CHRISTIAN SERVICE UNIVERSITY COLLEGE

DEPARTMENT OF NURSING

CONTRIBUTORY FACTORS OF POST-OPERATIVE WOUND INFECTIONS IN THE MALE AND FEMALE SURGICAL WARDS OF KATH

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DECLARATION

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We have read the university regulations relating to plagiarism and certify that this report is all our own work and do not contain any unacknowledged work from any other source. We also declare that we have been under supervision for this report herein submitted.

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ABSTRACT

Infection has always been a feature of human life and sepsis in modern surgery continues to be a significant problem for health practitioners across the globe. The research sought to determine the contributory factors to post-operative wound infections in the surgical wards (Surgical wound infections) of KATH. The study population involved Doctors, Nurses and Health Care Assistants at the surgical wards of KATH. It was a descriptive study using a simple random sampling technique, involving 76 respondents. Results from the study revealed that 96% of respondents used autoclave to sterilize equipment for wound dressing, 3% used steaming and 1% used high level sterilization. Procedure for wound dressing included 71% used sterile gloved hand, 26% used instruments and 3% used other methods. As to the number of times patients' wounds were dressed, 71% used alternate days, 24% on daily basis and 5% based on physicians order. It is concluded that most common method of sterilization was autoclaving. Majority of the respondents dress wound on alternate days, most of them use sterile gloved hands in dressing wound and most of the patients were educated before surgery.

DEDICATION

We dedicate this project to the Almighty God for his guidance, protection and wisdom throughout the work. We also dedicate it to our various families

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List of Abbreviations

CDC: Center for Disease Control

CSSD: Central Sterilization Supply Department

HAIs: Hospital Acquired Infections

HICPAC: Healthcare Infection Control Practices Advisory Committee

HPA: Hospital Physicits Association

KATH: Komfo Anokye Teaching Hospital

KNUST: Kwame Nkrumah University of Science and Technology

NICE: National Institute for HealthCare Excellence

NINSS: Nosocomial Infection National Surveillance Service

RTA: Road Traffic Accidents

SSI's: Surgical Site Infections (postoperative wound infections)

WHO: World Health Organization

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CHAPTER ONE

INTRODUCTION

Infection has always been a feature of human life and sepsis in modern surgery continues to be a significant problem for health care practitioners across the globe. Surgical wound infections, now known as surgical site infections (SSIs), are a real risk associated with any surgical procedure and represents a significant burden in terms of patient morbidity and mortality, and cost to health services around the world (European Wound Management Association, 2005).

Each year, In the United States, approximately 500,000 surgical patients develop surgical site infections. In some types of operations such colorectal surgery, the rate is close to 10% (Kevin,2010). A multitude of risk factors influence the development of surgical site infections and awareness of these will help to produce effective preventive strategies.

This project seeks to find out the factors that cause post-operative wound infections. Additionally, the purpose of this project is to determine the prevalence rate of post-operative wound infections at the Surgery Directorate of Komfo Anokye Teaching Hospital and to find out whether the preventive measures of post-operative wound infections are being adhered to and finally suggest or recommend measures to reduce post-operative wound infections.

1.1BACKGROUND INFORMATION

Wound is loss of integrity of normal tissues, (Oluwasani, 1979). It may be superficial, affecting only the surface structures, or severe, involving blood vessels, muscles, nerves, fascia, tendons, ligaments and bones.

Surgical wounds are wounds gotten after surgery. After any surgery involving a cut, whether minor or major, inflammation may occur. Surgical wounds are therefore classified as intentional

wounds since the person acquires it through operation. Unintentional wounds on the other hand, are acquired through accidents; an example is a road traffic accident (RTA).

Wounds, in general, can be classified by the mechanism of injury and the degree of contamination. Under the mechanism of injury, a wound can either be open, involving a break in skin or mucous membrane or closed when the tissues of the affected part are traumatized without the skin breaking (Culver, 2003). According to the degree of contamination, a wound can be aseptic, clean contamination, contamination, infected, and colonized wounds. They are aseptic when they have no pathogenic organisms present, clean contaminated when they are aseptic but involves a body cavity that normally harbor's microorganisms, contaminated when they are potential for infection, and infected when bacterial organisms are present in the wound and produce signs of infection (Mangram,2003).

There are various types of wound which are described according to how they are acquired, the type of injury and how they occur. These include:

- Incised wound: Here, the edges are straight with very little tissue death, it is caused by very sharp instruments.
- Punctured wounds: These are caused by sharp pointed objects. (eg. wounds caused by a nail in which the amount of tissue destroyed is small but there is damage to deep organs.
- Contusions: Here, the skin often is not breached but both skin and subcutaneous tissue may be extensively damaged by blunt trauma.
- Abrasions: These are superficial friction injuries leading to loss of the epidermis and viable amount of dermis.

Wound infection is the second most common nosocomial (hospital-acquired) infection. According to the Centers for Disease Control and prevention (CDC, 2010), a wound is infected if purulent material drains from it, even if culture is not taken nor has negative results. A contaminated wound or traumatic wound may show signs of infection early within 2-3 days (Garner, 1985). A surgical wound infection usually does not develop until the fourth and fifth post-operative day. The client will have fever, tenderness, and pain at the wound site, and elevated white blood cell count. The edges of the wound may appear inflamed. If drainage is present, it is odorous and purulent, which causes a yellow, green or brown color, depending on the causative organism.

In the recent past, the introduction of specific antibiotics and chemotherapeutic agents has influenced the incidence and course of many types of infections. In spite of these advances, infection is one of the most important causes of increased morbidity and mortality in surgical patients (Artz and Hardy, 1995).

The development of a wound infection depends on the complex interplay of many factors. If the integrity and protective function of the skin are breached, large quantities of different pathogenic organisms will enter the wound and initiate an inflammatory response. This may be characterized by the classic signs of inflammation; redness, pain, swelling and fever. This process ultimately aims to restore homeostasis. The potential for infection depends on a number of patient - related variables, such as the state of hydration, nutrition, and existing medical conditions as well as extrinsic factors, for example those related to pre-operative, intra-operative, and post-operative care, if the patient has undergone surgery(American Society of Anesthesiologists,2004).

