



SURGICAL SITE INFECTIONS

**ORTHOPEDIC AND TRAUMA NURSES VIEWS
ON CAUSES AND PREVENTION OF SURGICAL
SITE INFECTION SSI's**

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Abstract <p>Surgical site infections (SSIs) are the leading type of infection among hospitalized patients. Careful handling of the surgical equipments reduces the chances of surgical site infections, and those who incorporate best practice standards can reduce the morbidity and mortality associated with SSIs. The purpose of the research was to find out the knowledge of trauma and orthopedic nurses on how surgical site infections arise and what they are doing to prevent them.</p> <p>The study was done by qualitative method of research where it would be possible to get deeper views of the participants, the interview was a mixture of structured and unstructured as in a way there are a couple of questions that will be followed but the informants will be allowed to go to any direction regarding the questions.</p> <p>From the qualitative research conducted, the researchers found out that surgical site infections could be prevented by the following means: Aseptic measures from patient to the health care team or vice versa. Avoiding malnutrition which makes the immune system weak. Patient education is vital as it prepares them for the operation. Patients with other previously infections have a higher risk of re-infection. Catheters and cannules should be removed after surgery and if they should stay, they should be changed according to the rules, isolation of infected patients to prevent transmission and improving practices by following up all known infection control rules.</p>		
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1 INTRODUCTION

Postoperative surgical site infections (SSIs) according to Nichols (2001) remain a major source of illness in surgical patients. These infections number approximately 500,000 per year, among an estimated 27 million surgical procedures, and account for approximately one quarter of the estimated 2 million nosocomial infections each year.

There have been different reasons why people go for surgery; it can be an emergency reason or elective. According to Seltzer, McGrow, Horsman, and Korniewicz (2002) a primary concern in healthcare today is the prevention of infection. Surgical site infections (SSIs) are the leading type of infection among hospitalized patients.

Advanced practice nurses play a vital role in patient care, the nurse will make sure the equipments are sterile and will stay sterile till the end of surgery. Careful handling of the surgical equipments reduces the chances of surgical site infections, and those who incorporate best practice standards can reduce the morbidity and mortality associated with SSIs. Although when people go for surgery they have the information about what is about to happen, most people never consider seriously what the side effect of the surgery might be and therefore are not fully prepared for the consequences that occur if something negative happens, Surgical site infections (SSI's), is one of the side effect that occurs after a patient goes for surgery (Seltzer et al. 2002).

In surgical ward it is vital for personnel to understand the importance and pathway of wound care and execute them in details to prevent the client or patient from going through long and painful time recovery. Infections in operated areas are the most common ones after surgery; and may lead to death. The biggest numbers of surgical infections are postoperative infections. In cases where the hospital care is prolonged, the need for medical and special care increase and possible reoperation. This will inconvenience the family, cause the patient more pain and uncomfortably and cause economic and social hardship to the family. At the same time the longer the patient stays the more he/she is prone to other infections (Markkanen & Huhtala 2006, 3-4). In most cases infection develops during the healing process, it doesn't matter if it's an open or closed wound. When an infection occurs, it can be diagnosed from patient's weakened physical condition or from local symptoms from the wound. First the wound starts to get red from its margins, then swollen and painful. When the infection develops further, the wound starts to secrete and produce a bad odor. At this

point the wound bleeds more easily and the surface becomes wider and deeper (Markkanen & Huhtala 2006, 8-9).

The researchers aim was to find out what orthopaedics and trauma nurses know about surgical site infections (SSIs) and what they have done to reduce the infections in their respective wards. The researchers were suggested this topic by the nurses in the operating room and an increased interest came after the researchers discovered there were a couple of patients coming for revision of the previous surgery.

The research was conducted by qualitative method whereby the researchers intended to get the participants deeper views on what causes surgical site infections. The information gathered is intended to be provided to the hospital department and the school for the nurses and the students' educative purposes.

From the expected 10 participants, data will be collected from 6 selected participants who will be handed the questions to answer in writing at their own preferable atmosphere and time. The results will be collected, translated in English after which they will be transcribed and then analysed. The original results will be destroyed.

According to Nichols, (2001) it is impossible to point out exactly where the SSI come from and how they can be prevented, the researcher closely examines ways of preventing SSIs to save the patient from the pain of going through another surgery (if the surgery has to be repeated), or the torture of having the post operation wound for longer than necessary. Aseptic knowledge and techniques are the basis of SSIs prevention therefore the researchers aim is to research and educate the nurses on the right ways and procedure to follow in hospitals. Researchers also believe the knowledge will save patients extra pain and long hospital stay.

2 SURGICAL SITE INFECTIONS IN POST OPERATIVE CARE

A surgical site infection (SSI) is an infection that develops within 30 days after an operation or within one year if an implant was placed and the infection appears to be related to the surgery. Post-operative infections are the most common healthcare-associated infection in surgical patients, occurring in up to 5 percent of surgical patients. The Centres for Disease Control and Prevention (CDC) term for infections associated with surgical procedures was changed from surgical wound infection to surgical site infection in 1992 (Rhee & Harris, 2008).

SSIs occurs when a bacteria is present within a wound. The bacteria may be transferred by contact from surgeons or nurses' hands, the bacterial could be airborne during surgery, and or the patient may come in contact with bacteria after surgery. The most common forms of bacteria that cause surgical site infections include streptococcus pyogenes, and staphylococcus aureus (About Surgical Care Improvement Project Information, 2007).

There are different reasons as to why surgical patients get infected after surgery; Infections may be caused by endogenous or exogenous sources. Most SSIs are caused by the patient's own bacterial flora. The most common micro organisms causing surgical site infection are Staphylococcus aureus (20 percent), Coagulase negative staphylococcus (14 percent) and Enterococcus (12 percent) (Bonnie, 2003).

There are different types of bacteria that cause SSI's that may reach the wound and cause an infection. These bacteria may come from the patient's skin or from the environment such as soil, air, or water; for example, many gram- negative bacteria produce endotoxin which stimulates cytokine production. In turn, cytokine can trigger the system inflammatory response syndrome that sometimes leads to multiple system organic failure. Infections may also come from the instruments used during surgery. Other bacteria's may come from the body within where they normally live without doing any harm (Mangram, Teresa, Michele, Leah, William, 1999, 25).

