

Nurses' Knowledge and Practice for Prevention of Infection in Burn Unit at a University Hospital: Suggested Nursing Guidelines

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Abstract : Background: Infection is one of the main complications among burned patients. Nurses working with such patients must possess competencies and knowledge in order to ensure delivery of quality of care.

Aim: This study was carried out to assess nurses' knowledge and practice for prevention of infection in burn unit at a University Hospital; as well to suggest nursing guidelines according to study results.

Research questions: Q1: What is the nurses' knowledge for prevention of infection in the burn unit? Q2: What is the nurses' practice for prevention of infection in the burn unit?

Research design: A descriptive /exploratory research design was utilized to answer the research questions.

Sample: All nurses (20) in the burn unit at a University Hospital were enrolled in this study. **Tools:** Two tools were used to collect data which included: 1) demographic and nurses' knowledge assessment sheet 2) an observational checklist to assess nurses' practice in burn unit.

Results: Most of the studied sample (90%) had satisfactory level of knowledge ($\geq 75\%$) and unsatisfactory level of practice ($< 85\%$) regarding infection control measures with a total mean score of (26.76 ± 6.91) and (37.35 ± 12.07) respectively. No significant relationship was found in relation to knowledge and practice of infection control measures application ($r = 0.189$) except environmental cleaning was found moderate positive correlation ($r = 0.355$). No significant relationship was found regarding total nurses' knowledge and their total practice ($r = 0.201$). Also there was a negative correlation between the studied sample total practice score and years of experience ($r = -.482$).

Conclusion: Although the burned patients at high risk of developing life threatening problems as infection; most of nurses providing care for those patients have low level of practice especially application of infection control measures.

Recommendation: Written guidelines, and infection control manual should be available in burn units to be known for all health team members particularly nurses. An in-service training / continuing education must be stressed and provided for nurses working in such critical area of speciality. Also periodic estimation of infection rate and type of infection should be done in critically ill units such as burn units.

Key words: Burn Injury, Nosocomial infection, Infection Control Measures, Role of Nurses.

I. Introduction

Burn injuries are among the most devastating of trauma / all injuries and a major public health concern around the world (Qader & Muhamad, 2010). The worldwide incidence of burn-related injuries in 2004 was estimated to be 1.1 per 100,000 populations, with the highest rate in Southeast Asia and the lowest in the Americas. The incidence of burns in low and moderate income countries (LMIC) is 1.3 per 100,000 population compared with an incidence of 0.14 per 100,000 population in high income countries (WHO, 2008). Additionally Peck (2012) indicated that approximately 90% of burn injuries occur in low middle income countries. Burn patients are at high risk of developing nosocomial infection because of their destroyed skin barrier and suppressed immune system, compound by prolonged hospitalization and invasive therapeutic and diagnostic procedures. Nosocomial infections are one of the most common complications affecting hospitalized patients and contribute to excess morbidity and mortality (Azimi, Motevallian, Namvar, Asghari & Lari, 2011). Nosocomial microorganisms can originate from the patients themselves or from hospital environment, may also be acquired by health personnel working in the facility (Berman and Snyder 2012),

Nosocomial infection occurs in 5-10% of patients admitted to hospitals in the United States, and account 20-28% of all nosocomial infection recorded hospital-wide (O'Connell and Humphreys 2000). In Egypt, nosocomial infection continues to be a leading cause of morbidity and mortality. A study done by Gharib and Moukhtar (1994) revealed that nosocomial infection affect 40% of patients under artificial ventilation, and 30% of patients with urinary catheter in critical care Center at El Manial university hospital, Cairo University. Another study conducted at El-Mansoura University Hospital at the intensive care unit demonstrated that blood stream, lower respiratory and urinary tract infection, as well wound and skin infection was 40.63%, 18.75%, 17.97%, 6.25% and 3.91% respectively (El-Daker, 1998).

