Nurses' Practices Regarding Medical Wastes Disposal in Khartoum North Teaching Hospital, Khartoum State, Sudan

BY:

AMEL AHMED HASSAN MOHAMMED
B.Sc. in Nursing
Alzaeim Alazhari University (2007)
A Dissertation
Submitted in Partial Fulfillment of the Requirements
For the Degree of Master of Science
in
Community Health Nursing
Department of Nursing
Faculty of Applied Medical Sciences
University of Gezira

August 2012
Co-Supervisor: Dr. Ietimad Ibrahim Abd Elrahman Kambal

Main Supervisor: Dr. Bothyna Bassyoni Essayed Etewa
Nurses' practices Regarding Medical wastes Disposal in Khartoum North Teaching Hospital: Khartoum State, Sudan

By

Amel Ahmed Hassan Mohammed

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 -- Dr. Ietimad Ibrahim Abd-Elrhman M</td>
<td>Chairman</td>
<td></td>
</tr>
<tr>
<td>2 -- Dr. Faiza Ali Nasor Mohammed</td>
<td>External Exam</td>
<td></td>
</tr>
<tr>
<td>3 -- Dr. Sayda Edris AbdelRahman</td>
<td>Internal Exam</td>
<td></td>
</tr>
</tbody>
</table>

Examination Date: 7/8/2012
الأية

بسم الله الرحمن الرحيم

قال الله تعالى:

إِنَّا عَرَضْنَا الأَمَانَةَ عَلَى السَّمَاوَاتِ وَالأَرْضِ وَالْجِبَالِ
فَأَبْنَّ أَنْ يَحْمِلْنَهَا وَأَشْفَقْنَ مِنْهَا وَحَمَّلَهَا الإِنسَانُ إِنَّهُ
كَانَ ظَلُوْماً جَهُوْلاً 

صدق الله العظيم

سورة الأحزاب الآية (72)
Dedication

To Soul of my Father. To my greatest Mother, My Brothers and My Sisters who gave all their best and supported me in all my decisions,

To my best Friends.
Acknowledgement

First I wish to thank God for affording me the time and the ability needed to stand face of difficulty. I am deeply indebted to and grateful for my main supervisor: Dr. Ietimad Ibrahim Abd-Elrahman Kambal and my Co-advisor Dr. Bothyna Bassyonie Assayed Etewa for their helpful advices and valuable suggestions to me at the various stages of the research and their ultimate consultation.

I also appreciate their patience and the effort that they expended supplying me with opinion and suggestions, that I was to incorporate into my research.

I would like to thank Faculty of Applied Medical Sciences, Gezira University for giving me this opportunity to continue my post graduate education, my deepest thanks to the nurses who shared me in this study. I express my gratitude to my friends for their encouragement which gave me moral support and self-confidence.
Nurses' Practices Regarding Medical Wastes Disposal in Khartoum North Teaching Hospital, Khartoum State, Sudan

BY:

Amel Ahmed Hassan Mohammed
Master of Science in Community Health Nursing (2012)
Department of Nursing
Faculty of Applied Medical Sciences
University of Gezira

Abstract

Issuance of medical waste regulation aimed to managed the processes of hazardous waste to prevent occupational hazard such as the needle stick injuries, one of a major health problem face the health care providers. This is descriptive hospital based study was done aiming at assessing nurses' practices regarding medical wastes disposal at Khartoum North Teaching Hospital in Khartoum State, Sudan. The sample size consisted of (75) nurses during the period of (december 2011-february 2012). Data were collected by using a questionnaire designed for the study, and observation checklist was used to observe the nurses' practices in medical wastes disposal. Data analysis was performed by statistical package for social sciences (SPSS). Results revealed that all nurses (100%) responded with correct answers regarding definition of medical wastes, and the importance of wearing personal protective equipments, although all of them (100%) didn't wear personnel protective equipments correctly. (93.3%) of the study sample disposed sharp objects of the nurses discard the used blood bags correctly. )44%(in safety boxes. Statistically significant positive relationship was observed between the years of nurses’ experience and their performance regarding dispose gloves after used. The study concluded that nurses’ were adequate knowledge regarding discard of medical wastes but their skill were inadequate. It recommended that periodic workshop programs for nurses about dispose medical wastes and Training manual should be designed for management.
of medical wastes and similarly guidelines and protocols for nurses must be available in hospitals.
تقييم ممارسات الممرضين والممرضات تجاه كيفية التخلص من النفايات الطبية

بمستشفى الخرطوم بحرى التعليمي _ولاية الخرطوم_ السودان

إعداد:
امل أحمد حسن محمد
ماجستير التمريض في صحه المجتمع (2012)
قسم التمريض
كلية العلوم الطبية التطبيقية
جامعة الجزيرة

الخلاصة
التخلص من النفايات الطبية يعتبر الهدف الأساسي لمعالجة أخطارها والحماية من إصابات العمل الناتجة عن الإصابة بالإدوات الحادة التي تشكل واحدة من أهم المشاكل التي يعاني منها مقدمي الرعاية الصحية. الرعاية الصحية. أجريت هذه الدراسة بمستشفى الخرطوم بحرى التعليمي وشهدت هذه الدراسة على دراسة تقييم ممارسات الممرضين والممرضات تجاه كيفية التخلص من النفايات الطبية والحماية من إصابات العمل وأجريت الدراسة على عدد 75 ممرض وممرضة يتكونون عينة المتاحة أثناء جمع البيانات خلال الفترة من ديسمبر 2011 - فبراير 2012. تم جمع البيانات باستخدام استمارة إستبيان وقائمة الملاحظة لمراقبة أداء الممرضين أثناء التخلص من النفايات الطبية. تم تحليل البيانات بواسطة الحزمة الإحصائية للعلوم الاجتماعية (spss). أسفرت النتائج عن أن جميع الممرضين والممرضات (100%) كانت إجابتهم صحيحة عن تعريف النفايات الطبية واهتمامه ارتداء الأدوات الوقائية على الرغم من إن جميعهم (100%) لا يرتدين الأدوات الوقائية بطريقة صحية و (93.3%) يتخلصون من الألواح الخشنة في صندوق الامان. (44%) من أفراد العينة يخلصونن من أكياس الدم المستخدمة بطريقة صحية. خلصت الدراسة إلى أن معلومات أفراد العينة كانت كافية لكن مهاراتهم تجاة التخلص من النفايات الطبية غير كافية. أوصت الدراسة بعمل ورش عمل دورية للممرضين والممرضات عن كيفية التخلص من النفايات الطبية وتصميم كتاب عن كيفية التخلص من النفايات الطبية بحيث يكون متاح لجميع المستشفيات.
## Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedication</td>
<td>I</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>II</td>
</tr>
<tr>
<td>Abstract (in English)</td>
<td>III</td>
</tr>
<tr>
<td>Abstract (in Arabic)</td>
<td>IV</td>
</tr>
<tr>
<td>Contents</td>
<td>V</td>
</tr>
<tr>
<td>List of tables</td>
<td>VII</td>
</tr>
<tr>
<td>List of Figures</td>
<td>IX</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>X</td>
</tr>
</tbody>
</table>

### Chapter One: Introduction

| 1-1-Background:               | 1    |
| 1.2 Problem Statement        | 2    |
| 1.3 Justification            | 3    |
| 1.4 Objectives               | 3    |
| 1.4.1 General objective      | 3    |
| 1.4.2 Specific objectives    | 3    |
# Chapter Two: Literature Review

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Definitions</td>
<td>4</td>
</tr>
<tr>
<td>2.1.1 Medical waste</td>
<td>4</td>
</tr>
<tr>
<td>2.1.2 Biological waste</td>
<td>4</td>
</tr>
<tr>
<td>2.1.3 Solid waste</td>
<td>4</td>
</tr>
<tr>
<td>2.1.4 Hazardous waste</td>
<td>4</td>
</tr>
<tr>
<td>2.1.5 Biomedical waste</td>
<td>5</td>
</tr>
<tr>
<td>2.1.6 Sharps</td>
<td>5</td>
</tr>
<tr>
<td>2.2 Classification of Medical Wastes</td>
<td>5</td>
</tr>
<tr>
<td>2.2.1 General waste</td>
<td>5</td>
</tr>
<tr>
<td>2.2.2 Liquid waste</td>
<td>5</td>
</tr>
<tr>
<td>2.2.3 Pathological waste</td>
<td>5</td>
</tr>
<tr>
<td>2.2.4 Radioactive waste</td>
<td>6</td>
</tr>
<tr>
<td>2.2.5 Chemical waste</td>
<td>6</td>
</tr>
<tr>
<td>2.2.6 Infectious waste</td>
<td>6</td>
</tr>
<tr>
<td>2.2.7 Sharps</td>
<td>7</td>
</tr>
<tr>
<td>2.2.8 Pharmaceutical waste</td>
<td>7</td>
</tr>
<tr>
<td>2.2.9 Pressurized containers</td>
<td>7</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>2.2.10 genotoxic waste</td>
<td>7</td>
</tr>
<tr>
<td>2.2.11 waste with high content of heavy metals</td>
<td>7</td>
</tr>
<tr>
<td>2.3 major sources of health care waste</td>
<td>7</td>
</tr>
<tr>
<td>2.4 biomedical waste management</td>
<td>8</td>
</tr>
<tr>
<td>2.5 waste collection</td>
<td>9</td>
</tr>
<tr>
<td>2.6 problems of biomedical waste</td>
<td>9</td>
</tr>
<tr>
<td>2.7 health hazard of biomedical waste and its management</td>
<td>9</td>
</tr>
<tr>
<td>2.7.1 occupational health hazards</td>
<td>10</td>
</tr>
<tr>
<td>2.7.2 health hazards of health care waste</td>
<td>10</td>
</tr>
<tr>
<td>2.8 the main group at risk</td>
<td>10</td>
</tr>
<tr>
<td>2.9 treatment of disposal technologies for health care waste</td>
<td>11-12</td>
</tr>
<tr>
<td>2.10 hazardous result from exposure to the medical waste</td>
<td>12-15</td>
</tr>
<tr>
<td>2.11 basic hygiene practices for workers</td>
<td>16</td>
</tr>
<tr>
<td>2.12 linen</td>
<td>17</td>
</tr>
<tr>
<td>2.13 infection control</td>
<td>17-24</td>
</tr>
<tr>
<td>2.14 Nasocomial infection</td>
<td>24-29</td>
</tr>
<tr>
<td>2.15 previous studies</td>
<td>29-33</td>
</tr>
</tbody>
</table>

