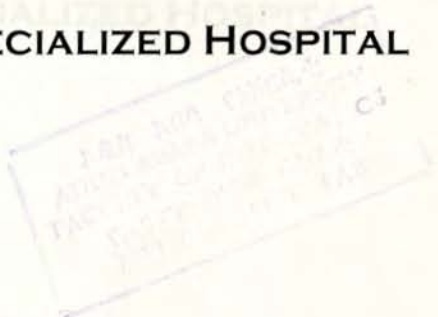


ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

***EVALUATION OF HEALTH MANAGEMENT INFORMATION
SYSTEM (HMIS) DISEASE CLASSIFICATION IN CAPTURING
MORBIDITY DATA:***

THE CASE OF TIKUR ANBESSA SPECIALIZED HOSPITAL



**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF
ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN
HEALTH INFORMATICS**

By

Emawayish Birhanemeskel

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ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

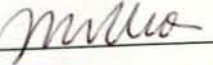
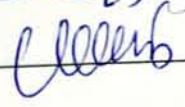
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DEDICATION

To my father Birhanemeskel Haile

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ABBREVIATIONS

AAUMF:	Addis Ababa University Medical Faculty
CDC:	Centers for Disease Control
COPD:	Chronic Obstructive Pulmonary Disease
CVD:	Cardiovascular Diseases
FMOH:	Federal Ministry of Health
FNR:	False Negative Rate
FPR:	False Positive Rate
GBD:	Global Burden of Diseases
HMIS:	Health Management Information System
HMN:	Health Metric Network
HSDP:	Health Sector Development Programme
ICD:	International Classification of Diseases
ICD-9-CM:	International Classification of Disease-9-Clinical Modification
ICT:	Information Communication Technology
IDF:	International Diabetes Federation
IPD:	InPatient Department
ISHMT:	International Shortlist for Hospital Morbidity data Tabulation
M & E:	Monitoring and Evaluation
MRN:	Medical Record Number
NCDs:	Non Communicable Diseases
OPD:	OutPatient Department
PIHCT:	Provider Initiated HIV Counseling and Testing
PPD:	Planning and Programming Department
ROC:	Receiver Operating Characteristic
SENS:	Sensitivity
SPEC:	Specificity
TASH:	Tikur Anbessa Specialized Hospital
TNR:	True Negative Rate
TPR:	True Positive Rate
WHO:	World Health Organization

ABSTRACT

The HMIS which draws its data from routine health service and administrative records provide an ideal source for indicators that are reviewed frequently to monitor and refine program implementation. However, the ability of HMIS shortlist in capturing morbidity data specifically has been debated. This study aims to evaluate the HMIS disease classification in capturing morbidity data.

A cross sectional study was employed using both quantitative and qualitative methods in Tikur Anbessa Specialized Hospital (TASH). Purposive sampling technique was used to select 15 key informants for in-depth interviews and morbidity data from abstract disease registers, registered in time period between 01/07/2001 to 30/06/2002 EC. A total of 10848 records were selected from medical and surgical departments to measure the efficiency of HMIS shortlist as compared with ICD-10 special tabulation shortlist for morbidity data as a gold standard.

The frequency distributions of disease lists of the HMIS and ICD-10 shortlists were compared and analyzed. The sensitivity and specificity of the HMIS disease lists was assessed and focus was made on four selected ICD-10 chapters. The sensitivity varied among the selected chapters. The highest sensitivity was for chapter I, 99.4%. The sensitivity for chapter II, chapter IX, chapter XIV was 45.2%, 54.6%, 27.2% respectively. The average sensitivity was 46.3%. The specificity ranges from 86.1% to 100% for the selected ICD-10 chapters, and the average specificity was 96.8%.

In general, this study demonstrated that the HMIS disease classification shortlist is inefficient and incomplete in capturing the overall morbidity data at TASH. However, the HMIS shortlist is effective and efficient in capturing morbidity data on infectious and parasitic diseases. The overall findings of this study imply the applications of ICD-10 shortlist with appropriate modifications for morbidity data collection, reporting and analysis in TASH.

Keywords: HMIS, ICD-10

CHAPTER ONE

INTRODUCTION

1.1. Back Ground

1.1.1. Tikur Anbessa Specialized Hospital

The current Tikur Anbessa Specialized Hospital (TASH) was established in 1973GC for memorial of Prince Mekonen, son of Emperor Haileselassie, and was named “Prince Mekonen the Duke of Harer memorial hospital”. During the period of establishment it was the biggest in Ethiopia and regarded as an exemplary hospital in the continent of Africa [1].

The hospital has been renamed as “Tikur Anbessa Hospital” in 1975 GC; and again in 1998 GC the hospital gets its current name “Tikur Anbessa Specialized Hospital”. Since 1998 GC the hospital has been administered under Addis Ababa University Medical Faculty (AAUMF) [1].

Now in the context of four tier health care delivery system**, TASH is at the top of the hierarchy and provides different services throughout the country. Currently, the hospital has been organized into eight departments*; namely 1) Internal Medicine, 2) Surgery, 3) Pediatrics, 4) Obstetrics and Gynecology, 5) Orthopedics, 6) Oncology, 7) Nuclear Medicine and 8) Radiology.

Department of internal medicine and surgery are further divided into subspecialty units/special referral clinics*. The subspecialties of internal medicine department include Endocrinology, Gastroenterology, Neurology, Hematology, Cardiology, Chest, Nephrology, Rheumatology, Infectious and Dermatology. General Surgery, Urosurgery, Neurosurgery and Pediatric Surgery are subspecialties for the department of surgery.

*: personal communication with personnel office

**Four tier health care delivery system

Primary Health Care Unit: contains a health center along with five satellite community health posts; provides preventive, promotive, curative, training as well as referral services; serving a total of 25,000 populations.

District hospital: the second higher level which provides studies and researches to help promotive, preventive and training service; curative services—including emergency services with minimum of 50 beds; serve about a population of 250,000.

Regional hospital: the third higher level which provides secondary and tertiary level and training services; curative and specialized services with minimum of 100 beds; serve about a population of 1,000,000.

Specialized/Teaching Hospitals: the last higher level, which provides tertiary level services; teaching, research, and other specialized services with minimum of 250 beds; serves about a population of 5,000,000. 1

The major activities of the hospital which are accomplished in various departments and units include providing medical services; education for medical professionals at different levels (from first degree to second degree graduate specialists); and conducting research activities in the fields of medicine [1].

The vision of TASH under AAUMF is “Being an institute for bringing citizens that could bring about social and economic development to the country, who are able to be role models in education, medicine as well as research fields”. In addition, the mission statement reads “to fulfill both quality and quantity human resource demands in medical care, educations and research fields; and to make contributions in tackling community health problems and improving health status of population by bringing professionals in graduate study fields (middle level trainings as well) in quality and capacity to implement medical plans and being engaged in research activities” [1].

As TASH is one of the federal hospitals in Addis Ababa, the Federal Ministry of Health (FMOH) is the main stakeholder for the hospital. Other partners of the hospital are national and international professional organizations who work in the field of education, medicine, and research areas as well [1].

Regarding registration and service provision processes, it begins at entry point where patient identification information is recorded on a manual medical record at record office. In order to get medical care, those medical records are directed to various departments. Patients who came with referrals from other governmental and private hospitals are also registered and directed to departments according to their health problems [1].

The OutPatient Department (OPD) provides service for regular and emergency out patients. When these outpatients need further senior or special follow ups, they are directed to special referral clinics /units depending on their pathology. In addition, patients are admitted to InPatient Departments (IPD) from OPD and referral clinics. The IPD services involve managing and treatments of critical conditions. It also includes further examinations and investigations of conditions and provision of treatments [1].

As a patient moves from unit to unit clinical data are generated and recorded, and supplemented by data from laboratory and pharmacy. In addition, the medical record also includes legal,

financial data and data from the care provider. The process of recording is concluded when the client leaves out of the compound. If patients need follow-up services, they will bring their index cards for tracing the previous medical records and then will be examined and treated again [2].

While providing appropriate services in various departments the hospital has been confronted with various problems that hinder provision of better health care services. Major problems of the hospital includes: incompatibility of demand and the service provision; inadequacy of rooms for medical service provisions and for office purposes; increased turnover rate of medical professionals due to inadequate salary, incentives and lack of medical health security; inadequacy of instruments and trained manpower for maintenance of medical equipments [1].

In addition to the problems above, unavailability of indicator/strategic plan is a major problem mentioned that directs the hospital future development. Although these problems thought to be resolved at different administrative levels; they hinder standard service provision in terms of quality, type, efficiency and reliability that the hospital is expected to accomplish [1].

1.1.2. Description of International Statistical classification of diseases

The World Health Organization (WHO) adopted the first version of the International Classification of Diseases (ICD) in 1900 to internationally monitor and compare mortality statistics and causes of death. Since then, the classification has been revised periodically to accommodate new knowledge of disease and health [3].

The sixth revision, published in 1948, was more radical than the previous five revisions because this edition made it possible to record information from patient charts to compile morbidity statistics. Subsequent revisions were made in 1955 (7th Edition), in 1965 (8th Edition), and in 1979 (9th Edition) [3].

ICD has expanded notably with each successive revision. Improvements included more detailed information in many categories, and the emergence of new categories as knowledge of diseases advanced and new ones were discovered. Now, the ICD-10 was implemented worldwide since 1994, contains a total of 12,421 codes distributed in 21 Chapters; which are broken down into 261 groups containing a total of 2,036 categories [4].

The greatest degree of detail allows for more in-depth analyses by diseases, either individually or in specific groups. However, it hinders the complete tabulation of data to obtain a panoramic view of the health situation, identify the most relevant problems and define priorities. For this reason, the ICD itself offers shorter lists based on the aggregation of several categories into a single group [4].

The “core” classification of ICD-10 is the three character code, which is mandatory level of coding for international reporting to WHO mortality database and for general international comparisons. The four character subcategories, while not mandatory for reporting at the international level, are recommended for many purposes and form an integral part of the ICD, as do special tabulation lists [5].

Although the ICD is primarily designed for the classification of diseases and injuries with the formal diagnosis, not every problem or reason for coming into contact with the health services can be categorized in this way. Consequently, the ICD provides a wide variety of signs, symptoms, abnormal findings, complaints, and social circumstances that may stand in place of a diagnosis of health related records [5].

1.1.3. Health Management Information System (HMIS)

HMIS directs the flow of information which is the “lifeblood” of today’s functional health system, just as real blood is critical to a functional human body [5]. The primary aim of HMIS is to support informed strategic decision-making by providing quality data that help managers and health workers plan and manage the health service system [2].

In this research the HMIS refers to the new health information system which is currently implemented in TASH as a part of national HMIS reform strategy. HMIS disease classification for national reporting is modeled based on International Shortlist for Hospital Morbidity Tabulation (ISHMT). During modeling a consensus was made, to shift from ICD to a simplified disease list, with staffs of major regional health bureaus and selected woreda and health facility personnel. An agreement was also made with the WHO and Centers for Disease Control (CDC) [7].

1.2. Statement of the problem

Currently health information systems in many developing countries are weak and fragmented and unable to supply sound health care data in a timely way [8]. An assessment of HMIS was conducted by the FMOH to determine its performance capacity, efficiency and effectiveness in preparation for a new design. The areas identified that needed due considerations were related to information use, data quality, data burden, human resources, information communication technology (ICT) and financial resources [9].

Based on this, the FMOH launched a national scale-up of HMIS reform. The activities include management of individual medical records, abstraction of data for quarterly based reporting and selection of sector-wide programmatic indicators with the involvement of all stakeholders. The reform also includes a design of simplified items of formats and integration of parallel reporting in order to create a unified flow of information. The ongoing reform includes standardization of procedures in data collection, analysis and reporting, and review of indicators for activity monitoring and performance improvements [9, 10].

An essential part of HMIS reform is improving the quality of data and its use in improving service delivery. This involves reducing the amount of data collected at each health facility by agreeing on which indicators are most relevant to signal the need for direct action, and use the HMIS to collect only the data that are required to calculate those indicators. If an indicator shows a performance problem, then the problem should be investigated. This investigation may require further data collection from existing records or from a special study [11].

The HMIS disease classification and case definitions are a companion to these indicators. It includes a classification of diseases to be reported through the HMIS and case definitions appropriate for higher and lower capacity facilities. The HMIS which draws its data from routine service and administrative records provides an ideal source for indicators that are reviewed frequently to monitor and refine program implementation [11].

The disease classification balances several priorities for disease reporting in Ethiopia: maternal, newborn and child health; HIV/AIDS; demographic transition from infectious diseases to chronic diseases; and international surveillance and performance agreements [7].

As HMIS disease classification is modeled based on ISHMT and the disease categories are arranged within ICD-10 frame; the classification incorporates the newly found diseases such as avian influenza and HIV/AIDS, and diseases of public health importance. It is also expected that, since developing countries (including Ethiopia) are on epidemiologic transition, the disease classification should balance communicable diseases with non communicable diseases.

This study is designed to evaluate the HMIS disease classification in capturing morbidity data at TASH that help managers at different level to make informed decisions based on morbidity data that are generated and collected during routine health care provision. By using available data, this study tries to address the completeness and balances of HMIS disease classification for communicable diseases and non-communicable diseases. It also assesses the HMIS disease classification for representation of disease lists for injuries and other ICD-10 chapters which are useful for morbidity data tabulation.

The findings from this study will provide valuable points in the improvement of standardization of procedures in data collection and reporting, so that improvement to HMIS disease classification can be made and specific educational practices related to its implementation can be incorporated. With the awareness and adoption of these changes, the implementation of HMIS disease classification will be hopefully better. In addition, the outcome of this study can serve as a baseline to make decisions on the usefulness of ICD-10 as part of standardization processes while point out the usefulness of ICD-10 shortlist for morbidity data tabulation with appropriate modifications.

1.3. Objective *Limitations of the study*

General objective

- ☞ To evaluate the HMIS disease classification in capturing morbidity data at Tikur Anbessa Specialized Hospital in Addis Ababa.

Specific objectives

- To assess completeness of HMIS disease classification in capturing morbidity data at TASH.
- To measure the efficiency of HMIS disease classification as compared to ICD-10 tabular short list in capturing morbidity data at TASH.
- To address limitations of HMIS disease classification in relation to capturing morbidity data.

1.4. Scope and Limitation of the study

The scope of this study is limited to evaluate HMIS disease lists using ICD-10 special tabulation shortlist for morbidity as a gold standard by using data collected from medical and surgical departments only i.e. from medical and surgical inpatient units, and regular medical and surgical outpatient OPDs.

The data used in this research do not reflect the whole hospital activity, which are also incomplete and registered within a year; the analysis done using these data is not powerful as compared with using a complete data that shows total hospital activity that are registered for a longer period of time. Moreover, the fund given to conduct this research has been a serious limitation to collect and analyze data from the remaining six departments.

1.5. Organization of the thesis

This thesis is divided into six chapters. The first chapter is an introduction part, which gives background information about TASH and the ICD, statement of the problem, objectives of the study, limitations and scope of the research.

The second chapter contains review of literatures. In this chapter issues related to health care data and hospital based registry, HMIS disease classification, ICD-6 disease classification, ICD-10 disease classification, non-communicable diseases, concepts on evaluation of a classification performance and related works are addressed.

The third chapter provides detailed explanations about the methods used in this research. This includes issues related to data collection, data selection and data quality assurance techniques.

The fourth chapter continues to discuss data preparation techniques. This involves data cleaning and data integration steps followed by data and attribute construction. The fifth chapter provides explanation on experimental analysis done on both quantitative and qualitative data. Finally the last chapter provides conclusion followed by recommendations.

CHAPTER TWO

LITERATURE REVIEW

Health Management Information System (HMIS) should incorporate all the data needed by policy makers, clinicians, researchers and health service users to improve and protect population health. The data needed for comprehensive HMIS includes data on birth, morbidity and mortality; type and location of health personnel, type and quality of clinical services provided at each level of health facility and finally to population indicators. Few countries in the world today have effective and comprehensive systems in place to gather this data [12].

All countries routinely collect HMIS data from health facilities. Despite the volume and variety of data generated through the routine HMIS, the information is not properly analyzed and utilized for the purpose of planning and program reviewing. Its incompleteness, poor quality and lack of timeliness are often described as problematic. Moreover, the data are inevitably biased because they relate only to the population using public health services [8].

In recent years, data quality has become an important issue, not only because of its importance in promoting high standards of patient care, but also because of its impact on government budgets for the maintenance of health services. These concerns are not only related to the quality of medical record documentation but also to the collection of health care statistics at all levels [13].

A crucial factor in the introduction of new HMIS is the change of the corporate culture of health organizations towards information. In the new system, data collection and analysis of information is part of the work of all managers, from the lowest level to the highest level. This is a major paradigm-shift from the old attitude of the 'boss knows all' [14].

World Health Organization (WHO) argues the investment in HMIS should reap multiple benefits. First it should help decision makers to detect and control emerging and endemic health problems, monitor progress towards health goals and promote equity. Secondly, it must empower individuals and communities with timely and understandable health-related information. Third, it should strengthen the evidence base for effective health care policies; permitting evaluation of scale-up efforts and enabling innovation through research. Finally it should enable improved governance, mobilizing new resources, and ensuring accountability [12].

The starting point for health care information is the collection of data, whether maintained manually or electronically. The data should be organized in such a way that we can understand and retrieve them when needed. In the context of health care, primary data are obtained from the original data source i.e. documentation in the patient's medical/health record. Secondary data are data sets derived from primary data, which can be individual or aggregated health care data found in disease registries and reports that are summarized from the source [13].

A hospital-based registry contains data on all patients with a specific type of disease diagnosed and treated at that hospital. The registry will organize relevant clinical information from the patient record and identify care elements based on nationally recognized, evidence-based medical guidelines [15]. A register is essential to provide systematic care to the appropriate patients. It enables retrieval of information on diseases and services, easy identification of relevant treatment groups, and supports subsequent audit and quality assurance [16].

Disease registers are also used for data compilation, by abstracting information from medical/health records on diseases treated and procedures performed, using a classification system to complete nationally required morbidity statistics. The accuracy of this information is important, as the facility uses it to review the utilization of health care facility services, the workload of doctors, nurses, and other staff, and to plan for future development and human resource management [13].

A well-designed data abstraction instrument is formatted to promote accuracy of data transcription; to limit the likelihood the abstractor will miss data items. This helps, at a later stage, efficient and accurate data entry into the computerized database that promotes analysis of data items which provides sound information for decision making [17].

This information is used at a national level to improve the performance of the health system and track progress towards health-related goals including prevention of premature mortality [8]. In addition to this, it is also required for educating the population on health risks within their country. It is used internationally to compare the health status of countries in a region or globally [13].

Analysis of morbidity and mortality patterns is a crucial aspect of planning. Plans should include activities that address the most common causes of morbidity and mortality [18]. Thus health decision makers need to agree what diseases and what resource management issues they wish to monitor on a regular basis. There are international requirements with regard to disease surveillance that governments are obliged to adhere to. Each country may also have specific patterns of disease that are worth monitoring as well [12].

However, disease surveillance isn't just a question of agreeing what diseases to report on. It also requires that clinicians are able to diagnose the diseases accurately and rigorous about selecting conditions for reporting. In addition to this, while reporting, it needs accurate and reliable statistics. WHO has created the International Classification of Diseases (ICD) to standardize disease reporting across the world, but not all countries use ICD [12].

2.1. Issues regarding the HMIS

2.1.1. Back ground

The health system in Ethiopia has changed drastically in the last few years from a centralized system to a decentralized system. A centralized system only focuses on morbidity and mortality reporting from individual health units to the district and national level. With the introduction of a decentralized system there has been significant change, emphasized by the Federal Ministry of Health (FMOH) through the implementation of HMIS, the use of information at the point of collection [9, 19].

