



Dorothy Chanda, MPH, BSc N, CPHN, IPN, SCM, SRN

This Manual is designed to help health care professionals who wish to become Infection Prevention Practitioners in health Care Settings and the Community. The users can use it as a reference material, learn from it or use it as a resource material for capacity building both at health care institutions and in the community for Community Based Agents. It is written in a simple and easy way so that every health care provider can understand it. The Manual will help the new

Infection Prevention Officer in setting up an effective Infection Prevention Programme with the support of the Hospital administration.

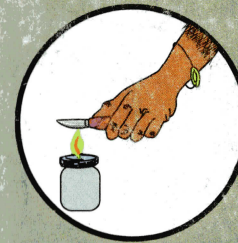
Mrs. Dorothy Osigwe Chanda is a Lecturer in Community Health Nursing at the Post Basic Nursing Department of the School of Medicine, University of Zambia. She is a renowned Infection Prevention Practitioner who has devoted a major part of her professional career in the practice of Infection Prevention before joining the University of Zambia. Her passion for Infection Prevention has been demonstrated by the many presentations at International Conferences. She has prime-moved the Infection Prevention Programme in the University Teaching Hospital, Lusaka, the Lusaka Trust Hospital, and the KANDO group of hospitals in the Copper belt province of Zambia. She is a member of the National Infection Prevention Team and participated in the production of the National Infection Prevention Guidelines. After being nominated as a Master Trainer in Infection Prevention by the Directorate of Clinical Care and Diagnostic Services of the Central Board of Health, the implementing arm of the Ministry of Health, she participated in capacity building of health care providers in Infection Prevention in the Provinces.

As a Lecturer in Community Health, she has a vast knowledge on HIV/AIDS issues and firmly believes that Infection Prevention is key to the prevention of hospital acquired blood-borne pathogens like HIV/AIDS, Hepatitis B, and C.

Mrs. Chanda is known by her writing skill, which has been demonstrated, in her authoring "An Infection Prevention Manual for Community and Health Care Institutions in Developing Countries." This Manual underscores the importance of transferring clinical experiences into the higher and tertiary institutions of learning for the benefit of students both at the pre- and post service areas, Infection Prevention Scholars, practitioners and the community members.

Dear Reader, do enjoy the use of this Manual.

AN INFECTION PREVENTION MANUAL FOR COMMUNITY AND HEALTH CARE INSTITUTIONS IN DEVELOPING COUNTRIES.



@ Dorothy O Chanda, 2004

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TABLE OF CONTENTS

CONTENT	PAGE
Foreword.....	xix
Preface.....	xxi
Acknowledgements.....	xxv
Dedication.....	xxix
Abbreviations.....	xxx

CHAPTER 1

1.0	HISTORICAL DEVELOPMENT.....1 AND CURRENT PERSPECTIVES OF HEALTH CARE PRACTITIONERS ON INFECTION PREVENTION.
1.1	The Beginnings of.....2 Infection Prevention.
1.1.1	Communities.....3
1.1.2	Health System and its Composition.....5
	The Role of the Traditional.....6 Healer in Primary Health Care.
	Community Health Workers.....7
	Traditional Birth Attendants.....8

1.2	Infection Prevention in the Roots of Africa.	9
1.2.1	A Survey Among Community Based Agents.	16
	Survey Findings on..... Traditional Birth Attendants.	17
	Survey Findings on Community..... Health Care Workers.	18
	Survey Findings on Home..... Based Care Givers.	18
	Survey Findings on..... Traditional Healers.	18
	Emphasis of the Survey.....	19
	Community Service Factors..... Noted.	19

CHAPTER 2

2.0	COMMUNITY AS A SOURCE OF INFECTION	22
2.1	Microorganisms in the Community.....	22
2.2	Housing.....	24
2.3	Epidemiology of Disease Outbreak..... in the Community.	24
2.4	Practical Aspects Of Infection Prevention for Community Based Agents.	28

2.5	Objectives for Visiting..... Traditional Healers in the Community.	35
2.6	Objectives for Visiting Community Health Care Workers.	39
2.7	Objectives for Visiting Traditional Birth Attendants in the Community.	41
2.8	Objectives for Visiting..... Home-Based Care Givers and their Patients in the Community.	48
2.9	Guidelines for..... Trained Community Health Care Workers.	51
2.10	Guidelines for Home Based Care Givers.	53

CHAPTER 3

3.0	HEALTH CARE SYSTEM IN THE COUNTRY	55
3.1	The Status of Health Care System.	55
3.2	Three levels of Health care.....	60
3.2.1	Primary level of Care..... Health Centres.....	60
3.2.2	Secondary Level of Care.....	67

District and first level.....	67
Referral hospitals.	
3.2.3 Tertiary Level of Care.....	68

CHAPTER 4

4.0 INTRODUCTION TO INFECTION.....	69
PREVENTION IN HEALTH CARE INSTITUTIONS	
4.1 What is Infection Prevention?.....	69
4.2 What is a Nosocomial Infection?.....	69
4.3 Hospital Environment as.....	70
a Source of Infection.	
4.3.1 Disease Factors.....	70
4.3.2 Patient factors.....	72
4.3.3 Hospital Environmental Factors.....	73
4.3.4 Practice Factors.....	75
4.4 Constraints in Infection.....	78
Prevention Programmes.	
4.4.4 Benefits of Infection.....	81
Prevention Programme.	

CHAPTER 5

5.0 MANAGEMENT OF HOSPITAL.....	82
INFECTION PREVENTION AND CONTROL PROGRAMME	

5.1 Hospital Infection.....	82
Prevention Committee.	
Components of an Infection.....	83
Prevention Programme.	
5.2 The Roles of Specific.....	84
Key members.	
The Microbiologist.....	84
The Role of the Infection.....	85
Prevention Nurse.	
The role of the.....	96
Ward Manager.	
5.3 Effecting Infection.....	96
Prevention Programme.	
Implementation Strategy.....	96
Financial..support.....	96
5.4 Education Strategy	97
Education Strategy	97
for Support Services staff.	
A Case History on	98
seminar for the Maintenance Staff.	
Laboratory Staff.....	103
Laundry Staff.....	105
Central Sterile Supplies.....	106
Dept. Staff.	

Kitchen Staff.....	108
The Porters and..... the Maids.	110
Education	114
for the patients and their relatives.	
For Health Care Providers.....	115

CHAPTER 6

6.0	BASIC MICROBIOLOGY	118
	IN INFECTION PREVENTION AND CONTROL	
6.1	Micro-Organisms in.....	118
	Relation to Hospital-acquired Infections.	
6.2	Normal Flora – Non.....	119
	Pathogenic in Their Usual Sites.	
6.2.1	How Normal Flora Cause.....	121
	Hospital -acquired Infections.	
	Endogenous Infections.....	121
	Exogenous Infections.....	122
6.3.0	Types of Microorganisms.....	124
6.3.1	Location of viruses.....	125
	parasites, and fungi in clinical settings.	

6.3.2	Bacteria.....	125
	Gram Positive Bacteria.....	126
	Gram negative bacteria.....	126
	Common types of bacteria	128
	and where found in clinical areas.	
6.3.3	Specific Microorganisms.....	129
	which cause hospital acquired infections,	
	<i>Staphylococcus aureus</i>	129
	<i>Pseudomonas aeruginosa</i>	131
	<i>Streptococcus</i> species.....	133
	<i>Hepatitis viruses</i>	136
	<i>The HIV Virus</i>	142
	<i>Clostridium Perfringens</i>	145
	<i>Neisseria Meningitidis</i>	147
6.4.0	Emerging Micro-Organisms.....	150
	in Low Income Countries.	
6.4.1	Ebola Virus.....	150
6.4.2	Severe Acute.....	151
	Respiratory Syndrome.	
6.5.0	Environmental.....	154
	Micro-organisms.	
6.5.1	The Biological Environment.....	155

CHAPTER 7

7.0 INSTRUMENT PROCESSING IN HEALTH CARE SETTING AND IN THE COMMUNITY 159

7.1 Introduction to Decontamination, Pre-cleaning and High-level Disinfection and Sterilization. 159

7.2 Definition of key-terms in Instrument Processing. 160

Critical Care procedures. 160

Semi critical care procedures. 160

Non critical –care procedures. 160

Decontamination. 161

Pre-cleaning. 161

High Level Disinfection. 161

Antisepsis. 162

Sterilisation. 162

Pasteurisation. 162

7.3.0 Method of Decontamination, Pre-cleaning, High Level Disinfection and Sterilisation. 162

7.3.1 Method of Decontamination. 162

7.3.2 Pre-cleaning Process. 164

7.3.3 Disinfectants for Disinfection. 164

Phenols. 164

Sodium Hypochlorite Solution (Jik). 165

Glutaraaldehyde (Cidex 2%). 166

Alcohol. 166

Povidone Iodine. 167

A Case History on the misuse of disinfectants. 167

7.4.0 High Level Disinfection. 168

Boiling. 168

2% Glutaraldehyde (refer to 7.6.5). 170

7.5 Antisepsis. 170

7.6. Sterilisation Methods. 171

7.6.1 Heat Sterilisation. 171

7.6.2 Dry Heat. 172

7.6.3 Gas Sterilisation. 172

7.6.4 Irradiation sterilization. 172

7.6.5 Chemical Sterilisation Using 2% Glutaraldehyde. 173

CHAPTER 8

8.0	THE DISEASE PROCESS	174
8.1	Three Interactive factors..... that cause diseases.	175
8.2	Agent Factors.....	175
8.3	Host Factors.....	175
8.4	Environmental Factors.....	176
8.5	Principal Methods of..... Spread of infection.	177
	Direct Transmission.....	177
	Indirect Transmission.....	177
8.6	The Invaders.....	179
8.7	The Pre-pathogenesis Phase.....	180
8.8	Pathogenesis Phase.....	180

CHAPTER 9

9.0	UNIVERSAL INFECTION.....	181
	PREVENTION MEASURES OR	
	STANDARD PRECAUTIONS	
9.1	Handwashing.....	182
9.2	Specimens.....	183

	Preservation of specimens.....	183
	For laboratory Investigations.	
	Specimen for Wild	184
	Polio Virus.	
	Pus specimens.....	184
	and Anti - Microbial Agents.	
	Mid-stream Specimen.....	185
	of urine.	
	Urine Specimen to Identify.....	185
	Schistosomiasis germs.	
	Urine specimen to identify	185
	Trypanosomiasis (sleeping Sickness) germs.	
9.3	Prevention of.....	186
	Occupational Hazards.	
	Action to be taken.....	188
	If a splash occurs in the eyes Or mouth.	
9.4	Isolation Processes.....	188
	Reverse Isolation.....	189
	Source Isolation or Barrier.....	190
	Nursing.	
	Isolation of Patients with.....	192
	Respiratory Infections.	
	Requirements for Isolation.....	193
	of Enteric Diseases.	
	In Medical Wards.....	195

	Neonatal Units.....	196
	Paediatric Wards.....	196
	Obstetric Unit.....	197
9.5	Notifiable Diseases.....	197

CHAPTER 10

10.0 PREVENTING HOSPITAL ACQUIRED.....199 INFECTIONS

10.1	Introduction to Infection199 Prevention Practices.
10.2	Steps to Prevent Nosocomial.....200 Infections in Clinical Areas.
	Proper Hospital Refuse.....202 Disposal System.
10.3	Ward Situation Analysis.....203
	Geographical Ward Division.....206
10.4	Infection Prevention In.....207 Specific Units.
	Neonatal Units.....207
	Intensive Care Units.....208
	Ward architecture, Care of.....212 Patient-Care Items And Maintenance of Basic

	Hygiene Practices.	
10.5	Factors Causing Postoperative Wound.....216 Infection In Operating Theatres.	
	Poor preparation of Patients.....218 for Surgery.	
	Unrestricted Areas In.....218 Theatre Suite.	
	Improper Care of Anaesthetic.....219 Equipment.	
	Improper Care of the System.....220 that Supports the Autoclave.	
	Improper use of the.....220 Theatre Trolleys.	
	Improper Care of.....220 Theatre Clothing.	
	Micro-organisms in.....221 Operating Rooms.	
	Ventilation Systems221 That do not Work.	
	Improper Cleaning of Theatres.....222	
	Unhealthy staff in the.....222 Operating Theatres.	

CHAPTER 11

11.0	DEALING WITH HOSPITAL ACQUIRED.....224 INFECTIONS
11.1	Manifestations of.....224

Nosocomial Infections.

11.2	The Process of Dealing with nosocomial Infections.	225
	The Patient	226
	The Disease	226
	The Health Care Givers	227
	The state of the affected ward	227
11.2	Pinpointing the Source of Infection.	228
	The Obstetric unit	228
	The Operation	229
	The Wound Care	229
	The Surgical Unit	230
	For Burns Cases Note also	230
	For Accident Cases Note Also	230
	The Paediatric Unit	231
	In Paediatric Cases	231
11.3	Monitoring and Evaluating Infection Rates.	232
	Monitoring	232
	Indicators for Monitoring Infection Prevention Programmes.	232
	Evaluation	235

References	238
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TABLES

Table 1	Location of most of the provincial and mine health facilities.	56
Table 2	Health Centers in Lusaka	66
Table 3	Ordering Ward stock	89
Table 4	Safety at work	102
Table 5	Viruses, parasites and fungi in Clinical Settings.	125
Table 6	Common Types of Bacteria and where found in clinical areas.	128
Table 7	Environmental Organisms.	157
Table 8	Ward Analysis	205

DIAGRAMS

Diagram 1	An African Surgeon using A 'Chikoloboyi.'	11
Diagram 2	Spirit Dancing Group	15
Diagram 3	<i>Staphylococcus Aureus</i>	130
Diagram 4	<i>Pseudomonas Areuginosa</i>	132
Diagram 5	Improvised thick cardboard Box for sharp disposal.	187

APPENDICES

Appendix 1	A Hospital Infection.....244 Prevention and Occupational Safety Policy
Appendix 2	Guidelines on Care of245 Anaesthetic equipment in Operating Theatres
Appendix 3	Guidelines for.....247 Surgical Wards
Glossary252
Index257

FOREWORD

This Manual on Infection Prevention is based on the principles and policies of Infection Prevention. It is the first Manual to be written on this subject in Zambia. It constitutes years of hard work and dedication to duty by the author.

This manual is very informative and will be beneficial to all those involved in patient care in Zambia and especially to those venturing into the Infection Prevention Field. Most developing countries will find this manual very useful also.

Unfortunately some of the principles and practices recommended in the manual have not been implemented due to financial constraints that the country currently faces.

International exposure of the contents of this manual might motivate our co-operating partners to support projects related to Infection Prevention at the University Teaching Hospital and the Health Care System in Zambia. This would help in implementing all the recommendations in the manual.

An Infection Prevention Programme is important due to its cost – effectiveness as has been illustrated in this manual. Hospital acquired infections cause clients to stay unnecessarily longer days in health care institutions.

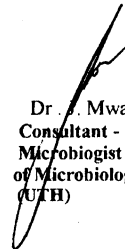
This leads to increased expenditures on the client, hospital and the country. Infection Prevention prevents this as well as raise the quality of client-care.

This manual has come at an opportuned time when the Government's health policy focuses on Quality Assurance and Infection Prevention programmes in the Health Care System.

It is our earnest hope that many health care providers and people, wishing to increase their health knowledge and therefore participate actively in their health care, will access this manual.



Dr Lambert
EXECUTIVE DIRECTOR
University Teaching Hospital
(UTH)



Dr. J. Mwansa
Consultant -
Microbiologist Dept
of Microbiology
(UTH)

PREFACE

PURPOSE OF THE MANUAL

The purpose of this manual is to produce a health learning material which will assist carers both in the community and health institutions to prevent and control hospital acquired infections.

This manual can also be used in training community based agents in Infection Prevention so as to take them on board as we all embark on achieving the vision of our Health Reforms which is to bring the health care as close to the family as possible.

Justification of Need

This manual will facilitate in bridging the practice-gap at all levels of the healthcare system. It is probably the first of its kind to be written in the sub-region. It is very informative and will benefit its readership and especially those involved in patient-care in Zambia and in all other developing countries. It brings out the benefits of an effective Infection Prevention Programme.

Prior to the establishment of the Hospital Infection Prevention programme in UTH in the December of 1983, there were no guidelines for practice. This manual now appends guidelines for the various hospital units and for the community based agents in the community.

Target Groups

The manual targets all health care providers venturing into the Infection Prevention Programme primarily as well as all the policy-makers. Community Health Nurses will find this manual very useful as well as the

general public who will be empowered with the knowledge they will acquire by reading this manual.

How to use this manual

The target groups can use this manual as a reference material, they can learn and teach nurses and the community based agents from it . They can also use this manual as a practical guide during their practice.

Organisation and language of the manual

The organisation and language of the manual is simple and clear so the lowest level of the health care professional in the health care institution will be able to understand it. The readership will benefit from this style because it makes the material content easy to follow and thus reader-friendly.

Precisely, this manual is basically concerned with bringing together the subject of hospital-acquired infections.

It takes you through the steps of the origin and the reasons for infections, the education and the awareness programme of these preventable infections. Further it deals with the causative agents, the outbreak of infections, their prevention and their subsequent control.

In detail, dear Reader, this manual has eleven chapters.

The first chapter deals with the origin of Infection Prevention and control, the role of the community and the community based agents, it also gives reasons why infections may be acquired in the hospital. It gives a most valuable insight of hospital situation to the general public and this forms a source of empowerment as the public acquires knowledge on how to protect themselves when in health care

institutions. It also gives a good insight of hospitals for non-governmental organizations and co-operating partners as to the best way to act as conduits of help in the health care system through their donations.

Chapter two deals with Infection Prevention among our Community Based Agents.

Chapter three is on our Health Care System, its status and on the author's analysis of the Health Reforms.

Chapters four and five define Infection Prevention and its management. They detail the staff educational strategies. These chapters aim at creating awareness of staff to the importance of Infection Prevention programmes and their proper management so they can relate to them and work towards their successes.

Chapter six deals with Micro-organisms in health care settings. All health care providers and laboratory workers will find this chapter most useful and helpful. A student once described it as 'Microbiology Made Easy' for Infection Prevention practitioners. This chapter also gives an up-to-date version on **severe acute respiratory syndrome (SARS)**. The entry points from the provinces into Zambia are highlighted here to facilitate monitoring of International Health.

Chapter seven is on Instrument Processing methods. It shows the recommended procedures for decontaminating, pre-cleaning and sterilizing patient care items in-order to maintain aseptic technique and basic hygiene practices in health care institutions. Students and new Infection Prevention practitioners will definitely embrace the section on "the role of the Infection Prevention Officer.

Chapters eight and nine deal with the Disease Process and the Universal Infection Prevention Measures.

The tenth chapter deals with methods of preventing hospital-acquired infections. It sets out mechanisms which help to ensure the prevention of cross infections in hospital environment between the patients and the healthcare providers. Lastly, it focuses on how factors responsible for causing wound infections in Operating Theatres could be prevented. Theatre nurses and researchers will find this section very useful.


Chapter eleven outlines the process of dealing with nosocomial infections in each hospital department focusing on the patient, the disease and the ward environment. This chapter ends by showing the Reader how to calculate infection rates. The manual has, also, an Index which points to the keywords in context.

Dear reader, I hope you enjoy reading and using this manual. It is my sincere hope that this manual will be of practical use in eliminating hospital acquired infections in all Health Care settings and even in the community. At the same time, I would be very grateful for any inadequacies noted from this manual to be brought to the attention of the author in-order to better improve future publications.

Thank you.


Dr. Ben Chirwa

Director General, CBoH


Dr. Velepi Mtonga
Director of Clinical Care & Diagnostic Services
Central Board of Health (CBoH)

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I thank my Almighty God for the publication of this Manual.

I also thank my late father, Rev. F. D. Osigwe, and my mother Mrs. Lucy Nwaneho Osigwe for their inspiration and all their sacrifices which continue to uplift me in all my life's encounters.

They saw me through my education in those hard times and their loving care and support to date, more especially for offering me a compassionate heritage, which has inspired me to be of service to the community.

To my husband Prof. M.W.Chanda who, out of sincere desire to please, has learnt to be a "medical doctor," a lecturer in Community Health, a nurse, and without whose contributions, love, support and encouragement this manual would never have been completed.

My acknowledgements go to our past and present Executive Directors of the UTH Board of Management, Dr. Lambert, Drs Limbambala and the late Dr. Katema, to the then Chairperson of the Hospital Infection Control Committee, Prof. N. Luo and currently Dr. J Mwansa who all encouraged and supported me in this work. My special gratitude goes to Dr. Velepi Mtonga, the Director of Clinical Care & Diagnostic Services and Dr. Joseph Nikisi, the Clinical Care Specialist both of Central Board of Health (CBoH) for their encouragement and support

which has seen the production of this manual. To Dr. Perera and Dr. J Mwansa for all the consultations, guidance and for editing this manual, and to all the laboratory staff for all their help and assistance in the laboratory especially Mr. John Mwaba, and Ms. Lukwesa both Biomedical Scientists in the Microbiology Laboratory of UTH, Lusaka.

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To our past and present Nursing Services Managers: Mrs. Olive Kopolo Munjanja, Mrs. Munkanta and Mrs. Mbewe our current Director of Nursing for all their support in making the Infection Prevention programme a success in our Hospital.

To the Health Learning Materials Manager, Mr. R Chitanda who noted and appreciated my writing skill after the organization of the Nutrition Exhibition in 1986. This led him to invite me, through Dr. Ben Chirwa, our current Director General in CBOH, to the first ever held workshop in Health Learning Material Production organized by The British Council.

To the consultants in Publication, Ms Erica Hall, Ms. Henri, Violet Namukwai and Mr. Winner Kayombe of UNESCO.

To the British Council through the Overseas Development Agency who sent me for the course in Infection Prevention and Control and to our Course Coordinator, Ms Margaret Worsely and all the Medical and Nursing Staff of the Manchester General Hospital who taught us so much and also created a conducive learning environment for us during our stay there.

My special gratitude goes to Professor Peter Sims of Overseas Development Agency for all the consultations, guidance and emotional support during his stay at the Department of Community Medicine of the School of Medicine

To Mr. Rick Hughes and his team in JHIEPIGO for their dedication and support to Infection Prevention in Zambia.

To the graphic artists at the Medical Illustration Unit of the Lusaka University Teaching Hospital. To Carol Namonda Namusa and Koji Soneka for their tireless efforts in making sure that the layout of this manual is perfectly done.

To our sons Mutale Chanda for being my cheering corner, Shula-Malindi for his painstaking devotion in the final computerization of this manual and to Mboloma Chanda who designed and drew the cover of the Manual as well as the non-medical illustrations in this manual. To Mwamba Chanda for all his emotional support while I worked on the manual. Last

but not the least, to Mrs Ann Malama for deciphering and typing the initial manuscript. To Ms. Florence Mwiya for computerising the manual a second time. To the late Ms. Miriam Nyimbili-Manda for finally computerizing the manual.

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To all the health care professionals from various hospitals in the country and the community, and also to the Infection Prevention Class of the Department Of Continued Education of the University Of Zambia all of who helped in the pre-testing of this manual, I say thank you all and God Bless.

DEDICATION

To my late father, Rev. F..D. Osigwe and my mother, Lucy Mwaneho Osigwe.

To my husband, Prof. Mutale Chanda

To our sons, Mutale, Shula-Malindi, Mboloma and Mwamba Chanda.

To all the nurses who have innocently died from hospital acquired infections especially during the HIV/AIDS pandemic and to the nurses still in practice who believe in their conviction to render care and offer service to humanity.

LIST OF ABBREVIATIONS

CBA	Community Based Agents
CHW	Community Health Worker
CSF	Cerebrospinal Fluid
CSSD	Central Sterile Supplies Dept.
DHMT	District Health Management Team
HAI	Hospital-Acquired Infection
HBCG	Home-Based Care Givers
HIPCC	Hospital Infection Prevention Control Committee
HIV	Human Immunodeficiency Virus
HLD	High Level Disinfection
ICU	Intensive Care Unit
IFC	Infection Control
IFPC	Infection Prevention and Control
ITN	Insecticide Treated Net
MRSA	<i>Methicillin-Resistan Staphylococcus Aureus</i>
STI	Sexually Transmitted Infections
TBA	Traditional Birth Attendant
THAPAZ	Traditional Healers And Practitioners Association of Zambia.
WBC	White Blood Cells

CHAPTER 1

1.0 HISTORICAL DEVELOPMENT AND CURRENT PERSPECTIVES OF HEALTH CARE PRACTITIONERS IN INFECTION PREVENTION

Introduction

Chapters one, two, three, four and five give the background of Infection Prevention and Control in Europe, Africa and Zambia.

They show the practical development of Infection Prevention in Zambia over the past years, the constraints that are faced by health care workers and the advantages of Infection Prevention in a hospital setting and the role of the Infection Prevention nurse.

Objectives

- To develop an insight into the history of Infection Prevention. in developing countries.
- To identify the reasons why infections occur in Health Care Settings.
- To develop an understanding of what Infection Prevention is.
- To identify the advantages and constraints of Infection Prevention Programmes.
- To list the role of the Infection Prevention personnel.

- To identify the factors that contribute to community being a source of infections.
- To monitor the practice of Community Based Agents (CBAs).

1.1 The beginnings of Infection Prevention

Florence Nightingale, the forerunner of the nursing profession, initiated the need for Infection Prevention in the Health Care Settings. During her work with wounded soldiers in the Crimean War, she noted that more soldiers died from preventable wound infections than from bullets.

In the 1850's women acquired infections during delivery. It was estimated that one woman in three died in post-natal wards. In Vienna, Dr Semelweis fought against hospital-acquired infections in the obstetric units. He introduced basic hygiene practices and that reduced the rate of infections in Obstetric Units. Later, Dr William Henry, Pasteur and Kock concerned themselves with sterilisation of hospital care equipment.

INFECTION OUT-BREAKS LEAD TO ESTABLISHMENT OF INFECTION PREVENTION PROGRAMMES. THIS HAPPENED IN THE U.K AND ZAMBIA

In 1939 - 45, the Medical Research Council suggested the appointment of a multi-disciplinary committee to prevent and control hospital-acquired infections.

In 1959, the outbreak of infection in Torbay Hospital in Devon - U.K. led to the appointment of a standing medical committee. The findings of the committee led to the

appointment of the first Infection Control Nurse in the United Kingdom.

Similarly, the Hospital Infection Prevention and Control Committee (HICC), in University Teaching Hospital (UTH), Zambia, was formed following an infection outbreak due to *Pseudomonas Aeruginosa* in the Neonatal Unit in 1983. In 1987, the hospital appointed its first Infection Prevention Nurse to work with the Hospital Infection Prevention and Control Committee.

By 1993, Infection Prevention liaison nurses had been trained for each hospital department, and educational programmes for all staff in the service and support-service areas of the hospital, based on departmental needs, were instituted. Due to the attrition levels, another course was conducted in 2001 at UTH. This included the community-based agents (CBAs) who needed to be taken on board in order to realise the vision of the Health Reforms.

Also, it has been noted that Infection Prevention is deep-rooted in Africa's health-system where it starts among the communities.

1.1.1 COMMUNITIES

The cradles of civilisation brought the concept of people living together. This togetherness ended up in the formation of communities. Communities comprise of groups of people. A community involves the actual population, which occupies a given geographical area.

The members of a community are bound to each other by a

shared system of norms, health needs and problems. These norms control their relationships with each other. Communities can exist within larger communities, which come into being to satisfy the varying needs of the individual members of the society. This desire to help leads to social consciousness.

Social consciousness, self-conviction and willingness are factors, which motivate individuals to sacrifice their personal talents, inclinations, and self interests for the good of the whole community. They ensure that they make necessary inputs and activities, which will fulfil the needs of the community where they live. This is usually done without supervision

This consciousness, in the society, has seen the springing up of the Community-Based Agents (CBAs) who have different roles to play in their different localities. In the African Society, these Community Based Agents formed and still continue to form roots on which the community members rely on during periods of sickness.

The CBAs together with their community health resources form the basis of the Primary Health Care. These CBAs are the Home Based Care Givers, Community Health Care Workers, Traditional Birth Attendants and Traditional Healers. These need to be trained by health care workers in order to upgrade and maintain quality health care as well as integrating them into the formal health care system. This will strengthen their roles in the society. Each community

has its own culture which protected the health of its communities. Also it has been noted that Infection Prevention and Control is deep-rooted in Africa's health-system which maintains the health of the community members.

1.1.2 Health system and its composition

Health System is a set of cultural beliefs about health and illness that forms the basis for health-seeking and health promoting behaviour. It embraces the institutional arrangements within which that behaviour occurs and includes socio-economic and political contexts for those beliefs and institutions.

Among all the community-based agents the Traditional Healers seem to have made the most impact in the country hence the recognition of their roles by the Ministry of Health.

Traditional Healers

Definition of Traditional Medicine

This is the sum total of all knowledge and practices used in diagnosis, prevention and elimination of physical, mental and social imbalance, totally based on practical experience and observations handed down from generation to generation either verbally or written. This is an integral part of nature and culture of Traditional Healers.(MOH, 1980).

The role of the Traditional Healer in Primary Health Care (PHC)

The Ministry of Health created Traditional Medicine unit in 1980. This was in recognition of the important role traditional healers had and continue to have in providing health services to the members of the community. The traditional unit was created to:

- Help traditional healers form their own association.
- Organise workshops and seminars for traditional healers
- Keep record of all traditional healers in the country
- Collect traditional medicines for research by relevant organisations.
- Organise traditional healing by encouraging healers associations to:
 - draw up plans for the development of traditional practice.
 - promote collaboration between the traditional and scientific medicine
 - promote a referral system acceptable by both practitioners.
 - to form Associations to study their art with view of amending or introducing new art that strengthen healing practices.

Traditional healers include:

- herbalists - a person skilled in herbs.

- spiritualists.
- fetish priests - using magic - worshipping objects for magic powers.
- priestesses and cult healers.

Identified Roles of Traditional Healers are:

- To contribute to health care delivery especially in the remote and rural communities.
- To help in the prevention and control of HIV/AIDS by giving health education to the people after they have been trained on the:
 - transmission of the virus
 - use of condoms
 - sterilisation of instruments
 - prevention of HIV/AIDS.
- To submit herbs and minerals used as medicine for research.
- To refer cases beyond their capability to health institutions.
- To distribute condoms to their sexually active clients. Health centres and district health staff supply these condoms to them. Traditional healers are capable of curing several ailments like mental illness and epilepsy.(Njilinjili).

Community Health Workers

These are persons selected by the community to undergo basic training in management of minor ailments in the

community. This training gives them knowledge and skill required in the treatment of these ailments.

The role of community health workers are:

- To carry out Primary Health Care activities
- To give first aid treatment.
- To diagnose and treat minor ailments and to refer serious cases to the health centre.
- To safely maintain and dispense some basic medicines like panadol, ferrous sulphate (feso_4) folic acid, Oral Rehydration Solution (ORS) and Malaria drugs.
- To organise and orient the community to participate in community health projects.
- To collect and maintain simple community data.
- To detect “at risk” groups e.g. malnourished children.
- To give guidance on food production and good nutrition.
- To promote basic sanitation through health education on good health practices, cleaning of environment, refuse-disposal, construction of pit-latrines and to mobilise the community.

Traditional Birth Attendants (TBAs)

A traditional birth attendant is a person who assists women during pregnancy, labour and post-natal period.

The role of TBAs

- They provide care to childbearing women during pregnancy, labour, post-natal and family planning.
- They give health education on good health practices.
- They participate in the distribution of ORS and condoms.

1.2 INFECTION PREVENTION IN THE ROOTS OF AFRICA

In Africa, the communities protected the health and wellbeing of its members through the practice of Infection Prevention, which goes back to our roots.

