PREVENTION OF SURGICAL SITE INFECTION FOR PATIENTS UNDERGOING TOTAL HIP ARTHROPLASTY: EVIDENCE-BASED NURSING

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ABSTRACT

Surgical site infection in patients after a total hip arthroplasty can lead to severe complications including sepsis, joint dislocation, and delayed hospital stay required for a secondary operation. Prevention of infections is the best practice because it can lead to the surgery desired outcomes while providing patients with high quality health care.

The objective of the study is to summarize all guidelines related to the prevention of surgical site infection for patients undergoing total hip arthroplasty. The researcher provides eight guidelines extracted from the Mahidol University database. These guidelines were appraised by AGREE II for their reliability, validity and applicability. The main activities recommends authors taken from the guidelines include; 1) perform skin preparation at preoperative phase using antiseptic solutions, 2) administer antibiotics at the preoperative, intraoperative, and post-operative stage as a precaution, 3) ensure the cleanliness of environment, equipments, and health care personnel during the operational procedure, 4) regularly assess signs and symptoms of surgical site infection, 5) perform continue observation in an effort to early detect infections and administer proper treatment, and 6) encourage patients and families to engage in preventive measures to decrease the chances of infection.

It is recommended that the main activities extracted from the evidence should be synthesized and applied to develop an evidence based guideline for the prevention of surgical site infection among patients who have undergone total hip arthroplasty in Bangladesh. Moreover, the guideline should be implemented in clinical setting and evaluated for its effectiveness.

KEY WORDS: SURGICAL SITE INFECTON / TOTAL HIP ARTHROPLASTY / EVIDENCE BASED NURSING / PREVENTIVE GUIDELINE /

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CHAPTER I
INTRODUCTION

1.1 Background and significance of the clinical problem

Total hip arthroplasty is a common orthopedic surgical procedure in aging populations. More than 1 million arthroplasty procedures are done every year worldwide (Pivec, Johnson, Mears, & Mont, 2012). Total hip arthroplasty, or surgical replacement of the hip joint with an artificial prosthesis, is a reconstructive procedure that has improved the management of these diseases of the hip joint that have responded poorly to conventional medical therapy. It is a procedure whereby the diseased articular surfaces are replaced with synthetic materials, thus relieving pain and improving joint kinematics and function. It is an orthopedic procedure that involves the surgical excision of the head and proximal neck of the femur and removal of the acetabular cartilage and subchondral bone (Erens, Thornhill, & Katz, 2014). When a sterile techniques is not strictly used during the surgical procedure with inadequate sterilization of equipment specially used of implant and lack of adherence to aseptic technique have been associated with outbreaks of surgical site infections (The Association for Professionals in Infection Control and Epidemiology, 2010).

Infection is one of the main complications found among patients undergoing total hip arthroplasty. These infections bring major complications to a patient's life. A prospective study was conducted in England, Wales, Northern Ireland and the Republic of Ireland, and the data showed the overall prevalence of health care associated infection (HCAI) to be 7.59% and some of this was surgical site infection (Humphreys, 2009). Moreover, the study showed that the global estimates of surgical site infections varied from 0.5 to 15% (Nwankwo, Ible, & Enabulele, 2012). A high incidence is found in developing countries where standards of patient care are limited. Surgical site infections among patients receiving total hip arthroplasty occur in the early days after the operation. The infection starts at the surgical wound, surrounding

tissues, muscle and fascia. In the advanced stages, the patients' prosthesis becomes infected.

1.1.1 Definition and classifications of surgical site infections among patients receiving total hip arthroplasty

A surgical site infection is infection that occurs after surgery in the part of the body where the surgery took place. Most of the patients who have surgery do not develop an infection. However, infections develop in about 1 to 3 out of every 100 patients who have surgery. Another evidence stated that when infections occurring up to 30 days after surgery (or up to one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site (Owens & Stoessel, 2008). They are significant hospital acquired infections found among postoperative patients, particularly patients with hip arthroplasty. The Center for Disease Control and Prevention (CDC), National Healthcare Surveillance Network (NHSN) classifies surgical site infections into the following three stages (Anderson, 2011; Burton, 2007):

1.1.1.1 Superficial incisional surgical site infection refers to a surgical site infection occurring within 30 days following surgery. The infection involves only the skin or subcutaneous tissues of the incision and meets at least one of the following criteria: a) Purulent drainage, with or without laboratory confirmation, from the superficial incision; b) Organisms isolated from an aseptically obtained culture from the superficial incision; c) The presence of at least one of the following signs or symptoms, pain, localized swelling, erythema or heat; d) Diagnosis of superficial incisional surgical site infections by the surgeon (Anderson, 2011).

1.1.1.2 Deep incisional surgical site infection involves deep soft tissues surrounding the incision, including fascia and muscles, meeting at least one of the following criteria: a) Purulent drainage from the deep incision; b) A deep incision that spontaneously dehisces when a patient has one or more of the following signs/symptoms: fever, localized pain; c) An abscess or other evidence of infection is found on direct examination, during repeat surgery, or by histopathologic or radiological examination; d) Diagnosis of deep incisional surgical site infections by the surgeon (Anderson, 2011; Burton, 2007).

1.1.1.3 Organ/space surgical site infection involves any part of the organs or organ spaces that are opened or manipulated during an operation (patients' hip joint) and at least one of the following: a) Purulent drainage from a drain that is placed through the incision into the organ/space; b) Organisms isolated from an aseptically obtained culture from the organ/space; c) An abscess or other evidence of infection involving organ/space that is found upon examination (physical, histopathologic or radiological) or during repeat surgery; d) Diagnosis of an organ/space surgical site infection by the surgeon (Anderson, 2011; Burton, 2007).

All classifications of surgical site infections occur within 30 days. Among patients with total hip arthroplasty, however, the organ/space infection occurs in the delayed stage within one year. Following total hip arthroplasty, patients who develop late stage surgical site infections require re-operation to remove the infected tissues and prosthetic joint (Poultsides et al., 2013)

1.1.2 Incidence of surgical site infection among patients receiving total hip arthroplasty

Surgical site infection is a worldwide clinical problem. According to the National Nosocomial Infection Surveillance (NNIS) system and the Center for Disease Control (CDC), surgical site infection accounts for 14% -16% of all infections among hospitalized patients in the United States (USA) and leads to increased length of hospital stay and medical expenses. Surgical site infection is commonly encountered among patients receiving total hip arthroplasty. The United Kingdom (UK) and Sweden show lower incidence rates of surgical site infection among patients with total hip arthroplasty ranging from 2% - 6.2% (Rajpura & Board., 2013). In Norway, approximately 22.5% of all postoperative total hip arthroplasty patients suffered from surgical site infection (Poultsides et al., 2013). In Northwestern Nigeria, surgical site infection ranged from 14% - 16% (Nwankwo, Ibeh, & Enabulele, 2012). According to the World Health Organization (WHO, 2012), current information shows that 45-70% of global hip fractures will occur in Asia by 2050 due to the growth of the elderly population. Therefore, it is expected that the rate of surgical site infection will be increased among this group of people. Other studies have supported the prevalence of *staphylococcus epidermis* and *staphylococcus aureus* as the primary pathogen in total

hip arthroplasty surgery infections of the *staphylococcus species*, and 76% of all isolated, gram positive organisms. In developing countries such as India, Pakistan, Nepal, Turkey, and Iran, the incidence rates of surgical site infection among patients receiving total hip arthroplasty are higher, ranging from 5.5 % - 25% (Desa, Sathe, & Bapat, 2008).