The objective of HMIS is to design a system that will improve informed health decision making at different levels of the health system through the utilization of complete, timely and accurate health information. HMIS and Monitoring and Evaluation (M&E) are one of the priorities of the Health Sector Development Programme (HSDP) III (2005/06-2009/10 GC). As HSDP III began in mid 2005 GC, national HMIS reform and implementation started with the assessment of the existing system in 2006 GC [19, 20].

For the reform, four technical areas have been identified for documentation of standards:

- 1) Indicator definitions: include indicator definition, interpretation, method of calculation and data source [11].

- 2) Disease classification and case definition: include classification of disease to be reported through HMIS and case definitions appropriate for higher and lower level facilities [7].
- 3) HMIS procedure manual: includes formats for recording client/patient encounters for HMIS data and procedures for transmitting HMIS data [2].
- 4) The information use guide line: provides the methodology on how to use information for evidence-based decision making with much emphasizes given at operational levels that provide service and generate data [18].

The HMIS reform and implementation is scheduled for 2008-2010 GC. The implementation activities are expected to be completed by 2010 GC. It is also expected that a complete evaluation will be undertaken, and the first review and updating of indicators will be done by the end of 2010 GC [19].

2.1.2. HMIS disease classification

“Classification is a method of generalization. Several classifications may, therefore, be used with advantage; and the physician, the pathologist, or the jurist, each from his own point of view, may legitimately classify the diseases and causes of death in the way that he thinks best adapted to facilitate his inquiries, and to yield general results.”

William Farr 1886 [5]

The HMIS re-design was based on the four components of the information cycle – Collection; Processing; Analysis and Presentation; and use (self-assessment and feedback). The process of data collection should be changed as little as possible, because health workers were already collecting and reporting data. The focus of the HMIS intervention should be reducing the data burden and standardize data collection to stimulate self-assessment and peer review [21, 23].

Regarding the HMIS disease classification, as part of reform Planning and Programming Department (PPD) of the FMOH consulted with staff of major regional health bureaus and selected woreda and health facility personnel. A consensus was made unanimously to shift from ICD to a simplified disease list for reporting. An agreement was also made with the stakeholders, particularly the WHO and Centers for Disease Control (CDC) [7].

The HMIS disease classification for national reporting is modeled based on the International Shortlist for Hospital Morbidity Tabulation (ISHMT) with certain modifications to be useful in the Ethiopian context. The classification is based on the priority diseases for epidemic control and the most common diseases found in Ethiopia. Except for infectious and parasitic diseases, the disease categories are organized according to ICD-10 chapters and the ICD-10 codes that included within each category are specified on the disease list [7].

The disease lists for infectious and parasitic diseases are divided into four blocks. These include epidemic prone diseases, immediately reportable diseases, priority infectious diseases and other infectious diseases. The remaining disease lists are arranged according to the ICD-10 chapters without a block. At the end of each chapter there is a “nonspecific disease list” labeled as “other or unspecified diseases of....” which will be used for inclusion of unspecified diseases on the list of each chapter. Annex IV provides detail description about HMIS disease lists, with corresponding ICD-10 chapters, and codes [7].

Each disease list categories are designated by four character sequential numbers (codes). For further specification of diseases, certain HMIS codes have five digits. For example HMIS code 0127.1 represents visceral and HMIS code 0127.2 represents cutaneous and mucocutaneous Leishmaniasis respectively. The HMIS codes are not codes used for ICD or Global Burden of Diseases (GBD) [7].

It is also explained that the design of HMIS disease classification considers the diagnostic capacities of lower and higher capacity facilities. Lower capacities refer to health posts and nucleus health centers: health institutions without laboratory or other diagnostic facilities and staffed by lower level health professionals. Higher capacity refers to health facilities with basic laboratory, radiology services and other advanced investigations and include health centers, district or referral hospitals [7].

The new integrated and unified HMIS has played a key role in encouraging alignment and harmonization by reducing the number of parallel reporting and indicators, and providing guidelines and tools to enhance information use for action [22].

It is expected that the FMOH will scale up the HMIS to all regions in Ethiopia [23]. Although the HMIS is currently mainly paper-based, FMOH with technical support from Health Metric Network (HMN) aims to implement an electronic data management and analysis system within the next few years [22].

2.2. Issues regarding ICD

A classification of disease can be defined as a system of categories to which morbid entities are assigned according to established criteria. The ICD is a comprehensive classification of causes of morbidity and mortality [5].

2.2.1. Issues regarding ICD-6

Before the HMIS reform, ICD-6 disease lists were used for national reporting. The ICD-6 disease list (the A-List) is an intermediate list of 150 causes of morbidity and mortality which was published by WHO in 1948 [24]. However, the A-list doesn't include certain disease conditions that exist in Ethiopia. The diseases not specified in the A-list, for example Chancroid, Granuloma Inguinale Venereum and Lymphogranuloma Venereum (viral) were included for reporting morbidity data [25].

ICD-6 disease reporting system used disease codes rather than disease names on the list. As a result the danger of using such codes resulted in errors as a result of miscoding [19]. The errors were exhibited on morbidity data collected from different regions and reported to the FMOH (morbidity reports, 1998-2000 EC) [26].

For instance, ICD-6 codes (031.1 and 031.2) which represent smallpox were reported from different regions (morbidity reports, 1998-2000 EC) despite the fact WHO declared small pox had been eradicated [27]. In addition, the reports exhibit another error for disorder and diseases of females in the reproductive age groups. For example Pre-eclamptic Toxemia (ICD-6 code 116.1), Eclamptic Toxemia (ICD-6 code 116.2), Hemorrhage of pregnancy and childbirth (ICD-6 code 117.1), Abortion with sepsis (ICD-6 code 119) and Ectopic pregnancy (ICD-6 code 120.1) were mistakenly coded and reported for males and also for females of age groups less than 4 years of age and above 65 years [26].

The ICD-6 classification is outdated and therefore does not include newly found diseases. Even though FMOH made several efforts to update the disease classification, currently health facilities in different regions use ICD-6 classification except hospitals and regions which implement the HMIS.

2.2.2. Issues regarding ICD-10

ICD-10 is a diagnosis coding standard owned and maintained by the WHO and has been revised periodically to incorporate changes in the medical field. The ICD-10 was adopted and forms part of the HMIS strategy in various countries, and currently serves as a choice of diagnosis coding standard in both public and private health care facilities across the world [28].

The purpose of ICD-10 is to translate diagnoses of diseases and other health problems from descriptions into an alphanumeric code, which permits easy storage, retrieval and analysis of the data. It also allows for the establishment of a systematic recording, analysis, interpretation and comparison of morbidity and mortality data collected within the country and across countries [28].

ICD-10 comprises three volumes. Volume 1 is the Tabular List, comprising a descriptive classification of diseases and injuries, supplementary classifications, and appendices. Volume 2 is an Instruction Manual which contains the WHO's guidelines for coding together with practical instructions. It also contains guidelines for presentation and interpretation of data. Volume 3 contains Alphabetical Index to diseases and injury. It covers external causes of injury and provides a table of drugs and chemicals [5].

Knowledge and understanding of the purpose and structure of the ICD are vital for statisticians and analysts of health information as well as for coders. Accurate and consistent use of the ICD depends on the correct application of all three volumes [5].

The disease classification, which is contained in volume 1, is divided into 21 chapters. The first character of the ICD code is a letter. Letter D is used in chapter II, Neoplasm and chapter III, disease of the blood and blood-forming organs and certain disorders involving the immune mechanism. Letter H is used in chapter VII and chapter VIII. Four chapters (chapter I, II, XIX,

and XX) use more than one letter in the first position of their codes [29, 30]. Annex I provides detail descriptions of ICD-10 chapters with the corresponding code ranges.

The chapters are subdivided into homogenous “blocks” of three-character categories. Within each block some of the three character categories are for single conditions selected because of their frequency, severity or susceptibility to public health interventions while others are for groups of diseases with some common characteristics [5, 29].

Most of three-character categories are subdivided into four-character subcategories after a decimal point of a numeric character. This allows up to ten four-character subcategories under each three character category. The four-character subcategories should be used in whatever way is most appropriate. The subcategories identify for example different sites or varieties of diseases if the three character category is for a single disease [29, 31].

Three-character categories and four-character subcategories are used as a title of diagnostic statements in ICD. Within three-character categories and four-character subcategories, there are lists of other diagnostic statements – known as “inclusion terms”. The given inclusion terms are related to important and common terms belonging to the given title. They also provide synonyms diagnostic statement and examples of diagnostic statement to be classified in the specific title [5, 31].

Although it is theoretically possible for coders to arrive at the correct code by the use of volume 1 alone, this would be time consuming and could lead to errors in assignment of codes. For this reason ICD-10 provides an Alphabetical Index as a guide to the classification which is contained in volume 3. The Alphabetical Index contains many terms which are used as an alternative names of diagnostic entities that are not included in volume-1. Thus a correct coding assignment requires consultation of both the index and the tabular list of ICD-10 [5, 31].

As indicated in ICD-10 volume 2, the health care practitioner responsible for the patient's treatment should select the main condition to be recorded as well as any other episode of health care. This information should be organized systematically by using standard recording methods. The condition to be used for single-condition morbidity analysis is the main condition treated or investigated during the episode of health care [5, 28].

The main condition or primary diagnosis can be defined as follows:

It is the condition diagnosed at the end of the episode of health care, primarily responsible for the patient's need for treatment or investigation. It is the "main condition treated" [5, 28].

If there is more than one such condition, then the one held most responsible for greatest use of resources should be selected. Only in circumstances where, if there is no information is available to determine which of the conditions is responsible for the greatest use of resources, one should revert to the default rule that allows selection of the first condition that the responsible clinician has recorded [5, 28].

If no diagnosis was made, the main symptom, abnormal finding or problem should be selected as the main condition rather than qualifying a diagnosis as "possible", "questionable" or "suspected" [5].

Episodes of health care or contact with health services are not restricted to the treatment or investigation of current illness or injury. Episodes may also occur when someone who may not currently be sick but requires or receives limited care or services. The details of the relevant circumstances should be recorded as the "main condition" [28].

In addition to the main condition the record should, wherever possible, also list separately other conditions or problems dealt with during the episode of health care and affect the management of the patient. Analyses of a single condition for each episode lead to lose of some available information. It is therefore recommended that, where practicable, carrying out multiple-condition analysis is important to supplement the routine data [5].

2.3. Issues Regarding Non Communicable Diseases

By the dawn of the third millennium, Non Communicable Diseases (NCDs) are sweeping the entire globe, with an increasing trend in developing countries where, the transition imposes more constraints to deal with double burden of infectious and non infectious diseases. In 2000, around 60% of all mortality, and 43% of the global disease burden was due to coronary heart diseases, stroke, cancers, and type 2 diabetes mellitus. Even in developing countries with high mortality,

90% of deaths in 2000 were due to CardioVascular Diseases (CVDs), greater than the number those due to HIV/AIDS and childhood under nutrition [32].

Increasing disease burden places a huge demand on health services, which in most developing countries are already extended [32]. By 2020, it is predicted that NCDs will be causing seven out of every 10 deaths in developing countries compared with less than half today. Many of the NCDs can be prevented by tackling associated risk factors and by taking efficient and urgent preventive measures. Otherwise developing countries will be unable to provide their people with standard health care [33].

According the WHO's statistics, globally chronic NCDs such CVDs, diabetes, cancers, obesity and respiratory diseases, account for about 60% of the 56.5 million deaths each year and almost half of the global burden of disease. These major NCDs are responsible for an increasing proportion of disease burden in many developing countries undergoing an epidemiological transition [33].

CVDs

CVD is the name for the group of disorders of the heart and blood vessels and include hypertension (high blood pressure), coronary heart disease (heart attack), cerebrovascular disease (stroke), peripheral vascular disease, heart failure, rheumatic heart disease, congenital heart disease and cardiomyopathies. CVDs in developing countries constitute the major contributors among NCDs. It is expected that by the year 2010 CVDs will be the leading cause of death in developing countries as a consequence of life style changes [33].

Diabetes

Regarding diabetes a recent statistics released by WHO and the International Diabetes Federation (IDF) state that, the number of diabetes in the world is expected to increase from 194 million in 2003 to 300 million in 2010 with three in four living in developing countries. Moreover, in developing countries the most frequently affected are aged between 35 and 64 which make the burden heavier in poorer countries. The burden of pre mature death from diabetes is similar to that of HIV/AIDs yet the problem is largely unrecognized [33].

Cancer

It is also explained that cancer is now a major cause of mortality throughout the world. The contribution of developing countries was 53% for incidence and 56% for deaths. Developing countries are responsible for the globally increasing trend. Between 2000 and 2020 the total number of cases of cancer in the developed world is predicted to increase by 29% where as in developing countries an increase by 73% is expected [33].

Chronic respiratory diseases

Chronic respiratory diseases represent a major burden for the health systems worldwide. Most developing countries have no standard protocols for assessing and managing chronic non communicable respiratory diseases such as Chronic Obstructive Pulmonary Disease (COPD) and Asthma. In these countries, the population afflicted by poverty and illiteracy, having very little (or no) access to health services, will die before the age of 40 years. Worldwide, it is estimated that 600 million people suffer from COPD and 2.5 million deaths were attributed to these diseases in 2000. By 2020, COPD is expected to become the third most common cause of mortality in the world [33].

The literature associated with these diseases in developed countries is abundant. However, despite the encouraging programmes and joint projects proposed by WHO and other organizations in the form of collaborative research agreements to developing countries, in order to support national registries; unreliable and insufficient data are still prevailing in most of these countries [33].

In Ethiopia national-level statistics on non-infectious diseases are scarce. There is no doubt, however, that these illnesses are adding to the growing burden of the myriads of diseases responsible for morbidity and mortality [34].

A study conducted in Butajira showed that the category of non-infectious adult illnesses accounted for 24% of morbidity and 14.2% of mortality. These included cardiovascular diseases, malignancies, diabetes mellitus, chronic liver diseases, bronchial asthma, nephritis and nephrosis, and musculo-skeletal diseases [34].

2.4. Concepts on evaluation of classification performance

An important goal in diagnostic medicine research is to estimate and compare the accuracies of diagnostic tests, which serve two purposes: providing reliable information about a patient's condition and influencing patient care. As new diagnostic tests are introduced, it is important to evaluate the quality of the classification obtained from this new test in comparison to existing tests or the gold standard [35, 36].

The purpose of a diagnostic test is to classify or predict the presence or absence of a condition of interest or a disease. The clinical performance of a diagnostic test is based on its ability to correctly classify subjects into relevant subgroups. Hence diagnostic test provides a framework for clinical decision making [35, 37].

The two basic measures of quantifying the accuracies of a classification performance are sensitivity (SENS) and specificity (SPEC). SENS is defined as the ability of a test to detect the disease status or condition of interest when it is truly present, i.e., it is the probability of a positive test result given that the patient has the disease or condition of interest. SPEC is the ability of a test to exclude the condition or disease in patients who do not have the condition of interest or the disease i.e., it is the probability of a negative test result given that the patient does not have the disease or condition of interest [35-37].

To elaborate more these terms, let us consider a series of N experiment to test the presence (positive) and the absence (negative) of a disease in a patient. Among the N sample for testing let's assume M_1 are positive and $M_2 = N - M_1$ are known to be negative while the experiment is conducted, N_1 of them are predicted to be positive and N_2 of them predicted as to be negative. Table 2.2 shows the desired (expected) and the predicted (actual experiment result) in a confusion matrix form.

Table 2.1: Confusion matrix showing concepts of sensitivity and specificity of a test

		Desired output		
		+ve	-ve	Total
Actual output	+ve	A	B	N ₁
	-ve	C	D	N ₂
	Total	M ₁	M ₂	N

As shown in table 2.2 among the M₁ expected positive only “A” of them are predicted correctly (true positives) and C=M₁–A of them are predicted wrongly as (false negative). Similarly, among the M₂ expected negative tests, only D of them are predicted correctly (true negative) whereas B= M₂–D of them are predicted wrongly (false positives). One can easily observe the following relations among the variables.

$$A + C = M_1$$

$$A + B = N_1$$

$$B + D = M_2$$

$$C + D = N_2$$

Accordingly SENS and SPEC are defined using these variables as follows

$$SENS = \frac{\text{count of true positives}}{\text{count of positive samples}} = \frac{A}{M_1} = \frac{A}{A + C}$$

$$SPEC = \frac{\text{count of true negatives}}{\text{count of negative samples}} = \frac{D}{M_2} = \frac{D}{B + D}$$

As one can observe from the SENS and SPEC equation, SENS defines the True Positive Rate (TPR) whereas SPEC defines the True Negative Rate (TNR). Simple observation shows both SENS and SPEC value ranges from zero to one inclusive. The higher both the values show the goodness of the experiment. Hence, both SENS and SPEC all together measures the fitness of the desired output and the predicted output [35-37].

SENS and SPEC are inversely related to the False Negative Rate (FNR) and the False Positive Rate (FPR) using the following simple relation.

$$\begin{aligned} FNR &= 1 - SENS \\ &= 1 - TPR \\ &= 1 - \frac{A}{A + C} \\ &= \frac{C}{A + C} \end{aligned}$$

$$\begin{aligned} FPR &= 1 - SPEC \\ &= 1 - TNR \\ &= 1 - \frac{D}{B + D} \\ &= \frac{B}{B + D} \end{aligned}$$

Once again, a sensitive test is effective in detecting existence of disease if it exists and characterized by very high TPR or very small FNR. Similarly, a specific test is effective in detecting absence of disease if it doesn't exist and characterized by very high TNR or very small FPR [35-37].

2.5. Related works

Most researchers uses retrospective chart review to study the validity of diagnosis codes as a source of data to compare with the information from other sources.

In the context of morbidity data, validity can be assessed at three different levels: diagnostic validity, classification validity and coding validity. Diagnostic validity assesses how medical information is transformed into diagnoses whereas classification validity addresses how diagnoses are classified into predefined class label according to the established criteria. Coding validity emphasizes how classified diagnoses are coded [38]. The following researches briefly explain these three concepts.

A study conducted by Quan et al [39] with the goal of determining the validity of the International Classification of Disease, 10th Version (ICD-10) for coding clinical conditions compared with International Classification of Disease-9-Clinical Modification (ICD-9-CM) uses randomly selected charts from four teaching hospitals in Canada.

The researchers reviewed 4,008 charts for patients admitted from January 1 to June 30, 2003 to determine the presence or absence of 32 clinical conditions and to assess the agreement between ICD-10 data and chart data. They re-coded the same charts using ICD-9-CM and determined the agreement between the ICD-9-CM data and chart data for recording those same conditions. The authors compare the accuracy of ICD-10 data relative to chart data with the accuracy of ICD-9-CM data relative to chart data [39].

Their result indicates that sensitivity values ranged from 9.3% to 83.1% for ICD-9-CM and from 12.7% to 80.8% for ICD-10 data. Positive predictive values ranged from 23.1% to 100% for ICD-9-CM and from 32.0% to 100% for ICD-10 data. Specificity and negative predictive values were consistently high for both ICD-9-CM and ICD-10 databases. Of the 32 conditions assessed, ICD-10 data had significantly higher sensitivity for one condition and lower sensitivity for seven conditions relative to ICD-9-CM data. The two databases had similar sensitivity values for the remaining 24 conditions [39].

The researchers concluded that the validity of ICD-9-CM and ICD-10 administrative data in recording clinical conditions was generally similar though validity differed between coding versions for some conditions. The implementation of ICD-10 coding has not significantly improved the quality of administrative data relative to ICD-9-CM. They also proposed that future assessments like this one are needed because the validity of ICD-10 data may get better as coders gain experience with the new coding system [39].

A study conducted by Shea et al [40] to assess the sensitivity of International Classification of diseases for codes for hyponatremia among commercially insured outpatients in the United States uses laboratory information as a gold standard. In this study the authors examined the validity of ICD-9-CM diagnosis codes for the identification of hyponatremia in an outpatient managed care population.

