff but patients and their relatives too. ´The research on I.V therapies, disinfection and infection control has updated by the years so nurses also need to develop their skill and knowledge regarding the new ways and studies on I.V therapy. (Hugill, K. 2017)

The good hand washing or hand hygiene practices, use of protective equipment, regular trainings and educational interventions of the nurses and good quality training to the students, early identification of the infected patients are important to minimize the cross infection and avoid the spreads of microorganisms that leads to HAIs. (While A, 2020).

HAIs thrive not only due to the presence of harmful pathogens but also due to absence of tools to fight them. One of the ways is to take a swab sample from a lobby or stairs or floor and then test it for presence of 16S rRNA gene which is found in the bacteria. Areas like showerheads and therapy pools act as home to wet moisture-loving bacteria that are often left uncleaned. Other surfaces that get ignored are keyboards, light switches, phones, shoes etc. that can host bacteria and pathogens. Measures like upgrading the ventilation and humidification system of the hospitals, placing of the patients' rooms, kitchen and washrooms in the wards may help in managing the microbes in the wards. (Arnold C.,2014) The study distinguishes between HAI-

specific networks and suspected HAI-specific networks. The HAI-specific network is found to be less reliable in demonstrating real patient movement patterns for those infected with an HAI, possibly due to differences in coding practices among hospitals. Highly connected hub hospitals, including university hospitals and large private hospitals in major cities, have the potential to harbor and transmit HAIs more rapidly. HAIs are most prevalent in certain types of hospitals, including cancer centers, university hospitals, and armed forces facilities. The study recommends decentralizing the healthcare system by moving human resources and specialized health services to regional and departmental levels. This could help reduce the high connectedness of hub hospitals in major cities and redirect patient transfers, potentially reducing large-scale HAI dispersal. (Nekkab N, et al, 2017).

In Finnish long-term care facilities (LTCFs), the use of antibiotics was widespread, and a significant portion of these antibiotics were prescribed for urinary tract infection (UTI) prophylaxis and treatment. To mitigate the risk of HAIs, LTCFs should aim to minimize urinary catheter usage and employ all available strategies to prevent pressure ulcers. Continual training and ongoing monitoring of hand hygiene compliance are vital. Each LTCF should, at the very least, track and document data on the consumption of hand rubs. Introducing mandatory hand hygiene proficiency training and testing, similar to a "Hygiene Passport," could be a valuable step forward. The Resident Assessment Instrument for Long-Term Care (RAI-LTC) could serve as a useful tool for collecting data on antimicrobial use and infections in LTCFs. Such a system would improve outbreak management and, ultimately, save lives. (Maija-lisa, 2013)

8 Discussion

Nosocomial infections continue to be a significant concern in healthcare settings worldwide. The environmental theory by Florence Nightingale helps to understand the ways in which our environment affects overall health and wellbeing. (Nery, 2015) These infections are contracted during the course of medical care, and they encompass a broad spectrum of pathogens, including antibiotic-resistant bacteria. To address this critical issue, several aspects need to be considered, including new strategies for prevention, the link between COVID-19 and nosocomial infections, and avenues for further research. Different methods have been suggested in the dissertation that helps in prevention of HAIs such as hospitals must implement robust infection control measures to reduce the transmission of antibiotic-resistant bacteria,

improved hand hygiene practices, strict adherence to isolation protocols, and enhanced cleaning and disinfection procedures.(WHO,2011) The emphasis on individualized early prevention for HA-UTI aligns with the notion of optimizing catheter insertion techniques and regular changes to mitigate the risk of bacterial growth and infection. (Elpern, E.,2016). I.v incidence are not just local phlebitis but also blood stream infections that increase serious morbidity. In order to prevent the iv incidences proper management of devices is important. Regular monitoring and use of accurate size of catheter or cannula, use of sterile package for insertion. Proper Hand washing is the initial step to prevent contaminated contact and cross infection as suggested in the Environmental theory. (Alligood, 2014) Assessment of all the devices and their disinfection should be made. Disinfecting the surface of the skin before insertion. Implementing surveillance systems to monitor the prevalence of antibiotic-resistant bacteria within healthcare facilities allows for early detection and intervention. Research into alternative treatment options, such as phage therapy, monoclonal antibodies, and new classes of antibiotics, is crucial in combating drug-resistant bacteria. The observed reduction in antimicrobial usage during the surveys suggests that LTCFs could benefit from interventions aimed in promoting antimicrobial treatments particularly with a focus on UTIs. multidisciplinary team successfully encouraged and maintained hand hygiene practices in LTCFs over the three-year follow-up period. Additionally, the use of the Resident Assessment Instrument (RAI) in with Minimum Data Set (MDS) data proved to be a practical approach for gathering information on antibiotic usage and infection rates in LTCFs. (Maija-lisa, 2013) The scoping review method provided a good and informative analysis of the articles which helped to provide answers to our research questions. To sum up, this is a bachelor's degree thesis and further research and development is required in this ever-growing topic.

