Sudan University of Science& Technology

College of Postgraduate studies

Deanship of Development &Quality

Total Quality & Excellence Center

Effect of implementation of Quality Improvement tool(Braden score) on incidence of Pressure Ulcers in Intensive Care departments -Ribat University hospital &Al Shaab Teaching hospital as Case study 2015

أثر تنفيذ أداة تحسين الجودة (Braden score) فى حدوث قرحة السرير في أقسام العناية المركزة ـ دراسة حالة مستشفى جامعة الرباط ومستشفى الشعب التعليمي-2015

A desertation submitted for parial fullfillment for M.Sc degree in quality management and excellance

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إستهلال

قال الله تعالى :

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(قُلْ يَا عِبَادِيَ الَّذِينَ أَسْرَفُوا عَلَى أَنفُسِهِمْ لَا تَقْنَطُوا مِن رَّحْمَةِ اللَّهِ إِنَّ اللَّهَ يَغْفِرُ الذُّنُوبَ جَمِيعًا إِنَّهُ هُوَ الْغَفُورُ الرَّحِيمُ)

سورة الزمر – الآية 53

Initiation

In the name of God, the Gracious, the Merciful.

(Say, "O My servants who have transgressed against themselves: do not despair of God's mercy, for God forgives all sins. He is indeed the Forgiver, the Clement.")

Al-Zomor (verse 53)

Dedication

To those whom I love.

Acknowledgement

I am mostly thankful to Allah for giving me the ability and strength to complete this thesis. My sincere thanks and appreciate to Dr.Adil for his advice and supervision throughout the study period. Great thanks for my colleges for their great help.

I would never be without my family, which supports me morally and financially. Whole-hearted thanks for my parents. I am gratefully thanking my brothers and sisters for their support and encouragement. I am greatly indebted to my big brother Yasir for his help during my journey.

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List of Abbreviations

ACCCN: Australian College of Critical Care Nurses

AHRQ: Agency for Healthcare Research and Quality

CACCN: Canadian Association of Critical Care Nurses

CDC: the Centers for Disease Control and Prevention

HICPAC: The Healthcare Infection Control Practices Advisory Committee

ICU : Intensive Care Unit:

RTA: Road Traffic accident

DM: Diabetes Mellitus disease

HTN: Hypertensive disease

TOM: Total quality management

CQI: Continual quality improvement

QA: Quality assurance

Abstract

Pressure ulcers are a continual problem in hospitalized patients especial in critical ill patient.

A case control comparative study is conducted to make out the effect in the incidence of the pressure ulcer among intensive care units' patients in duration of five months. The targeting sample will be the critical ill patients in intensive care unit in Ribat University hospital &Al Shaab Teaching hospital. The data analyzing by using case – control analysis (student's t. test, chi square test (cross tab) and ANOVA), in addition to descriptive statistics will be conducted, specifically looking into age, gender, Cause of admission, chronic illness, the training level of nurse. Results presented in tables and graphs

Aim:

To reduce the incidence of pressure ulcer among Intensive care unit's patients

Purpose of study:

To study implementation of Quality Improvement tool(Braden score) lead to decrease incidence of Pressure Ulcers in Intensive Care departmentsat

Objectives:

- To assess the effect of using the Braden score tool in the incidence of pressure ulcer among ICU's patient
- To assess the effect of availability of the support services in the incidence of pressure ulcer among ICU.

Results:

1. The study showed that 14.8% of the patients who used the Braden score tool developed pressure ulcer compare to 42.8 % of the patients who didn't use the tool.
2. Age and chronic illnesses were significant factors (p=.000,p=0.031 respectively)
3. There are no written policies and procedures for basic infection control
4. The supportive service was not appropriate

مستخلص الدراسة

مقدمة:

هدفت هذه الدراسة للتحقق من فاعلية استخدام أدوات الجودة فى متابعة الحالة الصحية لمرضى العناية المكثفة من حيث الإصابة بقرح السرير، حيث استخدمت الباحثة المنهج التجريبى وأجريت دراسة مقارنة لتطبيق أداة تحسين الجودة فى وحدات العناية المركزة والعينة تستهدف أن يكون المرضى المصابين بأمراض حرجة في وحدة العناية المركزة و أكبر من 18 سنة فى خلال خمسة أشهر. .وتم تحليل البيانات باستخدام SPSS 16 بالإضافة إلى إحصاءات وصفية، وتبحث على وجه التحديد في العمر والجنس وسبب الدخول والأمراض المزمنة، و مستوى تدريب الممرضين وتم عرض النتائج في جداول ورسوم البيانية .

الهدف : الحد من حالات قرح السرير بين المرضى فى وحدات العناية المركزة

هدف عام:

أثر تنفيذ أداة تحسين الجودة (Braden score) فى حدوث قرحة السرير في أقسام العناية المركزة

النتائج المهمة:

1- أظهرت الدراسة أن نسبة الإصابة بقرحة السرير بلغت 14.8٪ فى المجموعة التجرية (case) بينما بلغت 42.8٪ فى المجموعة الضابطة(control) .
2- العمر والأمراض المزمنة من عوامل الهامة (P = 0.000، p = 0.031 على التوالي)
3- لا توجد سياسات وإجراءات مكتوبة لمكافحة العدوى الأساسية
4- الخدمات الداعمة غير ملائمة

أهم التوصيات:

تدريب الاطباء وممرضين على استخدام أداة الجودة فى قسم العناية المركزة مع توفير معينات العمل

Chapter One

Overview

Introduction

"1% of errors are due to incompetent people, the other 99% are good people trying to do a good job who make very simple mistakes and it's the processes that set them up to make these mistakes." Dr. Lucian Leape, Harvard School of Public Health

Pressure ulcer (Bedsore) remained as a common health problem worldwide among hospitals especially at intensive care unit which is an area that provides highly technological care to critically ill patients and their families and/or support systems. The unit is designed in a way to provide care that is highly visible and accessible to the patient, while still promoting comfort with a patient and family focused philosophy. Furthermore, it is a socioeconomic and educational problem (CACCN .2004).

Pressure ulcer is defined as painful often reddened area of degenerating, ulcerated skin caused by pressure and lack of movement, and worsened by exposure to urine or other irritating substances on the skin (ACCCN. *ICU,2003*).Prevalence rates for PUs are 11.9% in acute care, 29.3% in long term acute care, 11.8% in long term care, and 19.0% in rehabilitation. A retrospective study done in a medical-surgical intensive care unit from October 2008 to May 2009,they found that among all hospitalized patients, prevalence rates of acquired pressure ulcers are the highest in patients in the intensive care unit (ICU), from 14% to 42% (Jill Cox,2011).

According to Mayo Clinic Family Health book (4th Edition), the complications of bedsore can lead to death as well as the major complications including:

1- Cellulites - a bacterial infection of the skin and the subcutaneous tissues-including septicemia (blood poisoning), and can spread to other parts of the body.

2- Bone and joint infections: if the infection spread to the joints or bones, the result will be damage to cartilage and tissue and a reduction in limb and joint function

3- Sepsis - bacteria can enter through sores, especially advanced ones, and infect the bloodstream. There is then a serious risk of shock and organ failure, a life-threatening condition.

4- Cancer : also sometimes the pressure ulcer become skin's squamous cell carcinoma

Also a report done by Russoc about the cost of health care of pressure ulcer found 80% increase in the occurrence of pressure ulcer from 1993-2006 and its cost $11billion *(*Russoc,Stremer,Spector ,2006).

Research problem

Pressure ulcers are often difficult to heal, painful and impact negatively on the individual's quality of life. The prevention of hospital acquired pressure ulcers in critically ill patients remains a significant clinical challenge.