The Home Based Care Givers (HBCGs), Community Health Workers (CHW), Traditional Birth Attendants (TBA) formed the health-care team and all of them provided care in the traditional setting. The care provided was within the context of the beliefs and health-seeking behaviour of community members. Infection Prevention is deep-rooted in Africa.

Infection Control in the Roots of Africa

Traditionally trained surgeons circumcised baby boys aseptically by flaming their equipment over ‘Chikoloboyi’ (open flame lanterns) between circumcisions. The mother was advised to keep the wound dry and the baby off the

ground till the wound healed. This advice prevented infections of the wounds.

In some parts of Africa, bigger boys are taken and kept in seclusion where they are circumcised, the wounds are washed at least three times a day with salted cold water till the wounds heal. In some tribes it is the custom to make the boys to have sex with older women before the wound heals. This proves their pain - threshold as well as prepare them for their roles as future husbands who need to be resilient in facing life's tough challenges.

Diagram 1

An African surgeon flaming his equipment over a 'chikoloboyi'.



Drawing by Mboloma Chanda

Our ancestors also practised health care through rituals like “kill a white cock, rub the blood on your great-grand –

father's grave, offer the cock to the spirits of your ancestors and that will make you well again" and faith in traditional healer's healing powers of our ancestors must have been cardinal in health care because people did get well again in those days.

Also at most celebrations the elderly people, usually, would offer drinks to the spirits of the dead ancestors for appeasement and protection against dangers and devilish attacks.

Africa has cures for most ailments, for example, if a spitting cobra spits into one's eye, the traditional treatment is to irrigate the eye with either urine or breast milk.

Breast milk is also used in treating 'red eyes.' Ichimamba, is a root which is used to cure diarrheal cases. This may explain why cholera cases are rare in most villages.

Cultural heritage played a significant role in traditional Infection Prevention practices. Marriages were a village concern as:

- Parents would look for a wife or a husband from a chronic-disease-free family for their daughters or sons
- When a girl matures i.e becomes of age, she is confined in a room where she gets taught personal hygiene practices. This knowledge and skill helps her to look after herself and her family when she starts a family of her own. Traditionally this is known as 'Chisungu.'

- Traditionally, Africa has always upheld faithfulness in the family. Usually after wedlock when the girl becomes pregnant, the married couple were taught to care for the 'fruit of the womb' (pregnancy) and the mother. Both were taught to stick to each other in-order to prevent 'the poison from the woman!!!' (Sexually-transmitted infections) in the family. In the Iboland of Nigeria it is called "nshi nwanyi."

'Omugwo' is the expression used in the Ibo land of Nigeria for confining mother and baby for a month after delivery. 'Ononanso' excludes the menstruating women and people suffering from infectious diseases, like leprosy, from the society.

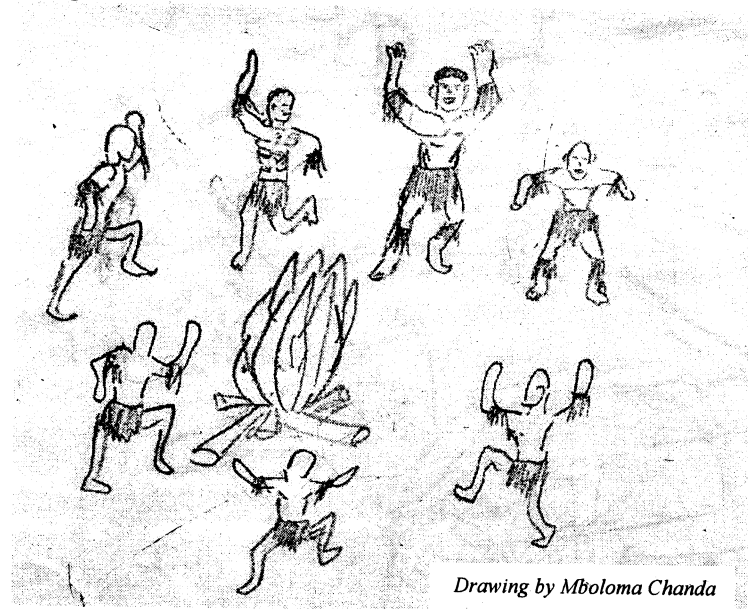
- Another custom – punishes an unfaithful husband severely if his wife dies before delivery. He is made to perform a traditional Caesarean Section on the dead wife using appropriate technology. The man was made to remove the body of the unborn baby with a blunt pole from a roof in the house before burial. This custom is called '**nchila**'
- Another ritual called "**nchetu**" is performed on an unfaithful wife after she dies. There is a belief that an unfaithful wife will die after delivery if she sees the baby and the blood. She was buried at the crossroads to teach other would-be offenders of the

punishment that awaits an unfaithful wife after death.

- Some tribes believe in severely punishing a man who allows his girl friend to visit his sick wife. This visit is seen as a bad omen, which, culturally, it is believed, usually leads to the death of the wife. In some tribes this is known as 'ichilolela.'

The traditional practices of confining mother and baby for a month after delivery, the seclusion of menstruating women and people suffering from infectious diseases are all methods of Infection Prevention for mother, baby, household members and the society at large. Some 'spirit dances' are protection against diseases or infections in the community. Thus, the African society has addressed Infection Prevention from time immemorial, however crude and ignorant some of the methods may have seemed.

Diagram 2



Spirit Dancing Group

It is with this background that many developing countries, Zambia inclusive, are now seeking for a truly equitable, cost-effective quality health care as close to the individual and family as possible.

Therefore, the issue of Infection Prevention in Zambia is as technical, medical, social, and economic as it is cultural. It is important that we know our roots – where we have come from, our cultures, traditions and their influences on health care delivery system in the country.

1.2.1 A SURVEY AMONG COMMUNITY-BASED AGENTS

Chanda, (2001), showed that most TBAs have stopped practicing because of enforced voluntarism.

The health care system, expects them to contribute to the approaches of Primary Health Care through community participation. This forces them to work on voluntary basis thereby defeating the purposes of poverty alleviation among the most vulnerable in our communities. In addition, most of them are widows with strings of orphans behind them. Voluntarism should not be enforced. The Neighborhood Health Committee should advocate for them to be remunerated by the community whom they serve.

Then came the HIV/AIDS pandemic.

The advent of the HIV/AIDS infection and disease has highlighted the important roles of the Community based agents, who work on voluntary basis in order to mitigate the impact of HIV/AIDS among the infected and the affected in our communities. Unfortunately, their practices promote the transmission of HIV/AIDS in their settings because most of them have not been taught the principles of prevention of HIV/AIDS in their working environments; also they do not have protective clothing while rendering care. Due to lack of motivation the CBAs stop work in order to look after their families. This abdication of their traditional roles has led to increase in maternal and Infant mortality rates.

Survey findings on Traditional Birth Attendants

- The survey also stated that in the wake of work stoppage by the trained TBAs, the untrained TBAs have taken their places with disastrous effects on the health of our mothers and children. For example, untrained TBAs push their foot in between the perineum while conducting labour to aid delivery.
- Women are sat on empty charcoal bags and dirty chitenges during delivery, since it is believed that the products of conception are unclean.
- The TBAs conduct deliveries with bare hands.
- They do not know how to put on gloves for delivery, and conduct deliveries without washing hands since soap is not always available in the homes of the clients. So they depend on God for protection from acquiring HIV/AIDS
- Most of the TBAs go unprepared to clients' homes since they work in crisis situations. As a result, they do not identify any 'at risk' groups among their clients.
- They also do not have any clue about the identification and subsequent care of women who develop obstetric emergencies during labour.
- The health care providers do not monitor the practices of the TBAs. The TBAs neither notify their deliveries nor refer their clients to the health center for postnatal care as a result there is high maternal and infant mortality rate. The postnatal examinations should be done at six (6) days and six (6) weeks post delivery.

Survey findings on Community Health Care Workers (CHW)

This group has very strong linkages between the health centers and the communities. The untrained community health care workers have very little or no knowledge on Infection Prevention measures.

Survey Findings on Home Based Care Givers (HBCGs)

Care International and the Catholic Church train home-based caregivers. Home Based Care givers came into being as response to mitigate the impact of HIV/AIDS on both the affected and the infected. The untrained ones also need to be taught Infection Prevention practices in their homes.

Survey Findings on Traditional Healers

• Attitude of Traditional Healers

Before this study, people thought that traditional healers operated in a cloud of top secrecy. We, now, know differently. They are very open and are willing to work together with health care workers.

- The practices of untrained traditional healers put their clients at risk of acquiring HIV/AIDS as well as their inadequate knowledge on HIV/AIDS Infection prevention measures at their environments of care.
- Environment of care. The survey found out the following:

Majority of traditional healers had very dirty environment of care. 40 (66%) out

of 60 were operating from dirty environments.

- 24 (40%) out of 60 had examination cubicles made out of dirty mealie-meal sacks with no windows.
- 15 (25%) out of 60 had totally unacceptable practice cubicles.

A dirty environment associated with traditional healers is bound to create fear that runs down one's spine within the environment. No wonder, the climate of mistrust that exists between them and their clients who insist on disposing of the razors used for scarifications themselves!! A traditional healer with a dirty, scary environment might do them additional harm through witchcraft!!.

Emphasis of the survey

There is paucity of knowledge in Infection Prevention measures, which can be classified into two factors – Community and Service factors as documented.

Community and service factors noted require:

- Identification and training of TBAs
- Replenishing of all the kits of the TBAs by the District Health Management Teams (DHMT).
- The Community Based Agents to be inextricably intertwined with the Neighbourhood Health Committee members. They can remind the Neighbourhood Health Committee on the importance of meeting the health needs of the communities

The study recommends the strengthening of the co-ordination and collaboration that exist between the health institutions, the community-based-agents and their clients especially those living with HIV/AIDS in the communities.

This can be achieved through the setting up of a monitoring and evaluation system by the DHMT through their health centers and in collaboration with the Neighborhood Health Committees, Traditional Healers and Practitioners Association Of Zambia (THAPAZ) and Grass-root Associations.

- THAPAZ needs to strengthen its Association through the provision of a code of conduct for all its practitioners. This will allow only practitioners with a minimum set of standards into its membership.
- Certificates of Registration to be issued to only Traditional Healers who meet these standards.
- Only those with these certificates should be allowed to practice.
- All Community Based Agents (CBA) who have undergone this training in HIV/AIDS Infection Prevention should be motivated to continue to health educate their clients on HIV/AIDS prevention activities. This motivation will come through continued monitoring of their practice, remuneration, training and

by the provision of protective wear for their use.

- Implementation of Universal Infection Prevention measures will be further enhanced by the formation of Grass-root Associations which would effectively, train, monitor, evaluate, remunerate and provide all items required by the Community Based Agents in the community. The Grass-root Associations will also undertake the training of the CBA in all District Health Management Teams in the country.
- Formation of Infection Prevention Association of Zambia inclusive of CBAs.
- For harmony in our communities, the job description, allocation and division of labour should be clearly defined between the community-health-care workers and the Neighbourhood Health Committees as a means of conflict resolution between them.
- The Ministry of Health may take the lead in the dissemination of existing policies in Infection Prevention, especially, in the rural areas where their existence is not known, hence their application has not been widely effected in the rural areas

CHAPTER 2

It should be noted that all the Community-Based Agents work within the framework of their health systems. The health care providers are aware of the potential of communities to act as sources of infection.

2.0 COMMUNITY AS A SOURCE OF INFECTION

Status of Environmental sanitation in the community

The health care provider should know how the environment of the community can be a source of infections to its inhabitants. He or she needs to know about the germs that inhabit our environment in the communities.

2.1 Micro-organisms in the Community

Micro-organisms can be present anywhere in the community but in Infection Prevention the micro-organisms of concern are those that cause diseases which may reach epidemic proportions e.g. refuse heaps will harbour organisms like *shigella shiga*, *sonnei*, *boydii flexneri* which cause dysentery.

Vibrio cholerae which can be found in pit-latrines and *Neisseria meningitidis* which can be found in nostrils and throats of carriers and malaria parasites which are found in stagnant water in pot-holes on our roads and in our maize gardens.

Environmental Sanitation

Defaecating and urinating haphazardly along wall fences not only pollute the air but also causes diseases due to breeding of flies.

Refuse Heaps

Refuse heaps combined with defaecation and urination form breeding sites for vectors like:

Flies These can infect foods with *Vibrio cholerae* and this can lead to cholera epidemic and increased number of 'Carriers' of the germ in the community. Other diseases that can be caused include dysentery and typhoid. All these are communicable diseases.

Green flies

These can lay eggs under the skin giving rise to itchiness and inflammation. The eggs hatch into worms which are expressed from the skin causing a lot of distress to the affected since they leave very unsightly scars.

Mosquitoes

Potholes, empty tins and containers, over grown grass and maize gardens in the neighbourhood also form breeding and resting sites for mosquitoes which cause malaria.

Rats

Rats in the environment may cause bubonic plague in the community.

2.2 Housing

Some houses do not have toilet facilities forcing people to improvise with 'Shake Shake, Inzovu, Chat, Timwengi and Nkwazi locally-brewed beer containers. These are usually thrown around the community and these can cause diarrhoeal diseases due to flies.

In the compounds, the houses are built very close together with little or no windows. So many people share these rooms. They sleep together in these poorly ventilated rooms. People infected with Tuberculosis germs can infect their friends since the T.B germs are spread through the air.

Sources of water supply

Sources of water supply, especially, if these are shallow wells, may be contaminated with faecal matter. This will occur when pit latrines are built on higher grounds. So when it rains faecal matter drain downwards into the shallow wells.

These shallow wells are used for washing plates that people eat from.

2.3 Epidemiology of disease outbreaks in the community

Vaughan and Morrow, editing a WHO publication (1989), defines *'epidemiology as a study of the distribution, frequency and determinants of health problems and disease in human populations. The purpose of epidemiology is to obtain, interpret and use the health information to promote*

health and reduce disease.

Therefore, when these diseases occur, the health care provider has to find out their sources in the community. In order to do this, she or he needs to keep good records on the community.

The community morbidity profile focuses on communicable diseases.

Provision of epidemiologic features of these communicable diseases will give an insight to sources of infections from different communities. This data is especially important on referred patients or clients.

The patients or Clients.

Demographic data

The demographic data of people suffering from communicable diseases should be recorded under :Age, sex, location, village, business, frequent disease suffered by the client, date of last admission, re-admission(s), the dates, and the current disease and the date of admission.

- Health Care Providers are required to keep an accurate record of the most commonly occurring infections. and the demographic data of all those affected.

Seasonality

The health care worker needs to note the seasons when these diseases occur so adequate preparations can be made to prevent them from occurring, for example, cholera

occurs during rainy seasons. Adequate preparations can be made by the community to avoid cholera epidemics by forming Epidemic Preparedness Committees, which will work together with the communities to improve environmental sanitation through social mobilisation.

Nationality -Origins of disease or infection outbreaks.

- Nationality will give us an insight as to the origin of the disease. This is important as a result of certain trades, like fishing, which encourages cross border mingling of peoples and influx of refugees into Zambia may lead to diarrhoeal diseases
- **Communities health-seeking behaviour**
The Community's cultural health and illness beliefs Influence their attitude during illnesses. This can be noted according to the way they utilise healthcare facilities or Traditional Healers:
- Cultural beliefs also influence their personal hygiene practices and their food habits.

The Infection Prevention Officer then needs to formulate a hypothesis from her or his findings and then should endeavour to conduct a Research for evidence – based findings, which can be injected into practice to prevent further disease outbreaks.

The health-care professional needs to recognise the

contribution of the CBAs to the Primary Health Care system in the communities. Hence the PHC was adopted as the vehicle for realising the vision of Health Reforms. An efficient and an effective health-care system has to start with and from the communities.

The above knowledge will help the health care providers in planning a Trainer of Trainers Course in Infection Prevention among Community Based Agents. During this training they will focus on the 'Practical Aspects of Infection Prevention in the Community.'

2.4 PRACTICAL ASPECTS OF INFECTION PREVENTION IN THE COMMUNITY FOR COMMUNITY BASED AGENTS

Introduction

Having learnt how the community can be a source of infection, the health care provider may now aim at developing rapport with the CBAs by improving their key areas of function. They should be given targeted information, education and communication so they can improve their key areas based on information given.

- **Personal hygiene:** A clean appearance will earn you the respect of your clients in the community. Bath daily and wear clean clothes. Wash clothes and dry them on the line. Do not dry clothes on the ground.
- Brush teeth daily with acceptable and locally available chewing sticks e.g. umuswaki. Ash can be used to clean the teeth properly daily and after each meal. Clean river sand can also be used to clean the teeth. This is to avoid tooth decay. Tooth decay is common nowadays due to high sugar content in our foods.
- Hair must be kept tidy at all times.
- Wash hands after using the pit latrine or toilet.

Some germs found in stool or faeces and urine can settle on hands after using the toilet. Some of these germs are the same as are found in our communities as already stated. Some other germs are:

- *Pseudomonas aeruginosa*, can be found in wet areas, like in stored liquids used for medicines by traditional healers. They are difficult to treat.
- *Staphylococcus aureus* can settle on hands of carers and infect patients or clients.

Nutrition

Eat balanced diet regularly to maintain high immune levels. This helps the body to fight disease germs.

Storage of water

Drinking water can be infected with germs that cause cholera, dysentery and typhoid.

The best source of water is from taps, fast-flowing rivers or protected wells. Treat all drinking water with chlorine according to directions of the manufacturers.

Store water in containers with narrow tops and cover with well-fitting lids.

Do not store water for longer than 14 days.

Boil, cool and store all drinking water.

Use of ash in our environment

Use ash for washing hands in the absence of soap.

Use ash for washing plates, forks, spoons, and knives.

Mix ash with sand to scrub the outside of pots and pans.

Environmental sanitation

- **Refuse Bin**
Each household should have a refuse bin covered from flies.
- **Refuse Pit**
Community, under the supervision of the Neighbourhood Health Committee Chairperson and Community Health Workers, should dig a deep refuse pit for refuse disposal for the community.
Refuse pits for community refuse disposal should be burnt daily or weekly depending on the communities' decision. This will prevent vectors from carrying germs from these pits onto food items.

Pit Latrines

- Pit latrines should be built far away from our sources of drinking water.
Use pit kins or fat-kins in pit latrines to liquefy contents of the pit latrines and kill germs.

Pit latrines should not be built on higher grounds in relation to our sources of drinking water in order to avoid contamination of water through drainage and underground water seepage.

All community-based agents are required to burn all waste refuse before throwing into pit latrines to avoid dogs and other scavengers from reaching them.

Care of the Environment of Care

Daily sweep and mop the floor with soap and water. Open the windows for thorough flow of air.

Arrange your items of care orderly e.g., herbs and roots to be stored in plastic containers which can be easily maintained and obtained from the health centres.

All items to be covered with clean cloth from dust. Dirty sacs should not be used to construct makeshift cubicles for caring for your clients. Keep water in narrow containers and basin for washing hands in a corner of your environment of care.

Keep a refuse bin for waste disposal in a corner of your care environment.

Care of the Patient or Client

Wash hands before attending to any client with soap or ash and water. Wear gloves while tattooing or rubbing medicine into tattoos.

Instrument processing

Razors to be used only once on each patient.

Dispose of used razor into the pit latrine.
Each patient to bring his or her own razors.
Boil all reusable items, store dry. Boil before re-use.

Blood Sucker - diagnostic equipment

Use each bloodsucker once for each patient.
Use each needle or sharp object once on each patient and throw down pit latrine.

Universal Infection Prevention measures in our communities. The CBAs should be taught to:

- Regard everyone as potentially infectious
- Wash hands before and after attending to any patient and after removing gloves
 - cover any cuts or skin abrasions with plastic dressing and wear gloves before attending to any patient; or while carrying out any wet procedures like:
 - bathing a patient.
 - changing the wet or soiled bed linen.
 - let someone with no cuts do the washing of linen or dishes.

Care of secretions & excretion

Blood

- Do not suck with your mouth
- Suck with the cut ball
- pour sucked blood in a bowl
- Cover with ash or jik if available.

- Pour down the pit latrine.

Faeces-

Disposal of faeces from the floor:

- Cover with ash or sand.
- Collect into torn cardboard paper and throw down into pit latrine.

Urine-

Mopping of urine from the floor

- Flood 0.5% Hypochlorite (jik) over it and leave for 10 minutes.
- Mop with a mop.
- Boil mop afterwards for 20 minutes timing from boiling point to render it safe to handle.
- Allow to cool. Wash and store dry.

Vomiting-

Disposal of vomitus from the floor

- Flood it with 0.5% Hypo chlorite (jik) or ash.
- Throw down pit latrine after 10 minutes.

Sputum-

Advise patients to spit into containers with lids.

- Cover with ash or flood with 0.5% Hypochlorite (jik).
- Pour down pit latrines.
- If a metal container, then boil it, cool it

before use.

Care of beddings

Linen and Blankets-

- Boil soiled linen to render it safe for handling.
- Boiling will kill most germs.
- Allow to cool.
- Wash with soap and water.
- Hang to dry on cloth-lines.
- Fold nicely.

Ideally, bed linen should be changed daily if soiled, change whenever necessary.

Gloves

Wear gloves whenever touching any body fluid, excretions and secretions, for example,

- Blood.
- Urine.
- Sputum.
- Faeces.
- secretions from the nose.
- Pus.
- Wounds.
- Sores.

Ask each patient to bring own pair of gloves. After use, throw down pit latrine. Do not give children to use as

balloons

Wash hands after removing gloves.

Care of Plates: Forks, Knives, Spoons: For people with lemon trees at home, wash these items with lemons, cut in halves.

Lemons are much cheaper than soap for washing plates.

Lemon juice can be used to wash plates.

Rinse and dry in the sun on racks constructed through appropriate technology.

Store dry and cover from dust with a clean cloth.

Guidelines to guide their practice should be written in the local language they are comfortable with for each community-based agent. The training should be followed by supervisory visits, monitoring and evaluation. Objectives of their training and future visits should be developed.

2.5 OBJECTIVES FOR VISITING TRADITIONAL HEALERS IN THE COMMUNITY

While visiting the traditional healer, the health care provider should develop objectives to guide the monitoring and supervisory visits.

Main objective

To identify aspects of the traditional healer and her/his environment which would need improvement.

Specific objective

- To monitor their practice.
- To teach them how to refer their clients to the next level of care.
- To teach them practical aspects of Infection Prevention that relates to their practice under these activities:

Personal hygiene

- Washing and wearing of clean clothes, combed hair, and wearing short finger and toe nails.

Care of patients

To observe how the patients are managed. There is the need to note the following:

- Management of clients.
- How are patients admitted? Hand-washing practices.
- Practices in use when giving treatment to patients eg. Management during tattoos.
- Follow up of patients.
- Excision of warts.
- Excision of polyps.
- Referral of patients.
- Types of patients referred
- Disposal of wastes of blood, urine and vomitus.

Processing of instruments in use

- To identify instruments in use and how they are

processed, under these activities.

- Decontamination of instruments to render them safe for handling by boiling for 20 minutes timing from boiling point. Leave to cool.
- Wash same instruments.
- Use of wrist watches for timing.
- Store boiled, cooled and dried instruments.
- Boil again before using on the next patient
- Are all these done?

Environmental sanitation

To give advice on the care of the environment, the CBAs need to be taught on:

- Cleanliness of environment of care.
- Ventilation and lighting.
- Methods of refuse and waste disposal.
- Methods of storage of herbs.
- Use of containers.
- Easy to clean containers.
- Source of drinking water .
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation and lighting.

Maintenance of basic hygiene practices

- Care and cleaning of environment of care.
- The importance of having dust bins with lids.
- Cleaning of floors.

- Hand-washing practices.

Health education to patients who are seen by traditional healers should be on these topics.

- Hand washing practices.
- Food hygiene.
- Personal hygiene.
- Environmental hygiene.
- Care of drinking water.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.

Self protection

To teach the THs how to protect themselves while rendering care.

- How to put on and use the gloves properly.
- Proper hand-washing practices with water and soap or ash in absence of soap.
- Abstaining from alcohol consumption while caring for patients.

2.6 OBJECTIVES FOR VISITING COMMUNITY HEALTH CARE WORKERS

General Objective

These visits aim at raising the health status of the community.

Specific Objective

To conduct supervisory visits.

To identify their different roles in the community and health care settings.

To provide guidelines for their practices in the community and the health centres.

To monitor their practices.

To teach them personal and environmental hygiene under these headings:

Personal hygiene regarding wearing:

- Clean clothes.
- Tidy hair.
- Short finger nails and short toe nails.

Environmental sanitation

To teach them on proper environmental sanitation through showing them the importance of maintaining:

- Cleanliness of environment of care.
- Proper Ventilation and lighting of their workplaces.

- Methods of refuse and waste disposal.
- Methods of storage of herbs.
- Use of easy to clean containers.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.

Maintenance of basic hygiene practices to focus on:

- Maintenance of hygiene around the environment of care.
- Dust bins with lids.
- Cleaning of floors.
- Hand-washing practices.

Health education to patients who are seen by community health workers should emphasise on:

- Handwashing practices.
- Food hygiene.
- Personal hygiene.
- Environmental hygiene.
- Care of drinking water.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.

Should conduct frequent visits with chairpersons of Neighbourhood Health Committees and also to

increase the frequency of contact with the health centre in charge who should orient him or her on:

- Care of drugs that she or he is allowed to dispense.

Self protection health talks to emphasise on the:

- Use of gloves.
- Hand-washing practices with water and soap or ash in absence of soap.
- Abstaining from alcohol consumption while caring for patients.

2.7 OBJECTIVES FOR VISITING TRADITIONAL BIRTH ATTENDANTS IN THE COMMUNITY

General Objective

The aim here is to improve reproductive health.

Specific Objectives

To teach them hygiene practices.

To reduce maternal and infant mortality rates.

To monitor the practices of Traditional Birth Attendants.

To correct their faulty practices.

To direct them on better health practices on following topics:

On Personal hygiene, the TBAs:

- Must be clean before attending to clients.

- Must wear clean clothes and chitenje.
- Should wear short finger and toe nails.

On Self protection, the supervisor should check on:

- The use of gloves during delivery.
- Hand-washing practices.
- Use of plastic aprons during delivery.
- Use of eye wear during delivery.

Check on state of TBA's kit contents of the TBA kit

- Soap with soap holder.
- 2 hand towels.
- 1 mackintosh.
- 1 plastic apron.
- 6 pairs of gloves.
- 1 roll cotton wool.
- 1 cord tie and 1 cord clamp (sterile).
- 1 packet of razor blades.
- 1 Salter scale with a bag.
- 2 candles with match box.
- 1 plastic receiver.
- 1 bowl.
- 1 Exercise book.

Management of clients

Antenatal period

- Clients should have clean boiled cooled water in

readiness at all times.

- Cleanliness of clients' home environment both inside and outside.
- Soap for hand washing .

On Environmental sanitation focus on the:

- Cleanliness of environment of care.
- Ventilation and lighting.
- Methods of refuse and waste disposal.
- Use of containers.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.
- Presence of deep refuse pits.

Health Education to Clients should be on the:

- Importance of proper balanced diet in pregnancy.
- Food hygiene.
- Importance of rest during the day.
- Personal hygiene.
- Environmental sanitation.
- Care of drinking water.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.
- Hand-washing practices.

TBAs to encourage their clients to attend antenatal clinics early in pregnancy for examinations including:

- Urine tests.
- Blood tests.
- BP checks.

Supervisors to orient them on Cases for Referral:

- First pregnancies.
- Women with fifth or more pregnancies.
- Women with swollen feet.
- Women feeling dizzy and having heart palpitations.
- Women who are pale.
- Women who have had more than two abortions.
- Women who have history of difficulty in delivering.
- Women whose babies have died at childbirth.
- Women who have history of sexually transmitted infections (STIs).
- Women with history of long illnesses like Blood pressure, sugar disease and tuberculosis.
- Women with history of frequent malaria attacks.
- Women whose infant/infants have died.

The TBA is to advise her clients to have the following at home always ready in case of emergency situations.

- A new razor blade, and cord ties.

- At least 2 pairs of gloves.
- Soap for hand-washing.

Check on whether TBAs keep a record of their deliveries While the TBA is conducting Deliveries, the supervisor should:

Check on hand washing practices during any procedure and on:

- Method of conducting delivery.
- Gloving during delivery.
- Availability of umbilical Cord-ties made from salvage edge of clean, washed and ironed chitenjes.
- Care of the umbilical cord- emphasising that nothing should be applied to the umbilical cord of the new born baby.
- Clean the umbilical cord with nappy – washed and ironed and kept for this purpose.
- Add a bit of salt in boiled cooled water and use for cleaning the umbilical cord.
- Record keeping of all her deliveries.

The supervisor is to remind them on Cases for immediate referral for example:

- Shoulder presentation.
- Hand presentation.
- Bottom presentation.
- Cord prolapse.
- Fitting mother.
- Mother bleeding more than usual.

On Postnatal care, the supervisor should:

- Check on whether the TBA accomplishes the following: Takes or accompanies her clients for post-natal check-ups.
- Gives health education to mother on care of the cord and the breasts.
- Helps and encourages mother to start breastfeeding as soon as possible. Care of the breasts.
- Knows how to care for the perineum.
- Advices mother on better nutrition.
- Maintains contact with health centre.
- Helps mother in bonding with the baby.
- Advises mother on the Immunisation schedule for baby and on the Notification of birth of the baby.
- Advises mother on Family planning together with clients' husbands. Maintains records of their clients and their activities

On Processing of instruments, the teacher should:

- Check on processing of instruments in use.
- Identify instruments in use. Decontaminate by boiling instruments for 20 minutes to render them safe for handling. Leave to cool.
- Wash the same instruments.
- Use of wrist watches for timing.
- Storage of boiled, cooled and dried instruments.

On Environmental sanitation, emphasise on:

- Cleanliness of environment of care.

- Ventilation and lighting.
- Methods of refuse and waste disposal.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.
- Disposal of products of conception.
- Methods of disposal of products of conception.

On Self-protection, the supervisor, should:

- Check on knowledge and skill for putting on the gloves.
- Use of gloves during delivery.
- Hand-washing practices with water and soap.
- Abstaining from alcohol consumption while caring for clients.
- Use of plastic aprons during delivery.
- Use of eye wear during delivery.

2.8 Objectives For Visiting Home Based Care Givers And Their Patients In The Community

General Objective

To improve care rendered to both the infected and the affected by the HIV/AIDS pandemic as well as protecting those rendering the care.

Specific Objective

To identify jobs done by the carers in patients' homes.

To monitor their practice.

To health educate them on preventive and protective measures on these topics:

On Personal hygiene, the supervisor is to emphasise on:

- Clean clothes.
- Tidy hair.
- Short finger nails and short toe nails.

On Self-protection, emphasise on the:

- Use of gloves.
- Hand-washing practices with water and soap or ash in absence of soap.
- Abstaining from alcohol consumption while caring for patients.

On Environmental sanitation emphasise on the:

- Cleanliness of environment of care.
- Ventilation and lighting.

- Methods of refuse and waste disposal.
- Methods of storage of prescribed drugs.
- Use of containers.
- Source and care of drinking water .
- Care of pit latrines.
- Care of vegetable gardens.
- Presence of cats and rodents in the room where patient is being nursed..
- Presence of pigeons in the environment.

On Management of patients, supervisors to check on:

The Care of patients in terms of:

- Bathing patients.
- Taking care of patients personal and oral hygiene.
- Feeding of patients .
- Does the carer decide when patient needs referral to health centre or hospital.
- Making patients comfortable.