The researchers obtained all serum sodium laboratory tests performed between 2004 and 2005. They also obtain all outpatient records incurred in 2004 and 2005 with diagnosis code of hyponatremia. Their results showed that the sensitivity of ICD-9-CM codes for hyponatremia in outpatient patients was 3.5%, even for severe cases sensitivity was 30%. The researchers concluded that ICD-9-CM codes in outpatient population data are insufficient to identify hyponatremia. They recommended that, whenever possible, supplementary laboratory information should be used to overcome this limitation [40].

There is also another study conducted by Geller et al [41] with the purpose of evaluating the accuracy of the International Classification of Diseases–9th revision codes for preeclampsia and eclampsia. The authors identify 135 women from 1999 through 2001 whose disease was coded as having preeclampsia or eclampsia. They compare the diagnosis that was determined through chart review and coded with ICD-9 codes with “American college of Obstetrics and Gynecology criteria” as a gold standard. The researchers classify true cases if ICD-9 codes matched with the gold standard diagnosis, and they calculate the positive predictive value of the codes.

Their results indicated that the overall predictive value for the complete sample was only 54%; but for severe preeclampsia was 84.8%, which was high as compared with mild preeclampsia (45.3%) and eclampsia (41.7%). They claimed that diagnostic (clinician) error was the most common reason for miscoding error. They conclude that ICD-9 codes for preeclampsia /eclampsia vary greatly in their accuracy of diagnosis, and review of medical records is required when data are being gathered on the incidence of preeclampsia and eclampsia [41].

A study conducted by Geraci et al [42] with the objective of testing the ability of ICD-9-CM codes in discharge abstracts to identify medical inpatients that experienced an in-hospital complication, uses complications identified through chart review as the gold standard. The researchers use two sets of ICD-9-CM codes: an inclusive set including many medical diagnoses that may also be coexistent complicating conditions on admission rather than complications; and an exclusive set consisting primarily specified complication codes of ICD-9-CM and adverse drug event codes.

Their results showed that according to receiver operating characteristic (ROC) analysis; either sets were not performed well as a diagnostic test for complication occurrence; ROC areas were 0.61 for the inclusive set and 0.55 for the exclusive set. Sensitivities of the ICD-9-CM codes for complications were 0.34 for the inclusive set and 0.14 for the exclusive set. Corresponding positive predictive values were 0.32 and 0.37, respectively. The authors concluded that, as sensitivities of code definitions for individual complications were generally poor, less than 0.5 in most cases, ICD-9-CM codes in discharge abstracts are poor measures of complication occurrence [42].

One can learn from the above studies that retrospective chart review can be used as a source of data to study the applicability and limitations of disease classification for coding. This research also uses retrospective data which are collected from disease registries to evaluate the classification validity of the HMIS shortlist for morbidity data tabulation. But unlike the above related works, this study doesn't compare specific disease codes (diseases) rather compares lists of diseases which comprises of groups of codes (diseases).

CHAPTER THREE

METHODOLOGY

3.1. Study area

This study was conducted in Addis Ababa at Tikur Anbessa Specialized Hospital (TASH). TASH is the largest specialized teaching hospitals in Ethiopia located in capital city Addis Ababa. The hospital covers 123000m.sq area and the buildings have settled on 45000m.sq area. There are 1262 rooms, from the basement up to the eighth floor, which are used as offices and providing medical services.

The hospital has 850 beds for adult and pediatric patients to be treated as inpatients. Recently, form year to year the number of patients has been increased that needs various services from the hospital. For instance, from 2001-2005 GC, on average 295642 patients were appeared at various departments. In 2006 GC 363623 patients get various services from the hospital. Currently the hospital owes a total of 91 specialists (includes teaching staffs) and 388 nurses.

Regarding current health information system working in TASH, the implementation of Health Management Information System (HMIS) started at around January 2001EC. However, data collection and reporting from each unit follows the following procedure.

Each department and units prepares a list of diagnostic statement groups with related variables for reporting. The HMIS disease classification makes the majority of the hospital activities as "other or unspecified". Moreover, it is incomplete for morbidity data generated from various units including special activities performed in the hospital. Because of this, currently diagnostic statement groups with related variables are used for morbidity data tabulation.

The diagnostic statement groups are prepared by collecting morbidity data in each unit. In addition, diagnostic statement groups with related variables on the previous month reports are used for reporting next month reports during each month. If new cases are appeared, they add it on the previous diagnostic statement groups.

At statistics office diagnostic statement groups with related variables from each department and unit are collected and compiled. The report is used internally, such as for bed occupancy rate and top 10 morbidity analyses, and reported directly to the FMOH.

3.2. Study design

A cross sectional study design was employed using both quantitative and qualitative methods. Retrospective surveying of manual disease registries were used for quantitative data collection and in-depth interviews were used to collect qualitative data.

3.3. Study attributes

Dependant attribute

- Disease lists on International Classification of Diseases (ICD)-10 shortlist

Independent attribute

- Disease lists on HMIS shortlist

3.4. Sampling procedures and Sample size

To achieve the research objectives, this research uses purposive sampling technique for both quantitative and qualitative data collection. For quantitative data analysis, this research uses secondary data obtained from 18 manual abstract disease registries. A total of 10848 records which were recorded from 01\07\2001 to 30\06\2002 EC were collected using a paper format.

3.4.1. Data source for initial quantitative data sets

Because of money and time constraints Department of Medicine and Surgery were selected purposely because the datasets cover the majority of ICD-10 chapters. Hence, sections of disease lists on HMIS as well as ICD-10 shortlists were covered adequately.

Initially data found on 13 InPatient Department (IPD) admission and discharge registers were collected from the inpatient surgical (B₃, B₄, C₃, C₄, D₃, D₄, D₅, surgical intensive care unit) and medical (B₅, B₈, C₈, D₈ and medical intensive care unit) wards.

The IPD admission and discharge register is used to abstract patient information from medical record folder. In TASH each piece of information is transcribed and filled by nurses who are working in each unit. The register is kept in IPD room. Single pages of register have 18 records. In each instance record, there are sequential numbers from (1) up to (17) representing type of information to be entered from patient medical record. The sequential numbers were organized into five categories.

Annex II illustrate the contents of admission and discharge register used to collect inpatient morbidity data in TASH. The description of each category and numbers are discussed on the instruction of the register.

In order to strengthen the study, this research also includes the OutPatient Department (OPD) data. For the OPD data collection, this research also purposely selects regular OPDs of medical-surgical department although these departments also have emergency and special referral clinic outpatients.

The reason for this is emergency OPD provides services for patients who came for emergency, i.e., the records only represent emergency patient cases. Regarding special referral clinics each unit also provide services for special cases. To cover all these units there is time and money constraints. Regular OPD were selected for the benefit for covering the majority of ICD-10 chapters because data are general. The data of emergency and subspecialty OPD clinics are represented by the inpatient data, since patients are admitted from these OPDs.

As the IPD register, outpatient abstract register is used for abstracting and transcribing pieces of patient information from medical record folder. At the end of the episode, it is filled by health care professionals and is kept in OPD room. A single page of the register has 18 records. An instance record has 13 sequential numbers that representing a piece of patient record data item and categorized under three headings.

Annex III illustrates the OPD abstract disease register used to collect outpatient morbidity data in TASH. The description of each category and numbers are discussed on the instruction of the register.

Even though there is a difference in the contents of IPD and OPD registers (observe Annex II and III), the selected attributes are same and the inpatient cases are also registered on OPD registers if a patient is not admitted during the episode from different reasons. Therefore, all records found on 5 outpatient abstract register were collected from surgical and medical (15_B, 16, 17_A, and 17_B) regular OPDs.

3.4.2. Data source for qualitative data

The nature and properties of quantitative data speaks many things about types of patients treated in each department and current practices of registration of patient information. Qualitative method is used in order to get an in-depth understanding about the situations of data collection and reporting processes. Moreover, because of time and money constraints morbidity data that existed in other departments are not covered, qualitative method also used as a complement for this limitation to get additional information if any regarding ICD-10 chapters in other departments.

For this purpose semi structured questions were prepared and administered by the principal investigator. These questions are designed to get a good insight about current situation regarding data collection and reporting processes, to identify if any limitations and difficulties that exist in collecting and reporting morbidity data, and to collect recommendations from key informants.

Purposive sampling technique was used to select 13 key informants from TASH, who are responsible for recording patient data on abstract disease registries (OPD and IPD registers); and compiling, analyzing and reporting such data to the second level. Nine head nurses and/or staff nurses from medical and surgical IPD and regular OPD, two statistics office workers and two quality control office workers (HMIS focal persons) were selected for the interviews. As TASH reported its quarterly report directly to the Federal ministry of health (FMOH), two FMOH HMIS officers were also included in the in-depth interview.

3.4.3. Data selection

Inclusion criteria

Main condition belongs to the following ICD-10 chapters are included for analysis

- Chapter I up to Chapter XIV, Chapter XVIII and Chapter XIX

Exclusion criteria

Main condition belongs to:

- ➡ Chapter XV, Chapter XVI and Chapter XVII
- ➡ Chapter XX: External causes codes (V, W, X, Y)
- ➡ Chapter XXI: Z codes

Even though main conditions belong to chapter XV and Chapter XVII are available in medical and surgical department, it is difficult to draw conclusions on data that are only obtained from these departments without collecting data from the other respective departments. Chapter XVI main conditions were not available in adult IPD units and OPDs.

External cause codes should not be used as main conditions. They are intended for identifying causes for conditions classified in chapter XIX. In addition, these codes may also be used with conditions classified in any other chapters having external cause. It is recommended that the external cause information should be registered apart from other diagnoses, and be tabulated and reported separately in a few broad groups.

Z-codes collected from registries are codes for administrative purposes, and codes for medical observation and evaluation for suspected diseases and condition. This chapter is excluded from this study because there is no further information or clarification for suspected conditions to be main condition or not on the registers.

3.5. Data quality management

Data quality management mechanisms have been used at different level. Before data collection, appropriate training was provided for data collectors. Data collection from abstract disease registry were done by diploma nurses (two) who have experiences in registering, coding and reporting the previous ICD-6 disease codes and HMIS disease lists, and currently working at Menellik II hospital. After data collection, the data were cross checked with the disease registers. Finally, the data were entered by trained data entry personnel who have IT background.

Data collectors and data entry personnel were supervised by the principal investigator. During the initial stages of data collection, the data were verified by the principal investigator through direct participation and appropriate instruction was given for data collectors and data entry personnel.

3.6. Operational definition

- Specific records: - are records represented by specific disease lists (codes) on the disease list of HMIS/ICD-10 short lists. (E.g. malignant neoplasm of breast)
- Non specific records: - are records represented by others or unspecified disease lists (codes) on the disease list of HMIS/ICD-10 short lists. (E.g. Other or unspecified malignant neoplasms)
- Specific-Specific (SS):- records are classified as SS if the HMIS disease lists (codes) were matched with the ICD-10 disease lists (codes) for specific records.
- Specific-Nonspecific (SN):- records are classified as SN if record is labeled as specific by HMIS disease lists (codes), but nonspecific by ICD-10 disease lists (codes).
- Nonspecific-Specific (NS):- records are classified as NS if record is labeled as nonspecific by HMIS disease lists (codes), but specific by ICD-10 disease lists (codes).
- Nonspecific-Nonspecific (NN):- are records classified as NN if the record is labeled as nonspecific on both HMIS and ICD-10 lists (codes).

3.7. Ethical considerations

Ethical issues were considered in all stages of the research process.

- Approval of research plan was received from AAU joint academic commission.
- Official letter of cooperation was written to responsible authorities of Tikur Anbessa specialized hospital.
- Detailed explanation about the objective (purpose) of the study was given to the responsible bodies of Tikur Anbessa specialized hospital.
- The collected data was used for the purpose intended in this research only.

3.8. Data analysis

Data were summarized using Excel spread sheet. Frequency distribution of the disease lists of HMIS and ICD-10 shortlists was done using Epi info version 3.3.2 software.

The effectiveness of HMIS disease classification in capturing morbidity data were measured by sensitivity and specificity by using ICD-10 special tabulation list for morbidity as 'gold standard'.

The tape recorded data and notes from interviews with key informants were analyzed systematically. Following each interview the data were transcribed and coded through ordering, reducing, categorizing using key themes and then summarized using compilation sheet. Whenever necessary the data were summarized into matrices and prepared for analysis.

3.9. Dissemination of results

The findings will be communicated to AAU, to school of public health as partial fulfillment of MSc degree in health informatics and to all potential stakeholders. It will be presented on annual conferences and also for possible publication.

CHAPTER FOUR

DATA PREPARATION

4.1. Data preparation

Data preparation involves two different types of activities. The first step is data discovery which includes finding and assembling the data from the sources. The second step is manipulating the data in order to enhance its use in analysis for the achievement of project objectives. The first step was discussed in the methodology section in detail. This section is dedicated to discuss data manipulation steps which are used in this research. These include data cleaning, data integration, data construction and finally attribute construction.

Data cleaning includes the process of smoothing noisy data, filling missing values, and resolving inconsistencies. Data integration involves merging data sets from various units into a single store. Data construction explains the steps of International Classification of Diseases (ICD)-10 code generation. Attribute construction is the process of deriving new attributes from the existing attributes. It explains construction of derived disease lists of Health Management Information System (HMIS) and ICD-10 shortlists. The following sections explain each steps of data manipulation used in this research.

4.1.1. Data cleaning

For data capturing, a paper format were used to collect the data that are registered on various paper based abstract disease registers. Data entries were done each day following data collection and data are prepared for preprocessing. The data were summarized in excel spread sheet, checked and edited. Noises such as abbreviation, misspellings and undecipherable symbols, etc... were cleaned and removed as required.

Abbreviation and undecipherable symbols were changed into a full description of diagnostic statements. Then the datasets collected from various units were integrated and misspellings are edited and corrected.

The following records were considered as irrelevant and removed from the data.

- Records with surgical procedures and diagnostic procedures: associated diagnoses are not mentioned so that it is difficult to speculate main conditions for these records.
- Records stating immediate postoperative periods: these records only describe the period after an operation for certain disorders.
- Questionable diagnoses: these diagnoses should not be used as standard diagnostic statements.
- Records with non specific HMIS diseases codes: these codes aggregate several disease codes together and it is difficult to identify specific main conditions to be selected.
- Illegible records: it is difficult to read and understand main conditions.
- Duplicated records and records presented with ambiguous abbreviations.

Table 4.1 provides descriptions of records that are collected from various departments. This table also shows the counts of preprocessed data in comparison with the initial data among various departments. The total numbers of records of the initial data are 15180.

Table 4.1: Count of records before and after data preprocessing

Departments	Number of records	
	Before	After
Medical IPD	2141	1825
Surgical IPD	3225	2123
Medical OPD	2701	2278
Surgical OPD	7113	4622
Total	15180	10848

IPD: - InPatient Department

OPD: - OutPatient Department

Table 4.2 provides comparison for categories of patients by age group and sex before and after data preprocessing. In the initial data as well as the final data, the majority of patients were belonging to the age group of 25-44 years.

Table 4.2: Characteristics of patients by age and sex before and after data preparation

<i>All patients</i>	<i>(n=15180)</i>	<i>(n=10848)</i>
Age group	Before	After
<14	475 (3.2%)	316 (2.9%)
15-24	3101 (20.8%)	2074 (19.1%)
25-44	5871 (39.3%)	4374 (40.3%)
45-64	4061 (27.2%)	2989 (27.6%)
>65	1434 (9.6%)	1095 (10.1%)
Missing values	238	198
Sex		
Female	6482 (42.7%)	4667 (43.0 %)
Male	8697 (57.3%)	6181(57.0%)
Missing values	1	1

After cleaning and editing the initial data and removing the noises, a single diagnostic statement was generated for the assignment of ICD-10 three character codes. Missing values and inconsistencies are corrected after coding is completed.

198 missing values for age attribute were filled with attribute mean for all samples that belong to the same disease categories. A missing value for sex is also filled according to the corresponding sex category. 97 missing values for Medical Record Number (MRN) are also found. All records without MRN were included in the final data sets, because MRN does not affect main condition definition.

Inconsistencies between diagnosis codes and sex were identified and appropriate measure was taken to correct it. For example ICD-10 code C60 (malignant neoplasm of the prostate) and N40 (hyperplasia of the prostate) are codes that belong to male category mistakenly entered for female, and ICD-10 code C53 (malignant neoplasm of the cervix) belongs to female category but entered for male category. Correction was done by using ICD-10 codes limited to one sex, and the correct sex category has been entered for these diagnoses.

4.1.2. Data construction

In this section, ICD-10 codes generation steps for main condition will be discussed. Main condition is defined as follows:

1. The condition diagnosed and treated at the end of the episode of health care, primarily responsible for the patient's need for treatment or investigation.
2. The one most responsible for greatest use of resources, if there is more than one condition.
3. The main symptom, abnormal finding or problem, if no diagnosis was made.

To select the main conditions, this research uses ICD-10 volume 2 guideline for recording diagnostic information for single condition analysis of morbidity data. The following section provides brief explanation on how to define main condition and the assignment of ICD-10 codes with exemplifications.

A. Single conditions

A diagnosis (diagnostic statement) describes a pathological condition that shows a morbid event or other circumstances during the episode of a health care. According to the degree of severity it can be further elaborated by using adjectives as a prefix. For example severe anemia; severe pneumonia; New York Heart Association (NYHA) Class I, II, III, IV congestive heart failure etc... These prefixes only indicate degree of severity which is helpful for the management of a patient in medical and nursing care perspectives.

The ICD-10 codes are not differing with the use of these adjectival modifiers; hence for all single diagnostic statements the corresponding ICD-10 code has been assigned.

Example 1:- NYHA Class IV congestive heart failure

Code (I50.0): Congestive heart failure

B. Coding of acute and chronic conditions

When the main condition is recorded as being both acute and chronic, the category for the acute condition should be used as the preferred main condition.

Example 2:- Acute Lymphocytic Leukemia + chronic Lymphocytic Leukemia

Code (C91.0). Acute Lymphocytic Leukemia

C. Coding of combinations of categories

A combination of categories could be a condition and an associated secondary process or two different conditions that can be coded together. ICD-10 provides such combination categories that can be coded together as a single diagnostic statement. These combinations should be used as the main condition where appropriate information is recorded.

Complications of diabetes mellitus, as associated secondary processes, can be coded together with diabetes mellitus. ICD-10 provides 10 subcategories for each type of diabetes mellitus that are used as a combination of categories.

Example 3:-diabetic foot ulcer, Hypertension, diabetes mellitus type I

Code (E10.7) Types I diabetes mellitus with diabetic foot ulcer

Combinations of categories, two different conditions combined together in a single category, also can be taken as a single main condition. For instance, if conditions in Code I50.- (heart failure) and Code N18.- (chronic renal failure) are mentioned with Code I10 (hypertension) these categories can be combined together as a single category. Examples 4, 5, 6, and 7 shown below describe these combinations of categories.

Example 4:- Malignant hypertension with acute or chronic congestive heart failure

Code (I11.0) hypertensive heart disease with (congestive) heart failure

Example 5:- Severe hypertension with hypertensive heart disease or

Hypertension + hypertensive heart disease

Code (I11.9) Hypertensive heart disease without (congestive) heart failure

Example 6:- Chronic renal failure secondary to hypertension

Code (I12.0) Hypertensive renal disease with renal failure

Example 7:-Hypertensive nephrosclerosis

Code (I12.9) Hypertensive renal disease without renal failure

D. Coding of post procedural condition and complications

Codes of post procedural condition and complications categories are provided in chapter XIX (T80-T88) for certain complications related to surgical and other procedures.

Example 8:- Post haemorrhoidectomy bleeding

Code (T81.0) Haemorrhage resulting from a procedure

E. Coding minor condition recorded with more significant condition

When minor condition recorded at first and more significant condition recorded in second position for a single record, the more significant condition is selected as a main condition.

Example 9:- Chronic otitis media + Brain abscess

Code (G06.0). Abscess of brain

F. Coding several conditions recorded together using a default rule

Where two or more conditions are recorded as diagnostic options for “main condition” but cannot be coded together, the first condition recorded was selected as main condition.