In Bangladesh, there is no single study available on surgical site infections among patients with total hip arthroplasty. Only a few studies have been conducted in recent years among patients undergoing general surgeries. According to the findings, 31.7% of patients who did not receive any antiseptic skin preparation suffered surgical site infection, while only 27.5% of patients received antiseptic (chlohexidine) skin preparation (Faruquzzaman, Mazumder, Haque, & Akter, 2011) suffered such infections. One study conducted in the Sher-e-Bangla Medical College Hospital (SBMCH) found the incidence rate to be 28.49% (Parvin, Mondol, & Begum, 2012). In Comilla Medical College Hospital, the average incidence rate was 22.05% (Islam, Akhter, & Sickder, 2007). Another study conducted in two medical college hospitals by Saha and Ashrafuzzaman in 2008 indicated the overall surgical site infection incidence rate to be 11.1% (Saha & Ashrafuzzaman, 2008).

1.1.3 Pathophysiology of surgical site infection

Surgical site infections are usually caused by bacteria. However, some studies have shown that fungi are the microorganisms leading to infection (Fry & Fry, 2012). Microorganisms manufacture toxins and other substances that enhance the capacity to attack a host, create damage inside the host, or live on or inside the host's tissue. These microorganisms inhibited oxygen supply to the cells on the affected area. Moreover, growth is impaired in the host's immune system with diminished neutrophil function. Signs and symptoms of pain, swelling, redness, tenderness and warm temperature occur (Sandiford & Skinner, 2009). Owens and Stoessel (2008) reported that gram-negative bacteria create endotoxin and stimulate cytokine production. Then cytokines trigger the systemic inflammatory response syndrome leading to sepsis and multiple system organ failure. In addition certain strains of clostridia and streptococci produce potent exotoxins that interrupt cell membranes and alter cellular metabolism (Owens & Stoessel, 2008; Anderson, 2011).

Normally, the skin can protect human from infection. It prevents microorganisms from invading the human body. When skin incisions are performed during surgery, the skin and epithelial layers are injured. This skin breakdown could lead to translocation of microorganisms from the skin to the patient's tissue and blood circulation. In addition to these mechanical barriers, there are other protective mechanisms including chemical substance, hormonal, immune, white blood cells and cellular barriers. However, several factors lead to decreased body resistance to infection (Seibert, 1999). Patients with nutritional insufficiency might have inappropriate and delayed wound healing as well as abnormal inflammation process. Poor nutrition results in impaired fibroblast proliferation, and prolonging inflammation which can be recognized clinically. These patients have delayed wound healing because they do not have adequate levels of glucose, oxygen or proteins supplied to the surgical site tissues. The immune-compromised patients who receive cortisone or immune-suppressive agents such as glucocorticoid steroids are also at high risk for infection (Mangram et al, 1999). Steroids prevent or suppress the inflammatory processes of surgical wounds. Uraemia and jaundice, disseminated malignancy and Acquired Immune Deficiency Syndrome (AIDS) iatrogenic causes immune-suppression caused by radiotherapy, chemotherapy or steroids, which are other contributors to infection. When enteral feeding is suspended during the perioperative period, bacteria tend to colonize the normally sterile upper gastrointestinal tract. These may then translocate to the mesenteric nodes and cause the release of end toxins. Macrophages increase susceptibility to infection and sepsis through the activation of pro-inflammatory cytokine release. The use of Selective Decontamination of the Digestive tract (SDD) is based on the prevention of this colonization. This can easily lead to surgical site infection (Seibert, 1999).

1.1.4 Risks factors contributing to surgical site infections among patients receiving total hip arthroplasty

Three main factors contribute to risk for surgical site infections in patients with total hip arthroplasty. These include patient factors, surgical wound factors and microbial factors (Seibert, 1999).

1.1.4.1 Risks Related to Patient Factors

Patient factors refer to any conditions occurring prior to the surgery, including patients' co-morbidities, preoperative nutritional status, body mass index, and utilization of immunosuppressive drugs and patients' age (Nutt, Papanikolaou, & Kellett, 2013). A number of studies have shown diabetes mellitus to be an important risk in the host's ability to control bacteria or normal skin flora settling into the incision during surgery (Richards, Kauffmann, Zuckerman, Obremskey, & May, 2012). While there is insufficiency of glucose, oxygen, or proteins supplied to incision tissues, delayed wound healing occurs. Surgical site tissues receiving inadequate oxygen and nutrient supply will become ischemic and become susceptible to infection (Nwankwo et al., 2012; Poultsides et al., 2013; Pruzansky et al., 2014). Poor preoperative nutritional status results in impaired fibroblast proliferation and leads to prolonged inflammation and wound infection. Patients who receive glucocorticoid steroids or any immunosuppressive agents demonstrate diminished glucose utilization in adipose tissue, fibroblasts, skin, thymocytes and polymorphonuclear leukocytes. The resulting increased protein breakdown and lipolysis consequently yields catabolic effects, including atrophy of lymphoid tissues, decreased muscle mass, negative nitrogen balance and thinning of the skin. These interfere with mediators of the inflammatory response and suppression of humoral immune responses. Patients, therefore, are prone to infections. Obese patients have increased the risk for poor wound healing and wound closure resulting in incision dehiscence (Seibert, 1999; Nutt et al., 2013). The explanation is that the thick adipose tissues of obese or morbid obese patients possess a problem in adequately suturing tissues to maintain the close integrity of layered wound edges to promote rapid epithelialization (Namba, Inacio, & Paxton, 2012). As a result of this condition, obese patients are at high risk for surgical site infections.

Another patient factor related to surgical site infection is increased age. When patients age, the immune system develops deteriorated function. This deterioration includes atrophy of the thymus, decreased ability to amount a delayed-type hypersensitivity to various stimuli and a generalized decreased ability of lymphocytes to respond to foreign stimuli (Owens & Stoessel, 2008; Nwankwo et al., 2012). Similarly, the study of Dale et al. found patients older than 80 years of age to

also be at higher risk for surgical site infections among patients with total hip arthroplasty than those who were under 60 years of age (Dale et al., 2011).

1.1.4.2 Risks Related to Wound' Factors

Wound-related factors include the extent of tissue injury during surgery, devitalization of tissues, presence of dead space and hematoma size. The study of Pivec et al. revealed patients with longer surgical times to be at risk for infection (Pivec et al., 2012). The presence of surgical drains from the surgical area may become a barrier to oxygen diffusion and serve as an excellent medium for bacterial growth resulting in prolonged inflammation and infection (Namba et al., 2012). Tissue damage from incision and manipulation of the wound induces changes in the host's immune system by impairing neutrophil function and serum opsonizing capacity. The prosthetic joint is considered a foreign material in potentiating wound infection and leading to chronic inflammation of the host tissues (Richards et al., 2012).