These infections are classified into incisional, organ, or other organ spaces manipulated during an operation; incisional infections are further divided into

superficial (skin and subcutaneous tissue) and deep (deep soft tissue-muscle and fascia).

Surgical site infections (SSI) include superficial incisional infections, infections of the deep incision space and organ space infections. A large body of evidence supports the premise that SSIs can be prevented through administration of appropriate prophylactic antibiotics (Mangram et al 1999, 5).

The diagram below, (Figure 1) explains the stages of surgical site infection of a depicting abdominal wall.

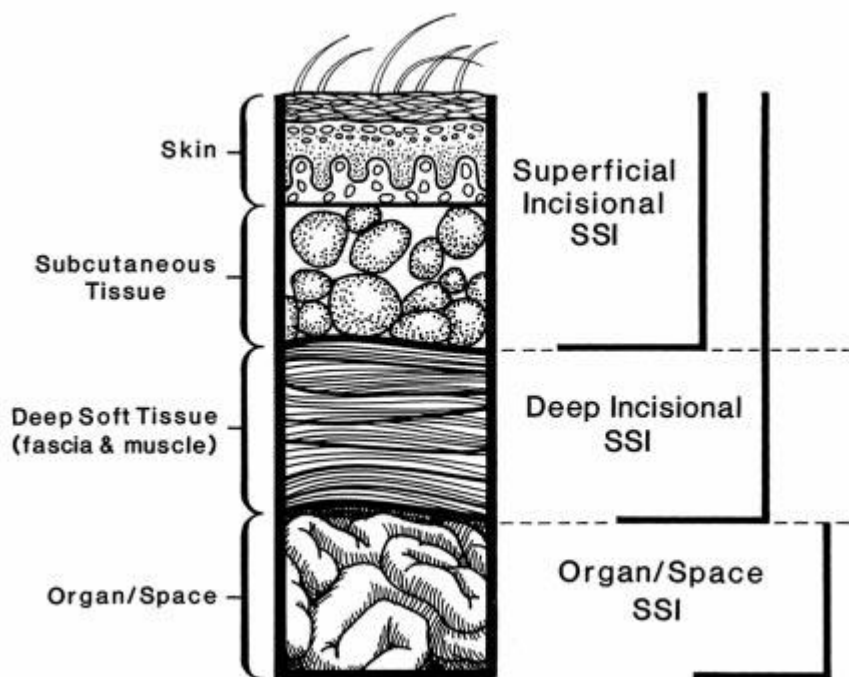


Figure1. Cross-section of abdominal wall depicting CDC classifications of Surgical site infection. (Mangram et al 1999, 5)

According to Nichols (2001) infection varies from surgeon to surgeon, hospital to hospital, from one surgical procedure to another, and most importantly from one patient to another. During the mid1970s, the average hospital stay doubled, and the cost of hospitalization was correspondingly increased when postoperative infection developed after six common operations. These costs and the length of hospital stay are undoubtedly lower today for most surgical procedures that are done on an outpatient basis, such as laparoscopic (minimally invasive) operations or those that require only a short postoperative stay (Nichols, 2001).

2.1 Microbiology

According to Mangran and co-workers (1999,8) the distribution and pathogens of surgical site infections (SSIs) has not changed, *Staphylococcus aureus*, coagulase-negative staphylococci, *Enterococcus* spp., and *Escherichia coli* remain the most frequently isolated pathogens. An increasing proportion of SSIs are caused by antimicrobial-resistant pathogens, such as methicillin-resistant *S. aureus* (MRSA), or by *Candida albicans*. The increased proportion of SSIs caused by resistant pathogens and *Candida* spp. may reflect increasing numbers of severely ill and immunocompromised surgical patients and the impact of widespread use of broad-spectrum antimicrobial agents. Outbreaks of SSIs have also been caused by unusual pathogens, such as *Rhizopus oryzae*, *Clostridium perfringens*, *Rhodococcus bronchialis*, *Nocardia farcinica*, *Legionella pneumophila* and *Legionella dumoffii*, and *Pseudomonas multivorans*. These rare outbreaks have been traced to contaminated adhesive dressings, elastic bandages, colonized surgical personnel, tap water, or contaminated disinfectant solutions. When an outbreak of SSIs involves an unusual organism, a formal epidemiologic investigation should be conducted.

MRSA (Methicilin – resistant *Staphylococcus aureus*) is a resistance strain of *Staphylococcus aureus* microbes (example penicillin and tetracycline). It's usually harmless, but may occasionally get into the body and cause infection. 20-30% people carry MRSA on their skin, nose and throat without knowing it, these patients are said to be colonised. The type of surgery, prolonged hospital stay and also a long time in ICU can increase the risk of being infected by MRSA. Occasionally, MRSA gets into the body through breaks in the skin such as cuts, wounds, surgical incisions or indwelling catheters. At the same time MRSA has the ability to survive in dry, dusty environment, it can also be spread through airborne, and therefore the most common infection route between patients is health care workers (Perttunen 2008).

2.2 Pathogenesis

Microbial contamination of the surgical site is a necessary precursor of SSI. The risk of SSI can be conceptualized according to the following relationship, exogenous and endogenous sources.

Endogenic Sources.

Microorganisms may contain or produce toxins and other substances that increase their ability to invade a host, produce damage within the host, or survive on or in host tissue. For example, many gram-negative bacteria produce endotoxin, which stimulates cytokine production. In turn, cytokines can trigger the systemic inflammatory response syndrome that sometimes leads to multiple system organ failure. Certain strains of clostridia and streptococci produce potent exotoxins that disrupt cell membranes or alter cellular metabolism (Mangram, et al 1999, 6).

For most SSIs, the source of pathogens is the endogenous flora of the patient's skin, mucous membranes, or hollow viscera. When mucous membranes or skin is incised, the exposed tissues are at risk for contamination with endogenous flora. These organisms are usually aerobic gram-positive cocci (e.g., staphylococci), but may include fecal flora (e.g., anaerobic bacteria and gramnegative aerobes) when incisions are made near the perineum or groin. When a gastrointestinal organ is opened during an operation and is the source of pathogens, gramnegative bacilli (e.g., *E. coli*), gram-positive organisms (e.g., enterococci), and sometimes anaerobes (e.g., *Bacillus fragilis*) are the typical SSI isolates (Mangram, et al 1999, 7).