In Sudan up to my knowledge, there are no published research about pressure ulcers according to my search in internet and Sudan Medical specialist library and college of nursery Khartoum university; however experience of doctors and nursing observation noted the incidence of pressure ulcers becomes very high specially in ICU, and there are no guidelines for ICU about the nursing care and infection control. Accordingly, we need to know the best way to decrease this problem.

Justification:

The health workers staff are one of the issue constitute important that influence in exist of pressure ulcer. They should be well trained to monitor all patients specially the intensive care unit‘s patients irrespective of age or contributing factors on daily basis. So we need to investigate and to review the studies which tried to implement the strategies mainly the effect of training of the staff to find stable and effective and easy tools for use.

Hypothesis:

I assume that the patient whom follows by quality tool (Braden score) has low degree to develop bedsore.

Research Question:

1- Does the use of the quality tool (Braden Score) will reduce the percentage of pressure ulcer among ICU's patients?

2- Do the support services have an effect on reduction of pressure ulcer?

Purpose of the study:

To study implementation of Quality Improvement tool(Braden score) that lead to decrease incidence of Pressure Ulcers in Intensive Care departments

Objectives of the study:

- To assess the effect of using the Braden score tool in the incidence of pressure ulcer among ICU's patient
- To assess the effect of availability of the support services in the incidence of pressure ulcer among ICU's patient

Limitation of study:

1- Time : duration of study was short

2- Place: change place of study due to political issues(Khartoum hospital closed)

3- Subject: this study was not faced any limitation regarding the subject.

Terms:

Pressure ulcer: also called bed sore is painful often reddened area of degenerating, ulcerated skin caused by pressure and lack of movement (CDC, 2012).

Hospital associations infection: also called "hospital acquired infection" can be defined as: An infection acquired in hospital by a patient who was admitted for a reason other than that infection This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility (Benenson AS, 1995).

Hand hygiene: A general term referring to any action of hand cleansing.

Hand rub or Hand washing with soap and water aimed at reducing or inhibiting the growth of micro-organisms on hands.

Alcohol-based (hand) rub:
An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to in activate microorganisms and/or temporarily suppress their growth.

Accreditation: a voluntary process in which facilities agree to follow a set of standards and receive recognition for having met those standards

Total quality management (TQM): is about doing the same things better (normally by identifying and reducing variation in the process(Parsley & Corrigan ,1999).

Continues quality improvement (CQI): all processes (even those working well) are believed to be capable of further improvement shifts from doing the same things better to do different things (Parsley & Corrigan ,1999).

Chapter Two
Literature Review & previous studies

The researches about pressure ulcer started from 1950s by Doroen Norlon –one of British nurses- she said that "the best treatment and prevention of pressure ulcer was removing the pressure by turning the patient every two hours" (Christian Nordquist, 2009).

The pressure ulcer may affect any part of the body, bony or cartilaginous area such as; elbow, knee, ankle and sacrum are most commonly affected. I found that in many researches, the incidence of pressure ulcer in intensive care unit ranges between 7% to 53.4% specially in two major side of body the sacrum and coccyx (Whittington, Briones, 2004) (Schurman et al., 2009).

2.1 Classification of pressure ulcer:

The pressure ulcer classified into four stages (grading) depend on severity, the National Pressure Ulcer Advisory Panel, USA, defines each stage. According to National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel (2009) these stages are:

1. "Stage I: starts as a persistent area of red skin, which may be itchy, painful and may also feel warm, spongy or firm when touched. Among people of African ancestry, and individuals with darker skin, the mark may seem to have a bluish/purplish cast; it may even look ashen or flaky. As soon as the pressure is relieved, the sore generally goes away rapidly."
2. "Stage II skin loss has already taken place. This could be in the epidermis (the outer layer of skin), or the dermis (deeper down in the skin) - sometimes both. The pressure ulcer is at this point an open sore, similar to an abrasion or a blister. The surrounding tissue may appear red or purple."
3. "Stage III: there is now a deep wound, like a crater; the damage has gone below the skin. There is skin loss which occurs throughout the entire thickness of the skin. The underlying muscles and bone are not damaged."
4. "Stage IV: the most severe type of ulcer. Skin is severely damaged and there is tissue necrosis (surrounding tissue starts to die). Underlying

muscles or bone (or both) may also be damaged. Tendons and joints may also be damaged. At this point there is a serious risk of developing a life-threatening infection."

Patients in the ICU are at an increased risk of developing Healthcare association infection due to:

1. The severity of the patient's illness and underlying conditions
2. The length of exposure to invasive devices and procedures
3. The increased contact with health-care personnel
4. The length of the ICU stay
5. The special environmental characteristics of the unit such as space limitations

2.2 Quality in Healthcare:

The earliest written health service records are probably those dating from the Babylonian Empire circa 1700 BC where sanctions are described for providing poor quality health care. In the law of Hammurabi, one of the kings of Babylonian, punishments are described which were applied to doctor who had caused a patient harm.

In 1860s, Florene Nightingale helped to lay the foundations for quality assurance programmes. In 1910, a report by Dr. Abraham Flexner revealed the poor quality medical education in the U.S (closing 60 out of 155 medical school). In 1914, Codman started to study the end result of care. His study emphasised the same issues that are being discussed now a days (the importance of licence &certification, accreditation, health &illness behaviour, economic barriers to receive care).

In 1913 the American college of surgeons was established , one of its goals was the improvement of patient care in hospitals and as a result of their hospital accreditation programme survey in 1918 only 12,9 % hospitals approved compared to 94,6% qualified for approval in 1952 (Timothy,1983).

In the next two decades (1940s – 1960s), the public developed increasing interest in the organization, planning and evaluation of the

health care services and demands for accessibility. And in 1960s, the public developed greater expectations about health care. The decade was marked by concern for consumer protection, human rights and concept of health care as a right. Also studies about quality of care were started and Donabedian described the differences between structure, process and outcome. According to this concept, more and more aspects of care were measured and compared with standard and criteria of quality care as well as more and more aspects of care were discovered that did not meet the standards (Donabedian, 1986).

During the 1970s, interest in quality assessment accelerated, formulating standards and criteria of all kinds of aspects of care became an important theme ,in what could be called, traditional medical quality assurance.There are six important factors : the organization culture, design, quality leadership, physician involvement, quality structure and technical competence (VieraWardhania2009)

Quality assessment measures the difference opportunities for improvement. Performance standards can be established for most dimensions of quality, such as technical competence, effectiveness, efficiency, safety, and coverage. Where standards are established, a quality assessment measures the level of compliance with standards. For dimensions of quality where standards are more difficult to identify, such as continuity of care or accessibility, a quality assessment describes the current level of performance with the objective of improving it

"A comprehensive strategy of organizational and attitude change , for enabling personnel to learn and use quality methods, in order to reduce costs and meet the requirements of patients and other customers" (Abdulsattar,2014).

Quality assurance (QA) includes all the actions taken to make healthcare better. These activities build on the principles of quality management, "a systematic managerial transformation designed to address the needs and opportunities of all organizations as they try to cope with the increasing change, complexity and tension within their environments" (Berwick 1991). So, quality management focuses on improving the processes by which services or products are produced, as well as the quality of the service or product itself. (NSW,2006).

Recently, much pressure has been exerted upon health care institutions to improve the efficiency and competitive advantages of their institutions in relation to cost effectiveness and quality of care. In other side many healthcare managers would reject the usefulness of TQM concepts to themselves and would strongly argue that the modern philosophy of TQM is more suited to the manufacturing sector than the healthcare sector. An additional, within healthcare is that the term customer does not sit easily with professionals when the same customer/patient would often rather not have to seek hospital services.