Among the pre-operative factors are inaccurate or ineffective preparations of the incisional site which may include adequate shaving and scrubbing of the area, inadequate sterilization of instruments and also knowledge deficit, on the part of the patient about wound infection. The intra-operative factors may also include improper scrubbing, ineffective aseptic technique during gowning and gloving on the part of the surgeon and assistants before surgery, frequent opening of doors and trooping in of health staff during the surgical procedure and also prolonged hours of surgery(American Society of Anesthesiologists,2004).The post-operative causes of wound infection can be associated with persistent touching of the wound by the patient, poor nutritional status of the patient which may lead to decreased immunity, poor patient compliance during wound dressing or ineffective wound dressing, improper covering of wound or deliberate exposure of wound and lastly, inadequate practice of aseptic technique during the process of wound dressing.

1.2 Problem statement.

Surgical site infection (SSI) is the most common postoperative incisional complication (others include postoperative blistering and wound dehiscence, which may often be related to SSI) and comprises approximately 20% of all healthcare associated infections (HCAIs). At least 5% of patients develop an SSI after a surgical procedure (NICE, 2008).

An SSI can have a considerable impact on a patient's quality of life, carry a higher risk of morbidity and mortality, and lead to a prolonged hospital stay (Coello et al, 2005) or rehospitalisation with greater use of healthcare resources and higher costs. Based on an SSI rate of 5%, NICE (2008) estimated each episode to cost £3500, and the overall cost to the NHS of managing SSIs to be around £700 million per year.

TABLE 1: Trend of wound infection and delayed discharge at Komfo Anokye Teaching Hospital 2010-2013

Year	Total number of cases operated	Number of post-operative wound infections	Number of patients who overstayed admission	% of patients whose wound got infected	% of patients who overstayed admission
2010	2124	102	70	4.8%	3.2%
2011	2892	203	109	7.0%	3.7%
2012	3680	456	198	12.3%	5.3%
2013	3655	288	321	7.9%	8.8%

(KATH Surgery Directorae, 2014)

The above table indicates the burden incurred on both the hospital and the patients. This increases economic burden such as the cost of meeting hospital expenses and social burden if the affected patients contribute to the welfare of the family. Prolonged disability days are reflected in the corresponding loss of income due to hospitalization.

1.3 RESEARCH OBJECTIVES

1.3.1 Main Objective

To determine the contributory factors to post-operative wound infection at the male and female surgical wards of Komfo Anokye Teaching Hospital (KATH).

1.3.2 Specific Objectives

1. To find out the various processes of sterilization of surgical instruments and equipment in the ward.
2. To determine how often various types of surgical wounds are dressed in the ward.
3. To determine the method or procedure for wound dressing on the ward.
4. To determine whether patients receive education on the measures to prevent wound infection.

1.4 Research questions

1. What are the processes of sterilization of surgical instruments and equipment in the ward? On or in the wards?
2. How often do various surgical wounds get dressed on the ward?
3. What is the method or procedure for wound dressing on the wards?
4. Do patients receive adequate education on the measures to prevent wound infection?

1.5 Significance / justification of study

Post-operative wound infections are among the most common nosocomial infections. Surgical site infections (SSIs) cause prolonged hospital stay, increased economic cost, patient dissatisfaction and sometimes increased mortality rate. Surgical wound infection rates are high, indicating the need for a comprehensive study into its etiology.

Results from this research will be used in attempts to establish a local data on the causes and effects of SSIs and to a larger extent, help to establish some guidelines, while reinforcing the existing one for the management of SSIs. The data obtained from this research can also be adopted by policy makers to lay a basic foundation for further extensive surveillance studies

within other hospitals. Finally, it will help improve client satisfaction and increase the quality of life of people who undergo surgical procedures as well as reduce the cost of management of post operative wound infections.

CHAPTER TWO

LITERATURE REVIEW

2.1 OVERVIEW OF WOUND INFECTIONS

Medical papyri, such as the Edwin Smith papyrus (circa 1600 BC) and the Ebers papyrus (circa 1534 BC), provided detailed information of management of disease, including wound management with the application of various potions and grease to assist healing. Hippocrates (Greek physician and surgeon, 460-377BC) known as father of medicine, used vinegar to irrigate open wounds and wrapped dressings around wounds to prevent further injury. The concept of wound healing remained a mystery, as highlighted by the famous saying by Ambroise Pare (French military surgeon, 1510-1590), “The physician dressed the wound, God heals it”

The 2002 survey report by the Nosocomial Infection National Surveillance Service (NINSS), which covers the period between October 1997 and September 2001, indicated that the incidence of hospital-acquired infection related to surgical wounds in the United Kingdom is as high as 10% and costs the National Health Service in the United Kingdom approximately 1.8 million dollars annually. Seventy-seven percent of the deaths of surgical patients were related to surgical wound infection.

Most post-operative surgical wounds are managed with the use of antibiotics which is the main treatment option for controlling wound infection. The concept of prophylaxis was established in the 1960’s when the experimental data established that antibiotics had to be in the circulatory system at a high enough dose at time of incision to be effective. A wound infection can prolong hospitalization by 5 to 20 days and substantially increase medical costs (Bremmelgoard *et al*., 1989; Haley *et al*., 1985). In patients undergoing colon surgery, the risk

of such an infection ranges from 3 to 22 percent, depending on such factors as the length of surgery and underlying medical problems (Culver *et al*., 1991).

Maintaining intra-operative temperature is likely to decrease infection and shorten hospitalization in patients, undergoing colorectal emergency (Kurz *et al*., 1971). The incidence of SSIs can be influenced by many factors, the most important being surgical skill and technique and criteria used to define the infection. Leigh *et al*. (1974) found that the incidence of wound infection in a series of appendicectomy was 19% and varied according to the state of appendix. Most surgical wounds are categorized as acute wounds, healing without complication in an expected time frame (Bale and Jones, 1997). However, like all wounds, healing is affected by intrinsic and extrinsic factors that may result in complications.

It is important for the surgeon to recognize the potential risk factors in his or her surgical patients, and subsequently initiate the chain of action that can attempt to prevent or at least minimize the potential for the development of surgical site infections.