On Processing of instruments, the supervisor should:

- Identify instruments in use and ensure that they:
- Decontaminate instruments by boiling in hot water for 20 minutes in-order to render them safe for handling. Leave to cool.
- Wash same instruments.
- Use wrist watches for timing.
- Storage of boiled cooled and dried instruments. Boiling before use on next patient.

On Maintenance of basic hygiene practices, check on:

- Care and cleaning environment of care.
- Dust bins with lids.
- Cleaning of floors.
- Hand-washing practices.
- Windows for thorough ventilation.

Health education to patients who are seen by Home Based Care Givers should emphasise on the:

- Hand-washing practices.
- Food hygiene.
- Personal hygiene.
- Environmental hygiene.
- Care of drinking water.
- Source of drinking water.
- Care of pit latrines.
- Care of vegetable gardens.
- Windows for thorough ventilation.
- Spiritual care by Pastors.

2.9 GUIDELINES FOR TRAINED COMMUNITY HEALTH CARE WORKERS

Personal hygiene

- Wash hands with soap and water before and after handling food.
- Wash hands with water and soap after use of toilet and handling any sick client.

Environmental sanitation

- Educate community on the importance of proper use of pit latrines and their maintenance. They are required to orient community members as follows.
- Do not build pit latrines on higher grounds than sources of drinking water.
- Dig rubbish pits and cover them when they are full.
- Do not build pit latrines near taps, wells or boreholes.
- Cut grass short and bury standing containers and bottles.

Prevention of infection

- Assist the community to identify their health needs and report to the clinic.
- Report disease outbreaks, their sources and locality to health centre in-charges.
- Identify 'at risk' groups e.g. underweight babies

and encourage mothers to take babies for growth-monitoring. The mothers should be informed about the children for follow-ups.

- Assist health care givers at Outreach Programmes.
- Educate the community on prevention of diseases such as TB, HIV/AIDS, malaria and other communicable diseases
- Importance of a balanced diet of traditional foods like finkubala and inswa.
- Keep surroundings clean by cutting grass short, bury used standing containers.
- Fill up potholes with sand or gravel to prevent breeding of mosquitoes through community participation.
- Follow up TB defaulters' list given by the clinic
- Educate the community on safe clean drinking water by the use of chlorine or boiling.
- Encourage and promote condom use and proper disposal of condoms after use in pit latrines. Refer all sick people to the health centre and keep records.
- Work together with Community Based Distributors, Peer Educators and TB Treatment Supporters.

2.10 GUIDELINES FOR HOME-BASED CARE GIVERS

General outlook of a provider

- A home based care giver is required to be energetic and presentable and should wear clean dress/chitenje and should be sober mood and empathic.
- He or she should be committed and interested in the work.

Self protection

- Tie head scarves.
- Wear gloves when nursing patients or clients.
- Wear plastic aprons while nursing patient over 'chitenge' outfits.
- Report to doctor during periods of own illness.

Nursing care

- Use appropriate technology where necessary:
 - Create rapport with family and patient.
 - Tie plastic bags around the wrists in the absence of gloves.
 - Wash hands before and after each procedure with soap and water.
 - In absence of soap, use ash from mbaula for hand washing.
 - Bath patient with soap and water and keep him or her comfortable.
 - Feed patient.

- Clean the patient's teeth and mouth to prevent teeth decay. Clients are to be advised to use 'umuswaki' for chewing and cleaning their teeth when they are able.
- Make bed and change bed linen.
- Boil soiled linen for patients and hang to dry in the sun. Linen can be washed by using 'ichimamba' , (a local detergent) which foams and really washes clothes clean.
- Wear gloves when bathing, touching and changing the patient.
- Wash and dry all cooking utensils (plates, cups, spoons) and dry on a home-made rack.
- Refer patient to health facility if condition worsens.

Environmental sanitation emphasise on how to:

- Maintain adequate light and ventilation in the house.
- Sweep and mop the floor of the practice area with soap and water.
- Sweep outside surrounding, dispose and burn refuse in a pit.
- Store drinking water in narrow containers with lids. Boil and store all drinking water
- Do not store water for more than fourteen (14) days.

CHAPTER 3

3.0 Health Care System In The Country

3.1 The Status Of the Health Care System.

In our society, the health-care-system is composed of the formal scientific and informal non-scientific health systems. The health care institutions constitute the formal health care while informal is formed by the home-based-care, the traditional birth attendants and the traditional healers.

The health care delivery system is a self-contained segment of the National Health System (WHO 1988). The health system consists of a variety of inter-related institutions. They contribute to health care in the workplace, schools, homes, communities and hospitals. It also includes, self care, and health care workers, hospitals, laboratory and other diagnostic and logistic support services. Since Independence, Zambia has gone a long way in improving its health facilities (Ministry of Health, 1992). Between 1964 and 1981 the number of hospitals and health centre beds doubled.

Location of most of the provincial, District and mine health facilities

Table 1

Eastern Province	Copperbelt Province	Luapula Province	Southern Province	Central Province	Northern Province	North-Western Province
Chipata General Hospital	Ndola Central Hospital	Mansa General Hospital	Livingstone General Hospital	Kabwe General Hospital	Kasama General Hospital	Solwezi Hospital
St. Francis Mission Hospital, Katete.	Kitwe Central Hospital	Samfya District Hospital	Zimba Rural Health Center	Mkushi District Hospital	Mbala General Hospital	Mwinilunga General Hospital
Chadiza District Hospital	Kamuchanga District Hospital	Kawambwa District Hospital	Choma General Hospital	Serenje District Hospital	Isoka District Hospital	Zambesi District Hospital
Petauke District Hospital	Arthur Davidson Children Hospital	Mbereshi District Hospital	Monze District Hospital	Mumbwa District Hospital	Luwingu District Hospital	Mukinge Mission Hospital
Lundazi District Hospital	Mpongwe Mission Hospital	Lubwe Mission Hospital	Macha Mission Hospital	Chilambo Mission Hospital	Mporokoso District Hospital	Mufumbwe Clinic
Nyimba District Hospital	Kalulushi, Chingola and Nchanga Mine Hospitals	Mwense Rural Health Center	Pemba Rural Health Centre	Liteta Leprosarium Hospital (Specialist Hospital)	Mpika District Hospital	Kansenshi Clinic
Mwami District Hospital	Chililabombwe Mine Hospital Kakoso Clinic		Mazabula District Hospital	Chibombo rural Health Centre	Chilonga Mission Hospital	
Chama Rural Health Centre	Nkana and Wusakili Mine Hospitals				Chilubula Mission Hospital	

Health care in Lusaka is provided by the government,

private sector, parastatal and private companies and traditional healers. Under the government sector, there are three hospitals namely the University Teaching Hospital (UTH) (1,835 beds), Chainama Hills Hospital (500 beds) and Maina Soko Military Hospital (66 beds).

Analysis Of The Health Reforms

Health Reforms can be defined as a process of change towards better health-care provision. This change process requires the application of the approaches of the Primary Health Care combined with the concerted efforts of all the related Ministries like Ministry of Education, Agriculture and Works and Supply.

The Health Reforms picture shows that Zambia has made a lot of achievements in the health sector reforms through the Primary Health Care approach. The Ministry of Health has embarked on logical and equitable distribution of scarce health care resources like trained Medical Doctors, Registered Nurse-Midwives, Clinical Officers and Laboratory Technicians and other essential medical and nursing care items, in all the provinces of Zambia. The communities are involved in the mobilization, maintenance and sustenance of adequate supply of resources required for the continued teamwork for the realization of quality health care for all Zambians starting from our communities among our community based agents. Efforts continue to be made in the provision of accessible health care within a few steps of each Zambian by establishing health-posts manned by our CBAs equipped with proper knowledge and

skill and thus integrating them into the formal health care system. The Health Reforms also brought in radical changes in our health-care systems; like the introduction of the cost sharing, cost recovery and pre-payment schemes. These have changed the health seeking behaviour of people. They no longer malingering to health -care facilities because their malingering or dodging from work will cost them money, which they do not have. Thus this has improved the quality of care. Cost sharing has also instilled a sense of ownership of the care being provided to the members of the community. Hence the expectations of the health-care consumers have risen, as they now demand quality care for their money's worth. In return, the health-care system has been sensitive to their demands in the face of the professional brain -drain that has left its mark in its wake.

Due to the economic hardships, it appears that the effect of the cost-sharing measures has been to distance some health care recipients from utilizing the health care services. These now opt for the services of the community -based -agents who are not equipped with HIV/AIDS Infection Prevention measures.

The emphasis of the Reforms is in the provision of preventable and promotive health services at the household and at the community level. The potential role of the formal health sector is to support the individuals in their effort to produce good health, to ensure that they have information and access to resources, which are required to maintain effective Infection Prevention measures at all

levels of the health care.

The Ministry Of Health, through legislation introduced an Infection Prevention policy and thus encouraged all its partners in the private sector and in the communities to create safe environments of care by initiating Infection Prevention in their health care provision since disease patterns have changed placing additional demands on the nursing and medical resources. HIV/AIDS is one such condition with linkages to modern-day unconventional tuberculosis and tumours both in adults and children. The ongoing epidemics have also compounded the situation. It is not unusual to have diseases like meningococcal meningitis, dysentery, cholera and measles occurring concurrently. With the overcrowding, overstretched resources and standards of care that are below acceptable standards becoming the trademark of health-care institutions, home-based care and traditional healers work-places have now become unquestionably alternative sources of care; therefore their environment of care need to be upgraded in the given circumstances.

The Zambian Government has recognized this important resource as far back as the 1970s even though the programme started in 1973. The TBAs, being influential people in their communities, undoubtedly, will have a good influence in lowering maternal and child death rates in our communities. In reality, the reverse is the case as fewer and fewer mothers are now delivered by the TBAs (MOH 1998). This could be due to anecdotal reports of maternal and child morbidity and mortality that occur among

women due to high infection rates. This is as a result of them not being trained in both Infection Prevention measures and also in the handling of obstetric emergencies, even, at the home level. Better referral systems, co-ordination and relationships between the CBAs in our communities and the health care providers in the formal health care system need to be improved. (Maimbolwa 1998, CBOH, 1998)

The Health Care System believes that care-recipients have a birth-right to safer and higher levels of care both in formal health-care institutions and the community by bridging the practice – gap between them.

3.2 Three levels of health care

Most health care systems can be subdivided into three levels:

- Primary level of care.
- Secondary level of care.
- Tertiary level of care.

3.2.1 Primary level of care

The primary level of care is the first level of contact between the individual, family and the community in the National Health Service system. This constitutes the primary health care where the primary health care activities are carried out, they are known as Essential Health Care. The health posts and the health centers both form the primary level of care. Both health institutions are required to provide care under the provisions of the Primary Health Care.

Definition of Primary Health Care

"It is scientifically sound and essential Health Care made universally accessible to individuals and acceptable to them through their full participation and at a cost that the community and country can afford based on the spirit of self-reliance and determination." (WHO 1978). The use of Appropriate Technology is very essential in PHC in developing countries.

Primary Health Care services are provided by the Ministry of Health through.

- Provincial Health Offices.
- District Health Management Board who supervise the Health Centres in urban and rural areas.

Functions of Primary Health Care (PHC)

The services provided in PHC are:

- Health education.
- Environmental sanitation.
- Immunisation.
- Protected water supply.
- Promotion of food supply.
- Nutrition.
- Maternal Child Health.
- Family Planning.
- Prevention and control of locally endemic diseases.
- Provision of health services.
- Provision of essential drugs.

Besides providing health care in the villages, the health care team also endeavours to bridge the gap between the rural people and organised health sectors. The people in the rural areas are also informed of the other health facilities in urban areas e.g. U.T.H. Lusaka is a referral hospital, so they know they can be referred to go to U.T.H. when they cannot be treated in their health centres.

Approaches to PHC.

- **Equity**
Equal distribution of Health Services throughout the country to all rich and poor irrespective of the ability to pay or not.
- **Community participation**
An awareness system is developed to teach people to know and to make maximum-use of health systems available. This is to involve them in decision-making in matters that affect their health. This will empower them to take control of their health and lives.
- **Intersectoral co-ordination**
All related ministries e.g. Ministry of Health, Agriculture, Water supply department, Education, Finance meet, consult and set out future health plans which will be easy and economic to implement for the people in the country.
 - Co-ordination and collaboration with

relevant Non Governmental Organisations.
- Governmental support through the formulation of Policies and legislation.

Appropriate Technology

- This is the technology that is scientifically sound. It helps to take care of local needs and easily fits into the local budget for which resources are easily available and are supposed to be within easy reach.

Examples of appropriate technologies used in Zambia are:

Use of pit latrines.

- Protected wells.
- Locally-made grinding machines to grind maize into mealie meal.
- Oil extraction to extract oil from Soya beans.
- Mud houses with windows.
- Storage houses for grains like millet, maize, and beans.
- Uses of Oral Rehydration Salts (ORS).

Final aim of PHC is to:

- Reduce infant mortality by the year 2,000 and beyond.

- To increase life expectancy.
- To reduce the crude death rate per year, by the year 2000 and beyond.
- To reduce the crude birth rate.
- To provide protected water to all by the year 2000 and beyond.
- All children to be immunised by the year 2000 and beyond.

With the introduction of the Health-Reforms, the health-care delivery focuses on the District Health Management Board besides the secondary and tertiary sources of care.

Health Posts

The health care package that have been designed closest to these community-based-agents (CBAs) are the Health Posts. A health post is intended to cater for a population of 500 households (3,500 people) in the rural areas within 12 kilometers and 1000 households (7000 people) in urban settings. All communities strive to establish own health posts.

Health centres

The health centre is the first health facility level in the community. Nevertheless, in most cases self medication, visits to traditional healers or consultation from the community health worker would have been done before hospitalisation. Case studies carried out in Lusaka's

Children's Hospital during hospitalization (UTH Pediatric Wing) have shown that 80% of admitted children had first seen a traditional healer or been treated by their grandmother (Khan et al 1997) There are about 5000 traditional healers in the city. Their activities have to be co-ordinated with the District Health Management Team activities. There is the need to have more interactions between the Neighbourhood Health Committee and the CBAs.

There are 22 government health centres. (The 22nd health centre within Chainama has been handed over to Chainama as its Teaching Outpost). The health centres are divided into 8 administrative zones. Ten of the centres have maternity facilities and the remaining twelve do not. The ten maternity centres offer a 24 hours services and are linked to radio communication and ambulance services.

- Urban health centers are intended to serve 30,000-50,000 people.
- Rural health centers are intended to serve 10,000 people.

TABLE 2

Health Centres in Lusaka

Zone	Delivery centres	Catchment Area Population	Total Zone
1	Chelstone Chainda Kaunda Square	67183 30538 2944	127155
2	Ngo'mbe Chipata Mandevu	14979 84438 78459	177876
3	George Matero Reference Matero Main	99248 61076 67183	227507
4	Makeni Kanyama	214113 114398	135811
5	Chawama Lilayi	68515 17827	86342
6	Kamwala Railway Civic Center	54968 45162 22987	123116
7	Chilenje Kabwata Bauleni State Lodge Prisons	79650 62549 52356 3584 3078	201217
8	Kalingalinga Mtendere	46570 58022	104592
TOTAL			1183616

The catchment population of the health centres ranges from 20,000 to 128,994 (Lusaka DHMT 1993). Under private

sector there are 104 private surgeries and two hospitals. There is one parastatal hospital (Zambia Consolidated Copper Mines [ZCCM]) now called Lusaka Trust Hospital since privatisation. There are approximately 28 known Non-Governmental Organisations (NGOs) engaged in preventive and rehabilitative PHC activities.

Lusaka has 93 townships, 30 of which are unplanned shanty compounds. About 75% of Lusaka's population live in the peri-urban areas (DHMT 1993). This has led to inadequate water supply and sanitation. As a result people have resorted to digging shallow wells. The Urban Health Task Force (1992) conceded that the absence of water and sanitation facilities have contributed, significantly, to epidemics of cholera and dysentery. The document sites, 1,500 wells in shanty compounds like George, Kanyama, Garden and Chazanga, all of which have heavily contaminated water supply due to digging wells near pit latrines.

3.2.2 Secondary level of care

At this level more complicated health problems are dealt with. These are done in District hospital and community health centres or any health care environment where referral health services are provided. They focus on early diagnosis and treatment.

District and first level referral hospitals

These are intended to serve 80,000-200,000 people.

3.2.3 Tertiary level of care

In tertiary level of care, more specialised care is given than in secondary level of care.

Tertiary level of care requires specific facilities.

It also requires highly specialised medical personnel.

They aim at preventing chronicity and disability,

Tertiary care provides training of medical personnel, specialized health care provision and Research.

All these are made possible in CENTRAL HOSPITALS which are intended to serve 800,000 people and above.

Examples of central hospitals are UTH, Lusaka, Kitwe Central and Ndola Central Hospitals.

The UTH is the National Referral Hospital and the hospital is apparently accessible to the majority of people in Lusaka. Maina Soko is a military hospital with some limited accessibility to civilians. Chainama was, until recently, a mental hospital, but cares for general patients now.

CHAPTER 4

4.0 INTRODUCTION TO INFECTION PREVENTION IN HEALTH CARE INSTITUTIONS

4.1 What is Infection Prevention?

Infection Prevention is a programme, which prevents cross-infection between patients, staff and patients; and vice-versa. It also aims at promoting the health of the carers and workers and thus reduces infection or disease outbreaks and absenteeism as a result of sickness among nurses and the Hospital workers. Therefore, each health care institution needs an effective Infection Prevention Programme.

4.2 What is a Nosocomial Infection?

A nosocomial infection is a hospital-acquired infection which makes patients to stay unnecessarily longer days in hospitals. Any infections occurring in patients who have been hospitalised for longer periods than the incubation period of these illnesses can be classified as hospital-acquired infections. They are neither present nor incubating when a patient is admitted into hospital. Any infection which develops in an in-patient, especially where the incubation period is unknown, or where the infection is due to malpractice by health-care providers, should be classified as being hospital-acquired, e.g. aspiration

Diarrhoeal diseases

Diarrhoeal diseases, like dysentery and cholera, can be spread through food that we eat. Food which are brought to patients in hospitals could also be sources of infection. Foods prepared unhygienically in hospitals for patients could also infect hospitalised patients. Therefore, if an in-patient develops gastro-enteritis, or dysentery supported by a positive culture from the microbiology laboratory, this should constitute a hospital-acquired infection.

Patient factors

Susceptible cases to infections in the wards

- Some patients' illnesses make it easy for them to get hospital infections e.g. accident cases who have already lost a lot of blood. They could have perhaps, stayed for long periods at the accident scene before receiving medical attention. Some who come for orthopaedic surgery with broken bones and who need the insertion of orthopaedic prosthesis.
- Some people are malnourished when they come to hospital. Others are too old, while premature babies have low immune status because their immune response mechanism is not fully developed.
- Some chronic diseases like TB, diabetes also predispose patients to hospital-acquired infections.

- Some people who suffer from cancer and who are on cancer treatment are more likely to get infections when they are in hospitals.

4.3.3 Hospital environmental factors

The ward area

In the wards, again patients with various illnesses are nursed together. Patients also receive visitors. This increased traffic also increases chances of cross infection in the wards.

Ward congestion

The wards are overcrowded. The bed status is less than a meter between beds. Floor beds abound, movement between beds and handling of patients become difficult. This situation encourages spread of infection between patients and staff.

Inadequate supply of patient care items

There is inadequacy in continued supply of patient care items. Health care givers end up improvising nursing care items to carry out their care thereby compromising nursing care. This practice leads to hospital - acquired infections among in- patients.

Staffing levels

Acute shortage of nurses

Officially the nurse/patient ratio is:

1 Zambia Registered Nurse to 6 patients.

1 Zambia Enrolled Nurse to 3 patients.

Currently, nurse/patient ratio stands at 1-20 - 40 or even more. It is not uncommon to have 2 nurses in a whole ward.

Poor pay for nurses demoralises them. Poor pay causes absenteeism amongst the few nurses available especially with the implementation of the Voluntary Separation Package (VSP). As a result, Infection Prevention practices are ignored.

Relatives as extra hands in the ward environment

Due to shortage of nurses, relatives carry out nursing care for their loved ones. The general public sees this as nurses abdicating their roles. Besides, this practice causes increased traffic and increased number of hospital-acquired infections in the wards.

Occupational hazards in the wards

Medical waste like dirty infectious dressings, used needles and other sharps and syringes, laboratory wastes, body fluid wastes, pose dangers for health-care providers who are subject to Hospital-acquired infections.

Hospital workers in support service areas

Most hospital workers are exposed to a lot of infections in their workplaces, e.g. the maintenance staff deals with infectious wastes whilst repairing the sewer systems.

- Those who work in the Central Sterile Supplies Department handle instruments, which could have infectious material on them.
- The Laundry Staff often handle infectious and soiled hospital linen, if these are not handled properly before transporting them to the laundry.
- Laboratory Staff handle infectious specimens whilst carrying out laboratory tests. They could also acquire hospital infections.

- **Hospital kitchens could be a source of infections**
The Kitchen staff could infect both patients and staff if they themselves are infected. Food could become infected due to improper storage and preparation and could cause danger to the patients who eat it.

4.3.4 Practice factors

- **Some medical procedures may cause hospital acquired infections**

Some medical procedures predispose patients to infections e.g. in operating theatres when the Doctor cuts the skin, the body's first line defence mechanism gets broken. Intact skin protects us from a lot of germs.

Surgical operations may get infected depending on the procedure and practice used during surgery.

- **Referrals**

The practice of referring patients from other hospitals with endemic diseases e.g. a hospital, may import cholera

patients from Luapula Province or even Bubonic plague from Eastern Province where there was an outbreak.

- **Transfers**

Transferring of patients from specialised units who may have resistant micro-organisms e.g Burns patients may have Methicillin Resistant *Staphylococcus aureus* (MRSA). The patients could infect the other patients in the wards with these same germs.

- **Carriers**

Admitting patients who are carriers with unrelated micro-organisms e.g. accident patients admitted into surgical block with *Salmonella typhi* may lead to out break of typhoid in the wards. This is usually done without knowing that the patients are carriers of some organisms.

- **Oxygen therapy**

The practice of giving oxygen therapy to some patients may be a source of acquiring hospital infections.

In hospitals, some patients who suffer from severe asthmatic attacks may require to be given oxygen. This oxygen-therapy needs moisture for it to work properly. Some of this moisture could have some germs which could infect the patient. Exchange of nebulizers, humidifiers and oxygen face masks could also be sources of infection.

- **Instrumentation**

One may be infected with bacteria during instrumentation

e.g in endoscopy if the endoscopes are not properly sterilised.

- **Catheterisation**

Again after Caesarean Sections, gynaecological, genito-urinary operations, patients may need to be catheterised. This procedure predisposes the patients to infections. This is the reason why urinary tract infections top the list of hospital-acquired infections.

- **Drug therapy**

Wrong and abusive usage of antibiotics leave the body open to infections. Antibiotics when prescribed or used indiscriminately may lead to development of resistant strains of micro-organism. This also leads patients to getting more infections while in hospitals.

- **Opportunistic Infections**

These may occur following antibiotic therapy. Prolonged antimicrobial therapy have the ability to displace the normal flora of a given environment in the body e.g in the stomach where the normal flora may give way to some other pathogenic micro-organisms to manifest themselves and cause disease.

4.4 Constraints in Infection Prevention Programmes

A number of hospital constraints, indirectly may cause hospital-acquired infections. In developing countries,

these constraints are due to inadequate funding which manifests in the following problems:

- **Inadequate Maintenance of Hospital Environment**

This is seen by the presence of cockroaches and rats in the manholes; and mosquitoes in the overgrown grass and flies in the environment. These vectors are mechanical transmitters of diseases. They run over foul material and later settle and infect food which patients eat. Infected mosquitoes bite and infect in-patients with malaria. These result in prolonged hospital stay.

- **Inadequate servicing of Major Hospital Facilities**

Major wards and C.S.S.D equipment break down due to lack of servicing e.g. steam boilers and autoclaves. Autoclaves are used for sterilising equipment used in sterile procedures like surgical operations.

- **Improper Hospital Refuse Disposal**

Most hospitals do not have incinerators for proper hospital refuse disposal.

Hospital refuse are classified into two categories:

Infectious wastes from:

- Laboratories.
- Wards.
- Human tissue from the operating theatres.

Indiscriminate refuse from:

- The kitchen.
- The hostels.
- The Schools.
- Litter from the hospital grounds.

Some Hospital refuse is tipped into mostly improvised pits for collection and burning. The public may develop bronchitis as a result of inhaling smoke from this open-air burning.

Before burning them, dogs may litter them in the neighbourhood. Also the community finds use for attractive looking but infectious hospital items. This scavenging may be the cause of various epidemics e.g. dysentery and cholera being experienced in most developing countries.

In Summary,

Hospital-acquired infections are expensive for the patients or clients, the hospital, the community and the country. This extra expenditure leads to poor and inadequate maintenance of health care institutions. Inadequate supply of medical and nursing care items lead to nurses improvising and this often leads to hospital acquired infections.

- The hospital environment acts as a reservoir for infectious agents.
- Many equipment present within the hospital environment, act as vehicles through which germs are transferred from the care giver to the patient, and even vice versa.

4.5 Benefits of Infection Prevention and Control Programme:

The most important benefits of Infection Prevention programmes are:

- The prevention of nosocomial infections.
- Hospitals are encouraged to formulate policies and guidelines to guide practice. Through the implementation of an antibiotic policy, the Hospital ensures the use of appropriate antibiotics. This prevents the emergence of resistant strains of bacteria due to indiscriminate use of antibiotics.
- The use of appropriate technology which is cheap and affordable in Infection Prevention Practices.
- **Hospital Decongestion** This occurs due to shortened in-patient days,
- Decreased morbidity and mortality rates. As a result, hospital beds will be available for those who really need hospitalisation.
- Improved standard of care.

In conclusion, the benefits of infection Prevention are seen as a result of the Hospital Infection Control Committee recommending the purchasing and continuous

supply of appropriate nursing care items for use by carers and the formulation of policies, guidelines and research to ensure evidence-based practice in the clinical areas.

CHAPTER 5

5.0 MANAGEMENT OF HOSPITAL INFECTION PREVENTION PROGRAMME

5.1 Hospital Infection Prevention Committee

Every modern hospital is expected to have an Infection Prevention Programme. The Hospital Infection Prevention programme is prime-moved by the Hospital Infection Prevention Committee.

Composition of the Hospital Infection Prevention Committee

It is a multi-disciplinary committee, chaired by the Head of the Medical Microbiology Department. Its members often are:

- the Microbiologist and
- the Head of Obstetrics and Gynaecology,
- the Head of the Medical Dept.
- the Head of Paediatrics.
- the Head of Surgical Department.
- the Head of Pharmacy and Purchasing.
- and a member from the Hospital Administration
- Other members are co-opted as need arises.

Objectives of a Hospital Infection Prevention and Control Committee

The main objective is to uphold the critical mass decisions regarding the prevention of hospital acquired infections in

the hospital.

In order to do this, the committee needs to define what constitutes a hospital-acquired infection in the institution. This will direct the actions of the committee during Infection Outbreaks. Specific objectives include the following:

- To give guidance to the purchasing of anti-microbial, antiseptic, disinfectant solutions, and the most appropriate and cost effective patient care items.
- To design strategies for implementing the Infection Prevention programme amongst all staff categories.
- To formulate Infection Prevention Policies and guidelines to guide practice and assure quality of care.

Components of Infection Prevention Programme

The components of the Infection Prevention Programme constitute the following activities

- Surveillance of nosocomial infections, which may be Ward or Laboratory-based.
- Production of an Infection Prevention Manual for use in health-care institutions.
- Formulation of Infection Prevention Policy and guidelines on aseptic technique, decontamination, Pre-cleaning, sterilization Procedures and Environmental sanitation. This also includes solid-waste disposal system.

- Staff health maintenance.
- Continued education of staff and orientation of new employees and targeted education for support services staff.
- Monitoring, documentation and dissemination of material on the use of Antibiotics and their sensitivity patterns.
- Monitoring the safety of laboratory workers.
- Notification of all notifiable diseases.
- Investigation of infection outbreak.
- Operational Research in the clinical areas
- Introduction of Infection Prevention among the community-based-Agents in the community.

5.2 The roles of specific key members

The microbiologist

The role of the Infection Prevention Microbiologist

The Consultant Microbiologist almost always acts as the Chairperson of the Hospital Infection Prevention Committee. She or he works very closely with the Infection Prevention Nurse who implements the day to day activities of the hospital Infection Prevention Committee. She or he should have an in-depth knowledge of infectious diseases and the appropriate use of antimicrobial agents. A microbiologist studies bacteria, viruses, fungi, parasites and other microorganisms. When there is an unexplained outbreak of an infectious disease, such as meningitis,

diarrhoea, or food poisoning, a microbiologist is primarily involved. He not only diagnoses these diseases by identifying the responsible organism, but also investigates its source, and the mode of spread. He is able to identify which drug will attack the organism and advises the clinicians accordingly. Thus microbiologists have a vital role in research, particularly investigations into the cause, prevention and management of outbreaks of infectious diseases.

Therefore, their role can be listed down below:

- To organise Infection Prevention courses for Medical Doctors. The microbiologist therefore needs to be a good teacher.
- Should have an in-depth knowledge on Infection Prevention issues.
- Should formulate policies and guidelines together with other team members in the Health Care Institution.

The qualities of a microbiologist

- She or he should be able to relate well with all hospital staff.
- Should be very tactful and diplomatic.
- Should be gentle but persuasive, based on sound knowledge base in Infection Prevention issues.

The Role of the Infection Prevention Nurse

The Infection Prevention officer faces a lot of challenges on taking up office especially as the role of the nurse

expands in the face of advancement in medical technology.

This officer is the only personnel who works on full-time basis with the Hospital Infection Prevention committee.

The role of the Infection Prevention nurse falls into two main areas:

- The primary roles.
- The secondary roles.

The primary roles relate to the participation at hospital meetings and visits to the service and support-service areas.

The secondary roles relate to the instructions and teaching programmes on Infection Prevention issues.

The implementation of the secondary roles depends on how well the officer performs her primary roles.

Primary roles

Visits to Support Service areas

The officer must have objectives for each visit.

Pharmacy Department

The officer's objective for visiting the Pharmacy's manufacturing rooms must be to monitor the maintenance of sterility and basic hygiene practices of the workers during the preparation of antiseptic and disinfectant solutions for ward use.

Central Sterilising Supplies Department (C.S S.D)

The team should ensure that the workers have sufficient knowledge and skill to operate the autoclaves. The officer should visit and monitor the decontamination, pre-cleaning, high level disinfection, and sterilisation processes of nursing care equipment. Visits to the laundry, laboratory, kitchen and mortuary departments must monitor the workers' practices in terms of basic hygiene, safety at work and health promotion practices.

Ward Affairs Meetings

The Infection Prevention Officer is required to attend these meetings. Several Infection Prevention issues surface at these meetings. Amongst them are issues which relate to hygiene maintenance and housekeeping in the wards.

Ward Visits

The officer should visit each department to follow up on issues discussed at these meetings. The officer is required to find solutions to these problems.

To solve the problem of ordering sufficient housekeeping material for the department, could be handled as stated below.

The Infection Prevention officer arranges a meeting with the Departmental Nursing Officer and ward sisters to find solutions to the problem e.g. The team, working and consulting each other, should do the following:

- Make a list of items required for house keeping.
- Write down the number ordered.
- Write down the number supplied.
- Work out the deficiency.
- Work out the amount required by the ward on a weekly basis.
- Find out the amount required per month.
- Write down areas where these items are used.

Create a table on the above and present it to the purchasing department, so they can order the right amount of house keeping material required on a monthly basis.

Below is a case history of how this problem was handled in a hospital. Ward purchases must be based on an accountability system.