2.3 Braden Scale / score:

Many guidelines and strategies were implemented to decrease prevalence of pressure ulcer, and several pressure ulcer risk assessment scales have been developed and used around the world. The most common tested pressure ulcer risk assessment scales abroad are the Braden and Norton scales. (Šáteková L, Žiaková K,2014)
The most commonly tested pressure ulcer risk assessment instruments include the Braden, Water low and Norton scales. The Braden Scale has optimal validity.

Braden scale is one of the tools to determine the pressure ulcer. It was published in 1987 in United States and adapted in Brazil1999 (Serpa, Santos, Companili and Queiroz, 2006). In 2006,a prospective cohort study conducted by Serpa to assess the Braden score if it is useful. The study found that it is usefully in the patient aged 18years old and above who admitted to intensive care unit (Serpa, Santos, Companili and Queiroz, 2006).

2.3.1 Content of Braden Scale:

It consists of 6 subscales:

1. Sensory Perception: Ability to respond meaningfully to pressure related discomfort
2. Moisture: Degree to which skin is exposed to moisture
3. Activity : Degree of physical activity
4. Mobility: Ability to change and control body position
5. Nutrition : Usual food intake pattern
6. Friction and Shear: Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance.

2.4 Risk Factors of pressure ulcer:

There are a lot of factors that affect the development of pressure ulcers (3):

1. Age:

   When people getting older age (over70years old) that will increase the risk of development of pressure ulcer. Because old people tend to have thinner skin, this situation makes their skin more susceptible to damage from minor pressure.

2. Chronic illness:

   Diabetics or vascular diseases affect the circulation, so there are some parts which received in adequate blood flow, thus increase risk of tissue damage, also long–term spinal cord injury lead to loss of sensation.

3. Malnutrition:

   If the patient takes a poor diet especially one deficient in protein, zinc and vitamin C, he/she may develop pressure ulcer, in addition to sever infection and slow healing of wound

4. Urinary or fecal incontinence:

   If patients have a problem with bladder control, this will increase the risk of pressure ulcer, because the skin stays moist and more Frictional likely to breakdown. Additionally, the bacteria can enter the wound causing severe infection and sepsis which become life – threatening.

5. Smoking:

Nicotine undermines circulation, while smoking reducing the amount of oxygen in the blood, which has negative effects on healing.

6. Nursing staff is one other factor that constitutes the important influence in development of pressure ulcer. They should be well trained to monitor all patient especially the intensive care unit‘s patient irrespective of age or contributing factors on daily basis to prevent pressure ulcer development.

Australian College of Critical Care Nurses (ACCCN) guidelines for intensive care unit mention a 1:1 nurse—patient ratio due to the increased acuity of the patients, the need for continuous monitoring and observations, and the supervision of technological life supporting tools.

2.5 Previous studies:

During 2000 a multicentre trial that conducted by March to assess the effects of dietary supplementation on dietary intake and on present of pressure ulcer; among critical ill older than 65 years old patients in French hospitals. They preferred randomly and divided the sample into: group who received the supplement (case) and group who did not receive the supplement (control) for 15 days; found that the incidence of pressure ulcer were decreased in case group compared to control group by used t-test and chi-square analysis. In addition, Cox proportional hazards model adjusted was used for calculate risk factors between two groups which became significant for hypo albuminemia, functional dependence, low Norton score, lower limb fracture (p=0.024) (Marchasson, Barateau, Rondeau, Dequae-Merchadou, Salles-Montaudon, Emeriau, Manciet, Dartigues, 2000).

In 2007 a prospective, randomized, non-blinded study acute conducted on the patients suffering from acute lung injury in intensive care unit to compared the incidence and the healing of pressure ulcers between those receiving a diet enriched in lipids (eicosapentanoic acid (EPA), gamma linolenic acid (GLA), vitamins A, C and E(case group) and those taking diet of macronutrients(control group). They found that occurrence pressure in case group was less than control group ,however the number of ulcers did not reduce(control group 1/24,case group 2/15) and also severity of illness was not significantly improved by using ANOVA analysis(Miryam Theillaa,b, Pierre Singera,b, Jonathan Cohena,b, Freda DeKeyserc, 2007)

Between 2001and 2003, a prospective cohort study done during 3 periods of time to determine short and long term effect of national and international guideline implementation on intensive care unit's patients in Netherland. The study trained the nurses before the implementation. They found the incidence density of pressure ulcer 43% at first period in

grade II – IV, decrease to 37% in second period and after one year the density became 28%, moreover they found 3 indicators: First, uses of different mattress in transfer p<0.001, the second is severity of illness p= 0.02 and the third is friction and shear p=0.02. However, they did not mention the other confounding factor. As a result that it is very important to implemented guidelines for all hospital with continuous follow up (Erik, Pickkers, Schoonhoven, Andre, Vereek, Tonfeuth and Achterbery, 2007).

Between 2005-2008, In study of descriptive cross-sectional which done in New Haven hospital for explanation the occurrence of pressure ulcer in patients managed in a surgical intensive care unit by use SPURA scale, they found 23.9% of patients developed pressure ulcer and the mean Braden score of patients who developed a pressure ulcer was 11.07 _ 1.98, where as the mean score of those who did not develop a pressure ulcer was 12.21 _ 2.23.These result were related to three main risk factors: Diabetes (p=0.008),not repositioned (p= 0.19),age ≥70 years old (p=0.012) analyzed by chi-square (Gerri, Slowikowski and Funk, 2010).

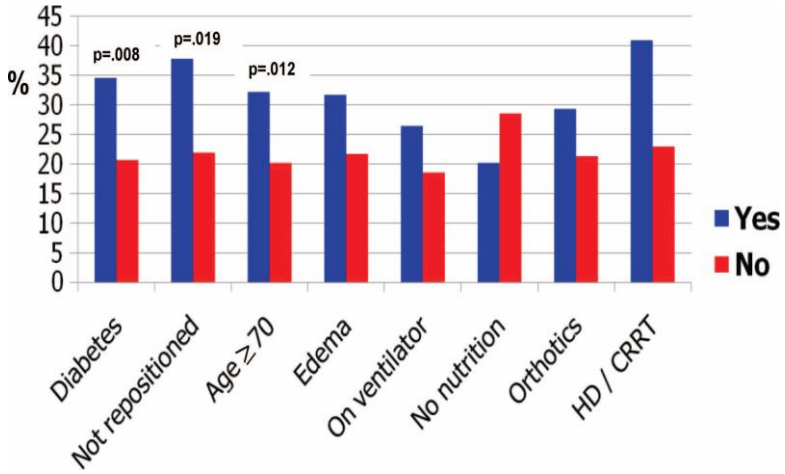


FIGURE 1. Bivariate predictors of pressure ulcers; HD/
CRRT indicates hemodialysis /continuous renal replace men therapy, 2010

Between October 2008 and May 2009, further retrospective descriptive correlation study was done in intensive care unit of New Jersey hospitals by Jill Cox to determine the risk factors that cause the pressure ulcer and the major one. By using logistic regression analysis about 347 patients found that 18.7% developed pressure ulcer, 35 % of them were stage II and 58 % location was in sacrum. The mean of Braden score was 14.28 for who have pressure ulcer and 14.63 for those who have not pressure ulcer. The risk factors were significant (95%) predictors of pressure ulcer:

Mobility $P=0.04$, age $p= 0.03$, stay duration $p<0.001$ and cardiovascular disease $p=0.007$(Jill Cox, 2011).