Talaat, Rasslan, Hajjeh, Hallaj, El-Sayed, and Mahoney, (2006) reported that estimating the burden of disease associated with hospital-acquired infections in Egypt is challenging because of limited surveillance activities and limited microbiology capacity in some public sector facilities. In addition, the complexity of applying the routine system of reporting infections and the complexity of case definitions hinders the availability of such data. Despite these limitations, some studies indicate that hospital acquired infections are emerging as an important public health problem.

The control and prevention of infectious diseases among burned patients present a greater and more specialized problem, because the skin barriers are disrupted, the environment in burn units can become contaminated with resistant organisms, and these organisms can be transmitted easily from one patient to another. Thus, a well conducted surveillance, infection control and prevention program can help reduce the incidence. It is known that effective surveillance and infection control may reduce infection, mortality rates, length of hospitalization and associated costs (Oncul, Ulkur, Acar, Turhan, Yeniz, Karacaer & Yildiz, 2009).

Optimal care of the burn patient requires a distinctive multidisciplinary approach. Positive patient outcomes are dependent on the composition of the burn care team and close collaboration among its members. At the center of this team is the burn nurse, the coordinator of all patient care activities. The complexity and multisystem involvement of the burn patient demand that the burn nurse possess a broad-based knowledge of multisystem organ failure, critical care techniques, diagnostic studies and rehabilitative and psychosocial skills. The nurse oversees the total care of the patient, coordinating activities with other disciplines such as occupational and physical therapy, social services, nutritional services and pharmacy. At the same time, the burn nurse is also a specialist in wound care. As a burn wound heals, either spontaneously or through excision and grafting, the nurse is responsible for wound care and for noting subtle changes that require immediate attention, prevention of infection and pain management (Greenfield, 2010).

Burn care nurse must not only continue to learn about the new advances required in burn care, but should also participate actively in learning skills for developing their inner knowledge, intuition, and wisdom as well as the discipline to integrate such skills into daily practice (Ali, 1995 & Aron, 1996). Smeltzer and Bare (2010) mentioned that although sophisticated technology is an integral part of medical care, there is an emphasis on bedside clinical care which remains a key component of the burn care. The major part of nurses' role during burn care is detecting and preventing infection. The nurse is responsible for providing a clean and safe environment for closely scrutinizing the burn wound to detect early signs of infection.

In this regards, infection control in burn unit may be stressful, challenging and rewarding experience. It may be stressful because of many skills, procedures and responsibility demanded by the burn care nurse. It may be a challenging because nurses play an essential role in the bio-psychosocial assessment and management of their patients, caring for such patient may also be rewarding because it gives nurses an opportunity to demonstrate their understanding of holistic nursing care (Harkens & Dinchher, 1998; Greenfield, 2010). However, there is evidence that management and care of patient with burn injury requires a unique body of knowledge and skills from a range of multidisciplinary team members especially the nurse, and encompasses a wide variety of roles and responsibilities, mainly prevention of infection.

Aim of the study

The current study was carried out to assess nurses' knowledge and practice for prevention of infection in burn unit at a University Hospital, as well as to suggest nursing guidelines according to study results.

Significance of the Study

According to WHO statistics (2012) estimated number of (195000) death every year is caused by burn wounds, and the vast majority occur in low and middle-income countries. The statistical and medical records department at El-Manial hospital revealed that the number of patients who diagnosed with burn injury are increased in the following three consecutive years (2010, 2011, & 2012) as (405, 543, 487) burnt patients respectively. Burn injuries are considered immediately or potentially life threatening; whereas, burnt patients require special care that should be given by a knowledgeable and skilful nurse who is able to make accurate decisions to reverse, and to minimize the effect of burn injury and prevent complications as infection which may end patient's life. Because of burnt patients are more susceptible to acquire infections more than other patients, the nurses should flow strict aseptic techniques when dealing with such patients, also it is very important for the nurse to be aware of early signs and symptoms of nosocomial infection, how to prevent or minimize as well as how to deal with infected patient. Therefore, this study was carried out to assess nurses' knowledge and practice to prevent infection in burn unit, and to suggest nursing guidelines according to study results hoping that these may improve patients' outcomes and consequently enhance quality of provided nursing care.