9 Conclusion

In conclusion, from a nurse's perspective, preventing HAIs is of paramount importance. Our daily practices, such as hand hygiene and proper use of protective equipment, play a critical role in minimizing the spread of harmful pathogens in healthcare settings. It's crucial to maintain vigilance in all aspects of patient care, from catheter insertion to the cleaning of high-touch areas. Reducing the misuse and overuse of antibiotics is crucial in preventing antibiotic-resistant infections. Regular and thorough cleaning and disinfection of high-touch surfaces and

patient surroundings are essential in minimizing the reservoirs of infectious agents. Chlorhexidine bathing can be effective in reducing the risk of bloodstream infections, particularly in intensive care units. Continuous research into infection prevention methods, technologies, and treatments is essential to staying ahead of evolving pathogens and resistance patterns. Nurses must also stay updated on the latest research and best practices in infection control. Advanced surveillance systems are critical steps in reducing the incidence of HAIs and safeguarding patient safety. The COVID-19 pandemic has posed unique challenges in managing nosocomial infections. Patients with severe COVID-19 are often hospitalized for extended periods and may require invasive medical interventions like mechanical ventilation and central lines, increasing their susceptibility to HAIs. During the early stages of the pandemic, antibiotics were sometimes prescribed unnecessarily to COVID-19 patients due to uncertainty regarding bacterial coinfections. This has the potential to contribute to antibiotic resistance. Adequate personal protective equipment (PPE) and stringent infection control practices are essential to prevent the spread of both COVID-19 and nosocomial infections in healthcare settings. Assessing healthcare worker behavior and knowledge through behavioral and educational studies can inform interventions aimed at improving infection control. Collaborative efforts among healthcare providers, researchers, policymakers, and the pharmaceutical industry are crucial to tackling this critical global health issue. As new pathogens and challenges emerge, ongoing research and innovation will remain key in our fight against HAIs. Ultimately, the well-being of our patients is at the heart of our mission as healthcare professionals, and every step we take to reduce HAIs is a step toward better patient care and safety.

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Appendnices:

	Title,Author,Publication,Year	Aim	Methodology	Result
1.	Preventing bloodstream infection in IV therapy, Hugill, K. *British Journal of Nursing, (*2017).	This article aims to propose relation between iv therapy and blood stream infections and different measures to prevent HAIs.	Analysis of incidences of iv therapy blood stream infections and central line blood stream infections in a care facility.	Prevention of bloodstream infections is an evolving process and requires continuous training and competence including education of staff related to care and management of IV devices, handling the IV procedures with aseptic techniques, preparation, and proper disinfection of insertion site.

2.	Microbial Growth on the Nails of Direct Patient Care Nurses Wearing Nail Polish, Blackburn, L., Acree, K., Bartley, J., DiGiannantoni, E., Renner, E., & Sinnott, L. T., *Oncology Nursing Forum*, (2020).	The aim of the article is to determine the risk of infection to the patients from nurses wearing nail polish.	The researchers categorized the participants' three middle fingers of their dominant hand into three groups: those with no nail polish, those with nail polish that was applied one day earlier, and those with nail polish that was applied four days earlier at the time of sample collection. A uniform application technique was used for standard nail polish. Participants were instructed to complete a work shift just before the nail cultures were taken and adhere to regular hospital hand hygiene practices. Bacterial samples were collected from both the unpainted nail and the nails with polish when the polish had aged for one day and four days.	the four-day-old nail polish displayed a notable increase in microorganisms compared to the one-day-old polish. This trend was also observed with gram-negative microorganisms.