Between 2005-2008 in another study of qualitative exploratory method conducted by Nanjo and his collages to link morphological characteristic of pressure ulcer to risk factor of patient in Tokyo's university hospital used "Fujimoto and colleagues' method" in phase one and identified the etiological factors in phase two. They found 4 major causes:

(1) development of a pressure ulcer risk episode;(2) failure of the peripheral circulation; (3) critical immobility condition and (4) position change inducing skin deformation

However they found in 3 ICUs who did not use their method, the leaf pressure ulcers did not develop compared to 6 ICUs where developed the pressure ulcers and used just their method. So, they found that the new method will be trail before implemented, as important to change the strategies for turning or repositioning ICU patient. ((Nanjo, Nakagami, Kaitani, Naito, Takehara, Lijuan, Yahagi and Sanada, 2011)

From 2002 to 2011, a study by McGahan, Kucharski and Coyer reviewed 19 studies conducted to assess the relationship between nurse staffing levels and the incidence of mortality and morbidity in adult intensive care unit patients. They found that no significant association between nurse staff level and incidence of pressure ulcer in two studies. Conversely, other study found significant association (OR 0.69).Moreover, another study talking about number of staff: "a 10% increase in staff numbers decreasing pressure ulcers by two percent." The reasons for this are due to miscommunication and incorrect records (McGahan, Kucharski and Coyer, 2012)

Chapter Three

Materials and Methods

3.1 Research design:

The study is a case control compartive analyic study conducted on April -August2015

3.2 Research area:

ICU' rooms in Al Ribat University hospital & Al Shaab Teaching hospital ,

The study was conducted in Alshaab Teaching Hospital ICU locality of Khartoum, Khartoum State .Alshaab Hospital is a one of the Ministry of Health, Khartoum State Hospitals. It is a referral hospital of Cardiology, Respiratory and Cardiothoracic surgery. It includes emergency room, outpatient clinic, operation room, cardiac catheterization, diagnostic department, general words and intensive care unit. Average number of patients per year is 7500 patients. The Average number of operations is 250 operations.

Also Al Ribat University hospital is the central hospital in Khartoum State which was established to offer medical care to police forces and their families. It started in 1976 as dressing unit, developed to provide medical, curative and rehabilitation services.

3.3 Study population:

Patients admitted to intensive care unit during the period from April to Augusts

3.3.1 Inclusion criteria:

18 years old patient and above

Admitted to ICU for 24hours ago,

3.3.2 Exclusion criteria**:**

Children and adolescents
Symptomatic individuals (those currently with pressure ulcers)

3.4 Sampling method:

All the patient whose stayed in ICU 24 hours after admission were selected , the data collation sheet fill by the researcher or researcher's assistant after check include and exclude criteria . The total number of participants was 220, the number of the case was 80 and the control was 140 were followed for 5 months.

3.5 Data collection Tool:

Using questionnaire, Braden score tool and checklist:

3.5.1 ICU Environment Checklist: The HICPAC/CDC published "Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007" which are available at http://www.cdc.gov/ncidod/hip.

This checklist was used by the principal investigator to check for: Basic information about ICU, supplies and hand wash facilities.

3.5.2 Structured questionnaire : Structured questionnaire was tested by professional personals (2 doctors and 1 statistician) and I put their comments into consideration ,then it was used by the principal investigator to collect data about personal information of the participants and risk factors

3.5.3 Braden score: The patient who admitted to ICU assessed by the principal investigator after 24 hours of admission, then every 3 days.

Braden Score calculation:

The subscales from 1- 5 are subdivided into 4 score rates, except for subscale 6 which is subdivided into 3 score rates. The total score of the subscales will give an indication about the likelihood of ulcer development. The maximum score of 23 would indicate no risk to develop ulcer; while a score of 6 indicate the most severe risk for developing pressure ulcer. Finally, any patient with score below 18 would be at high risk for developing pressure ulcer.

The Braden score was used for the cases participant (80 cases) while the control participants (140 cases) were followed in normal situation of ICU without using the Braden score to observer the development of the pressure ulcers and the burden of the harm(death and disability)

3.6 Analytic Framework:

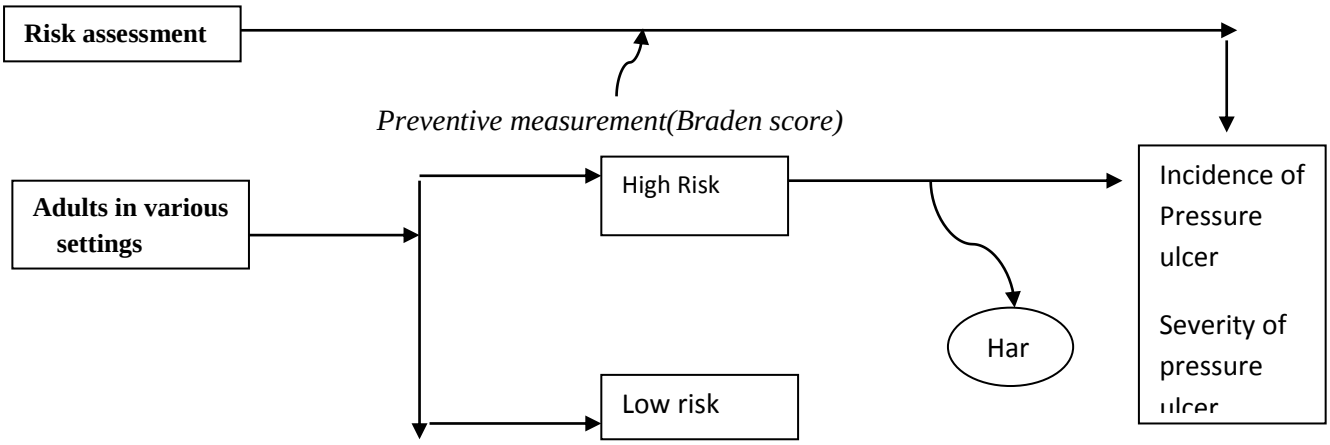


Fig.1 :Harm: mean complication happened to patient which is disability or death. (CACCN, 2004)

3.7 Piloting:

A pilot test of the data collection tools (checklist from) and the performance of the team were conducted before the start of the survey at Khartoum State in settings other than the selected hospital.

3.8 Data Analysis:

Data entry and editing was done by principal investigator.

SPSS 16 was used in analyzing by using case –control analysis (student's t. test, chi square test (cross tab) and ANOVA). In addition to descriptive statistics will be conducted, specifically looking into age, gender, Cause of admission, chronic illness, the training level of nurse. Results presented in tables and graphs

3.9 Ethical considerations

Approval from Alshaab Teaching Hospital management was obtained

Approval from AlRebat Teaching Hospital management was obtained

Chapter Four

Data analysis and Discussion

A/ Descriptive Results of participants:

Result 4.1: Distribution of socio-demographic

Table 4.1 Distribution of socio-demographic data of the study group (n1: 80) and control group (n2: 140):

Characteristics	Study group(%)	Control group (%)
Age		
18-27	18.8	0
28-37	8.8	0
38-47	11.2	25.0
48-57	12.5	11.4
58-67	23.8	26.4
68 and above	25.0	37.1
Total	100.0	100.0
Mean	38-48 (3.89)	48-58 (4.76)
Gender		
Male	56.2	59.3
Female	43.8	40.7
Total	100.0	100.0
Mean	Male (1.44)	Male (1.41)
socioeconomic status:		
High	**1.2**	0
Moderate	67.5	54.3
Low	**31.2**	45.7
Total	100.0	100.0
Mean	Moderate (2.30)	Moderate **(2.46)**
Occupation :		
Professional	12.5	24.3
Clerk	16.2	7.9
Labor	13.8	7.1
Housewife and retired men	57.5	60.7
Total	100	100.0
Mean	Labor (3.16)	Labor (3.04)

This table shows that more than 60% are above 48years old in both groups beside that more than half are male in study group (56.2%) and control group (59.3%). Also 42.5% of study group are worker compare to 39.3% in control group and the rest of them are Housewife and retired men. The socioeconomic status of study group was 98.7% and control group was 90.0% either low or moderate.