A case History

Protective Wear Requirements for Department

The Infection Prevention nurse should co-ordinate with the ward sisters in order to work out their departments' protective wear requirements as shown in the table next page. This data will help the Nursing Services Manager to defend the nursing budget on protective clothing effectively; since the manager will base her arguments on proven data. She needs to do this in order to produce an acceptable activity based budget.

TABLE 3 Ordering Ward Stock

DEPT	NURSES	PORTER & MAIDS	TOTAL NUMBER	PLASTIC APRONS	GLOVES HEAVY DUTY	BOOTS	MASKS GOGGLES
Specialist Clinics of 15 areas	57	20	77	154	40 Prs/mth	5 10 5	15 boxes/mth
E Block of wards	106	10	116	232	20 Prs/mts	5 8 5	4 boxes/mth
PH III Theatre	58	20	78	156	40 Prs/mth	5 10 5	Theatre stock
O Block	28	10	38	76	20 Prs/mth	5 8 5	Theatre stock
PH V	104	10	114	228	20 Prs/mth	5 8 5	10 boxes/mth
Filter	91	20	111	222	40 Prs/mth	5 10 5	40 boxes/mth
D Block of Areas	20	10	30	60	20 Prs/mth	5 8 5	10 boxes/mts
C Block	80	10	90	180	20 Prs/mth	5 8 5	10 boxes/mth
H Block Labour Ward	89	20	109	218	40 Prs/mth	5 10 5	10 boxes/mts
Mother's Shelter	250	90	340	680	180 Prs/mth	2 18 1	
Night Super	5	10	15	10	262		

Initiating Research Topics

During ward visits, the officer should notice problems existing in the wards e.g. wound infections and urinary tract infections in surgical wards. The officer is required to initiate research into their causes. The findings are circulated and discussed at departmental meetings. Improvements are made where necessary.

These studies show the factors, which cause these infections:

- The germs which cause them.
- Their antibiotic response and sensitivity patterns and,
- How to prevent further infections from occurring.

Swabbing strategic Hospital Departments, and nursing care items

As a result of the wound infections, the officer must swab the infected wounds and the nursing care equipment which come directly in contact with patients in strategic hospital departments.

These nursing care equipment include:

- Suction tubings.
- Endotracheal tubings.
- Anti-static anaesthetic face masks.
- Operating theatre table mattresses.
- Laryngeal tubes.
- Sterile trays to ensure their sterility.

In strategic hospital department like the theatre especially the cardiac theatre, McKonkey and Blood Agar media are exposed for a specified period.

Blood agar and Mackonkey plates

These are culture media used to isolate germs in the laboratory. Exposing these culture media is one of the most basic methods of monitoring levels of germs in an environment. There are many other elaborate methods.

Incidences of wound infections should guide the Infection Prevention Nurse as when to carry out this procedure.

Blood agar

This media is enriched with blood so that fastidious germs can grow on it e.g. *Streptococcus pneumoniae*. Gram positive and gram negative germs can grow on this media also.

Mackonkey

This acts as an indicator. It is a differential media i.e. they can identify some lactose-fermenting organisms e.g. *E. coli*. They show up in pink colour.

Non-lactose fermenting organisms like *proteus spp.*, *pseudomonas aeruginosa* will show up in pale colour.

Both media are exposed at the same time in the environment to be monitored. This is done using aseptic technique. The media receive a wide range of germs which fall from the air. Exposure time is an hour in order to get accurate readings of droppings of bacteria-carrying particles per minute.

At the end of one hour, both plates are covered and sent to the laboratory for analysis.

The Hospital Infection Prevention Committee then recommends what actions are to be taken in the interest of the patients depending on the results.

This ensures that the acceptable levels of germs are not exceeded in operating theatres. Other strategic areas include the Delivery rooms, Intensive Care Units and the Burns Unit.

Policies and guidelines.

The officer should co-ordinate with the Hospital Infection Prevention Committee to ensure that the Hospital develops an Infection Prevention Policy.(Appendix 1)

Policies

The Hospital Infection Prevention Policy is a health professional policy which guides the hospital community on Infection Prevention measures. It protects the health and safety of all its personnel in a safe and conducive health-care environment.

The nature of policies

Policies made in any institution should affect every department in the institution. Each department should derive their guidelines from the policies formulated by the Hospital Management and the Infection Prevention Committee. In Infection Prevention, the Hospital Infection Prevention committee and the Hospital Management need to agree that the formulation of the policy is essential.

Policies form the framework within which the carers execute their practices.

They are concerned with what should be done but not how to do it.

Infection Prevention policy will cover areas like

- Minimizing the spread of nosocomial infections.
- Implementing good practices in all clinical areas.
- Auditing Infection Prevention practices.
- Continuing education and training.
- Conducting research for updating practice.

Rationale for policies

In Infection Prevention, Policies are very essential because they ensure compliance to Infection Prevention Measures. Policies also provide the much-needed support for the health care providers.

They help the carers to practice very confidently knowing that they have the support of the Hospital Management behind them.

Points to note while formulating a good policy

Keep Policies simple, clear and easy to understand. They should be reader-friendly

Inform and consult the hospital community before formulation of policies

Consider current procedures in the clinical areas before formulating a new policy.

Enlist the co-operation of the staff before making policies- they should not be imposed on the staff.

They should be disseminated widely and followed up regularly to avoid misunderstanding and misconceptions.

Consider costs, cheaper alternatives and the regularity in supply of patient care-items when formulating policies.

The Policies should be publicised for people to know about them before putting them into circulation.

Guidelines

These guide practice. They are concerned with how things are done. They are derived from policies for application purposes. Therefore, they are about implementation of the agreed policies. They are specific, clear and give directions about the procedure, people, skills, resources and gives directions on how to do it. Guidelines help to cost and quantify the resources to be used. They also help to provide a service, which achieves agreed minimum set of standards within the resource limitation.

Guidelines can cover areas like

- Maintenance of safety and occupational health environment.
- Maintenance of isolation processes.
- Refuse disposal.
- Sharp disposal.

- **Implementation of recommendations, policies and guidelines of the Hospital Infection Prevention Committee**

During ward visits, the officer should ensure that the recommendations of the Hospital Infection Prevention Committee are implemented in the clinical areas e.g. hygiene practices and the aseptic technique.

- **Communication**

On a daily basis the officer must communicate with the Hospital Infection Control Committee and the Nursing Services Manager as she performs the primary roles.

- **Secondary roles**

These roles will focus on capacity building to increase their knowledge-base, the skills competencies, proficiencies and attitude of all health care providers. The officer needs to coordinate with the In Service Education Department in order to perform these teaching roles effectively.

- **Advocacy**

One of her very important roles is to advocate for nurses. She or he should identify and carry out Research on issues that affect the health of nurses and the hospital workforce. At the end of her monitoring, she or he should come up with indicators for an Infection Prevention Programme. The main objective of monitoring and evaluating the programme is to improve the quality of care and prevent Hospital Acquired Infection.

This can be achieved through the improvement of effective and efficient use of available resources. Setting indicators for Infection Prevention Programme aids in setting minimum standards, which help, in economic use of medical and nursing care items.

The Role of the Ward Manager

The ward manager supports and implements the Infection Prevention measures at the ward level. She/he ensures that the ward nurses comply with the Infection Control (IFC) Policies and guidelines. She/he may need to seek guidance on matters concerning Infection Prevention e.g. Barrier Nursing and Isolation processes from the Infection Prevention nurse. The ward manager also has advocacy roles for the ward staff and also should create awareness and instill a sense of responsibility, and compliance to Infection Prevention issues among its ward staff.

5.3 Effecting Infection Prevention Programme

This requires developing workable and effective strategies as shown below

- **Implementation Strategy**

Setting up of an Infection Prevention Committee with an Infection Prevention officer to engineer the programme. Setting up of an Infection Prevention Structure to ensure that the recommendations of the Committee are implemented in the service areas.

- **Financial Support**

This programme needs to be sustained through the financial support of the hospital management. This can be achieved by including its activities in the strategic plan of the institution. Thus the programme will have its own cost-centre and budget allocation. This programme will

fail to take off without this management financial support.

5.4 Education Strategy

The activities are so numerous, so priorities are set in order to accomplish most of them. The Infection Prevention Programme will not be met unless the basic concepts and practices can be taught to the entire hospital workforce so they can understand the reasons why infections occur in hospitals.

The objective of this strategy is to create awareness in the Hospital Community, among the medical doctors, the hospital work force, the patients and their relatives.

Educational Strategy for Support Services Staff

The educational strategies should include the support services staff. These include staff from the maintenance, laboratory, laundry, C.S.S.D., departments, kitchen and the porters. Their participation during these instructions is very essential. This process necessitates analysing their jobs in terms of the following thus: Their duties

- Aims while carrying out their jobs.
- Dangers associated with their jobs.
- Precautions to be taken.

Instructions on personal hygiene and prevention of communicable diseases further reinforce the exercise.

In addition, the staff should be conscientised on Infection Prevention issues from two main sources e.g.

- Issues noted during departmental visits.
- Departmental reports from the occupational health unit.

Below is a report on a seminar held for the maintenance department of a major hospital

A Case History

Report on seminar for maintenance staff

Background of seminar

The seminar took place at the In-service Education Department. It was organised by the Infection Prevention Unit.

Participants

Participants came from the maintenance department, which comprises of:

- Boiler House.
- Electrical.
- Carpentry.
- Building.
- Engineering.
- Refrigeration.
- Institutional Housing.
- Plumbing.

Why was the seminar held?

The seminar was organised because statistics from occupational health department revealed that maintenance

staff attend the clinic most frequently.

Aims of the seminar

- To understand what their jobs entail, their problems, the dangers they are exposed to.
- To seek ways of preventing the above.
- To change their attitude at workplace and therefore improve attendance.

Objective of the seminar

To equip the participants with the knowledge of working carefully and safely at the healthcare workplace.

Topics covered

These include:

- Attitude to work.
- Transmission of communicable diseases.
- Personal hygiene.
- Environmental hygiene.
- Safety at work place.
- Preventive measures in HIV/AIDS infection for hospital workers.

Job analysis

Job analysis was done under safety at work to bring out what each job entails, their dangers, protective clothing required and preventive measures.

Suggestions from seminar

- The workers wish to have a Medical Doctor or a Clinical Officer instead of a nurse at the Occupational Health Department.
- Milk to be given to them at the end of each shift.
- On employment, all employees to be given protective clothing and tool box. Each employee who loses theirs should be charged.
- The Head of each department is to get samples of equipment used in their departments. These should then be given to purchasing department for purchase. This ensures that the right equipment is bought for each department. Using right tools help to prevent accidents.

Evaluation

- All participants emphatically said they would attend the seminar if offered again.
- Nine participants liked the discussion on "SAFETY AT WORKPLACE," best.
- One liked it least.
- Three rated all of them equally.
- One liked the sharing of ideas most.
- Nine found the topic on "SAFETY AT WORK," and HIV/AIDS most informative.
- Two - Modes of Transmission was most informative.
- One - Attitude to work was most informative.
- All said that all topics were of equal.

importance to them.

- On what they would change about the workshop:
- Ten would wish it to be extended.
- One wanted all of them to attend together.
- Two wanted it extended and certificates given at the end of seminar.
- two wanted this done twice monthly.

On any other comments:

- All participants wanted all the suggestions to be taken seriously by the management in terms of implementation.
- All workers should be allowed to attend this workshop.
- They all enjoyed it.

TABLE 4

Safety at work

JOB	DANGERS	PROTECTIVE WEAR	PREVENTION
Mechanics in Boiler House deal with hot pipes. Deal with fuel which produce steam	Fire ---Burns, Inhalation of fumes due to fuel leakage. Injuries, exposure to diseases in other departments where they are called upon to work.	Anti-acid overalls leather gloves which conducts heat slowly heavy duty elbow length gloves, safety boots Dunlop/gum boots. Hard helmet, Masks Fire extinguisher Rubber squeezers to remove fuel from floor.	Supply of milk at end of shift. Half yearly medical examinations due to exposure to diseases in some department e.g laundry.
Carpentry	Injuries, exposure to diseases. Inhalation of particles	Overalls. Heavy duty gloves Safety boots with metals in front. Dunlop boots for use in basement. Masks Hard helmets	Hand washing after each job and before meals. Supply of milk at end of shifts. Half yearly medical examinations.
Plumbing deals with cold pipes	- Potential infection with germs in secretions. - Injuries while out to work. - Falls when climbing at basement	Anti-acid overalls. Heavy duty elbow length gloves. Safety boots with metal in front. Dunlop boots. Hard helmets masks. Ladder	As above
Painting	Inhalation of paint, fumes and dust from scrappings	Masks, Dunlop boots. Anti-acid overcoat, gloves Heavy duty elbow length gloves. Hard helmets, Ladder	Hand washing after each job and before meals. Supply of milk at end of shifts. Half yearly medical examinations
Electrical Institutional	Electrocutions - Heavy duty pole belt - Manox lead testers. - Avo meter - Potential live lines from 380 Volts and 380 Volts - 11 KV	protective gloves - safety boots with metal in front. - Anti-acid overcoat. -Hard helmet.	Hand washing after each job and before meals. Supply of milk at end of shifts. Half yearly medical examination

The above table shows that Infection Prevention incorporates Occupational Health, which is defined as the 'Promotion and maintenance of the highest degree of physical, mental and social well being in all occupations: the prevention among workers of departures from health caused by their working conditions, the protection of workers in the employment from risks resulting from factors adverse to health, the placing and maintenance of the worker in an occupational environment, the adaptation of work to man and each man to his job.' (ILO /WHO, 1950) Since Infection Prevention also aims at reducing absenteeism due to sickness at the work place among the work force, the seminar went on to identify the dangers associated with the different groups of the support services staff like the laboratory, laundry, CSSD, kitchen staff, porters and the maids.

Laboratory staff

Duty

They receive and handle infectious specimen from the wards for bacteriological, haematological and histological analysis.

Aim

To equip the staff with the knowledge and skill of working without infecting themselves at work.

Danger

The laboratory staff can infect themselves and others.

Since they handle blood, and patients' secretions and excretions they are at special risk of contracting the HIV and *hepatitis B viruses* and other infectious diseases.

Precautions

The staff must wear sterile gloves, masks and overcoats whilst carrying out their duties. They are required to wash their hands with soap under running water followed by antiseptic hand rub. They must wash hands thoroughly before wearing their sterile gloves. Hands must be washed on removal of gloves and especially after handling blood, body excretion and secretions, and specimens brought in for tests.

They must disinfect all work surfaces with 0.5% hypochlorite solution at the end of each shift. The cleaners in the laboratory are involved with washing of used specimen containers for example, laboratory reusable petri-dishes are autoclaved and stored away. They are required to wear heavy-duty elbow-length gloves; plastic aprons, facemasks, and goggles while carrying out these duties.

All used infected material should be disposed of according to laid down procedures.

They must not eat or drink while carrying out laboratory tests.

Laundry staff

Duty

Their duty is to handle, sort, wash, dirty, soiled and infected linen from the service areas.

To distribute cleaned and ironed linen to the wards and clinics.

Aim

To equip the laundry staff with the knowledge and skill of controlling the spread of germs at work.

Dangers

There may be dangers from stray sharps e.g. needles.

Precautions

They must be on the look out for stray sharps e.g. needles etc.

The staff that handle, sort and wash linen must wear the following protective wear:

- Elbow-length heavy duty gloves.
- Thick plastic aprons.
- Boots.
- Goggles.

Avoid shaking soiled linen.

Avoid handling soiled linen by rolling clean edges towards the soiled area of linen.

Place in washing machine according to laid down procedures.

Disinfection of linen

Linen must be washed at 65°C for 10 minutes at least or at 71°C for at least 3 minutes. The Laundry staff must be fully immunised.

Distribution of linen

Keep washed clean linen safe and secure according to regulations. Sort, iron and distribute to the wards in heavy duty linen bags meant for that purpose.

Central Sterile Supplies Dept. (C.S.S.D) Staff Duties

To receive used equipment and instruments from the wards. To receive used gloves from the theatres for recycling. To clean, disinfect, pack and sterilise the instruments and dispatch them to the wards.

Aim

To prevent occupational injuries and the spread of germs while carrying out their duties.

Dangers

There may be stray needles amongst the instruments. Therefore, there is the danger of accidental inoculation, with infected sharps that may lead to danger of infection

with the HIV and Hepatitis B infections.

Precautions

The staff should be on the look out for stray sharps amongst their equipment and instruments.

They are required to wear protective clothing e.g. gloves and plastic aprons on duty. They should wear facemasks whilst powdering recycled gloves.

In case of any accidental cut or needle prick injury, express blood, wash area with soap and water and then report to the Infection Prevention unit.

Methodology

Staff must ensure that equipment and instruments are decontaminated and pre-cleaned with soap and water from the clinical area. The staff must ensure that trays are packed properly for autoclaving. The autoclave must be tested prior to use in order to ensure sterility of articles being autoclaved. Biological indicators should be placed at the centre of the largest pack to check that sterilisation has actually taken place. Staff must be trained before being deployed to work at the CSSD.

Distribution: Sterile packs must be handled and transported to the wards adequately without contaminating them, in any way, en route e.g. dropping them on the floor.

Kitchen Staff

Duties

They receive food items from suppliers.

The store the food items.

They prepare the food for staff and patients in the hospital.

They clean the kitchen area after food preparation.

Aim

To guard against patients and staff eating contaminated food items from the hospital kitchen.

Dangers

Patients could contract diarrhoeal diseases from eating infected food. There is the danger of food poisoning occurring amongst staff and patients who eat infected food.

They must wear headgears and appropriate cooks' uniform and shoes on duty. Clean uniforms must be provided at each shift.

Precautions

Kitchen staff must keep all perishable food items like milk, bread, meat and fish well refrigerated. They must check that the fridge is working at the right temperature. Temperatures above 69°C will kill most germs whilst temperatures below will prevent germs from multiplying. Fridge must be cleaned regularly according to ward routine.

Care of kitchen utensils

Kitchen staff must keep all the work surfaces clean. All kitchen utensils must be washed with hot soapy water after use. All washed kitchen utensils must be rinsed in hot water and left to dry afterwards.

Food preparation

All food requiring washing e.g. vegetables must be washed thoroughly with clean water. Cook food thoroughly especially vegetables and meat to kill germs. Keep all food covered until dished for each ward. Cover all food while transporting to the wards. Interval between cooking food and consumption of food should be short. If there is any unavoidable delay in serving, the food should be refrigerated.

Food care by ward staff

Cover all food served to patients until patients are ready to eat. Ensure that each patient has his or her own water jug. All food utensils e.g. mtikos (cooking stick) must be held by their handles. Avoid touching the inner surface of cups, mugs, glasses and dishes when serving. Ensure all food remnants are adequately disposed of. No food item should be left lying around in the ward kitchen. Clean and mop kitchen floor afterwards. Cover and transport all crockery and left over food back to the kitchen.

The Kitchen staff should wash all crockery on arrival to the kitchen in hot soapy water. Rinse in hot water and dry in open air. Store all clean crockery in a germ-free area for next use.

Medical exams

All kitchen staff must be medically examined before employment. From then on, they must have half-yearly medical examinations including 3 stool samples for culture-to detect carriers of enteric diseases.

They must report to the occupation health unit when they are sick.

Health education for kitchen staff

They must bathe everyday.

They must comb their hair regularly but not when in the kitchen carrying out their duties.

They must wear their nails short.

They must wash their uniforms daily.

They must wear a clean uniform everyday.

The Porters and the Maids

These category of staff clean the wards and the corridors. They carry the infectious wastes from all service areas to the incinerators. Included are the mortuary staff who transport the dead bodies to the mortuary. Instructions are carried out in the local languages.

Aim

To enable the participants to develop an indepth knowledge on communicable diseases, their prevention, the dangers associated with their duties and the importance of wearing protective clothing while on duty.

Duties of maids and porters/couriers

They come into contact with potentially infectious nursing care items e.g. poorly disposed sharps.

They clean and mop the floors, empty and wash patients' bed-pans and urinals and sluice soiled linen. They also handle infected linen.

The mortuary porters transport and handle dead bodies. Bodies remain infective even after death.

Whilst carrying out these duties, this category comes into contact with patients' excretions and secretions.

Dangers

Therefore they are at special risk of contracting HIV and Hepatitis B viruses should they sustain accidental inoculations on any part of their bodies.

Precautions

These should be the same as for laundry staff.

Observation skills

The porters and maids are instructed to be especially observant when on duty. They must watch out for poorly disposed sharps when disposing of sharp containers. Any broken glassware must be swept immediately and disposed into a sharp container.

In case of accidental injury, they are advised to report to the ward sister immediately.

Protective clothing

The porters and maids are taught about protective clothing and why they should wear them on duty.

Protective clothing help to control the spread of germs between staff and patients. They are worn when necessary.

The types of protective clothing available for them are:

- Heavy duty elbow-length gloves.
- Face masks.
- Plastic aprons.
- Boots.

Face masks

This covers the nose and the mouth. They protect the worker from acquiring germs that are spread in the air. Since they cover the mouth, they also prevent splashes and suspension of infective materials from entering the mucous membrane of the mouth while sluicing soiled linen or whilst washing toilets, bedpans and urinals.

Plastic aprons

These are worn over the uniform dress. They are impermeable to water. They prevent viruses and bacteria from reaching the uniform dress. They must be washed after each shift. Each worker must keep and care for their plastic aprons.

Gloves

They protect the wearer from touching infective material with the bare hands. Hands must be washed before and after removing them. Because they are heavy duty and long, they protect the hands and forearm.

Boots

These protect the feet from infective material, while they are sluicing the soiled linen.

Aspects of Health Promotion and disease prevention strategy for health personnel

Infection Control Unit teaches health workers on the importance of health promotion.

Health workers are advised to eat regular nutritious diet to increase their resistance to infection. They are advised to exercise regularly. They must have a half-yearly medical examination. All new staff are also medically examined. This procedure helps to isolate and treat healthy carriers.

- All health workers must be immunised against

measles and mumps.

- All child-bearing female staff should be immunised against rubella.
- All pregnant staff are required to be vaccinated against tetanus to protect themselves and the babies from tetanus.
- Every ten years, all health workers should get influenza vaccine.

Those working in areas where they handle blood and who are exposed to needle stick injuries should vaccinate against *Hepatitis B virus*. They must report to the occupational health unit when sick. With the increase in tuberculosis infections, all health workers should be tuberculin positive.

Educational strategy for the patients and their relatives

The departmental educational programmes are designed for patients and their relatives. These focus on the following:

- The importance of basic hygiene practices.
- The spread of communicable diseases.
- The danger of overcrowding in the wards.

A Case History

Handling overcrowding in Medical Wards

Over crowding decreases ventilation in the ward environment. It also hinders freedom of movement by the medical staff and therefore promotes cross infection. The extra traffic increases the chances of spread of infection. It must be noted that the number of germs in any area depends on the number of people there and the activities they engage in.

In a hospital, the wards and their corridors were always overcrowded with patients' relatives. This increased ward traffic also increased chances of cross-infection in the wards. So visiting periods had to be restricted to stipulated times. Each patient could have two visitors at a time. The hospital security guards now man the entrances to the wards during visiting hours in order to enforce this rule. The relatives were sad about these arrangements. The ward staff started the above educational programmes during visiting periods. They bore fruit. The relatives soon realised that they put themselves at risk by prolonged visiting. They found a makeshift waiting area under the trees just outside the block in between visiting hours.

For Health-Care-Providers-Rationale

The Infection Prevention Educational Program for health care workers aims at increasing compliance to Infection Prevention practices. There is the need to create awareness of the Infection Prevention Programme among the health care providers and the hospital workforce. The education

strategies must meet the needs of each department within the framework of the Hospital Infection Control Committee Policies. The hospital is categorised into the following as:

Strategic Hospital departments - these include the

- Operating Theatre Departments and the Casualty.
- The Labour Wards.
- Intensive Care Units (Adult and Paediatric).
- Dental Units.
- The Burns Unit.
- The Paediatric Surgical Unit

The topics included in the education strategy for each department are: -

- Maintenance of basic hygiene practices.
- Procedures carried out in the department.
- Equipment in use.
- Decontaminating, pre-cleaning, and sterilising of medical care items in use.
- Universal Infection Prevention Measures and prevention of occupational hazards.
- Isolation processes.
- Investigating and monitoring the outbreaks of hospital-acquired infections.

In summary, the Infection Prevention Officer should conduct a Needs Assessment in the Hospital. She/he would, then, identify and prioritize the problems. She/he then finds answers to the what, who, where, when and the

available budget to solve the problems.

In conclusion, the hospital work force has a collective responsibility in maintaining Infection Prevention measures. This requires working together conscientiously for the benefit of the relatives and hospital visitors and specifically for patients whom we care for.

CHAPTER 6

6.0 BASIC MICROBIOLOGY IN INFECTION PREVENTION AND CONTROL

6.1 Micro-Organisms In Relation To Hospital - Acquired Infection

Human beings live, breathe, touch and eat micro-organisms unknowingly. It should not puzzle us, then, that some live normally within and on us without causing disease.

Objectives

The learner/reader should be able to

- Define micro-organisms or germs and their classification.
- Identify their probable sites in clinical areas.
- List the advantages and disadvantages of Normal Flora.
- Classify hospital and community acquired infections.

Definition of micro-organisms:

Micro-organisms or germs are small tiny living organisms that cannot be seen by the naked eye but only through the microscope. They live on objects, dust particles and in the air that we breathe. They also live in and on the body of

animals, plants and human beings in the presence or absence of disease. Microorganisms may be bacteria, virus, fungi and protozoa. Some can cause disease (pathogenic) while others cannot. Those that do not cause disease are called the Normal Flora.

6.2 Normal Flora - Non-Pathogenic In Their Usual Sites

The microorganisms, which live peacefully within or on us without causing diseases, are called the normal flora. Various body sites have their own normal flora. Age, diet, and the environment influence the normal flora of an individual. We help out each other. We house them while they protect us in many ways. The advantages of these normal flora are listed below:

Advantages of normal flora:

- **Protection against malnutrition:**
In the intestine, they produce vitamins of the B group which protect us from malnutrition.
- **Blood Clotting:**
In the colon, they manufacture vitamin K which is necessary for blood clotting.
- **Protection against infection:**
In the adult vagina, the normal flora called lacto bacilli produce acid, which kill off germs that can cause disease in the vagina.

The presence of the normal flora helps to prevent infections by pathogenic bacteria.

• **Disadvantages of Normal Flora:**

Normal flora is not found in all the organs and tissues of the body. eg. Some sterile areas of the body, however, do not have any normal flora. These include the blood, the cerebro-spinal fluid, the urinary bladder, the uterus and its fallopian tubes, the middle ear and the para-nasal sinuses, the gallbladder, the trachea, bronchi and the lungs. The acid content of the stomach ensures that no normal flora survives in the acid media of the stomach.

Some differences in normal flora exist between bottle-fed and breast – fed babies. This is due to the mode and requisites for the preparation of infant feeds like the feeding bottles. So it is not uncommon to find *clostridium* species, *pseudomonas aeruginosa* and other gram-negative bacilli in the stool specimens of bottle-fed babies. The vagina of newly born baby girls should have no normal flora but acquire some within three days of delivery.

- In immuno-compromised clients they cause opportunistic infections.
- Normal flora can cause hospital-acquired infections.

6.2.1 How Normal Flora Cause Hospital Acquired Infections:

Normal flora can cause infections when transferred from their usual areas of abode to other areas due to unhygienic health practices. This can happen between patients and staff and vice-versa. One can also infect oneself by unhealthy life-style practices.

Hospital acquired infection can be endogenous or exogenous.

Endogenous infection

These are infections that are caused by patients resident normal flora. These have been transferred to unusual areas; where they can now cause disease.

Causes of endogenous infections

- Trauma e.g. ruptured intestine can pour its contents into the peritoneal cavity causing peritonitis.

By traumatising mucous membranes during semi-critical care procedures like catheterisation. The normal flora enters the blood stream causing infection which may lead to septicaemia.

Unhealthy life style

Unhealthy life practices like smoking can damage the ciliated epithelial linings of the respiratory tract. This trauma creates a portal of entry for the normal flora of the

respiratory tract. like *Streptococcus pneumoniae* which then becomes pathogenic and causes pneumonia by invading the traumatised epithelial lining of the respiratory tract.

Smoking also damages the ciliated epithelium of the upper respiratory tract when this happens squamous epithelium grows and replaces the ciliated epithelium. This then predisposes the individual to cancer. Alcoholism also damages the digestive tract. Oesophageal varices result and may eventually lead to cirrhosis of the liver.

Viral infections

These damage the epithelial linings of the respiratory tract. Normal flora enters and causes infections.

Unhygienic health practices

The patients can infect others by not observing basic hygiene practices e.g. not washing hands after using the toilet. These cause infections in the digestive tract e.g. cholera.

Immune deficiency diseases

Normal flora cause opportunistic infections in people with lowered immunity e.g. in immuno-compromised patients.

Exogenous infections

These are infections that are caused by extraneous organisms from the:

- Hospital environment.

- Health care providers.
- Equipment used for patient-care.

This can occur during critical care procedures when aseptic technique procedures are ignored.

Extraneous organisms are introduced into body tissues giving rise to exogenous infections. By not observing aseptic technique when caring for patients, health workers can cross infect their patients with extraneous organisms.

- Through the use of unsterile patient care equipment in sterile areas of the body.
- Through environment with improper patient and public conveniences e.g inadequate or complete lack of conveniences e.g toilet facilities.

Micro-Organisms in Carrier State:

Sometimes some health care providers and visitors can have some bacteria in them without suffering from the disease. But they can infect other people e.g. some people have the germ which causes meningococcal meningitis in their nasal passages. They do not suffer from meningitis but can infect others with low immunity. These people are said to be healthy carriers of the disease germs.

About 4% of the normal population carry *Neisseria meningitidis* in their nasal passages while some people carry *Salmonella typhi* in their gastro-intestinal tract.

Some people carry the *HIV/AIDS virus*, *Hepatitis B and C viruses* in the blood. The normal population of about 40% -80% carry *Haemophilus influenzae*, in their nasopharynx.

Streptococcus pneumoniae can be found in the nasopharynx of about 20-40% of the normal population. *Beta haemolytic streptococcus* are found in the nasopharynx of about 5-15% of the normal population.

Pathogenic bacteria

These are the bacteria which cause disease e.g. *Salmonella typhi* which cause typhoid. *Shigella shiga, boydii, sonnei, flexneri* which cause different types of dysentery.

6.3.0 Types of micro-organisms:

There are several types of microorganisms. For example

- Bacteria.
- Viruses.
- Fungi.
- Parasites.

Table 5 shows some of their locations in clinical care setting

6.3.1 Location of Viruses, parasites, and fungi in clinical settings.

Table 5

	Common Types	Where found in Clinical area
Viruses	HIV Virus Hepatitis B Virus	Infected blood and blood products. Patients' infected secretions and excretions. Used Sharps e.g. <ul style="list-style-type: none"> • Needles • Trocar and cannulae • Scalp vein sets etc.
Fungi	<i>Candida albicans</i>	bath tubs Shower floors Contaminated towels and bed linen Hands and clothing of Carers.
Parasites	<i>Trichomonas vaginalis</i>	feeding bottles teats Laryngeal blades Suction catheters Suction tubings.

6.3.2 Bacteria

Bacteria is a group of micro-organisms. They cause most cases of hospital-acquired infections. Therefore, they are of special interest in infection control programmes. They include cocci which are spherical in shape and bacilli

which look like rods

Vibrio Cholerae which are shaped like the “comma”.

Bacteria occur in two major groups, these are gram positive and gram-negative bacteria.

Each group is further divided into cocci and rods.