These factors can be divided into essentially two categories, intrinsic and extrinsic factors. Intrinsic factors are those factors related to the patient and to the surgical procedure being performed. Patient-related risk factors include the patient's age, the presenting condition, the potential for concomitant disease, preexisting infection, tobacco usage, malnutrition, obesity and uncontrolled diabetes. These are all independent risk factors for developing a postoperative infection (Aiken A. et al., 2012)

Sorenson and colleagues found the optimal abstinence period required in heavy smokers to reduce the risk of surgical site infections was four weeks (Khan K. et al., 2012). Malnutrition lowers a host's defenses and compromises the immune system, thus predisposing the patient to infection and poor wound healing. Recognizing at-risk patients prior to surgery is essential

to successful management of these complicated patients during the perioperative period.. Malnutrition lowers a host's defenses and compromises the immune system, thus predisposing the patient to infection and poor wound healing (HPA, 2011). Recognizing at-risk patients prior to surgery is essential to successful management of these complicated patients during the perioperative period. The American society of Anesthesiologists (ASA) developed a five classified system of patients' physical status in order to identifying at-risk patients prior to surgery.

Table 2: ASA Score of Patient Physical Status

Class I	A patient in normal health
Class II	A patient with mild systemic disease resulting in no functional limitations
Class III	A patient with severe systemic disease that limits activity, but is not incapacitating
Class IV	A patient with severe systemic disease that is a constant threat to life
Class V	A moribund patient not likely to survive 24 hours

Immediately after wound occurs, mast cells degranulate and release inflammatory mediators, which allow local blood vessels to dilate. Neutrophils enter the wounded area to digest bacteria, followed by macrophages, which flood the wound bed to release growth factors and prostaglandins to influence the healing process (Nathan, 1987). This inflammatory phase is often characterized by redness and swelling around the wound, accompanied by heat and pain (Tortora and Grabowski, 1996). In clean surgical wounds, this stage can last for three to seven days. In the reconstructive, or proliferation stage, the growth of new vessels and tissues takes place. Fibroblasts move into the wound and collagen synthesis occurs alongside new vessel growth to

fill the wound with granulation tissue (Eckersely and Dudley, 1988). As the defect fills, the wound contract and epithelial tissue forms at edges. This stage ends when the wound is fully closed. In the final stage of healing maturation the wound regains its tensile strength and, as the collagen fibers reorganize, the scar loses some of its red pigmentation and lies flatter to the surface of the skin. This phase can take up to 18 months to complete (Clark, 1988).

2.2 Pre-operative skin preparation

This has been the subject of some debate; particularly with regards to its potential impact on post-operative wound infection. It is made up of two main steps; shaving and pre-operative showering

2.2.1 Shaving:

In some instances shaving is necessary to gain access to the surgical site and prevent hair becoming entangled in the suture line. Shaving became a routine part of pre-operative care and remained unchallenged until the 1970s when it was suggested that it may be associated with post-operative wound infection by causing superficial damage to the skin and allowing bacteria colonization (Seropian and Reynolds, 1971). However, there is no definitive research on the subject.

2.2.2 Pre-operative bathing or showering:

In the past, patients were encouraged to wash with antiseptic solutions prior to surgery. However, Byrne *et al*. (1990) suggested that at least three showers with chlorhexidine would be required to effectively reduce the skin's bacterial count, though they failed to produce statistically significant results on the incidence of wound infection. Showering is generally preferable to bathing as it is less likely to result in the transfer of organisms from highly colonized sites, such as the perineum, to less colonized sites (Briggs, 1997). Equally, there is less

chance of transfer of organisms from patient to patient if baths are not cleaned adequately between patients.

Other lesions which harbor bacteria, such as pressure ulcers, increase the risk of postoperative wound infection, and if possible, surgery should be delayed until these have healed. Orthopedic surgery can be catastrophic if the patient develops deep wound or bone infection, and is rarely undertaken if there is any infection elsewhere. Where surgery cannot be avoided, covering existing lesions with a hydrocolloid, at least one day before surgery and leaving it until 24-48 hours after may offer the best protection since it is totally occlusive (CDC,1999) There is no research evidence to support this.

2.3 HOW STERILIZATION AND STORAGE OF DRESSING INSTRUMENT ASSIST IN WOUND HEALING

Sterilization is a term referring to any process that eliminates (removes) or kills all forms of life, including transmissible agents (such as fungi, bacteria, viruses, spore forms, etc.) present on a surface, contained in a fluid, in medication, or in a compound such as biological culture media(HICPAC,2008). Sterilization can be achieved by applying heat, chemicals, irradiation, high pressure, and filtration or combinations thereof. Joseph Lyster, a pioneer of antiseptic surgery stated that, in general, surgical instruments and medications that enter an already aseptic part of the body (such as the bloodstream, or penetrating the skin) must be sterilized to a low sterility assurance level (SAL).

Heat (flame) sterilization of surgical instruments is known to have been used in Ancient Rome, but it mostly disappeared throughout the Middle Ages resulting in significant increases in disability and death following surgical procedures. Sterilization as a definition terminates all life whereas sanitization, pasteurizing and disinfection terminate selectively and partially (HPA,

2011). Sanitization, pasteurizing and disinfection reduce the number of targeted pathogenic organisms to what are considered "acceptable" levels - levels that a reasonably healthy, intact, body can deal with. Many of the instruments' components are very delicate and would not withstand very high temperatures, so scientists use different techniques: heating to 120 °C, chemical sterilization, oxidization, and irradiation with ultraviolet light and other kinds of radiation. The commonest form of the heat sterilization is the; the dry heat sterilization and the moist heat sterilization. A widely used method for heat sterilization is the autoclave, sometimes called a converter. Autoclaves commonly use steam heated to 121–134 °C (250–273 °F), achieve sterility, a holding time of at least 15 minutes at 121 °C (250 °F) at 100 kPa (15 psi), or 3 minutes at 134 °C (273 °F) at 100 kPa (15 psi) is required (NICE,2008). Additional sterilizing time is usually required for liquids and instruments packed in layers of cloth, as they may take longer to reach the required temperature (unnecessary in machines that grind the contents prior to sterilization). Following sterilization, liquids in a pressurized autoclave must be cooled slowly to avoid boiling over when the pressure is released. Modern converters operate around this problem by gradually depressurizing the sterilization chamber and allowing liquids to evaporate under a negative pressure, while cooling the contents.

Proper autoclave treatment will inactivate all fungi, bacteria, viruses and also bacterial spores, which can be quite resistant. At KATH, two autoclave machines located at the Accident & Emergency Center and at the Central sterile Supply Department (CSSD) of the main theater, perform the sterilization of surgical instruments and wound management materials and distribute them to the various wards and units. Other heat methods include flaming, incineration, boiling, tindalization (named after John Tyndall), and flaming such as Bunsen burner. These are however, not used at KATH.