Example 10:-Type II diabetes mellitus + Hypertension

Code (E11.9) Type II diabetes mellitus without complication

The default rule allows selection of the first condition that the responsible clinician has recorded. But this rule should be used only in circumstances if no information is available to determine which of the conditions is responsible for the greatest use of resources.

The following chapter specific guidelines were followed to assign chapter specific codes and in assigning codes for multiple conditions or combination of conditions that are recorded together for single patient record.

Chapter I: Certain infectious and parasitic diseases

☞ B20 – B24:- Human immunodeficiency virus (HIV) diseases

Categories and subcategories provided in this block are used for code HIV with various resultant diseases.

Example 11:- Disseminated Tb + RVI

Code (B20.0): HIV disease resulting in Mycobacterial infection

Example 12:- Kaposi's sarcoma with HIV or HIV+ Kaposi's sarcoma

Code (B21.0): HIV disease resulting in Kaposi's sarcoma

Chapter II: Neoplasm

☞ For malignant neoplasm with specification of site, the corresponding code were assigned

Example 13:- Breast Cancer

Code (C50): malignant neoplasm of the breast

☞ Malignant neoplasm without specification of site

Example 14:- Carcinoma

Code (C80) - Malignant neoplasm without site specification

Chapter III: Diseases of blood, blood forming organs and certain diseases including immune system

“Dagger and asterisk” system allows two codes to be used simultaneously for a single diagnostic statement. The dagger code referring to the underlying generalized disease (marked with dagger (†)). The asterisk code represents a manifestation of a disease in a particular organ or site which constitutes a clinical problem in its own right (marked with asterisk (*)) [3, 28].

The dagger code is regarded as primary code, while the asterisk code is an optional additional code. But for hospital activity analysis, the manifestation code (asterisk code) is more relevant than the etiological code (dagger code). As an example for a patient with diabetic cataract

,which is a diabetic eye complication, it is more relevant to describe the patient condition as eye disease that needs eye surgery rather count the stay only as due to diabetes [43].

ICD-10 provides limited asterisk codes (ICD-10, volume 2, p.27). As recommended in ICD when asterisk categories are used, there must be a dagger category since asterisk codes should not be used alone.

Example 15:- Anemia secondary to hematologic malignancy

Code (D63.0*) Anemia in neoplastic diseases (C96†)

Chapter IV: - Endocrine Nutritional and Metabolic Disorders

☞ (E10-E14) Diabetes mellitus

In coding the main condition for

- (E10.-) Insulin dependent diabetes mellitus
- (E11.-) Non insulin dependent diabetes mellitus
- (E14.-) unspecified diabetes mellitus, and for additional conditions appropriate subcategory was selected in coding a single main condition.

Example 16:- Type I diabetes mellitus with DKA or Type I diabetes mellitus + DKA

Code (E10.1) Type I diabetes mellitus with diabetic ketoacidosis

Example 17:- Type II DM with diabetic foot ulcer or Type II DM + diabetic foot ulcer

Code (E11.7) Type II diabetes mellitus with diabetic foot ulcer

Chapter VI: Diseases of the nervous system

☞ (G81- G83) Paralytic syndromes.

As stated in ICD, paralytic syndromes are not preferred codes to be used as a main condition if a current cause is recorded, see example 18. When paralytic syndromes are recorded as case for the episode, as example 19 describes, they are taken as a main condition.

Example 18:- Hemiplegia secondary to hemorrhagic stroke.

Code (I61.9) Hemorrhagic stroke

Example 19:- Hemiplegia

Code (G81.9) Hemiplegia unspecified

Chapter XVIII: Symptoms and abnormal clinical findings

Categories from this chapter should not be used as "main condition" unless the symptom, sign and abnormal finding was clearly the main condition treated or investigated during an episode of care and was unrelated to other conditions recorded by the health care practitioner.

As example 20 describes, where symptoms or abnormal findings recorded together with given diagnosis, the diagnosis is selected as a main condition. If the symptom or abnormal findings are clearly recorded as a main condition, as example 21, these symptoms and abnormal findings are taken as main conditions.

Example 20:- Intracranial space occupying lesion secondary to Meningioma

Code (D32.9) Meningioma

Example 21:- Intracranial space occupying lesion

Code (R90.0) Intracranial space occupying lesion

Chapter XIX- Injury, poisoning and other consequences of external Causes

For multiple injuries that are recorded together for a single record, the following steps were followed.

For coding different types of injuries the S-section (S00-S99); and for multiple injuries as well as poisoning and other consequences of external cause the T-section were used. For fractures recorded with open wounds, fractures were selected as "main condition" and the corresponding ICD-10 code was assigned. For fracture of the skull with associated intracranial injury, code was assigned to intracranial injury as "main condition".

Example 22:- Fracture of the humerus (open)

Code (S42.3) Fracture of humerus

Example 23:- Epidural hematoma + depressed skull fracture

Code (S06.4) – Epidural hematoma

As stated in ICD, where multiple injuries are recorded and no one of these have been selected as the main condition code is assigned for statements of multiple injuries. Section T (T00 – T07) was used for coding of bilateral involvement of the same body regions. This section is also used for coding injury types involving two or more body regions classifiable with S00-S99. (T08-T14) used to assign codes for injuries of unspecified body regions.

Example 24:- Bilateral fracture of tibia and fibula

Code (T02.5) fracture involving multiple regions of lower extremity

Example 25:- Comminuted tibiofibular fracture, pubic rami and femoral shaft fracture.

Code (T02.3) fracture involving multiple combinations of body regions

Example 26:- Spinal cord injury

Code (T09.3) Injury of spinal cord, level unspecified

4.1.3. Attribute construction

To define main conditions for all records the attributes patient age, sex and diagnostic statements were selected from IPD and OPD abstract registers. An attribute MRN is selected only for the purpose of identification of individual medical record. To construct disease lists main conditions as defined in ICD-10 were selected and the corresponding codes were assigned.

After coding the main condition for all records, 409 three character ICD-10 codes have been generated. In fact to map most of three character categories, four character subcategories were assigned. Disease lists of HMIS and ICD-10 short list are constructed by re-coding each three character ICD-10 codes using HMIS and ICD-10 codes on the shortlists, and prepared for analysis.

CHAPTER FIVE

EXPERIMENTAL ANALYSIS

The Health Management Information System (HMIS) disease classification for national reporting is modeled based on the International Shortlist for Hospital Morbidity Tabulation (ISHMT). However, this research selects International Classification of Diseases (ICD)-10 special shortlist for morbidity data tabulation for measuring the effectiveness of HMIS disease lists. This is because all blocks of infectious and parasitic diseases on the HMIS shortlist are covered by ICD-10 shortlist, but not by ISHMT.

The following section dedicated to discuss the experimental analyses done on both qualitative and quantitative data.

The interviews are aimed at getting an in-depth understanding about data collection, reporting and analysis at different levels following the flow of morbidity data. In addition, the interviews try to address difficulties and limitations of the HMIS disease classification during data collection, compilation, reporting and analysis.

Regarding quantitative analysis all tables, from Table 5.1 to Table 5.24, give an explanation on morbidity data found at Tikur Anbessa Specialized Hospital (TASH). Since all the records are collected only from medical and surgical departments, each table describes characteristics of data found in these departments. Moreover, each table explains morbidity data collected within a year duration i.e. from 01/07/2001 to 30/06/2002 EC.

Table 5.1 and Table 5.2 gives comparison regarding the distributions of top 10 leading causes of morbidity using the HMIS and ICD-10 shortlists. Table 5.3 provides the overall picture of ICD-10 chapters at TASH. The constructed disease lists for the HMIS and ICD-10 shortlists will be discussed in detail form Table 5.4 up to Table 5.18. Finally tables from Table 5.19 to Table 5.24 provide explanations on the relationship between the HMIS and ICD-10 shortlists.

The interview findings regarding data collection and analysis showed the following: "the process of data collection and compilation begins by abstracting information from manual medical records onto manual abstract disease registries. On monthly bases data were compiled and reported to statistics office from each unit using a disease list prepared by collecting the diagnostic statements with related variables from each unit. At statistics office, the reports collected from each department were compiled on HMIS tally sheets and reported to FMOH. At national level, HMIS reports from different health institutions and regions were compiled and used for morbidity pattern analyses and interpretations."

Table 5.1 and Table 5.2 gives comparison regarding the distributions of top 10 leading causes of morbidity on the HMIS and ICD-10 shortlists which is used for analyzing morbidity patterns. The percentage is computed from the overall data and the leading causes are presented in each table. Table 5.1 shows the distribution of top 10 leading causes of morbidity using the HMIS disease lists on data collected from 01/07/2001 to 30/06/2002 EC at TASH.

Table 5.1: Top 10 leading causes of morbidity using HMIS disease lists

Type	No	HMIS disease lists	Count	%
N	1	Other or unspecified disorders of the genitourinary system	1162	10.70%
N	2	Trauma (injury, fracture.etc)	1062	9.80%
N	3	Other or unspecified malignant neoplasms	1056	9.70%
N	4	Other or unspecified diseases of the circulatory system	785	7.20%
N	5	Disease of the musculoskeletal system and connective tissue	740	6.80%
N	6	Other or unspecified diseases of the digestive system	472	4.40%
S	7	Diabetes mellitus	424	3.90%
S	8	Breast cancer	389	3.60%
N	9	Other or unspecified disease	332	3.10%
S	10	Cerebrovascular accident	320	2.90%
Total of leading causes			6742	62.10%
Total of all causes			10848	100.0%

S: Specific N: Nonspecific

From Table 5.1 someone can easily observe that the majority of leading causes of morbidity are nonspecific which provides only little information about the types of morbid entities treated in the hospital.

Table 5.2 shows the distribution of top 10 leading causes of morbidity using ICD-10 tabular short list for the same data used to construct Table 5.1. From Table 5.2 one can easily grasp the leading causes of morbidity in meaningful way.

Table 5.2: Top 10 leading cause of morbidity using ICD-10 tabular short list

Type	No	ICD-10 disease lists	Count	%
S	1	Urolithiasis	524	4.80%
S	2	Heart failure	500	4.60%
S	3	Diabetes mellitus	424	3.90%
S	4	Malignant neoplasm of breast	389	3.60%
S	5	Intervertebral disc disorders	326	3.00%
N	6	Other symptoms, sign and abnormal findings	323	3.00%
S	7	Hyperplasia of the prostate	320	2.90%
S	8	Human immunodeficiency virus diseases	297	2.70%
N	9	Other diseases of the urinary system	282	2.60%
S	10	Cholelithiasis and cholecystitis	280	2.60%
Total of leading causes			3665	33.70%
Total of all causes			10837	100.0%

Note: - 11 cases are acute febrile illnesses, have no ICD-10 codes.

Comparing the two shortlists illustrated in Table 5.1 and Table 5.2 shows a big difference regarding the information one can get from morbidity data that is helpful for decision making.

The HMIS identifies 3 specific disease lists (No 7, 8 and 10) represent 10.4% of the total morbidity data, whereas the nonspecific lists (from No 1 to 6, and 9) comprise 51.7% of the total morbidity data. Since half of the morbidity data are described as nonspecific the HMIS obscures the dimension of specific diseases. Hence, from the point of view of hospital activity analysis, the HMIS shortlist limits health problems to be appeared adequately in their own dimensions.

This contradicts with the idea and the purpose of using a shortlist for morbidity data tabulation. As mentioned by the expert group who develops ISHMT, the purpose of shortlist is to get broad and meaningful picture of the diagnostic panorama at hospitals. This is possible if there is a thorough understanding of the structure and specific activities of the hospital [43].

On the contrary, ICD-10 tabular shortlist identifies 8 specific disease lists (all except No 6 and 9) represent 28.1% of the total morbidity data whereas the nonspecific disease lists (No 6 and 9) only represented by 5.6% of the total morbidity data. In addition, as Table 5.2 illustrates, majority of records specifically describe patients with non communicable diseases treated in the hospital. This indicates that ICD-10 short list is able to capture morbidity data specifically in a meaningful way than the HMIS.

This discrepancy indicates, for the analysis of morbidity patterns, the HMIS disease list is inefficient in providing information for decision making in comparison with the ICD-10 tabular shortlist. This difference also implies ICD-10 shortlist is better and appropriate to understand the overall situations of the hospital. However, since 5.6% datasets are nonspecific the ICD-10 shortlist needs modifications in order to enhance its usefulness in morbidity pattern analysis.

Analysis of morbidity patterns needs not only appropriate short list but also requires accurate and reliable statistics during data collection and compilation. Findings in the interviews showed that there are difficulties as well as limitations of the HMIS disease classification during data collection, compilation and reporting.

As the respondents state in various units at TASH, there are difficulties in reporting multiple diagnoses that are registered for a single record. These include reporting multiple conditions and combinations of conditions as discussed with the examples in data preparation section. A common example of multiple conditions, Tuberculosis and Retroviral co-infection (Tuberculosis + Retroviral infection), is mentioned by informants.

According to the respondent nurses, there are two approaches to report such types of multiple diagnoses for a single record. Some of them report multiple diagnoses as written in the above example to statistics office, whereas the others report each diseases separately on a given disease lists i.e., for reporting tuberculosis they use the tuberculosis disease list and for retroviral infection they uses HIV disease list.

Thus, this results in lack of uniformity in reporting across different departments. It also leads to counting a single patient more than once for such types multiple conditions and combinations of conditions resulting in inconsistent and unreliable statistics.

At statistics office, there are limitations during data compilation, analysis and reporting specific diseases, injuries, other morbid entities and procedures. As the respondents replies if specific diagnostic statement is found on the HMIS list it is filled as appropriate. If a specific list is not available, it is filled as others or unspecified diseases. The key informants state "for our hospital morbidity analyses, the majorities of diseases were included and reported under nonspecific disease lists so that it is difficult to compute top 10 leading causes of morbidity for hospital activity analysis using the HMIS shortlist."

In addition to this while aggregating data from different departments, there is also another difficulty in reporting procedure that are performed in radiology department. As the key informants state, there were a number of patients treated with radiotherapy in radiology department. They are reporting this activity in chapter II of ICD-10 by using code (C50) which is code for malignant neoplasm of breast.

This creates another inconsistency in statistics which gives incorrect and inflated figure for breast cancer reported each month, in fact this procedure is performed for other neoplasms too.

The key informants at TASH state the majority of activities of the hospital are referrals from different hospitals and health institutions. However, there is no space for activities done in our hospital specialized units. The respondents also claim that, this HMIS diseases classification might be appropriate at district level.

The above response is also supported by informants at Federal Ministry of Health (FMOH). The informants agreed on the claim about the usefulness of the HMIS shortlist at the district health facilities. The following quote, from the FMOH HMIS officers, reflects the presence of variation on disease patterns across different health facilities. "Groups of experts should sit down and see differences of disease patterns at different health care delivery system."

Table 5.3 gives detail explanations regarding the distribution of ICD-10 chapters with their dimensions at TASH using morbidity data collected from 01\07\2001-30\06\2002 EC. This Table indicates, almost half of the patients treated with non communicable diseases represented by three ICD-10 chapters. The first one is neoplasm comprises of 18.8 % the total records. The second one, diseases of the circulatory system represent 15.3 % of the total morbidity data. The third one is diseases of the genitourinary system represent 14.2 % of the total records.

Table 5.3: Distribution of ICD-10 Chapters

ICD-10 chapters	Count	%	Cum %
Neoplasms	2034	18.80	18.00
Diseases of the circulatory system	1654	15.30	34.10
Diseases of the genitourinary system	1536	14.20	48.30
Diseases of the digestive system	1251	11.50	59.80
Injury, poisoning, other consequences of external causes	1088	10.00	69.80
Endocrine, nutritional and metabolic diseases	743	6.90	76.70
Diseases of the musculoskeletal system and connective tissue	740	6.80	83.50
Certain infectious and parasitic diseases	643	5.90	89.40
Diseases of the respiratory system	343	3.20	92.60
Symptoms, signs, abnormal clinical and laboratory findings	332	3.10	95.70
Diseases of the nervous system	324	3.00	98.70
Diseases of the blood and blood-forming organs	112	1.00	99.70
Mental and behavioral disorders	20	0.20	99.90
Diseases of the skin and subcutaneous tissue	13	0.10	100.0
Diseases of the eye and adnexa	3	0.00	100.0
Diseases of the ear and mastoid process	1	0.00	100.0
Total	10837	100.0	100.0

Note: - 11 cases are acute febrile illnesses, have no ICD-10 codes.

It is possible to have a broad picture regarding TASH activities from Table 5.3. This table explains infectious and parasitic diseases only represent 5.9% of the total datasets. This table also shows the overall medical service provisions in this hospital are mainly associated with non communicable diseases.

The key informants at TASH reply the shortlist should include these activities in order to understand the activities and the disease patterns. This helps to analyze the morbidity patterns, and to get information and knowledge on areas where the hospital specifically functions. The respondents also strongly explain that this knowledge helps for informed decision making based on the information that are generated from specific morbidity data. They claimed, "based on this information and knowledge we can for the future develop our hospital in terms of human power and resources."

The above response is also shared by the informants at national level. The interviewee agrees on morbidity pattern differences at specialized hospitals and the districts. The informants state "as the name implies disease treated in specialized hospitals are different from the districts." One slogan has come back from the FMOH HMIS officers regarding morbidity pattern differences and preparation of a shortlist.

"In fact we are infantile in information use, higher level officials should understand the preparation of a shortlist for specialized hospitals, and therefore a group of experts should sit down and look the differences of morbidity pattern across the health care delivery system."

The following section provides chapter specific distribution of disease lists on the HMIS and ICD-10 shortlists. In each table the HMIS disease lists appear first then followed by ICD-10 disease lists. This is helpful for looking the similarities and differences between the HMIS and ICD-10 shortlists, hence provides baseline information on the selection of appropriate shortlist for TASH.

In each table, from Table 5.4 up to Table 5.17, the following marks are interpreted as follows:

- (✓) agreement between HMIS and ICD-10 shortlists in identifying specified disease list with count, i.e., SS (Specific-Specific) or NN (Nonspecific-Nonspecific)
- (✕) argument between HMIS and ICD-10 shortlists in identifying specific disease list, i.e., SN (Specific-Nonspecific) or NS (Nonspecific-Specific); and the counts of disease list with (✕) mark are included in the nonspecific disease list.
- (0) indicates the absence of disease list or chapter on the shortlists

Table 5.4 shows the distribution of infectious and parasitic disease on the HMIS and ICD-10 short lists at TASH. The disease lists are arranged according to the HMIS disease list blocks. At the end of the disease lists, “nonspecific” by the HMIS is specified by ICD-10 specific disease lists.

Table 5.4: Distribution of infectious and parasitic diseases

Lists of diseases	HMIS	ICD-10	Type
<i>Epidemic prone diseases</i>	Count	Count	
Malaria	18	✓	SS
Diarrhea with blood	3	✓	SS
Meningitis	32	✓	SS
Acute febrile illness	11	0	
<i>Priority infectious diseases</i>			
Human immunodeficiency virus diseases	297	✓	SS
Tuberculosis	213	✓	SS
Pneumonia	75	✓	SS
Leishmaniasis	9	✓	SS
<i>Other infectious diseases</i>			
Tetanus	10	✓	SS
Viral hepatitis	6	✓	SS
Septicemia (Septic shock)	27	✓	SS
Varicella and zoster	×	1	NS
Mycosis	×	9	NS
Hydatidosis	×	47	NS
Other or unspecified infectious & parasitic diseases	60	3	NN
Total	761	750	

Note: - 11 cases are acute febrile illnesses, have no ICD-10 codes.

There is an agreement between the two shortlists for the majority of infectious and parasitic diseases. Table 5.4 indicates Hydatidosis, the nonspecific category by the HMIS, is the fourth frequent disease from all diseases. Therefore, from the point of hospital morbidity analysis,

specified list for Hydatidosis might be necessary than the list frequent diseases observed in this section.