1.1.4.3 Risks Related to Microbial' Factors

Microbial-related factors refer to any type of microorganisms leading to surgical site infections. Microorganisms are a part of the human skin but can cause infection to incisions if preoperative skin preparation is not performed well. Moreover, 20% of skin-associated bacteria localized in hair follicles and sebaceous glands increase the risk for infection. Transection of the skin structures may bring the patient's skin bacteria deep into the wound and consequently lead to infection (Pivec et al., 2012).

Patients' endogenous flora at the time of surgery is the most common mechanism inducing infection. In patients with total hip arthroplasty, the prosthetic joint could act as substrata increasing bacterial adhesion and proliferation. The adhering bacteria form an extracellular slime or glycocalyx protecting the bacteria from antibiotics and host defenses (Namba et al., 2012).

1.1.5 Impacts of surgical site infections

Patients who develop surgical site infection will have effects on physical, psychological and socio-economic status. The orthopedic patients usually receive

treatment and nursing care from unfamiliar people. Hence, they develop some uncertainty about treatment and outcome (Mangram et al., 1999). Patients with surgical site infections require longer hospitalization and the median duration of hospitalization in infected patients is 11 days compared to 6 days in uninfected patients (Owens & Stoessel, 2008). In deep infected patients' dependence on others results in less confidence (Pruzansky et al., 2012). Death from Thromboembolic events typically occurs in the first few weeks after surgery (Nutt et al., 2013). The cost of care depends on severity, significant clinical problems involving not only morbidity and mortality but also financial problems (Fry & Fry, 2007). Patients and their families have to pay a great amount of money for treatment of surgical site infection. According to a study in the USA, hospitalized infected patients in cure extra costs about 24,344 US dollars compared to 6,636 US dollars in uninfected patients. European university hospital researchers found patients with surgical site infections to have longer hospital stays of up to 16. 8 days with additional medical expense amounting to as much as 11,586 US dollars (Islam, Akhter, & Shikder, 2007). Other evidence has shown that surgical site infections result in 7.3 extra days of hospitalization after surgeries and require extra charges amounting to 3,152 US dollars (Faruquzzaman et al., 2012).

1.1.6 Prevention of surgical site infections among patients with total hip arthroplasty

Surgical site infections can be prevented at the preoperative, intra operative and postoperative phases. Darouiche et al (2010) conducted an experimental study to evaluate the effectiveness of antiseptic showers before total hip arthroplasty. Patients were divided in two groups, one group received providone iodine cleansing and another group received chlorhexidine–alcohol cleansing. According to the findings, the overall rate of surgical site infection was significantly lower in the chlorhexidine–alcohol group than in the providone–iodine group. This finding was supported by CDC guidelines showing that preoperative antiseptic showers and chlorhexidine reduced bacterial colony counts. The explanation was that chlorhexidine gluconate-containing products require several applications to attain maximum

antimicrobial benefits. Hence, repeated antiseptic cleansing is said to reduce surgical site infection (Mangram et al., 1999).

According to the standard guidelines on surgical site infection in patients with total hip arthroplasty, the preventive measures are comprehensive and cover the preoperative, intraoperative as well as the postoperative period. Recommends emphasized on the provision of prophylactic antibiotics, patients' skin preparation, intraoperative environmental control and infection control after the operation (Smith & Dahlen, 2013; Ricciardi et al, 2014).

1.2 Clinical problem of the study

Surgical site infections are infections occurring up to 30 days after surgery (or up to one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site (Owens, & Stoessel, 2008). The author works at the National Institute of Traumatology & Orthopedic Rehabilitation Center (NITOR). It is the leading post-graduate institute of orthopedic service and training of orthopedic surgeons, nurses and physiotherapists in the country. There are increasing numbers of accidents and injury patients with the highest referral center for orthopedics patients. The facility has 500 beds with 293 nursing staff members, 90,208 yearly OPD visits, 40,783 emergency visits and 19,343 total admissions. The total number of patients admitted to the hospital in 2012 was 17,323. At any given time, 30% of all beds in the district and Thana hospitals are occupied by trauma patients where the mortality rate was 15.67%, the bed occupancy rate was 87.96% during the aforementioned year (Health Bulletin, 2012).

Many patients come to this hospital with different traumatic injuries. In Bangladesh, many patients suffer with this issue. Most of the patients suffer from surgical site infections. In the conditions of the author's clinical setting and in the author's work experience, nearly all patients have inadequate knowledge about infection. They do not know how to prevent infection. In the aforementioned setting, patients are allowed visitors in every department, except the operation theater. A number of factors affect surgical site infection such as caregivers' inadequate knowledge about infection, including poor nutritional condition, inadequate personal

hygiene, improper use of antibiotics and use of unsterile dressing materials. Patients suffer from inflammatory disease, osteoarthritis, femoral head necrosis; implant related factors and poor surgical techniques. Males are more likely to be affected by surgical site infection than females. Patients with different types of cancer, patients suffering from liver disease, hematological factors, coagulopathy, electrolyte imbalance, congestive heart failure, and pulmonary circulatory disorders are also more likely to develop infections. Other evidence has found that nurses do not provide education for their patients about prevention of surgical site infection and 100% nurses do not follow evidence-based guidelines to prevent surgical site infections. Most of the patients come from remote area their socioeconomic condition not so good. They have not enough knowledge about take care of arthroplasty patients. Recurrent infection and excess readmission rates lead to loss of hospital resources, long-term bed occupation, nurses' workload and increased hospital burden. Routine care provided in the author's hospital includes saving and preoperative cleaning at the incision site, hand washing before handling patients. Intra-operative periods: patients washed with providone, use of sterile sheets, autoclaved metallic instruments and surf equipment disinfected by keeping in savlon antiseptic fluid. During the post-operative period, all postoperative patients are shifted to the post-operative ward, given antibiotics and use separate syringes. Patients suffer surgical site infection in which many complications are developed such as pulmonary embolus, vascular injuries, peripheral nerve injuries, periprosthetic fractures, muscle stiffness, profuse blood loss, joint immobility, deformity, deep vein thrombosis (DVT), dysfunction of the deltoid muscle and amputation in some patients. According to Ricciardi et al., (2014) the pre-intervention surgical site infection rate is 0.45%. After intervention, the same rate was 0.19%. The above evidence reveals that the use of evidence-based guidelines can reduce the rate of infection with cost-effective methods of preventing surgical site infections to promote early recovery.

Thus, evidence-based guidelines are important in reducing infection in the author's clinical setting. Some of the aforementioned barriers include deficient evidence-based practice, knowledge and skills; labor shortages and other resources in searching for and applying evidence-based care, no information due to the absence of professional journals, no administrative support or incentives, no evidence-based

practice mentors and heavy patient loads. In the author's country, nurses at this hospital have no special training in the prevention of surgical site infections and how to care for patients properly in the surgical unit. Moreover, nurses are unable to pay attention to patients' instructions properly due to shortage of time cause by patient overcrowding as well as a shortage of nursing staff. Improving quality care can reduce surgical site infection rates and patient overloads in hospital through evidence-based nursing practice. According to the above information, the most important issue is to reduce nurses' workloads as well as hospital burdens. Preventing infection can reduce hospital and family burden while also saving money. However, without proper guidelines and evidence-based practice surgical site infection cannot be prevented. By applying evidence-based practice, better outcomes can be achieved by using minimal resources.