Result 4.2: Descriptive Statistics of the Study Variables:

Table 4.2 Causes of admission, location of pressure and duration of stay of study group (n1: 80) and control group (n2: 140):

Characteristics	Study Percent (%)	Control Percent (%)
Cause of admission		
RTA	2.5	0
surgical cause	12.5	3.6
chronic illness	61.2	73.6
medical cause	23.8	22.9
Total	100.0	100.0
Location of pressure ulcer	**N= 12**	**N=60**
Sacrum	25%	15%
Coccyx	25%	25%
Ischia	8.33 %	8.33%
heel/ankle	8.33 %	0%
Others	8.33%	0%
sacrum+ coccyx	8.33 %	46.67%
sacrum+ coccyx+ Ischia	8.33 %	5%
coccyx+ Ischia	8.33 %	0%
Total	100%	100%
Duration of stay		
Mean	11 days	
Minimum	3	
Maximum	43	

Among the causes of admission, the chronic illness was the most common cause. The most common location of pressure ulcer was sacrum and coccyx with 25 % for each in study group and 46.67% in control group.

Furthermore the mean of stay duration in ICU was 11 days in both groups which is risky for developing pressure ulcer

Result 4.3:

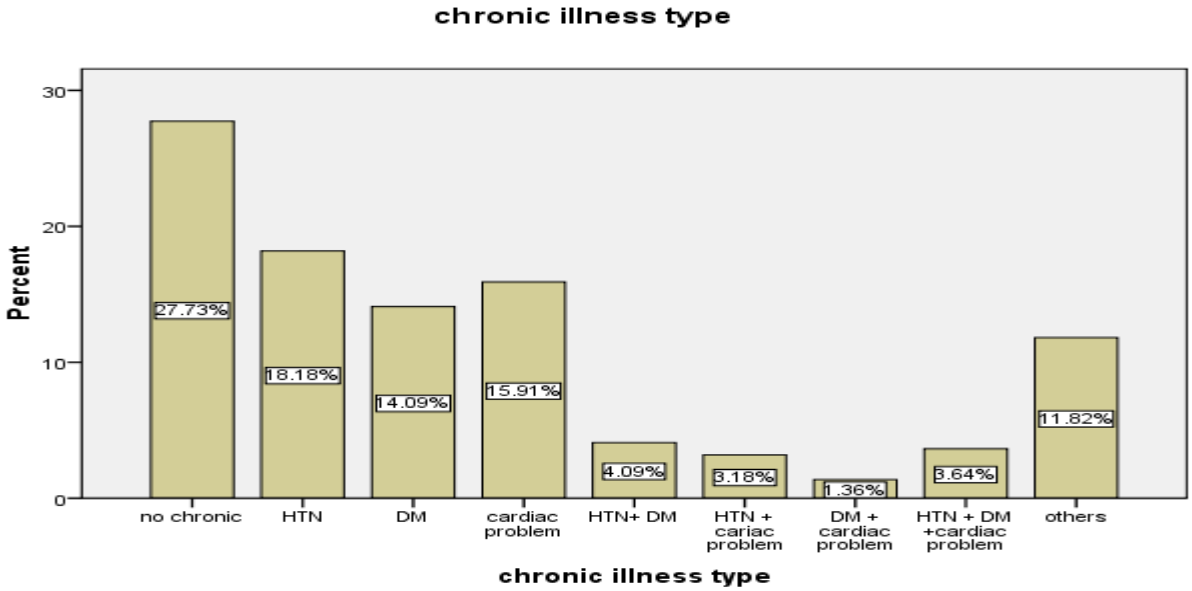


Fig.(2) Types of chronic illness in ICU (n=220):

The chronic illnesses among study population are hypertension, diabetes, cardiac problems and others. Hypertension and diabetes and cardiac problems co-morbidity accounted to 3.64% while hypertension and diabetes co-morbidity is contributed to 4.09% of patients, hypertension and cardiac problems co-morbidity is contributed to 3.18% of patients, diabetes and cardiac problems co-morbidity is contributed to 1.36% of patients.

Result 4.4:

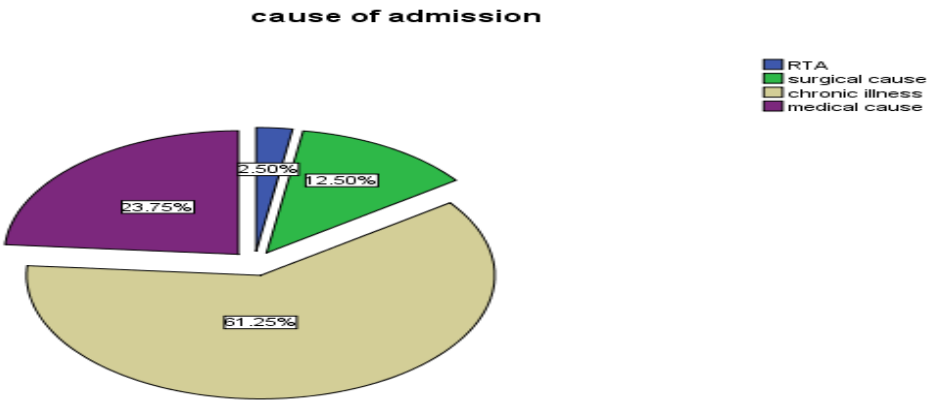


Fig.(3) Causes of the study group' admission (n=80) :

Result 4.5:

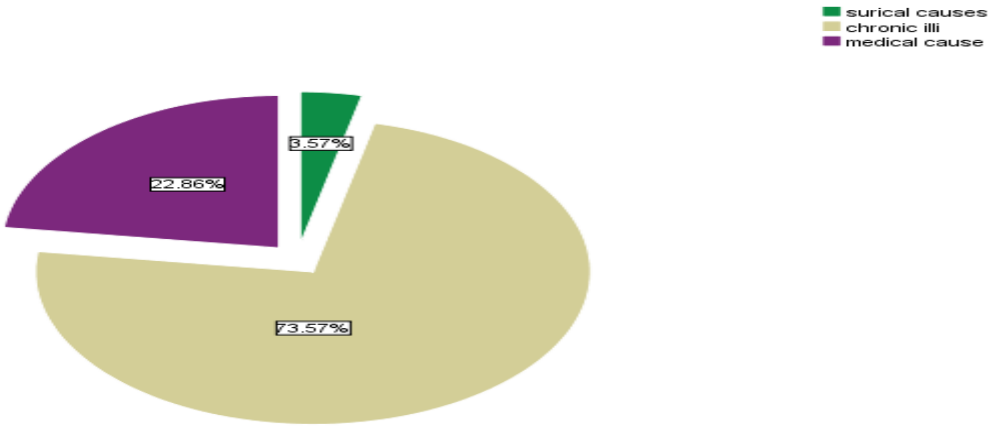
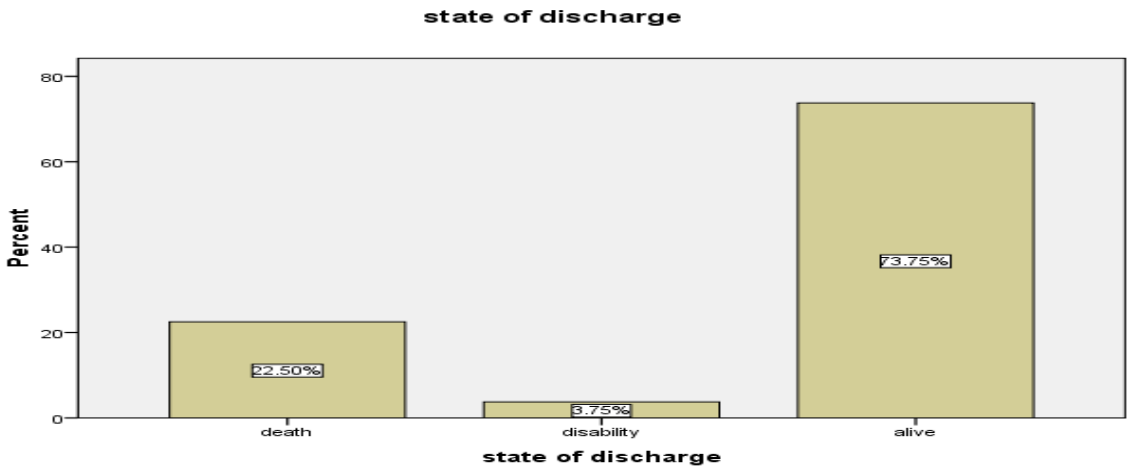


