

Medicine and Society

Health information management: An introduction to disease classification and coding

PREM KUMAR MONY, C. NAGARAJ

ABSTRACT

Morbidity and mortality data constitute an important component of a health information system and their coding enables uniform data collation and analysis as well as meaningful comparisons between regions or countries. Strengthening the recording and reporting systems for health monitoring is a basic requirement for an efficient health information management system. Increased advocacy for and awareness of a uniform coding system together with adequate capacity building of physicians, coders and other allied health and information technology personnel would pave the way for a valid and reliable health information management system in India. The core requirements for the implementation of disease coding are: (i) support from national/institutional health administrators, (ii) widespread availability of the ICD-10 material for morbidity and mortality coding; (iii) enhanced human and financial resources; and (iv) optimal use of informatics. We describe the methodology of a disease classification and codification system as also its applications for developing and maintaining an effective health information management system for India.

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INTRODUCTION

Morbidity and mortality data are important measures of the health of populations. The systematic recording, reporting and dissemination of such data constitute an efficient health information management system (HIMS) that is able to provide valid, reliable and comparable measures of public health considered critical for health policy and planning.¹ Presently, the coverage of the topic of health information system is suboptimal in the formal training of physicians, health administrators and other allied health personnel.

HISTORY OF CLASSIFICATION OF DISEASES

Classifications have been used to describe diseases over the ages. Since the seventeenth century, pioneers such as John Graunt, William Farr, Florence Nightingale and Jacques Bertillon attempted to classify diseases systematically. Subsequently, WHO

has been responsible for continued revisions of the Bertillon classification; the current version is the tenth revision of the International Classification of Diseases and Related Health Problems (ICD-10).²

Clinical coding is defined as the translation of diagnoses of diseases, health-related problems and procedural concepts from text to alphabetic/numeric codes for easy storage, retrieval, and uniformity of comparison and analyses.³ Morbidity and mortality data constitute a very useful tool for health planners and administrators to identify priorities for public health interventions, budgeting, future research needs and preparation of guidelines.

AN OVERVIEW OF THE ICD-10 CLASSIFICATION

The ICD-10 is a hierarchical classification containing a list of code categories describing all disease concepts. There are 3 key elements to the structure of ICD-10:⁴

1. It has 3 volumes. Volume I is a tabular listing of diseases, volume II is an instruction manual and volume III is an alphabetical index of all diseases.
2. The ICD-10 contains 22 chapters, each identified by a Roman numeral and associated alphabet(s) (Table I). These 22 chapters cover 2046 disease categories.

TABLE I. Classification of diseases in the International Classification of Diseases-10

I. Certain infectious and parasitic diseases
II. Neoplasms
III. Diseases of the blood and blood-forming organs, and the immune mechanism
IV. Endocrine, nutritional and metabolic diseases
V. Mental and behavioural disorders
VI. Diseases of the nervous system
VII. Diseases of the eye
VIII. Diseases of the ear
IX. Diseases of the circulatory system
X. Diseases of the respiratory system
XI. Diseases of the digestive system
XII. Diseases of the skin and subcutaneous tissue
XIII. Diseases of the musculoskeletal system
XIV. Diseases of the genitourinary system
XV. Pregnancy, childbirth and the puerperium
XVI. Certain conditions originating in the perinatal period
XVII. Congenital malformations and chromosomal abnormalities
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified
XIX. Injury, poisoning and certain other consequences of external causes
XX. External causes of morbidity and mortality
XXI. Factors influencing health status and contact with health services
XXII. Codes for special purposes (e.g. diseases of uncertain aetiology)

Institute of Population Health and Clinical Research (IPHCR), St John's National Academy of Health Sciences, Koramangala, Bangalore 560034, Karnataka, India

PREM KUMAR MONY

Regional Office for Health and Family Welfare—National Vector-Borne Diseases Control Programme, Kendriya Sadan F Wing, Koramangala, Bangalore 560034, Karnataka, India