For this reason, specific guidelines are essential to preventing infection among patients and providing cost-effective nursing care through evidence-based practice. According to the review of previous literature, the author found many evidence-based guidelines for the prevention of surgical site infection among patients receiving total hip arthroplasty. Accordingly, the author would like to analyze and synthesize these guidelines and summarize the recommendations to use as guidance for clinical practice in the authors' setting.

1.3 Purposes of the study

To summarize current evidence-based guidelines for the prevention of surgical site infection among adult patients undergoing total hip arthroplasty.

1.4 Expected benefits of the study

The recommendations from the evidence can be used to develop an appropriate nursing practice guideline for the prevention of surgical site infection among adult patients undergoing total hip arthroplasty in Bangladesh.

CHAPTER II
METHODOLOGY

The main purpose of the study was to summarize current evidence based guidelines for the prevention of surgical site infection for patients undergoing total hip arthroplasty. The author set search strategy to search and select the evidence. Relevant evidences were appraised for their quality and feasibility by considering setting and situation, health care resources, and patient preferences and values. This chapter described the search strategy, appraisal methods and level of evidence.

2.1 Search Strategy

2.1.1Search frame work ; The author searched related evidence by following PICO format (Melnyk & Fineout-Overholt, 2011).

P (Patients or population) = Patients undergoing total hip arthroplasty

I (Intervention) = Prevention of surgical site infection

C (Comparison intervention) = usual care

O (Outcome) = surgical site infection

2.1.2 Scope of searching

2.1.2.1 Key words used in this study are described as follow;

The search used a Boolean operator. For each PICO element, the author collected any synonym by linking term with “OR”, then located citation that are relevant to all the PICO elements by linking with “AND”. Key words used in the following ways.

P (Population) = patients undergoing total hip arthroplasty/ total hip arthroplasty in aging population/

total hip
arthroplasty in adult patients/ orthopedic surgery

I (Intervention) = prevention of surgical site infection/ Prevention of infection/ surgical site infection

C (Comparison) = standard care /usual care

O (Outcome) = surgical site infection/ infection of arthroplasty/ post-operative infection of arthroplasty

2.1.2.2 Databases /sources used for searching: The author searched into electronic database of Mahidol University library system. The databases used included Pub Med, Science Direct, Cumulative Index of Nursing and Allied Health (CINAHL), Ovid Full Text, and Springer Link. The author also conducted a searching on the websites that hold national and international guidelines.

2.1.2.3 Type of evidence: The author searched for international and national guidelines published in English and distributed on line in the selected databases between the years 2010 - 2014 were selected.

2.2 Appraisal method and levels of evidence

The author selected the guidelines for appraisal that were scientific, evidence-based, match with real clinical setting, and published form 2010 to 2014. The guidelines were evaluated by AGREE II appraisal method (AGREE II Next Steps Consortium, 2009). The appraisal method by using AGREE II consist of 6 domain with 23 key items the domain are as follows:

Domain 1 Scope and Purpose,
Domain 2 Stakeholder involvement,
Domain 3 Rigor of Development,
Domain 4 Clarity of Presentation,
Domain 5 Applicability,
Domain 6 Editorial independence.

In this whole appraisal includes score for quality of the guidelines and whether the recommendations would be suggested for use in practical setting. The key items are rated on a position scale, 1= (Strongly Disagree) and 7= (Strongly Agree). A score of 1 is given when there is no information on that item or if it is weakly reported. A score of 7 is given if the quality of coverage is excellent and when full criterions have been met (in the User's Manual). This AGREE II refers to validity, reliability and applicability of the guidelines. The principle of the tool is to differentiate between higher and lower quality of guidelines. Items in each domain of the AGREE II appraisal instrument are described below;

Domain 1. Scope and Purpose

1. The guideline was specifically described the overall objectives
2. The health question was covered and specifically described
3. The guideline was described specific population, patients, or public.

Domain 2. Stakeholder Involvement

4. The guidelines development committee includes from all related professional.
5. The preferences and views of the guidelines for target population.
6. The guideline was clearly defined for target users.

Domain 3. Rigour of Development

7. The guideline has been used to pilot study.
8. Systematic methods used for searching the evidence.
9. Authors were clearly described the strengths and limitation of evidence.
10. The recommendations were clearly described in the evidence.

Domain 4. Clarity of Presentation

11. The side effects, risks, and health benefits, have been measured for making the recommendations.

12. There is link between supporting evidence and the recommendations.
13. The guideline was reviewed by experts before publication.

14. Authors were followed the process for updating the guideline.

15. The recommendations were unambiguous and specific.

16. The health issue was clearly presented in the different options of management.

17. Easily identify the Key recommendations.

Domain 5. Applicability

18. The guidelines provides advice for recommendations how to apply and change in domain.

19. The facility and barriers was describes to its application.

20. Implications of the possible resource and applying the recommendations have been measured.

21. The guideline was presents the monitoring or auditing criteria.

Domain 6. Editorial Independence

22. The content of the guidelines have not influenced by funding body.

23. The guideline development group members have been competing interests recorded and addressed.

CHAPTER III
FINDINGS

In this chapter the search results and summary of evidences will be described in order to elaborate the activities or measures to prevent surgical site infection among patients undergoing total hip arthroplasty. Details are presented as following;

3.1 Search results

The author was found 18 guidelines searched in the electronic 5 database of Mahidol University than excluded 10 guideline, because most of the guideline were not match in contents. Finally author selected 8 practice guidelines that contents are very relevant in this study. Those guidelines were appraised by AGREE II for their reliability, validity and applicability. List of evidences used in this study showed in table 3.1

Table 3.1 List of the evidence

No	Authors/year	Title	Type of evidences
1	Institute for Healthcare Improvement /2012.	How-to guide: Prevent surgical site infection for hip and knee arthroplasty	International guideline
2	Merollini, K. M. D., Zheng, H., & Graves , N. /2013.	Most relevant strategies for preventing surgical site infection after total hip Arthroplasty: Guideline recommendations and expert opinion	Consensus guideline

Table 3.1: List of the evidence (Cont.)

No	Authors/year	Title	Type of evidences
3	Ricciardi, B. F., Bostrom, M. P., Lidgren, L., Ranstam, J., Merollini, K. M. D., & W-Dahl, A. /2014.	Prevention of Surgical Site Infection in Total Joint Arthroplasty: An International Tertiary Care Center Survey	Consensus guideline
4	The Association for Professionals in Infection Control and Epidemiology /2010.	Guide to the Elimination of Orthopedic Surgical Site	International guideline
5	Scottish Intercollegiate Guidelines Network /2014.	Antibiotic Prophylaxis in Surgery: A National Clinical guideline	National guideline
6	American academy of Orthopaedic Surgeons. (2010).	Orthopedic Infection Prevention and Control	National guideline
7	Pharm, D., Susan, R., Dombrowski, M. S., &Susan, J., Skledar, B. S./2013 .	Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery	International guideline
8	Smith. M. A., Dahlen, N. R., /2013.	Clinical Practice Guideline Surgical Site Infection Prevention	National guideline

Brief summary of Evidences: Each evidence was read and the contents related to prevention of surgical site infections were extracted and briefly presented.