Exogenic Sources

These SSIs pathogens include surgical personnel (especially members of the surgical team), the operating room environment (including air), and all tools, instruments, and materials brought to the sterile field during an operation. Exogenous flora are primarily aerobes, especially gram-positive organisms (e.g., staphylococci and streptococci) (Mangram, et al 1999, 8).

3 RISK FACTORS FOR SURGICAL SITE INFECTIONS (SSI's)

There are four main factors which influence the infection rates in surgical wounds, they include, Patient variables, Preoperative preparation, Operative procedure and Postoperative care, as summarised in Appendice 5 (Flanagan 1997, 54). From these factors, the following were identified as the main risk factors for SSI's.

3.1 Patient variables

Diseases

The contribution of diabetes to SSI risk is controversial, because the independent contribution of diabetes to SSI risk has not typically been assessed after controlling for potential confounding factors. Also, increased glucose levels in the immediate postoperative period were associated with increased SSI risk. More studies are needed to assess the efficiency of perioperative blood glucose control as a preventive measure. Other diseases are like cancer of liver and kidney or lung conditions that may slow the healing process. Medical condition, such as low blood protein may also affect healing (About Surgical Care Improvement Project Information, 2007).

Hyperglycaemia and hypoglycaemia

Elevated blood sugar concentration impaired the function of phagocytic cells in experimental studies. Constant checking of blood sugar levels for patients with diabetes is important to maintain the blood sugar at a constant level. Intraoperative and postoperative blood sugar control remains a logistical problem. Furthermore, the ideal blood sugar level remains undefined. It generally is agreed that maintaining euglycemia (i.e., normal blood glucose concentration) for the patient is desirable. Future developments in real-time, on-line measurement of blood glucose will allow this conundrum to be resolved (Donald, 2007).

Weak Immune System

The immune system is the part of the body that fights infection. For some type of operation, severe protein-calorie malnutrition is crudely associated with postoperative nosocomical infection, impaired wound healing. The immune system may be weakened by radiation, poor nutrition, certain medications (anti-cancer medicines or steroids). Weight and age may also decrease the ability to respond to injury (Beaver, 2008).

3.2 Preoperative care

Prolonged Hospital Stay

According to Bonnie, (2003) prolonged perioperative hospital stay is frequently suggested as a patient characteristic associated with increased SSI risk. However, the length perioperative stay is a likely surrogate for severity of illness conditions requiring inpatient work-up and therapy before the surgery.

Perioperative Transfusion

Mangram and co-workers (1999) states that, it has been reported that perioperative transfusion of leukocyte- containing allogeneic blood components is an apparent risk factor for the development of postoperative bacterial infection including SSI. However, there is currently no scientific basic for withholding necessary blood transfusion from surgical patients as a means of either incisional or organ/ space SSI risk reduction.

3.3 Operative procedure

Type of Surgery

When a surgery has to be done on an infected wound, the chances of SSI are increased. An emergency surgery on traumatic injuries and over 3 hour's surgery also increases the risks of SSI. It may also include surgeries also done on certain body organs, such as the stomach or intestines (bowels). The risk may be greater if an object pierced through the skin and into an organ. SSI is likely to occur after an open surgery than a laparoscopy surgery. Drains and blood transfusion may increase the chance of bacteria reaching the wound causing infection (Surgical Site Infection, 2008).

Foreign Objects

Patients involved in an accident, usually some foreign objects, such as glass or metal or dead tissues present in the wound may delay wound healing. It's also possible to have SSI if there is an infection on another part of the body or a skin disease (Donald, 2007).

3.4 Post Operative Care

According to Mangram and co-workers (1999), the type of postoperative incision care is determined by whether the incision is closed primarily, left open to be closed later, or left open to heal by second intention. When the wound is closed primarily, it is covered by sterile dressing for at least 24-48 hours therefore reducing the chances of infection. When the surgical incision is left open for a few days before it is closed (delayed primary closure), it is likely for the site to be infected or patients condition may prevent primary closure, (e.g edema at the site). When a surgical incision is left to heal by second intention, it is packed with sterile moist gauzes and covered with sterile dressing. Its also recommended that when changing the dressings, it is appropriate to use sterile gloves to reduce the chances of infection.

Nicotine use delays the primary wound healing also increasing the risk of SSI, at the same time patients receiving steroids or other immunosuppressive drugs perioperatively may be predisposed to developing SSI. Even though nicotine is found to be a reason among other patients to be the cause of surgical site infection, it's not 100% proven to have relations with causes of SSI (Mangram et al 1999, 20-25).

Asepsis

There are several aseptic agents available for preoperative preparation of the skin at the incision site. Alcohol is considered to be the most available, inexpensive and the most rapid-acting skin antiseptic. Before the skin is prepared, it should be free of gross contaminations (i.e soil or dirt). The skin is prepared by applying an antiseptic in concentric circles. The prepared area should be large enough to extend the incision or create new incisions or drain site if necessary (Bonnie, 2003).

Mobile phones

Mobile phones have been the source of communication within the hospital. According to a resent research by Ulger, Esan, Dilek, Yanik, Gunaydin and Leblebicious (2009, 1-2) hospital operating rooms (OR) and intensive care units (ICU) are the workplaces that need highest standard of hygiene, also the same requirements for the personnel working there and the equipment used by them. They did not do a direct comparison of transmission rate of bacteria from surface to hands. Risk of infection involved in using mobile phones in the OR has not yet been determined as

there are no cleaning guidelines available that meet hospital standards. However, mobile phones are used routinely all day long but not cleaned properly as healthcare workers may/do not wash their hands as often as they should. They found out that healthcare workers hands and their mobile phones were contaminated with various types of microorganisms. Mobile phones used by healthcare workers may be the source of nosocomical infections in hospitals.

4 PREVENTION OF SURGICAL SITE INFECTIONS (SSI)

Before the surgery, all surgical materials must be sterilized; this include any instruments, needles, sutures, dressings, gloves and solutions that may come into contact with the wound and exposed tissues. In addition, the surgical team must prepare themselves by scrubbing the hands with soap and water and using the disinfectant as required. Head and hair must be covered and mask should be worn throughout the operation. Only the personnel's involved in the surgery should touch the sterile equipments. After the operation, the wound is protected from possible contamination by sterile dressings; the dressing should be sterile at least 24hours before it is changed if there is no bleeding (Smeltzer and Bare 1992, 421). Surgical Site Infections might be prevented by controlling the risk factor in cases of scheduled surgery. Appendices 6 and 7 shows clearly infection transmission and their intervention (Smeltzer & Bare, 2008, 624).