Gram Positive Bacteria

Microorganisms are categorised by gram staining. Staining classifies germs into gram negative and gram positive germs. Gram-positive organisms appear violet in colour. This is because they retain the colour of the primary stain, which is crystal violet.

Gram Negative Bacteria

These bacteria appear pink when seen under the microscope. This is because the primary stain is decolourised so they take up the colour of the counter stain, which is pink.

The Infection Prevention officer should know where these different bacteria occur in clinical settings.

Microorganisms are further classified depending on how they respond to antimicrobial agents.

Some can be resistant microorganisms, others can be sensitive to some antibiotics. This classification helps the physicians to make intelligent decisions on the use of effective antimicrobial agents. Thus they are able to predict how to handle these organisms when they occur in patients e.g. *Staphylococcus aureus* resistant to Methicillin has posed serious threats globally. As a result, patients with Methicillin Resistant *Staphylococcus aureus* (MRSA) should be isolated in health care institutions.

MRSA are, usually, also resistant to a wide-range of antibiotics. Other organisms which are resistant to a wide range of antibiotics are *Pseudomonas aeruginosa*. There is also Vancomycin resistant enterococci.

TABLE 6

Common types of bacteria and where found in clinical areas.

BACTERIA	COMMON TYPES	WHERE FOUND IN CLINICAL AREAS
1. Gram Positive Cocci	<i>Streptococcus species</i>	Anaesthetic equipment - endotracheal tubes - oral airways - face masks - laryngeal blades - suction catheters - suction tubings - dental unit - dental equipment
Gram positive anaerobic cocci	<i>Clostridium perfringens</i>	Theatre trolley wheels
2. Gram positive aerobic bacilli	<i>Bacillus species</i>	Clinic environment
3. Gram negative aerobic bacilli	<i>Pseudomonas aeruginosa</i>	Weak disinfectant fluid. Standing water solutions used in soaking instruments and thermometers in the clinical areas. Suction tubings, suction catheters etc.
Gram negative rods	<i>Salmonella typhi</i> <i>Shigella species</i> <i>Escherichia coli</i>	Exposed food items left on patients lockers.
Gram negative aerobic rods	<i>Klebsiella species</i> <i>Serratia species</i> <i>Acinetobacter species</i>	Long standing solutions like antiseptics and other lotions. Wet sites like washing bowls, bath tubs, infant feed bottles, nail brushes, floor mops, toilet brushes, buckets, sinks, drains and flower water, and respiratory suction equipment.

The knowledge gained from this tabulation and where the microorganisms can be found in clinical areas will help the Infection Prevention nurse to know the significance of specific microorganisms in nosocomial infections.

6.3.3 Specific Micro-Organisms Which Cause Hospital Acquired Infections

The commonest organisms, which cause nosocomial infections, are:

- *Staphylococcus aureus*.
- *Pseudomonas aeruginosa*.
- *Streptococcus species*.
- *HIV/AIDS virus*.
- *Hepatitis viruses*.
- *Clostridium perfringens*.
- *Neisseria meningitidis*.

The Infection Prevention nurse must know where they occur in clinical areas; their significance, their mode of spread and preventive measures.

Staphylococcus aureus

They are gram-positive cocci. They are arranged in clusters. They can be found on the skin, nostrils, urethra and perineum of healthy carriers.



Staphylococcus aureus, Adapted from North Manchester G. Hosp., Teaching Aids.

Significance of *Staphylococcus aureus*

They cause post-operative wound infections in surgical wards.

In the burns unit, they cause sepsis of the skin. They can also infect intravenous infusion sites. This infection can lead to bacteraemia.

In obstetric units, they can cause post-partum breast abscesses with pus and perinatal conjunctivitis.

In neonates, they can cause pustular skin rashes e.g. staphylococcal skin syndrome.

In medical wards, during lumbar puncture, they can infect cerebro - spinal fluid causing meningitis. In the Intensive Care Units this organism can infect patients on respirators. *Staphylococcus aureus* is very difficult to treat. It has the ability to secrete an enzyme, which dismembers and neutralises most penicillins. There is an emergence of strains of enterococci, which are resistant to vancomycin and methycillin. The genes for vancomycin-resistance is capable of being transferred into staphylococci. All carers must be aware of the implications of nosocomial infections with vancomycin and methycillin-resistant staphylococci.

Mode of spread

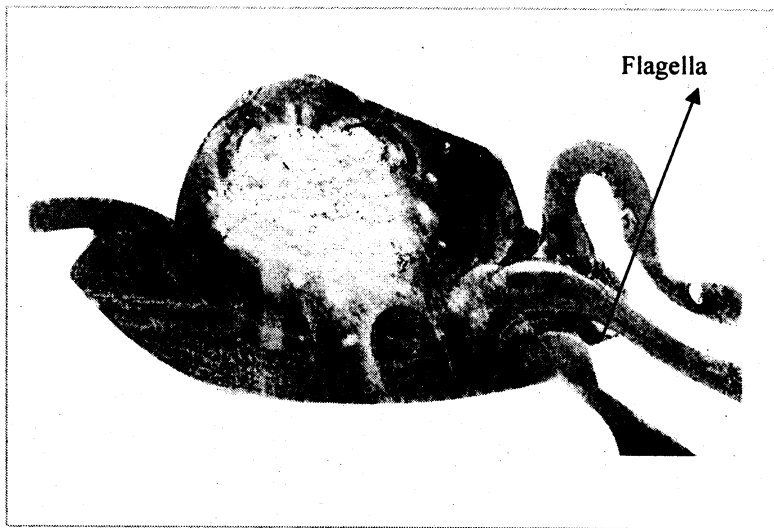
Staphylococcus aureus can be spread from person to person, through contaminated articles and air-borne dust particles.

Methods of prevention

Maintaining basic hygiene, especially by washing hands in between patient care, can effect Infection Prevention. All new staff must be screened before they start working.

Pseudomonas aeruginosa

They are gram-negative aerobic bacilli. They grow in standing water, weak disinfectant and antiseptic solutions used in soaking thermometers, cheatle forceps, suction catheters and instruments in theatres and emergency resuscitation equipment in the wards.



Pseudomonas aeruginosa, Adapted from North Manchester G. Hosp., Teaching Aids.

Significance of *Pseudomonas aeruginosa*

They are highly resistant to many antibiotics. They can grow in many types of environment including water in the sinks, wet beds, so they are said to be ubiquitous..

In neonatal units, they can cause umbilical sepsis. This can lead to septicaemia, meningitis and death.

They have been known to cause gangrene of the tongue in premature babies in some referral hospital in Zambia.

In Ear, Nose, and Throat wards, they can infect tracheostomy wounds.

Mode of Spread:

They can be spread by using contaminated nursing care items e.g laryngeal, endotracheal tubes, oral airways and mouth gags used in resuscitation.

Preventive Measures:

Carers must wash their hands before and after patient care. Where possible, use disposable items and dispose after single use. Autoclave all anti-static nursing care equipment used for patient care. Do not soak instruments, cheatle forceps and thermometers in weak disinfectant solutions.

The solutions may not get changed regularly due to heavy workload in the wards. Clean thermometers with some detergent, rinse, and wipe with methylated spirit and store dry. Use sterile cheatle forceps to pick up dressings from sterile drums. Sterilise and store emergency items in dry sterile trays.

***Streptococcus* species**

These are gram positive bacteria. They occur in chains which can be:

- Beta haemolytic.
- Alpha haemolytic.
- Gamma haemolytic.

Beta Haemolytic Group:

This group has other groups. These are groups A, B, and D.

***Streptococcus pyogenes* (GROUP A)**

These are the most significant microorganism in this group. They are also the most virulent.

Significance of *Streptococcus pyogenes*

They can cause hospital-acquired infections, since some health workers are healthy carriers of this organism.

They can be found commonly in the throat, and sometimes in the vagina.

They can cause wound sepsis in surgical and burns units.

Mode of spread

This is by droplet infection and by contact.

Method of prevention

Identify and treat all healthy carriers by conducting medical exams before starting work and half yearly for all hospital workers. All dressings must be done aseptically. All health carers must practise basic hygiene.

Streptococcus agalactiae: (GROUP B)

These occur as normal flora of the vagina and rectum.

Significance

Since they are present in the genital tract of mothers; so babies acquire the infection during delivery. In neonatal units, babies who get infected may develop pneumonia, respiratory distress, septicaemia, shock and subsequent meningitis. Death may even occur.

Streptococci (Group D)

They can be divided into *enterococci* and non-

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enterococci groups. They can be found in the lower part of the intestines and in the vagina as normal flora.

Significance

These organisms have been isolated in hospital wounds and urinary tract infections. They can cause nosocomial infections in the urinary tract, pelvic inflammatory disease and sometimes bacteraemia resulting in development of bacterial endocarditis. Most strains of the enterococci group are resistant to many antimicrobial agents eg penicillins, sulphonamides, cephalosporins, streptomycin and gentamycin

As normal flora of the gastro-intestinal tract, they can cause endogenous infections. They can survive heat of up to 60° C for 30 minutes. The Infection Prevention nurse needs to use this information when teaching laundry room staff, porters and maids who transport and sluice linen in clinical areas.

Alpha haemolytic

They are usually found as normal flora in the throat. This group causes partial breakdown of red blood cells. *Viridans* belong to this Streptococci group. The *viridans streptococci* which occur as normal flora of the mouth and oropharynx can cause subacute bacterial endocarditis in patients with rheumatic heart disease. *Streptococcus pneumoniae* is a common cause of pneumonia and meningitis. At least six species of *Viridans Streptococci* have been isolated. This includes *Streptococcus*

Pneumoniae. The other groups are *Streptococcus Salivarius*, *Streptococcus Milleri*, *Streptococcus Mutans*, *Streptococcus Miti*, *Streptococcus Sanguis*.

Significance

They cause dental caries especially *Streptococcus Mutans* and to a lesser extent *Streptococcus Sanguis*. They break down dietary sucrose and produce acid and hard adhesive dextran. The acid damages dentine while the dextran binds food debris, epithelial cells, mucus and bacteria to form dental plaques, which lead to dental caries. (Source Arora and Arora 2001).

Dental caries has become public health concern. (WHO, 2004).

So the Infection Prevention officer needs this knowledge to back up her teaching on the importance of oral care on patients to both home based caregivers in the community and health care providers in health institutions.

Gamma haemolytic Group

Gamma means 'no haemolysis' hence they are called 'non haemolytic' since they do not break down red blood cells in the blood Agar in the laboratory. Some are found in the intestines eg. *Strep Faecium* and *Strep*

of the Gamma haemolytic are found outside the
Strep Bovis, *Strep Equines*, *Strep Avium*

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f Hepatitis viruses. The

commonest types are Hepatitis A and Hepatitis B viruses.

Hepatitis A virus

WHO states that about 10-50 /100,000 persons suffer from this infection per year mainly in developing countries. It causes inflammation of the liver with an incubation period of 2 to 4 weeks. The disease is benign. Symptoms include fever, chills, headache, generalised weakness, aches and pains, anorexia, nausea, vomiting, dark urine and jaundice.

Mode of spread

It is spread through the oral-faecal route being an enterovirus. The virus can be isolated from the saliva, urine, faeces, blood, serum, and other fluids especially during the 2 weeks before and 1 week after onset of jaundice. Hepatitis A infection may occur among homosexual people due to oral-anal, and vaginal contact.

There is no vertical spread between mother and baby.

Significance of Hepatitis A virus

The virus is fairly resistant to heat and chemicals but autoclaving can destroy it. Also high-level disinfection by boiling is able to destroy it.

It is not affected by chlorination of well water and can survive for more than 9 weeks in wells hence the importance of building protected wells.

Once the disease is diagnosed and treatment given, one is completely cured. There is no chronic state of the infection.

Prevention

Passive immunity can be achieved by giving immunoglobulin injection. Proper disposal of faeces. Washing of hands after visiting the toilet.

Hepatitis B virus

The type B virus causes inflammation of the liver. This infection is characterised by fever and jaundice. This virus can be seen in infected blood, blood products, saliva, and semen and breast milk.

Incubation period

This lasts between 6 weeks to 6 months. The incubation period can even be as long as two years.

Significance: Risk of disease transmission

Accidental exposure of Hepatitis B virus (HBV) infected blood, of as little as .0000001 ml which is equal to a very small drop of blood containing Hepatitis B virus (HBV) can transmit HBV to a susceptible host. (Source, Bond, et al, 1982).

Health care workers are mostly at risk. Also patients who are exposed to infected blood, sexual contacts of infected people, contacts of infected mothers. Drug addicts who inject themselves and their friends with infected needles and syringes are at risk. Babies and children who are exposed to infected breast milk are also at risk. Syringes filled with multiple doses with multiple injections are also at risk. Blood that is drawn into the barrel of the syringe.

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If this serum is infected, the next child to be injected will be at risk of being infected. It can cause cancer of the liver.

Mode of spread

Hepatitis B can be spread by using needles and syringes contaminated with infected blood or blood products. It can also be spread by accidental inoculation with infected sharps in clinical areas.

Spread can also occur by being transfused with infected blood. Vertical transmission occurs when mother is infected. Babies can be infected by sucking their mothers breast milk. Children get infected when infected maids, nannies and mothers pre-chew food given to small babies. School children can infect each other by sharing bitten food. This disease is also spread by sexual contact.

Preventive measures

Infection can be prevented in the following ways:

- Screen all blood for Hepatitis B virus before transfusion is made. Barrier-nurse known patients - regard all patients as potentially infective.
- Screen all patients and their contacts in hospital. All staff to be screened e.g. Theatre, Intensive Care Unit staff, Renal Dialysis unit staff.
- Use sterile needles and syringe for each injection.
- Avoid accidental inoculation by not recapping needles after injection.
- Dispose sharps properly into Sharp containers.

Seal when full and incinerate.

- Infected mothers should not breast feed their infants.
- Do not feed children with pre-chewed food.
- School children should not share bitten food e.g. chewing gum or sweets.
- Practice safer sex, wear condoms if sexual contact must take place during period of illness.
- Screen and treat all healthy carriers.
- Health educate all groups at risk.

Prevention can also be achieved by vaccinating at risk groups with Hepatitis B vaccine.

Hepatitis C

This was identified in 1989. It used to be known as Hepatitis Non-A, Non-B. It is now known as hepatitis C. The incubation period is 6-7 weeks.

Mode of spread

It is mainly transmitted through transfusion of contaminated blood or blood products. It is common among intravenous drug users who share unsterile needles.

Prevention of Hepatitis C

1. Personal hazard for all health care providers. This infection can be very common, Community Based Agents, like traditional procedures like traditional

circumcision, tattooing and other types of tribal or ancestral scarifications with unsterile blades and needles. The disease is often mild but causes cirrhosis of the liver or cancer of the liver especially among alcoholics. From July 1, 1997 all blood donated by blood donors must be screened for Hepatitis C virus. (WHO 1997).

Prevention

- Conduct health education on the use of unsterile needles for injections.
- Create awareness on the susceptibility of health care providers to hepatitis C viral infection.
- Importance of screening of all donated blood before transfusion for hepatitis C virus.
- Provision of hepatitis C test kits at lower cost for developing countries.
- Barrier nurse - known patients - regard all patients as potentially infective.
- Screen all patients and their contacts in hospital. All staff to be screened e.g. theatre, Intensive Care Unit (I.C.U.) staff and who work in renal dialysis unit.
- Use sterile needles and syringe for each injection.
- Avoid accidental inoculation by not recapping needles after injection.

Treatment

Interferon, which is very expensive remains, a drug of

choice. Relapse occurs when treatment stops in about 50% of patients. Scientists continue to strive to find a vaccine for prevention of hepatitis viral infection.

The HIV virus

The health care workers can infect their patients and themselves with the HIV virus while rendering care. So they need to take great care to prevent this infection.

The Infection Prevention nurse must know how the HIV virus is transmitted. The officer must impart this knowledge to all care givers.

This knowledge will help the nurses to nurse infected patients without fear and at the same time be able to prevent nosocomial infections with the HIV virus to their patients and to themselves.

The HIV virus is a retrovirus. It possesses the reverse transcriptase enzyme. It is an intra-cellular organism. Once outside a cell, it dies very quickly. It has several glyco-proteins on its surface. One of them is the glyco-protein called GP 120. The HIV virus gets attracted to a cell of cells, which also have a glyco-protein molecule, CD 4 on their surfaces.

cells which are found in the thymus.
producing lymphocytes.

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The GP 120 of the HIV virus attaches itself to the CD 4 glyco-protein of the above cells. The HIV virus enters these host cells. The DNA of the HIV virus becomes integrated with the host cell where it replicates more HIV cells because it takes control of the DNA of the host cell and influences it to produce more HIV cells.

When the virus is inside any cell, it produces specific viral coded antigens on the surface of the host cell. This makes it possible for the cellular immune system to recognise it as a viral infected cell. When this recognition is made, the cytotoxic cells rush out to destroy it, but fail to do so.

In HIV infection, when the virus is attached to the T4 lymphocytes, it incapacitates it, therefore the cell-mediated immunity does not take place.

This leads to reduction in T4 lymphocytes in the body and gradual and steady loss of the immune response system of the body. The number of T4 lymphocytes in the body in normal individuals is above 800. During pathogenesis the numbers keep going down and if they get to 200 or below one is labeled full-blown HIV/AIDS patient. This level allows opportunistic infections to set in.

Significance of HIV infection

It has no cure or vaccines. Carriers look healthy but can still infect others.

The HIV viruses, which originate from the communities, continue to present overwhelming challenges in medicine.

Micro-Organisms Which Cause Opportunistic Infections in HIV/AIDS Patients

Opportunistic infections occur due to very low-immune levels of the sufferer.

Most of these opportunistic infections are spread by droplet infection in the communities where people cough and spit carelessly.

Corynebacterium diphtheriae causes myocarditis, and paralysis. The non-toxigenic strain causes pharyngitis. Wilson (1994) isolated some *Corynebacterium diphtheriae* in HIV patients attending an STI clinic in USA.

The nostrils and throats of HIV patients need to be swabbed in STI clinics or on admission.

Mycobacterium tuberculosis is also aerosol spread especially in high-density communities.

Cryptococcal meningitis is another very common opportunistic infection among the immuno-compromised patients.

The nostrils and throats of patients attending outpatient clinics need to be swabbed especially during the cold and windy seasons when these diseases occur.

These diseases also occur in patients with HIV virus. The nurse should take measures to prevent spread if the

permeable membrane of the

eyes and mouth can absorb infected blood and blood products, body excretions and secretions.

- By having sexual intercourse with an infected person.
- Vertical spread can occur between mother and baby.
- Intravenous drug users.
- Transfusion with infected blood.
- By re-using needles or other sharps.
- By transplanting with infected organ.

Preventive measures:

Refer to Universal Infection Prevention Measures or Standard Precautions in Chapter 9

Clostridium perfringens

These organisms are gram-positive bacilli. They are anaerobic because they can grow in environments without oxygen. They produce endospores, which can live in the soil, dust and clothes for long periods.

These germs can occur in carrier state in about 2 - 30% of the population. They are found in animals like cattle and pigs, also in fish and poultry. The spores are not killed by normal cooking temperature.

Significance of *Clostridium perfringens*

The Infection Prevention nurse must know that this germ can cause food poisoning in hospitals.

5% of females have them as normal flora in the genital

tract. If they have instrumental abortion with contaminated instruments they can develop endometritis or gas gangrene of the uterus, which can lead to the patient having a hysterectomy.

Incubation period

This can be from about 8-24 hours of eating infected food items.

Mode of Transmission

This micro-organism can be transmitted by eating pre-cooked or re-heated food items, e.g. when heat-resistant germs survive the initial heating and the organism multiplies rapidly e.g. meat dishes, especially where cooling and storing at room temperature is prolonged.

By using contaminated instruments especially those used in operations on the gastro-intestinal tract.

Signs and Symptoms

Infected patients will present with diarrhoea and abdominal pain. Sometimes, the germ can cause necrotising enteritis. In accident cases, especially those near the buttocks area, where the blood supply has been cut off or is inadequate, the germ may infect the wounds and cause gangrene.

Preventive Measures:

This involves good cooking and hygiene and proper refrigeration. In hospital, kitchen staff must be instructed on maintaining proper standard of food hygiene. Food not to be consumed immediately after serving must be

adequately refrigerated. Patients must be advised to avoid eating pre-cooked or reheated food items. Patients must be fed with freshly cooked food.

Neisseria meningitidis:

This is a gram-negative diplococci. During epidemics the carriers increase. They are found in the naso-pharynx of the upper respiratory tract.

Significance

The infection control nurse must know when to expect this disease. So as to mount preventive measures well ahead of time to prevent getting a flood of patients.

The epidemics occur during the months of May to October which are the cold and windy months in Zambia. It usually ends with the onset of the rains in November. Mostly children and young people are affected but during epidemics even adults are also affected.

Incubation period

The incubation period is usually within 4 days.

Mode of transmission

The disease is spread by air-borne droplet infection during sneezing, coughing and even talking facing each other directly. This disease spreads faster where there is overcrowding and poor ventilation.

Signs and symptoms:

Usually there is a history of sore throat or upper respiratory

tract infection. During this period, the germ multiplies in the naso-pharynx. Few days later, the patient may develop fever, headache that becomes more severe as disease progresses. Nausea and vomiting, stiff neck, patient may lose consciousness. Some rash may be present.

Preventive measures

In the ward, affected patients should be isolated. Patients' relatives and health - care-providers at risk should be vaccinated. The Infection Prevention nurse must organise health education sessions in the hospital. This aims at teaching people to avoid crowded areas like bars, parties and funeral gatherings, people should also be taught to sleep in well-ventilated rooms especially at night.

People must be taught to develop good health practices like, coughing and sneezing into handkerchiefs and to avoid spitting carelessly.

Vaccination

There are many antigen strains of *Neisseria meningitidis*. These are A,B, C and most recently new strains of W - 135, x, y have been isolated. In Africa, types A and C are the most common strains isolated. 'In Burkina Faso, the W- 135 strain was identified as the primary cause of a major epidemic of meningitis in Africa from February to May of 2002.' (Tropical Medicine and hygiene news, 2002).'

Contacts

Contacts must be protected by vaccinating them with the

tetravalent vaccine against meningitis. The vaccine provides protection against four strains of meningitis including A, C and W 135. The immunity may last up to 2 years, but duration of protection is not yet established.

Notification

The Infection Prevention nurse must keep a record of the analysis of cases of meningococcal meningitis as shown in the table below. As soon as the disease trend increases in the laboratory, the officer must notify relevant authorities and through them to the World Health Organisation since this disease is a Global Public Health problem.

Table 8.

summary/analysis of meningitis for august, 1993 UTH laboratory, Lusaka zambia

Total specimens received.....	333
Total culture positive.....	86
Neisseria meningitidis.....	54
Strep. Pneumonia.....	15
Haem. Influenza.....	3
Klebsiella.....	1
Salmonella.....	2
Cryptococcus.....	2
E. coli.....	1
Acinetobacter	-
Staph Epidemidis.....	1
No. Of samples of clear CSF.....	209
(WBC 5 Cells M)	

No. Of growth.....	-
No. Of samples of turbid.....	86
CSF. (WBC 10 cells M ³).....	-
No growth.....	-
Neisseria meningitidis adult/paediatric	- Adult (38)
Paediatrics	(16)

6.4.0 Emerging Micro-organisms in Low Income Countries

6.4.1 Ebola virus

Nick, (2000), reported that there had been outbreaks of the ebola virus in the Democratic Republic of Congo and in Uganda. There have been 4 known cases of ebola in USA. However in USA, the strain of ebola only affected monkeys and did not affect the human population. The strain was named "Ebola Reston" after the first case. The outbreaks occurred in monkeys at the following places:-

- 1989 - Quarantine facilities in Virginia Texas
- 1990 - Pennsylvania
- 1992 - Virginia Texas Quarantine facility
- 1996 - Sienna Quarantine facility
- 1996 - Phillipines outbreak of Ebola Reston at a monkey export facility.

Treviron, (2000), reported that scientists do not know where the virus specifically comes from, but it is contracted through body secretions and excretions. Even touching an infected person will cause one to contract the virus. Even if a person is cured, he can still pass the virus

through sexual intercourse up to a period of 6 months.

Nick, (2000), also confirmed Treviron's report that the ebola virus is transmitted by body fluids e.g blood, semen, saliva, and all body excretions and secretions. If the person survives the virus they still remain "hot" which means they still carry the virus in the system. Males carry the virus in the sperm, so even if they are unaffected, they can still pass it on to others through sexual intercourse.

There is no known cure for ebola. To help aid in survival, patients are treated heavily with fluids to fight dehydration. This is not a cure but it helps to fight the symptoms. To date there are no real prevention methods, other than to avoid contact with the infected people.

6.4.2 Severe Acute Respiratory Syndrome (Sars)

SARS: In full, this stands for Severe Acute Respiratory Syndrome.

Acute means this infection can start quite suddenly Syndrome means that this disease has a group of signs and symptoms, which can also be found in several other respiratory diseases. The signs and symptoms resemble those of pneumonia.

This disease has killed 580 people and infected more than 7,000 people worldwide since it emerged in southern China in late November 2002. SARS causes great fear globally.

Causative Organism

It is caused by an unusual strain of **corona virus**. Scientists have discovered that this virus has an enzyme called protease, which is key to the replication of the virus.

Mode of spread

It is a droplet infection, which is spread by air travellers. The spread of the virus is promoted when people are in close contact in a closed environment.

Signs and Symptoms

It is heralded by very high temperature, sneezing, dry cough, loss of appetite and weight.

Incubation Period is seven (7) to ten (10) days.

Treatment

There is yet no cure. Broad – spectrum antibiotics is used to prevent secondary bacterial infections. Treatment can be achieved by the use of protease inhibitors but this is still under scientific research.

Significance

This infection spreads very fast and so the casualties can be many. Anecdotal evidences exist on the death of medical care practitioners who have been infected and subsequently died while caring for infected patients. Since health care providers are very much at risk there is the need for them to protect themselves from infection while rendering care by carrying out universal infection prevention measures or

standard precautions. Special face masks should be worn while caring for patients.

Countries affected are mainly China, Japan, Canada and other far Eastern Countries and South Africa. It kills fast and affects socio-economic life and growth globally.

Prevention and Control Strategies

Health Border Posts control the entry of people who have been to the affected countries into Zambia. In Zambia these Border posts are used to monitor people who come into Zambia and who may be suffering from infectious diseases like SARS. In this way, International Health measures between Zambia and its Neighbours are maintained by Air at the Lusaka International Airport, and from land at Chirundu border post in Siavonga, Southern Province which forms an entry point from Zimbabwe, Mwami border post in Chipata, Eastern Province, forms the entry point into Zambia from Malawi. Mukambo border post in Mufulira, Copper Belt province forms the entry point into Zambia from the DR. Congo, Nchelenge and Chiengi both in Luapula Province form entry points from DR. Congo. Katima Mulilo Border post in Western Province which forms an entry point from Namibia. Kazungula in the Southern Province forms an entry point from Botswana while Kalabo also in the Western Province forms an entry point from Angola. Luangwa in the Lusaka Province forms an entry point from Mozambique. Livingstone, Zimbabwe border post in Southern Province forms an entry point from Zimbabwe. Nakonde border post in the Northern Province forms an entry point from

Tanzania. Mpulungu also in the Northern province forms entry points from DR.Congo, Tanzania and Burundi. Kasumbalesa border post in Chililabombwe in Copperbelt province forms an entry point from DR Congo. If people with suspected SARS enter the country, they are quarantined for periods that are longer than the incubation period. This is to ensure that they are not incubating the disease and so be a danger to the countries they are traveling to hence travelers are made to fill in forms indicating whether they have traveled to the affected countries.

The Infection Prevention personnel are required to have excellent working knowledge of all the entry points into Zambia for effective monitoring of International Health measures.

During care, patients are nursed on one to one basis, ie one nurse to one patient in-order to reduce the high risk of cross infection that may lead to increased numbers of hospital-acquired infections.

In some other countries infra-red lights are used to identify sufferers who have any symptoms of flu.

All affected persons are quarantined until well after the incubating period of the disease.

6.5.0 Environmental Micro-organisms

Environment is a collective term used to describe all the living and non-living things that make up our surroundings. There are four aspects to an environment. The purpose of this manual is concerned with the Biological environment.

6.5.1 The Biological Environment

The biological environment is made up of

- Insects – e.g. The female anopheline mosquitoes carry the Plasmodium Falciparum parasite which causes about 95% of malaria in Zambia.

Tsetse fly causes sleeping sickness (Trypanosomiasis). House flies infect our exposed food items with *Vibrio Cholerae*, *Shigela Shiga* and *Salmonella Typhi* which cause cholera, dysentery and typhoid respectively.

- Animals like infected rabid dogs can transmit rabies to their victims.
- Vegetation can harbour snakes and rats.
- Infective micro-organisms live in the environment.

The infective microorganisms can cause diseases; therefore, the environment dictates which diseases people may suffer from.

Environmental microorganisms live in our surroundings, and in our homes. Most of them can be found in the intestines because we eat things, which grow in our surroundings e.g. vegetables, especially when they are partially cooked or eaten raw. Again, due to water

shortages, we drink stored water, sometimes in containers without lids. *Campylobacter* normally found on cattle and poultry can settle on stagnant water in the environment. In the hospital environment, the most common pathogenic bacteria isolated by the Infection Prevention Unit of a referral hospital in Zambia between January-September 1995 are listed below.

- *Staphylococcus aureus*.
- *Escherichia coli*.
- *Klebsiella* species.
- *Proteus*.
- *Pseudomonas aeruginosa*.
- *Salmonella typhi*.
- *Streptococcal* species.

All the above microorganisms can cause hospital-acquired infections in patients.

In the environment of the same referral hospital in Zambia, streptococcal species were isolated from the following items

- Oxygen tubing.
- Incubators.
- Suction tubings.
- Theatre floors.
- X-ray couches.
- Weighing scale for babies.
- Cheatle forceps.
- Chopping board.

Pseudomonas aeruginosa was isolated from another

referral hospital in Zambia in the following items:

- trays for soaking emergency resuscitation equipment.
- in tubes for soaking thermometers.
- in containers for soaking cheatle forceps.

These environmental organisms can cause nosocomial infections during critical care procedures.

TABLE 7

Environmental organisms

Micro-organism	Group
<i>Moraxella species</i> <i>Serratia species</i> <i>Acinetobacter species</i> <i>Providencia species</i> <i>Campylobacter species</i>	Gram -ve rods
<i>Bacillus species</i> <i>Clostridium botulinum</i>	Gram + ve bacilli
<i>Cryptococci fungus</i>	Fungi

Significance of environmental micro-organisms

In the surgical wards, they can cause postoperative wound infections. They are known as facultative organisms because they can grow aerobically or anaerobically. When they grow anaerobically they can cause gangrene of affected tissues. They can also contaminate specimens collected for laboratory analysis. In addition, some of the

bacteria can grow in the hospital environment under moist conditions, e.g *Pseudomonas aeruginosa*. Having learnt about micro-organisms and especially the specific ones related to hospital-acquired Infections, the Infection Prevention nurse must now be able to effect plans focusing on preventing hospital acquired infections through proper instrument processing.

CHAPTER 7

7.0 INSTRUMENT PROCESSING IN HEALTH CARE SETTINGS AND IN THE COMMUNITY.

7.1 Introduction to Decontamination, Pre-Cleaning, High Level disinfection and Sterilization

General objective

To equip the reader with the knowledge and skill of the methods of decontaminating, precleaning and sterilising medical and nursing care items using available resources.

Specific objective

- To increase the understanding, knowledge, skill competence and proficiency in decontamination, disinfection, pre-cleaning and sterilising medical and nursing care items in health care settings and in the community.
- To prevent infection outbreaks in the Health Care System.