**Chapter Three: Materials and Methods**
3.1 Study Design 34
3.2 Study Area 34
3.3 Study Population 37
3.3.1 Inclusion Criteria 37
3.3.2 Exclusion Criteria 37
3.4 Sample size 37
3.5 Data collection tools 37
3.6 Sample technique 38
3.7 Data analysis 38

Chapter four  Results and Discussion

4.1 Results 39
4.2 Discussion 54

Chapter five Conclusion and Recommendations

5.1Conclusion 57
5.2Recommendations 58

References 59
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Distribution of manpower in Khartoum north teaching Hospital</td>
<td>53</td>
</tr>
<tr>
<td>Table 2</td>
<td>Distribution of wards and beds in Khartoum north teaching hospital</td>
<td>63</td>
</tr>
<tr>
<td>Table 3</td>
<td>Distribution of the study sample according to their Age and education level</td>
<td>39</td>
</tr>
<tr>
<td>Table 4</td>
<td>Distribution of the study sample according to their Job</td>
<td>40</td>
</tr>
<tr>
<td>Table 5</td>
<td>Distribution of the study sample according to their Training program</td>
<td>34</td>
</tr>
<tr>
<td>Table 6</td>
<td>Distribution of the study sample according to their Place of work</td>
<td>44</td>
</tr>
<tr>
<td>Table 7</td>
<td>Distribution of the study sample according to their nurses' performance regarding to their attitude</td>
<td>25</td>
</tr>
<tr>
<td>Table 8</td>
<td>Distribution of the study sample according to their importance to wearing protective personal equipments when dealing with patients body fluids</td>
<td>35</td>
</tr>
<tr>
<td>Figure</td>
<td>Title</td>
<td>page</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Figure 1</td>
<td>Distribution of the study sample according to their Experience</td>
<td>41</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Distribution of the study sample according to their Source of knowledge.</td>
<td>42</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Distribution of the study sample according to their knowledge regarding Sharp objects</td>
<td>45</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Distribution of the study sample according to their knowledge regarding Importance discard of medical wastes correctly.</td>
<td>46</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Distribution of the study sample according to their knowledge regarding safety box capacity.</td>
<td>47</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Distribution of the study sample according to their knowledge regarding Occupational injuries by sharp objects</td>
<td>48</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Distribution of the study sample according to their performance regarding dispose gloves after used.</td>
<td>49</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Distribution of the study sample according to their performance regarding discard of blood bags after used.</td>
<td>50</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Distribution of the study sample according to their performance regarding discard of sharp objects</td>
<td>50</td>
</tr>
</tbody>
</table>
List of abbreviations

BMW: Biomedical Waste
HCW: Health Care Waste
EMCS: Emergency Medical Care Services
PHC: Primary Health Care
HD: Haemodialysis
HBV: Hepatitis B Virus
HBV: Hepatitis C Virus
HIV: Human Immunodeficiency Virus
AIDS: Acquired Immunodeficiency Syndrome
NSI: Needle Sticks Injuries
MW: Medical Waste
AHA: American Hospital Association
HAI: Hospital Acquired Infection

Spss: statistical package of social sciences.

UK: united Kingdom.

ICU: Intensive Care Unit.
ENT: Ear, Nose, Throat.
Pt: patient.
1-Introduction

1-1-Background:

Waste generated by health care activities includes a broad range of materials, from used needles and syringes to soiled dressings, body parts, diagnostic samples, blood, chemicals, pharmaceuticals, medical devices and radioactive materials (Parks, 2007). Poor management of health care waste potentially exposes health care workers, waste handlers, patients and the community at large to infection, toxic effects and injuries, and risks polluting the environment. It is essential that all medical waste materials are segregated at the point of generation, appropriately treated and disposed of safely. With the vast amounts of waste produced in the form of household garbage, human excreta, and agricultural and industrial products including hazardous chemical and radioactive substances, it is no wonder that waste management and disposal has become an important and pressing topic in recent decades. (Hendrickson, 2008).

Solid and hazardous wastes pose wide range of public health concerns. Therefore, it is imperative that health officials, including nurses become aware of the possible health hazards that these wastes present to individuals and to communities. All human activities produce waste; we all know that such waste may be dangerous and need safe disposal. Industrial waste sewage and agricultural waste pollute water, soil and air. It can be dangerous to human being and environment. Similarly, hospital and other health care facilities generate lots of waste which transmit infectious; particularly Human Immune Deficiency Virus (HIV), hepatitis
B and C, and tetanus to the people handle it or come in contact with it (Streifel, 2009).

1-2- problem statement:

Worldwide, an estimated 16 billion of medical waste produces each year, this amount to almost 44million injections per day. (William, 2010). The each year United Kingdom (UK) we generate over 80 million tons of waste around 40%of waste from household, 55%industrial waste and residual of hospital waste, about 210million tons is solid waste, 12.4 million tons of glass and about 80 million tons of paper. (Wiliks, 2010) United State (US,2009), 1000 health care workers developed Hepatitis B Virus (HBV) and each year 100 of Health Care Workers (HCW) dies from this disease. (Maryland, MK &etal, 2006). In1995 estimated 560-1,120 cases of Hepatitis C Virus (HCV) infection exposed to blood (Sitana, 2006). In 1997, health workers risk of Hepatitis C Virus(HCV) more than 50years is much more transmitted the HIV, and exposure of eye, nose ,or mouth to Human Immune Deficiency Virus (HIV) with infected blood is estimated to be the average 0.1% and risk after exposure of the skin to be less than 0.1%(Maryland, MK &etal,2006). In Spanish 84 accidental injuries associated with discarded needles, no cases of HIV transmission (shally& etal, 2010).

In developing countries large urban hospitals can generate more than two million tons of waste each year about 15% is sharp objects. In India waste generation about 0.33million tones per year between75-90% of the waste produced by the health care providers is non risk waste and 10-25% is hazardous wastes about 15%pathological and infectious waste, 1%sharps waste, 3% chemical and pharmacological waste, less than1% radioactive waste. (Hennery, 2011)
In Sudan medical waste about 10 tons per year, in Gedaref town 70% of waste is solid waste and about 15 tons in 1990, 50 tons daily in 2006 and 90% in year 2007. (Shally, 2011).

1-3-justification

The nurses spend maximum time with patient in the ward and in more contact with them than any other member of the health team, increase their exposure and risk to hazards present in hospital environment, mainly biomedical waste (BMW). They need to be well equipped with latest information, skills and practices in managing this waste besides reducing hospital acquired infections such as (hepatitis B and C and HIV) to protect their own health. They are also responsible for preventing risk due to waste to the other health team and community as whole. So this study was conducted to investigate nurses performance regarding discarded of medical wastes and prevent occupational health hazards.

-No previous study.

1-4-objectives:

1-4-1-General objective:

Nurses' practices regarding medical wastes disposal in Khartoum North Teaching Hospital during the period of December 2011-February 2012.

1-4-2-Spesific objectives:
- To assess nurses’ knowledge regarding discard of medical waste hazard.
- Monitoring nurses’ performance regarding discard of medical wastes and prevention of occupational health hazards.
2- Literature review

2-1 Definitions:

2-1.1 Medical waste (MW):

Any solid waste that is generated in the diagnosis, treatment or immunization of human being or animals in research pertaining there to or in the production of testing of biological. This definition includes but is not limited to blood-soaked bandages, cultures dishes and other glass ware, discarer surgical gloves and instruments and needles used to give shots or draw blood cultures, stocks, swabs used to inoculate cultures, removed body organs (tonsils, appendices, limbs), and discard lancet (streifel, 2006).

2-1.2 Biological waste:

Define as any blood or body tissues, bedding, bandages, and syringes removed from medical facilities (hennery, 2012).

2.1.3 Solid waste:

Includes all solid or semi solid, on soluble material include gases and liquids such as medical waste municipal garbage and sewage sludge (hennery, 2012).

2.1.4 Hazardous waste:

Means solid waste, or combination of solid wastes, which, because of it is quantity, concentration, or physical, chemical, or infectious
characteristics may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed (Vasundhra, MK & et al., 2005).

2.1.5 Biomedical waste:

Biomedical waste, waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities pertaining there to or in production or testing of biological. (Park's, 2007).

2.1.6 Sharps:

Defined as comprising of needles, syringes, scalpels, blades, glass any things that may cause puncture and cuts. These include both used and unused sharps. (Valley, 2010).

2.2 Classification of medical wastes:

2.2.1 General waste

Includes general domestic type waste from offices, public areas, stores, catering areas, metal cans and floor sweepings (Tomy, 2006).

2.2.2 Liquid waste:

Is waste generated from laboratory and washing, cleaning, housekeeping and disinfected activities (Tomy, 2006).

2.2.3 Pathological waste:
Consist of tissues, organs, body parts, human fetuses, animal carcasses, blood and body fluids (park, 2007).

2.2.4 Radioactive waste:

Containing radioactive substances: unused liquids from radiotherapy or laboratory research, contaminated glassware, packages or absorbent paper, urine and excreta from patients treated or tested with unsealed radionuclide, sealed sources, solid, liquid and gaseous waste, contaminated with radioactive isotopes (rait) generated from "invitro'analysis of body tissues and "invivo"body organ imaging (park's, 2007).

2.2.5 Chemical waste:

Comprises discarded solid, liquid, and gaseous chemicals for example from diagnostic and experimental work, cleaning, housekeeping and disinfectant procedures. (Vasundhra, MK etal, 2008) and film developer and solvents (park's, 2007).

2.2.6 Infectious waste:

The environmental production agency states that approximately 15percent of waste are infectious (Robert, 2005).

Infectious waste is that which can cause harm to people or the environment, and this category includes items such as bandages, surgical gloves, surgical instruments, needles, and microbial dishes cultures and clothes. Other types include waste found in household garbage cans, such as paper or plastic (Robert, 2005).