Prophylactic Antimicrobial

Although there are various ways of preventing SSIs, the most appropriate way is administering antibiotic prophylaxis at the appropriate time, (20 min before surgery). Example is Zinacef 1,5g or 3g according to the surgeons' instructions. The administering of antimicrobial prophylaxis before surgery has been proved to decrease greatly the incidence of postoperative infection particularly where the inoculum of bacteria is high, such as vaginal surgery or where there is insertion of an artificial device, for example hip prosthesis. Appropriate timing of administering antibiotics to prevent surgical infections is critical but ignored. Surgical site infections may be prevented by controlling the risk factors in cases of scheduled surgery (Michael Andrea, Jose, Wendon & Ginsburg, 48).

According to Beaver, (2008) antibiotic cycling can prevent hospital-acquired MRSA; it also decreases development of antibiotic resistance strains of gram-negative organisms. The benefits of antibiotic cycling appear to reduce the “monotonous exposure” to one agent over time and reduce the selection pressures for any single agent.

Asepsis

Rigorous adherence to the principle of asepsis by all scrub personnel is the foundation of SSI prevention. Anaesthesia personnel also should abide to these principles; there have been cases where the anaesthesia personnel were implicated as the source of the pathogens. Lack of adherence to the principles of asepsis during the anaesthesia procedure has been associated with outbreak of post-operative infections (Mangram et al. 1999).

Skin and Hand Hygiene

When it comes to preventing SSI, skin antisepsis is the cheapest and most simple way to reduce SSI, but very important. The surgical team takes skin preparation very seriously because it plays a bigger role in SSI prevention.

The outer layer of the skin (corneal) protects the skin from bacteria and foreign particles. Corneal cells are surrounded by a lipid platform which consists of ceramides, cholesterol and free fatty acids. The lipid platform plays the role of destroying some microbes. Repeated wash removes lipids from the corneal therefore weakens the protection towards microbes. There are approximately 100-1000 microbes on the skin and are mostly situated on the corneal layer, if the hands are not disinfected properly after patient contact, the microbes will be transferred to the next patient (Markkanen & Huhtala 2006, 12).

Hypothermia

Patient warming is another issue healthcare professionals generally agree is a factor in SSI occurrence, but sometimes disagree on the extent and the solutions. According to Beaver (2008) lack of proper warming may result to postoperative complications such as shivering, wound infection, and cardiovascular problems, plus metabolism of drugs is prolonged. “All of these complications can contribute to prolonged postoperative recovery,” she adds. It’s important to maintain the patients’ temperature during intraoperative period to prevent complications resulting from hypothermia.

She believes that not enough attention is paid to the preoperative use of warming devices, and that this leads to intraoperative “catch-up” to achieve normal temperature. There may be a direct correlation between the use of preoperative warming devices and SSI.

Patients’ temperature plays a great role to the immune system and therefore a key factor in prevention of wound infection. She believes that if all patients are kept in the normal temperature through out, the amount of patients who develop SSIs will decrease. She also suggested that every hospital should develop protocols to make sure patients complete their operation and goes to the recovery area in a normothermic state (Beaver, 2008).

Paulikas, (2008) states that, most common complications arise when normothermic is not maintained. Perioperative nurses should understand the importance of maintaining normothermia, the causes of hypothermia and the adverse patients result from hypothermia. Nursing interventions to help prevent hypothermia can be implemented during each phase of perioperative care.

Improving Practices

Surgical Site Infections can be prevented by follow up of all known infection control protocols and to monitor compliance of those protocols. It therefore requires the follow up of all surgical patients for possible post operative infection, and tracking results so that the team can be kept fully informed about rates and types of infections, so that any potential negative trend can be acted upon (Beaver, 2008).

Education

According to Deverick, (2008) regular education to surgeons and perioperative nurses minimizes the risk of surgical site infections (SSIs) through the implementation of recommended measures. Several education components regarding the outcomes associated with surgical site infections, risk for surgical site infections and methods to reduce risk to all patients, patients families, surgeons and perioperative personnel’s should be efficient and affective that are easily understood and remembered. Educating the patients and their family members is also another effective method of reducing surgical site infections.

The patient also plays a role in prevention of SSI. In cases where the operation is

scheduled the patient might be required to stop smoking early in advance before the surgery because smoking can damage the heart if untreated. General anaesthesia and surgery cause stress. There is the possibility of pain, changes in blood pressure, loss of blood that might occur during surgery. The latest studies at the Medical College of Wisconsin have shown that smoking before surgery can minimize blood flow to the heart. It was found that those who smoked during the last 24 hours before outpatient surgery with general anaesthesia were having episodes of inadequate oxygen supply to the heart 20 times more than those who were non-smokers or ex-smokers. It's advisable for overweight patients to lose weight before the surgery. The surgeons will advise the patient of the recommended weight that is required when the patient is going to surgery. Most overweight people with sleep apnea face greater risks of complication during surgery where anaesthesia is required. The symptoms are usually snore while sleeping and lack of breath during sleep. The risks of anaesthesia in sleep apnea sufferers can be minimized using continuous positive airway pressure before and after surgery (Beaver, 2008).

5 AIM AND PURPOSES OF THE RESEARCH

The purpose of the research was to find out the knowledge of orthopaedic and trauma nurses on how surgical site infections (SSI's) arise and what they are doing to prevent them.

The aim of the research was to create awareness on causes and prevention of surgical site infections (SSIs) and develop proper surgical wound care techniques. The researchers intend to use the results for educative purposes both in the hospital and the university.

THE RESEARCH QUESTION

What knowledge do trauma and orthopaedic nurses have in regard to causes and prevention of surgical site infections (SSIs)?

6 IMPLEMENTING THE RESEARCH

6.1 Method of data collection

The research was conducted by qualitative method of data collection. Fain (2004, 193) states that, qualitative research is directed at the discovery of meaning rather than cause and effect. It involves the use of language, concept and words rather than numbers to represent evidence from research. He further states the word *qualitative* also implies an emphasis on process and meaning in context.