For certain disease lists the specificity of the HMIS and ICD-10 shortlists varies. For example, HMIS shortlist specifies Leishmaniasis using two specific disease lists. HMIS code 0127.1 represents visceral Leishmaniasis (ICD-10 code B55.0) and HMIS code 0127.2 represents cutaneous and mucocutaneous Leishmaniasis (ICD-10 code B55.1, B55.2) (see Annex IV). The ICD-10 shortlist includes the specified four character subcategory ICD-10 codes into a single three character category code B55, which represents for Leishmaniasis (see Annex V).

In the data ICD-10 three character code (B55, Leishmaniasis), and ICD-10 four character codes (B55.0 and B55.2, visceral and mucocutaneous Leishmaniasis) are found. The ICD-10 three character code B55 includes the specified four character codes B55.0 and B55.2. Therefore two disease lists (codes) of HMIS were included in a single ICD-10 disease list (code).

This also holds true for the ICD-10 short list. For example, ICD-10 shortlist has two disease lists for tuberculosis: respiratory tuberculosis ICD-10 codes (A15-A16) and other tuberculosis ICD-10 codes (A17-A19) (see Annex V). The HMIS shortlist includes the specified two forms of tuberculosis as tuberculosis (HMIS code 0123) (see Annex IV). The corresponding ICD-10 codes specified on the HMIS shortlist include ICD-10 codes (A15-A19, B90).

Despite the differences in the specificity, since one general group and/or category code includes the specific ones, these disease lists are taken as they are similar and considered there is an agreement between the two shortlists.

Table 5.5 provides detail description of lists for neoplasms on the HMIS and ICD-10 shortlists in TASH. Among the non communicable diseases of ICD-10 chapters, neoplasms are the first leading causes of morbidity. Despite this fact the HMIS list has only 4 specified lists of malignant neoplasms which represent 685 patient records, whereas the nonspecific list for malignant neoplasm includes 1056 records. On the contrary, the ICD-10 specific disease lists represent 1505 patient records of malignant neoplasms and the nonspecific one includes only 236 records.

Table 5.5: Distribution of Neoplasms

Lists of neoplasms	HMIS	ICD-10	Type
	Count	Count	
Malignant neoplasm of breast	389	✓	SS
Malignant neoplasm of cervix	33	✓	SS
Leukemia	117	✓	SS
Lymphoma	148	✓	SS
Malignant neoplasm of lip, oral cavity and pharynx	x	26	NS
Malignant neoplasm of Esophagus	x	279	NS
Malignant neoplasm of Stomach	x	91	NS
Malignant neoplasm of colon	x	60	NS
Malignant neoplasm of recto-sigmoid junction, rectum, anus and anal canal	x	92	NS
Malignant neoplasm of liver and intrahepatic bile ducts	x	34	NS
Malignant neoplasm of pancreas	x	11	NS
Malignant neoplasm of larynx	x	10	NS
Malignant neoplasm of bronchus and lung	x	38	NS
Malignant neoplasm of bone and articular cartilage	x	38	NS
Malignant melanoma of skin & other cancer of skin	x	9	NS
Malignant neoplasm of mesothelial and soft tissue	x	46	NS
Malignant neoplasm of prostate	x	21	NS
Malignant neoplasm of bladder	x	61	NS
Malignant neoplasm of brain	x	4	NS
Other malignant neoplasm	1056	236	NN
Benign neoplasm of breast	x	13	NS
Other benign neoplasms, neoplasms of uncertain and unknown behavior	291	278	NN
Total	2034	2034	

We can also observe that ICD-10 shortlist provides much meaningful information regarding types of malignant neoplasms. This also indicates ICD-10 shortlist is better in capturing neoplasms than the HMIS as it identifies specific categories and groups of neoplasms through 11 additional specified lists.

Table 5.6 demonstrates the distribution of diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism on the HMIS and ICD-10 shortlists at TASH. There is a specificity difference on the HMIS and ICD-10 shortlists. (See annexes IV and V). However, there is no much difference in capturing specific diseases.

Table 5.6 Distribution of diseases of the blood and blood-forming organs

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Anemias	95	✓	SS
Other or unspecified diseases of blood	17	✓	NN
Total	112	112	

Table 5.7 shows the distribution of endocrine, nutritional and metabolic diseases on the HMIS and ICD-10 short lists at TASH. Table 5.1 and Table 5.2 demonstrate diabetes mellitus is among the top 10 leading causes of morbidity in TASH. From other specified endocrine and metabolic disorders, diabetes mellitus also represents majority of the records. But as Table 5.7 shows there are also other endocrine disorders which represent 316 (HMIS), and 283(ICD-10) patient records in the non specific category. This is an indication to look for specific disease lists from the nonspecific diseases from point of view of hospital morbidity analysis.

Table 5.7: Distribution of Endocrine, nutritional and metabolic diseases

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Diabetes Mellitus	424	✓	SS
Iodine deficiency related goiter	3	✓	SS
Thyrotoxicosis	x	33	NS
Other endocrine, nutritional and metabolic disorders	316	283	NN
Total	743	743	

Table 5.8 shows the distribution of mental and behavioral disorders on the HMIS and ICD-10 shortlists at TASH. There is also an agreement between the two shortlists for three specified disease lists. As this table explains mental and behavioral disorders do not have much contribution on morbidity statistics in medical and surgical departments. Therefore, it might be

necessary to collect the total data in various departments and units to understand this chapter well.

Table 5.8: Distribution of mental and behavioral disorders

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Dementia	1	✓	SS
schizophrenia	1	✓	SS
Depression	5	✓	SS
Neurotic, stress-related, and somatoform disorder	×	13	NS
Other mental and behavioral disorder	13	zero count	NN
Total	20	20	

Table 5.9 shows the distribution of diseases of the nervous system on the HMIS and ICD-10 shortlists at TASH. As this table describes the HMIS shortlist has only one specific list for nervous system diseases. The majority of patients in this section are represented by the nonspecific disease list. ICD-10 shortlist describes specific types of patients treated in this chapter in detail as compared to the HMIS. Therefore, again from the idea of hospital morbidity analysis, the specified lists of ICD-10 provide meaningful information regarding diseases of the nervous system.

Table 5.9: Distribution of diseases of the nervous system

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Epilepsy	42	✓	SS
Inflammatory diseases of central nervous system	×	5	NS
Parkinson’s disease	×	9	NS
Multiple sclerosis	×	1	NS
Migraine and other headache syndromes	×	12	NS
Nerve, nerve root and plexus disorders	×	25	NS
Paralytic syndromes	×	105	NS
Other diseases of the nervous system	250	93	NN
Total	292	292	

Table 5.10 shows the distribution of diseases of the eye and adnexa, and diseases of the ear and mastoid process on the HMIS and ICD-10 shortlists at TASH. As Table 5.3 illustrate ICD-10 chapter VII and VIII diseases do not have any contribution on the figure of morbidity statistics in medical and surgical departments. To understand these chapters, it might be necessary to investigate and understand data from other departments as well.

Table 5.10: Distribution of diseases of the eye and the ear

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Glaucoma	1	✓	SS
Conjunctivitis	×	2	NS
Other or unspecified diseases eye and adnexa	2	zero count	
otitis	1	✓	SS
Total	4	4	

Table 5.11 shows the distribution of diseases of the circulatory system on the HMIS and ICD-10 shortlists at TASH. Circulatory system disorders are among the major non communicable diseases treated next to neoplasms. The HMIS disease classification has four specified lists for diseases of the circulatory system.

There is also specificity difference between the HMIS and ICD-10 shortlists for the first four specified lists in Table 5.11. For example, the HMIS code (0903) represents ischemic heart disease and corresponding ICD-10 code is (I20-I25). ICD-10 shortlist gives two separate disease lists as acute myocardial infarction (I21-I22) and other ischemic heart disease (I20, I23-I25). By the principle of generalization the HMIS includes two disease lists of ICD-10 shortlists, and considered as there is an agreement between the two lists. For the remaining specificity differences on disease lists see annex IV and V.

Table 5.11: Distribution of diseases of the circulatory system

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Hypertension and related disease	254	✓	SS
Rheumatic heart disease	212	✓	SS
Ischemic heart disease	83	✓	SS
Cerebrovascular accident (stroke)	320	✓	SS
Conduction disorder and cardiac arrhythmias	×	23	NS
Heart failure	×	500	NS
Atherosclerosis	×	3	NS
Diseases of arteries, arterioles and capillaries	×	8	NS
Thrombophlebitis, vein Thrombosis	×	49	NS
Varicose vein of lower extremities	×	73	NS
Haemorrhoids	×	67	NS
Other diseases of circulatory system	785	62	NN
Total	1654	1654	

As Table 5.11 describes the HMIS specific disease lists represent 869 records. Even if the HMIS disease lists represent most frequent records, it misses heart failure which is one of the leading causes of morbidity. The ICD-10 specific lists represent 1592 records. ICD-10 shortlist is more efficient than the HMIS in capturing diseases of the circulatory system as it makes only 62 records nonspecific. This is another implication regarding ICD-10 shortlist usefulness for morbidity data tabulation.

Table 5.12 shows the distribution of respiratory system diseases on the HMIS and ICD-10 shortlists at TASH. There is an agreement between the HMIS and ICD-10 lists in identifying specific diseases. However, there are 203 nonspecific records on HMIS and 198 on ICD-10 shortlists. This is an indication of modifications of the shortlists. There is also specificity difference for chronic obstructive pulmonary diseases between the two shortlists. (See annex IV and V)

Table 5.12: Distribution of diseases of the respiratory system

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Acute upper respiratory infection	22	✓	SS
Asthma	21	✓	SS
Chronic obstructive pulmonary diseases	22	✓	SS
Chronic sinusitis	×	3	NS
Chronic disease of tonsils and adenoids	×	2	NS
Other diseases of the respiratory system	203	198	NN
Total	268	268	

HMIS code (0125) that represents pneumonia specified on chapter I, infectious and parasitic disease lists on the HMIS shortlists. The corresponding ICD-10 codes specified on the HMIS are (J12-J18). This shows this disease list belongs to Chapter X. On ICD-10 shortlist pneumonia is specified in Chapter X. It is important to note that the counts of this disease were included in HMIS code (0125) that represents pneumonia under chapter I of the HMIS (See annex IV and V).

Table 5.13 shows the distribution of diseases of the digestive system on the HMIS and ICD-10 shortlists at TASH. As Table 5.13 describes HMIS and ICD-10 shortlists have an agreement for the majority of records of digestive system disorders. There is also an argument between the two shortlists in capturing specific diseases. In addition, the nonspecific disease list represents large number of records than the specific ones on both shortlists. This is also another indication for modification of the shortlist by further specification of the nonspecific categories. This makes morbidity data reporting more meaningful from the point of view of hospital morbidity analysis.

Table 5.13: Distribution of diseases of the digestive system

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Dental and gum diseases	1	✓	SS
Dyspepsia	25	×	SN
Peptic ulcer disease	174	✓	SS
Gastritis and duodenitis	×	21	NS
Cirrhosis of the liver	1	×	SN
Appendicitis	109	✓	SS
Hernias without intestinal obstruction	65	✓	SS
Intestinal obstruction	134	✓	SS
Cholelithiasis	270	✓	SS
and Cholecystitis	×	10	NS
Acute pancreatitis and other diseases of the pancreas	×	10	NS
Other diseases of the digestive system	472	457	NN
Total	1251	1251	

Table 5.14 shows the distribution of diseases of the skin and subcutaneous tissue on the HMIS and ICD-10 short lists at TASH. As Table 5.14 indicates diseases of the skin and subcutaneous tissue do not have much contribution on the figure of morbidity statistics in medical and surgical departments. Thus, it might be necessary to analyze data from other departments.

Table 5.14: Distribution of diseases of the skin and subcutaneous tissue

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Infection of the skin and subcutaneous tissue	4	✓	SS
Other diseases of the skin and subcutaneous tissue	9	✓	SS
Total	13	13	

Table 5.15 shows the distribution of diseases of musculoskeletal system and connective tissue on the HMIS and ICD-10 short lists at TASH. As Table 5.15 illustrates there is no any specified lists for diseases of musculoskeletal system and connective tissue disorders on the HMIS disease lists. However, there are two case definitions one indicating the presence of specific disease lists and the other is for the nonspecific disease list for this particular chapter on the HMIS case definitions [21]. This shows incompleteness of the HMIS disease classification in capturing morbidity data on disorders of musculoskeletal system and connective tissues.

It is also important to note that among the leading causes of morbidity in Table 5.2, intervertebral disc disorder is 5th leading cause of morbidity. In addition, according to Table 5.3 this chapter contributes about 6.8 % burden in this hospital. ICD-10 specified disease lists in Table 5.15 are appropriate for morbidity data tabulation for this chapter.

Table 5.15: Distribution of diseases of musculoskeletal system and connective tissue

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Diseases of musculoskeletal system and connective tissue	740		
Rheumatoid arthritis and other inflammatory polyarthropathies	×	67	NS
Osteoarthritis	×	87	NS
Other disorders of joints	×	8	NS
Systemic connective tissue disorders	×	8	NS
Intervertebral disc disorders	×	326	NS
Other dorsopathies	×	85	NS
Soft tissue disorders	×	28	NS
Disorders of bone density and structure	×	31	NS
Osteomyelitis	×	95	NS
Other diseases of musculoskeletal system	×	5	NS
Total	740	740	

Table 5.16 shows the distribution of diseases of genitourinary system on the HMIS and ICD-10 shortlists at TASH. The HMIS only identifies specifically 374 records where as the nonspecific list comprises 1162 records. On the contrary, ICD-10 short list only makes 374 records nonspecific while specifically captures 1505 records. Table 5.16 demonstrates this fact.

Table 5.16: Distribution of diseases of genitourinary system

Lists of diseases	HMIS	ICD-10	Type
	Count	Count	
Urinary tract infection	46	×	SN
Nephritis	8	✓	SS
Hyperplasia of prostate	320	✓	SS
Renal tubule-interstitial diseases	×	167	NS
Renal Failure	×	106	NS
Urolithiasis	×	524	NS
Cystitis	×	2	NS
Hydrocele and spermatocele	×	8	NS
Disorders of the breast	×	66	NS
Non inflammatory disorder of ovary	×	3	NS
Disorders of menstruation	×	1	NS
Other disorders of the genitourinary system	1162	331	NN
Total	1536	1536	

There is an agreement and an argument between the two shortlists in capturing specific diseases. The HMIS also makes records with much frequent count nonspecific as compared to the specific ones. As a result the HMIS is unable to capture diseases among the leading causes of morbidity which represent this chapter. In fact ICD-10 shortlist has a much better performance in capturing diseases of genitourinary system than the HMIS, "Other disorders of genitourinary system" represents 331 records. This is also an indication for the modification of the shortlist from the point of hospital morbidity analysis.

Table 5.17 shows the distribution of symptoms, signs and abnormal clinical and laboratory findings on the HMIS and ICD-10 shortlists at TASH. Table 5.3 indicates ICD-10 chapter XVIII shares 3.1% of total records. However, it is omitted from the HMIS disease list. Moreover, this chapter is recommended by the expert group who develop ISHMT for hospital morbidity data tabulation, and by the WHO. This also shows another incompleteness of the HMIS disease classification for hospital morbidity data tabulation.

As Table 5.17 shows majority of the records are represented by the nonspecific list. Moreover, this nonspecific list also becomes one of the leading causes of morbidity using ICD-10 shortlist (Table 5.2), and also on the HMIS as "Other or unspecified disease" (Table 5.1). This indicates that it needs certain modification to be useful for morbidity data tabulation.

Table 5.17: Distribution of symptoms, signs and abnormal clinical and laboratory findings

Lists of symptoms, signs and abnormal findings	HMIS	ICD-10	Type
	Count	Count	
Abdominal and pelvic pain	0	9	NN
Other symptoms, signs and abnormal findings	0	323	NN
Total	0	332	

Table 5.18 shows the distribution of injury, poisoning and certain other consequences of external causes on the HMIS and ICD-10 shortlists at TASH. Under this section there are four specified lists on the HMIS. The first one is "Trauma (injury, fracture.etc)" with code 1801. As Table 5.18 demonstrates this code represents 1062 patient records with different injury types. This code represents leading cause of morbidity using the HMIS lists in Table 5.1. One can clearly seen that it is nonspecific and gives only little information about injury, and obscures meaningful information on injury types and other consequences of external causes.

On the contrary, ICD-10 shortlist has 11 specific lists and one nonspecific list for these 1062 patient records. It provides understandable information about the types of injuries. These 12 specified lists of ICD-10 are listed below the HMIS list "Trauma (injury, fracture.etc)" up to "Burns and corrosions". As someone observes from Table 5.18, these lists provide information on different types of injuries in a meaningful way.

Table 5.18: Distribution of injury, poisoning and other consequences of external causes

Lists of injuries ,poisoning, other external causes	HMIS	ICD-10	Type
	Count	Count	
Trauma (injury, fracture.etc)	1062		
Fracture of the skull and facial bones	×	87	NS
Fracture of neck, thorax or pelvis	×	57	NS
Fracture of femur	×	199	NS
Fracture of other limbs	×	279	NS
Fracture involving multiple body regions	×	19	NS
Dislocations, sprains and strains of specified and multiple body regions	×	92	NS
Injury of eye and orbit	×	1	NS
Intracranial injury	×	15	NS
Injury of other internal organs	×	20	NS
Traumatic amputations	×	2	NS
Effects of foreign body entering through the natural orifices	×	18	NS
Other injuries of specified, unspecified and multiple body regions	×	273	NN
Burns and corrosions	7	✓	SS
Poisoning by drugs and biological substances	3	✓	SS
Early complications of trauma, complications of medical and surgical care	×	9	NS
Toxic effects of substances	×	7	NS
Other or unspecified effects of external causes	16	zero count	NN
Total	1088	1088	

As the researcher observes the properties derived disease list, from Table 5.4 to Table 5.18, there are agreements between the HMIS and ICD-10 disease lists for the majority of specific disease lists. The major difference observed between the two shortlists is the ICD-10 makes the majority of the records specific much more than the HMIS. In addition, there is also an argument between the two lists on some specific disease lists at certain ICD-10 chapter, i.e., one makes specific the other makes nonspecific and vice versa.

The following sections discuss relationships between the HMIS and ICD-10 shortlists, which quantify this in terms of sensitivity (SENS) and specificity (SPEC). Table 5.19 describes the relationship on total morbidity data. The remaining tables, from Table 5.20 to Table 5.23, provide explanation on relationship for the selected ICD-10 chapters. Finally, Table 5.24 gives a summary on the relationships of the HMIS and ICD-10 shortlists.

Table 5.19 shows the relationship between the HMIS and ICD-10 shortlists on total data at TASH that are collected from 01\07\2001 to 30\06\2002 EC. As Table 5.19 indicates, there is a big difference between the HMIS and ICD-10 shortlists in capturing morbidity data specifically. The HMIS makes only 37.4% (4051/10837) of the records specific whereas 62.6% (6786/10837) of the records are nonspecific. On the other hand, ICD-10 shortlist identifies 79.2% (8588/10837) of records as specific and 20.8% (2249/10837) as nonspecific.

This explains ICD-10 short list has greater performance in classifying and capturing the overall morbidity data specifically than the HMIS.

Table 5.19: Relationship between the HMIS and ICD-10 shortlists on total data

		ICD-10 list		
HMIS list		Specific	Nonspecific	Total
	Specific	3978	73	4051
	Nonspecific	4610	2176	6786
	Total	8588	2249	10837

Note: - 11 cases of acute febrile illnesses have no ICD-10 codes.

$$\begin{aligned}
 SENS &= \frac{3978}{8588} \\
 &= 0.463 \\
 &= 46.3\%
 \end{aligned}$$

$$\begin{aligned}
 SPEC &= \frac{2176}{2249} \\
 &= 0.968 \\
 &= 96.8\%
 \end{aligned}$$

The test carried out in the above table showed that the HMIS shortlist have low-SENS (46.3%) and, hence, high False Negative Rate (FNR) (0.537). This indicates the HMIS disease lists are inefficient in capturing the overall morbidity data specifically. However, the SPEC value which

is 0.968 and a very low False Positive Rate (FPR) (0.032) shows the nonspecific list of the gold standard is also nonspecific in HMIS which is desirable feature of the HMIS.