Number of Evidence 1

1.1 Title: How-to guide: Prevent surgical site infection for hip and knee arthroplasty.

1.2 Authors: The institute for health care improvement Cambridge, Massachusetts, USA.

1.3 Publication source: The US department of health and human services and supported by the American Academy of Orthopedic Surgeons.

1.4 Type of Evidence: National guideline.

1.5 Methodology: systematic searched of selected evidences with expert consensus

1.6 Objective: To provide recommendations on successful prevention activities to prevent surgical site infections in patients undergoing hip and knee arthroplasty procedures.

1.7 Main activities:

1.7.1 Adequate preoperative skin preparation to prevent entry of skin flora into the surgical incision is an important basic infection prevention practice.

1) Preoperative skin preparation of the operative site involves use of an antiseptic agent with long-acting antimicrobial activity, such as chlorhexidine gluconate (CHG) and iodophors.

2)Two types of preoperative skin preparations that combine alcohol (which has an immediate and dramatic killing effect on skin bacteria) with long-acting antimicrobial agents appear to be more effective at preventing surgical site infections than povidone-iodine (an iodophor) alone.

1.7.2 Instruct patients to bath or shower with chlorhexidine gluconate (CHG) soap for at least three days before surgery

1) Chlorhexidine Gluconate bathing or showering substantially reduces the density of microorganisms on skin that can lead to surgical site infections. This is the rationale for the 1999 Hospital Infection Control Practices Advisory Committee (HICPAC) guidelines for prevention of surgical site infections recommendation that patients shower or bathe with an antiseptic agent at least the night before the operative day.

2) Patients may benefit from bathing or showering with chlorhexidine gluconate soap for at least three days before surgery in order to achieve the most benefit.

1.7.3. Screen patients for staphylococcus aureus (SA) and decolonize SA carriers with five days of intranasal mupirocin and bathing or showering with chlorhexidine gluconate soap for at least three days before surgery.

1.7.4 Implementing a hospital-wide prescreening program to identify and decolonize SA carriers prior to elective orthopedic surgery is feasible and can lead to significant reductions in SSI rates.

1.7.5. Procedure face-to-face communication at staff meetings, outreach to surgeons' offices, or telephone calls from opinion leaders to their peers.

6. Engaging the patient and family as partners by providing information and tools to enhance their understanding of and participation in care.

Evidence Number 2

2.1 Title Most relevant strategies for preventing surgical site infection after total hip arthroplasty: guideline recommendations and expert opinion.

2.2 Authors: Merollini, K. M. D., Zheng, H., & Graves , N. (2013).

2.3 Publication source: American Journal of Infection Control, Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane, Queensland, Australia. (retrived from CINAHL)

2.4 Type of evidence: Review of the consensus guideline.

2.5 Methodology: Systematic searched of evidence based guidelines and synthesis by the experts.

2.6 Objective: To prevent surgical site infections in patients with total hip arthroplasty at preoperative, intra operative and post-operative phase.

2.7 Main activities:

This review guideline uses various infection prevention strategies, this activities are divided in three stages as follows;

2.7.1 Perform antiseptic skin preparation of patient: In preoperative period antiseptic skin preparation is more effective. Its reduce skin flora

when perform of surgery in this period better chance of invade of microorganism in the incision site of the skin.

2.7.2 Forearm antisepsis given and hand decontamination of staff: It should be provided all surgical team who perform operation, to reduce infection.

2.7.3 Provide preoperative antimicrobial prophylaxis: Antibiotic should be given before operation because most of the arthroplasty surgeries need to be long time.

2.7.4 Sterile gowns/surgical attire have to be reduce infection in to the intraoperative period

2.7.5 Ultraclean/laminar air operating room to be used: Its provides a localized, optimally filtered, sterile surgical environment to carry out microsurgical procedures and sterile air flow is carried directly on to the operating surface, using laminar down flow technique. The surgical team can move around freely without adversely affecting the sterile field.

2.7.6. During surgeries properly management of incision site, it's should prevent intraoperative infection.

2.7.7. Administration of oxygen: low oxygen carried more chance of infection, so during operation oxygen is most important to prevent infection.

2.7.8.Surveillance: surveillance methods should be used to detect high risk of infection. It should be uses strategies for evaluation.

2.7.9. Nutrition intervention: Adequate nutrition is very important functions in recover of incision site, poor nutritious patients is high risk of infection. It is very essential to identify the risk factors. Provide high caloric food each meal in with regular diet.

Evidence Number 3

3.1.**Title:** Prevention of Surgical Site Infection in Total Joint Arthroplasty: An International Tertiary Care Center Survey.

3.2 Authors/ year: Ricciardi, B. F., Bostrom, M. P., Lidgren, L., Ranstam, J., Merollini, K. M. D., & W-Dahl, A. / 2014.

3.3 Publication source: Hospital for Special Surgery Journal (retrieved from CINAHL)

3.4.Type of evidence: Review of the expert consensus on the recommendations from evidence based guidelines

3.5Methodology: Systematic searched of consensus guidelines and synthesis by the experts.

This guideline provided 28 recommendations that were used to create evidence based surgery of infection prevention strategies by orthopedic surgeon and compared the results between existing consensuses.

3.6 Objective: To identify the most important infection prevention strategies in Total Joint Arthroplasty from existing evidence-based guidelines.

3.7 Main activities are

3.7.1. Antibiotics prophylactic is more effective to prevent surgical site infection.

1) Antibiotics prophylactic has become the standard of care for contaminated and clean-contaminated surgery and for surgery involving insertion of artificial devices.

2) Appropriate antibiotic prophylaxis can reduce the risk of postoperative wound infections, for most parenteral antibiotics this is usually on induction of anesthesia.

3) A single dose of antibiotic is usually sufficient if the duration of surgery is four hours or less. It should give according to volume of surgery.

4) Inappropriate use of antibiotics for surgical prophylaxis increases both cost and the selective pressure favouring the emergence of resistant bacteria

3.7.2. Preoperative skin preparation of patients and staff: Adequate skin preparation of the patients and operative team who perform surgery. Properly uses of chlorhexidine gluconate bathing or showering significantly reduces the microorganisms on the skin

3.7.3. Topical antimicrobial agent uses over surgical incision in intra-operative periods to prevent infection.

3.7 4. Using sterile surgical attire: Its means when use of sterile surgical attire to prevent of infection. Proper aseptic technique is one of the most fundamental and essential principles of infection control in the operative patients.

3.7 5. Preoperative showering with chlorhexidine, and remove of piercings. It may be more benefit from bathing or showering with chlorhexidine gluconate soap before surgery.

3.7.6. Sterile wound dressing for 24-48 hours, and given of antibiotic: Sterile wound dressing means free from microorganisms. It is involves meticulous hand washing, use of a sterile field, use of sterile gloves for application of a sterile dressing, and use of sterile instruments. Sterile technique is considered most appropriate in acute care hospital settings, and certain procedures such as sharp instrumental wound debridement.