Infectious waste must be managed and contained to avoid spreading infection, toxins, and pollutants if these materials penetrate the
body they can lead to serious diseases. The containment and safe transportation of biomedical waste is required for healthcare organizations. Pharmaceutical products, veterinary practices, and other such environments (maxi, 2005).

### 2.2.7 Sharps:

This includes needles, syringes, scalpels, saws, blades, broken glass, nails, and any other items which could cause acute or puncture (vasundhara, 2008) and infusion sets and knives (park's, 2007).

### 2.2.8 Pharmaceutical waste:

This includes pharmaceutical products, drugs, and chemicals which have been returned from wards or have been spilled, are outdated, contaminated, or to be discarded because they are no longer required (maxi, 2008).

Items contaminated by or containing pharmaceuticals: bottles, box (parks, 2007).

### 2.2.9 Pressurized containers:

Gas cylinder, gas cartridge, aerosol cans, hold innocuous or insert gasses, and are to be discarded together with general domestic waste. Since aerosol cans could explode if incinerated either with domestic waste or accidentally, they should be punctured (parks, 2007).

### 2.2.10 Genotoxic waste:

Waste containing substances with genotoxic properties: waste containing cytostatic drugs often used in cancer therapy, genotoxic chemicals (parks, 2007).
2.2.11 Waste with high content of heavy metals:

Batteries, broken thermometers, blood pressure gauges (park, 2007).

2.3 Major sources of health –care waste:

governmental hospitals, private hospital, general, district and university hospital, nursing homes, physicians and dentists office, emergency medical care services (EMCS), obstetrics and maternity clinics, outpatient clinics, health care centers and dispensaries, primary health center (PHC), mortuaries and autopsy centers, animal houses, slaughter houses, research organization, vaccinating centers, medical research and training establishments, dialysis centers, transfusion centers, military medical services, first-aid posts and sick bays, long-term health care establishments and hospices, biotechnology institutions, blood bank and blood collection services, psychiatric hospitals, disabled persons centers, nuclear medicine laboratories, ambulance services, acupuncturists and chiropractors (parks, 2007).

2.4 Biomedical waste management:

BMW generates primarily from health care establishments parts of waste health care establishments. Parts of the waste from health care facilities are referred to as (Biomedical or biohazardous). Sometimes it referred to as health care waste (HCW). This includes all the waste generated by health care establishment's research facilities, and laboratories. In addition, it includes the waste originating from minor or "scattered" sources such as the produced in the course of health care undertaken in the home (dialysis, insulin injection, etc) (william, 2006).
It can cause risks to human health by being potentially infectious. Such wastes require proper handling and disposal because of environmental, aesthetic, and occupational concerns as well as risk to human health. Current waste management practices fall well short of these accepted practices resulting in indirect exposure to biohazardous waste and the poor biohazardous includes, improper packaging of biomedical waste, Improper segregation of biomedical waste, improper on-site waste handling and movement, improper on-site storage of biomedical waste, improper off-site transportation of biohazardous, and improper treatment and disposal of biomedical waste and poor in-house monitoring of current waste management (William, 2006).

2.5 Waste collection:

To be done by sanitary staff on daily basis, and transferred to central waste storage facility of the institute. (William, 2006)

2.6 Problems of biomedical waste:

The improper management of biomedical waste causes serious environmental problems in terms of air, water, and land pollution. The nature of pollutants can be classified into biological and chemical and radioactive environmental Problems can arise due to the mere generation of biomedical waste and from the process of handling, treatment and disposal (Robert, 2005).

2.7 Health hazards of biomedical waste and it is management:

According to World Health Organization (WHO), the global life expectancy is increasing year after year. However, deaths due to infectious disease are increasing. A study conducted by the WHO in 2002 reveals that
more than 50,000 people die every day from infectious diseases. One of the causes for the increase in infectious diseases is improper waste management blood, body fluids and body secretions which are constituents of biomedical waste harbor most of the viruses, bacteria and parasites that cause infections. This passes via a number of human contacts, all of whom are potential (recipient) of the infection. Human immune deficiency virus and hepatitis viruses spearhead an extensive list of infections and diseases documented to have spread through biomedical waste tuberculosis, pneumonia, diarrheal diseases, tetanus, whooping cough and other common diseases spread due to improper waste management (Barbara, 2008).

2.7.1 Occupational health hazards:

The health hazards due to improper waste management can not only affect the occupants in institutions, but also spread in the vicinity of the institutions. Occupational health concerns exist for janitorial and laundry workers, nurses, emergency medical personnel, and refuse workers. (Barbara, 2008).

Injuries from sharps and exposure to harmful chemical waste and radioactive waste also causes health hazards to employees in institutions generation biomedical waste proper management of waste can solve the problem of occupational to a large extent. (Barbara, 2008).

2.7.2 Health hazard of health care waste:

Exposure to hazardous health care waste can result in disease or injury due to one or more of the following characteristics:

- It contains infectious agent
• It contains toxic or hazardous chemicals.
• It contains Sharps.
• It contains Genotoxic and radioactive.

All individuals exposed to such hazardous health care waste are potentially at risk, including those who generate the waste or those who either handle such waste or are exposed to it as a consequence of care less management (Park's, 2007).

2.8 The main groups at risk are:

• Medical doctors, nurses, health care auxiliaries, and hospital maintenance personnel.
• Patients in health care establishments.
• Visitors in support service allied to health care establishments such as laundries, waste handling and transportations.
• Workers in waste disposal facilities such as landfills or incinerators including scavengers. (Park's, 2007).

2.9 Treatment and disposal technologies for health care waste:

Waste management is now tightly regulated in most developed countries and includes the generation, collection, processing, transport and disposal of waste. In addition the remediation of waste sites is an important issue, both to reduce hazards whilst operational and to prepare the site for a change of use.

2.9.1 Incineration:
Is a high temperature dry oxidation process, that reduces organic and combustible waste to inorganic combustible matter and results in a very significant reduction of waste volume and weight. The process is usually selected to treat waste that cannot be recycled or disposed off in landfill site. (Parks, 2007).

Is the method of choice where suitable land is not available.

Hospital refuse which is particularly dangerous is best disposed of by incineration. Is practiced in several of the industrialized countries, particularly in large cities due to lack of suitable land (Robert, 2005).

Incineration is not a popular method in India because the refuse contains coal proportion of fire ash while makes the burning difficult. It is more expensive to separate ash and dust. Disposal of refused by burning is loss to community in terms of the much needed manure. (Barbara, 2008).
2.9.2 Waste segregation:

Is the separation of an individual or group of individuals from a larger group, in order to apply special treatment to the separate individual or group. Segregation can also involve the separation of items, from a larger group, as seen with the handling of funds in certain types of accounts. Different color coding has to be assigned to various wastes for effective segregation, as Black (for non-risk waste), Red (for waste with sharps), Blue (for risk waste without sharps), Yellow (for radioactive waste), and Green (for chemical like mercury cadmium). (William, 2006).

2.9.3 Recycling—the recovery of materials from products after they have been used by consumers. (Rickes, 2007).

2.9.4 Sewage treatment—a process of treating raw sewage to produce a non-toxic liquid effluent which is discharged to rivers or sea and a semi-solid sludge, which is used as a soil amendment on land, incinerated or disposed of in landfill. (Rickes, 2007).

2.9.5 Composting—an aerobic, biological process of degradation of biodegradable organic matter. (Rickes, 2007).

2.9.6 Landfill—the deposition of waste in a specially designated area, which in modern sites consists of a pre-constructed ‘cell’ lined with an impermeable layer (man-made or natural) and with controls to minimize emissions. (Rickes, 2007).

2.10 Hazards result from exposure to the medical waste:

2.10.1 Needle sticks injuries:

Needle sticks injuries are wound caused by needles that accidentally puncture the skin. These injuries can occur at any time when people use, disassemble, or dispose of needles. When not disposed of properly, needles
can become concealed in linen garbage and injure other workers who encounter them unexpectedly (koko, 2009).

The causes are not restricted solely to the use of the needles and bone fragment and glass vials, but also involve other medical devices, surgical instruments.

The hazards of needle stick injuries are happened when accidental punctures by contaminated needles, which can inject hazardous fluid into the body through the skin (Koko, 2009).

Also it may infect other people who come in contact with trash.

Accidents injuries of blood born viruses is the major hazards of needle stick injuries, specially the viruses that cause Acquired Immune Deficiency Virus (AIDS), hepatitis B, and hepatitis C. the risk of infection after exposure to infected blood varies by blood borne pathogen. The risk of transmission after exposure to Human Immune Deficiency Virus (HIV) infected blood is about 0.3%, whereas, it is estimated to be up to 100 times greater for hepatitis B virus about 30% and could be as high 10% for hepatitis C virus. Needle stick injuries have transmitted many other diseases involving viruses, bacteria, fungi, and other microorganisms to health care workers, laboratory researchers and veterinarians staff. This disease include: gonorrhea, brucellosis, staphylococcus auras, syphilis, toxoplasmosis and TB. even many of these diseases were transmitted in rare, isolated event, they still demonstrate, however, that needle stick injuries can have serious consequences. (Koko, 2009).

A provide information published by Canadian center for occupational health and safety on reported occupational exposure to HIV by needle stick
injuries. There was total of 690 reported exposures as of Dec 2007, the nurses sustained the largest number of exposure 485 of the total, common exposure type 320 or 75% of total (Koko, 2009).

United State( US )occupational safety and health administration write under title of safer needle devices: protection health care worker occupational risk of NSI hospital based health care worker exposure some 800,000 NSI each year in the US about 2% or approximately 16,000 of these are likely to be contaminated by HIV (koko, 2009).

2.10.1.1 Prevention of needle sticks injuries:

- Avoid using needles whenever possible.
- Don’t bend, break or otherwise manipulate needle by hand.
- Don’t recap needle by hand, don’t remove needles from syringes.
- Immediately after use, discard needles and syringe (whether contaminated or not into puncture resistant sharps containers).
- Never discard sharps into regular trash.
- Never discard sharps into bags or biological waste.
- Use care or caution when cleaning up after procedures the required the use of syringes and needles.
- Don't overfill sharps containers, close completely when they are 3/4 full.
- Located sharp containers in areas in which needles are commonly used, make containers easily accessible (Koko, 2006).