The following section explains the relationship between four selected ICD-10 chapters: chapter I, chapter II, chapter IX, chapter XIV. These chapters are selected for the following reasons. Chapter I describes infectious and parasitic diseases, and the others represent almost half of patients treated in TASH. (See Table 5.3)

Table 5.20 describes the relationship between the HMIS and ICD-10 shortlists on infectious and parasitic diseases at TASH. This table explains the HMIS classify 92 % (690/750) of records as specific and 8% (60/750) of records as nonspecific. This table also illustrates that the ICD-10 classify 99.6% (747/750) of records as specific with only 0.4% (3/750) nonspecific records. Even though the difference is insignificant, this table shows ICD-10 short list better classifies records specifically than the HMIS.

Table 5.20: Relationship between the HMIS and ICD-10 on infectious and parasitic diseases

		ICD-10 list		
		Specific	Nonspecific	Total
HMIS list	Specific	690	0	690
	Nonspecific	57	3	60
	Total	747	3	750

Note: - 11 cases of acute febrile illnesses have no ICD-10 codes.

$$SENS = \frac{690}{747}$$

$$= 0.994$$

$$= 99.4\%$$

$$SPEC = \frac{3}{3}$$

$$= 1$$

$$= 100\%$$

The test in Table 5.20 illustrates the greater SENS (99.4%) and, hence, a very low FNR (0.06) shows the efficiency of the HMIS disease lists in capturing morbidity data specifically regarding infectious and parasitic diseases. In addition, the maximum SPEC shows the desirable feature of the HMIS as measured by the gold standard. This in turn implies the effectiveness HMIS disease list in capturing morbidity data on infectious and parasitic diseases at TASH.

Regarding non-communicable diseases (NCDs) someone can clearly observe that NCDs have greater dimensions and took the major medical service provision at TASH. Neoplasms are the first leading causes of morbidity in TASH and accounts 18.8% of patients treated among the ICD-10 chapters included in this study.

Table 5.21 demonstrates the relationship between the HMIS and ICD-10 shortlists regarding neoplasms at TASH. This table illustrates HMIS identifies and captures 33.8% (687/2034) of the records specifically, whereas it chunks 66.2% (1347/2034) of the records as nonspecific. On the contrary, the ICD-10 short classifies and captures 74.7% (1520/2034) specific records by only making 25.3% (514/2034) of the records non specific.

This shows ICD-10 shortlist captures neoplasms specifically than the HMIS. This explains the usefulness of ICD-10 shortlist for TASH and its importance as it captures the leading cause of morbidity with greater specificity.

Table 5.21: Relationship between the HMIS and ICD-10 on neoplasms

		ICD-10 list		
		Specific	Nonspecific	Total
HMIS list	Specific	687	0	687
	Nonspecific	833	514	1347
	Total	1520	514	2032

$$\begin{aligned}
 SENS &= \frac{687}{1520} \\
 &= 0.452 \\
 &= 45.2\%
 \end{aligned}$$

$$\begin{aligned}
 SPEC &= \frac{514}{514} \\
 &= 1 \\
 &= 100\%
 \end{aligned}$$

The test carried out on the lists of neoplasms demonstrate that HMIS disease lists have low SENS (45.2%) and, hence, high FNR (0.548). This indicates that the HMIS shortlist is inefficient in capturing neoplasms specifically as measured by ICD-10 shortlist. However, the maximum SPEC value indicates the nonspecific list of the gold standard is also nonspecific in HMIS. This in turn indicates the desirable feature of the HMIS.

Table 5.22 shows the relationship between the HMIS and ICD-10 shortlists on diseases of circulatory system at TASH. This table explains the HMIS makes 52.5% (869/1654) of records specific and 47.5% (785/1654) nonspecific. On the other hand, the ICD-10 shortlist makes 96.3% (1592/1654) specific and 3.7% (62/1654) nonspecific.

Overall, diseases of circulatory system contribute 15.3% burden at TASH. In addition, these diseases are the second leading cause of morbidity among the ICD-10 chapters next to neoplasms. Therefore, ICD-10 shortlist is important as it captures morbidity data specifically on circulatory system that is useful for hospital activity analysis.

Table 5.22: Relationship between the HMIS and ICD-10 on circulatory system diseases

		ICD-10 list		
HMIS list		Specific	Nonspecific	Total
	Specific	869	0	869
	Nonspecific	723	62	785
	Total	1592	62	1654

$$SENS = \frac{869}{1592}$$

$$= 0.546$$

$$= 54.6\%$$

$$SPEC = \frac{62}{62}$$

$$= 1$$

$$= 100\%$$

The test performed in the above table have SENS (54.6 %) and, hence, a high FNR (0.454). This indicates the HMIS disease classification disease lists are inefficient in capturing morbidity data on diseases of circulatory system. However, maximum SPEC value shows that the desirable feature of the HMIS in comparison with the gold standard, i.e., nonspecific disease list of the ICD-10 is also nonspecific in HMIS.

Table 5.23 shows the relationship between the HMIS and ICD-10 shortlists on diseases of genitourinary system at TASH. This table describes the HMIS categorized 24.3% (374/1536) of the records as specific and 75.7% (1162/1536) as nonspecific. On the other hand, ICD-10 categorizes 78.5% (1205/1536) of the records specific while makes 21.5% (331/1536) of the

records nonspecific. This provides another explanation regarding the usefulness and importance of ICD-10 shortlist for TASH morbidity data tabulation regarding genitourinary system.

Table 5.23: Relationship between the HMIS and ICD-10 on diseases of genitourinary system

		ICD-10 list		
HMIS list		Specific	Nonspecific	Total
	Specific	328	46	374
	Nonspecific	877	285	1162
	Total	1205	331	1536

$$\begin{aligned} SENS &= \frac{328}{1205} \\ &= 0.272 \\ &= 27.2\% \end{aligned}$$

$$\begin{aligned} SPEC &= \frac{285}{331} \\ &= 0.861 \\ &= 86.1\% \end{aligned}$$

The test carried out in table 5.23 shows a very low SENS (27.2%) and, hence, a very higher FNR (72.8%). This indicates the HMIS disease classification shortlist is poor in capturing diseases of genitourinary system specifically. However, the SPEC value which is 0.861 and relatively low FPR (0.139) shows the desirable feature of the HMIS as measured by the gold standard.

An explanation for the very low SENS is the HMIS disease classification shortlist has only 3 specific genitourinary system disease lists. In addition, the nonspecific diseases have greater dimensions than the specific ones on leading cause morbidity data analyses. Therefore, from hospital morbidity analysis point of view ICD-10 shortlist is important in capturing morbidity data on diseases genitourinary system.

Table 5.24 shows the summary of relationships between HMIS and ICD-10 shortlists. This table demonstrates that SENS value varies greatly among ICD-10 chapters. The highest SENS was for infectious and parasitic diseases. On the other hand, the SENS for NCDs observed for the selected ICD-10 chapters were generally low. This implies the inadequacy of the HMIS disease lists for NCDs. The specificity ranges from 86.1% to 100% for the selected ICD-10 chapters, and the sensitivity for total data set is 96.8%, indicates the desirability of the HMIS.

Table 5.24: Summary of relationships between HMIS and ICD-10 shortlists

	Sensitivity	Specificity
Infectious and parasitic diseases	99.4%	100%
Neoplasms	45.2%	100%
Circulatory system diseases	54.6%	100%
Genitourinary system diseases	27.2%	86.1%
Average (total data sets)	46.3%	96.8%

In general, the HMIS shortlist is poor and inefficient in capturing the overall morbidity data specifically in comparisons with the gold standard ICD-10 special tabulation shortlist at TASH except for infectious and parasitic diseases.

Morbidity data reported from TASH and other hospitals at the same level are quite different from the districts. Inefficiencies and inadequacies of the HMIS are also observed at national level while analyzing morbidity data collected at various levels of health care delivery system. The findings of interviews at national level point out this fact.

During analysis and interpretations of morbidity data reports from various health facilities from different regions, there is a limitation that hinders understanding of the whole situation through the HMIS reports. As the interviewees state, in fact the aim is to analyze the top 10 leading causes of morbidity with related variables, i.e. age groups and sex, the HMIS disease code (9999) or “other and unspecified diseases” becomes a leading cause of morbidity.

The key informant replies that, it is difficult to understand those diseases in code (9999). The informants claim “we couldn’t say these diseases are the leading causes of morbidity and therefore this code is excluded from analysis and interpretations.”

Health and Health-Related Indicators supports these sayings. This document is published by the FMOH through aggregating HMIS morbidity data that are collected from various levels of health care delivery system. According to this document, the analyses of leading causes demonstrated that code (9999) or “other and unspecified diseases” represents from 7% to 9% of total morbidity data for various age groups [44].

This disease code (9999) represents suicide, senility and other unclassified diseases on the HMIS disease list. However, there is no unclassifiable disease on the HMIS disease list except ICD-10 chapter XVIII. This might be an indication of lack of uniformity in reporting nonspecific diseases that are not specified on the HMIS disease lists across different health facilities.

The inadequacy of HMIS shortlist is also observed on morbidity data at different ICD-10 chapters. As the key informant states, there are limitations in understanding “other or unspecified diseases” on the HMIS disease list at different ICD-10 chapters. Respondents claim again “it is difficult to know, understand and retrieve specific diseases from this nonspecific disease list for analysis.”

The interviewee states that HMIS disease classification chunks diseases together in a nonspecific category, since it is difficult to analyze and interpret these nonspecific data, this limits information usefulness for decision making. It could rather point out only patients with different ICD-10 chapter disorders, so that it hinders the overall understanding of situations and use of information regarding specific diseases.

The Health and health related indicators also support the above sayings. As this document demonstrated, diseases described as “other and unspecified diseases for specified chapter” represent from 4.9% to 17.5% of total morbidity data in various age groups among the leading causes of morbidity. This shows the inadequacy of the HMIS shortlist in capturing morbidity data specifically with their dimensions at different health facilities [44].

The above problems described, starting from the grass root level to the national level, regarding data collection, compilation, analysis and interpretations might be resolved if the following measures are taken.

The inconsistency observed at each unit in TASH regarding reporting multiple conditions could be resolved by introducing ICD-10 disease classification. In addition, it also needs an introduction of guidelines on how to use the disease classification for multiple and combinations of conditions. Besides, it is necessary to provide appropriate training and guidance for primary data producers on the selection of main conditions.

Moreover, since the HMIS documentation for disease classification and case definitions do not provide any guidance for reporting multiple and combinations of conditions, it is necessary to develop a standard guideline regarding the selection of main conditions and reporting of multiple conditions to enhance uniformity in reporting across different departments and health facilities.

Regarding inconsistencies observed at statistics office in TASH, it might be also resolved by introducing ICD-10 and preparation of adequate shortlist for morbidity data tabulation.

The problem of reporting radiotherapy might be resolved by preparation of a shortlist that includes Z-codes for radiotherapy and by provision of appropriate training. From other countries experiences, Z-codes are used for repeated treatments such as radiotherapy, chemotherapy, renal dialysis. Z-codes also used for short stays for observations, follow-up examinations and rehabilitations. In fact the HMIS disease lists includes chapter for Z-codes, there is no clear instructions regarding on how to report radiotherapy procedure.

The limitations of the HMIS observed at national level also resolved by selection and construction of appropriate shortlist.

As the quantitative and qualitative analyses demonstrate, the analyses of morbidity data can be influenced in many different ways. It begins from the abstraction of patient information from medical records; the selections of main conditions; and consistency in data collection, compilation and reporting. However, the most important impact in the analyses is the way morbidity data is organized and tabulated.

The choice of an adequate disease list (or construction of a specific one) is fundamental for organizing morbidity data. It allows relevant health problems to appear in their own dimensions adequately. Moreover, it avoids erroneous and biased conclusions that may damage evaluations and decisions. It allows easy comparisons of diagnostic panorama in hospitals and diseases patterns through time period.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This study demonstrated that the Health Management Information System (HMIS) disease classification shortlist is poor and inefficient in capturing the overall morbidity data as measured by the gold standard International Classification of Diseases (ICD)-10 shortlist. However, the HMIS lists are effective and efficient in capturing morbidity data on infectious and parasitic diseases.

Therefore this study concluded that, the use of ICD-10 short list has great implications for Tikur Anbessa Specialized hospital (TASH) for morbidity data tabulation for the following main points.

First infectious and parasitic diseases which include epidemic prone diseases, priority infectious diseases and other infectious diseases are totally captured by ICD-10 shortlist. ICD-10 disease lists also cover immediately reportable diseases.

The implication of ICD-10 shortlist can be seen, in addition to infectious and parasitic diseases, on diseases related to analysis of top 10 leading causes of morbidity. These diseases are generally able to be captured in a more specific and meaningful way through the use of ICD-10 shortlist.

Moreover, the usefulness of ICD-10 shortlist is found in relation to major non communicable diseases (NCDs) treated in TASH. These include neoplasms, cardiovascular system diseases and diseases of genitourinary system. Since HMIS disease lists are inefficient and poor in capturing morbidity data on NCDs, the ICD-10 shortlist also has a great implication in this respect.

The implication ICD-10 shortlist also goes to chapter XIII and XVIII, since the HMIS shortlist are incomplete in capturing morbidity data generated in chapter XIII and XVIII. Chapter XIX also captured specifically using ICD-10 shortlist in a meaningful way.

Finally, the usefulness of ICD-10 also goes in collection and reporting multiple and combination of conditions since there is no clear guideline or instruction on the HMIS disease classification and case definition. Hence the problems of unreliable statistics regarding multiple conditions might be resolved by introduction of ICD-10 with guidelines.

6.2. Recommendations

The following recommendations are forwarded based on critical issues affecting morbidity data collection, reporting and analysis that are found in this research.

1. Preparation of a shortlist is mandatory and very important for TASH to overcome the limitations of the HMIS.
2. The problems of main condition selection might be resolved by interventions towards the specialist and nurses.
3. Introduction of ICD-10 is needed for standardization processes in data collection and reporting.
4. In general, an exploration of ICD-10 usefulness is mandatory since HMIS disease lists are inefficient and incomplete in capturing the overall morbidity data. Therefore further study is needed in order to investigate the applications of ICD-10 on data at other departments.

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Annexes

Annex I: ICD 10 code ranges with chapter description

Code range	Chapter	Description
A00-B99	Chapter I	Certain infectious and parasitic diseases
C00-D48	Chapter II	Neoplasms
D50-D89	Chapter III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
E00-E90	Chapter IV	Endocrine, nutritional and metabolic diseases
F00-F99	Chapter V	Mental and behavioral disorders
G00-G99	Chapter VI	Diseases of the nervous system
H00-H59	Chapter VII	Diseases of the eye and adnexa
H60-H95	Chapter VIII	Diseases of the ear and mastoid process
I00-I99	Chapter IX	Diseases of the circulatory system
J00-J99	Chapter X	Diseases of the respiratory system
K00-K93	Chapter XI	Diseases of the digestive system
L00-L99	Chapter XII	Diseases of the skin and subcutaneous tissue
M00-M99	Chapter XIII	Diseases of the musculoskeletal system and connective tissue
N00-N99	Chapter XIV	Diseases of the genitourinary system
O00-O99	Chapter XV	Pregnancy, childbirth and the puerperium
P00-P96	Chapter XVI	Certain conditions originating in the perinatal period
Q00-Q99	Chapter XVII	Congenital malformations, deformations and chromosomal abnormalities
R00-R99	Chapter XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
S00-T98	Chapter XIX	Injury, poisoning and certain other consequences of external causes
V01-Y98	Chapter XX	External causes of morbidity and mortality
Z00-Z99	Chapter XXI	Factors influencing health status and contact with health services

INSTRUCTIONS FOR INPATIENT ADMISSION/DISCHARGE REGISTER AT HEALTH CENTER/HOSPITAL

Register kept in IPD room (HC/Hospital-AdmDisReg). Completed by nurse or statistician at time of admission and discharge.
Location information to be completed at front of register.

Region	Write the region where the facility is located
Woreda / Sub-City	Write the woreda/sub-city where the facility is located.
Name of Health Facility	Write the name of the health facility where the IPD services are provided.
Register begin date	Enter the date of the first entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)
Register end date	Enter the date of the last entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)

SN	Datum	Comments
	Identification: Personal information	
1	Serial Number	Sequential serial number in registration book; to be entered on client's registration card for later identification in register
2	Medical Record Number (MRN)	Unique individual identifier used on medical information folder, fill only at HC and hospital.
3	Age	Enter age in years. If patient is under 1 year, enter age in months, followed by M. If patient is under 1 month, enter age in days, followed by D.
4	Sex	M = Male ; F = Female
5	Woreda	Enter name of woreda where patient resides.
	IPD Service Admission	
6	Date of admission	Date of admission in IPD, written as (EC) Day / Month / Year (DD/MM/YY)
7	HMIS admission disease classification	HMIS disease classification at admission
	Provider Initiated HIV Counseling and Testing (PIHCT)	
8	HIV Test offered	Tick if HIV test offered under provider initiated HIV counseling and testing guidelines
9	HIV Test performed	Tick if client tested for HIV/AIDS
10	HIV Test results	Enter R in red pen if test is reactive ; NR in normal color of pen if test is not reactive ; or I in normal color of pen if test is indeterminate .
	IPD Service : Discharge	
11	Date of discharge	Date of discharge from IPD, written as (EC) Day / Month / Year (DD/MM/YY)
12	Length of stay	Number of days patient remained in hospital (Date of discharge minus date of admission)
13	Condition at discharge	Enter improved , referred to higher facility, left against medical advice (LAMA) , absconded , or dead depending on patient's condition at discharge.
14	HMIS discharge disease classification	HMIS disease classification at discharge.
	IPD/OPD Service : Finance - these fields reserved for use after facility internal charging arrangements completed.	
15	Cost of service	Cost of service (cost of providing services)
16	Amount paid	Amount paid for service
17	Voucher number	Number on receipt for payment

Monthly counts for service delivery:

At end of month, add

- the number of admissions (column 6) to report on admissions (Indicator D1.4)
- the number of discharges (column 11) and length of stay (column 12) to report on Bed Occupancy Rate (Indicator D1.5) and Average Length of Stay (Indicator D1.6)

Provider Initiated HIV Counseling and Testing (PIHCT) services are tallied at the end of the day, from columns 8, 9, and 10, on the Health Center / Hospital PIHCT Tally (HC/Hospital-PIHCTTally).

- Tests offered, tests performed, and positive tests are tallied by sex and age group (15-24 years and 25 years and older).

Special instructions: Normally patients stay in the hospital less than a week. However, a few may stay much longer, and there is a danger that these will be ignored when adding up the number of discharges (column 11) and the length of stay (column 12) at the end of the month. Therefore the following procedure should be used when adding up the number of discharges and the length of stay:

- Each month, keep a list of the serial number and date of admission for patients discharged more than 2 months after admission. (This list may be kept at the back of the register.)
- At the end of the month, be sure to add in the PIHCT data: numbers of HIV tests offered, tests performed, and test results; and the utilization data: discharges and lengths of stay for patients who are on the list made in step 1.
- At the end of the month, review all discharges in the previous 2 months to make sure that all discharged in the current month are recorded.

Ward _____

[illegible]

*Condition at discharge for column 13: type code!

a) improved b) dead c) referred to higher facility
d) abandoned e) AAAA - left against medical advice

cost			sum
damage			days

*Age in months (M) if under 1 year
or in days (D) if under 1 month

INSTRUCTIONS FOR OUTPATIENT REGISTRATION AT HEALTH CENTER / HOSPITAL

Register kept in OPD room (HC/Hospital-OPDAbstract); completed by health professional from individual's Patient Card, which is kept in integrated medical records folder.