The key to Infection Prevention is cost effectiveness. This must be demonstrated in the use of indigenous technology in the environment of care while processing instruments in use in the community.

Health care providers need to observe basic hygiene practices in order to effect acceptable, decontamination, pre-cleaning, high level disinfection and sterilisation processes.

Basic hygiene practices require the provision of adequate soap and water supply, elbow-operated-taps, foot-operated bins (pedal bin) with well fitting lids and individualised hand drying towels.

7.2 Definition of key terms In Instrument Processing

Critical Care Procedures

These are sterile procedures, which require aseptic technique. They involve invasion of the patients sterile tissues e.g. surgical operations and injections. Critical care procedures require the use of critical care items.

Semi-Critical Care Procedures

These are surgically clean procedures, which involve contact with the patient's mucous membranes without penetrating it e.g. catheterisation. Semi-critical care procedures require the use of semi-critical care items.

Non-Critical Care Procedures

These are clean procedures. They come into contact with the patients' skin. The mucous membrane and the sterile tissues are not contacted during these procedures e.g taking a patient's blood pressure using the sphygmomanometer and the blood pressure machine.

Decontamination

This is the process, which precedes pre-cleaning of instruments during which all instruments are opened up and immersed in 0.5% sodium hypochlorite solution (chlorine) for 10 minutes to render them safe for handling.

It actually kills Hepatitis B and HIV virus within 3 minutes. In the community, boiling for 20 minutes, timing from boiling point can disinfect instruments.

Pre-cleaning

It is the process of removing organic material and grease which harbour germs from medical and nursing care items using brush and detergent or soap under running water or in a bowl of clean water. Pre-cleaning ensures adequate disinfection. Surfaces and furniture in the hospital environment require cleaning daily.

In the community, the community-based- agents can clean plates, pots, pans and bowls using ash from brazier. Ash has abrasive actions and thus makes effective cleaning agent in the absence of soap. If lemons are available e.g growing in the compound, these could be squeezed and their juice used for cleaning purposes in the homes, by the home based caregivers, when there is no soap.

High-level disinfection

This is the process of destroying and removing microorganisms in order to prevent their growth on inanimate or non-living objects. This process does not

affect the spores of the microorganisms. This can be achieved by using either heat or chemicals. **Spores** are inactive but nevertheless, viable forms of bacteria.

Antisepsis

This is the process of preventing the growth of germs on living tissues. This process does not affect the microbial spores.

Sterilisation

This process destroys the germs and their spores completely from items of patient care. It is an absolute term. Equipment and materials used in procedures, which involve a break in the skin or mucous membrane, should be sterilised e.g surgical instruments, intravenous fluids and drugs.

Pasteurisation

This is the process that checks the fermentation of milk. It kills TB bacilli and other pathogenic bacteria at a temperature of 63.0°C for half an hour.

7.3.0 Method Of Decontamination, Pre-Cleaning, High Level Disinfection And Sterilization

7.3.1 Method of Decontamination

In order to decontaminate any patient care items, the caregiver needs to have some specific measurement of water to be mixed with some specific amount of

hypochlorite solution. This knowledge and skill are necessary for successful decontamination process.

Calculating Required Strength of solution to use

How to calculate the total parts of water to be used in preparing the appropriate strength of dilution. Things to note

- Available strength of sodium hypochlorite solution or (jik) is what manufacturers have written on the bottle of sodium hypochlorite solution e.g 3.5% is the strength of hypochlorite solution sold in Zambia. Required strength of dilute e.g 0.5%. This is the strength of solution to be used for decontamination.

The formular is

$$\frac{\text{Available strength}}{\text{Required strength of dilute}} = 1$$

$$\begin{aligned} \frac{\text{Available strength}}{\text{Required strength}} &= \frac{3.5 \% \text{ concentrate}}{0.5\%} \\ &= 7-1 \\ &= 6 \text{ parts of water.} \end{aligned}$$

Source: (Zambia Infection Prevention Guidelines, 2003)
This means the carer needs to mix 6 parts of water to 1 part of hypochlorite solution in order to get 0.5% strength of solution. Decontamination inactivates Hepatitis B virus and HIV virus within 10 minutes of soaking in the appropriate strength of diluted hypochlorite solution. Immerse

contaminated instruments completely in the tank of hypochlorite solution for 10 minutes to render them safe for handling. Rinse instruments after wearing gloves and any other appropriate personal protective equipment. e.g. face masks and plastic aprons.

7.3.2 Pre-cleaning process

Pre-cleaning instruments with water alone removes about 50% of the germs on the equipment. The decontaminated instruments are then cleaned with brush and available soap under water until visibly clean. This method removes up to 80% of the germs. Pre-cleaning is necessary. Organic material may still be present after decontamination. It allows proper penetration of steam during sterilisation.

7.3.3 Disinfectants for disinfection

Disinfectants have certain qualities, which classifies a good disinfectant. A good disinfectant should be:

- Germicidal but not harmful to both man and animals.
- Needs time to act.
- Should not stain, bleach or burn fabrics.
- Should act in both acid and alkaline media.
- Should be readily available and affordable.

Examples of disinfectants used commonly in most hospitals in developing countries are:

Phenols

They can kill both bacteria and viruses. They can be used to disinfect *mycobacterium tuberculosis* germs. They are

cheap and are not readily inactivated by organic material. It can be toxic. An example of a phenolic preparation is the **carbolic acid**. It can kill tuberculosis germs. Other examples of phenolic preparations are the following:

- Chlorinated phenol, e.g. pynol, kynol, dettol. Phenolics are not effective against gram-negative rods e.g. *pseudomonas aeruginosa*. They can be used to clean up faeces or vomit, from patients with profuse diarrhoea as occurs in cholera patients, or in patients with dysentery, and typhoid or in cases where transmission of infection is likely. They can also be used to clean up sputum from patients suffering from pulmonary tuberculosis or patients who have methicillin resistant *staphylococcus aureus* infection.

Sodium hypochlorite solution (jik)

This disinfectant is both bactericidal and virucidal. It acts very quickly. It is used for decontamination and disinfection purposes, especially where barrier nursing is carried out. It should be used as soon as possible after preparation. It can burn the skin. It is very effective for viruses including HIV virus. Hypochlorite solution (Jik) can be used to clean up bloodstained material from patients suffering from *Hepatitis B virus* or in the Renal Dialysis Unit. Users should protect the solution from heat and sunlight for it to work effectively. Hypochlorite solution comes in different strengths. In our environment, household hypochlorite solution is used for disinfecting our

drinking water in order to avoid waterborne diseases like cholera because jik is non-toxic at low concentration. It is also not easily inactivated by organic material. Sodium hypochlorite solution can damage instruments or equipment made of rubber, metals and some plastics. It can be used to clean mattress covers, urinals and other items and furniture in close contact with infectious or immuno-compromised patients. Containers used for jik should be rinsed and dried.

Point to remember - The solution should be used within 24 hours.

2% Glutaraldehyde (Cidex)

This disinfectant can kill both bacteria and viruses. It can be used to disinfect instruments. It does not damage rubber and plastics. It can be used for endoscopes, ventilator tubings and respiratory equipment. It has a disinfecting stage of 10 minutes. During this period, it should destroy all vegetative bacteria including *mycobacterium tuberculosis*, *pseudomonas aeruginosa* and viruses. The solution should not be used when it is cloudy. The life of the solution is 14 days.

Alcohol

This is commonly called "spirit". It is not harmful to the skin. This can be used to clean instruments, and clean surfaces. It acts quickly and leaves surfaces dry. It is flammable. Alcohol 70% is effective in cleaning electrical equipment and also those items that cannot be immersed in other disinfectants like bell of stethoscopes and x-ray

equipment. It is popularly used in disinfecting trolleys before setting up for dressings. Alcohols are effective against HIV, HBV and HCV viruses. Ethyl and Isopropyl alcohol do not inactivate endospores. Ethyl alcohol kills all viruses. Isopropyl and ethyl alcohol kill tuberculosis germs (Rutala 1996).

Povidone Iodine

A good example is Betadine, which we use for pre-operative skin preparations. These antiseptics do not kill spores. They are very effective against gram-positive cocci. They are very expensive.

A case history on misuse of disinfectants

Most hospitals misuse disinfectants by using them for floor cleaning. Evidence based study has shown that soap and water can be used for proper cleaning of floors. It saves hospital money. The key to Infection Prevention in low-income countries is cost effectiveness. This was aptly demonstrated when we cleaned our hospital environment with Zamwasha (a local detergent).

Before this exercise, housekeeping budget stood at K80 million because disinfectants were used in cleaning. When we cleaned the environment with soap and water, the budget was brought down to an all time low cost of K10 million. Thus saving the hospital a staggering sum of K70 million.

Therefore, Infection Prevention practices should be acceptable and cost-effective. Appropriate and effective

use of disinfectants depends on acquisition of the knowledge and skill on the use of disinfectants in health care workplace. Germs die quickly on surfaces, which are clean and dry. This means that indiscriminate use of disinfectants will kill the harmless germs therefore allowing the growth of those germs, which are likely to cause disease. Most routine cleaning of surfaces can be done using some liquid detergent solution, water and clean cloth.

In summary, sometimes, disinfectants may not work because of improper mixture, and storage. In order to use disinfectants appropriately, the user needs to know how to mix them, their range of activity in terms of killing of spores, vegetative bacteria, viruses and fungi, their cost and toxicity.

7.4.0 High level disinfection

This process is used in the absence or breakdown of autoclaves. It can kill up to 95% of germs like *Hepatitis B* and *HIV viruses*. It does not kill bacterial spores.

This can be achieved by the following methods:

- Boiling.
- 2% glutaraldehyde (cidex) a chemical disinfectant.

7.4.1 Boiling

Hot water boilers can be used to render instruments safe for handling before cleaning and for disinfecting clean items for re-use. It is cheaper and more effective than the

use of disinfectants.

The use of hot water boilers

These are used in all service areas when autoclaves break down. Boiling in pots is the best way of processing instruments in the community. All items must be decontaminated in 0.5% chlorine for 10 minutes and then cleaned with brush, and soap under running water before being completely immersed under the water tank in health care institutions. The hot water boilers work between 65° C-100° C for 20 minutes.

The higher the temperature the shorter the exposure time. Disinfection of the immersed articles is timed from the boiling point of the water in the tank. This process can be used to disinfect instruments like, linen, bedpans, urinals and crockery.

Dressing forceps.

Vaginal speculae.

Coscles speculae

Cheatle forceps.

Gallipots and kidney dishes.

Respiratory equipment can be processed using hot water boilers. They must be dried thoroughly preferably air-drying after boiling. If left wet, gram-negative bacilli, like *pseudomonas aeruginosa* can grow on them and can infect patients. Hospital linen can be boiled at a temperature of 65° C for 10 minutes to disinfect them. During outbreaks of infective hepatitis linen must be washed at 93° C for 10 minutes to kill the *hepatitis virus*.

In the community, home based care givers can boil infected linen and contaminated patient care item for 20 minutes before washing. The carers are required to wear "shopping plastic bags" tied around their wrists or arms while handling the linen or other infective material. In the homes of patients with infectious diseases, hot water can be used to decontaminate plates, cups, forks, spoons and knives before washing them with ash from braziers.

Disadvantages of hot water boilers

Health care providers stand the risk of being burnt or scalded by the steam. Also by human error, items could be removed before being disinfected adequately, since no one times the boiler. There is need to time the boiler when it starts boiling. The heat does not penetrate the closed instruments e.g. artery forceps. It does not kill bacteria endospores and tuberculosis bacilli. Surfaces are wet when taken out of the steriliser so microorganisms can grow on them very easily.

2% Glutaraldehyde (cidex) This has a disinfecting stage of 10 minutes. (refer to 7.3.3 and 7.6.5.)

Antisepsis

can be used on skin tissue e.g. chlorhexidine. It is very effective against gram-positive cocci and spores. It is not to be used to clean the

7.6. Sterilisation Methods

7.6.1 Heat sterilization

- Moist Heat sterilization can be achieved by using Autoclave: The autoclave uses steam under pressure. The WHO and the Medical Research Council UK recommends the use of autoclave at these temperatures.

Temperature	pressure required	Time
121 °C	at 15lbs pressure for	15 minutes
126 °C	at 20lbs pressure for	10 minutes

Autoclave kills all germs including their spores. This method is available in most major hospitals in low income countries.

Points to remember

- All items to be sterilised should be properly packed.
- All sterile packs are to be used within 14 days.
- Store all sterile packs in dry and dust - free shelves.

7.6.2 Dry Heat

Dry heat sterilisation can be achieved by using Hot Air Oven. Hot Air Oven sterilisation can be found in most hospitals in developing countries. It destroys germs by oxidation. This process requires long exposure time in order to kill all germs and their spores on items to be sterilised.

Some Hot Air Ovens need special techniques to ensure that

all parts of items are exposed at the appropriate temperature for the appropriate length of time. Some Hot Air Ovens need fans to ensure their safety. Otherwise they can be dangerous and expensive to maintain.

Temperature	Time
Exposure	
160°C	2 hours
170°C	1 hour

• **7.6.3 Gas sterilisation**

This type of sterilisation uses the gas called Ethylene Oxide. Big industries in Europe use this type of sterilisation when sterilising items like urinary catheters etc. This process kills bacterial spores and viruses. The sterile packs remain sterile until opened.

Disadvantages

The gas is poisonous. It is very expensive. For now, this process is not available in most countries with resource limitations.

• **7.6.4 Irradiation sterilisation**

This type of sterilisation uses gamma rays from a radioactive source like cobalt 60. It penetrates closed packs effectively. It does not leave any radioactive residue on sterilised items. It cannot be used to sterilise glass items. It is commonly used commercially for sterilisation of disposable plastic items.

7.6.5 Chemical Sterilisation Using 2% Glutaraldehyde (cidex).

Chemical sterilisation is achieved by using 2% glutaraldehyde (cidex). This chemical is not effective until activated by adding the vial content into the accompanying solution. It is then shaken and can be used immediately. The life span of this mixture is 14 days if the mixture is well covered in proper cidex dish. Test stripes confirm the efficacy of the mixture at any one time. It should not be used when the solution appears cloudy. Instruments must be decontaminated, pre-cleaned thoroughly before immersion in cidex for sterilisation purposes. For sterilisation, all previously decontaminated, pre cleaned instruments are immersed completely in the solution for 10 hours to destroy resistant pathogenic spores like *Clostridium tetani*. At the end of sterilising, all items must be removed, rinsed thoroughly with either sterile water or sterile normal saline. They must then be stored using sterile technique especially equipment used in emergency situation like oral airways, mouth gag etc. Note that cidex is irritable to skin tissues and mucous membranes.

CHAPTER 8

8.0 THE DISEASE PROCESS

Introduction

The Infection Prevention nurse should know the disease processes if he or she is to effect their prevention and control both in the health care institutions and in the communities.

The disease process tells us what causes the disease (agent) where these are found (environment) and who harbours these disease-causing organisms (Host).

Chapter 4.1 - 4.3.1 defined Infection Prevention, nosocomial infection and reasons why infections occur within health care settings and susceptible patients to infections in the wards. Chapter 6.1 defined microorganisms while Tables 5 and 6 show where they can be found in clinical areas. This chapter discusses briefly the disease process.

General objective

To enable the reader to develop an in-depth knowledge of the disease process.

Specific objective

To define the key concepts in this topic:

- Agent.

- Host.
- Environment.

8.1 Three Interactive Factors That Cause Disease

There are three factors, which interact to cause disease. These are the environment, the Host and the Agent factors.

8.2 Agent factors

The agent factors are the germs, which cause diseases. The most important in the triad is the agent. The agents can be living or non-living. Living agents are called biological agents or vectors; these can be bacteria, viruses, rickettsiae, fungi and parasites. Infection can occur if only the infective dose is reached, e.g if a susceptible person ingests 100 organisms that cause dysentery, that person can suffer from dysentery.

Infection, on the other hand, can occur if one breaks the protective barrier by physical, or mechanical agents creating a portal of entry for microorganisms.

Poor nutrition lowers the immunity and contributes to infection by microorganisms.

Hormonal imbalance as occurs in diabetes mellitus creates a conducive environment in the blood stream which promotes growth of organisms.

8.3 Host factors

The host is the person who suffers from the disease. Illness or disease follows the entry of germs into the host.

The factors, which may influence the host defence mechanisms, are the following:

- Sex.
- Age.
- General mental and emotional health.
- Amount and duration of exposure to infection
- The person's natural immune mechanisms.
- Specific immune antibodies e.g. from previous exposure, vaccinations.
- Secretion currents e.g. tears.
- Glandula secretions e.g. saliva, gastric acid.
- Natural protective qualities e.g. mechanical barrier e.g intact skin.
- Environment.

8.4 Environmental factors

The environment is the place where the germs are found. The hospital environment, as a source of infection, has been dealt with in Chapter 4.3.

Each of these factors is insufficient to cause disease singly.

In the community, poor environmental sanitation can cause diseases. Germs like *shigella shiga*, *flex-neri* and *vibrio cholerae* can be found in pit-latrines, refuse heaps, infected water and food and on the hands of people who do not wash their hands after using the toilet. Mosquitoes are found in stagnant water in empty containers, overgrown grass, dambos and maize gardens during rainy season.

An interaction between the environment, host and the

agent factors has to occur in order to complete the epidemiologic triad. This interaction may lead to the spread of infection through many ways.

8.5 Principal Methods of Spread of Infection

Direct Transmission

- Physical: direct contact.
- Airborne-talking, sneezing and spitting.
- Contact with soil.
- Inoculation into skin or mucosa.
- Trans-placental vertical spread.

Indirect transmission

- Vector- borne: mosquitoes, lice, rat.
- Droplet nuclei.
- Dust.
- Formite-borne.
- Food-borne.

Definition of terms in the disease process.

Infection: This is defined as invasion of tissues by living microorganisms, which develop or multiply in man or animals. This invasion gives rise to an inflammatory process during which the body tries to defend itself against this invasion through an immune response. It is worthy to note that an infection does not always cause an illness.

Contamination

This is the presence of microorganisms on surfaces of the body, on or in clothes, beddings, toys, surgical instruments or dressings or other inanimate items like food, water and milk.

Pathogenicity: Capacity of a germ to produce disease change in a host.

Host: A person or animal/birds and arthropods (inclusive) that house an infectious agent under natural conditions.

Obligate host: This means the only host that can suffer from the disease e.g. man in measles and typhoid fever.

Primary or definitive host: This is the host in which the germ reaches its maturity or passes its sexual stage.

Virulence: This is the degree of disease-producing capacity.

Commensal: This is an organism that is normally present on the host.

Exotoxin: Disease causing protein, which is secreted by living bacteria.

Endotoxin: Disease-causing protein which is released

when the bacteria dies. It sets up an inflammatory process.

8.6 The Invaders

- **Bacteria:** e.g Positive/negative cocci, bacilli, spirochaetes, rods etc living, have enzyme systems.
- **Viruses:** Too numerous e.g neuro, vicerio, adeno, entero, viruses can only live inside cells.
- **Rickettsiae:** Tick/flea borne e.g typhus, resemble large viruses or small bacteria.
- **Fungi:** e.g Monilia (Candida) Cryptococcus.
- **Animal parasites:** Protozoa (Amoeba, malaria parasites).
- Nematode (hookworm, whipworms).
- Cestodes (pork, beef tapeworm).
- **External parasites:** Arthropods (lice)

When the germ enters the host, it may or may not cause an obvious disease. This may then set the natural history of disease into motion.

The natural history of disease thus occurs in two phases: the pre-pathogenesis and the pathogenesis phases.

8.7 The pre-pathogenesis phase

This period precedes the onset of a disease in man. The disease agent is in the environment; man has not yet come into contact with it. Man nevertheless, stands the chance of being exposed to the risk of catching this disease. This disease can affect only one person or many people at a time. When many people in the community are affected at the same time, we say that an epidemic has occurred.

8.8 Pathogenesis phase

The chain of infection begins when the causative organism enters a susceptible host through a direct or indirect contact. Majority of hospital-acquired infections occur through direct (person to person) contact. Indirect mode of transmission is through infected food, water, body excretions and secretions.

The mode of entry of these germs can be through the oro-faecal route, mucus membrane, broken or abraded skin.

On entry, into the host, the germ multiplies and may cause some tissue inflammatory reaction or physiological changes. These result in the signs and symptoms of the disease. The disease may then progress through an incubation period and advances to late pathogenesis. The patient may either recover, develop some sort of disability or defect or go into a chronic state of the disease like occurs in liver disease or may even die.

Sometimes the disease may not be clearly evident (subclinical). The host may end up being a carrier of the disease like may occur in typhoid.

CHAPTER 9

9.0 UNIVERSAL INFECTION PREVENTION MEASURES OR STANDARD PRECAUTIONS.

The main aim of Infection Prevention is to prevent spread of infection from a patient to another patient or from a health care worker to a patient or vice versa. This is achieved through the practice of Universal Infection Prevention Measures or Standard Precautions.

These are internationally approved measures which prevent health care providers from either infecting their patients or acquiring hospital infections whilst rendering care. In order to prevent disease transmission in the healthcare workplace, all carers are required to be knowledgeable on Universal Infection prevention measures or standard precautions.

Standard precautions stipulate that health care providers:

- Regard every one and every specimen as potentially infective.
- After exposure to specimens, blood and body-fluids, wash hands even if gloves are worn.
- Before removing gloves, wash hands thoroughly with soap under running water or water poured from a jug.
- Wear necessary protective clothing while nursing patients.
- Cover all cuts and bruises which offer portals of entry

for the HIV virus.

- Do not recap needles and syringes.
- Do not re-use single-use-disposable needles and syringes.
- Hands must be washed before and after each patient contact.

Source: Zambia Infection Prevention Guidelines, 2003

9.1 Handwashing

- Hand-washing is the single most important aspect in Infection Prevention.

Wash hands:

- Before and after each patient contact.
- After removing gloves, gloves may have holes in them
- After exposure to blood or any body fluids (secretions and excretions) even if gloves are worn.

Steps

- Use a plain or antiseptic soap.
 - Vigorously rub lathered hands together for 10-15 seconds.
 - Rinse with clean running water from a tap or jug of water.
 - Dry hands with own clean towel or air dry them
- (Source: Larsen 1995), (Zambia Infection Prevention Guidelines 2003).

All these aim at preventing occupational hazards. Health care workers need instructions on Universal Infection Prevention measures. They have been emphasised due to incidences of hepatitis among health care workers and

more so, since the advent of the HIV/AIDS pandemic. This knowledge base makes them feel part and parcel of the Infection Prevention Programme.

When contact is made with blood/body fluids from patients, gloves and plastic aprons must be worn. Gloves should be worn when carrying out a wet procedure. All health care givers must cover all cuts and abrasions with plastic dressings. This prevents absorption of blood and body fluids. Masks and goggles must be worn in operating theatre rooms and delivery rooms where splashing and suspension of blood and body fluids may occur. This prevents absorption of potentially infective blood or body fluids into the mucous membranes of the mouth and eyes. Standard precautions are a must when collecting specimens.

9.2 Specimens are defined as any part of tissue, blood or body fluids (body secretions or excretions) which are taken from the patients under the Doctor's orders and sent to the laboratory for investigations for the purpose of identifying causative organism(s), which may facilitate diagnosis and effective treatment.

Preservation of Specimens for Laboratory Investigations.

Specimens are preserved in **Peptone Water**.

Peptone water is an alkaline solution, which is used to preserve specimens for laboratory investigations. It maintains the PH and the viability of the bacteria in the specimens.

When a specimen is taken, e.g. stool specimen during cholera outbreak, the health care provider is required to break the mounted swab into the bottle of peptone water and close the lid tightly. This allows the full concentration of the bacteria for laboratory investigations.

In cases of *Vibrio cholerae*, it preserves the bacteria for long distances of journey to be undertaken especially from rural areas to the next health care centre with laboratory facilities. Specimens should reach the laboratory wet as dry specimens are not viable for laboratory examinations.

Points to note when collecting certain specimens for proper laboratory investigation and diagnosis in health care settings.

Collecting specimen for Wild polio Virus

Take two stool specimens: one for each day. Both specimens to reach the laboratory within 72 hours. After this time, the concentration of the virus starts going down. All stool specimens should be taken to the laboratory while warm, if not, the germ can die, for example in amoebic dysentery, the amoeba, just, dries out.

Pus specimens and Anti-Microbial Agents

Health care providers should not take specimens for laboratory investigations while patients are on antibiotic therapy. Antibiotics denature the cellwalls of the offending bacteria. So if pus is taken for laboratory investigations the specimens will not grow any bacteria because the cellwalls

have been denatured.

Mid- Stream Specimen of Urine

Urine specimens should be taken to the laboratory within an hour. If delayed oxidation occurs, urine may smell of ammonia and contaminants also may multiply. Crystals occur in oxidized urine, which may be mistaken for excreted renal calculi. This may lead to wrong diagnosis, wrong treatment and necessitates the patient staying unnecessarily longer days in the hospital.

Urine Specimen to Identify Schistosomiasis Germs

Advise patient to come and have the urine collected at mid-day. The germs have a tendency of boring through the bladder to reach a very high concentration at midday.

Advise patient to collect the last part of the urine during urination. This part of the urine contains the blood, which contains the bacteria.

Urine Specimen to Identify Trypanosomiasis (sleeping Sickness) germs. The highest concentration of the germs is at mid-night. Collect urine specimens best at midnight.

9.3 Prevention of Occupational Hazards

Health care workers face the danger of occupational hazards if they fail or ignore to observe the Standard Precautions.

Occupational exposure occurs when a hospital worker sustains an injury from a sharp object within the hospital environment e.g a needle-stick injury; or when a splash in the eyes or mouth occurs during specimen collection or blood or blood-products transfusion.

Health care givers should not recap needles after use. They must use disposable syringes and needles and dispose them into puncture-proof-containers. These are later sealed when 3/4 full and incinerated.

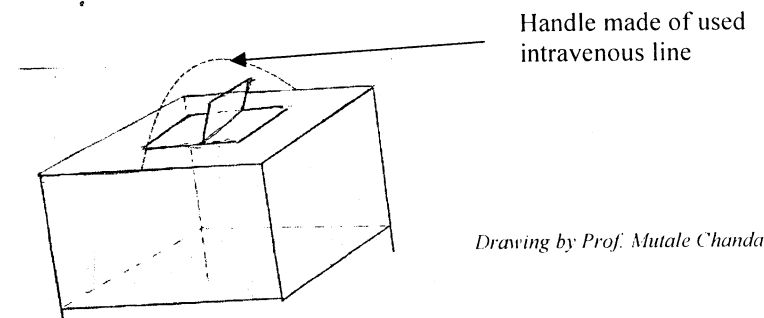
Double gloving is now recommended for all surgeons and nurses who scrub up for surgical cases or who suture episiotomies in delivery room suites. A study done at UTH in 1995 showed that 14 (82%) out of 18 Doctors, 12 (71%) out of 20 nurses who recap needles sustained needle stick injuries. (Chanda, 1995).

Guidance is, therefore, given on prevention of occupational hazards by proper handling and disposal of sharps, needles, syringes, intravenous cannulae and using the improvised sharp box.

Method of use

Seal the bottom of the box. Turn over to the top of the

box. Make a hole on top of the box long enough to accommodate both needle and syringe. Make two tiny holes at each side of the box. Insert and tie used disposable intravenous lines through these holes. This forms improvised handle for easier and safer carriage. When about 3/4 full, cover box by bringing the flap and seal the box. Wearing heavy-duty gloves, industrial shoes, and an overcoat, the porter should carry and dispose of it in the incinerator, or where not available in a pit-latrine in rural areas or a pit dug very deep enough for the purpose, so it is not within easy reach for the general public to get at them.



Improved thick cardboard box used for sharp disposal in UTH. (Initiated by the author in 1986)

What to do in case of an injury from a sharp object

Express blood immediately from the site of injury.

Cleanse area with an antiseptic solution.

Report to Infection Prevention Nurse and Casualty Department for an injection of Anti Tetanus Toxoid (ATT).

Check the HIV status of the source patient. Pretest

counseling is done to the injured. HIV status is checked in the laboratory if consent is given. If negative, test is repeated in three months time, and again in another three months time. If sero conversion has taken place, the incidence is documented as hospital acquired infection. The Hospital Management is informed for necessary actions.

The client is monitored from then on and stopped from working in critical care departments like, the Operating Theatre, Delivery suites and casualty department.

Actions to be taken if a Splash Occurs in the Eye or Mouth.

Immediately, wash eye with water and report to Infection Prevention nurse. Identify the source patient. Establish the client's HIV status. Go through the process of pre-test counseling and establishing the HIV status of the injured and offer care.

Antiretroviral drug, for example, Zidovudine, may be given to the injured in the above cases where the HIV status of the source patient is known to be positive.

Universal Infection Prevention and measures are practised for all procedures requiring aseptic technique. These include collecting bacteriological samples for laboratory tests. In strategic Hospital departments, the hand washing using soap under running water is to be followed by an antiseptic hand rub.

9.4 Isolation Processes

This is a procedure carried out when it is essential to

isolate and nurse a patient suffering from a communicable disease like pulmonary tuberculosis. The medical Practitioner is required to indicate when to institute barrier nursing for the safety of the patient, visitor and the carer. This decision is usually based on confirmed clinical diagnosis.

There are two types of Isolation Processes:

- source isolations.
- reverse or protective isolation.

Reverse Isolation

This is the process of protecting the most susceptible patients from acquiring infections in the wards.

The practice of putting patients with profuse diarrhoea at the last bay nearest to the toilet facilities is a classical example of reverse isolation in the form of intelligent geographical ward demarcation since these patients are mostly immuno-compromised. This practice protects them from the other patients as well as guaranteeing easy access to the toilets.

“The immuno-compromised clients are at increased risk of food-borne diseases and should not be allowed to eat high risk foods e.g. raw vegetables like (raw impwa, raw inswa and unwashed fruits from the market) left-over food or warmed-up food. The Bouchier Report (1998) on “*Cryptosporidium*,” stated that this organism, found in water supplies, can cause gastro-intestinal diseases. Hence, all drinking water should be boiled or chemically

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treated (Dept of Health, 1998). This should be done for the immuno-compromised clients especially those who have diarrhoea. It is worthwhile to note that these germs may already be present in the individual as normal flora. The endogenous flora of a client may alter due to the acquisition of new organisms and this can happen before isolation is started. Barrier-nursing a patient may not prevent them from developing an infection.

Source Isolation or Barrier Nursing

Clients who are frequently the source of infections should be isolated. This is mostly done in single rooms within the wards. In low-income countries, single rooms are limited so these clients are barrier-nursed in cubicles behind the screens.

Source Isolation includes nursing the client under the screen or in a single room if available. Barrier nursing measures are undertaken to prevent the health care provider from acquiring germs accidentally on the hands, and over the uniform dress. Protective Clothing made of impervious aprons or gowns may prevent the acquisition of germs in health care settings. The plastic aprons are worn over the uniform dress.

Staff should be very tactful on the use of protective clothing while nursing clients because of the psychological impact of protective wear on clients.

Protective clothing should be used to prevent contact with body fluids or other sources of contamination. Care should

be taken to ensure that body fluids do not come into contact with broken skin or mucous membrane. Protective clothing should be removed promptly when no longer required and disposed of as clinical waste. It is important to control the traffic within the environment of care. The pressure areas are cared for on four hourly bases to prevent pressure sores from forming. Also the mouth and teeth are cared for on four hourly basis. Wash hands after the removal of protective clothing. Face masks protect hospital staff from splashing of the patient's body fluids into the mucous membrane of the mouth.