Research questions:

The following research questions were formulated:

- 1: What is the nurses' knowledge for prevention of infection in the burn unit?
- 2: What is the nurses' practice for prevention of infection in the burn unit

Research design:

A descriptive/exploratory research design was used. The purpose of descriptive/ exploratory studies is to observe, describe, and document aspects of a situation as it naturally occurs and sometimes to serve as a starting point for hypothesis generation or theory development. This design helps the investigator to collect detailed descriptions of existing variables and use the data to justify and assess current condition (Polit & Beck, 2012).

Subjects & Setting

The study included all nurses (20 nurse) working in a burn unit at El Manial University Hospital, Cairo -Egypt.

Tools

Two tools were used in this study for data collection:

1. Knowledge assessment sheet were divided into two parts;

first part: covered the nurses' sample demographic' characteristics such as age, years of experience, qualification, and post academic education (any training courses regarding infection control).

The second part: covered questions related to nurses' knowledge and included 65 questions related to Nosocomial infection' definition, causes, source, mode of transmission, infection control measures; knowledge about burn (e.g. definition, causes, degree, and calculation of burn surface area) and also questions about nosocomial infections in burn unit.

2. An observational checklist, it was designed for the purpose of assessing nurses' practice in burn unit. The observational checklist covered (nurses' practice to maintain safe environment, initial care of burn wound, changing burn dressing, starting I.V infusion. Each nurse was observed for three consecutive times by one of the researchers (to maintain consistency & avoid subjectivity). Pilot study was done to test the clarity and feasibility of the developed tools.

A score of one was given for each correct answer, and a zero for incorrect answer. For scoring of nurses' practice, each step done correctly given two and one for each step done incorrectly, for step was not done given zero score. The Satisfactory level of nurses' knowledge accepted at 75% and above while less than 75% (48.75) considered unsatisfactory score. This level of knowledge was chosen because all nurses were diploma degree and most of them attend from one to two seminars of infection control only. Regarding nurses' practice satisfactory level accepted at 85% and above while less than 85% (224.4) considered unsatisfactory because burned patients are more susceptible to acquire infections more than other patients.

Validity and Reliability

Content validity of both knowledge and practice assessment sheets were checked by three experts in Medical-Surgical Nursing and modification done accordingly.

To check reliability of the tools an Alpha Coefficient was used. Measurement of reliability ranged from 0.00 to 1.00. The reliability of knowledge assessment tool was established at Alpha Coefficient of 0.90 of total test, with 0.92 for the area of knowledge regarding nosocomial infections in general, 0.69 for the area of knowledge regarding burns and nosocomial infection in burn unit. For observational checklist reliability was 0.93. Also in relation to maintaining safe environment for performing procedure the Alpha Coefficient was 0.97, 0.81 for initial care of burn wound. In addition, for change of burn dressing and starting I.V. infusion, the Alpha Coefficient was 0.88 and 0.91 respectively.

Procedure:

Once permission was granted to proceed with the proposed study, each nurse was interviewed individually for about 10 min. thus, to explain purpose and nature of the study. An informal consent was obtained orally to participate in the study. Then, knowledge assessment sheet were distributed for each nurse and collected at the end of the shift. The study sample filled knowledge sheet while they were on duty. Researcher was available through the shift to answer / clarify any questions needed by the subjects. As regards, observational checklist, each nurse of study subjects have been observed and assessed by the same researcher three times during providing care on three different patients, and on different days. Data collection was completed over a period of two months through year 2012.