According to Buckeldee and McMahon (1994, 33), deciding the overall research approach is sometimes felt to be a relatively straight forward procedure, however it is far more complex and it's often impossible to choose a methodology before many other aspects have been taken into consideration. They further state when defining the research question, it's agreeable that it's the most difficult stage of any research project because so much depends on it. The researcher has to know what lays ahead, the approach, methods of data collection and type of data analysis that will be used.

The researchers decided to use qualitative method of research where it would be possible to get deeper views of the participants, the whole process will be a mixture of structured and unstructured as in a way there are a couple of questions that will be followed but the informants will be allowed to go to any direction regarding the questions . Sapsford and Abbott (1992, 108), state that open or unstructured interviewing is simply a way of finding out peoples views on a topic or a service, not knowing enough in advance to put together a structured questionnaire. They further state that open interviewing is not a one method, but a term used for a range of different ways of processing. Most researchers go in with an outline 'agenda' but for some this consists of a list of topic areas to cover and a few 'stock questions' to get things started and bridge gaps in the conversation.

Unstructured interviews centred on a topic may produce a wealth of valuable data, but such interviews require a great deal of expertise to control and a great deal of time to analyse. Conversation about a topic might lead to useful insights into a problem, but it has to be remembered that an interview is more than just an interesting conversation. The researcher needs certain methods devised to obtain that information if at all possible (Bell 1987, 94).

The nurses were given two sample questions for guideline and preparation. The research was estimated to take three to four days but due to the three working shift hours, some of the nurses were not at work during the “orientation” of the thesis therefore, they were then offered a time limit of two weeks to write their views on the question paper and the results were collected afterwards. The researchers felt that the interviewees had a chance to explain themselves if they had a relaxed and freedom atmosphere. Questions in finish were also provided, and the researchers had a finish translator during the transcription of the results.

According to Burns and Grove (2001, 455) the cost factor must also be examined when planning the research. Expenses can be direct or indirect for example printing and postage are direct while time, cost for travel and food is indirect. To prevent unexpected budgets from delaying the study, a budget need to be made during the planning phase of the study. The researchers covered all the expenses undergone through during the research.

From the expected 10 participants, only 6 agreed to participate and four of them formed a group of two where they wrote their views for each group on one single paper.

6.2 The Sample Group

Sampling is selecting a group of people, events, behaviour or other elements with which to conduct a study. Sampling decision has a major impact in the meaning of the finding (Burns & Groove 2001, 365).

The target was trauma and orthopaedic nurses' on their views on causes and prevention of surgical site infection, therefore the participants had to be from a surgical wards. Participants were selected from the respective wards in a Central Hospital in Finland. According to Sapsford and Abbott (1992, 98), its important to have a sample size that is manageable, there is nonetheless every reason to try to pick 'cases' randomly from a sampling frame if at all possible to avoid unrealised bias in the sampling. The researchers intend to hand out papers where the participants will write their views therefore the maximum number of participants' was 10.

The sample was selected from the participants who have atleast one to two years working experience. This was to get results from qualified nurses who had been working there for a longer time and could give their views why patients are infected after operation. The researchers tried to minimize the criteria for participation as for most nurses; they were so young and newly employed. Another issue was the language, some of the nurses felt its impossible to write in English even though they could understand therefore the nurses were offered the chance to write in Finnish so that they could be more open. The finnish questions also motivated the experienced nurses to participate as it seemed more of the experienced (with two years experience and above) had low self esteem of English language.

7 DATA ANALYSIS

Data analysis was done using content analysis which as described by Sapsford and Abbottt (1992, 120-122) as a research technique focusing on objective, systematic and description of manifested content in communication. Content analysis is focused on the actual data and internal features of the data collected. It determines the presence of certain words, concepts, themes, phrases, characters or sentences within data collected and bring out their presence in an objective manner.

Content analysis was used because it focuses in identifying the main themes discussed by the participants and the researchers' main purpose was to find out the views of orthopaedic and trauma nurses in surgical site infections.

Participants were given two weeks to write their view on paper, after which they were collected in one envelope and kept in the office from where the researchers collected the results. Because some of the participants had written their views in Finnish, a translator was available to translate exactly what the nurses had written. A spot was selected where it was appropriate for both the researchers, convenient in atmosphere and with the materials required for transcription. The researchers read the results carefully in order to identify the main themes of the results and the outcome of the analysis is shown in summary in appendice 8. The first step is to look for all concepts and make an index of them (Sapsford and Abbott 1992, 120).

8 ETHICAL ISSUES

According to Smeltzer and Bare (1992, 50) ethics refers to the philosophical study of morality, and one relies on formal theory rules, principles, or codes of conduct to determine the "right" course of action. To avoid bias, the participants won't need to write their names on the research paper to make it impossible to trace the result to the participant.

It's general practise to promise respondents *confidentiality*, that you only will be able to match up names and the results, and that the informants will never be used in such a way that will be identified. Sampling widely enough that no individual is unique is an example of that ensures confidentiality (Sapsford and Abbott 1992, 98). Even though the researchers planned to use a wide range in sampling, hindrs like language barriers prevent it to be possible therefore it was up to the researchers to ensure confidential measures are observed.

Conducting a research requires not only expertise and diligence, but also honesty and integrity. Ethical considerations are made from identification of the topic to the publication of the study (Burns and Groove 2001, 191). The research participants have the right to privacy, anonymity and the right to assume the data collected will be

kept confidential. According to Burns and Groove (2001, 201), complete anonymity exists if the subject's identity cannot be linked, by the researcher, with his or her individual responses.

The researchers practiced right to autonomy and confidentiality after obtaining the signed consent from the participants. Approval to conduct the research was received from the head nurse of the department (Appendix 1), after which the participants signed a consent form (Appendix 2) that they are willing to participate in the research. A sample of the question used in the research (Appendix 3) was also provided for the participants to have an idea of the questions to be asked.

9 FINDINGS

According to Woods and Haber (1994, 425), findings are results, conclusions, interpretations generalization and implications for future research and nurses practice and can be addressed by separating the presentation in two major areas, results and the discussion of the results. The researchers' findings were similar to what the researchers had obtained from the theoretical literature. Direct quotation from the research is identified by the use of italic in the results. A summary of the results is shown on table 1.