Location information to be completed at front of register:

Region	Write the region where the facility is located
Woreda / Sub-City	Write the woreda/sub-city where the facility is located.
Kebele	If Health Post, write the name of the kebele where the Health Post is located.
Name of Health Facility	Write the name of the health facility where the OPDAbstract services are provided.
Register begin date	Enter the date of the first entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)
Register end date	Enter the date of the last entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)

SN	Datum	Comments
Identification: Personal information		
1	Serial Number	Sequential serial number in registration book; to be entered on patient's summary sheet to link integrated medical records folder with this register
2	Registration date	Date of attendance at OPD, written as (EC) Day / Month / Year (DD/MM/YY)
3	Medical Record Number (MRN)	Unique individual identifier used on integrated medical records folder at HC and hospital.
4	Age	Enter age in years. If patient is under 1 year, enter age in months, followed by M. If patient is under 1 month, enter age in days, followed by D.
5	Sex	M=Male, F=Female
6	Woreda	Enter name of woreda where patient resides.
OPD services: Assessment, diagnosis, and treatment		
	Assessment, diagnosis and treatment	Detailed free form medical record on card.
	Main diagnosis	Main diagnosis: This is free diagnosis, made according to the judgment of the provider, and written on the patient card.
	Other diagnoses	Secondary, underlying, and concomitant diagnoses, if necessary, written on the patient card.
7	HMIS diagnosis	HMIS disease classification. If patient admitted, write admitted instead of diagnosis on abstract register. The HMIS disease classification may be the same as the Main Dx or based on the Main Dx. The HMIS Dx must be assigned by the health professional who sees the patient and written at the end of the notes on the patient card as HMIS Dx.
OPD services: Type of visit		
8	New visit	Tick if visit is for a new episode of illness.
9	Repeat visit	Tick if visit is followup for a previous episode of illness.
10	Referred to	Enter 1 if patient referred to hospital; 2 if referred to Health Center; 3 if referred to Health Post; 4 if referred to MCH care; 5 if referred to ART; 6 if referred to SOPD (Surgical Outpatient Department); 7 if referred to OBGyn; 8 if referred to TB Clinic; 9 if referred to another service / health institution.
Provider Initiated HIV Counseling and Testing (PIHCT)		
11	HIV Test offered	Tick if HIV test offered under provider initiated HIV counseling and testing guidelines.
12	HIV Test performed	Tick if client tested for HIV/AIDS.
13	HIV Test results	Enter R in red pen if test is reactive; NR in normal color of pen if test is not reactive; or I in normal color of pen if test is indeterminate.

Service conditions and attendance are tallied at the end of the day on the Health Center / Hospital Diagnosis and Attendance Tally (Form HC/Clinic/Hosp OPDDxAttTally).

- Diagnosis and New / Repeat Attendance are tallied by sex and age group (under 5 years, 5-14 years, 15 years and older).

Provider Initiated HIV Counseling and Testing (PIHCT) services are tallied at the end of the day, from columns 11, 12, and 13, on the Health Center / Clinic / Hospital PIHCT Tally (HC/Clinic/Hospital-PIHCTTally).

- Tests offered, tests performed, and positive tests are tallied by sex and age group (15-24 years and 25 years and older).



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† : Hospital
‡ : Health Center

3 - Health Post
4 - MOHS-ART
E-SOPD

7 - OnGyn
8 - TB Clam

③ 其他

*Age in months (M) if under 1 year or in days (D), if under 1 month

Annex IV HMIS disease classification and codes

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
0100	Infectious and parasitic diseases	A00-B99		
	<i>Epidemic prone diseases</i>			
0101	Malaria (clinical without laboratory confirmation)	B54	✓	✓
0102	Malaria (confirmed with <i>P. falciparum</i>)	B50	✓	✓
0103	Malaria (confirmed with species other than <i>P. falciparum</i>)	B51-B53	✓	✓
0104	Diarrhoea (non-bloody)	A09	✓	✓
0105	Diarrhea with dehydration	A09	✓	✓
0106	Diarrhea with blood (dysentery)	A02.0, A03.0-A03.9, A04.0-A04.9, A06.0-A06.1, A07.0-A07.9	✓	✓
0107	Meningitis	A39.0, G00-G03	✓	✓
0108	Typhoid fever	A01.0	✓	✓
0109	Relapsing fever	A68.0-A68.9	✓	✓
0110	Epidemic typhus	A75.0	✓	✓
0111	Acute febrile illness		✓	
	<i>Immediately reportable diseases</i>			
0112	Acute poliomyelitis/Acute flaccid paralysis	A80.0-A80.9	✓	✓
0113	Measles	B05.0-B05.9	✓	✓
0114	Plague	A20.0-A20.9	✓	✓
0115	Cholera	A00.0-A00.9	✓	✓
0116	Yellow fever	A95.0-A95.9	✓	✓
0117	Dracunculiasis	B72	✓	
0118	Neonatal tetanus	A33	✓	✓
0119	Viral hemorrhagic fevers	A96.0-A96.9, A98.0-A98.8, A99	✓	✓
0120	Avian Human Influenza	J09	✓	✓
0121	Rift Valley Fever	A92.4	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
	<u>Other priority infectious diseases</u>			
0122.1	Human immunodeficiency virus [HIV] disease	B20-B24	✓	✓
0122.2	AIDS	B20-B24	✓	✓
0123	Tuberculosis	A15-A19, B90	✓	✓
0124	Leprosy	A30.0- A30.9, B92	✓	✓
0125	Pneumonia	J12-J18	✓	✓
0126.1	Sexually transmitted infections: urethral discharge	A54.0(excludes with: genitourinary gland abscess(A54.1)and periurethral abscess (A54.1)), A56.0	0126.1	
0126.2	Sexually transmitted infections: persistent / recurrent urethral discharge	A54.0 (excludes with: genitourinary gland abscess (A54.1) and periurethral abscess (A54.1)), A56.0	0126.2	
0126.3	Sexually transmitted infections: genital ulcer	A51.0, A55, A57, A58, A60.0, A60.1, A60.9	0126.3	
0126.4	Sexually transmitted infections: vaginal discharge syndrome	A59.0, B 37.3, N76.0, N76.1	0126.4	
0126.5	Sexually transmitted infections: lower abdominal pain syndrome (Pelvic Inflammatory Disease – PID)	A54.2, A56.1, N70-N77	0126.5	
0126.6	Sexually transmitted infections: scrotal swelling syndrome	N45.0, N45.9	0126.6	
0126.7	Sexually transmitted infections: Inguinal bubo swelling (swollen glands)	A55, A57, A58	0126.7	
0126.8	Sexually transmitted infections: neonatal conjunctivitis	A54.3, P39.1	0126.8	
0126.9	Sexually transmitted infections: neonatal herpes	P35.2	0126.9	
0127.1	Leishmaniasis (Visceral)	B55.0	✓	✓
0127.2	Leishmaniasis (Cutaneous and Mucocutaneous)	B55.1, B55.2	✓	✓
0128	Onchocerciasis	B73	✓	
	<u>Other infectious diseases</u>			
0129	Diphtheria	A36.0-A36.9	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
0130	Pertussis	A37.0-A37.9	✓	✓
0131	Tetanus (other than neonatal tetanus)	A34-A35	✓	✓
0132	Trypanosomiasis	B56.0-B56.9	✓	✓
0133	Schistosomiasis	B65.0-B65.9	✓	✓
0134	Trachoma	A71.0-A71.9, B94.0	✓	✓
0135	Viral hepatitis	B15-B19	✓	✓
0136	Rabies	A82.0-A82.9	✓	✓
0137	Helminthiasis	B76-B83	✓	✓
0138	Septicaemia	A02.1, A22.7, A24.1, A26.7, A32.7, A40-A41		✓
0199	Other or unspecified infectious and parasitic diseases	remainder of A00-B99	✓	✓
0200	Neoplasms	C00-D48	✓	
0201	Breast cancer	C50.0-C50.9		✓
0202	Cancer of the cervix	C53.0-C53.9		✓
0203	Leukemia	C90.1, C91.0-C91.9, C92.0- C92.9, C93.0-C93.9, C94.0- C94.7, C95.0-C95.9		✓
0204	Lymphoma	C81.0-C81.9, C82.0-C82.9, C83.0-C83.9, C84.2-C84.5, C85.1-C85.9, C96.3		✓
0249	Other or unspecified malignant neoplasms	remainder of C00-C96		✓
0250	Uterine fibroma (leiomyoma of uterus)	D25.0-D25.9		✓
0299	Other or unspecified benign neoplasms	remainder of D00-D48		✓
0300	Diseases of the blood and blood forming organs and certain disorders involving the immune mechanism	D50-D89		
0301	Anaemias	D50-D64	✓	✓
0399	Other or unspecified diseases of the blood	D65-D89	✓	✓
0400	Endocrine, nutritional and metabolic diseases	E00-E90		
0401	Diabetes mellitus	E10-E14	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
0402	Iodine-deficiency-related goiter	E01.0-E01.2	✓	✓
0403	Moderate acute malnutrition	E44.0	✓	✓
0404	Severe acute malnutrition	E43	✓	✓
0499	Other or unspecified endocrine, nutritional and metabolic diseases	remainder of E00-E90	✓	✓
0500	Mental and behavioural disorders	F00-F99	✓	
0501	Dementia	F00-F03		✓
0502	Schizophrenia	F20-F21		✓
0503	Depression	F32-33		✓
0599	Other or unspecified mental and behavioural disorders	remainder of F00-F99		✓
0600	Diseases of the nervous system	G00-G99		
0601	Epilepsy	G40-G41	✓	✓
0699	Other or unspecified diseases of the nervous system	remainder of G00-G99	✓	✓
0700	Diseases of the eye and adnexa	H00-H59		
0701	Cataract	H25-H26, H28	✓	✓
0702	Glaucoma	H40.0-H40.9, H42	✓	✓
0799	Other or unspecified diseases of the eye and adnexa	remainder of H00-H59	✓	✓
0800	Diseases of the ear and mastoid process	H60-H95		✓
0801	Otitis	H60, H62.0-H62.4, H65-H67	✓	
0899	Other or unspecified diseases of the ear and mastoid process	remainder of H60-H95	✓	
0900	Diseases of the circulatory system	I00-I99		
0901	Hypertension and related diseases	I10-I15	✓	✓
0902	Rheumatic heart disease	I01.0-I01.9, I02.0, I05-I09		✓
0903	Ischemic heart disease	I20-I25		✓
0904	Cerebrovascular accident (stroke)	I60-I69		✓
0999	Other or unspecified diseases of the circulatory system	remainder of I00-I99	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
1000	Diseases of the respiratory system	J00-J99		
1001	Acute upper respiratory infections	J00-J06	✓	✓
1002	Acute bronchitis	J20-J20.9	✓	✓
1003	Asthma	J45-J46	✓	✓
1004	Chronic obstructive pulmonary disease (COPD)	J40-J44, J47	✓	✓
1099	Other or unspecified diseases of the respiratory system	remainder of J00-J99	✓	✓
1100	Diseases of the digestive system	K00-K93		
1101	Dental and gum diseases	K00-K08	✓	✓
1102	Dyspepsia	K30	✓	✓
1103	Peptic ulcer disease	K21.0, K22.1, K25-K28		✓
1104	Cirrhosis of liver	K70.3, K71.7, K74.0-K74.6		✓
1105	Appendicitis	K35-K37		✓
1106	Hernias without intestinal obstruction	K40-K46		✓
1107	Intestinal obstruction	K56.0-K56.7		✓
1108	Cholelithiasis	K80.0-K80.8		✓
1199	Other or unspecified diseases of the digestive system	remainder of K00-K93	✓	✓
1200	Diseases of the skin and subcutaneous tissue	L00-L99		
1201	Infections of the skin and subcutaneous tissue	L00-L08	✓	✓
1299	Other or unspecified diseases of the skin and subcutaneous tissue	L09-L99	✓	✓
1300	Diseases of the musculoskeletal system and connective tissue	M00-M99	✓	✓
1400	Diseases of the genitourinary system	N00-N99		
1401	Urinary tract infection	N39.0	✓	✓
1402	Nephritis	N00-N03		✓
1403	Hyperplasia of prostate	N40		✓
1499	Other or unspecified disorders of the genitourinary system	remainder of N00-N99	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
1500	Pregnancy, childbirth and the puerperium	O00-O99		
1501	Medical abortion without complication (safe abortion)	O04.4, O04.9	✓	✓
1502	Other abortion (spontaneous, with complication etc.)	O03, O04.1-O04.3, O04.5-O04.8, O05-O07	✓	✓
1503	Single spontaneous delivery	O80		✓
1504	Other delivery	O81-O84		✓
1505	Prolonged obstructed labor	O64-O66		✓
1506.1	Antepartum Hemorrhage (APH)	O46, O67		✓
1506.2	Postpartum Hemorrhage (PPH)	O72		✓
1507	Pregnancy induced hypertension and edema	O12-O16		✓
1508	Ectopic pregnancy	O00.0-O00.9		✓
1509	Puerperal sepsis	O85		✓
1598	Other causes of abnormal pregnancy, childbirth and puerperium	O10-O48, O60-O62, O85-O92 – in OPD O10-O45, O47-O48, O60-O62, O86-O92 – in IPD	✓	✓
1599	Other or unspecified obstetric conditions	remainder of O00-O99	✓	✓
1600	Certain conditions originating in the perinatal period	P00-P96	✓	
1601	Birth asphyxia	P21.0-P21.9		✓
1602	Prematurity	P07.2-P07.3		✓
1603	Neonatal sepsis	P36.0-P36.9		✓
1604	Low birth weight of newborn	P07.0-P07.1		✓
1699	Other or unspecified perinatal diseases	remainder of P00-P96		✓
1700	Congenital malformations, deformations and chromosomal abnormalities	Q00-Q99	✓	✓
1800	Injury, poisoning and certain other consequences of external causes	S00-T98		
1801	Trauma (injury, fracture etc.)	S00-T19	✓	✓
1802	Burns and corrosions	T20-T32	✓	✓

HMIS CODE	HEADING	ICD-10 CODES	reported from OPD	reported from IPD
1803	Poisoning	T36-T50	✓	✓
1899	Other or unspecified effects of external causes	remainder of S00-T98	✓	✓
1900	External causes of morbidity and mortality	V01-Y98		
1901	Road traffic injuries	V01- V99	✓	✓
1902	Violence and other intentional injury	X60-X84, X85-Y09	✓	✓
1999	Other or unspecified external causes of morbidity and mortality	remainder of V01-Y98	✓	✓
2000	Factors influencing health status and contact with health services, including visit for examination and investigation (check-up, examination for driving license etc.)	Z00-Z99	✓	
9000	Other unclassified diseases			
9001	District / region specific disease 1		✓	✓
9002	District / region specific disease 2		✓	✓
9999	Other or unspecified diseases		✓	✓

Tabulation list for morbidity

001	Cholera	A00
002	Typhoid and paratyphoid fevers	A01
003	Shigellosis	A03
004	Amoebiasis	A06
005	Diarrhoea and gastroenteritis of presumed infectious origin	A09
006	Other intestinal infectious diseases	A02, A04-A05, A07-A08
007	Respiratory tuberculosis	A15-A16
008	Other tuberculosis	A17-A19
009	Plague	A20
010	Brucellosis	A23
011	Leprosy	A30
012	Tetanus neonatorum	A33
013	Other tetanus	A34-A35
014	Diphtheria	A36
015	Whooping cough	A37
016	Meningococcal infection	A39
017	Septicaemia	A40-A41
018	Other bacterial diseases	A21-A22, A24-A28, A31-A32, A38, A42-A49
019	Congenital syphilis	A50
020	Early syphilis	A51
021	Other syphilis	A52-A53
022	Gonococcal infection	A54
023	Sexually transmitted chlamydial diseases	A55-A56
024	Other infections with a predominantly sexual mode of transmission	A57-A64
025	Relapsing fevers	A68
026	Trachoma	A71
027	Typhus fever	A75
028	Acute poliomyelitis	A80
029	Rabies	A82
030	Viral encephalitis	A83-A86
031	Yellow fever	A95
032	Other arthropod-borne viral fevers and viral haemorrhagic fevers	A90-A94, A96-A99
033	Herpesviral infections	B00
034	Varicella and zoster	B01-B02
035	Measles	B05
036	Rubella	B06
037	Acute hepatitis B	B16
038	Other viral hepatitis	B15, B17-B19
039	Human immunodeficiency virus [HIV] disease	B20-B24
040	Mumps	B26

041	Other viral diseases	A81, A87-A89, B03-B04, B07-B09, B25, B27-B34
042	Mycoses	B35-B49
043	Malaria	B50-B54
044	Leishmaniasis	B55
045	Trypanosomiasis	B56-B57
046	Schistosomiasis	B65
047	Other fluke infections	B66
048	Echinococcosis	B67
049	Dracunculiasis	B72
050	Onchocerciasis	B73
051	Filariasis	B74
052	Hookworm diseases	B76
053	Other helminthiasis	B68-B71, B75, B77-B83
054	Sequelae of tuberculosis	B90
055	Sequelae of poliomyelitis	B91
056	Sequelae of leprosy	B92
057	Other infectious and parasitic diseases	A65-A67, A69-A70, A74, A77-A79, B58-B64, B85-B89, B94, B99
058	Malignant neoplasm of lip, oral cavity and pharynx	C00-C14
059	Malignant neoplasm of oesophagus	C15
060	Malignant neoplasm of stomach	C16
061	Malignant neoplasm of colon	C18
062	Malignant neoplasm of rectosigmoid junction, rectum, anus and anal canal	C19-C21
063	Malignant neoplasm of liver and intrahepatic bile ducts	C22
064	Malignant neoplasm of pancreas	C25
065	Other malignant neoplasms of digestive organs	C17, C23-C24, C26
066	Malignant neoplasms of larynx	C32
067	Malignant neoplasm of trachea, bronchus and lung	C33-C34
068	Other malignant neoplasms of respiratory and intrathoracic organs	C30-C31, C37-C39
069	Malignant neoplasm of bone and articular cartilage	C40-C41
070	Malignant melanoma of skin	C43
071	Other malignant neoplasms of skin	C44
072	Malignant neoplasms of mesothelial and soft tissue	C45-C49
073	Malignant neoplasm of breast	C50
074	Malignant neoplasm of cervix uteri	C53
075	Malignant neoplasm of other and unspecified parts of uterus	C54-C55
076	Other malignant neoplasms of female genital organs	C51-C52, C56-C58
077	Malignant neoplasm of prostate	C61
078	Other malignant neoplasms of male genital organs	C60, C62-C63
079	Malignant neoplasm of bladder	C67
080	Other malignant neoplasms of urinary tract	C64-C66, C68
081	Malignant neoplasm of eye and adnexa	C69