Fig.(4) Causes of the control group' admission(n=140)

The cardiac problems are the main chronic illness among the study group while hypertensive diseases are the main chronic illnesses among the control group

Result 4.6:

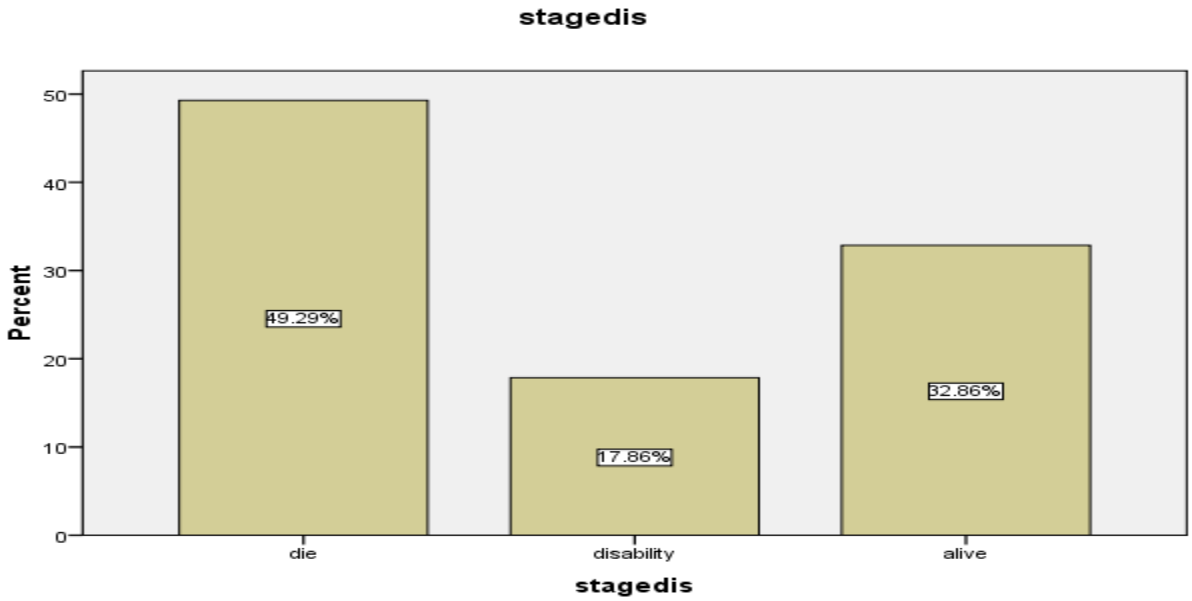
Fig.(5) The study group' discharge state (n=80):



Among the study group 3.75% of the patients have experienced disability and 22.50% of the patients were died.

Result 4.7:

Fig.(6) The control group's discharge state(n=140):

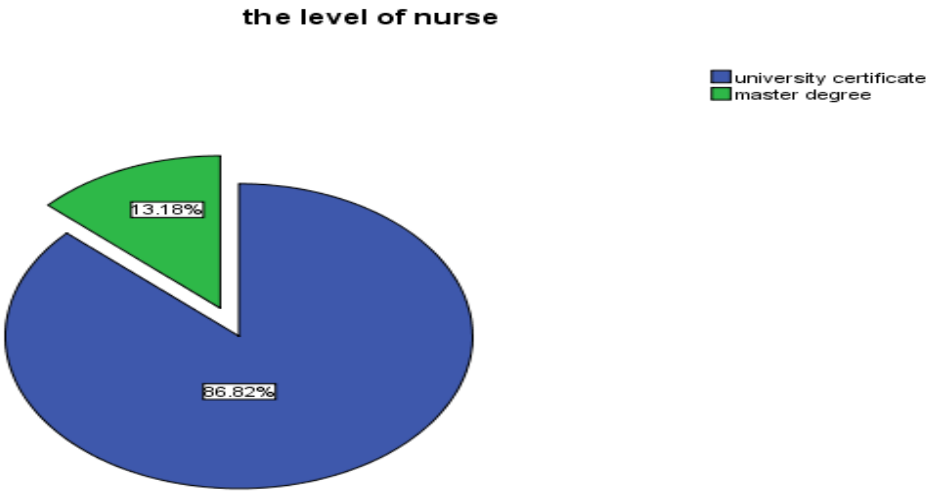


Among the control group 17.86 % of the patients have experienced disability and 49.29 % of the patients were died.

B/ Descriptive results of nurses:

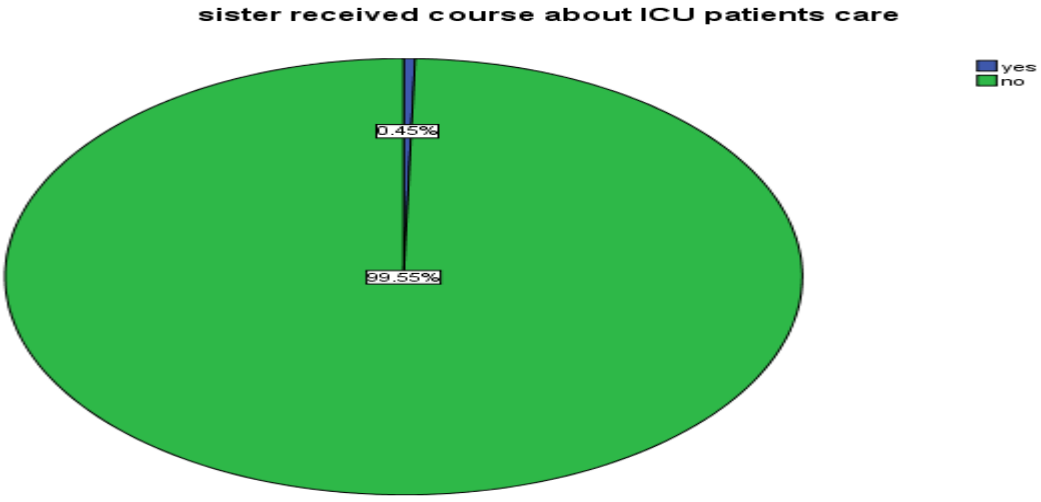
Results 4.8:

Fig. (7) **The level of nurses' education (n=80):**



Result 4.9:

Fig.(8) **The nurses' training about ICU(n=80):**



Result 4.10:

There is no written infection control or ICU critical patient care policy or guideline

C\ Analysis results:

Results 4.11:

Table 4.3: The difference between age and cause of admissions and type of chronic illness against present of pressure ulcer (n=220) (ANOVA test)

Variables	**F**	**P value**
Age of patient	14.557	**.000**
Cause of admission	.786	**.376**
Chronic diseases	3.970	**.031**
state at discharge	94.829	**.000**

Result 4.12:

Table 4.4: Relationship between the presences of the pressure ulcer and duration of stay in study group (n=80)

		Stay	Ulcer
stay	Pearson Correlation	1	.402**
	Sig. (2-tailed)		.000
	Number of patients	80	80
Ulcer	Pearson Correlation	.402**	1
	Sig. (2-tailed)	.000	
	Number of patients	80	80

**. Correlation is significant at the 0.01 level (2-tailed).

Result 4.13: The effect of using Braden score

Braden score Cut -off point was 18

Table 4.5: Relationship of the difference between scores (visit 1 score-visit 2 score) & (visit 1 score – visit 3 score) three days interval between the visits:

	Paired Differences				t	Sig. (2-tailed)
	Mean	Std. Deviation	95% Confidence Interval of the Difference			
			Lower	Upper		
Pair 1 score of visit one - score of visit two	-1.812	2.176	-2.297	-1.328	-7.449	**.000**
Pair 2 score of visit one - score of visit three	-2.727	3.309	-3.733	-1.721	-5.468	**.000**

Results 4.14:

Table 4.6: Incidence of pressure ulcer among study group (n=80) and control group(n= 140)

ulcer * 2 Cross tabulation (Chi square test)

		Braden score		Total	P value
		use tool	not use tool		
Ulcer	no ulcer	68(85%)	80(57.14%)	148	0.000
	have ulcer	12(15%)	60(42.85%)	72	
Total		80	140	220	

Result 4.15:

Table 4.7: Relationship between Braden score tool and state of patients at discharge:

Stage of harm * 2 Cross tabulation

harm	Braden score		Total	P Value
	use tool	not use tool		
Harm	21 (26.25%)	94(67.14%)	115	0.000
not harm	59 (73.75%)	46 (32.85%)	105	
Total	80	140	220	

Note: Harm mean complication happened to patient which is disability or death

D/ Results of support services checklist (ICU's Environment):

Result4.16: Al-Shaab Teaching Hospital ICU:

1. It consists of 4 rooms =30 beds with no isolation beds.
2. The ceiling is concrete, smooth surface and easy to clean and the walls surfaces are smooth and washable.
3. The distance separating two beds was 1.5 meters and separated by curtains
4. The average number of patients assigned to each nurse/shift was 1 during morning shift and 2 during night shift.
5. There are no written policies and procedures for basic infection control
6. Only the nursing staff was trained on infection control practices at the beginning of work.
7. Latex clean gloves, sterile gloves, surgical masks and apron were the available personal protective equipments

8. Alcohol, Iodophore and chlorhexidine were the available antiseptics for patients.
9. The waste receptacle that was available was standard card boxes for sharp waste disposal.
10. Environmental cleaning / disinfectant agents were not available.
11. One refrigerator for medication in each room
12. The room was ventilated with split units and fan.
13. Regarding to hand washing facilities:

- ✓ There was one sink; of hand type with running water located about 5 steps from the nearest bed and specified for hand washing.
- ✓ Bar plain soap was used for hand washing
- ✓ Soap rack was available.
- ✓ Hand drying materials were not available.
- ✓ Alcohol based hand rub was not available

Result 4.17: Al Ribate University hospital ICU:

1. ICU consists of two rooms =8 beds with no isolation beds, 2 nurse offices, 1doctor rooms and 1 room for the medical manager
2. The ceiling is concrete, smooth surface and easy to clean and the walls surfaces are smooth and washable.
3. The floor is made of Epoxy (smooth washable easily impervious non porous)
4. The distance separating two beds is 2 meters and separated by curtains made from linen
5. Ventilation is by suction fans (1 per room) and split Unit Air conditioners(2 room) and lighting is adequate
6. One refrigerator for medication in each room

7. Regarding to personal productive equipments: Latex clean gloves, sterile gloves, surgical masks and apron were available personal protective equipments

8. The waste receptacle that was available was standard safety boxes for sharp waste disposal. And other waste receptacles were separated in different colours

9. Alcohol, Iodophore and chlorhexidine were the available antiseptics for patients

10. Environmental cleaning / disinfectant agents were available

11. Regarding to hand washing facilities:

- ✓ There was one sink specified for hand washing.
- ✓ The available hand washing solution is liquid plain soap (antiseptic is alcohol present in portable bottle in the nursing station, some nurses have pocket) no dry towels
- ✓ Alcohol, Iodophoine and chlorhexidine were the available antiseptics for patients

Discussion

I am going to present the result in order of important finding, so I start by different between study and control group on percentage of ulcer.

In this study, a Braden Scale score of 18 was predictive of the development of a pressure ulcer. In fact, 14.8% of the patients in the study group were classified as at risk for pressure ulcers (Braden Scale score ≤18) but remained ulcer-free compared to control group which were found to be 42.8 % at risk for pressure ulcers with significant (p value 0.000)(see table 2) this result was similar to a retrospective study that has been done in a medical-surgical intensive care unit from October 2008 to May 2009,that revealed that among all hospitalized patients, prevalence rates of acquired pressure ulcers are the highest in patients in the intensive care unit (ICU), from 14% to 42%.

This study revealed that the mean of Braden score of patients who developed a pressure ulcer was 12.00, while as the mean score of those who did not develop a pressure ulcer was16.90 with significant age ($p < 0.005$) and state at discharge ($p< 0.005$) and chronic illness ($p= 0.031$) significant with hypertension disease, contrast to descriptive cross-sectional study which has been done in New Haven hospital at 2008 revealed that mean of Braden score of patients who developed a pressure ulcer was 11.07, where as the mean score of those who did not develop a pressure ulcer was 12.21 which is significant with chronic diseases mainly diabetes and also with age ≥70 years old. But In my view there is selection bias because the sample have taken only from patients on days that researcher was working on. Also In retrospective descriptive study in 2008-2009 has been done in intensive care unit of New Jersey hospitals revealed that the mean of Braden score was 14.28 for who have pressure ulcer and 14.63 for those who have not pressure ulcer with significant risk factors (age $p= 0.03$, stay duration $p< 0.001$ and cardiovascular disease $p= 0.007$). I think there is a record bias because the study depended on records which done by nurses, also the limitation on generalization due to selection of certain population (ICU's patient) in certain hospitals without random selection.

Furthermore cause of admission p= 0.376 which mean whatever the cause of admission there is change to develop pressure ulcer inside the ICU.

Regarding to staff's training, found that there is 98.7% of nurses not trained on infection control and no guideline about ICU care also it is very important that found the significant result (P value=0.005) of using tools in preventive pressure ulcer, compare to a prospective cohort study which has been done in 2003 about implementation guidelines on intensive care unit's patients in Netherland , found that the effect of training the ICU's nurses reduced the percentage of pressure ulcer from 43% to 28% However, they did not mention the other confounding factors.

The result of the study revealed that the duration of stay in ICU was significant (p = .000) which is consistent with the result of the study showed that the development of pressure ulcers was more likely in patients with longer ICU stays than in patients with shorter stays, the mean MS ICU stay was (11.7 days) for patients who developed pressure ulcer and (3.3 days) for patients who mained ulcer-free.

Limitation:

1- Short duration of study.

Chapter Five

Conclusion & Recommendations

5.1: Conclusion

1- The study showed that 14.8% of the patients who used the Braden score tool developed pressure ulcer compare to 42.8 % of the patients who didn't use the tool.

2- Age and chronic illnesses were significant factors (p=.000,p=0.031 respectively)

3- There are no written policies and procedures for basic infection control

4- The supportive service was not appropriate.