Themes	Participants with the same answer
Asepsis	6
Malnutrition	5
Information for patients	4
Previous infections	6
Catheters and Cannules	4
Isolation	6
Emergency Surgeries	3

Table 1. Summary of the results

Asepsis

Asepsis seems to be the basis of prevention of surgical site infection. It all starts from the patient to the surgeon and back to the patient. If the level of asepsis is not maintained it is very easy for the patient to have an infection after the surgery. The level of asepsis should always be maintained at very high standard and not dropped at any time.

“Asepsis should be of high standards in the operating theatres and the wards”.

Nurses should make sure that the sterile materials stays sterile and remind the surgeon if they see a mistake has been done by the surgeon (e.g. touching the lamps which are not sterile) to change their gloves or follow the required measures. The wound should not be opened at least for 24hrs if there is no bleeding therefore, ward nurses should make sure the bandage is not opened until need be. A breach in asepsis can develop

from any member of the team (surgical team or ward nurses) and it will be difficult to identify where and when it happened, therefore responsible officials should be trained and re-trained to be able to offer the highest level of asepsis.

They further clarified that aseptic measures were not only on the instruments, but also in patient clothing and skin. The patient also needs to learn how to take care of the wound aseptically as he/she is the last link to wound healing. Opening and cleaning of the wound plays the biggest role in aseptic measures. At home the patient has to know what to use for cleaning the wound (warm water, antiseptics and single use cleaning materials), how to clean the wound (from inside to outside), and covering the wound afterwards.

Malnutrition

Older patients are known for not eating, the doctors always check on patients' laboratory tests to see if the patient is fit or not fit for surgery. The doctors advise the patients on what to do before the surgery but in most cases the patients don't follow instructions.

“Malnourished patients are very weak and this makes their immune system also weak. The healing process of malnourished patients is longer than healthy patients. These patients stay here longer and the risk of infection is increased with each day”.

Identifying malnutrition before surgery in massive weight loss patients will significantly decrease surgical complications, accelerate wound healing, improve scar quality and boost patient energy levels. The nurses suggested that it would be best if the surgeons saw that the patient doesn't really need the surgery, it should be postponed until the patient is fit. This will motivate the patient to do what is required to be fit for the surgery.

The nurses suggested use of supplements for patients who it's a must to have the surgery. This patients need more energy after the surgery because the body is working twice for wound healing, at the same time because of the blood loss the body needs to form more blood cells and therefore it required the right supplements which if they are not available readily, the body is over worked and becomes exhausted.

Information for patients

Patients have been receiving information about surgery and how to prepare for it for a long time now. The information that is not passed well is how to take care of the wound after the surgery. Some remember to ask before they leave the hospital, but others are glad that their time is up and are going home. A patient thinks that the release from the hospital means that the wound is healed, which in most cases it's almost healed and because of this, anything unhygienic that passed through the wound can bring about an infection.

“We have the responsibility to educate patients and at the same time motivate them to take care of the wound for faster healing”.

“Patients don't understand the importance of mobility, if well informed, they will work hard for a quick recovery”.

Other patients might have all the information that they need, but think it's the work of the nurse to take care of them. This happens with the older generation and some who have given up in life. Some of them don't have family members to motivate and take care of them so are left at the hands of the nurses. Here the patient may not comply with wound care advice and may contaminate their wounds or they are likely to be more active and fail to rest adequately, which will exert undue stress at the wound incision.

“How can we educate a person who has given up on themselves? We nurse them for faster recovery so they can leave the hospital”.

“When releasing the patient it's important to give them verbal and written information”.

Previous Infections

Patients with previous infections have a high risk of infection. Infections like urine infection, skin infection and diseases such as diabetes and arthritis that may hinder fast recovery. MRSA is another microbacteria that is resistant to antibiotic and therefore hinders the healing process of the wound.

“Constant doses of antibiotics should be administered to prevent the infection of the operated area”.

“Before the operation take care of the previous and possible other infections. Wounds have to be healed and the skin should be ok”.

The nurses identified surgical site infection as caused mostly by previous infections. They explained that rarely, healthy uninfected patients get infected as easily as those who have had an infection previously. Therefore before taking a patient for surgery, the previous infection must be dealt with the infection arises from the skin but diseases like diabetes should be put under control and regular follow ups observed to maintain the blood glucose levels at a stable level.

Medication for arthritis also maintained the disease at a substantial level. Patients with arthritis should have their medication at all times regardless of whether they are going for surgery or not.

Catheters and canules

There is need for catheters and canule in the theatre but if they are not needed after that, they should be removed because they are sometimes the cause of infection. If the patient has to have the catheter longer, it should be changed according to the rules and how long it's supposed to stay. The same applies to the canule which can be changed to a different position if need be. In some cases it would be advisable to use a central venous catheter when the patient needs more fluids and fluid balance.

“Patients also might need a central venous catheter if more liquids and follow up is required, it should be handled aseptically to avoid possible infections”.

“Catheters are foreign objects to the body; avoid possible ways of getting infection”.

The nurses identified catheters and canules as foreign objects whilst the literature identified other sources as foreign objects (e.g. glasses, wood and sand) depending on the cause of a patient infection.

Isolation

Infection has been known to be transferred from one patient to another by the nurses. Patients with a high risk of infection or are infected already should have their own rooms but in some cases its not possible because the rooms might be full and nothing can be done.

“Infected patients should have their own rooms and also their own nurses”.

Resistance diseases like MRSA patients should have their own rooms and at the same time the nurses handling those patients should be catered for only those patients to prevent infections to other patients in the same hospital. They clarified that the patients are sometimes isolated but due to the shortage of working staff its impossible to have the nurses for those patients only for instance if the infected patient is only one.

Not only was it about the infected patients, the patients should be put in wards according to their status. The healthy ones with only just the surgical wound should be in the same room and those with a history of infection even though at the time there is no infection should be kept in a different room. The isolation will enable the healthy patients healing process to be faster and less work for the nurses and therefore an early discharge.

Emergency surgeries

A patient from a car accident, a fire accident or fighting where he /she have multiple fracture, needs to be taken for an emergency surgery. The nature of injury will determine how fast the patient needs an operation.

“Patients who come straight from a car accident or have unknown bleeding go to the operating room as soon as possible, this can be an advantage as it can hinder the operating room officials to follow aseptic rules”.

“If it can be avoided, a patient should not be taken to the ward before surgery then to surgery and after to the ward. Some patients get infected in the ward before the surgery”.