Statistical analysis: Statistical analysis was done using SPSS version 20 statistical software package. Data were presented using frequency, Mean \pm SD; correlation between quantitative variables was done, Significant level was pre-set at $p \leq 0.05$.

Ethical considerations:

To precede with the proposed study an official permission was obtained from the head of burn unit. Prior to the initial interview, the researchers introduced themselves to study subjects, each nurse was fully informed with the, purpose and nature of the study, and then oral consent was taken from participants. The researchers used coding numbers for each nurse's knowledge and observational' checklist to guarantee nurses' privacy.

II. Results

Results of the study will be presented into two parts:

Part 1: represent demographic characteristics of the study sample. Findings revealed that all the study sample were females with a diploma degree and with a mean age-of ($X \pm SD 36.60 \pm 7.53$), 40% of them have 10-20 years of experience; followed by 35% with less than 10 years of experience, while 25% have more than 20 years of experience ($X \pm SD = 14.84 \pm 6.954$). The results also showed that 75% of the study sample attended one or two seminars in infection control, while only 5% of them attended more than two seminars in the area of infection control; on the other hand, 25% did not attend any seminars.

Part 2: Represents nurses' knowledge and practice for prevention of infection in burn unit:

The findings pointed up that most of the study sample (80%) had satisfactory level of knowledge ($\geq 75\%$) with a total mean score (45.10 ± 10.11). According to definition of infection, cause, source and mode of transmission the majority of the study subjects (80%, 90%, 90% and 65%) had satisfactory level of knowledge with a subtotal mean score of ($2.10 \pm .718$, 5.45 ± 1.14 , $2.35 \pm .670$ and 2.65 ± 1.14) respectively and a total mean score (12.55 ± 2.83)

As regards infection control measures 90% of the study sample achieves the satisfactory level of knowledge ($\geq 75\%$) with a mean score of (26.76 ± 6.91). In relation to nurses' knowledge about burn injury (definition, causes and calculation of burned area) approximately one quarter 35% of the study subjects only had satisfactory level of knowledge ($\geq 75\%$) with a mean score of (1.80 ± 1.00); while slightly more than half of them (55%) had satisfactory level of knowledge related to infection control in burn unit (3.95 ± 1.79).

Regarding nurses' practice scores, the findings indicated that very low percentage 10% of the study sample had satisfactory level of practice ($\geq 85\%$) related to maintain a safe environment with a mean score of (37.35 ± 12.079), initial care of burn wound, 15% ($\times = 30.40 \pm 12.11$), procedure for changing dressing 20% ($\times = 42.25 \pm 17.21$), and starting I.V. infusion represent 20% with a mean score of ($\times = 21.45 \pm 13.02$).

Table (1) Relationship between total nurses' knowledge and their practice scores

Total Knowledge		Total Practice		r
\bar{x}	SD	\bar{x}	SD	
45.10	10.11	132.75	47.29	0.201

$P = \leq 0.05$

No significant relationship was found regarding nurses' knowledge and their practice.

Table (2) Nurses' knowledge and practice regarding application of infection control measures:

Item	Knowledge		Practice		r
	\bar{x}	SD	\bar{x}	SD	
- Environmental cleaning	7.05	2.06	14.05	6.67	0.355*
- Waste disposal	1.50	.513	2.65	2.00	0.077
- Sharp objects & handling disposal	3.25	1.06	2.15	1.63	0.188
- Handling department equipment	7.70	2.40	14.95	4.52	0.045
- Hand washing	7.25	2.04	3.55	1.87	0.127
Total	26.75	6.91	37.35	12.07	0.189

As shown in table (2) the correlation between total nurses' knowledge and practice regarding application of infection control measures was not significant except knowledge and practice of environmental cleaning there was a moderate positive correlation.

Table (3) Correlation between demographic characteristics of the study subjects and total knowledge and practice scores.