7. Blood glucose control in diabetic's patients is very important way to prevent infection.

3.7 7 Ensure the patient is in the best possible condition about normal level of blood glucose for surgery.

1) Enhance the diabetes management including identification of other comorbidities. Ensure that the patient is well informed, understands the treatment options and has realistic expectations about the risks and benefits of surgery and the processes involved.

2) Having had the time and support to consider, the patient can then make an informed decision to proceed with surgery.

Evidence Number: 4

4.1 Title: Guide to the Elimination of Orthopedic Surgical Site Infections

4.2 Authors/ year: The Association for Professionals in Infection Control and Epidemiology (APIC) /2010

4.3 Publication source: The Association for Professionals in Infection Control and Epidemiology, USA

4.4 Type of evidence: International guideline.

4.5Methodology: Consensus of experts.

4.6 Objective: This guideline was to ensure patient safety and optimum patient outcomes, IPs, surgeons, perioperative staff, nurses, and all members of the healthcare team must work together to implement evidence-based practices that minimize the risk of infection.

4.7 Main activities:

4.7.1 Performed the risk assessment**:**

1) Risk assessment and to collect analysis is very important for prevention of surgical site infection. Before starting in this procedure at first develop the risk assessment team, include care giver as well as patients relative who take care the patients.

2) Performing the risk assessment are: It should be remarkable such as volume of surgery, what are the major procedure will do, frequency of in this surgery with readmission rate and major pathogens are identified.

3) Team should collect information and set for assessment. They observe preoperative skin cleansing, skin irritation.

4.7.2 Evaluation of Process Measures: Evaluate current literature and previous developments, It should be easier to compare the previous and presents situations.

4.7.3. Preoperative preparation of the skin: Applied appropriate antiseptic agent(s), and correct application is effective way to preventions of surgical site infections.

4.7.4. Antibiotic prophylaxis criteria including preoperative timing is essentials to prevent surgical site infections.

1) Antibiotics are selected according to postoperative duration. It must reveal local disease with resistance forms

2) Antibiotic prophylaxis criteria including preoperative timing for reach an effective concentration in any particular tissue reflects.

3) Antibiotic selected according to postoperative duration and frequency must be 6-8 hourly, if time is not maintain decrease the effectiveness.

4.7.5. Appropriate hair removal

1) The preparation of people for surgery has traditionally included the routine removal of body hair from the intended surgical wound site. uses of clippers versus razors are easier processes.

2) Timing of the hair removal is need to necessary in arthroplasty surgery, it should remove early in the morning on the day of surgery.

3) Most of the cases are no need of hair removal.

4) Female patient who are undergoing arthroplasty their should instructed not necessary to shave for arthroplasty surgery.

4.7.6 Preoperative Normothermia is need to be patient who will go to arthroplasty surgery.

1) Patients should be keep in cotton blanket, air warming is more effective than cotton or reflective blankets.

2).For preventing hypothermia give intravenous fluid if necessary.

Number of Evidence 5

5.1Title: Antibiotic prophylaxis in surgery A national clinical guideline

5.2 Authors: Scottish Intercollegiate Guidelines Network (2014).

5.3 Publication source: Scottish Intercollegiate Guidelines Networ

5.4.**Tpe of evidence**: National guideline.

5.5 Methodology: Consensus of experts

5.6 Objective: The aim of this guideline is to identify the operations for which routine prophylaxis is supported by evidence and to reduce the incidence of surgical site infection by use antibiotics in a manner that is supported by evidence of effectiveness

5.7 Main activities:

5.7.1.Provide antibiotic prophylaxis cover of all aspect according to volume of surgery with severity of patients.

1) The choice of antibiotic into account local resistance patterns. It should be cover the expected pathogens for that operative site

2) Used single standard therapeutic dose of antibiotic prophylaxis except in special situations such as prolonged surgery, profuse blood loss multiple organ failure.

3).The guideline development group considers that antibiotic therapy for emergency operations with contaminated or dirty wounds is standard therapy rather than prophylaxis. It will be changing the antibiotic of choice for prophylaxis.

4) Antibiotic prophylaxis should be considered for all patients. It must cover the expected pathogens for operative site. Broad spectrum antibiotic less expensive than narrow spectrum, so it is not only reduce infection but also reduce hospital cost.

5.7.2. When patients are identified with *S. aureus* or MRSA they may be used prophylactically intranasal mupirocin for reduce high risk of major morbidity.

1) Clinical record should be help to assess the risk of infection. Minimum data set to give facilitate audit of the appropriateness of surgical antibiotic prophylaxis, it should be legal requirement.

2) All aspects of should be clearly recorded in the case patients where prophylaxis is not given when recommended.

3).In this case the criteria used for risk assessment was recorded of local protocols should clearly identified where to document is patients record such as drug chart, anesthetic chart.

4) Screening for relevant organisms for recorded

Number of Evidence 6

6.1Title: Orthopedic Infection Prevention and control An Emergency New Paradigm

6.2 Authors /year: American academy of Orthopaedic Surgeons. (2010).

6.3 Publication source: March 9 - 12, 2010 New Orleans, Louisiana

6.4 Type of evidence: National guideline.

6.5 Methodology: Consensus of experts

6.6 Objective: To describe increased incidence, severity, and extent of disease caused by drug resistant organisms, prevention and treatment.

6.7 Main activities;

6.7.1. To select appropriate antimicrobial agent such as cephalosporin some patients use clindamycin or vancomycin. If infected or colonized with MRSA1, use vancomycin Cephalosporin, use clindamycin or vancomycin when patients founds ß-lactam allergy, consider preoperative screening for MRSA1 colonization If infected or colonized with MRSA1, use of injection vancomycin intravenously

6.7.2. Antibiotic should be started 60 minutes before incision. Clindamycin should start before 120 minutes of incision. Intravenous completed before tourniquet inflation using postoperative doses within 24 hours after that it should be discontinue.

6.7.3. Double dose antibiotics will give when patients significant blood loss in prolong duration of surgery, or major operation according to severity of surgery.

Evidence Number 7

7.1 Title: Clinical Practice guidelines for antimicrobial prophylaxis in surgery.

7.2 Author/year: Pharm. D. Susan R. Dombrowski, M. S., &Susan J. Skledar, B. S./2013.

7.3 Publication source: The American Society of Health-System Pharmacists

7.4 T**ype of evidence:** International guideline.

7.5 Methodology: Consensus of experts

7.6 Objective: To provide practitioners with a standardized approach to the rational, safe, and effective use of antimicrobial agents for the prevention of surgical site infections based on currently available clinical evidence and emerging issues.

7.7 Main activities:

7.7.1. Topical administration of irrigations, pastes, and washes. Limited high quality data are available in this issue, intravenous and oral administration of antimicrobial suggest in this guideline.

1) Antimicrobial prophylaxis may be beneficial in surgical procedures associated with a high rate of infection clean-contaminated or contaminated procedures and in certain clean procedures where there are severe consequences of infection such as prosthetic implants.

2) If infection is unlikely. while prophylactic antimicrobials are not indicated for some clean surgical procedures, available data suggest in this guideline that the relative risk reduction of SSI from the use of antimicrobial prophylaxis is the same in clean and in higher-risk procedures.