Occupational risk of hepatitis B poses to the health care worker:
Studies done by US occupational safety and health administration on Oct 2003 under title occupational health risk of hepatitis B for more than 50 years, HBV infection, a well documented and recognized occupational hazard has been and continues to be are of the most common blood borne pathogens among health care workers. Studies conducted prior to implementation of recommendation to prevent blood borne transmission (1976-1985) show that health care workers had a prevalence of HBV infection 3:5 times higher than the general in USA population. HB is much more transmissible the HIV, HCW are greatest risk work in areas where they are directly exposed to blood (emergency rooms, clinical laboratories, operating rooms, Heamodialysis( HD) units, and center for disease control and prevention) In 2004, 1000 health care workers developed HBV infection, and each year 100of Health care workers die from this disease (John&etal, 2006).

2.10.1.2 Best practices:

Both the department of the health professional organizations have issued guidelines on the handling of medical devices agency issued 2001, to reiterate the available guidance on the safe use and disposal of sharps. In all `cases emphasis should be placed on the correct handling before, during, and after use for safe disposal of such devices. An appropriate training of staff is essential in reducing the risk of needle stick and sharps injuries (Canda&etal, 2006)

2.10.2 Occupational risk of Hepatitis C:

Hepatitis C virus infection is a major cause of chronic liver diseases in the US and worldwide. The virus because of it is similarities to HBV
presents an occupational risk to persons who work activities involve handling human blood and body fluids. As many as 85% of all HCV infected persons develop choice infection. Person for chronic hepatitis C risk for cirrhosis and primary hepatocellular carcinoma. Hepatitis C is now the leading reasons for the liver transplantation in the US. In 1995, an estimated 560 to 1,120 cases of HCV infection exposed to blood. (Hendrickson, 2006).

Parental route of transmission are the main risk factor hepatitis C infection. However in the large proportion of patient, the source of infection remains unknown. These injuries typically involve small pore needle that contain only limited amount of blood, and the viability of any virus present is limited. In Spanish studies of 84 accidental injuries associated with discarded needles, no cases of HCV transmission. (Shally & etal, 2010).

2.10.3 Occupational risk of HIV:

Several hundred care workers have been accidentally exposed, with HIV, Exposures from needle stick or cuts cause most infection. The Average of exposure through this ways is 0.3%of 1:300 and the risk after exposure of the eye, nose, or mouth to HIV infected blood is estimated to be on the average 0.1% or in 1000 and risk after exposure of the skin to be less than 0.1%. (Marten, 2006).

2.11 Basic Hygiene Practices for Workers:

- Wash hands with soap and water immediately after handling human waste or sewage.
• Avoid touching face, mouth, eyes, nose, or open sores and cuts while handling human waste or sewage.
• After handling human waste or sewage, wash hands with soap and water before eating or drinking.
• After handling human waste or sewage, wash hands with soap and water before and after using the toilet.
• Before eating, removed soiled work clothes and eat in designated areas away from human waste and sewage-handling activities.
• Prevent smoke or tobacco or chewing gum while handling human waste or sewage.
• Keep open sores, cuts, and wounds covered with clean, dry bandages.
• Gently flush eyes with safe water if human waste or sewage contacts eyes.
• Use waterproof gloves to prevent cuts and contact with human waste or sewage.
• Wear rubber boots at the worksite and during transport of human waste or sewage. (Delthia, 2009).

2.12 Linen:

Infected linen must be placed in area alginate polythene bag. The bag is tight shut and then placed in the red linen bag to send in the safe manner to the laundry for barrier washing, the linen is placed in full alginate bag in the washing machine where it dissolve allowing the hot water to wash and disinfect the linen, this help in protection of the staff and hospital environment from Nasocomial infection (Wilkins, 2005).

2.13 Infection control:
2.13.1 Infection

An infection is the colonization of a host organism by parasite species. Infecting parasites seek to use the host's resources to reproduce, often resulting in disease. Colloquially, infections are usually considered to be caused by microscopic organisms or micro parasites like viruses, prisons, bacteria, and viroids, though larger organisms like macro parasites and fungi can also infect. Hosts normally fight infections themselves via their immune system. Mammalian hosts react to infections with an innate response, often involving inflammation, followed by an adaptive response. Pharmaceuticals can also help fight infections. (Hennery, 2012)

2.13.2 Transmission

In order for infecting organisms to survive and repeat the cycle of infection in other hosts, they (or their progeny) must leave an existing reservoir and cause infection elsewhere. Transmission of infections can take place via many potential routes. Infectious organisms may be transmitted either by direct or indirect contact. Direct contact occurs when an individual comes into contact with the reservoir. This may mean touching infected bodily fluids or drinking contaminated water or being bitten by the deer tick. Direct contact infections can also result from inhalation of infectious organisms found in aerosol particles emitted by sneezing or coughing. Another common means of direct contact transmission involves sexual activity - oral, vaginal, or anal sex (Riley, 2006).

Indirect contact occurs when the organism is able to withstand the harsh environment outside the host for long periods of time and still remain infective when specific opportunity arises. Inanimate objects that are
frequently contaminated include toys, furniture, door knobs, tissue wipes or personal care products from an infected individual. Consuming food products and fluid which have been contaminated by contact with an infecting organism is another case of disease transmission by indirect contact (Geneva, 2012).

A common method of transmission in under developed countries is fecal-oral transmission. In such cases, sewage water is used to wash food or is consumed. This results in food poisoning. Common pathogens which are transmitted by the fecal-oral route include Vibrio cholerae, Giardia species, rotaviruses, Entameba histolytica, Escherichia coli, and tape worms. Most of these pathogens cause gastroenteritis. (Hennery, 2012)

2.13.3 Cycle of infection

Prevention and control of infection is of vital importance to the patient as well as to health care personnel. In order to provide proper care for patients with communicable diseases or infectious organisms, you should understand the components of infection and the methods to control the cycle of infection. The cycle of infection is like a chain consisting of six links. To produce disease, each link of the infectious process must be present in a logical sequence. Removing one link in the chain will control the cycle of infection. The six links are discussed in the following paragraphs (Geneva, 2012).

a. Infectious Microorganisms (Agent). These are the pathogens that cause communicable diseases.

b. Reservoir. The reservoir (source) is the person or animal that has the disease. Sometimes a person may have a disease but is not ill. This type of person is called a carrier. The carrier known as Typhoid Mary is a classic
example. She was a food worker in a restaurant who spread the disease typhoid by contaminating the foods she handled. Other examples of reservoirs are a person with a common cold, a person with malaria, a person with syphilis, a rat with plague, and a bat with rabies.

c. **Mode of Escape.** This refers to the route by which the infectious microorganisms escape the reservoir. For example, pathogens that cause respiratory diseases usually escape through the respiratory tract (coughing, sneezing, and so forth) Modes of escape and methods of controlling the mode (preventing the escape) as follow, (Geneva, 2012).

![Cycle of infection](image)


### Modes of escape

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>MODES OF ESCAPE</th>
</tr>
</thead>
</table>
Microorganisms leave the body of the infected person by means of droplets exhaled as a spray in coughing, sneezing, talking, or just breathing. Microorganisms also escape in nose and throat secretions.

**Respiratory Tract.**

1. Wear a mask.
2. Do not talk directly into patient's face.
3. If you have an upper respiratory disease, such as a cold, do not work around patients.

**Gastrointestinal Tract.** Microorganisms that leave the body of the infected person by means of body secretions, for example, hepatitis, the virus is shed in the stool of the infected person.

1. Handle body secretions properly.
2. Perform patient care hand wash.

**Skin.** Microorganisms that leave the body of the infected person by wound drainage or through skin lesions.

1. Dispose of wound dressings properly.
2. Perform patient care hand wash.

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>VECTORS (MODES OF TRANSFER)</th>
</tr>
</thead>
</table>
| • Perform patient care hand wash.  
• Avoid direct contact with wound drainage.  
• Wear a mask. | **Contact (Direct Transfer).** Physical contact with an infected person or items contaminated by an infected person, e.g., syphilis and wound drainage. |

Sources: Guidelines for hand hygiene in health care settings (Geneva, 2012).

**Vector.** The vector is the connection between the source of the disease (reservoir) and the person who is going to catch the disease (host). The vector is sometimes referred to as the "vehicle of disease transmission."

Vectors and their control
**Indirect Contact (Airborne Transfer).** Inhalation of droplets or dust particles contaminated with infectious agents from coughs and sneezes.

- Wear a mask.

**Insects.** Transmittal of pathogens through arthropods such as flies, mosquitos, and ticks that bite infected persons causing such diseases as malaria and yellow fever.

- Proper control of disease-carrying insects.

**Food and Water.** Through consumption of improperly cooked pork or poultry, contaminated raw fish, or water contaminated with feces, urine, or other infectious material.

- Wear a mask.

**Fomites.** These are articles contaminated with microorganisms from infected persons or animals. Some examples are surgical instruments, bed linen, and eating utensils.

- Proper control of disease-carrying insects.

- Maintain high standards of mess sanitation.
- Water purification.
- Selection and preparation of food.

- Wash linen.
- Use sterilized equipment for surgical procedures.
- Sanitize eating utensils.

**Sources:** Guidelines for hand hygiene in health care settings (Geneva, 2012).

**Mode of Entry.** The mode of entry refers to the method by which the pathogens enter the person (host). For example, some pathogens are inhaled (respiratory tract).

Modes of entry and their control.

<table>
<thead>
<tr>
<th>MODE OF ENTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear a mask.</td>
</tr>
<tr>
<td><strong>Respiratory Tract.</strong> Small residues (droplet nuclei) that result from evaporation of droplets</td>
</tr>
</tbody>
</table>
from the respiratory tract of infected persons remain suspended in the air of poorly ventilated spaces for relatively long periods of time. The infectious microorganisms can be inhaled by a well person who may then become infected with the disease.

| Dispose of body excretions carefully. | **Gastrointestinal Tract.** Pathogenic microorganisms enter the body of a new host when food or water contaminated by feces is ingested. |
| Dispose of wound dressings carefully. | **Skin.** Pathogenic microorganisms enter the body when a person comes into contact with wound drainage or skin secretions. |

Sources: Guidelines for hand hygiene in health care settings (Geneva, 2012).

f. **Susceptible Host.** The host is the person who gets the disease. Once the host has the disease, he becomes a reservoir for future transmission of the disease.