3.	Rethinking sterile: the hospital microbiome. Arnold C, Environmental health prospective,2014	The aim of the article is to understand the importance of good hand hygiene and aseptic techniques.	Depth analysis of hospital rooms for a specific period.	provides information about transmission of pathogens and ways to prevent transmission and spread of infections and improving hand hygiene techniques among healthcare staff.
4.	A case study of organizational risk on HAI, Shelly Johnson, Nursing Economics, (2018)	The focus of the article is to describe the efforts and practices conducted by healthcare workers to prevent HAIs.		Implementation of evidence-based techniques to prevent HAIs is a must. Management of risk factor to prevent the occurrence of incidences may help in minimizing the spread of HAIs.

5.	The impact of chlorhexidine bathing on hospital-acquired bloodstream infections: a systematic review and meta-analysis. Musuuza, J.S., Guru, P.K., O'Horo, J.C. BMC Infectious Diseases, 2019.	In this meta-analysis, we investigated the impact of Chlorhexidine (CHG) bathing in preventing Hospital-Acquired Bloodstream	We undertook a meta-analysis by searching Medline, EMBASE, CINAHL, Scopus, and Cochrane's CENTRAL registry from database inception through January 4, 2019, without language restrictions. We included randomized controlled trials, cluster randomized trials and quasi-experimental studies that evaluated the effect of CHG bathing versus a non-CHG comparator for prevention of HABSIs in any adult healthcare setting. Studies of pediatric patients, of pre-surgical CHG use, or without a non-CHG comparison arm were excluded. Outcomes of this study were HABSIs, patient-centered outcomes, such as patient comfort during the	Bathing patients with Chlorhexidine (CHG) led to a notable reduction in the occurrence of Hospital-Acquired Bloodstream Infections (HABSIs) in both ICU and non-ICU environments.

			bath, and implementation fidelity assessed through five elements: adherence, exposure or dose, quality of the delivery, participant responsiveness, and program differentiation. Three authors independently extracted data and assessed study quality; a random-effects model was used.	
6.	Prediction of risk of acquiring urinary tract infection during hospital stay based on machine-learning: A retrospective cohort study, Møller JK, Sørensen M,	aim is to anticipate an individual patient's risk of contracting HA-UTI before its onset, enabling healthcare practitioners to implement appropriate preventive measures.	cohort analysis was conducted on around 300,000 adult admissions. Models were developed with five algorithms to predict UTI.	Models hold great promise as a valuable tool to assist healthcare professionals in identifying high-risk patients based on their UTI risk scores, enabling them to tailor individualized preventive measures to mitigate the development of UTIs

	Hardahl C,PLOS ONE, 2021			during a patient's hospital stay.
7.	Prevention of Catheter-Associated Urinary Tract Infections in Adults. Elpern, E., Critical *Care Nurse*, (2016)	The aim of the article is to determine different ways to prevent catheter associated urinary tract infections.	assessment of the patient should be conducted to determine whether there are valid reasons for catheter placement. meticulous documentation of all instances involving indwelling urinary catheters is essential.	A significant reduction in the rate of Catheter-Associated Urinary Tract Infections (CAUTIs), amounting to a 53% decrease, was observed when an intervention reminder system indicating catheter presence and stop orders to prompt the removal of unnecessary catheters were implemented. Furthermore, the implementation of infection surveillance programs, which include tracking unit-based urinary catheter days and monitoring CAUTI rates, has proven to be a valuable strategy
8.	Effect of a real-time automatic	This article explores the	A descriptive analysis was conducted on	The utilization of RT-NISS proves highly

	nosocomial infection surveillance system on hospital-acquired infection prevention and control., Wen, R., Li, X., Liu, T, BMC infectious Disease, 2022.	need to implement real time automatic nosocomial infection surveillance system (RT-NISSs) in hospitals.	inpatients' data spanning from January 2017 to December 2019. During this period, the authors systematically gathered information on cases of hospital-acquired infections (HAIs) and infections caused by multidrug-resistant organisms (MDROs) using conventional surveillance methods.	valuable in the effective and precise collection of Hospital-Acquired Infection (HAI) cases. This technology serves as a pivotal tool for preventing and managing HAIs.
9.	Nurse-Physician Collaboration and Hospital-Acquired Infections in Critical Care. Boev, C., & Yinglin Xia, Critical Care Nurse, (2015.	The objective is to investigate the correlation between collaborative efforts between nurses and physicians and the incident of healthcare-associated infections in chronic adult patients.	a secondary analysis of five years' worth of data derived from nurses' perceptions, encompassing 671 surveys from four different intensive care units. Our focus was on investigating the incidence of ventilator-associated pneumonia and central catheter-associated bloodstream infections.	Intensive care units with a higher proportion of certified nurses were associated with a 0.43 lower incidence of bloodstream infections (P= .02) and a 0.17 lower rate of the pneumonia