082	Malignant neoplasm of brain	C71
083	Malignant neoplasm of other parts of central nervous system	C70, C72
084	Malignant neoplasm of other, ill-defined, secondary, unspecified and multiple sites	C73-C80, C97
085	Hodgkin's disease	C81
086	Non-Hodgkin's lymphoma	C82-C85
087	Leukaemia	C91-C95
088	Other malignant neoplasms of lymphoid, haematopoietic and related tissue	C88-C90, C96
089	Carcinoma in situ of cervix uteri	D06
090	Benign neoplasm of skin	D22-D23
091	Benign neoplasm of breast	D24
092	Leiomyoma of uterus	D25
093	Benign neoplasm of ovary	D27
094	Benign neoplasm of urinary organs	D30
095	Benign neoplasm of brain and other parts of central nervous system	D33
096	Other in situ and benign neoplasms and neoplasms of uncertain and unknown behaviour	D00-D05, D07-D21, D26, D28-D29, D31-D32, D34-D48
097	Iron deficiency anaemia	D50
098	Other anaemias	D51-D64
099	Haemorrhagic conditions and other diseases of blood and blood-forming organs	D65-D77
100	Certain disorders involving the immune mechanism	D80-D89
101	Iodine-deficiency-related thyroid disorders	E00-E02
102	Thyrotoxicosis	E05
103	Other disorders of thyroid	E03-E04, E06-E07
104	Diabetes mellitus	E10-E14
105	Malnutrition	E40-E46
106	Vitamin A deficiency	E50
107	Other vitamin deficiencies	E51-E56
108	Sequelae of malnutrition and other nutritional deficiencies	E64
109	Obesity	E66
110	Volume depletion	E86
111	Other endocrine, nutritional and metabolic disorders	E15-E35, E58-E63, E65, E67-E85, E87-E90
112	Dementia	F00-, F03
113	Mental and behavioural disorders due to use of alcohol	F10
114	Mental and behavioural disorders due to other psychoactive substance use	F11-F19
115	Schizophrenia, schizotypal, and delusional disorders	F20-F29
116	Mood [affective] disorders	F30-F39
117	Neurotic, stress-related, and somatoform disorders	F40-F48
118	Mental retardation	F70-F79
119	Other mental and behavioural disorders	F04-F09, F50-F69, F80-F99
120	Inflammatory diseases of the central nervous system	G00-G09

121	Parkinson's disease	G20
122	Alzheimer's disease	G30
123	Multiple sclerosis	G35
124	Epilepsy	G40-G41
125	Migraine and other headache syndromes	G43-G44
126	Transient cerebral ischaemic attacks and related syndromes	G45
127	Nerve, nerve root and plexus disorders	G50-G59
128	Cerebral palsy and other paralytic syndromes	G80-G83
129	Other diseases of the nervous system	G10-G13, G21-G26, G31-G32, G36-G37, G46-G47, G60-G73, G90-G99
130	Inflammation of eyelid	H00-H01
131	Conjunctivitis and other disorders of conjunctiva	H10-H13
132	Keratitis and other disorders of sclera and cornea	H15-H19
133	Cataract and other disorders of lens	H25-H28
134	Retinal detachments and breaks	H33
135	Glaucoma	H40-H42
136	Strabismus	H49-H50
137	Disorders of refraction and accommodation	H52
138	Blindness and low vision	H54
139	Other diseases of the eye and adnexa	H02-H06, H20-H22, H30-H32, H34-H36, H43-H48, H51, H53, H55-H59
140	Otitis media and other disorders of middle ear and mastoid	H65-H75
141	Hearing loss	H90-H91
142	Other diseases of the ear and mastoid process	H60-H62, H80-H83, H92-H99
143	Acute rheumatic fever	I00-I02
144	Chronic rheumatic heart disease	I05-I09
145	Essential (primary) hypertension	I10
146	Other hypertensive diseases	I11-I15
147	Acute myocardial infarction	I21-I22
148	Other ischaemic heart diseases	I20, I23-I25
149	Pulmonary embolism	I26
150	Conduction disorders and cardiac arrhythmias	I44-I49
151	Heart failure	I50
152	Other heart diseases	I27-I43, I51-I52
153	Intracranial haemorrhage	I60-I62
154	Cerebral infarction	I63
155	Stroke, not specified as haemorrhage or infarction	I64
156	Other cerebrovascular diseases	I65-I69
157	Atherosclerosis	I70
158	Other peripheral vascular diseases	I73
159	Arterial embolism and thrombosis	I74
160	Other diseases of arteries, arterioles and capillaries	I71-I72, I77-I79
161	Phlebitis, thrombophlebitis, venous embolism and thrombosis	I80-I82

162	Varicose veins of lower extremities	I83
163	Haemorrhoids	I84
164	Other diseases of the circulatory system	I85-I99
165	Acute pharyngitis and acute tonsillitis	J02-J03
166	Acute laryngitis and tracheitis	J04
167	Other acute upper respiratory infections	J00-J01, J05-J06
168	Influenza	J10-J11
169	Pneumonia	J12-J18
170	Acute bronchitis and acute bronchiolitis	J20-J21
171	Chronic sinusitis	J32
172	Other diseases of nose and nasal sinuses	J30-J31, J33-J34
173	Chronic disease of tonsils and adenoids	J35
174	Other diseases of upper respiratory tract	J36-J39
175	Bronchitis, emphysema and other chronic obstructive pulmonary diseases	J40-J44
176	Asthma	J45-J46
177	Bronchiectasis	J47
178	Pneumoconiosis	J60-J65
179	Other diseases of the respiratory system	J22, J66-J99
180	Dental caries	K02
181	Other disorders of teeth and supporting structures	K00-K01, K03-K08
182	Other diseases of the oral cavity, salivary glands and jaws	K09-K14
183	Gastric and duodenal ulcer	K25-K27
184	Gastritis and duodenitis	K29
185	Other diseases of oesophagus, stomach and duodenum	K20-K23, K28, K30-K31
186	Diseases of appendix	K35-K38
187	Inguinal hernia	K40
188	Other hernia	K41-K46
189	Crohn's disease and ulcerative colitis	K50-K51
190	Paralytic ileus and intestinal obstruction without hernia	K56
191	Diverticular disease of intestine	K57
192	Other diseases of intestines and peritoneum	K52-K55, K58-K67
193	Alcoholic liver disease	K70
194	Other diseases of liver	K71-K77
195	Cholelithiasis and cholecystitis	K80-K81
196	Acute pancreatitis and other diseases of the pancreas	K85-K86
197	Other diseases of the digestive system	K82-K83, K87-K93
198	Infections of the skin and subcutaneous tissue	L00-L08
199	Other diseases of the skin and subcutaneous	L10-L99
200	Rheumatoid arthritis and other inflammatory polyarthropathies	M05-M14
201	Arthrosis	M15-M19
202	Acquired deformities of limbs	M20-M21
203	Other disorders of joints	M00-M03, M22-M25

INTERNATIONAL CLASSIFICATION OF DISEASES

204	Systemic connective tissue disorders	M30-M36
205	Cervical and other intervertebral disc disorders	M50-M51
206	Other dorsopathies	M40-M49, M53-M54
207	Soft tissue disorders	M60-M79
208	Disorders of bone density and structure	M80-M85
209	Osteomyelitis	M86
210	Other diseases of the musculoskeletal system and connective tissue	M87-M99
211	Acute and rapidly progressive nephritic syndromes	N00-N01
212	Other glomerular diseases	N02-N08
213	Renal tubulo-interstitial diseases	N10-N16
214	Renal failure	N17-N19
215	Urolithiasis	N20-N23
216	Cystitis	N30
217	Other diseases of the urinary system	N25-N29, N31-N39,
218	Hyperplasia of prostate	N40
219	Other disorders of prostate	N41-N42
220	Hydrocele and spermatocele	N43
221	Redundant prepuce, phimosis and paraphimosis	N47
222	Other diseases of male genital organs	N44-N46, N48-N51
223	Disorders of the breast	N60-N64
224	Salpingitis and oophoritis	N70
225	Inflammatory disease of cervix uteri	N72
226	Other inflammatory diseases of female pelvic organs	N71, N73-N77
227	Endometriosis	N80
228	Female genital prolapse	N81
229	Noninflammatory disorders of ovary, fallopian tube and broad ligament	N83
230	Disorders of menstruation	N91-N92
231	Menopausal and other perimenopausal disorders	N95
232	Female infertility	N97
233	Other disorders of genitourinary tract	N82, N84-N90, N93-N94, N96, N98-N99
234	Spontaneous abortion	O03
235	Medical abortion	O04
236	Other pregnancies with abortive outcome	O00-O02, O05-O08
237	Oedema, proteinuria and hypertensive disorders in pregnancy, childbirth and the puerperium	O10-O16
238	Placenta praevia, premature separation of placenta and antepartum haemorrhage	O44-O46
239	Other maternal care related to fetus and amniotic cavity and possible delivery problems	O30-O43, O47-O48
240	Obstructed labour	O64-O66
241	Postpartum haemorrhage	O72
242	Other complications of pregnancy and delivery	O20-O29, O60-O63, O67-O71, O73-O75, O81-O84

243	Single spontaneous delivery	O80
244	Complications predominantly related to the puerperium and other obstetric conditions, not elsewhere classified	O85-O99
245	Fetus and newborn affected by maternal factors and by complications of pregnancy, labour and delivery	P00-P04
246	Slow fetal growth, fetal malnutrition and disorders related to short gestation and low birth weight	P05-P07
247	Birth trauma	P10-P15
248	Intrauterine hypoxia and birth asphyxia	P20-P21
249	Other respiratory disorders originating in the perinatal period	P22-P28
250	Congenital infectious and parasitic diseases	P35-P37
251	Other infections specific to the perinatal period	P38-P39
252	Haemolytic disease of fetus and newborn	P55
253	Other conditions originating in the perinatal period	P08, P29, P50-P54, P56-P96
254	Spina bifida	Q05
255	Other congenital malformations of the nervous system	Q00-Q04, Q06-Q07
256	Congenital malformations of the circulatory system	Q20-Q28
257	Cleft lip and cleft palate	Q35-Q37
258	Absence, atresia and stenosis of small intestine	Q41
259	Other congenital malformations of the digestive system	Q38-Q40, Q42-Q45
260	Undescended testicle	Q53
261	Other malformations of the genitourinary system	Q50-Q52, Q54-Q64
262	Congenital deformities of hip	Q65
263	Congenital deformities of feet	Q66
264	Other congenital malformations and deformations of the musculoskeletal system	Q67-Q79
265	Other congenital malformations	Q10-Q18, Q30-Q34, Q80-Q89
266	Chromosomal abnormalities, not elsewhere classified	Q90-Q99
267	Abdominal and pelvic pain	R10
268	Fever of unknown origin	R50
269	Senility	R54
270	Other symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00-R09, R11-R49, R51-R53, R55-R99
271	Fracture of skull and facial bones	S02
272	Fracture of neck, thorax or pelvis	S12, S22, S32, T08
273	Fracture of femur	S72
274	Fractures of other limb bones	S42, S52, S62, S82, S92, T10, T12
275	Fractures involving multiple body regions	T02
276	Dislocations, sprains and strains of specified and multiple body regions	S03, S13, S23, S33, S43, S53, S63, S73, S83, S93, T03
277	Injury of eye and orbit	S05
278	Intracranial injury	S06
279	Injury of other internal organs	S26-S27, S36-S37

280	Crushing injuries and traumatic amputations of specified and multiple body regions	S07-S08, S17-S18, S28, S38, S47-S48, S57-S58, S67-S68, S77-S78, S87-S88, S97-S98, T04-T05
281	Other injuries of specified, unspecified and multiple body regions	S00-S01, S04, S09-S11, S14-S16, S19-S21, S24-S25, S29-S31, S34-S35, S39-S41, S44-S46, S49-S51, S54-S56, S59-S61, S64-S66, S69-S71, S74-S76, S79-S81, S84-S86, S89-S91, S94-S96, S99, T00-T01, T06-T07, T09, T11, T13-T14
282	Effects of foreign body entering through natural orifice	T15-T19
283	Burns and corrosions	T20-T32
284	Poisoning by drugs and biological substances	T36-T50
285	Toxic effects of substances chiefly nonmedicinal as to source	T51-T65
286	Maltreatment syndrome	T74
287	Other and unspecified effects of external causes	T33-T35, T66-T73, T75-T78
288	Certain early complications of trauma and complications of surgical and medical care, not elsewhere classified	T79-T88
289	Sequelae of injuries, poisoning and of other consequences of external causes	T90-T98
290	Persons encountering health services for examination and investigation	Z00-Z13
291	Asymptomatic human immunodeficiency virus [HIV] infection status	Z21
292	Other persons with potential health hazards related to communicable disease	Z20, Z22-Z29
293	Contraceptive management	Z30
294	Antenatal screening and other supervision of pregnancy	Z34-Z36
295	Liveborn infants according to place of birth	Z38
296	Postpartum care and examination	Z39
297	Persons encountering health services for specific procedures and health care	Z40-Z54
298	Persons encountering health services for other reasons	Z31-Z33, Z37, Z55-Z99

Data Request Form

Name: _____ ID No: _____ Department: _____
Institution: _____ Date Requested: _____

1. **Data Requested** (specify patient population, time period, etc.)

A. Required Patient Information (specify variables/attributes)

- | | | |
|----------|----------|----------|
| 1. _____ | 3. _____ | 5. _____ |
| 2. _____ | 4. _____ | |

B. Time period

From: _____ To: _____

2. **Purpose of the request**

- | | | | |
|--------------------------|------------------------------------|--------------------------|-------------------------|
| ☐ | Presentation at conference/meeting | ☐ | Spin-off Research Study |
| ☐ | Publication | ☐ | Patient Care |

3. **Is the research study for which the data is requested, approved from Joint Academic Commission (JAC)?**

- | | |
|--------------------------|---|
| ☐ | Yes If Yes, provide the JAC Number and attach a copy of the approval memo |
| ☐ | No If No, provide the reason: |

4. **If presentation or publication of data is anticipated, identify collaborators and co-authors to be credited:**

1. _____
2. _____

Signature: _____ Date: _____

Confidentiality Statement

Name _____ ID No: _____

Department: _____ Institution: _____

I declare that I understand and abide by the rules of confidentiality, security and release of information for the _____ registry as outlined below.

Rules of Confidentiality, Security and Release of Information.

1. Data held by Registries at IPD, OPD on patients is intended for the purposes of Scientific Research and Statistical Analyses, Healthcare and Hospital Administration support only. The data cannot be used for any other purpose.
2. Data received from the registry should not be divulged to any person whose name is not specified as a co-user of the data nor should it be used for any other purposes than that declared in Registry Data Request Form.
3. Proper safeguards should be applied in keeping and destroying the data upon completion of the work/project in order to prevent any breach of confidentiality.
4. The Chairman of Quality Control Office should be notified immediately of any misuse or loss of data.
5. Any statistics or results of research based on data received from the registry should not be made available in a form which directly identifies individual data subjects and/or is not covered by the purpose of request specified in the Data Request form.

(Signature): _____ (Date): _____

Statement of Agreement

For Hospital Based Disease Registries

I, _____ the Principal Investigator for

_____ registries understand and agree that data collected for the hospital-based registries is under the ownership of the institute; Tikur Anbessa Generalized Specialized Teaching Hospital. I also understand and agree that any request for the data from the registry book should be preceded by an approval of the research project by Joint Academic Commission.

Principal Investigator (s)

Registry Chairman

Date

Consent form

I undersigned have been informed that the format prepared is to collect data from abstract disease registries. I am assured that the confidentiality of information's which is I am going to collect will be kept strictly confidential. Therefore, I have consented to participate as disease registry reviewer and I will also keep all patient information strictly confidential.

Personnel designated for data collection.

Date: _____

Signature: _____

Benefits and harms
There are no direct benefits and possible minor harm from participating in this research.

Confidentiality
All responses will be kept confidential. This means that your answers/responses will only be shared with researcher and I will ensure that any information we include in my report does not identify you as the respondent. You don't have to talk about anything you don't want to and you may end the interview at any time.

Discrimination
The fund for running this research project will be obtained from School of Public Health.

Contact person
Principal investigator
Address: 101, Main St - 2012 44767
Email: principal@school.edu

Signature: _____

Thank you in advance

Information sheet

Title of the project

Evaluation of Health Management Information System (HMIS) disease classification in capturing morbidity data at Tikur Anbessa Specialized Hospital (TASH), 2009/10.

Name of investigator

- Emawayish Birhanemeskel Haile

Back ground of the study

This study will be conducted by Addis Ababa University (AAU). The purpose of this study is to evaluate the HMIS diseases classification in capturing morbidity data. It will help all the stakeholders to get more understandings on how HMIS disease classification in relation to capturing morbidity data in TASH. In addition to this it will contribute in the improvement of standardization of procedures in data collection, analysis and reporting process that is currently implemented by Federal Ministry of Health (FMOH).

Benefits and harms

There are no tangible benefits and possible harms upon participating in this research.

Confidentiality

All responses will be kept confidential. This means that your interview responses will only be shared with researcher and I will ensure that any information we include in my report does not identify you as the respondent. You don't have to talk about anything you don't want to and you may end the interview at any time.

Dissemination

The fund for running this research project will be obtained from School of Public Health.

Contact person

Principal investigator

Address: - Tel Mobile: - 0913 847697

Email: - emameskel@yahoo.com

Signature _____

Thank you in advance

Consent form

This study will be conducted by AAU. The purpose of this study is to evaluate the HMIS diseases classification in capturing morbidity data at TASH. The results of this project will help FMOH in the improvement of standardization of procedures in data collection, analysis and reporting processes. It will also help all the stakeholders to get more understandings on how HMIS disease classification in relation to capturing morbidity data.

The interview should take less than an hour. I will be tape recording the session because I don't want to miss any of your responses. Although I will be taking some notes during the session, I can't possibly write fast enough to get it all down. Because we're on tape, please be sure to speak up so that I don't miss your responses and comments.

I undersigned have been informed that the questionnaire prepared is part of the study to collect data from key informants that evaluate the HMIS disease classification. I have been told that, this study will help all the stakeholders to get more understandings on how applicable the HMIS disease classification in relation to capturing morbidity data at TASH. In addition the researcher explained that, it will also contribute in the improvement of standardization of procedures in data collection, analysis and reporting process that is currently implemented by FMOH. I am assured that the confidentiality of information's which is I am going to give will be kept anonymous and strictly confidential. Therefore I have consented to participate in the study.

Interviewee

Date

QUESTIONS FOR INTERVIEWING THE KEY INFORMANTS

For HMIS expert (FMOH)

1. What are your current experiences regarding hospital morbidity data collection from different areas; analyzing and interpreting it.
2. Are there any difficulties or limitations faced during collecting, analyzing & interpreting those morbidity data's reported at hospital level?
3. Under what circumstances you believe HMIS disease classification is appropriate. Explain it in detail
4. To what extent you accept this HMIS disease classification for hospital morbidity data analysis and interpretation.
 - Would you describe strengths and weaknesses of HMIS disease classification observed at hospital level
5. Diagnostic statements/Diagnosis codes that should be added; changed and/or deleted for hospital morbidity data analysis (Tikur Anbessa specialized hospital in particular).
6. What are your recommendations to improve HMIS disease classification that are helpful for clinical data coding, reporting, analyzing and interpretation for hospital?

Question for Quality control office

1. What is your current experience about collecting, analyzing & reporting morbidity data?
2. Would you describe the strengths and weaknesses of HMIS disease classification?
3. Under what circumstances you believe HMIS disease classification is appropriate. Explain it in detail
4. Any other diagnostic statements/ codes that should be added; changed and/or deleted.
Specify in which section you need further detail and Explain in detail why
5. What are your recommendations to improve HMIS disease classification in order to code diagnostic statements for morbidity data analysis in your hospital?

Question for statistics office

1. What is your current experience about collecting & reporting morbidity data for statistical analysis?
2. Is there any limitations /difficulties faced during collecting, reporting and analyzing morbidity data
3. Would you describe the strengths and weaknesses of HMIS disease classification?
4. What are your recommendations to improve HMIS disease classification in order to code diagnostic statements for morbidity data analysis in your hospital?

Question for nurses

1. What is your current experience regarding registering patient information's from medical records onto abstract disease registries, compiling & reporting morbidity data?
2. Is there any limitations /difficulties faced during registering and reporting morbidity data
3. Would you describe the strengths and weaknesses of HMIS disease classification?
4. Any other diagnostic statements/ codes that should be added; changed and/or deleted.
Specify in which section you need further detail & Explain in detail why
5. What are your recommendations to improve HMIS disease classification in order to register and report morbidity data that would help for data collection process in your unit?

DECLARATION

This thesis is my original work and has not been submitted as a partial requirement for a degree in any university.

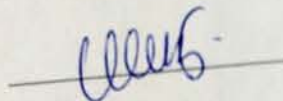


Emawayish Birhanemeskel

This thesis has been submitted for examination with my approval as university advisor.



Dr. Sebesebe Hailemariam



Professor Misganaw Fantahun