Susceptible hosts and control measures.

<table>
<thead>
<tr>
<th><strong>CONTROL</strong></th>
<th><strong>SUSCEPTIBLE HOSTS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Separate high risk persons from persons with known or potential infections.</td>
<td>Children who are very young. People who are very old. People on inadequate diets.</td>
</tr>
</tbody>
</table>
(2) Provide nutritional supplements to persons on inadequate diets.
(3) Vaccinate against certain types of diseases.
(4) Maintain proper sanitation.

<table>
<thead>
<tr>
<th>People who are chronically ill.</th>
<th>People receiving medical therapy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who are already ill.</td>
<td>People with open wounds.</td>
</tr>
</tbody>
</table>

Sources: Guidelines for hand hygiene in health care settings (Geneva, 2012).

**2.13.4 Treatment and prevention**

All the above modes are examples of horizontal transmission because the infecting organism is transmitted from person to person in the same generation. There are also a variety of infections transmitted vertically - that is from mother to child during the birthing process or fetal development. Common disorders transmitted this way include AIDS, hepatitis, herpes, and cytomegalovirus viable treatment and prevention strategies will disrupt the infection cycle. For example, direct transmission can be diminished by adequate hygiene, maintaining a sanitary environment, and health education (Burke, 2009).

When infection attacks the body, *anti-infective* drugs can suppress the infection. Four types of *anti-infective* or drugs exist: antibacterial (antibiotic), antiviral, ant tubercular, and antifungal. Depending on the severity and the type of infection, the antibiotic may be given by mouth, injection or may be applied topically. Severe infections of the brain are usually treated with intravenous antibiotics. Sometimes, multiple antibiotics are used to decrease the risk of resistance and increase efficacy. Antibiotics only work for bacteria and do not affect viruses. Antibiotics work by slowing down the multiplication of bacteria or killing the bacteria. The most common classes of antibiotics used in medicine include
penicillin, cephalosporin's, amino glycosides, macrolides, quinolones and tetracycline's. (Burke, 2009).

Techniques like hand washing, wearing gowns, and wearing face masks can help prevent infections from being passed from the surgeon to the patient or vice versa. Frequent hand washing remains the most important defense against the spread of unwanted organisms. Nutrition has to be improved and one has to make changes in lifestyle—such as avoiding the use of illicit drugs, using a condom, and entering an exercise program. Cooking foods well and avoiding eating foods which have been left outside for a long time is also important. Do not take antibiotics for longer than needed. Long term use of antibiotics leads to resistance and chances of developing opportunistic infections like clostridium difficile colitis. Vaccination is another means of preventing infections by facilitating the development of immune resistance. (Hennery, 2012)

2.14 Nasocomial infection:

A nasocomial infection (nos-oh-koh-mi-al), also known as a hospital-acquired infection or HAI, is an infection whose development is favoured by a hospital environment, such as one acquired by a patient during a hospital visit or one developing among hospital staff. Such infections include fungal and bacterial infections and are aggravated by the reduced resistance of individual patients. In the United States, the Centers for Disease Control and Prevention estimate that roughly 1.7 million hospital-associated infections, from all types of microorganisms, including bacteria, combined, cause or contribute to 99,000 deaths each year. In Europe, where hospital surveys have been conducted, the category of
Gram-negative infections are estimated to account for two-thirds of the 25,000 deaths each year. Nasocomial infections can cause severe pneumonia and infections of the urinary tract, bloodstream and other parts of the body. Many types are difficult to attack with antibiotics, and antibiotic resistance is spreading to Gram-negative bacteria that can infect people outside the hospital. (Burke, 2009).

2.14.1 Transmission

The drug-resistant Gram-negative germs for the most part threaten only hospitalized patients whose immune systems are weak. The germs can survive for a long time on surfaces in the hospital and enter the body through wounds, catheters, and ventilators. (Burke, 2009).

2.14.2 Main routes of transmission

2.14.2.1 Contact transmission

The most important and frequent mode of transmission of nasocomial infection (Edmond, 2005).

2.14.2.2 Droplet transmission

Occurs when droplets are generated from the source person mainly during coughing, sneezing, and talking, and during the performance of certain procedures such as bronchoscopy. Transmission occurs when droplets containing germs from the infected person are propelled a short distance through the air and deposited on the host's body. (Edmond, 2005).
2.14.2.3 Airborne transmission

Occurs by dissemination of either airborne droplet nuclei (small-particle residue \{5 \mu m or smaller in size\} of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time) or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled by a susceptible host within the same room or over a longer distance from the source patient, depending on environmental factors; therefore, special air handling and ventilation are required to prevent airborne transmission. Microorganisms transmitted by airborne transmission include Legionella, Mycobacterium tuberculosis and the rubella and varicella viruses. (Edmond, 2005).

2.14.2.4 Common vehicle transmission

Applies to microorganisms transmitted to the host by contaminated items such as food, water, medications, devices, and equipment. (Edmond, 2005).

2.14.2.5 Vector borne transmission

Occurs when vectors such as mosquitoes, flies, rats, and other vermin transmit microorganisms (Orlando, 2006).

2.14.3 Routes of contact transmission

Involves a direct body surface-to-body surface contact and physical transfer of microorganisms between a susceptible host and an infected or colonized person, such as occurs when a person turns a patient, gives a patient a bath, or performs other patient-care activities that require direct personal contact. Direct-contact transmission also can occur between two
patients, with one serving as the source of the infectious microorganisms and the other as a susceptible host. (Orlando, 2006).

2.14.3.1 Indirect-contact transmission

Involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, such as contaminated instruments, needles, or dressings, or contaminated gloves that are not changed between patients. In addition, the improper use of saline flush syringes, vials, and bags has been implicated in disease transmission in the United States (US), even when healthcare workers had access to gloves, disposable needles, intravenous devices, and flushes. (Orlando, 2006).

2.14.4 Prevention

Hospitals have sanitation protocols regarding uniforms, equipment sterilization, washing, and other preventative measures. Thorough hand washing and/or use of alcohol rubs by all medical personnel before and after each patient contact is one of the most effective ways to combat nosocomial infections. More careful use of antimicrobial agents, such as antibiotics, is also considered vital, Despite sanitation protocol, patients cannot be entirely isolated from infectious agents. Furthermore, patients are often prescribed antibiotics and other antimicrobial drugs to help treat illness; this may increase the selection pressure for the emergence of resistant strains. (Orlando, 2006).

2.14.4.1 Sterilization

Sterilization goes further than just sanitizing. Sterilizing kills all microorganisms on equipment and surfaces through exposure to chemicals, ionizing radiation, dry heat, or steam under pressure (Geneva, 2012).
2.14.4.2 Isolation

Isolation precautions are designed to prevent transmission of microorganisms by common routes in hospitals. Because agent and host factors are more difficult to control, interruption of transfer of microorganisms is directed primarily at transmission (Edmond, 2005).

2.14.4.3 Hand washing and gloving

Hand washing frequently is called the single most important measure to reduce the risks of transmitting skin microorganisms from one person to another or from one site to another on the same patient. Washing hands as promptly and thoroughly as possible between patient contacts and after contact with blood, body fluids, secretions, excretions, and equipment or articles contaminated by them is an important component of infection control and isolation precautions. (Orlando, 2005).

The spread of nosocomial infections, among immunocompromised patients is connected with Health Care Workers hand contamination in almost 40% of cases and it is a real challenging problem in the modern hospitals. The best way for Health Care Workers to overcome this problem is acting right hand hygiene procedures; this is why the WHO launched in 2005 the GLOBAL Patient Safety Challenge. Two categories of microorganisms can be present on Health Care Workers hands: transient flora and resident flora. The first one is represented by the microorganisms taken by Health Care Workers from the environment, and the bacteria in it are capable of surviving on the human skin and sometimes to grow. The second group on the other hand, is represented by the permanent microorganisms that lived on the skin surface (on the stratum corneum or immediately under it). They are capable of surviving on the human skin and to grow freely on it. They have low pathogenicity and infection rate,
and they create a kind of protection from the colonization from other more pathogenic bacteria. The skin of Health Care Workers is colonized by $3.9 \times 10^4 - 4.6 \times 10^6$ cfu/cm$^2$. The microorganisms creating the resident flora are: Staphylococcus epidermidis, Staphylococcus hominis, Microccoci, Propionibacterium, Corynebacterium, Dermobacterium, Pitosporum, while in the transitional could be found Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter spp, Enterobacter spp and Candida spp. The goal of hand hygiene is to eliminate the transient flora with a careful and proper performance of hand wash, using different kinds of soap, from the normal one to the antiseptic, and alcohol-based gel. The main problem found in the practice of hand hygiene is connected with the lack of available sinks and time-consuming performance of hand washing. An easy way to resolve this problem could be the use of alcohol-based hand rub, because of its faster application compared to a correct hand washing (Orlando, 2005).

Although hand washing may seem like a simple process, it is often performed incorrectly. Healthcare settings must continuously remind practitioners and visitors on the proper procedure in washing their hands to comply with responsible hand washing. Simple programs such as Henry the Hand, and the use of hand washing signals can assist healthcare facilities in the prevention of nosocomial infections (Orlando, 2005).

All visitors must follow the same procedures as hospital staff to adequately control the spread of infections (Burke, 2009).

2.15 Previous studies

One of the most critical control components of the health care worker production against bloodborne pathogens must be the reduction of
sharp-related incidents. The statistics cited below provide a picture of the seriousness of the problem.

Hospital based health care workers experience some 800,000 needle stick injuries each year in United States (jagger, 2007).

About 2% or approximately 16,000 of these are likely to be contaminated by HIV (American health association, 2008).

Based on various studies, researchers have documented that needle stick injuries are under reported by health care workers and the number of exposures could potentially be much higher (chiarello, 2007).

Worldwide, an estimated 16 billion of medical waste produces each year, this amount to almost 44 million injections per day. (William, 2010).

The United Kingdom (UK) each year they generate over 80 million tons of waste around 40% of waste from household, 55% industrial waste and residual is hospital waste, about 210 million tons is solid waste, 12.4 million tons of glass and about 80 million tons of paper. (wiliks, 2010).