10.	A Patient Safety Imperative for the Perioperative Setting, Allen, G., AORN Journal, (2015).	The focus of the article is to provide information regarding the SSIs and its prevention.	Statistics from CDC were analysed.	Different ways such as regular cleaning. Storing and disinfection of equipment is a key element.
11.	Hand and other hygiene practices. While, A., *British Journal of Community Nursing*, 2020.	This article explores different hand hygiene practice that are key in prevention of HAIs.	Survey of 180 nurses regarding the principle of hand hygiene in medical wards were analysed.	Use of hand sanitizer, proper hand washing, maintaining good personal hygiene and ward hygiene helps in prevention of HAIs.
12.	Global prevalence of nosocomial infection: A systematic review and meta-analysis., Raoofi S, Pashazadeh Kan F, Rafiei S, Hosseinipalangi Z, Noorani Mejareh Z, Khani S., PLOS ONE, 2023.	The primary objective of this study was to conduct a systematic review and a meta-analysis, with the aim of examining the global prevalence of HAIs.	The analysis was performed using a random-effects model, alongside assessments for heterogeneity and the testing of publication bias.	The prevalence of universal Hospital-Acquired Infections (HAIs) stands at 0.14 percent. Moreover, there is an annual increase in the HAI rate of 0.06 percent.

13.	Spread of hospital-acquired infections: A comparison of healthcare networks, Nekkab N, Astagneau P, Temime L, Crépey P, PLOS Computational Biology (2017)	objective is to evaluate and draw comparisons among healthcare networks. Authors focus on two distinct populations: patients diagnosed with Hospital-Acquired Infections (HAIs) and the broader general patient population. The aim is to gain deeper insights into the potential consequences about predicting the spread of HAIs.	To identify Hospital-Acquired Infections (HAIs) within the surgery, intensive care, and obstetric units at the University Hospital, patient discharge summaries from the Patient Medical Summary Information (PMSI) database were used.	When we evaluate hospitals by means of centrality measures and apply community detection algorithms to compare community clustering, it becomes evident that, despite variations in patient populations, the HAI-specific and suspected-HAI networks share a common underlying structure with that of the general network. This finding suggests that the general network may offer greater reliability when investigating the potential spread of Hospital-Acquired Infections (HAIs).

14.	Antimicrobial Use and Infections in Finnish Long-Term Care Facilities, Maija-Liisa Rummukainen, THL,2013.	The primary objective of this study was to investigate the utilization of antimicrobials and the occurrence of infections within Long-Term Care Facilities (LTCFs) in Finland. Additionally, the study aimed to assess the practicality of different methodologies for gauging antimicrobial use and infection prevalence in LTCFs.	The study encompassed all residents who had stayed in nine voluntary Nursing Homes (NHs) for at least 24 hours (totaling 5,791 individuals). Specifically, the study focused on residents who were under systemic antimicrobial treatment on the day of the survey. Data regarding the use of antibiotics, including their purpose (whether for prophylaxis or treatment) and the type of infection they were addressing, were gathered during three periods.	The observed reduction in antimicrobial usage during the surveys suggests that LTCFs could benefit from interventions aimed in promoting antimicrobial treatments particularly with a focus on UTIs. multidisciplinary team successfully encouraged and maintained hand hygiene practices in LTCFs over the three-year follow-up period. Additionally, the use of the Resident Assessment Instrument (RAI) in with Minimum Data Set (MDS) data proved to be a practical approach for gathering information on antibiotic usage and infection rates in LTCFs

Abbreviations:

HAI	Hospital acquired infections.
NHSN	National Healthcare Safety Network
HCAP	Health care acquired Pneumonia.
HAP	Hospital acquired pneumonia.
VAP	Ventricular associated pneumonia
THL	The Finnish Institute for Health and Welfare
CDC	Centers for disease control and prevention
WHO	World Health Organisation
IPC	Infection prevention and control
SIRO	Sairaalainfektio-ohjelma
ICU	Intensive care unit
SSI	Surgical site infection
UTI	Urinary tract infection
CAUTI	Catheter associated urinary tract infection.
LTCF	Long term care facility
PPE	personal protective equipment