Item	Years of experience	Number of seminars
	r	R
- Total knowledge	.047	.033
- Total practice	-.482*	.144

Table (3) clarify that a negative significant relationship was found between nurses' mean practice scores and their level of experience ($r = -.482$). While, no significant relationship was found between nurses' sample total knowledge scores and their years of experience ($r = .047$). Also there was no correlation found between total knowledge/practice score and years of experience and number of seminars ($r = .033, .144$) respectively.

III. Discussion

Infection can lead to deterioration of the wound healing process and severe systemic complications and is the leading cause of morbidity and mortality in patients with burns (Leseva, Arguirova, Nashev, Zamfirova & Hadzhyisk 2013). In recent years, nosocomial infections have reached epidemic proportions and are one of the main concerns in the health care arena. A continuously increasing prevalence, 10 % of patients on general hospital units will acquire a nosocomial infection during their hospital stay. This warning alarm raises the necessity for qualifying and updating knowledge of health care providers who carry out the clinical responsibilities while providing an optimal quality of level of patient care (Jackson, Chiarello, Gaynes, & Gerberding, 2002 and Chen, & Chiang, 2007). In this regards (Oncul, Ulkur, Acar, Turhan, Yeniz, Karacaer & Yildiz, 2009) emphasize the need for careful and strict infection control procedures in areas that serve immunosuppressed individuals, such as burn patients. So the nurse must be meticulous about following measures of preventing it. Therefore, the aim of this study was to assess nurses' knowledge and practices for prevention of infection in burn unit and to suggest a nursing guideline according to study results.

The current study findings revealed that 75% of the study sample attended between one to two sessions only for prevention of infection. Kable, Guest, & McLeod (2011) who found that just one-third of their studied nurses attended in-service training courses about infection control. Also Ebied, (2011) found that more than half of nurses attended infection control course, attending continuing nursing education courses and training programs. In this regards, (Rasslan, 2011) decided that in order to have qualified professionals to take over infection prevention and control activities it would be important to have a more comprehensive training programme.

Regarding individual items the study shown that, most of the studied sample had satisfactory level of knowledge regarding definition, causes, source, mode of transmission of nosocomial infections and infection control measures in general. These results are agreement with Ibrahim, Said & Hamdy (2011), who found the majority of their studied group aware with, what infection is, and how it is transmitted. as well as Alwutaib, Abdulghafour, Alfadhli, Makboul & El-Shazly (2012) who reported acceptable knowledge level regarding modes of transmitting diseases. While, their knowledge regarding burn (definition. causes & calculation of burn area) and nosocomial infection in burn unit was low. From the researcher point of view this might be related to all nurses with a diploma degree and calculation of burn area was the doctor responsibility.

Also Mussa and Abass, (2014) carried out study about assessment of Nurses Knowledge Regarding Nursing Care for Patients with Burn revealed that the nurses knowledge of burn and nursing care were moderately adequate at Azady hospital in compare to adequate knowledge at western hospital. Knowledge regarding treatment showed adequate knowledge at both hospitals and their knowledge of complication of burn were moderately adequate at both hospitals. These results emphasized that training program about infection control system should be designed in such a way that all members of staff can understand the hospital policy and system as well as to motivate them to adhere to it.

The findings of the present study indicated that very low percentages maintain a safe environment; as well low percent provide initial wound care. Berman and Snyder (2012) stressed that universal precaution are a set of practices that be used with all patients mainly compromised one such as those who have skin impairments i.e. patients with severe dermatitis or major burns, thus to prevent spread of infection. These results pointed out that the nurse is responsible for providing a clean and safe environment, and for closely scrutinizing the burn wound to detect early signs of infection.