United State (US) 1994, 1000 health care workers developed Hepatitis B Virus (HBV) and each year 100 of Health Care Workers (HCW) dies from this disease. (Maryland, MK & etal, 2006).

In 1995 estimated 560-1,120 cases of Hepatitis C Virus (HCV) infection exposed to blood (Sitana, 2006).

In 1997, health workers risk of Hepatitis C Virus (HCV) more than 50 years is much more transmitted the HIV, and exposure of eye, nose, or mouth to Human Immune Deficiency Virus (HIV) with infected blood is
estimated to be the average 0.1% and risk after exposure of the skin to be
less than 0.1%(Maryland, MK &etal,2006).

In Spanish 84 accidental injuries associated with discarded needles,
no cases of HIV transmission (shally& etal, 2010).

In developing countries large urban hospitals can generate more than
two million tons of waste each year about 15% is sharp objects.

In India waste generation about 0.33million tones per year
between75-90% of the waste produced by the health care providers is non
risk waste and 10-25% is hazardous wastes about 15%pathological and
infectious waste, 1%sharps waste, 3% chemical and pharmacological
waste, less than1% radioactive waste. (Hennery, 2011)

In Sudan medical waste about 10 tons per year, in Gedaref town 70%
of waste is solid waste and about 15 tons in 1999 to 50 tons daily in 2006
and 90% in year 2007. (shally, 2011).

Biomedical waste management is a crucial challenge Faced by all
hospitals. We presented this manual on biomedical waste management self
learning document for nurses and paramedical, as steps towards sensitizing
the hospital professionals and supported staff on management of
biomedical waste management. This manual is the result of sincere and
hard work of all the team members. It is has become important in health
care establishments. Although we don’t often think about it but, health care
facilities and hospitals are potential settings for transmission diseases. It is
to be understood that management of biomedical waste is an integral part
of health care. The study aimed to know what is biomedical waste to
understand the importance and purpose of biomedical waste management
in hospitals, to understand the risks to environmental and occupational health from biomedical waste. It contribute to environmental pollution and risk of occupational hazard who generate, collect, segregate, handle, package, store, transport, treat and dispose biomedical waste. The reuse of infectious syringes represented a major threat to public health. The WHO estimated that in the year 2000 worldwide, immunization undertaken with contaminated syringes caused about 23 million infection of hepatitis B&C virus and HIV. The risk of hepatitis B virus from single needle stick or cut exposure to HBV infected blood ranges from 6-30%, HCV is approximately 1.8%, and HIV about 0.3%. (Gachibowli, 2010).

It is possible to prevent the occupational exposures by adopting various techniques like not recapping needles by hand, disposing of used needles in appropriate sharps disposed containers and using medical devices with safety features designed to prevent injuries. If an exposure occurs to the blood of patient immediately wash needle sticks and cuts with soap and water, flush splashes to the nose, mouth, or skin with water, saline, or sterile irritate eyes with clean water and report the exposure to senior nurse. (Gachibowli, 2010).

This has resulted in issuance of Medical Waste Regulation that aimed at regulating the management processes of such hazardous waste. To provide information on medical waste generation rates, the average generation rates ranged from 0.29 to 1.36 kg/bed/day, while in terms of patient numbers it is from 0.36 to 0.87 kg/patient/day. The total daily amount of medical waste generated at the Jordanian hospitals was estimated to be 6 tones/ Day. The daily amounts of medical waste generated at King Abdullah University Hospital were found to follow a log
normal probability distribution. indicated that the infectious waste Category is the highest, followed by sharps category and finally pathological, cytotoxic and pharmaceutical Categories were the lowest. The study concluded that all hospitals covered by the survey are practicing segregation of hazardous medical waste from general medical waste. However, the segregation process in some hospitals is still inefficient and there is a potential for improvements toward minimizing the hazardous Medical waste generational reported by (Hani Abu Qdais, Attalla Rabi & Fayez Abdulla, 2007).

The challenge of medical waste management, the results indicated that more than 13.59 tones day of total medical waste and 4.06 tones day of hazardous-infectious medical waste are generated by the active hospitals of the city. Currently, there are no practical instructions, or suitable supervision on different levels of waste management. The health authorities and hospital managers do not accept sufficient responsibility for the medical waste due to financial problems and the lack of awareness regarding the hazards of medical waste. Segregation and minimization of waste are not carried out correctly in any of the hospitals reported by (Mohammed mosafri, 2006).
3. Materials and Methods

3.1 Study Design:

This descriptive hospital based study was conducted at Khartoum north teaching hospital to assess nurse's practices regarding medical wastes disposal during the period from December 2011 to February 2012.

3.2 Study Area:

The study was carried out in the nursery, intermediate care unit, surgical, medical, pediatrics, and Obs, neurosurgery, and ENT wards, at Khartoum North Teaching hospital, in Khartoum State, in the Sudan. The hospitals consisted of two surgical wards 96 beds, two medical wards 96 beds, paediatrics ward 40 beds, obs and gynecological wards 60 beds, neurosurgery ward 35 beds, haemodialysis unit entailed 10 machines, intermediate care unit 3 beds, intensive care unit (ICU) 6 beds, endoscopy unit, Ultra Sound (US) and X-ray unit. Khartoum North Teaching Hospital (Sudan) is the one of the Capital Hospital in the Khartoum state.
Table (1) Distribution of manpower in Khartoum north teaching Hospital

<table>
<thead>
<tr>
<th>Position</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>51</td>
</tr>
<tr>
<td>Registers</td>
<td>64</td>
</tr>
<tr>
<td>Medical officers</td>
<td>32</td>
</tr>
<tr>
<td>House officers</td>
<td>168</td>
</tr>
<tr>
<td>Nurses</td>
<td>57</td>
</tr>
<tr>
<td>Sisters</td>
<td>100</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>12</td>
</tr>
<tr>
<td>Lab technqtion</td>
<td>24</td>
</tr>
<tr>
<td>Dietitian</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>511</td>
</tr>
</tbody>
</table>

Source: Statistical department of Khartoum north teaching hospital, 2010
Table (2) Distribution of wards and beds in Khartoum north teaching hospital

<table>
<thead>
<tr>
<th>Wards</th>
<th>No of words</th>
<th>No of beds</th>
<th>Average no of beds</th>
<th>Average no of patient staying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>2</td>
<td>96</td>
<td>50</td>
<td>6 -10</td>
</tr>
<tr>
<td>Surgery</td>
<td>2</td>
<td>96</td>
<td>30</td>
<td>3- 5</td>
</tr>
<tr>
<td>Pediatric</td>
<td>1</td>
<td>40</td>
<td>33</td>
<td>2 -10</td>
</tr>
<tr>
<td>E N T</td>
<td>1</td>
<td>35</td>
<td>23</td>
<td>1 -3</td>
</tr>
<tr>
<td>Obs and gynea</td>
<td>1</td>
<td>60</td>
<td>45</td>
<td>2hrs-5</td>
</tr>
<tr>
<td>Haemodialysis</td>
<td>1</td>
<td>10</td>
<td>40</td>
<td>2hrs-4hrs</td>
</tr>
<tr>
<td>Intermediate</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5-15</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>1</td>
<td>35</td>
<td>22</td>
<td>5-10</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>6-10</td>
</tr>
</tbody>
</table>

Source: Statistical department of Khartoum north teaching hospital, 2010
3.3 Study Population:

The population of the present study includes all nurses who have direct contact with health care activities "Number 75" nurses (bacalorea, diploma and auxiliary nurses).

3.3.1 Inclusion Criteria:

Purpose sample of nurses who have direct contact with health care activities in Khartoum North Teaching Hospital.

- All nurses with one year experience and more in the hospital

3.3.2 Exclusion Criteria:

- Nurses have experience less than one year.
- Nurses working in the hospital and not contact with the health care activities (matron and assistant).

3.4 Sample size:

Purpose sample of nurses (75) who work in the wards and units were responsible for caring of patients at the hospital were included in the study during the period from December 2011 to February 2012.

3.5 Data collection tools: Two tools of data collection were used:

Tool 1: Interview questionnaire:
Structured questionnaire was designed by the researcher and utilized for two purposes as follows:

**First:** To find out the general characteristics of the study sample. It contained the basic data related to their general characteristics such as age, education, and years of experience.

**Second:** To assess nurse’s knowledge regarding variables of medical wastes disposal and prevent occupational health hazards.

**Tool 2 Observation Check List:**

- To assess the nurse's skills in discard of medical wastes in Khartoum north teaching hospital during the period of December 2011-February 2012.

**3.6 Ethical consideration:**

Official letters for the head manager and matron of Khartoum North Teaching hospital for approval to collect the data.

- All nurses with one year experience and more were collected from the available staff included 75 nurse who are responsible for caring of patients at time of this research execution.

- Explanation for the nurses about the study questionnaire.

- Questionnaire was distributed for each available nurse to fill within 15-20 minutes under the researcher guidance.

- The researcher observed the clinical performance of each selected nurse regarding discard of medical wastes by using observation check list.
3.7 Data analysis:

For the purpose of this study, data were collected, processed, and transferred to computer coding. The descriptive analysis was adopted which includes percentage, means, frequency distribution in form of tables and figures, and graphic illustration of frequency distribution was done. Statistical package of social studies (SPSS) program was applied to determine the relationship between independent variable and dependent variables.

### 4-1 Results

Table (3): Distribution of the study sample according to their educational level

<table>
<thead>
<tr>
<th>Items education level</th>
<th>No</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post graduate</td>
<td>zero</td>
<td>zero</td>
</tr>
<tr>
<td>graduate</td>
<td>32</td>
<td>42.7</td>
</tr>
<tr>
<td>Secondary school</td>
<td>43</td>
<td>57.3</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table (3): This table shows that 57.3% of nurses hold their Education level secondary school.
Table (4): Distribution of the study sample according to their Job

<table>
<thead>
<tr>
<th>Items</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant nurse</td>
<td>11</td>
<td>14.7</td>
</tr>
<tr>
<td>nurse</td>
<td>64</td>
<td>85.3</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table (4): This table shows that 85.3 % are qualified nurse.
Figure (1): distribution of the study sample according to their experience

Figure (1): This Figure revealed that 37.3% of their experience more than 11 years.
Figure (2): distribution of the study sample according to their Source of knowledge.