There seemed to be a contrast in the issue of a patient being taken directly to the operating room and first waiting in the ward for an appropriate time to have a surgery. Some of the nurses argued that waiting in the ward causes infection and others argued that if the surgery is done immediately a patient is received some aseptic measures cannot be followed and this might lead to an infection.

Patients awaiting surgery and being nursed in the ward can get infected during the nursing process in the ward. Nurses taking care of these patients are the same nurse taking care of the infected patients. If the nurses don't follow the aseptic rules as it should be the patient awaiting surgery might get infected during the waiting time. They all agreed that it depends on how the patient is handled that will conclude or increase the chances of an infection.

10 DISCUSSION

Nursing research is focused on the generation of new knowledge. The information discovered through rigorous research methods assist nurses in the development, implementation and evaluation of nursing interventions (Wood and Haber, 1994, 482).

Data from qualitative research are subjective and incorporate the perceptions, beliefs of the researcher and the participants (Bennet 2002). The researchers had an aim of getting "first hand" information from the nurses who will be of help to them and also to the patients as it will assist in decreasing and at the same time identifying the causes of surgical site infections. Even though death is rare after orthopaedic operation, orthopaedic surgeons operate on a diverse group of patients and many of these patients have concomitant medical problems (Bhattacharyya, Timothy, Iorio, Richard, Healy and William, 2002). Writing this research has made the researchers aware of the causative agents of surgical site infections and at the same time the preventive measures to take to prevent re infection.

Wood and Haber (1994, 483) further state that the purpose of qualitative research is to describe or explain a phenomenon or culture and because the goal is not to predict or control the findings, qualitative findings are used differently as the research is generalised to a smaller group. The researchers' main themes were discovered and from the themes no new information aroused. Repetition of the same information was

one thing the researchers were avoiding and this limited them to having their own conclusion.

From the results and time provided for the research, the nurses seemed to be rather shy and half willing to participate. The researchers were limited on ways of motivating the participants (example giving the participants coffee coupons) as they were limited on time and also financial status. Not every research is successful and a qualitative research is based on evidence based results therefore the researchers had to work on the results they had received.

Since the researchers were interviewing nurses who were dealing with surgical site infections most of the time, it could be seen from their answers that they were aware of the research and were well educated on how to handle the situation and one of the nurse said there was a need for advanced knowledge about the risks of infection.

At the same time, the nurses did not point out about after discharge what they thought also caused the infections, the information was limited to within the hospital and this proved that nurses dealt with patients only during hospital stay and after discharge it was up to the patient to find out what to do. Even though the interviewees pointed out on information to the patients, they did not clarify on diversity of after discharge information. It shows that nurses had education on their responsibilities but putting the information into practice was not observed.

The prevention methods that this research brought up are simple and adaptable. All of the prevention methods are easy to be carried out in hospitals, home nursing or in other health care facilities. In our opinion the prevention methods are very broad, and if they were put into practice, most of the surgical site infections could be prevented. The only remaining issue is to ask how the nurses practice what they know in the prevention of SSI's.

In conclusion, the results of the research shows that Surgical site infections could be managed by providing a perfect healing environment for the patient. If only the priority of preventive work was higher and the nursing staff would actually use and put into practice the knowledge they have on prevention of surgical site infections. Nurses seem to have a key role in the preventive work as they deal with the patients

on a daily routine in educating and ensuring they have a conducive atmosphere before, during and after surgery .

The purpose of the research was to find out the nurses views on the prevention of surgical site infections and most of them came up with the following:

1. Aseptic Technology is essential in infection transmission management. This controls infection when used systematically.
2. Proper nutrition maintains, promotes, supports wound healing and tissue repair eliminating or minimizing complications associated with malnutrition and delayed wound healing.
3. Patient with prolonged previous diseases also seemed to be a major issue for the healing of the surgical wound, therefore a different approach was followed when dealing with such particular patients.

This clearly shows that there were no recent preventive methods of surgical site infection clearly shown from the literature review and interviews, but with the growing need for infection control education which was achieved by holding learning meetings to teach the health care members ways of handling developing situations on infection control and hygiene.

11 IMPLICATIONS FOR FUTURE RESEARCH

The research was conducted on the basis of personal interest, curiosity and suggestion from nurses but from the result obtained, it has proven itself to be of advantage and helpful and the need for further research required.

The participants turn out was not as anticipated and the information was very brief, a further research on the same basis will be helpful if tackled from different perspective. The same topic can be researched from the operating theatres to also find their view. At the same time, post operative patients can be interviewed on what information they receive after the surgery if it's enough to actually help them cope with the surgical wound or if there's need for further information.

Surgical site infection is a very wide topic and can be tackled from different perspectives. A research on cleaning and handling of the sterile equipments also

would be another angle to research on surgical site infections as it is impossible to discover exactly where infections arise.

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APPENDICES

Appendice 1: Introduction Letter

Keski Suomen Keskussairaala,
Keskussairaalantie 19,
40620, Jyväskylä.

TO WHOM IT MAY CONCERN

RE: LETTER OF INTRODUCTION

We are third year students at the Jyväskylä University of Applied Sciences studying a Degree programme in Nursing. Following the completion of our studies we are required to carry out a research for our Bachelors Thesis, Thus we kindly request for your approval and assistance on the same. Our Bachelor's Thesis topic is "*Nurses views on causes and prevention of Surgical Site Infection SSI's.*"

The research was suggested by some nurses and further interest came into picture when we were doing our perioperative practical training and discovered out of approximately 20 surgeries, three were post operative infection.

Our main purpose of doing this research is to find out the awareness of trauma and orthopedic nurses on surgical site infections and how they have participated in preventing the SSI's and their recurrence. The research will be conducted in interview form with the use of a tape recorder. The interviews will be conducted between week 9 -10, during working hours and it will take 30-45mins for each participant.

The research requires 6 to 10 participants and it is based on voluntary basis, whereby the interview process will be conducted in English. The participants are required to sign a consent form that they are willing to participate in the research interview. The participants may contact the researchers if they have any questions or concerns about the research methods.

Confidentiality of the process will be highly maintained and the data collected will be disposed off appropriately after transcription. The finished report will be sent to the ward and will be available for the nurse's further education purposes.

We sincerely thank you for your participation.

Yours,

Eunice Odhiambo and Zainab Kangau.