Recent advances in instrument sterilization include the introduction of gas plasma sterilization and the increased use of glutaraldehyde (Leonard Y, et al,2006). Gas plasma sterilization has the advantages of no toxic residue effects, reduced turnover time, and applicability for sterilization of heat- and moisture-sensitive instruments. Chlorhexidine gluconate (4%) appears to be a superior pre-operative surgical scrub for both the surgeon and the patient because of its increased antimicrobial efficacy, residual activity, and minimal tissue reactions (NICE, 2008).

Studies in the early 1970s suggested that wrapped surgical trays remained sterile for varying periods depending on the type of material used to wrap the trays. Safe storage times for sterile packs vary with the porosity of the wrapper and storage conditions (e.g., open versus closed cabinets). Heat-sealed, plastic peel-down pouches and wrapped packs sealed in 3-mil (3/1000 inch) polyethylene overwrap have been reported to be sterile for as long as 9 months after sterilization. The 3-mil polyethylene is applied after sterilization to extend the shelf life for infrequently used items (Maloney, 2006). Supplies wrapped in double-thickness muslin comprising four layers, or equivalent, remain sterile for at least 30 days. Any item that has been sterilized should not be used after the expiration date has been exceeded or if the sterilized package is wet, torn, or punctured.

Although some hospitals continue to date every sterilized product and use the time-related shelf-life practice, many hospitals have switched to an event-related shelf-life practice. This latter practice recognizes that the product should remain sterile until some event causes the item to become contaminated (e.g., tear in packaging, packaging becomes wet, seal is broken) . Event-related factors that contribute to the contamination of a product include bioburden (i.e., the amount of contamination in the environment), air movement, traffic, location, humidity, insects, vermin, flooding, storage area space, open/closed shelving, temperature, and the properties of the

wrap material (Rutala and Cardo, 1999). There are data that support the event-related shelf-life practice. One study examined the effect of time on the sterile integrity of paper envelopes, peel pouches, and nylon sleeves. The most important finding was the absence of a trend toward an increased rate of contamination over time for any pack when placed in covered storage (Butt, 1999). Another evaluated the effectiveness of event-related out-dating by microbiologically testing sterilized items. During the 2-year study period, all of the items tested were sterile (Webster, 2003). Thus, contamination of a sterile item is event-related and the probability of contamination increases with increased handling (Mayworm, 2004).

Following the sterilization process, surgical devices must be handled using aseptic technique in order to prevent contamination. Sterile supplies should be stored far enough from the floor (8 to 10 inches), the ceiling (5 inches unless near a sprinkler head [18 inches from sprinkler head]), and the outside walls (2 inches) to allow for adequate air circulation, ease of cleaning, and compliance with local fire codes (e.g., supplies must be at least 18 inches from sprinkler heads) (HICPAC, 2008). Medical and surgical supplies should not be stored under sinks or in other locations where they can become wet. Sterile items that become wet are considered contaminated because moisture brings with it microorganisms from the air and surfaces (NICE, 2008). Closed or covered cabinets are ideal but open shelving may be used for storage. Any package that has fallen or been dropped on the floor must be inspected for damage to the packaging and contents (if the items are breakable). If the package is heat-sealed in impervious plastic and the seal is still intact, the package should be considered not contaminated. If undamaged, items packaged in plastic need not be reprocessed.

2.4 Basis for the choice of dressing and chemical use

According to National Health Survey (NHS) report, 1998, wound care has, in the past, not been well managed because of the limited understanding of the healing process and the inadequate range of dressing materials available. Wound management has now come full circle, back to Hippocrates' principles and dressings are being developed to provide the ideal environment for nature to do its work. There are many new wound dressings and topical medications for treatment of wounds, but the efficacy of most of these preparations has been evaluated only in humans, dogs, and cats. The ideal topical wound preparation and dressing for equine wounds, particularly wounds affecting the distal limb, have not yet been found. (Equine et al, 1996)

Hampton (2004) emphasizes that preserving the skin's integrity in a patient is one of the primary jobs of a nurse and this can often be a complex and difficult task especially in cases of chronic wounds. Factors affecting the repair and management of wounds also shed light on maintenance of skin integrity and general nursing needs in wound management. It requires dressings which are suited to the size, depth, position and level of exudates- The wound itself should be clean after surgery, although this depends on the nature of, and reason for surgical intervention (Baxteer. 2003).

The primary function of wound dressing is to promote healing by providing a moist environment and protecting the wound from potentially harmful agents or injury. In closed surgical wounds the main function of the dressing is to absorb blood or haemoserous fluid in the immediate postoperative phase (Bhattacharyya et al, 2005; Cosker at al 2005). There are many types of dressing available for surgical wounds, and the choice is often based on cost and personal preference. The most commonly used dressings are simple, low-adherent island dressing.

The dressing material absorbs the exudates. It also restricts motions that disrupt the coming together of wound edge and also hides the ugliness of the wound. The choice of dressing should also be based on the patient's needs. If for example, the patient is treated as a day case, a shower- proof dressing may be most appropriate, if it is required for more than 24 hours. How frequently, or for how long, a surgical wound should be dressed is also a matter of personal preference. Some units leave wounds exposed from the moment of suturing is done, others uncover them, after 24hours, and others keep them dressed until complete healing has taken place and sutures/clips/staples are removed.

There is no evidence to support a particular regimen for incision sites. When dressings are applied in theatre, it is recommended that they are not disturbed unless they become stained by discharge, clinical signs of infection are present or the patient shows signs of systemic infection (Bale and Jones, 1997).

Chrintz *et al*. (1989) suggested that it is not necessary to dress a closed surgical wound at all after 48 hours. Some patients, however, may prefer to have their wound dressed and should be done appropriately, according to size, depth and position.

There are three types of wound dressings: passive, interactive and active. Passive dressings have only a protective function and maintain a moist environment for natural healing. They include those that just cover the area. Examples are Duoderm, Tegaderm which may remain in place for several days.

Interactive dressings are capable of absorbing wound exudates, while maintaining a moist environment in the area of the wound, allowing the surrounding skin to remain dry. They include hydrocolloids, alginates and hydro gels. It is thought that interactive dressings are able to modify

the physiology of the wound environment by modulating and stimulating cellular activity and by releasing growth factor (Thanh *et al*., 2002).