Figure (2): This figure revealed that 54.7% their Source of knowledge from colleague.
Table (5): Distribution of the study sample according to their attendance Training program

<table>
<thead>
<tr>
<th>Items</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>every 6 month</td>
<td>8</td>
<td>10.6</td>
</tr>
<tr>
<td>every years</td>
<td>13</td>
<td>17.3</td>
</tr>
<tr>
<td>no training</td>
<td>54</td>
<td>72.0</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table (5): This table shows that 72% of nurse said that no training program.
Table (6): Distribution of the study sample according to their Place of work

<table>
<thead>
<tr>
<th>Items</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>medical ward</td>
<td>22</td>
<td>29.3</td>
</tr>
<tr>
<td>surgical ward</td>
<td>35</td>
<td>46.7</td>
</tr>
<tr>
<td>Obs and gynecological ward</td>
<td>15</td>
<td>20.0</td>
</tr>
<tr>
<td>other ward(nursery,ENT,neurosurgery,intermediate)</td>
<td>3</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table (6): This table shows that 46.7% of nurses working in surgical ward.
Figure (3): Distribution of the study sample according to their knowledge regarding Sharp objects

Figure (3): This figure illustrated that 94.7% of nurses discard sharp objects after used in safety box.
Figure (4): Distribution of the study sample according to their knowledge regarding Importance discard of medical wastes correctly.

Figure (4): This figure illustrated that 82.7% of nurses responses with correct answers regarding discard of medical wastes prevent from blood transmission diseases and protect health care providers from needle stick injuries.
**Figure (5):** Distribution of the study sample according to their knowledge regarding safety box capacity.

Figure (5): This figure revealed that 48% of nurses full the safety box by sharp objects after used till the line present in box and 37.3% full till 3/4 box.
Figure (6): Distribution of the study sample according to their knowledge regarding Occupational injuries by sharp objects

Figure (6): This figure illustrated that 89.3% of nurses stated that injuries by sharp objects can cause blood transmission diseases.
Figure (7): Distribution of the study sample according to their performance regarding dispose gloves after used.

Figure (7): This figure revealed that 74.4% of nurses discard gloves after used in infectious containers.
Figure (8): Distribution of the study sample according to their performance regarding discard of blood bags after used.

Figure (8): This figure illustrate that the higher proportion of nurses who represented 44% of the total nurses discard the blood bags after used in proper containers (red color containers).
Figure (9): Distribution of the study sample according to their performance regarding discard of sharp objects after used.

Figure (9): This figure revealed that 60% of nurses discard the sharp object after used in safety box immediately without bend and recap.
**Table (7):** Distribution of the study sample according to their nurses' performance regarding to their attitude

<table>
<thead>
<tr>
<th>Statement</th>
<th>agree</th>
<th>disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important to wear all protection equipments when deal ℓ patients body fluids</td>
<td>100</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Important of hand washing before and after touch the Pt</td>
<td>100</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Important of gloving before touch the Pt</td>
<td>100</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Gloving ℓ out hand washing enough to deal with patients</td>
<td>13.3</td>
<td>86.7</td>
<td>75</td>
</tr>
<tr>
<td>Important of discard medical waste according to types in special containers</td>
<td>100</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Keep the medical waste correctly can prevent from transmission of infectious diseases</td>
<td>100</td>
<td>0</td>
<td>75</td>
</tr>
</tbody>
</table>

**Table (7):** This table shows that 86.7% of nurses stated that Gloving ℓ out hand washing enough to deal with patients.
Table (8): Distribution of the study sample according to their performance regarding wearing personal protective equipments when deal with patients body fluids  

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not done</th>
<th>Done incorrectly</th>
<th>Done correctly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put sharp instruments in safety box</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Used special container to cotton swab disposal</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Used code containers for medical waste</td>
<td>0</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Put the empty ampoules in special container</td>
<td>3</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>Put the general waste in black color container</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Put gloves in yellow color container</td>
<td>15</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Put the blood bags in red color container</td>
<td>0</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Put empty intravenous bags in non infectious container</td>
<td>73</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Put gloves in waste disposal</td>
<td>70</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Wear mask, gloves, cap, eye glasses, and overshoes for patient body fluid disposal</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>total</td>
<td>23.6</td>
<td>18.4</td>
<td>58</td>
</tr>
</tbody>
</table>

Table (8): This table shows 58% of nurses discard medical waste probably.

4.2 Discussion
Poor management of health care waste potentially exposes health care workers, waste handlers, patients and the community at large to infection, toxic effects and injuries, and risks polluting the environment. It is essential that all medical waste materials are segregated at the point of generation, appropriately treated and disposed of safely. With the vast amounts of waste produced in the form of household garbage, human excreta, and agricultural and industrial products including hazardous chemical and radioactive substances, it is no wonder that waste management and disposal has become an important and pressing topic in recent decades. (Strifel, 2005).

The study is descriptive study aimed at assessing nurses’ practices regarding medical wastes disposal in Khartoum North Teaching hospital during period (2011-2012).

This result of the present study show there was a statistically the most method to learning from colleague figure (2).

The study revealed that 74.7% of them disposed gloves after used in infectious containers in the study period (2011-2012) figure (7). This disagreement with result reported by (William, 2006) stated that discard gloves for non risk containers.

From the study it was obvious the nurses discard the sharp objects in safety box figure (3). This study agreement with result reported by (Barbara, 2008) she stated that discard sharp objects in safety box to prevent needle stick injuries.
The result from figure (8) similar to what had been reported by (Geneva, 2012) she stated that; the blood bags after use must be discarding in red color container and deal with it as infectious and dangerous wastes.

The study revealed that ( 82.7% ) of total nurses said the discard of medical wastes correctly prevent from blood transmission disease and protect cleaners from needle stick injuries figure (4), this findings similar to what had been reported by( Hendrickscon,2005) he stated that, the proper discard of medical waste prevent from blood transmission diseases.

The study revealed that ( 60%) of nurses dispose the sharp objects in safety box immediate without bend and recap figure( 9) similar to what had been reported by( koko,2006) he stated that, don’t bend ,break or otherwise manipulate needle by hand and don’t recap needle by hand and don’t discard needles from syringes.

The study show that (86.7%) of nurses table (7) deaths due to infectious disease are increasing. This result is similar to estimation of (William, 1992) which revealed that more than 50.000 people die every day from infectious diseases and one of the causes is improper waste management.

The study also revealed that (37%) of nurses stated that the capacity of safety box full till 3/4 box figure (5). This result is in conformity with obtained by (koko, 2006) stated that don’t overfill sharps containers, close completely when they are 3/4 full.

The large percentage (89.3%) of occupational injures by sharp objects because blood transmission diseases figure (6). Reported the same finding
reported by (shally, 2001) she stated that 1000 workers risk for hepatitis B, 560 cases of hepatitis C.

Study revealed that (16.1 %) of nurses' deals with patients' body fluids without wear personal protective equipments Table (8). The finding of this study is disagreement with (koko, 2006) stated that barrier equipments protect health care providers from infectious diseases. Finding of the present study show there was a statistically significant relationship between years of nurses' experiences and performance regarding discard of gloves after used.
5. Conclusion and Recommendations

5.1 Conclusion

Based on the results of this study the researcher concluded that:

Health care workers got very high risk to infectious diseases due to improper waste management and dealing with patients without safety majors with strongly resulting of blood transmission diseases related to needle stick injuries.
5.2 Recommendations

- Health education is the cornerstone of the problem, because of the greater number of nurses not using the barrier equipments.

- Vaccination for workers exposed to sewage or human waste should be developed in consultation with local health authorities. Tetanus and Hepatitis B vaccinations.

- Proper and continuing supervision to assess the impact of the nurses' performance.

- Continuous training should be conducted for all nurses working in Khartoum north teaching hospital regarding medical wastes and orientation program should be conducted for newly employees.

- Learning staff facilities as library Books and periodical Journals regarding medical wastes should be available for the nurses at hospitals.
References


2. Asses of knowledge, Attitude, & Practice of nurses' staff regarding discard of medical wastes at Khartoum Teaching Hospital & Khartoum Bahri Teaching Hospital 2006.


http://www.appliancemagazine.com/news.php?article=1498614&zone=0&first=1


Gezira University

Post graduated program of nursing science

Part one: personal data:

- Name……………………………………………………………………………………………..
- Age: 20-25 years ( ) 26-30 years ( ) 31-40 years ( ) more than 40 years ( ).
- Education level: primary ( ) secondary ( ) tertiary ( ) graduate post graduate ( ).
- Job: nurse ( ) qualified nurse ( ).
- Experience: 1-5 years ( ) 6-10 years ( ) more than 11 years ( ).
- Source of knowledge: book ( ) friends ( ) training program ( ) multimedia ( ) other ( ).
- Training program: every 6 month ( ) every years ( ) continuous ( ) no training ( ) others mentioned ( ).
- Years of experience: mention years if present ………………………
- Place of work: medical ward ( ) surgery ward ( ) Obs and gynecological ward ( ) other ward ( ).

Part two: Information's:
Definition of medical waste:

- Discard of materials results from patients after use.
- Residual of hospital food and papers.

**How to discard medical waste?**

- Disposed gloves.
  - Discard in infectious container ( ).
  - Discard in non infectious container ( ).
  - Discard in safety box ( ).
  - All above wrong ( ).
- Empty ampoules:
  - Discard in safety box ( ).
  - Discard in infection code container ( ).
  - Discard in any container ( ).
  - Consider from non infection medical waste and most be discard in special container ( ).
  - Other mentioned ( ).
- Sharps objects:
  - Discard in safety box ( ).
  - Discard in container ( ).
  - Put beside the Pt table ( ).
  - All above Right ( ).
- Dressing materials:
  - Put in special container ( ).
• Put in any container (     ).
• Put in safety box (     ).
• Other material (     ).
• Patients objective like catheter / canula/ NGT after usage:
  • Put in code container (     ).
  • Put in safety box (     ).
  • Incinerator (     ).
  • All above right (     ).
  • Other mentioned (     ).
• Solid waste:
  • Put in special container (     ).
  • Put in yellow color container (     ).
  • Put in solid waste container (     ).
  • All above right (     ).
  • Other mentioned (     ).
• Blood pages after usage:
  • Put in special container (     ).
  • Put in red color container (     ).
  • Put in any container (     ).
  • All above wrong (     ).
  • Other mentioned (     ).
• **Importance of right discard of medical waste means:**
  • Protection from infectious disease (     ).
• Protection from blood transmission disease (   ).
• Protection of cleaners from infectious diseases (   ).
• All above right (   ).