3). Preoperative-dose should be given according to body weight, correctly maintain of timing, and also repeated dose should require when need to long time of procedure. Single dose should provide or continuation for less than 24 hours. Applied different concepts to all types of surgical procedure , specially suggest primary perioperative prophylaxis lines focus in these guideline.

7.7.2.Preoperative screening and decolonization: *Staphylococcus aurous* is most common cause pathogen of surgical site infection. Accounting for 30% of SSIs in the United States. Colonization with *S. aureus*, primarily in the nares, occurs in roughly one in four persons and increases the risk of surgical site infection.

7.7.3. Preoperative screening for *S. aureus* carriage and decolonization strategies have been explored as means to reduce the rate of SSIs. Anterior nasal swab cultures are most commonly used for preoperative surveillance, but screening additional sites can
increase detection rates.

Evidence Number 8

8.1 Title: Clinical Practice Guideline Surgical Site Infection Prevention

8.2 Author/year: Smith, M. A,. Dahlen, N. R. / 2013.

8.3 Publication source: National Association of Orthopedics Nurses.

8.4 Type of evidence: Clinical Practice Guideline is to educate staff in promoting a multifaceted approach to prevent all orthopedics surgery-related infections.

8.5 Objective: To educate staff in promoting a multifaceted approach to prevent all orthopedic surgery-related infections.

8.6 Methodology: Consensus of experts

8.7 Main activities:

8.7.1. Antibiotic prophylaxis should be prior to inflation of the tourniquet.

1) Many facilities include antibiotic prophylaxis as a routine part of the surgical time-out. An important consideration in total knee replacements is the infusion of the antibiotic prior to inflation of the tourniquet

2) Intravenous antibiotic given up to 60/ minutes before incision. Another antibiotic given such as cefazolin, cefuroxime, up to 120 minutes before incision: Single dose of antimicrobial agent given in preoperative period
Some cases redoes antibiotic use in procedure exceeds of antibiotic's half-life

3) Used preoperative patient skin cleansing chlorhexidine containing. It should

8.7. 2. The selection of the preoperative skin antiseptic agent. It should be based on patient assessment for any allergy or sensitivity to skin preparation agents.

8.7.3. Used preoperative hair removal. If hair removal is required in the perioperative setting, it should be removed just prior to the surgical procedure. It is recommended that hair removal take place with electric clippers

8.7. 4. Uses of preoperative nasal swabbing help to screen for patients.

8.7.5. Sterilize all surgical instruments according to proper ways. It is important way to reduce infection. Aseptic technique refers to specific practices which reduce the risk of post-surgical infections in patients by decreasing the likelihood that infectious agents will invade the body during clinical procedures. These practices also are designed to help the surgical team avoid being exposed to blood,

body fluids, tissue and other potentially infectious material (OPIM) during surgical procedures.

3.1.2 Summary of evidence evaluation

All of 8 guidelines as presented above were appraised by using the criteria of AGREE II appraisal method (AGREE II Next Steps Consortium, 2009). The author read each guideline thoroughly and use 23 items to ask question in order to appraise each guideline for its validity, reliability and applicability. In order to confirm the accuracy of the appraisal results, the author worked closely under the supervision of the major advisor and the co advisor.

The final result of the appraisal procedure revealed that all guidelines were reliable, they were developed by the group of experts, the evidences to support guidelines were high quality researches, the method to develop those guidelines was scientific merit and the recommendations of the guidelines can be applied in the author's clinical setting. Although some equipment or supplies recommended in the guidelines were relatively expensive but they are available in the author's clinical setting and some of equipment can be modified to suit the context of Bangladesh.

3.2 Recommendations

3.2.1 All of the evidence supported more effective care for patients in order to reduce surgical site infection rates by cost effective methods. Hence, the aforementioned is required for all patients undergoing total hip arthroplasty. The recommendations from the guidelines are as follows:

3.2.1 .1 Antimicrobial prophylaxis plays an important role in reducing the rate of surgical site infection so that it should be given in the preoperative period, maintain sterile techniques in intra-operative and postoperative, wound dressing surveillance. (Institute for Healthcare Improvement, 2012; International guideline; Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014.; Consensus guideline; The Association for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014; National guideline , American academy of

Orthopaedic Surgeons, 2010; National guideline; Pharm, et al, 2013; National guideline Smith. & Dahlen, 2013; National guideline)

3.2.1.2 Chlorhexidine protocol by using whole-body bathing or showering preoperatively is a low risk and relatively low cost intervention that may be employed even if the magnitude of benefit is marginal. (The Association for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014; National guideline Moucha, et al,2010; National guideline; Pharm, et al, 2013; National guideline Smith. & Dahlen, 2013; National guideline;

3.2.1.3 Duration of time: prevention of SSI recommendation that patients shower or bath should be given with antiseptic agent at least the night before the operation (Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014.; Consensus guideline; The Association for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014; National guideline Moucha, et al,2010; National guideline; Pharm, et al, 2013; National guideline Smith. & Dahlen, 2013; National guideline)

3.2.1.4 The Centers for disease Control (CDC) and National Health and Medical Research Council's (NHMRC) recommend maintaining a sterile wound dressing for 24-48 hours (Ricciardi, et al, 2014; Smith, & Dahlen, 2013;

3.2.1.5 Nutritional intervention should be provided for immune system improvement as well as to reduce infection (Institute for Healthcare Improvement, 2012; International guideline; Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014.; Consensus guideline; The Association for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014; National guideline Moucha, et al,2010; National guideline; Pharm, et al, 2013; National guideline Smith. & Dahlen, 2013; National guideline).

3.2.1.6 Antimicrobial agents should be provided to prevent wound infection and for promoting wound healing (Institute for Healthcare Improvement, 2012; International guideline; Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014.; Consensus guideline; The Association

for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014; National guideline Moucha, et al,2010; National guideline; Pharm, et al, 2013; National guideline Smith. & Dahlen, 2013; National guideline).

3.2.1.7 Surgical hand antisepsis is a crucial factor in preventing surgical site infections. It is performed before donning sterile gloves. (Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014.; Consensus guideline; The Association for Professionals in Infection Control and Epidemiology, 2010; International Guideline; Scottish Intercollegiate Guidelines Network ,2014).

3.2.1.8 Preoperative blood glucose control is important factors to reduce surgical site infections (Merollini, Zheng, & Graves , 2013; Consensus guideline; Ricciardi, et al , 2014).

3.2.1.9 Engaging the patient and family as partners by providing information and tools to enhance their understanding of and participation in care. **(**The Association for Professionals in Infection Control and Epidemiology (APIC) 2010; International guideline; The institute for health care improvement Cambridge, Massachusetts, USA. 2012; International guideline).