Active dressings improve the healing process and decrease healing time. They include skin grafts and biologic skin substitutes. Both interactive and active dressings create a moist environment at the interface of the wound with the dressing (Krasner *et al*., 2002).

Unsuccessful wound care can make a wound control a life. People may have to cope with specialized devices or beds, lack of mobility, dressing changes, drainage, odor, clothing limitations and sleep deprivation. Furthermore, unsuccessful wound care can lead to limb loss or even death (McGuckin, 1998).

The epidemiology and economic burden of wound is well documented in North America. Each year, in North America, between five and seven million complex wounds occur. The devastating effects of the improperly treated wounds can be inferred from the American experience. This illustrates that wound care is a great, unmet need, requiring government interventions and individual preparedness for significant improvement (Krasner *et al*., 2007).

Wound care is the fastest growing area in the field of health care. Now more than ever it's essential for health care administrators and managers to ensure standardized and evidence-based wound care (Baxton, 2009).

There is now the availability of a large variety of dressings but an appropriate selection can be made if certain principles are maintained. These principles are referred to as the five rules of wound care (Krasner et.al. 2002).

- Rule 1: Categorization. The nurse learns about dressings by generic category and compares new products with those that already make up the category. The nurse becomes familiar with indications, contraindications and side effects. The best dressing may be

created by combining products in different categories to achieve several goals at the same time.

- Rule 2: Selection. The nurse selects the safest and most effective, easy-to-use, and cost-effective dressing possible. In many cases, nurses carry out the physician's prescriptions for dressings, but they must be prepared to give the physician feedback about the dressing's effect on the wound, case of use for the patient and other considerations when applicable.
- Rule 3: Change. The nurse changes dressings based on client, wound and dressing assessments, not on standardized routines.
- Rule 4: Evolution. As the wound progresses through the phases of wound healing, the dressing protocol is altered to optimize wound healing. It is rare, especially in cases of chronic wounds, that the same dressing material is appropriate throughout the healing process. It is assumed that the nurse and the client or family have access to a wide variety of products and are knowledgeable about their use.
- Rule 5: Practice with dressing material is required for the nurse to learn the performance parameters of the particular dressing. Refining the skills of applying appropriate dressings correctly and learning about new dressing products are essential nursing responsibilities (Krasner *et al*., 2002).

Krasner *et a*l., (2002), emphasized the need for nurses to work in partnership with clients to meet their clinical care, quality of life and psychological needs. The nurse teaches the patient or family care giver about wound care and ensures that the family has access to appropriate dressing choices.

Quality of life issues, personal preferences, priorities and motivation are important considerations in wound management. Clinicians educate client to relieve odor and pain and help the mobility of their clients, encouraging them to be well groomed, allowing them to maintain adequate hygiene by bathing and above all, making them welcome so that they can be embraced, marry and be employed (Ryan, 1993).

A study by Maylor (2005) concluded that a deteriorating wound is marked by increased pain. As with other aspects of effective wound care, pain reduction during dressing is a challenging management issue which has been examined by Meaume *et al*. (2004). Meaume and colleagues attempted to examine pain in patients with acute or chronic wounds of various causes during dressing removal and the effects of switching to non-adherent dressing and in their study 656 primary care physicians reported details of acute and chronic wounds during routine visits.

The pain experienced during dressing changes was evaluated after patients completed a self-evaluation questionnaire. Five thousand eight hundred and fifty (5850) patients with chronic and acute wounds reported moderate to severe pain. Dressing removal was considered painful when there was an adherence to the wound bed and switching to non-adherent dressing reduced pain during dressing changes in most cases. Thus, authors conclusively argue that pain is a major problem and challenge to nursing management in wound care and is almost always related to dressing selection. They point out that selecting a suitable non-adherent dressing improves patient acceptability.

A study using a hydro fiber dressing, as opposed to traditional gauze dressings in excision surgery showed a reduced length of stay, decreased pain, improved patient confidence and enhanced healing rates, as well as being easier to apply and remove (Foster and Moore, 1997)

2.5 The number of times wound dressing is changed

The main goals of wound management are the prevention of wound infections and the halting of wound deterioration to achieve more rapid healing and the prevention of wound-related disability. These goals can be accomplished only by appropriate, timely quality care intervention. The primary function of normal intact skin is that it can control microbial populations living on skin surface from entering underlying layers or organs and thus protects the body from pathogens. Exposure of subcutaneous tissue with a wound provides a moist and warm environment for microbial organisms (Bowler *et al*., 2001).

Effective wound treatment that improves the quality of life of all people and returns them to productive, self-sufficient lives is a challenge that must be met to prevent further loss of our most precious resource in every country (Treadwell, 2006).

In a study by Maylor (2005), nurse practitioners and post-registration nurses responded on a wound management survey and ranked signs and symptoms of wound healing, stasis and deterioration according to their supposed importance. According to the survey, the top ranking sign for a healing wound was size or reduction of the wound.

An article by Shukla (2007) stated that, inappropriate care of acute warm traumatic wounds was the most common cause of chronic wounds.

One of the aims of wound care is to disturb the wound as little as possible to allow healing and prevent bacterial invasion (Baxter, 2003). Purposes of wound dressing are to remove a soiled dressing, to clean the wounds removing microorganisms and drainage, and also to assess the healing process. It aids in haemostasis and helps in supporting or splinting the wound site (Eshun, 2009).

Surgical incision sites that are healing by primary intention should be clean (Ballard and Baxter, 2000). The skin edges are re-apposed, allowing a clot to form on the incision site, providing a barrier against bacterial invasion. The tissue edges of the wound knit together 48 hours after surgery but have little tensile strength and require continued support from sutures or clips until full epithelialization takes place (Baxter, 2003).

Wound care, as illustrated by Eshun, (2009) is important because it prevents the entry of pathogenic organisms, promotes healing and protects the wound from further injury. It reduces haemorrhage by applying pressure where there is bleeding from the wound site. It also prevents odour from the wound, especially with septic wounds and cancerous wounds.

Many times a client receives conflicting therapeutic recommendations from other health care professionals, leading to frustration, easily misdirected towards the wound clinician. Development of clinical training programs at medical school, nursing training institutions and post-graduates levels is necessary to address such deficits (Ennis et. al, 2004). Ideally, their training will be about the best methods in wound healing while rich in understanding of local belief and culture (Brantus, 2008).