Indications For Isolation

- Immune suppression where the client's blood neutrophil count is very low like in HIV infected clients.
- Immune suppression may occur for a variety of reasons eg
 - Organ transplants.
 - Extensive burns.
 - Some genetic disorders like sickle-cell anaemia.
 - Cancer clients who are being treated with high doses of chemotherapy.

Micro-organisms may be acquired from the hands of hospital staff, equipment or food.

Environment and Equipment

Single use items should be discarded after use.

No flowers and plants should be allowed in rooms where the immuno-compromised e.g. SARS patients are being nursed. They act as reservoirs for gram negative bacteria or fungal spores. Thorough environmental cleaning is necessary e.g. removing dust from surfaces. This may prevent infection.

Hand Hygiene

This is fundamental to all infection prevention measures. A combination of ordinary liquid soap supplemented with an alcohol-based hand rub is recommended.

Requirements in room/cubicle isolation

These depend on whether the identified germ is spread by contact or is airborne.

Isolation of Patients With Respiratory (airborne) Infections

The most common respiratory infection is the pulmonary tuberculosis and most recently the dreaded Severe Acute Respiratory Syndrome (SARS). The rooms/cubicles should be well ventilated. It must have its own toilet, hand washing facilities, a linen bin for client's dirty linen and clothing. There should be a supply of clean bed linen and hospital gowns. A trolley containing patients' crockery must be available, also wash-hand basins with elbow-operated taps, or two bowls for water on stands and jugs of water for pouring while washing the hands, a covered bin for litter, and a sputum carton which can be incinerated when full. Masks and barrier nursing gowns must be

provided for use by carers. A bell is required should the patient need attention. These requirements could be placed on trolleys or tables in case barrier nursing is done behind the screen.

'**DO NOT ENTER**' sign also written in the most popular local languages is posted on the outside of the door or barrier-nursing screen, barrier nursing ceases when the sputum tests are negative. Treatment is then continued at Tuberculosis Out-Patient Department (O.P.D). The client is referred to continue treatment at the local clinic under TB treatment supporters. The Tuberculosis Treatment Supporters are required to abide by the DOTS Strategy.

Requirements for Isolation of Enteric Diseases

These infections include cholera and infective hepatitis, typhoid and dysentery. In addition to requirements in a respiratory isolation room, the following are needed:

- a box.
- a barrier-nursing gown on the inside of the door.

How to Put on the Gown

Gowns must be worn properly. Wash hands thoroughly before wearing the gown. Touch only the inner part of gown while putting on the hands. Fasten neck ties, then waist ties. Put on gloves. Explain procedure to the patient. Carry out procedure as efficiently and friendly as possible while explaining the reasons for wearing the gown very tactfully to the patient.

Removing the gown

- Wash hands thoroughly.
- Undo the waist ties. Remove the gloves and dispose them in the bin. Wash hands thoroughly again. Untie gown at neck. Take it off and put into linen bin. Hang it up in case of linen shortage. Wash hands after patient care.

Care and advice to the patient

Explain the reason for the isolation and its procedures to the patient or client. The patient or client should be advised to observe basic hygiene practices e.g. washing his or her hands thoroughly before eating and drinking, after using the toilet and after blowing the nose. The patient must always use the sputum carton. The bin must be used for litter. Patients' personal effects should not be kept within the isolation room. These carry germs. Patient is allowed to move about within the room. Usually visitors are restricted. Pastors can visit the clients for their spiritual well being.

Advice to the visitors

Visitors are advised to report to the nursing station before going to the isolation rooms. Explain why the isolation is necessary to the clients. The nurse seizes this opportunity to explain isolation procedures to them. If visitors are present, they should not be allowed to visit the patient if their immunity is already too low. The

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visitors must be told why the isolation is necessary. They are required to leave their personal belongings at the nursing station. Advise visitors to wash their hands before entering and after leaving the isolation room. They must be helped in putting and removing the barrier-nursing gowns. Make visitors feel free to ask for clarifications whenever in doubt as to what to do in the isolation room. Barrier nursing should be carried out in the following cases:

In Medical Wards

- Meningitis cases due to *Neisseria meningitidis* should be isolated for the duration of the illness.
- Infective hepatitis to be isolated for the duration of hospitalisation.
- Typhoid fever to be isolated till after three negative results of blood culture.
- Anthrax to be isolated till the duration of illness.
- Gas gangrene to be isolated till the duration of illness.
- Rabies cases to be isolated till the duration of illness.
- Brucellosis to be isolated till the duration of hospitalisation.
- Bacillary dysentery to be isolated till the duration of illness.
- Amoebic dysentery to be isolated till the duration of illness.

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Advice to the visitors

Visitors are advised to report to the nursing station before going to the isolation rooms. Explain why the isolation is necessary to the clients. The nurse seizes this opportunity to explain isolation procedures to them. If visitors are unwell, they should not be allowed to visit the patient being isolated since their immunity is already too low. The

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- Bacillary dysentery to be isolated till the duration of illness.
- Amoebic dysentery to be isolated till the duration of illness.

- Cholera to be isolated till the duration of illness.
- Open Kocks' infection until two weeks after the commencement of effective treatment to which the patient has responded and after health-education on basic hygiene practices in the home and continued therapy at the nearest clinic.
- Extensive burns till the burns heal.

Neo-natal Units

- Also neonates with staphylococcal infections and gram-negative microorganisms resistant to anti-microbial agents like methicillin and gentamycin should be isolated ideally till the duration of illness. In neo-natal units, premature babies born to mothers suffering from cholera and dysentery should be barrier-nursed. Also to be isolated are babies with skin infections of staphylococcal origin e.g. the staphylococcal skin syndrome to be isolated till the duration of illness.
- Herpes Simplex till the duration of illness.
- Ophthalmia neonatorum till the duration of illness.
- Umbilical sepsis till the duration of illness.
- Jaundiced babies till the duration of illness.

Paediatric Units

In Paediatric unit, barrier nursing must be carried out on children suffering from communicable diseases e.g. tuberculosis and measles These children should be isolated until

four-five days after onset of rash.

- Mumps, children with mumps should be isolated for at least nine days after onset of swelling.
- Whooping cough cases to be isolated for at least seven days after commencement of medication.
- Children suffering from diphtheria to be isolated till the duration of illness.
- Children suffering from chicken pox to be isolated till the duration of illness.

Obstetric Unit

In post-natal wards, mothers with puerperal sepsis should be isolated till at least twenty-four hours after starting on a sensitive antibiotic therapy.

9.5 Notifiable Diseases

Most of the diseases, which are barrier-nursed, also need to be notified to the Ministry of Health.

The following diseases are notifiable:

Ebola

Paratyphoid

Plague

Rabies

Relapsing fever

Sleeping sickness

Yellow fever

fever Malaria

Leptospirosis

Leprosy

Food poisoning –

individual or group

Typhus

Cholera

Tuberculosis

Severe Acute Respiratory Syndrome (SARS)

Way Forward

Nurses should recognize the reaction of the client to protective clothing. The nurse should then reflect it in the nursing care plan and carry out interventions to respond to the psychological need of the patient so as to put the patient's mind at ease.

Conclusion

The Primary responsibility of staff is to maintain the highest standards of established Infection Prevention practice and so protect the patients who are most vulnerable from avoidable hospital acquired Infection

CHAPTER 10

10.0 PREVENTING HOSPITAL ACQUIRED INFECTIONS IN HOSPITALS

10.1 Introduction To Infection Prevention Practices

There is need for the Hospital Management to be committed to the constant and regular provision of resources through efficient budgeting and prioritizing. This would facilitate consistent cleaning of all clinical areas. This can also be enhanced by periodical surveillance of strategic hospital departments as a priority.

The Infection Prevention Officer should ensure the constant availability of soap and running water for hand washing in-between patient-care, provision of elbow-operated taps, foot-operated bins and facility for hand drying. However, the maintenance of basic hygiene practices, so essential in prevention of cross infections, in health institutions should be achieved at a price that the institution can afford.

In the service areas, the officer should motivate the carers to improvise sensibly without compromising nursing care so as to achieve the same goal of Infection Prevention even under extreme financial constraints.

General Objectives

To enable the officer to resolve the constraints and causes of hospital-acquired infections in the most economic way.

Specific Objectives

- To protect susceptible cases from acquiring infections in hospitals.
- To differentiate between hospital and community-acquired infections.
- To identify methods of preventing hospital-acquired infections in specific units in the Hospital.

10.2 Steps to Prevent Nosocomial Infections in clinical areas.

Limiting Over-crowding

Ideally, spaces between beds should be three meters. The hospital policy must limit overcrowding of beds in all services areas. Overcrowding limits freedom of movement of the nurses who are giving care. This space-limitation encourages cross-infection between staff and patients. Hospital beds should be able to be moved around easily for cleaning and caring purposes.

Nurse-patient ratio

Again, the hospital policy must limit the nurse-patient ratio. In most strategic hospital units like Intensive Care Units the ratio should be 1 Registered nurse to a patient. Acute shortage of nurses encourages patients' relatives to come into the wards and help their loved ones. Uninstructed, these relatives could spread germs to their patients and themselves.

Proper Maintenance of Hospital Environment

Mosquito Control Exercise

The Infection Prevention nurse has the responsibility to co-ordinate with appropriate units like the Environmental unit to effect mosquito control exercises e.g Patients should sleep under Insecticide Treated Nets.

- grass must be cut as low as possible
- maize gardens should be prohibited within hospital grounds
- all windows must have wire meshes

These measures would help to prevent mosquitoes entering the wards and infecting in-patients, staff and visitors.

Pest Control Exercises

The Infection Prevention nurse can ensure that pest control exercises are carried out regularly in manholes and sewer systems. These exercises help to prevent diarrheal diseases amongst patients. They also stop gigantic rats from eating the bodies of dead patients, much to the distress of relatives.

Hygiene Exercises

The Infection Prevention nurse must co-ordinate with the head of the general workers to ensure that hygiene is maintained in hospital outpatient toilets.

All bins should have lids. Bins must be emptied after each mealtime. The bin should be washed and kept dry. Patients and relatives must be encouraged to use litter bins

properly. This practice will discourage breeding of flies.

Proper Hospital Refuse Disposal System

In the absence of an incinerator, hospital refuse must be burnt in refuse pits. This will have these desired effects e.g.

- Breeding of flies will be prevented
- Littering by dogs will be stopped.
- The urban poor will not get at them and infect themselves.

A Case History

Operation Refuse Disposal-Colour-Coded Plastic Bin-Liners

Aim: To achieve a clean health care environment. All refuse to be regarded as potentially infective.

Method: Calculate number of dust bin liners to be used in each ward.
Identify colour code for each type of refuse.

Yellow for medical waste like used dressings, bandages, gauze and dirty swabs.

Yellow puncture-proof containers for sharp disposal where these are available.

Red for toxic materials, for example,

radioactive waste-material, chemicals and human tissue eg. amputated limbs, infected hospital wastes e.g. and specimens from the laboratories.

use proper containers for chemo
Black for domestic refuse like wet kitchen refuse e.g. ward food remnants and kitchen refuse.

Plain for dry refuse e.g. papers.

Each dust bin liner is to be tied up and taken for incineration except the wet refuse.

Leave wet refuse only in designated areas while awaiting collection by the City Council.

The City Council collects the wet refuse as per arrangement with the kitchen staff.

Maintenance department ensures the wet refuse is collected as per arrangement to prevent dogs littering them.

Expected Outcome: Each dust bin is to have its own refuse, there should be no mixing of refuse material

A CLEAN ENVIRONMENT IS A JOY TO THE EYE

10.3 Ward situation analysis

The Infection Prevention nurse, together with the ward staff, must work out a process, which facilitates nursing without the infection hazard in the wards.

The ward is analysed into cubicles for:

- critically ill patients.
- semi-dependent patients.
- patients for investigation.
- critically ill patients depend completely on nurses to do everything for them e.g unconscious patients.
Nurses must change their positions on two hourly basis to prevent chest infections which are caused by secretions settling on one side of the lung. This secretion provides an excellent growth media for bacteria, which can cause pneumonia.
- Semi-dependent patients need staff to perform certain duties for them e.g. dressings.
- patients for investigations need nurses attention for aseptic specimen collections. They need a floating nurse.

The table below shows how this ward analysis can be practiced.

Table 8

NO. OF STAFF REQUIRED	CONDITION OF PATIENT	TYPE OF ALLOCATION	WARD ROUNDS
2 Registered nurse student nurses	Critically ill	Patients allocation	In-charge
1 registered nurse with student nurses	Semi-dependent patients	Task allocation e.g dressings emptying of urine drainage bags. This ensures clean procedures are done before dirty procedures. It also prevents cross infection.	
1 floating zen nurse	Patients for investigations	This ensures that all specimens are collected aseptically and sent for Laboratory testing	

Total No. Of Nurses = 5

1 In-charge.

2 Zambian Registered Nurses (ZRNs).

1 Zambian Enrolled Nurse (ZEN).

Ps. This table just gives an idea of how a ward can be organized.

Geographical Ward Division

The ward situation analysis works better when combined with dividing the ward geographically thus:

In Medical Wards

- The critically ill patients are nursed in the centre bay opposite the nurses' station.
- Institute appropriate isolation procedures like keeping sputum positive T.B patients in the side rooms. With the increased number of these patients currently, day rooms could be converted into T.B. wards.
- Patients with non-epidemic diarrhoeal diseases are nursed in the last bays for easy access to the toilet facilities.
- Patients who develop cholera are transferred to cholera unit following the ward guidelines.
- All these methods will protect patients at risk from hospital-acquired infections.

Surgical, Obstetric and Gynaecological Wards

The same principle of geographically dividing the ward and analysing the patient-situation should also be applied in the surgical wards. They aim at preventing wound infections amongst surgical patients by:

- Admitting patients for elective surgery on morning of operations.
- Mothers who have Caesarean Sections, can have their own beds preferably in a bay and side rooms.

They must have own toilet facilities. They could bring in own wash-basins if desired.

- Remove dressings from operation sites on first day post operation. Nurses must be able to recognise signs of wound infection.
- Keep operation sites dry with methylated spirit till suture is removed.
- Do dressings at least an hour after ward cleaning. By this time dust have settled on the floor. Once settled on the floor the dust is not easily re-suspended in the air.
- Catheterise patients only when absolutely necessary.

10.4 Preventing hospital-acquired infections in Specific hospital units.

Neonatal Units

Cross infections may occur during nursing interventions or between mother and baby during delivery or breastfeeding.

Hand washing is the most single important method for Infection Prevention in the unit. If the institution can afford it, this should be followed by an antiseptic hand-rub.

Plastic aprons or cotton aprons should be worn over the uniform dress whilst rendering care.

Cleaning of baby scales:- Wipe over with paper towel soaked in 0.5% jik or one in 30 alcoholic savlon concentrate.

Incubators: Wipe over daily with paper towel in 0.5% Jik or one in 100 aqueous dilution of savlon hospital concentrate. After discharge of a baby, the inner surface of the incubator should be cleaned with soap and water, and dried, (gram negative bacteria can multiply in moist areas). In isolation rooms disinfect with 0.5% hypochlorite solution and air-dry.

Intensive Care Units

This is one of the strategic hospital units, which receive patients at high risk of acquiring infections as inpatients. All care must be taken to protect them from nosocomial infections by observing the following rules:

Restricting visitors to control traffic in the unit. All staff must wear protective clothing while rendering care, and a cotton gown over the uniform at all times in the unit.

Health-care providers in Intensive Care Unit

Health-care providers, in this unit, should render the highest standard of care at all times. All staff must observe stringent hand washing technique in-between patient care and before and after any procedure.

Infected Patients In The Unit

Precautionary measures must be taken for all infected patients requiring isolation. Where possible all patients suffering from infectious conditions are to be barrier-nursed in special cubicles.

Prevention of Urinary Tract Infection in Catheterised Patients

Care of urethral catheters should be carried out under aseptic technique daily.

Catheter specimen of urine, if required by the doctor, must be collected using sterile procedure.

Back-flow or urine must be avoided when emptying urine bags. Nurses are required to anchor urine bags with urine-bag holders on the patient's bedstead.

Prevention of Infections on Intravenous Sites

Intravenous Therapy

Cleaning of the Skin Before an Intravenous Therapy

Before setting up intravenous infusion. Clean the insertion site, with one in ten alcoholic dilution of hibitane concentrate or methylated spirit as it has a drying effect, using a circular outward motion from the site of insertion.

Allow drying before inserting IV needle.

This procedure is done under aseptic technique. The puncture site should be covered with a sterile dressing.

Observe for Signs of Inflammation Daily.

Intravenous catheter used in cut-downs should be changed every 72 hours.

Do not use cloudy infusions as they may be contaminated. The same infusion bottle should not run for more than 12 hours.

Do not use ordinary needles as air-inlets. The needle, which accompanied the giving set, is to be used for this purpose.

Change all giving sets, at least, every 48 hours, especially if dextrose solution has been administered. In cases of blood transfusion, change the giving-set at the end of the transfusion.

Put up intravenous infusion therapy aseptically. Thereafter the intravenous site must be closely observed for any inflammation.

Nurses must wash their hands with soap and water in between patient care in all areas but in Intensive Care and Burns Unit, hand washing must be followed by an antiseptic hand rub.

Care Of Tracheostomy and Intubated Patients

Patients on artificial or mechanical respiration are predisposed to nosocomial infections, like pneumonia. This is because the exudate within the circulatory tubing can be contaminated with hard-to-treat microorganisms. Microorganisms can colonise the oropharynx and the trachea of patients on mechanical ventilation predisposing them to nosocomial pneumonia. Once a patient is infected, same infection can very easily be transferred to other patients.

Examples of these germs are

- *enterococci faecalis*.

- *pseudomonas aeruginosa*.
- *staphylococcus aureus*.

Therefore, before sucking out secretions from a patient, wash hands with soap under running water. Wear gowns and masks and sterile gloves. Dress the wound under strict aseptic technique. Lubricate the sterile catheter with sterile water before sucking the patient.

In low income countries, where the same suction machine is used on several patients, change the catheter and suction tubing after sucking each patient. If used for only one patient, change only the catheter for each procedure.

Change the suction tubing daily. It is important to send the aspiration for laboratory analysis daily if the doctor orders it.

Care Of Respirators

• Disinfecting Mechanical Respirators

Different manufacturers make different respirators. They are, therefore disinfected differently. So it is best to follow the manufacturers guide whilst disinfecting the machine. The modern designs have respiratory circuits, which can be autoclaved.

As a rule, follow these principles

- Use one respirator for one patient.
- Always wash and disinfect the humidifier, or the nebuliser tubing and other removable parts or

autoclave the respiratory circuit before use on another patient.

- Change, disinfect, or autoclave the humidifier, tubing and removable parts every 24 hours, where possible, if the patient is on continuous or intermittent positive pressure machine.

Disinfect and refill humidifier bottles on oxygen cylinders every 24 hours if used on the same patient, or between uses by different patients in all clinical areas.

The Infection Prevention Officer should co-ordinate with the Departmental Nursing Officer on how to improve all service areas in order to keep them hygienically clean by:

- providing adequate soap and running water for hand-washing. Ideally taps should be elbow operated.
- Providing paper hand towel or individual towels for drying of hands.
- Providing foot-operated bins.

Ward architecture, Care of patient-care items And Maintenance Of Basic Hygiene Practices

The wards must be cross-ventilated. This prevents the spread of air-borne diseases by encouraging thorough airflow.

Care of the Ward Kitchen

The Infection Prevention nurse is required to stress to the maid supervisor to ensure that all food remnants are cleared from the ward and the kitchen after meal times.

Dustbins are emptied, washed, dried and covered.

Samples of food items eaten by patients are taken and sent to the Food and Drug Laboratory before each meal is served. These samples are used for Laboratory analysis should food-poisoning outbreak occur. Results of the analysis help the hospital to prevent further outbreak from occurring.

Care of the Ward Floors: The ward floors must be cleaned with water and liquid detergents regularly and especially after visiting hours. When there are spillages, mop with 0.5% hypochlorite solution. Follow written guidelines.

Care of Mops: Check for the presence of sharps e.g. needles and blades. Decontaminate in 0.5% Chlorine for 10 minutes and wash thoroughly in detergent, wring out, and air dry.

Care of Mop Buckets: Plastic buckets are recommended. Wash with soapy water, and store dry.

Care of Patient's Excretions and Secretions

These consist of patient's bowel motions, urine, sputum and vomitus.

In the absence of bedpan washers and sterilisers, the nursing-staff should wear face masks and disposable gloves when handling bedpans and urinals. Patients excretions and secretions should be flooded with 0.5% hypochlorite solution for 10 minutes before pouring down sewer drains. Wash bedpans and urinals with brush, soap and water. Soak them in hypochlorite 0.5% solution for 10 minutes. Hang up to dry. Remove gloves and discard into waste bin. Wash hands with soap under running water.

Care for Sewer Drains in the Wards

Sewer drains should be flushed. Scrub, using a toilet brush, wash with liquid detergent and water solution. Disinfect with hypochlorite solution 0.5 % or flush with harpic liquid.

Care of Toilet Seats

Wearing appropriate protective clothing, decontaminate the toilet seats by wiping them with disposable paper soaked in 0.5% hypochlorite solution, mop dry.

Cleaning of Bath and Wash Basins

Scrub with a separate mop, cloth or brush using 0.5% chlorine solution daily and whenever necessary.

Care of Bed-stead

Clean with water and detergent.

Bedding

For all linen, washing should include a disinfecting stage at 65°C for at least 10 minutes or at 71⁰ C for at least 3 minutes.

Plastic mattress and pillow cases should be decontaminated by wiping over with 0.5% hypochlorite solution. Leave for 10 minutes, Wash with soapy water and dry before next use.

Thermometers

These should be stored dry, and wiped with 70% Isopropyl alcohol before and after use.

Cleaning of Aurescopes

Wash with detergent rinse and dry. Immerse in 70% isopropyl alcohol for 3 minutes and store dry.

Cleaning of Stethoscopes

Wipe bell and ear piece with 70% Isopropyl alcohol.

Care of Syringes and Needles

All used sharps including syringes and needles should be disposed of into improvised thick cardboard boxes which cannot be penetrated by sharps ordinarily, i.e. where the institution cannot afford puncture-proof disposable plastic containers. These can be obtained from the pharmacy department of the health institution.

Care of Suction Machines

Store dry when not in use. Before use fill the bottle with

an available disinfectant to a depth as stipulated in the guidelines. Empty at least twice a day when in use. Use a sterile suction tubing daily and a sterile catheter for each new patient. The health-care-provider should be competent and skillful at changing the bacterial filters. Faulty filters will result in spraying the room or cubicle with bacteria when the suction machine is switched on. Check and replace bacterial filters daily or whenever they get wet.

10.5 Factors Causing Post-operative Wound Infections

Some patients develop wound infections after clean surgery. There should be no wound infections in clients for elective cases. Sometimes, wounds may get infected due to faulty operation techniques, or due to carriers among the theatre team, or microorganisms may be in materials or instruments used for the operation. These may be pre, peri-or post operative factors due to the following:

- Poor preparation of patients for surgery.
- Unrestricted entrance into theatres.
- Improper care of Theatre equipment.
- Insufficient supply of operating Theatre clothing.
- Microorganisms in operating theatres.
- Improper cleaning of theatres.

Health care providers are required to be conversant with the classification of surgical wound infections in order to identify the type of infection and its proper management. This international classification, shown in the next page, facilitates wound surveillance.

Clean Wounds: These comprise of, mainly, wounds following elective surgery, for example, elective Caesarean section wounds in Obstetrics, and herniorrhaphy wounds in general surgery. These wounds normally do not have a history of trauma or any inflammation before the operation. The respiratory, alimentary, and the genito-urinary tracts are not penetrated and aseptic technique maintained during the operation. A patient who had herniorrhaphy done should be discharged after four days while a caesarean section mother should go home after six to seven days. Their clean wounds can get infected due to several factors in the hospital. This could cause them to stay longer days in the hospital.

Potentially Contaminated Wounds: These comprise of surgical operations where at least one of these e.g. respiratory, gastro-intestinal, genito-urinary or biliary tracts may have been penetrated with consequent spillage of their contents which may be infected into normally sterile tissues of the body. This could result in the operation becoming infected post-operatively. Usually, in such cases, it is difficult to maintain adequate aseptic technique during surgery.

Contaminated Wounds

These comprise of fresh traumatic wounds, characterised by the following:

- acute non-purulent inflammation, or infective spillage from at least one of these e.g. the

respiratory, gastro-intestinal, genito-urinary, and biliary tracts or where there has been a major breakdown in the aseptic technique.

Dirty Wounds

These are characterised by surgery on wounds with purulent discharge that may occur in post-operative Caesarean section wound infections, drainage of abscesses, debridement of old traumatic wounds, wounds with faecal contamination. Surgical wound infections may manifest from 2-3 days after surgery depending on the immune status of the patient and the level of the aseptic technique practiced during surgery.

Poor Preparation of Patients for Surgery

In order to prevent wounds getting infected in Operating Theatres the Infection Prevention nurse is required to co-ordinate with ward staff to see that patients for theatre are bathed with soap and water.

They must wear theatre gowns and caps.

Unrestricted Areas in Theatre Suite

The officer must restrict entrance into Theatre suites to theatre personnel and patients only. Consequently this limits the amount of germs going into theatres.

This restriction applies to the receiving bay also. Proper theatre organisation ensures that ward staff who bring patients to theatres stop at the receiving bay where patients are checked and transferred into clean-inside theatre trolleys. The outside trolley wheels have environmental

bacteria e.g. *clostridium perfringens* on them. Trolley wheels must be thoroughly cleaned at the end of each day's list. Entrance from the dirty corridors into the operating theatre rooms during sessions must be restricted.

Improper care of Anaesthetic equipment

All anaesthetic equipment should be properly decontaminated, high level disinfected and sterilised as appropriate. From the receiving bay, the patients are moved into the anaesthetic room to be anaesthetised. Anaesthetic equipment are categorised as semi-critical care items because they do not pierce intact skin or mucus membrane. Prevention of nosocomial infection through the use of anaesthetic equipment can be effected by appropriate instrument processing of these semi-critical care items using either high-level disinfection or an autoclave. Other theatre equipment must be categorised for appropriate and adequate high level disinfection or sterilisation processes.

All theatre staff should be competent and skillful in the processing of instruments and equipment in use in the theatre. For the theatre staff to be competent there is the need to train them and provide them with guidelines for use in the theatres.

Improper Care of the system that supports the Autoclave

The autoclave sterilises critical-care items used for critical-

care procedures for prevention of post-operative wound infections. The autoclave functions with steam from the boiler house. So care of the autoclave starts from the proper maintenance of the **Boiler House Equipment**.

The autoclave must be tested every morning with chemical or biological preparations to ensure that all packs are properly sterilised. In this way, the incidence of using unsterilised equipment for critical-care procedures does not occur. The Infection Prevention nurse should identify other areas in the hospital or other health institutions where theatre packs can be sterilised. Arrangements should be made with these departments or health institutions for the use of these alternative autoclaves in case of breakdown of this major hospital facility.

Improper Use of Theatre Trolleys

It is not uncommon for theatre trolleys to be misused in the theatre environment. The Infection Prevention nurse should ensure that theatre trolleys are designated and used as "Inside and Outside Trolleys".

Improper Care of Operating Theatre Clothing

Theatre clothing should be well cared for. In order to prevent infections in operating theatres, all staff should wear properly laundered theatre clothing, caps and clean antistatic theatre shoes. The operating theatre should be provided with sufficient linen for use in the theatre.

Microorganisms in the Operating Rooms (OT)

OT rooms should be sterile. Besides the environmental microorganisms in the theatre, the surgical team can spread *staphylococcus aureus*, which can be found on the hands of staff, if holes occur in their gloves. So they should guard against this happening. Torn gloves must be changed for sterile ones immediately.

Staphylococcus aureus, as an airborne particle, can also infect patients' operation sites. To prevent this, opening doors leading into operating theatre rooms should be controlled. These doors should be kept closed during operation sessions.

Theatre personnel with skin lesions or other infections should be excluded from the theatres till completely free from infections. Outbreaks of infections in post-operative wounds with *staphylococcus aureus* have been reported where the source of infection were nasal, rectal and vaginal carriers.

Ventilation Systems Which do not Work

Ventilation systems in OT rooms should work.

Functioning ventilation systems in operating rooms remove bacteria released in the theatre by personnel, and also prevent the entry of bacteria from the theatre corridors and also from the hospital. Twenty-five air changes per hour are recommended for sterile areas. The anaesthetic rooms require less in-flow of air. In this way, the number of germs reaching the operating site is reduced.

Improper Cleaning of Theatres

Damp-dust all surfaces including the operating lights, and the operating table to remove any visible dirt before starting the theatre list.

Clean theatre floors with liquid detergent and water between cases and at the end of each operation session. In cases of infective spillage, flood spillage with 0.5% hypochlorite solution, leave for 10 minutes before mopping and later incinerate the cloth used. The theatre floor must then be cleaned with disinfectant solution according to the agreed guidelines. The scrub-up sinks must also be cleaned after each scrubbing-up. The theatre must be cleaned daily.

Unhealthy Staff in the Operating Theatres

Sick staff should not work in the OT rooms.

Sick staff can infect the patients, so staff in operating theatres should be cared for in-order to keep them in good health. In developed countries, patients are now demanding to know the HIV status of their surgeons before the surgeons could attend to them. Theatre staff should follow these rules:

- All nursing, anaesthetists and surgical staff should regard all patients as potentially infective. When a known full-blown AIDS patient is undergoing surgery the following precautions should be put in place.

- Remove all unnecessary equipment from the operating room.
- The operation should be performed by the most senior and experienced surgeon.
- The scrub-up team is required to wear masks with face-guards or goggles.
- Wear impervious gowns or waterproof apron under the cotton-gown. The scrub-team should be double-gloved.
- Sharps, like needles, scissors, scapel, blades on Bard Parker handles are to be passed on to the surgeon using the hands-free technique. This technique requires theatre nurses to pass sharp instruments in a receiver.
- Fingers should not be used as guides whilst suturing the skin of a patient.
- Hand needles should not be used.
- Instruments should be decontaminated before being pre-cleaned and sent for autoclaving.
- Anaesthetists should take full precautions when establishing intravenous lines.

CHAPTER 11

11.0 DEALING WITH HOSPITAL ACQUIRED INFECTIONS

Introduction

When infection outbreaks occur methods of investigations are carried out to identify the source of infection. This can be due to procedures or equipment used. Investigations help us to see how future incidences can be prevented. They also help to provide data for reviewing our guidelines and policies periodically. The ward manager should inform the Infection Prevention nurse of any outbreak of an infection. The officer must know what constitutes nosocomial infections amongst in-patients.

General objective

To equip the reader with the knowledge and skill to handle outbreaks of hospital acquired infections in specific hospital units effectively and efficiently.

Specific objectives

To classify any infection outbreak as being hospital or community-acquired.

To calculate incidence and prevalence infection rates.

11.1 Manifestations of nosocomial infections

There are many ways in which a nosocomial infection can be manifested. For the purpose of this section, we shall

utilise classical cases of hospital-acquired infections in :

- Caesarean section post-operative wound infection in a mother who was booked for the operation. As a booked case, she came in perfect health, with intact membranes and was not in labour.
- Also, wound infection, in a patient who came in as a booked case for the repair of hernia.
- Patients whose intravenous infusion sites become infected.
- Catheterised patients who develop urinary tract infections, which were not there before the catheterisation.
- Babies who develop umbilical sepsis in the neonatal units.
- Burns cases which get infected.
- Some respiratory tract infections in surgical patients.

11.2 The process of Dealing with the Nosocomial Infections.

The Infection Prevention Nurse should then follow a process of dealing with the infections. This process involves the following:

- Obtaining some demographic data on the patient (s) involved.
- Identifying the disease itself.
- Isolating the infecting micro-organism.
- Specifying the treatment modalities e.g. invasive

procedures.