Regarding the nurses' knowledge about hand washing, the current study illustrates a significant difference between nurses' knowledge and their practice. Manisha, Vinita, Bibhabati, Archana & Poonam (2012) reported that Infection control practices are of paramount importance in any healthcare setup for prevention of HCAI. Hand hygiene is the first initial step towards successful infection control in any healthcare setup. Although the results found that most of nurses 90% had unsatisfactory level of practice regarding hand wash more than half of them had satisfactory knowledge level more than 75%. Many research studies

investigate the effectiveness of aseptic technique. For example, a number of studies have shown a link between artificial fingernails, nail polish, nail length, and hand jewellery and colonization with pathogens, but only artificial nails have been shown to influence transmission, especially fungal (Ward, 2007). On the other hand, Praissman (2008) pointed out that because hand hygiene is performed so frequently, it provides a good opportunity for the nurse to take a moment to breathe and prepare for next client encounter. Furthermore, by allowing a full, quite breath in, and a slow, complete exhalation, the nurse can focus his or her attention and intention to remain mindful, where this attitude increases the effectiveness and safety of care. These indicate that nurses should use critical thinking and follow agency policy in implementing infection control procedures.

The quality of nursing care depends to a large extent on the knowledge, skills, attitude and activities of the practicing nursing staff. The results of this study clarified that nurses' practice in relation to prevention of infection while providing care to burned patient was low. The results of the present study was congruent with Fahim, Hekmat, Salwa & Heba (2011) who illustrate that, there was a positive significant statistical relation between obtaining training courses and nurses good performance. The study recommended that: Provision of continuing education programs on regular basis is suggested in order to refresh and update nurse's knowledge, as well as reinforce proper practice related to infection control.

Results of the present study from the researcher point of view might be due to unavailability of resources and no restrict policy and continuous education. In this regards Najeeb & Taneepanichsakul, (2008) revealed that nursing practice is not only influenced by knowledge, but also by organizational factors such as nursing staff to patients' ratio and sufficient supplies that help to achieve the goal of infection prevention. As well, lack of nurses' sample training and lack of facilities in the unit they work. Results of current study are in agreement with Ignatavicius, Workman (2013) and Tantawy (2000) who concluded that nurse shown inadequacy in their skills about infection control measures in operating room. On the same line, Hibbert, (2000) reported that untrained staff cannot be able to provide good practice.

Berman and Snyder (2012) stressed that meticulous use of medical and surgical asepsis is necessary to prevent transport of potentially infectious microorganisms. For example, many nosocomial infections can be prevented by using proper hand hygiene techniques, environmental controls, and sterile technique. The problem of infection can be avoided using strict aseptic technique while providing patient care. The present study findings indicated that study subjects' practice scores for starting and keeping IV infusion and following principles of asepsis were low. As regards maintaining clean environment Leseva et al. (2013) concluded that linen and clothing should be impregnated with antimicrobial substance to prevent colonization of newcomers to the unit with nosocomial pathogens where this action is considered as part of environmental measures that control NI. Yusuf (2012) emphasized that standard precautions should be used for all burn care i.e. improved aseptic technique when inserting devices could decrease the rates of nosocomial infections in burn units. In addition, all invasive lines and tubing must be routinely changed. The study results revealed that nurses' knowledge and practice scores regarding objects handling and its disposal, also waste handling were low. This result might ensure that nurses working in burn unit always in need of updating their knowledge.

In addition, the present study showed negative significant relation between nurses' mean practice scores and their level of experience, as well as no significant relation between nurses' experience and their knowledge scores. This is contradicting with Whyte, Ward & Eccles (2009) who study the relationship between knowledge and clinical performance in novice and experienced critical care nurses. And found that experienced nurses possessed highly superior knowledge when compared with novice nurses ($P < .001$). The results further demonstrated a lack of reliable differences in actual clinical performance. However, there were stark individual differences and variability in performance within the experienced group. More than half of the highly experienced and knowledgeable nurses still performed at a level that was comparable to that of a novice.

Burn nurse should protect the patient from sources of contamination including other patients, visitors and equipment. These results emphasize that whenever possible, the nurse should implements strategies to prevent infection. If infection cannot be prevented, the nurse's goal should be directed to prevent the spread of infection within and between persons, and treating existing infection.