2.6 Patient education on post-operative wound infection

Many patients after an operation fear losing their independence (Jones, 2002). Patients will be motivated to learn why it is necessary for them to care for themselves. Therefore, nurses should make it a point to educate their patients before any surgical procedure.

Various studies demonstrates that a reduction in postoperative wound infections is directly related to increased education (for the surgeon, the operating room team and the patient) and awareness of the causes and risk factors for the development of postoperative infections (Horie H. et al, 2006).

When educating, timing is crucial. For instance, if the patient has just been informed of a diagnosis and a possible operation, he or she will need time to cope with this information. There might be associated feelings of grief, powerlessness, fear, and vulnerability (Jones, 2002). This will cloud the ability to learn and commit to memory. The goal of educating the patient and family is to improve patient health outcomes by promoting recovery, speeding return to function, promoting health behavior and appropriately involving the patient and family in their care and care decisions. Patients who are physically and psychologically prepared for surgery tend to have better surgical outcomes. Preoperative teaching meets the patient's need for information regarding the surgical experience, which in turn may alleviate most of his or her fears. Patients who are more knowledgeable about what to expect after surgery, and who have an opportunity to express their goals and opinions, often cope better with postoperative pain, reduce the incidences of surgical site infections(SSIs) and decreased mobility(NICE,2008). Preoperative care is extremely important prior to any invasive procedure, regardless of whether the procedure is minimally invasive or a form of major surgery.

Knowledge about what to expect during the postoperative period is one of the best ways to improve the patient's outcome. Instruction about expected activities can also increase compliance and help prevent complications (HICPAC, 2008). This includes the opportunity for the patient to practice coughing and deep breathing exercises, use an incentive spirometer, and practice splinting the incision. Additionally, the patient should be informed about early ambulation (getting out of bed). The patient should also be taught that the respiratory interventions decrease the occurrence of pneumonia, and that early leg exercises and ambulation decrease the risk of blood clots.

Patients hospitalized postoperatively should be informed about the tubes and equipment that they

will have. These may include multiple intravenous lines, drainage tubes, dressings, and monitoring devices. In addition, they may have sequential compression stockings on their legs to prevent blood clots until they start ambulating.

Patient's lifestyle modifications such as abstaining from smoking, alcohol intake and taking a temporal leave from one's work until full recuperation and or healing is achieved is significant to be included in the education list. The risk of infection continues even after the patient leaves the hospital. Caregivers should educate the patient and relatives regarding proper incision care, how to recognize signs of wound infection and the importance of reporting symptoms to their surgeons as well as primary care providers. Educate patients and relatives and other healthcare professionals on optimal wound care, how to identify a wound that is failing to heal and who to contact if they are concerned about a possible SSI (NICE, 2008). Take-home materials should be easy-to-read and available in multiple languages. It is also important to coordinate post-discharge SSI surveillance activities between the facility's infection prevention program, the surgeon, the surgical unit, and possible referral or re-admission centers so that accurate statistics can be collected on the incidence of SSI by types of patients, surgeries and surgeons (NICE,2008). Considering that more than half of all surgeries are performed in out-patient settings and more than 65% of all in-patient surgery SSIs are identified after the patient leaves the facility, it is very easy to significantly underestimate SSI rates and miss serious infection issues (CDC, 1998);

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The research was conducted at the male and female surgical wards of Komfo Anokye Teaching Hospital. The hospital is located in Kumasi, the regional capital of Ashanti region in Ghana with a total population of about 3,204,604 (1998). The road network of the country and commercial nature of Kumasi make the hospital easily accessible. Referrals are received from all the northern regions, namely Northern, Upper East and West, Western, Brong Ahafo, Central, Eastern and parts of the Volta Region. It is the second largest hospital in Ghana which trains doctors, nurses, anesthetists and health care assistants. The hospital is divided into directorates namely, Polyclinic, Accident and Emergency, Medicine, Surgery (where this research was carried out), Gynaecology, Paediatric and others. It is a 1500 bed capacity hospital with staff population of about five thousand (5000), which includes nurses, doctors, laboratory technicians, pharmacists and other paramedical staff.

3.2 Research design

This was a cross-sectional survey.

3.3 Study population

A target population of 50 male and 50 female Patients and respondents comprising of Nurses, Doctors and Health care assistants on the wards

3.4 Sample selection and size

Simple random sampling was used. In this case, each respondent was chosen entirely by chance and each member of the population had an equal chance, or probability of being selected. A population of 100 and a sample size of 80 respondents were obtained.

3.5 Data collection technique

A structured questionnaire with both open and close- ended questions were used in a one-to-one interview, to elicit responses from the target population to determine the factors contributing to post-operative wound infections. It was constructed in English. Questionnaires were given to respondents. The answered questionnaire by respondents was retrieved by hand for analysis.

3.6 Ethical Approval

Ethical approval was sought from the Committee on Human Research, Publications and Ethics. Permission was granted by the Department of Surgery of K.A.T.H.

3.7 Pre-Testing of Questionnaire

Questionnaire was pre-tested with ten nurses from Manhyia Government Hospital. The data collected was analyzed to check if the objectives of the study would be met. After the analysis, few areas that needed amendment were made. Some changes were also made in the questionnaire.

Statistical Analysis

Data was analyzed using statistical software comprising of frequency tables, simple percentages and pie charts since this study is a quantitative form of research.

CHAPTER FOUR

RESULTS

Table 3: Demographic characteristics of respondents

AGE (years)	**FREQUENCY**	**PERCENTAGE**
20 – 27	28	37
28 – 35	45	59
36 – 43	3	4
Above 43	0	0
JOB RANKING		
Medical Officer	5	7
Nurse	68	89
Health Care Assistance	3	4
SEX		
Male	29	38
Female	47	62
DEMOGRAPHIC CHARACTERISTICS OF PATIENTS		
AGE (years)	**FREQUENCY**	**PERCENTAGE**
20 – 27	20	26
28 – 36	28	38
37– 43	14	18
Above 43	14	18
SEX		
Male	35	46
Female	41	54

From table 3, the highest age range of respondents was 28-35, followed by the 20-27 age groups. The minimum age group was 36-43, while none was recorded for those above age 43.this shows that respondent are in their active and productive years.

With regards to the job ranking, the highest numbers of respondents was nurses, followed sparsely by doctors and lastly ward assistants making the least.