- The knowledge, attitude and practice of health carers in the affected ward.

The Patient

The officer must collect data on the patient regarding the sex, age, occupation, nutritional status, date of admission and HIV status after pretest counseling and the address.

The Infection Prevention officer should also note if the patient visited a traditional healer before coming to hospital because the patient may contract an infection from this visit. The officer should note whether there are any factors in the above data, which made the patient(s) susceptible to infection in the hospital.

The officer must then work out the number of patients who could still be at risk and decide on a line of action e.g. isolating affected patients or discharging them etc.

The Disease

The officer should then collect information on the disease itself. The officer should know what the disease is:

- The infecting microorganism could be isolated from the laboratory.
- The incubation period.
- The onset of the disease.
- The signs and symptoms.
- Its mode of spread and preventive measures.
- Whether the treatment of the disease required a critical care procedure.

- If there are any contacts.

The officer should decide whether more patients or staff are still at risk. This will be decided if the time of exposure to the disease is longer than the incubation period of the disease. This shows that the patients or staff have passed the danger period. But if the time of exposure is shorter, it can be concluded that the risk of infecting other patients or staff is still there. Then the Infection Prevention nurse must consider the following options:

- Isolating the patient(s)
- Transferring the patient to an isolation unit.
- Discharging the patient.
- Closing the ward temporarily.

When the ward is closed, it should be thoroughly cleaned and aired before re-opening.

The Health Care Givers

Depending on the infecting microorganism, the Infection Prevention officer should find the source of the infection by monitoring the knowledge, attitude and practices of the carers in the affected ward by:

- Noting their working knowledge of patient-care equipment for their use.
- Noting their attitude to rendering care.
- Observing their attitude during own ill health.
- Their practice and standard of care should be monitored while they carry out sterile procedures during which their hygiene practices should be observed also.

The State of the Affected Ward

The Infection Prevention nurse must also monitor the state of the affected ward and its routine. This will help the officer in finding the source of the infection.

The Infection Prevention nurse must find out:

- Whether soap and running water for maintenance of basic hygiene practices are available.
- The cleaning routine of the ward.
- If the ward is overcrowded as overcrowding facilitates cross infection.
- The dressing routine of the ward.
- The method of disposing dirty dressings.
- The procedure for disinfection and sterilisation of nursing care items.

11.3 Pin-pointing the Source of the Infection

It is necessary to know the infecting micro-organism and to trace its source, e.g if it is *Pseudomonas aeruginosa*, we look out for moist environment, swab the environment, send the swabs to the laboratory in-order to identify the source of the infecting organism.

Depending on the disease and its causative agent, the Infection Prevention nurse should ask different questions in different wards in order to find the source of the infecting germ.

Obstetric Unit

In addition to the previous questions, the officer is required

to know the following:

- Previous obstetric history.
- Parity.
- Date and time of onset of labour.
- How the membrane ruptured.
- Duration of ruptured membranes before seeking hospitalisation.
- The number of vaginal examinations carried out on the patient.
- Any infection prevention guidelines.

Operation

- The reason for the operation.
- Was the operation booked?
- Was it an emergency operation?
- Was the patient catheterised?
- How long was the urethral catheter insitu?
- Did the patient have an intravenous infusion?
- Is the wound site infected?
- Was the patient pyrexial?
- Note date and time of onset of pyrexia.
- Did patient receive anti-malaria therapy?
- Did patient respond to it or not?
- The technique of the operation.
- Was the patient on pre-operative or peri-operative antibiotics?

The Wound Care

- Is the operation site dry and clean?
- Is the wound infected?
- What is the causative organism?
- The Infection Prevention nurse must send a wound swab to the laboratory in order to identify the germ causing the infection.
- Is there any wound drain?
- How was the drain cared for?
- Does the ward have a dressing routine?
- How long does the ward staff wait after ward cleaning before starting wound dressings in the ward?
- Are sterile dressings available?
- What are the patients' HIV status?

The Surgical Unit

For Burns Cases Note Also

- Causative organism.
- Basic hygiene practices.
- Cleanliness of nursing environment.
- Dressing technique.
- Nursing technique of burns cases.
- Any Infection Prevention guidelines in use in the ward.

For accident cases note also

- Length of stay before hospitalisation.
- Length of stay in Casualty before operation.
- Theatre technique.
- The use of Infection Prevention guideline to guide practice.

The Paediatric Unit

For Paediatric cases

Note should be taken of the following:

- Source and Date of admission.
- Source and Date of re-admission.
- If there is diarrhoea, method of preparation of feeds and of sterilising the feeding utensils.
- The causative organisms.
- If it is a communicable disease, note incubation period of illness.
- Does danger still exist for other babies in the ward?
- If yes, transfer affected babies to isolation unit.
- Consider closure and cleaning of ward after discharge of last patient.
- Contact tracing may be necessary.

11.4 Monitoring and Evaluation of Infection Rates

Monitoring:

The Infection Prevention nurse should continuously be observing, recording and reporting on the Infection Prevention activities in all clinical areas during her/his ward rounds. This should be done on a daily basis.

The aim of this monitoring is to ensure that health care providers comply and implement the Infection Prevention guidelines.

Complying to the Infection Prevention guidelines will prevent the outbreak of hospital acquired infections.

Indicators for Infection Prevention Programme

For the purpose of monitoring and evaluation, the health care institution needs to develop indicators for monitoring the Infection Prevention Programme.

Specifically designed tools can be used as part of the process for monitoring Infection Prevention measures. The checklist for monitoring and evaluating Infection Prevention on a regular basis is shown below.

Monitoring and evaluation can be done at a level that the hospital can afford.

Checklist: Maintenance of Basic Hygiene Practices:

- Regular and constant provision of soap and water for hand washing.
- Ward hand-drying practices.

- Times for Bed making.
- Availability and the use of foot-operated bins.
- Availability and the use of elbow-operated taps. The Infection Prevention Team can ask the nurses these questions for qualitative analysis of their responses.

Question: When is hand washing seen as important to the Health Care Provider (HCP)?
How often is the bed linen changed?

Pest Control

Use of pesticides against.

- Cockroaches.
- Are rodents present in the hospital environment especially in the wards and hospital kitchens.

Barrier Nursing

- Face masks.
- Indicators for wearing them by nurses.
- Indicators for wearing them by surgeons.

Handling of Diarrhoea Cases

- Prevention of infection to other patients.
- Is this practice maintained?

Prevention of Wound Infection

- Wound classification:
- Care of clean wounds.

- Care of infected wounds
- Care of septic wounds.
- Deep vein thrombosis, chest infections, myocardial infarction.
- Post-up monitoring of temperature, pulse and blood pressure.

Operating Theatre

- Cleaning of Operating Theatre.
- Care of Anaesthetic Equipment.
- Care of Theatre instruments.
- Protection of Surgeons/Theatre staff.

Policies and Guidelines

- Does the Hospital Management have an Infection Prevention Policy?
- Do the wards and support service areas have guidelines, which guide their practice?
- Are they being followed?

Staff Health Promotion

Staff should be vaccinated against:

- HEP. B.
 - HEP. C.
- Staff to undergo Periodic medical exams.
Conduct medical exams prior to starting work.
Monitor staff attitude during own illness.
- Check staff off sick certificates.

Care of the Ward

- Monitor cleaning routine.
- Care of sharps.
- Monitor refuse disposal.
- Monitor task allocation or Patient allocation.
- Geographical ward division.
- Monitor dressing.

Care of the Ward Fridge

- Check contents of the ward fridge.
- Monitor maintenance of the temperature of the ward fridge.
- Do bacteriological sampling of the fridge.

Evaluation

This is a continuous process of assessing the achievement of the stated objectives of the Infection Prevention Programme.

The Infection Prevention nurse should focus on the levels of:

- Infections in the wards focusing on the clients who come for elective surgery.
- The compliance of the hospital staff to Infection Prevention practices.
- Adequacy and availability of nursing and medical care resources.
- Efficiency of all the health care providers to the programme.
- Availability of all the resources required to

effectively handle the outbreak.

Evaluation should be carried out on targeted strategic hospital units.

When an outbreak of infection does occur, the Infection Prevention nurse and the team needs to control the outbreak. During and at the end of the outbreak, the Infection Prevention nurse needs to reflect the percentage of patients affected in her/his report for record keeping. . The easiest way of doing this is to calculate the incidence and prevalence rates of infection.

Before starting, the Infection Prevention nurse should decide on the following:

- The length of time to accomplish this task. The officer may need more staff.
- She/he may need to make it an on-going exercise. Ideally it should be done quarterly or whenever an outbreak occurs. The nurse needs the following information to calculate the incidence rate:

A = the total number of admissions or discharges for the period under study.

B = the total number of newly infected patients

$$\text{Incidence rate} = \frac{B}{A} \times 1000$$

An exercise

In an Obstetric Unit in January 1986 to January 1987 there were 500 booked Caesarean sections done. Fifty (50)

cases became infected. What is the incidence rate of infections in booked Caesarean sections for the year? Incidence rates are expressed according to the number of new occurrences per year, therefore the incidence rate of infections occurring among mothers with Caesarean sections in that year in that hospital could be calculated thus:

$$\frac{50}{500} \times 1000 = \underline{100 \text{ per } 1000 \text{ per year}}$$

The process necessary to collect the information for calculating the incidence rate can be time consuming and expensive. A cheaper and quicker method of monitoring infections is the prevalence rate. This can be done at any time to validate the incidence rate.

To calculate the prevalence rate the nurse needs to know:

C = the number of patients infected at the time of study.

D = the number of booked Caesarean section cases in the ward at the time of study.

$$\text{Prevalence rate} = \frac{C}{D} \times 100\%$$

An Exercise

In a puerperal ward in the Obstetric Unit, there were 20 booked Caesarean section mothers. Four (04) of them had infected wounds. What is the prevalence rate of booked infected Caesarean section wounds in that ward at the time being studied.

$$\text{Prevalence Rate} = \frac{4}{20} \times 100 = 20\%$$

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APPENDIX 1

HOSPITAL'S INFECTION PREVENTION AND OCCUPATIONAL SAFETY POLICY.

The Board of Management recognizes and accepts the responsibility for providing a safe, and healthy working environment for all its employees. This embodies an admission policy for a safe clinical environment for patients. This policy has a zero – tolerance to overcrowding for prevention of nosocomial infections. The policy aims at minimizing hospital-acquired infections, auditing Infection Prevention practices, education, training and conducting research in clinical areas, for evidence-based practice

The Management recognizes the importance of caring for its carers as a key to providing quality health care.

To meet this obligation, it is committed to the formation, financial and material support of all the activities and recommendations of the 'Safety, Occupational Health and Infection Prevention Committee.

APPENDIX 2

GUIDELINES ON CARE OF ANAESTHETIC EQUIPMENT IN OPERATING THEATRES IN UTH, LUSAKA ZAMBIA

- Regard all patients as potentially infective. Render used anaesthetic equipment safe for handling by doing the following:
 - Wearing double gloves, plastic apron and a face mask immerse all used endotracheal tubes, oral airways, anti-static face masks, anaesthetic tubing in hypochlorite solution to disinfect them for at least 10 minutes at the end of each theatre session or after an infected case.
 - Wearing a facemask, goggles, double gloves and using a pair of forceps, retrieve all items into a receptacle. Wash with soap and brush under running water. Where possible brush and flush any organic material out under running water.
 - Immerse all items completely in a cidex bath with a cover for 10 hours to sterilise them.

- Wash hands thoroughly and wearing sterile gloves and a facemask, line a sterile container with a sterile gauze or linen to receive sterile items.
- Rinse all items thoroughly with either sterile water or saline.
- Place all used items in the sterile dish and cover ready for use on the next patient.
- Change solution after 14 days or after being used or where possible test for the efficacy of the solution using test stripes.

APPENDIX 3.

GUIDELINES FOR SURGICAL AND MEDICAL WARDS

Maintenance Of Basic Hygiene Practices.

Ensure the constant and regular provision of adequate supply of soap, running water and individual towels for hand-drying., hypochlorite solution and scouring powder. All health-care workers should wash their hands before and after each patient contact.

Preventive Maintenance Of Hospital Structure/Facilities

- Cross-ventilate all the clinical areas.
- Fly-screen all windows for protection against mosquitoes and flies.
- Provide adequate lighting to prevent unnecessary accidents.
- Repair and maintain all hospital facilities used by patients and visitors.
- The hospital medical equipment engineers should maintain all major hospital facilities like the autoclaves, anaesthetic machines, resuscitation machines, trolleys, and suction machines on a weekly basis.
 - Only qualified staff with adequate knowledge should man the autoclaves in the operating

theatres.

- The Hospital Maintenance Department should maintain and repair broken hospital structures like the windows and doors on a weekly basis.

Maintenance Of Clean Environment

- Ensure the constant and regular supply of hypochlorite solution.
- Clean walls and floors thoroughly daily at stipulated times
- Environmental Health Officers to ensure the maintenance of the hospital environment.
- Do not dispose of hospital refuse haphazardly.
- Clean barrier-nursing cubicles with hypochlorite solution 0.5%.
- Clean walls and floors at least six times in 24 hours and whenever necessary with soap and water
- Damp-dust lockers and beds on a daily basis with soap and water.
- Carbolize beds after a patient's discharge or demise.
- Decontaminate, pre-clean, disinfect and sterilize all patient-care items.
- Disinfect elevators with hypochlorite solution 0.5%.
- Clean the inside of the toilet bowls with spirit of salt or hypochlorite solution 0.5%.
- Clean bathtubs with hypochlorite solution 0.5%.

Barrier Nursing

Create a cubicle or room for this facility. Put a "DO NOT ENTER", by the door.

- Provide all nursing care items and supplies in this cubicle eg". Gloves, gowns masks, soap in a soap-dish, hypochlorite solution in a mop-bucket with a mop. Trolleys and feeding utensils and a bucket with a lid for decontamination of infected linen.
- Allocate one staff daily to this room.
- Clean the rooms /cubicles thoroughly using 0.5% hypochlorite solution on discharge or demise of the patient.
- Air the room for 48 hours before occupation by another patient.

Caring For The Carers

- Conduct pre-employment medical exams to establish their health status before commencement of duties.
- This should be followed by routine half-yearly medical exams.
- Put all staff on a health Insurance scheme.
- All staff to take their local leaves and annual leaves so as to be off hospital premises.
- Give hepatitis B and C vaccines to staff that handle blood and blood products.
- Supply meals and milk and eggs (high protein) to

staff on night shift and to those working in potentially hazardous and infectious areas and strategic hospital departments.

- Reduce length of night shifts either by the number of days worked or by number of hours worked per night.
- Monitor the health of the carers through periodic medical exams and adequate number of sick days given for recuperation when sick.
- Provide staff with own protective clothing.
- Orient all new staff members to be oriented in Infection Prevention Measures to ensure compliance to Infection Prevention practices.

Sharp Disposal

- All staff to observe plastic colour –codes for disposal of different types of refuse.
- Label and place Sharps to be disposed of in a sharps box or container.
- Label and place all sharp containers in easily identifiable and accessible areas in the ward environment.
- Dispose of and incinerate Sharp containers when $\frac{3}{4}$ full. Contents should not be emptied.
- Provide heavy-duty utility gloves to workers carrying the sharp containers for disposal and ensure they wear them.

Domestic Refuse

- The staff is to throw domestic refuse into bins labeled with the appropriate colour-coded plastics
- Locate all the bins where they can be easily accessed by all users eg the sluice room, Doctor's rooms and at strategic areas in the wards.
- Take back all left over food to the kitchen.

Biomedical Wastes

- Use foot-operated pedal-bins lined with the appropriate colour-coded plastics for biomedical waste.
- Label all bins used for biomedical waste.
- Decontaminate and sterilize contents before discarding into the bin to render them safe for handling.

Incineration

- The incinerator should be well sign-posted for all to see.
- Orient all new staff to the geography of the hospital and the exact location of the incinerator.
- Incinerator staff to be provided with protective clothing, gloves, boots and elbow-length gloves.
- Orient all staff on how to dispose of sharp boxes and other refuse in the incinerator.

GLOSSARY

Carrier

A carrier is a living being that harbours specific infectious microorganisms in the body. This being does not exhibit any clinical signs of the disease, but has the potential to act as a source of infection to other susceptible people.

Cleaning of floors

Cleaning of hospital floors and surfaces with a detergent removes about 80% of germs while disinfectants remove about 90-99%. However, recontamination is rapid in a busy ward and precleaning levels of germs is reached within one or two hours regardless of whether a detergent or disinfectant was used for the initial cleaning.

Communicable diseases

These are diseases that are of public health concern. Specific microorganisms or their toxic products cause these diseases. They can be transmitted directly or indirectly between living species. This transmission can occur through the air, dust, soil, water, and food items. Examples of communicable diseases are diseases of the under-five children like measles, mumps, tuberculosis, diphtheria and whooping cough.

Factors associated with communicable diseases are the

following

Overcrowding, inadequate knowledge, unhealthy life styles, poor socio-economic status and poor environmental sanitation.

Contagious disease

These are a group of diseases that are transmitted through close contact with an infectious person or animal. Examples are scabies and chicken pox.

Contamination

This is the presence of an infectious agent on medical and nursing care items. Contamination can also occur in water, milk, and food items and on inanimate objects, household items like toys.

Epidemic

The unusual occurrence of an outbreak of a disease in excess of an expected occurrence. Hence the outbreak of a disease, like cholera, in a community where it is usually unheard of would constitute a potential epidemic.

Incineration

This is the safest method in use for burning and ultimate disposal of clinical or hospital infectious material in waste management. All refuse including human tissue is burnt

up as the incinerator reaches its maximum temperature of 1,200 °C. A pipe draws off the fumes into the atmosphere to prevent hazardous environmental pollution.

Infection

This is the entry and development of microorganisms in living species. An infection does not always cause an illness.

Infectious disease

This is a disease, which manifests clinically on a host as a result of an infection.

Infestation

Infestation occurs when arthropods like lice live on the hair of living species like human beings. Usually, human beings are infected through contact with people infested with lice. Worms live in the soil. Worm infestation can occur in living species when parasitic worms invade the intestines. It usually enters the host through the soles of the feet. This occurs mostly in people who walk bare-footed on infected soil.

Opportunistic infection

These are diseases that are easily passed on to susceptible people who may be immuno-compromised.

Policy

This comprises definite courses of actions which embrace the goals and objectives of the institution. They are agreed upon by a critical mass decision of the hospital management team. These courses of actions are chosen from several others, considering the prevailing socio-economic and political environments through a process of prioritization. They guide and determine the present and future decisions of the organization.

Pollution

Stanhope and Lancaster (1988) define water pollution as the addition of something that changes the natural qualities of water. Industrial waste can deplete the oxygen content of water and this can cause the fish in our rivers to die.

Referral System

This is a system of transferring a client with unmanageable condition from a lower level of health-care facility to a higher level of health-care facility where there are better medical care technologies for better management.

Refuse pits

These are holes dug in the ground for the purpose of burning rubbish. It is a type of appropriate technology for peri-urban and rural waste management. They should be sited at least 30 meters away from the water house and 30 meters away from the water source. They should be at least 1 meter deep. When well managed, they could be a source of good compost for gardening.

Reservoir

A reservoir can be of living species, plant or soil in which an infectious agent lives; multiplies, reproduces and depends primarily on that environment for survival.

Source of infection

This is the person, animal, or an object or substance, which harbours an infectious agent within its environment. However, an infection can only occur when there is an interaction between the host, the environment and the agent.

Unhealthy Life style

These are a group of life-style practices like smoking cigarettes, excessive alcohol intake which lead to diseases of affluence like hypertension and obesity. It also includes promiscuity which may lead to the acquisition of Sexually-transmitted infections.

INDEX

A

Accidents, 100, 248,
Acinetobacter, 128, 149, 157,
Administrative Zones, 65,
Advocacy, 95, 96,
African surgeon, 11, 38, 47, 122, 192, 215
Alcohol, 38, 41, 47, 48, 122, 141, 166, 167, 192
Alcoholics, 141, 207, 209
Alpha haemolytic, 133, 135
Ambulance services, 65
Amoebic dysentery, 184, 195
Ancestors, 11, 12
Anthrax, 195
Antibiotics, 195
Antiretrovirals, 77, 80, 152, 184, 229,
Antisepsis, 162, 170
Appropriate technology, 13, 35, 53, 63, 80
Ash, 28, 29, 33, 161, 170,
Aspects of health, 113
Associations, 6, 20, 21
At risk, 8, 17, 51, 138, 139, 152, 206
Aurescopes, 133, 215
Autoclaves, 78, 87, 168, 169, 220, 248
Available strength, 163,

B

Bacteria, 135, 136, 158, 166, 172, 184, 204, 208
Bacillary dysentery, 195
Bacteraemia, 130, 135,
Bad omen, 14
Barrier nursing, 96, 165, 189, 190, 192, 193, 195
Beddings, 34, 178,
Beta haemolytic, 124, 133
Bath, 28
Basins, 192, 207, 214
Blood agar, 90, 91, 136
Bloodsucker, 32
Boiling, 33, 34, 49, 137, 168, 170
Boiler equipment
Border posts, 153
Buckets, 213, 128

C

Caesarean sections, 77, 206, 236, 260
Care 136, 138, 142, 152, 160,
Carrier, 22, 23, 76, 110, 123, 129
Campylobacter, 156, 157,
CD4 cells, 142
Celebrations, 12
Chikoloboyi, 9, 11

Chisungu, 12
Chlorhexidine, 170
Chlorinated phenols, 165
Cholera, 12, 22, 23, 76, 122, 126, 166, 184, 193, 206,
Cidex (see Glutaraldehyde) 166, 168, 170, 173, 246,
City council, 203, 260
Circumcised, 9, 10
Civilisation, 3
Clean wounds, 7, 21, 233
Clostridium perfringens, 128, 129, 145, 219,
Clostridium species, 120
Clostridium tetani, 173
Cobalt 60, 172
Communities, 5, 7, 9, 16, 18, 20, 21, 22, 140, 143, 174,
Community acquired infections 159, 161, 169, 180,
Community based agents, 3, 4, 5, 6, 7, 14, 16, 239
Community health care workers, 18, 19, 20, 21, 22, 23
Community micro-organisms, 35, 39, 48, 51,
Cestode, 179
Color-coded plastic bin liners, 202
Commensal, 178
Compounds, 24, 67,
Concept, 97, 74
Constraints, 11, 78, 199
Contamination, 31, 178, 190, 244, 253
Control, 1, 2, 3, 4, 5, 61, 80, 82, 95, 105, 112, 118, 125
Cost recovery, 58
Cost sharing, 58
Critically-ill patients, 204
Crude, 14, 64

Cryptosporidium, 189
CSSD, 103, 107
Cult healers, 7
Cultural beliefs, 5, 26
Cultural heritage, 12
Culture media, 90

D

Dambos, 176,
Decontaminating, 37, 83, 159, 160, 162, 164, 165,
Dental caries, 136
Dettol, 165
Development, 1, 6, 77, 135, 253
Diarrhoeal, 24, 26, 68, 72, 206
Diseases, 12, 13, 14, 16, 23, 25, 29, 44, 51, 59, 69, 70,
Disinfectants, 164, 167, 168, 169, 253
Disinfection, 161, 162, 164, 165
DNA, 143
Dysentery, 22, 23, 29, 59, 67, 72, 79, 124, 155, 165, 175

E

Ebola virus, 150, 151
Educational strategy, 97, 114
Endogenous, 121, 135, 190
Endotoxin, 178
Enteric diseases, 110, 193
Enterococci faecalis, 210
Environment (al), 18, 19, 22, 23, 35, 37, 40, 43
Escherichia coli, 156
Ethylene oxide, 172
Exogenous, 122, 123
Exotoxin, 178

F

Family, 9, 12, 13, 15, 46, 53, 60, 61
Fetish priests, 7
Financial support, 96, 97
Finkubala, 52
Florence Nightingale, 2
Fungi, 84, 119, 124, 125, 157, 168, 175, 179

G

Gamma haemolytic, 136
Gas gangrene, 195,
Geographical, 189, 206, 234
Glial cells, 142
GP 120 glyco-protein, 142
Guidelines, 35, 39, 51, 53, 80, 81, 83, 92, 94, 96, 163

H

Haemophilus influenza, 123
Handwashing, 70, 182
Health center, 17, 18, 20, 56, 60, 65
Health needs, 20,
Health posts, 60, 64
Health Reforms, 27, 57, 58
Health system, 5, 22, 55, 62
Hepatitis viruses, 129, 136
Hepatitis A virus, 137
Hepatitis B virus, 111, 114, 125, 137, 138,
Hepatitis C virus, 141
Hepatitis non A, non B, 140
Herbalist, 6
High level disinfection, 82, 159, 160, 162, 168, 219
Historical, 1

HIV/AIDS 7, 16, 17, 18, 20, 48, 52, 58, 59, 99, 100,
Hormonal imbalance, 175
Host, 70, 79, 138, 143, 174, 175, 176 178
Host defence mechanism, 176
Hospital-acquired infections, 180, 181, 185, 186, 188
Hospital infection prevention committee, 82, 84, 86, 91,
Hot air oven, 172, 171
Hot water boilers, 168, 169, 170
Households, 58, 64, 166
Housekeeping budget, 167
Hypochlorite solution, 161, 163, 164, 165, 166, 213

I

Ichilolela, 14,
Ichimamba, 12, 54,
Ignorant, 14
Immunity, 122, 123, 138, 143, 149, 175, 194
Immuno-compromised, 120, 122, 144, 166, 189, 190,
Implementation strategy, 96
Incinerator, 78, 110, 187, 202, 255,
Indicative for Isolation, 191
Infective hepatitis, 169, 193, 195
Infection prevention, 1, 2, 3, 5, 12, 14, 15, 18, 19, 20, 21
Inflammatory process, 177, 179
Instruments, 7, 36, 37, 46, 49, 75, 107
Insecticide Treated Nets, 201
Inswa, 52, 189

Intravenous therapy, 209

J

Jik (see Hypochlorite solution), 32, 33, 163, 165, 106,

K

Kanyama, 66, 67

Kitchen, 75, 79, 87, 97, 103, 105, 109, 110, 203

Klebsiella species, 156

L

Levels of care, 60,

Life expectancy, 64

Limiting over-crowding, 200

M

Macrophages, 142

Mackonkey, 90, 91

Meetings, 86, 87, 89

Meningitis, 59, 70, 84, 123, 131, 132, 134, 135, 144

Methicillin resistant, 165

Microorganisms, 84, 119, 124, 126, 127, 134, 144

Moist heat, 17

Monitoring, 20, 21, 35, 52, 84, 90, 95, 116, 154, 227

Monocytes, 142

Mosquito, 23, 52, 78, 155, 176, 177, 201, 248

Mtikos, 109

Mud, 63

Mucus membrane, 121, 144, 180, 219

Mycobacterium tuberculosis, 144, 165, 166

N

Nchetu, 13

Nchila, 13

Neighbourhood health committee 19, 20, 30, 40, 65

Neisseria meningitides, 22, 70, 123, 129, 147, 148

Nematode, 179

Non epidemic

Non-governmental, 67

Normal flora, 77, 118, 119, 120, 121, 122
Notifiable diseases, 197
Nutrition, 8, 29, 46, 61, 119, 175, 226

O

Objectives, 35, 39, 41, 48, 82, 86, 118
Obligate host, 178
Occupational Health, 94, 98, 100, 103, 114, 245
Oil extraction, 63
Oral rehydration salt, 63
Ononanso, 13
Operating theatres, 75, 79, 92, 216, 218, 220
Opportunistic infections, 77, 120, 122, 143, 144

P

Pathogenicity, 178
Pasteurization, 162
Patients, 25, 29, 33, 36, 38, 40, 41, 48, 49, 50
Pest control exercises, 201
Phenols, 164
Policies, 21, 63, 87, 80, 83, 85, 92, 93, 94, 96,
Porters, 135
Potentially, 32, 111, 139, 141, 181, 183, 202, 217

Pre-cleaning, 83, 87, 159
Pre-payment, 58
Priestesses, 7
Primary health care, 4, 8, 16, 27, 57, 60, 61, 241
Primary level of care, 60
Povidone iodine, 167
Procedures, 37, 75, 78, 83, 93, 104, 106, 116, 121, 123
Processing, 158, 159, 160, 169, 219
Protected wells, 29, 63, 137
Proteus, 91, 156
Pseudomonas aeruginosa, 91, 120, 127, 129, 132, 156,
Pyrexia, 229

R

Rabies, 155, 195, 197
Radio communication, 65
Rats, 23, 78, 155, 201,
Razors, 19, 31, 32,
Red eyes, 12
Referral hospitals, 62, 67, 68, 132, 156, 157
Refuse bins
Refuse pit, 30, 43, 202, 256
Research, 26, 68, 81, 84, 85, 89, 93, 95, 152, 172
Respiratory infections, 70
Required strength, 163
Reverse isolation, 189
Rickettsiae, 179

River sand, 28
Rural health center, 56, 65

S

Sacrifice, 4
Salmonella typhi, 76, 123, 124, 128, 155, 156, 268
Sharp box, 186, 187, 251
Secondary roles, 86, 95
Seratia, 128
Severe acute respiratory syndrome, 151, 192, 198,
Shigella boydii, 22
Shigella shiga, 22, 124, 176
Shigella sonnei, 22
Social consciousness, 4
Source patient, 187, 188
Soya beans, 63
Specimen, 75, 103, 104, 120, 149, 157, 181, 183, 185
Spirits, 12
Spirit dancing, 15
Spiritualist, 7
Standard precautions, 153, 181, 183
Staphylococcus aureus, 24, 29, 70, 211, 221,
Staphylococcal skin syndrome, 130, 196,
Status of health care system, 55
Steam boilers, 78

Stethoscopes, 215
Sterilization, 83, 159, 162, 171
Streptococcus avium, 136
Streptococcus bovis, 136
Streptococcus durans, 136
Streptococcus faecium, 136
Streptococcus milleri, 136
Streptococcus mutans, 136
Streptococcus miti, 136
Streptococcus pneumoniae, 91, 121, 135, 136, 269
Streptococcus pyogenes, 70, 133, 134
Streptococcus sanguis, 129, 133
Streptococcus species
Streptococcus viridans
Storage houses, 63
Subclinical, 180
Supervision 4, 30,
Survey, 16, 17, 18, 19
Susceptible patients, 174, 189
Syndrome, 130, 151, 196, 198

T

Tattooing, 31, 141
Teeth, 54, 191
Tetavalent, 149
T4 helper cells, 142
Tertiary level of care, 60, 68,
Theatre, 75, 79, 89, 90, 92, 106, 116, 128, 131, 141
Thermometers, 157, 215
Towel, 42, 125, 160, 182, 207, 212, 247
Traditional birth attendants, 4, 8, 9, 12, 17, 41, 55, 241
Traditional healer, 4, 5, 6, 7
Traditional medicine, 5, 6
Traditionally trained surgeons, 9
Transcriptase, 142
Trolleys, 167, 193, 218, 220
Typhoid, 23, 29, 76, 124, 155, 165, 178, 180, 193

U

Universal infection prevention measures, 21, 32, 116,
Urban health centers, 65,

V

Vaccine, 114, 140, 142, 143, 144
Vancomycin resistant, 127
Ventilation systems, 221
Virulence, 70, 71, 178
Viruses, 71, 84, 104, 111, 113, 124

W

Ward affairs, 87,
Ward manager, 96, 224
W 135, 149,
Willingness, 4
World Health Organisation, 149
Wounds, 10, 34, 90, 132, 135, 146, 217

Z

Zidovudine, 188
Zamwasha, 167