E mail: D6006@jamk.fi , D1509@jamk.fi

Appendice 2: Letter of participation

Keski-Suomen Keskussairaala
Keskussairaalantie 19
40620 Jyväskylä

Eunice Odhiambo & Zainab Kangau,
JAMK School of Health and Social Studies,
Keskussairaalantie 21 E,
FI-40620 Jyväskylä

RE: PARTICIPATION IN THESIS RESEARCH

Dear Sir/ Madam,

We are third year students of the above named school and kindly request participants for our thesis research. The thesis is about **Surgical Site Infection**.

Our research topic is Nurses views on causes of surgical site infection (SSI) and prevention.

The main purpose of the research is to find out the opinions of trauma and orthopedic nurses on how surgical site infections (SSI's) arise and what they are doing to prevent them.

We would require your name and signature as an approval of participation in the research.

Yours sincerely,

Odhiambo and Kangau

NAME

SIGNATURE.....

Appendice 5: Factors influencing surgical infection rates.

Patient Variables.

Anxiety
 Age
 Hydration
 Obesity
 Presence of existing chronic infection
 Immunosuppressive drugs
 General physical condition
 Skin condition
 Nutritional status.

Preoperative care

Invasive procedures (cannulation, catheterization)
 Length of hospitalization
 Skin preparation shaving/clipping/showering/bathing
 Time interval between skin preparation and surgery
 Prophylactic use of antibiotics

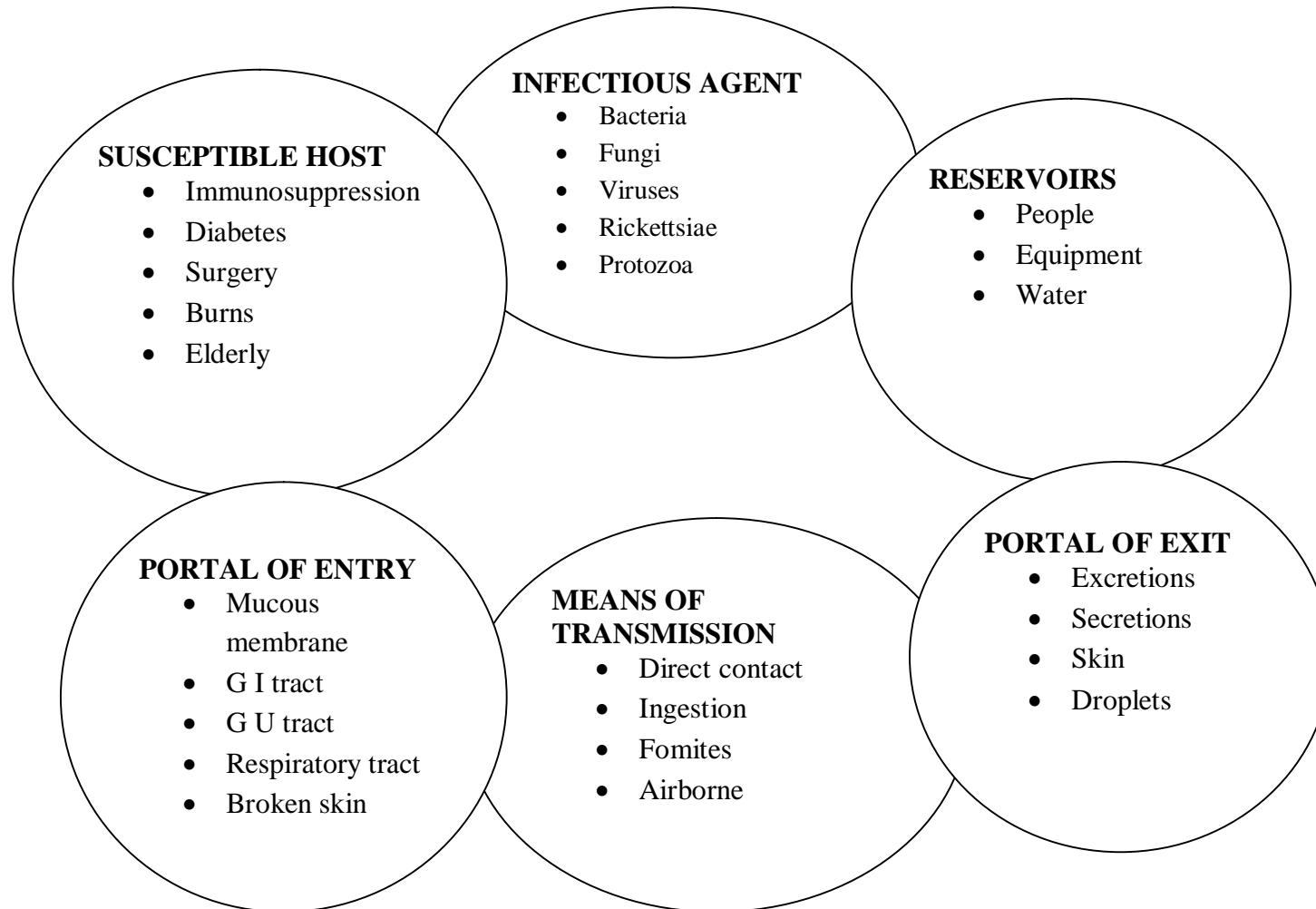
Operative Procedure

Degree of contamination during surgery
 Type of surgery
 Surgical technique
 Duration of surgery
 Skin-closure techniques
 Extent of tissue loss
 Trauma to tissues during surgery
 Skin cleansing in theatre

Postoperative Care

Adequate wound drainage
 Application of principles of asepsis
 Postoperative antibiotic therapy for high risk-patients
 Patient compliance
 Hand washing techniques
 Mobility and pain control
 Appropriate management of wound dressings'
 Early discharge

Appendice 6: Infection transmission.



Appendice 7: Infection transmission interventions.

Infectious agent

- Rapid accurate identification of organisms

Susceptible host

- Treatment of underlying diseases
- Recognition of high risk patient

Portal of entry

- Aseptic technique
- Catheter care
- Wound care

Means of transmission

- Hand washing
- Sterilization
- Standard precautions
- Airflow control
- Food handling
- Isolation

Portal of exit

- Hand washing
- Control of excretions and secretions
- Trash and waste disposal

Reservoirs

- Employee health
- Environmental sanitation
- Disinfection/sterilization.

Appendice 8: Data analysis Summary