There were more female respondents than male in the three categories (nurses, doctors, ward assistants) of respondents. The table also indicates that, most of the patients were in 28-36years of age, followed by 20-27years and 37-43years with minimum being above 43years.The sex of patients showed more female patients were used for the study.

TABLE 4: Dressing of surgical wounds

Number of times post-operative wounds were dressed

HOW OFTEN WOUNDS WERE DRESSED	FREQUENCY	PERCENTAGE
Daily	18	24
Alternate	54	71
Others	4	5
Total	76	100

Table 3, indicates that, most surgical wounds were dressed on alternate days, followed by daily wound dressing. 'Others' recorded the minimum, which comprised of those who performed wound dressing twice daily and those based on the surgeon's instruction.

Table 5: Procedures for wound dressing

METHOD	FREQUENCY	PERCENTAGE
Sterile instrument	20	26
Sterile gloved hand	54	71
Others	2	3
Total	76	100

From table 4, the most common method of wound dressing was the use of sterile gloved hand, followed by the use of sterile instruments with the least number using other methods such as a combination of the two methods or with the use of disposable gloves.

Table 6: Process of sterilization

TYPE OF STERILIZATION	FREQUENCY	PERCENTAGE
Autoclaving	73	96
Steaming	2	3
Others High level sterilization	1	1
Total	76	100

The major method of sterilization was autoclaving as seen in table 6.This was followed by steaming while one indicated the use of high level sterilization.

Table 7: Range of wound infections recorded within the period of study

RANGE OF WOUND INFECTION	FREQUENCY	PERCENTAGE
0-3	52	68
4-6	18	24
7-9	3	4
Above 9	3	4
Total	76	100

Table 7 indicates that, most range of wound infections was between 0-3.This was followed by the 4-6 range with the 7-9 and above 9 both forming the least range of wound infections.

Table 8: Patients' educations

EDUCATION	FREQUENCY	PERCENTAGE
Yes	66	87
No	10	13

From table 8, more patients were educated prior to surgery during the period of study than were not educated.

Table 9: The impact of patient education on wound infection

No of patients who were educated	**Outcome of wound management (infected)**
66	8
No of patients who were not educated	**Outcome of wound (infection) recorded**
10	9

Table 9, highlights the value of patient's education prior to surgery. More patients who were educated recorded the least number of wound infections by one, whilest out of the10 patients who were not educated, more wound infections were recorded. It supports the suggestion that, there would have been more post-operative wound infections, if more of the patients were not educated prior to surgery.

CHAPTER FIVE

DISCUSSION

5.1 DISCUSSION

The objective of this study sought to determine the contributory factors of post-operative wound infections. The study was conducted at the surgical wards of Komfo Anokye Teaching Hospital, Kumasi with a sample size of 76 respondents.

Questionnaires containing both open and close ended questions were used to gather information from the respondents. The respondents included medical doctors, staff nurses and ward assistants. The findings from the study indicated that majority, 68 (89%) of the respondents were nurses with 5 (7%) as medical doctors, and 3(4%) as health assistants. This was so because wound dressing is one of the major duties of nurses on surgical wards. Medical doctors were second in majority for the reason that doctors most of the time; they perform wound dressing alongside nurses on patients who need certain specific and specialized care. Ward assistants were in the minority because wound dressing is not part of their duty but are sometimes allowed to manage simple wounds when there is so much workload on nurses. Results from the age range of respondents indicated that, majority were between 28-35years, followed by those in 20-27years and 36-43years in that order. None was recorded for those above 43year.These show that respondents are in their productive years and are actively involved, and experienced in wound management in their wards. It is also observed from the results on sex of respondents that, there were more females than males. The reason being that, the majority of respondents were nurses and there more female nurses than male nurses at KATH, where the study was conducted. According to the Human Resource Department, KATH, the ratio of female nurses to male nurses is about 9 to 1.Results from the range of age of patients indicate that, majority of patients were

between 28-36years. Most patients in this age group were on admission during the period of study. There were more female patients than male patients on the wards during the period of study as seen from the results on the sex of patients.

From the responses gathered, 54(71%) of wounds on the ward are dressed on alternate days,24% said daily and others 5%, which culminated into a lower number of postoperative wound infections. Thus the wounds were not being exposed spontaneously. Frequent exposure of wounds can contribute immensely to wound infection. This is in line with the Centers for Disease Control and Prevention (CDCP), Garner (1985) study that reveals that the causes of surgical wound infection could be attributed to some post-operative practices which includes improper covering of wound or spontaneous exposure of wound. It can therefore be deduced that exposure of wound by frequent dressing leads to surgical wound infection. It is also in line with Baxter's assertion, who said that, one of the aims of wound care is to disturb the wound as little as possible to allow healing and prevent bacterial invasion (Baxter, 2003)

About the procedure for wound dressing, majority (71%) of respondents used sterile gloved hand for wound dressing, 26% used sterile instruments, while 5 % of the respondents used other methods such as a combination of the two methods or with the use of disposable gloves. The reason given by respondents was the unavailability of instruments on some of the wards.

Results from sterilization of instruments revealed that the major form used was with an autoclave; 96% of respondents applied this method. 3% used steaming and 1% used high level sterilization. The use of autoclave also contributed to the lower incidence of postoperative wound infection. This is supports NICE (2008) stand on the use of autoclave for sterilization of surgical instruments. That, an autoclave achieves the sterility of instruments at a holding time of at least 15minutes at 121-134 at 100kPa or 3minutes at 134 at 100kPa.The finding also supports Equine

et al,1998 which used recent advances in instrument sterilization of gas plasma which has no toxic residual effect and applicability of heat and moisture sensitive instrument.

Out of 76 respondents, 87% educated their patients prior to surgery, while 13% did not. The minority of respondents who did not educate their patients before surgery cited work overload and lack of time as the cause their failure. Others also stated that their patients came in an emergency state and therefore no opportunity was presented to them to educate their patients.

It can be observed from the results on impact of patient's education on post operative wound infection that, the contribution of patient's education to preventing surgical wound infection cannot be understated. The results show that, the 87% of respondent who educated their patients before surgery, 8 postoperative wound infections were recorded. The 13% of respondents, who did not educate patients as part of their pre-operative preparations, recorded 9 wound infections postoperatively. These findings agree with Horie et al (2006) who stated that, various studies demonstrates that a reduction in postoperative wound infection is directly related to increased education (for the surgeon, the operating team and the patient), and that the awareness of the causes and risk factors for the development of postoperative wound infections.