3.2.2 Brief summary:

In conclusion the author searched Mahidol data base and collected 22 articles and 8 published guidelines about prevention of surgical site infection from 2009 to 2014. There are very popular 8 guideline, which describe the preventive measure are effective of surgical site infection among patients with undergoing total hip arthroplasty. Other evidences were focus on general surgical site infection prevention, they did not discuss about prevention of total hip arthroplasty, Most of the guideline started use of antibiotic, antimicrobial agents chlorhexidine protocol by using whole-body bathing or showering preoperative day, also stated that patients were used an antiseptic skin preparation, uses of sterile equipment. 1st guideline name How-to Guide:Prevent Surgical Site Infection for Hip and Knee Arthroplasty “Prevent surgical site infection for hip and knee arthroplasty by implementing the interventions recommended in this guide “ In this guideline is cover all procedure to prevent

surgical site infection in arthroplasty patients . Another 2 evidence showed re dose antibiotic use when procedure exceeds of antibiotic's half-life some evidence showed of antibiotic given during operation, this procedure may already be accepted as routine clinical practice, whether these practices should be continued for this patient group will be informed by modeling the cost-effectiveness of infection prevention strategies. Another 4 evidence showed antibiotic regimen best prophylaxis against surgical site infection in patients undergoing hip and knee surgery. Outcome measured by using the clinical sign wound inflammation, breakdown, or discharge, uses of safety checklist. Uses of quality-adjusted life years (QALYs).Fisher's exact test to determine the rate of infection. Successful prevention of surgical site infection after total hip arthroplasty requires a comprehensive approach using a combination of interventions.

In the preoperative period antibiotic given before surgery or within one hour of incision, Perform antiseptic skin preparation of patient hand, and forearm antisepsis by surgical staff, in intra-operative sterile gowns/surgical attire have to be used, ultraclean/laminar air operating room should be provided with antibiotic-impregnated cement should be used after operation nurses can perform the surveillance process to monitor and early detect surgical site infection.

CHAPTER IV
CONCLUSION AND SUGGESTIONS

4.1 Conclusion

Surgical site infection is a significant problem among patients undergoing total hip arthroplasty. Worldwide, 1 million arthroplasty procedures are performed every year. In Bangladesh, an average of approximately one-third of total hip arthroplasty patients suffers from surgical site infection. The orthopedic patients usually receive treatment and nursing care from unfamiliar people and some develop uncertainty about treatment and outcome. In the author's country, patients' suffer a great deal during the post-operative period because nurses are not well-trained and possess deficient knowledge about the care of patients. There is no protocol to prevent surgical site infection or secondary infection among these patients. Evidence has shown that patients with arthroplasty usually require 5-7 days and surgical site infected patients have average hospital stays of 15 days with approximately double that amount in re-hospitalization rates. Patients not only undergo physical or mental suffering, but also great financial loss, such as increase of hospital acquired infection rates, excessive use of hospital expenditure or non-expenditure logistics, as well as shortage of nursing and non-nursing manpower. In this group of patients, some require amputation and non-rehabilitated orthopedic patients depend on others which results in less confidence. The author's country has only one rehabilitation center, namely, the National Institute of Traumatology and Orthopedic Rehabilitation center (NITOR), but this center does not cover all patients' rehabilitation needs. The aforementioned are common barriers to achieving good overall outcomes and thereby add more burdens to family, society and even country.

Successful prevention of surgical site infection after total hip arthroplasty requires a comprehensive approach using a combination of interventions. Strategies considered most important by experts were preoperative antibiotic prophylaxis, antiseptic skin preparation of patients, hand/forearm antisepsis by surgical staff,

intraoperative use of sterile gown/ surgical attire, ultraclean/laminar air operating room, and antibiotic-impregnated cement, followed by postoperative surveillance. All of these strategies also were recommended by at least one of the guidelines reviewed. Some measures were recommended by the guidelines but not classified as relevant because they did not fulfill the second criteria of expert appraisal. These included patient showering before the operation, use of surgical mask and sterile gloves, oxygen administration, application of a sterile wound dressing for 24-48 hours post surgery, and administration of antibiotics for up to 24 hours post surgery. Most of the selected evidence shows that antibiotic prophylaxis of antimicrobial agents and preoperative antiseptic preparation of patients reduces the risks of infection. Hence, evidence-based guidelines are very helpful for the prevention of surgical site infections in arthroplasty patients. For the above reasons, the author has selected this topic for its significance in patient care. The aim of the study was to analyze and summarize all related evidence in regard to preventing surgical site infection for adult patients undergoing total hip arthroplasty.

In all of the factors considered, the author searched for available current evidence and used the Mahidol database and websites to search for the related evidence. Science Direct, Pro Quest nursing, Pub Med, Cumulative Index to Nursing and Allied Health (CINAHL), Ovid Full Text, and Springer link were used to search for single research studies. The PICO framework was used to guide the searching terms. The key words used were surgical site infection, orthopedic patients, total hip arthroplasty, patients undergoing orthopedic surgeries, evidence-based nursing, preventive guidelines, routine care or standard care and hospital acquired infection**.** The guidelines for the quality and strength of the evidence were assessed according to evidence AGREE II criteria.

For each PICO element, the author collected any synonyms by connecting terms with “OR”, then located citations relevant to all of the PICO elements by linking with “AND”. Evidence was included in international guidelines, national guidelines and consensus guidelines. All of the studies were published in English from 2010 to 2014. The author selected eight guidelines and read the full text versions of the guidelines. The appraisal was performed according to AGREE II. The 1st International guideline name How-to Guide: Prevent Surgical Site Infection for Hip and Knee

Arthroplasty. the title is “Prevent surgical site infection for hip and knee arthroplasty by implementing the interventions recommended in this guide; this guideline cover all aspect. The strategies recommended by the majority of experts were preoperative antimicrobial prophylaxis.

4.2. Suggestions

It should be suggested that the prevention of surgical site infection following activities should be performed by the implementation of this framework which can be used as a guideline for project development in various clinical settings.

4.2.1 Implications for practice

1) Organize a meeting with all departmental heads, orthopedic surgeon, all operative nurses, the anesthesia department, hospital authority and other ancillary staff who perform the operation and post-operative care.

2) Develop special team members for this program incorporating the team leader charge nurse, the head nurse of the operation theater, the hospital nursing superintendent, one nursing teacher, a physiotherapist, a social worker who supports poverty stricken patients and some of the ancillary staff.

3) Establish clinical practice guidelines for nurses on the basis of the prevention of surgical site infection which should require financial support involving stakeholders by maintenance of proper channels.

4) Priority should be given according to the context of the country and feasibility at all level of patients and severity of disease.

5) The guideline will be include in health policy in our country, it is more appropriate in all level of health care service.

6) Arrange short course training programs for nurses, which may increase and share knowledge among nurses and another health care personnel.

7) Involve the patients and family members in caring practice for control of surgical site infection.

8). Recognition should be given to best performers in the institution in which the clinical setting should select a suitable ward that enables health care staff members to directly request additional assistance from a specially trained individual.

9) Implement best practices or evidence-based guidelines to prevent associated bloodstream infections.

Nurses should be trained to perform tasks oriented for nursing care rather than problem-solving oriented nursing care.

4.2.2 Implications for research

1) Before developing the core program at the first pilot study, the feasibility of implementing the guidelines should be confirmed.

2) Experimental study should be conducted to evaluate the effectiveness of the protocol in prevention surgical site infection among patients with arthroplasty.

3) The effects of chlorhexidine gluconate bath in preventing surgical site infection should be evaluated by study of research.

4) Compare in another research finding in a large group of patients for measurement of outcomes.

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