5.2 Recommendations:

Specific:

1. Implementation of Braden score tool in ICU room
2. Training the ICU staff (resident doctors and nurses) for using Braden score
3. Advocacy and maintenance for the support services

General:

1. Writing policy and maintaining supervision toward the implementation of standard operating procedure about pressure ulcer prevention in intensive care unit.
2. Improving favorable attitude among staff toward the preventing of pressure ulcer programme in hospital.
3. Providing more applied curriculum regarding pressure ulcer prevention program in undergraduate nursing education
4. Conduction of further research :
   Emphasizing on the fact that this is one of the few studies in Sudan which conduct to evaluate the effectiveness of quality improvement tools (Braden score) as example and the fact that it focused only on two hospitals and not cover the behaviors changes Therefore more studies should be carrying out.

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Appendices

Form 1

ICU Audit Checklist A

ICU Profile (structure)

- Please observe all rooms and put the suitable code, and in questions that need answers please interview the responsible person.
- Use (√) for yes and (X) for no whenever appropriate.

Date _____/_____/___ Observer name _____

Facility name: _____

Observation items	**Result/Answer**
Basic information – Circle or fill in the appropriate response	
Number of beds: ○ICU beds ○Isolation beds	_____ _____
Average number of patients assigned to each nurse/ shift ○Morning shift : ○Afternoon shift: ○Night shift	_____ _____ _____
Are there written policies and procedures for basic infection control? ○H.H ○Use of PPE ○Processing of patient care equipment ○ Done locally ○ Centrally in SSD ○Environmental cleaning/disinfection: ○ House keeping ○ Clinical contact surfaces ○ Handling blood/other body fluid spills ○Waste disposal ○Personnel health and safety	 _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

Are there trained **LINK** nurses?	
Is the working staff trained on IC practices? ○Clinical staff ○Nursing staff ○Environmental service personnel	_____ _____ _____
If yes ○At beginning of work ○On-job ○Periodically	

Supplies	
Are PPE available? ○Latex clean gloves ○Non latex clean gloves ○Sterile gloves ○Surgical/procedure masks ○Head caps ○Gowns ○Aprons	_____ _____ _____ _____ _____ _____ _____
Are antiseptics for patients available? **If yes, mention type** ○Alcohol ○Iodophore ○Chlorhexidine ○Chlorhrxidine in alcohol ○Other, specify	_____ _____ _____ _____ _____

Are different waste receptacles are available? ○Bags for ordinary waste for patients ○Bags for ordinary waste for working staff ○Leak proof bags for infectious waste If yes, mention type of infectious waste receptacles ○Covered with foot pedal opening system ○Covered without foot pedal opening system ○Not covered ○Sharp waste disposal boxes If yes, mention type ○Standard plastic boxes ○Standard card boxes ○Others, specify	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____
Are environmental cleaning/ disinfectant agents are available? ○Cleaning agents for housekeeping (if yes, mention type) ○Disinfectant for contact surface (if yes, mention type) ○Disinfectant for blood/other body fluid spills (if yes, mention type)	_____ _____ _____

Please observe each room if more than one room, and fill the following					
Observation	**Room 1**	**Room 2**	**Room 3**	**Room 4**	**Room 5**
No of beds					
If more than one bed/room ○Distance separating between 2 beds ○Separation between beds ○Partitions (mention material) ○Curtains (mention material) ○Other, specify ○No separation					

Type of ventilation (mention all types present) o Central Conditioning system o Working air conditioners, split units o Working air conditioners, window units o Working Exhaust fans o Fans o Others, specify					

Hand washing facilities					
Observation	**Room 1**	**Room 2**	**Room 3**	**Room 4**	**Room 5**
Are sink/sinks with running water available?					
If yes What is the distance between the sinks and the farthest bed? (by steps)					
Number of sinks?					
Are the sinks specified for HH only					
Type of sink/s o Foot pump o Elbow o Hand o Others…					
Type of soap for hand washing o Bar plain soap o Liquid plain soap o Antiseptic soap					
If bar soap, is soap rack present?					
Are hand-drying materials available?					

If yes, Type of hand drying materials o Hot air dryers o Common towel o Single use cloth towel o Single use paper towel o Roll paper o Others, specify o No drying material					
Is alcohol based hand rub present?					
If yes, (comment on distribution) o Wall dispensers with disposable bags o Wall fixed refilled dispensers o Wall removable refilled dispensers o Portable bottles o Other, specify					

Form 2:

Data Collection Sheet

No. ( )

Notes : The Braden score will be behind the sheet and will fill by researcher

A. Socio-demographic Data:

1- Age: a/ 18-27 b/ 28-37 c/ 38-47 d/48-57 e/58-67 f/ 68-above

2- Sex: a/ Male b/ Female

3- Occupations that the patient work in:
a/ professional b/ Clerk C/ Labor d/others……

4- Form the occupation the socioeconomic status will be (fill by researcher in charge):

a/ High b/ Medium c/ Low

5- Date of the admission:

6- Cause of admission:
a/RTA b/surgical cause c/ chronic illness d/Medical cause

7- if Patient have chronic illness:
a/ Hypertension b/ Diabetics c/ cardiac problem d/ Others…….

8- location of pressure ulcer :
a/ sacrum b/coccyx c/ Ischia d/ Heel/Ankle e/others……..

9- Date of discharge:

10-State of discharge: a/ death b/ disability c/ alive

B. Information related to Sister/ Nurse who take care of this patient :

12- The level of nurse:
a/ University certificate. b/ Master degree C\PhD

13- Sister received course about ICU patient's care :
a/yes b/No

14- Sister has procedures about patient care in ICU
a/ yes b/N0

15- Sister was implementing the procedures correctly:

a/ yes b/No

Subscales					No.of follow up			
					F1	F2	F3	F4
Sensory Perception Abiltity to respond meaningfully to pressure related discomfort	1. Completely Limited: Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminshed level of consciousness or sedation, *OR* Limited ability to feel pain over most of body surface.	2- Very Limited: Responds only to painful stimuli Cannot communicate discomfort Except by moaning or restlessness, *OR* Has a sensory impairment, which limits the ability to feel pain or discomfort over 1/2 of body.	3. Slightly Limited: Responds to verbal commands but cannot always communicate discomfort or need to be turned, *OR* Has some sensory impairment, which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. No Impairment Reponds to verbal command. Has no sensory deficit which would limit ability to feel or voice pain or discomfort				
Moisture Degree to which skin is exposed to moisture	1. Constantly Moist: Perspiration, urine, etc keep skin moist almost constantly. Dampness is detected every time patient is moved or turned.	2. Moist: Skin is often but not always moist. Linen must be changed at least once a shift.	3. Occasionally Moist: Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. Rarely Moist: Skin is usually dry; linen requires changing only at routine intervals.				
Activity Degree of physical activity	1. Bedfast Confined to bed.	2. Chairfast: Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheel chair.	3. Walks Occasionally: Walks occasionally during day but for very short distances, with or without assistance. Spends majority or each shift in bed or chair.	4. Walks Frequently: Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
Mobility Ability to	1. Completely Immobile: Does not make even slight changes in body	2. Very Limited: Makes occasional slight changes in body or extremity position but unable	3. Slightly Limited: Makes frequent though slight changes	4. No Limitations: Makes major and frequent changes in				

change and control body position	or extremity position without assistance.	to make frequent or significant changes independently.	in body or extremity position independently.	position without assistance.				
Nutrition Usual food intake pattern	1. Very Poor: Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR Is NPO and/or maintained on clear liquids or IV for more than 5 days.	2. Probably Inadequate: Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR Receives less than optimum amount of liquid diet or tube feeding.	3. Adequate: Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR Is on a tube feeding or TPN regimen, which probably meets most of nutritional needs.	4. Excellent: Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
Friction and Shear	1. Problem: Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	2. Potential Problem: Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. No Apparent Problem: Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
				TOTAL SCORE (Addressograph)				