Part three: Hospital facilities to discard of medical wastes:

• Presence of special containers to discard of medical waste:

  Yes (   )  No (   )

If answer is yes:

• Color: a) red (   )
  b) Yellow (   )
  c) Black (   )
  d) All above (   )
  e) Not present (   )

• Code: a) medical waste (   )
  b) All hospital wastes (   )
  c) Infectious wastes (   )
  d) All above (   )

3. Numbers: a) availability of container beside any bed (   )
  b) Availability of one container in every ward (   )
  c) Availability of one container beside every two bed (   )
  d) Not present (   )

• Availability of safety box:

  Yes (   )  No (   )

If yes: who capacity of safety box:

84
• Completely full (   )
• Full till 3/4 of box (   )
• Full till 1/2 box (   )
• Full till the line present in box (   )

• **Occupational injuries by sharp objects can cause:**
  • Hepatitis B and HIV (   )
  • Hepatitis B only (   )
  • HIV only (   )
  • All the blood transmission diseases (   )

• **Protection from waste health hazards and practice followed to discard it:**
  • Handling of infectious medical waste:
    • Must be wear gloves, mask, gown and cap (   )
    • Use forceps only (   )
    • Wear gloves only (   )
    • Direct contact by hand (   )
    • Discard of sharp objects after use:
      • Bend the needles then discard (   )
      • Recap the needles before discard (   )
      • Removed needles from syringes (   )
      • Put in safety box immediate ē out bend and recap (   )

• **Nurse role of discard medical wastes:**
  • Immediate inform about full containers (   )
  • Health education of staff (   )
• Discard of medical waste in special place (  )
• All above right (  )
• Other mentioned (  )

Part four: Nurses attitudes and practice about how to deal with patients:

   Answer    Yes (  ) or    No (  )

• Important to wear all protection equipments when deal with patients body fluids (  )
• Important of hand washing before and after touch the PT (  )
• Important of gloves before touch the PT (  )
• Gloves out hand washing enough to deal with patients (  )
• Important of discard medical waste according to types in special containers (  )
• Keep the medical waste correctly can prevent from transmission of infectious diseases (  )
جامعه الجزيرة
برنامج ماجستير علوم التمريض

إستبيان عن كيفية التخلص من النفايات الطبية ومدى خطرتها

الجزء الأول: بيانات شخصيه

الاسم: 1

العمر 25-20 سنة ( ) 30-26 سنة ( ) 40-31 سنة ( ) أكثر من 40 سنة ( )

3. مستوى التعليم: إبتدائي ( ) متوسط ( ) ثانوي ( ) جامعي أو فوق الجامعي ( )

4. المهنة: ممرض ( ) ممرض بشهادة ( )

5. سنوات الخبرة: سنين 5 سنوات ( ) 10-6 سنة ( ) أكثر من 11 سنة ( )

6. مصادر المعلومات: الكتب ( ) الأصحاب ( ) دورات تدريبيه ( ) وسائل الإعلام ( ) أخر ( )

7. برنامج التدريب : كل ستة أشهر ( ) كل عام ( ) تدريب مستمر ( ) لا يوجد تدريب ( ) أخر يذكر ( )

8. تاريخ التدريبات: ذكر العام إن وجدت...........

9. مكان العمل: عنبر الباطنيه ( ) عنبر الجراحه ( ) عنبر الأطفال ( ) عنبر النساء والتوليد ( )

(أخير تذكر).................

الجزء الثاني: خاص بالمعلومات

/ ما هي النفايات الطبية:

1. هي نفايات تنتج عن الأدوات بعد استخدامها للمريض ( )

2. هي نفايات الأطعمة وأوراق المستشفي ( )

87
كيفية التخلص من النفايات الطبية:

2. الجوينات المستخدم للكشف الطبي:

1. يجب التخلص منه في سلة النفايات المعدية ( × )
2. يجب التخلص منه في سلة النفايات غير المعدية ( _ )
3. يجب التخلص منه في صندوق الأمان ( _ )
4. كل ماذكر خطأ ( _ )

الأمبولات الدوائية الفارغة:

1. يجب التخلص منها في صندوق الأمان ( _ )
2. يجب التخلص منها في سلة النفايات المعدية المعنونة ( _ )
3. يجب التخلص منها في أي سلة ( _ )
4. تعتبر من المخلفات الطبية غير المعدية و يجب التخلص منها في السلة الخاصة بها ( _ )
5. آخر تذكر

الأدوات الحادة بعد استخدامها كالمشارف والإبر:

4. الأدوات الحادة بعد استخدامها كالمشارف والإبر:

1. يجب التخلص منها في صندوق الأمان ( _ )
2. يجب التخلص منها في السلة ( _ )
3. يجب تركها على تربيزه المريض ( _ )
4. كل ماذكر صحيح ( _ )

- لمعدات غيارات الجروح:

1. التخلص منها في سلة خاصة بها ( _ )
2. التخلص منها في أي سلة ( _ )
3. وضعها في صندوق الأمان ( _ )
4. آخر تذكر ( _ )
5/ متعلقات المريض كالقسطره، أنبوبه المعد، الكانيولا بعد استخدامها:

1/ يجب التخلص منها في سلة معدونها ( )
2/ يجب دفنه ( )
3/ يجب وضعها في صندوق الأمن ( )
4/ كل ماذكر صحيح ( )
5/ أخری تذكر ( )

6/ النفايات الصليبة:

1. يجب التخلص منها في السلة الخاصة بها ( )
2. التخلص منها في السلة ذات اللون الأصفر ( )
3. التخلص منها في سلة معدونه بالنفايات الصليبة ( )
4. كل ماذكر أعلاه ( )
   أخری تذكر ( )

7/ أكياس الدم بعد استخدامها:

1/ التخلص منها في سلة خاصة ( )
2/ التخلص منها في السلة ذات اللون الأحمر ( )
3/ وضعها في أي سلة ( )
4/ كل ماذكر خطأ ( )
5/ أخری تذكر ( )

8/ أهمية التخلص من النفايات بطريقة صحيحة يعني:

1/ الوقاية من الأمراض المعدية ( )
2/ الحماية من الأمراض المنتقلة بالدم ( )
3/ حماية عمال النظافة من الإصابة بالأمراض المعدية ( )
4/ كل ماذكر أعلاه ( )

الجزء الثالث: إمكانية المستشفى لتوفير الأدوات اللازمة للتعامل من النفايات الطبية:

1/ هل توجد سلات مخصصة لرمي المخلفات الطبية :
   نعم ( )
   لا ( )

إذا كانت الإجابة بنعم:
1. ألوانها: أحمر ( ) أصفر ( ) أسود ( ) كل مذكّر ( ) لا يوجد ( )

2. عناوينها: المخلفات الطبية ( ) كل مخلفات المستشفى ( ) المخلفات الطبية الناقل للعدوى ( ) كل مذكّر أعلاه ( ) لا توجد ( )

3. عددها: توفر سله بجانب كل سرير ( ) توفر سله واحده كبيره فقط بكل عنبر ( ) توفر سله بجانب كل سريرين ( ) لا توجد ( )

هل توجد صناديق آمن لوضع الآلات الحاده:

نعم ( ) لا ( )

إذا كانت الإجابة بنعم: ماهي السعة لصندوق التخلص من الآلات الحاده:

1/ أن يكون ممثلا تماما ( ) 2/ ممثلي حتى 3/4 الصندوق ( )

3/ ممثلي حتى النصف ( ) 4/ ممثلي حتى الخط المبين علي الصندوق ( )

3/ عند الإصابه بأداء حاده ملوثة يمكن الإصابة بالآتي:

1/ يرقان البدء الفيروسي ب والإيدز ( ) 2/ يرقان البدء الفيروسي فقط ( )

3/ الإيدز فقط ( ) 4/ كل الأمراض المنقلة بالدم ( )

كيفية الحماية من مخاطر النفايات الطبية والممارسات المتبعه عند التخلص منها:

1/ عند حمل النفايات الطبية الملوثة:

يجب إرتداء جوينت، كمامه، قاون و طاقيه خاصه ( )

يجب استخدام جفت ( ) يجب إرتداء جوينت فقط ( )

يجب حملها بواسطة اليد مباشرة ( )

2/ عند التخلص من الحقن بعد استخدامها:
3/ دور الممرض في التخلص من النفايات الطبية:

التبلغ الفوري عن السلات الممتلئة ( ) التنقيف الصحي للقائمين بأمر الصحة ( )
التخلص من النفايات في المكان المخصص لها ( ) كل ماذكر أعلاه ( ) أخر تذكر ....

4/ الجزء الرابع: الممارسات المتبعة وسلوكية الممرض عند التعامل مع المريض

نعم ( ) لا ( )

1. مهم إرتداء الأدوات الواقية عند التعامل مع سوائل المريض ( ) ( )

2. مهم غسل الأيدي قبل وبعد التعامل مع المريض ( ) ( )

3. مهم لبس الجوينت عند التعامل مع المريض ( ) ( )

4. لبس الجوينت يعني غسل الأيدي ( ) ( )

5. مهم وضع النفايات حسب أنواعها في المكان المخصص لها ( ) ( )

6. حفظ النفايات الصحيحة يمنع انتقال الأمراض المعدية ( ) ( )

91
Post graduate board studies master program

Check list for nurses' practices regarding medical wastes disposal in Khartoum north teaching hospital: Khartoum state, Sudan

Done correctly ( )   Done incorrectly ( )   Not done ( )

• Put sharps instruments in safety box.
• Used special container to disposal cotton swab.
• Used code containers for medical waste.
• Put the empty ampoules in special containers.
• Put the general waste in black color containers.
• Put gloves in yellow color container.
• Put the blood pages in container of red color.
• Put empty intravenous bags in non infectious container.
• Put the post dressing equipments in infectious containers.
• Wear gloves in waste disposal.
• Wear mask, gloves, cap, eye glasses', and over shoes for discard of patient's body fluids.