IV. Conclusion And Recommendations

Burns are immediately or potentially life-threatening injuries. Patients with burn injuries are characterized by presence of, or being at high risk of developing life threatening problems due to the rapidly changing physiologic status, number of supportive devices and the multiple potential complications. Infection is one of the main complications among burned patients. The major part of nurses' role during burn care is detecting and preventing infection. Therefore, they must be well oriented with various protocols of care that can be followed to rationally manage a given situation. In addition, nurses working with such patients must possess competencies and knowledge in order to ensure delivery of quality of care. Also, staff in burn units should maintain a good working practice, and must be aware of the risk of infection. The common threads in preventive

measure listed for various types of infections including proper hand washing, proper barriers while dealing with sepsis, cleanliness and disinfecting the equipment.

According to study findings it is recommended that: infection control committee should encourage carrying out surveillance, follow written guidelines, as well infection control manual should be available in burn units and to be well known to all health team members working in every unit particularly nurses. Also periodic estimation of infection rate and type of infection should be done in critically ill units such as burn units. An in-service training / continuing education must be stressed and provided for nurses working in such critically units.

Nursing implications

The nurse plays a crucial role in preventing infection among the burned patients. Therefore the finding of this study and nurses follow the nursing guide line are going to help in prevent infection and consequently enhance the quality of nursing care. Regarding research, the study findings also may provide basis for other researchers who would want to carry out further research on infection prevention and control principles.

Suggested Nursing Guidelines:

I- Isolation Guidelines

- a- Standard precautions should be followed when caring for all patients with burn injury.
- b- Appropriate barrier garb (clean gowns, plastic aprons) is recommended for any patient contact unless wounds are minimal and can be occlusively wrapped.
- c- Other requirements of standard precautions include appropriate hand washing,
- d- Removal of garb immediately upon leaving the room,
- e- Changing gloves that become contaminated with patient secretions or excretions before contact with another site.
- f- Addition of sterile gloves, hats and masks when caring for an open burn wound or other sterile procedures.
- g- Equipment and surfaces should be appropriately decontaminated before storage or use on other patients.
- h- Appropriate garb should also be worn when decontaminating this equipment.

II- Category Specific Precautions

- a- Two groups of burn patients are unique and require additional precautions, patients with larger burn injuries (greater than 25% to 30% TBSA burn) and those colonized with multiply resistant organisms.
- b- Patients with greater than 30% TBSA burn injuries are more immunocompromised, due to the larger size of their injury. This, in combination with their loss of physical defences and need for invasive devices, significantly increases their risk of infection. These patients also represent a significant risk for contamination of their surrounding environment with organisms, which may then be spread to other patients on the unit. It is recommended that patients with larger burn injuries be isolated in private rooms or other enclosed bed spaces to ensure physical separation from other patients on the unit.

III- Environmental Issues

- a- Plants and flowers should not be allowed in units with burn patients because they harbor gram-negative organisms, such as *Pseudomonas* species, other enteric gram-negative organisms, and fungi. Many of these organisms are intrinsically resistant to multiple antibiotics, which may serve as reservoirs to colonize the burn wound.

IV- Sites of Infection and Prevention Techniques

1- Burn Wound Infection.

- a) Prevention of burn wound infection involves assessment of the wound at each dressing change for changes in the character, odor or amount of wound drainage, with immediate notification of the physician if any deterioration occurs.
- b- Strict aseptic technique should be used when handling the open wound and dressing materials as well as frequency of dressing should be based on the assessment of the wound condition.
- c- If the wound has necrotic material present, a debriding dressing should be chosen while a protective dressing is best for clean, healing wounds.

V- Prevent Urinary Tract Infection

- a- Removal of the catheter as soon as it is no longer required for clinical monitoring of urine output.
- b- Maintaining a closed urinary drainage system.
- c- Performance of urinary catheter care.

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