Regarding the results on the range of wound infections recorded within the period of study, majority (68%) of wound infection recorded were in the range of 0-3, 24% was documented in the 4-6 range, while 4% each was recorded in the range of 7-9 and above 9 respectively. These can be deduced that, lower incidences of postoperative wound infection was recorded during the period of study, which can be attributed to the fact that; most wounds were dressed on alternate days, thus not exposing them spontaneously to contaminants, the wounds were dressed using sterile gloved hands, the dressing items were sterilized using autoclave, and most patients were

educated on the preventive measures of postoperative wound infection prior to surgery. These have been strongly backed by other studies and scholars.

5.2 CONCLUSION

This study concludes that:

- Most of the respondents used autoclaving as a method of sterilization of surgical instruments and materials which led to low incidence of post-operative wound infections.
- Few number of patients who were not educated on the preventive measures of post-operative wound infections recorded higher number of post-operative wound infections.
- Majority of the respondents used sterile gloved hand in wound dressing for which there was a corresponding low incidence of post-operative wound infections.
- Change of dressing is generally done every other day (alternate days). This resulted in relatively fewer post-operative wound infections.

5.3 RECOMMENDATIONS

- It is recommended that autoclaving at the Central Sterile Supply Department (CSSD) should be used in sterilizing dressing instruments and materials.
- Any patient undergoing even a minor surgical procedure should be educated appropriately on post-operative wound infection prevention principles.
- Alternate day wound dressing should be encouraged unless otherwise indicated and depending on the type of surgery.
- A further research should be conducted into the effectiveness of usage of sterile gloved hand dressing over that of the sterile instrument method of method wound dressing.

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APPENDIX 1

FACTORS CONTRIBUTING TO SURGICAL WOUND INFECTION IN THE MALE AND FEMALE SURGICAL WARDS OF KATH, KUMASI, ASHANTI REGION-GHANA

QUESTIONNAIRE

Dear Respondent,

We are students from the Christian Service University College, Kumasi; conducting a study into factors causing post-operative wound infection at the surgical wards of KATH.

We would be very grateful if you could spend some few minutes of your time to answer this questionnaire.

Your identity would not be disclosed, so feel at ease to cooperate by giving your honest opinion.

The questionnaire has been divided into five sections.

Thank You

Please tick or write.

SECTION A

BACKGROUND INFORMATION OF RESPONDENT

1. Sex Male [ ] Female [ ].
2. Age…….
3. Profession (Rank)……..
4. Religion…….

BACKGROUND INFORMATION OF PATIENT

1. Sex Male [ ] Female [ ]
2. Age of patient…….
3. Type of health problem of patient……..
4. Type of surgery……
5. Length or Duration of surgery……
6. Bed capacity of the ward……
7. Specialization of the ward
    a. Trauma [ ]
    b. General Surgery [ ]
    c. Plastics [ ]
    d. Urology [ ]

SECTION B

PROCESS OF STERILIZATION OF SURGICAL INSTRUMENTS

1. Are instruments sterilized before use?

    Yes [ ] No [ ].
2. If yes, what solution do you use in processing the instruments before sterilization?
    a. Parazone 1:10 [ ]
    b. Parazone 1:14 [ ]
    c. Savlon [ ]
    d. Other [specify] …….

3. How long are the instruments kept in the solution before sterilization?
    a. 5-10 minutes [ ]
    b. 11-15 minutes [ ]
    c. 16-20 minutes [ ]
    d. Above 20 minutes [ ]
4. What method do you employ in the sterilization of the instruments after use?
    a. Autoclaving [ ]
    b. Steaming [ ]
    c. Other [specify]……..
5. What is the duration of the sterilization of the instrument?
    a. 15-30 minutes [ ]
    b. 31-45 minutes [ ]
    c. 45minutes – 1 hour [ ]
6. Does the duration for sterilization of the instruments have any effect on the state of the wound?

    Yes [ ] No [ ]

    If yes specify the effect……

    ……..
7. How are the surgical materials or instruments stored and handled?
    a. In sterile packs [ ]
    b. Sterile drums [ ]
    c. Others [specify]

8. Does the storage and handling of the materials or instruments contribute to wound infection?

   Yes [ ] No [ ]

   If yes……

SECTION C

FREQUENCY OF WOUND DRESSING

1. On what day is the first post-operative wound dressing?

   a. 3rd day [ ]

   b. 4th day [ ]

   c. 5th day [ ]

   d. Other [ ]

   If other why?.....

   ……...

2. How often do you dress surgical wounds in this ward?

   a. Daily [ ]

   b. Alternate [ ]

   c. Other ……

3. Does the frequency of wound dressing contribute to wound infection?

   Yes [ ] No [ ].

   If yes how?

……

……

4. How many patients have had surgeries on the ward from 7/8/14 – 7/9/14?
   a. 5-10 [ ]
   b. 11-15 [ ]
   c. 16- 20 [ ]
   d. Above 20 [ ]
5. How many of them had post-operative wound infections?
   a. 0-3 [ ]
   b. 4-6 [ ]
   c. 7-9 [ ]
   d. Above 9

SECTION D

METHOD OR PROCEDURE OF WOUND DRESSING

1. What method do you employ in wound dressing?

a. Sterile instruments dressing [ ]

b. Sterile gloved hand dressing [ ]

c. Other [specify] …….

2. How effective is the method in preventing post-operative wound infections?

a. Not effective [ ]

b. Effective [ ]

c. Very effective [ ]

SECTION E

PATIENT EDUCATION

1. Are patients aware of the factors that contribute to surgical wound infection on their parts?

   Yes [ ] No [ ].

   If no, why? ……

   ……..

2. Are patients educated on the preventive measures of wound infection?

   Yes [ ] No [ ].

   If no, why? ……

   ……..

3. Do you prepare site of wound before dressing?

   Yes [ ] No [ ]

   Please explain your response…….....

   ……

4. Was this patient's post-operative wound infected?

   Yes [ ] No [ ]

5. Is wound infection preventable?

   Yes [ ] No [ ]

   Please explain your response…….....

   ……

6. What are your recommendations or suggestions to help reduce or prevent post-operative wound infection in the wards?

   …….

   …….

   …….