C. NAGARAJ

Correspondence to PREM KUMAR MONY; prem_mony@iphcr.res.in

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3. The alphanumeric structure of the code uses one letter followed by 2 or 3 numeric characters, e.g. A15 (first character from A to Z, followed by 2 digits). Three-character coding is used for public health purposes. Most categories are further divided into subcategories to enable coding of a disease condition more specifically, e.g. A15.1 (first character from A to Z, followed by 2 digits, then a decimal point and finally another digit). Specifically, A15 is respiratory tuberculosis, bacteriologically and histologically confirmed; A15.0 is tuberculosis of the lung, confirmed by sputum microscopy with or without culture, and A15.1 is tuberculosis of the lung, confirmed by culture only.

AN OVERVIEW OF MORBIDITY CODING

In the context of ICD, the term morbidity covers illnesses, injuries and reasons for contact with health services including screening and preventive care. Coding usually relates to an ‘episode of healthcare’ (inpatient or ambulatory care) in an institution but may also apply to surveys or other diagnostic data.

Concepts for morbidity coding

At the end of an episode of care, the clinician should record all conditions that affected the person during that period. A health authority may decide on either single-condition coding or multi-condition coding. Clinicians and coders will find their task easy if the patient is treated for only one condition. However, in many instances there may be more than one disease in the same person necessitating the need to differentiate between the ‘main condition’ and the ‘other conditions’. The main condition is defined as the diagnosis established at the end of the episode of healthcare to be the condition primarily responsible for the patient receiving treatment or being investigated. The ‘other conditions’ are those that exist or develop during the episode of healthcare.

Re-selection of main condition

In some instances, the main condition recorded by the clinician may not be consistent with the WHO definition or may not have been specified. WHO has developed a set of rules to ensure that the correct main condition is selected and coded for the particular episode of care (illustrations for these are provided in ICD, Vol. II).^{3,4} Medical records personnel need to familiarize themselves with these rules to be able to apply them appropriately.

AN OVERVIEW OF MORTALITY CODING

Death certificates are the main source of mortality data. In some settings, verbal autopsy reports may be available where deaths do not occur under medical care. The person certifying the cause of death has to enter the sequence of events leading to death on the International Death Certificate specified by WHO (Table II). This has 2 parts.

1. Part I is used for diseases related to the sequence of events leading directly to death. It has 3–4 lines to record the sequence of events leading to death, in reverse order. Each event in the sequence should be recorded on a separate line—the *direct cause of death* is entered on the first line, the *underlying cause of death* is entered on the lowest used line, and any intervening causes on the lines between the first and the lowest used line.
2. Part II is used for co-morbid conditions that have no direct connection with the events leading to death but which, by their nature, contributed to death.

Underlying cause of death

Many death certificates give only one cause of death. However, if 2 or more diseases have contributed to death, all must be recorded on the certificate. In such cases, it has been customary to select one of the causes of death for coding and reporting purposes. This single cause is called the underlying cause of death. The concept of the underlying cause of death is central to mortality coding. WHO defines the underlying cause of death as:

1. The disease or injury which initiated the train of morbid events leading directly to death; or
2. The circumstances of the accident or violence which produced the fatal injury.

WHO has defined a set of rules to be followed for coding the underlying cause of death.^{3,4}

Globally, disease classification systems have been used to obtain quantitative estimates of the relative magnitude of diseases, injuries and their risk factors through the Global Burden of Diseases and Risk Factors study.⁵ There have also been attempts to translate the knowledge from this output for relevant application in the spheres of health policy and practice in developing countries through the Disease Control Priorities project.⁶

MEDICAL CODING IN INDIA: THE PRESENT STATUS AND THE WAY FORWARD

The main requirements for the implementation of ICD-10 are:⁴

1. support from regional/institutional administrators
2. the ICD-10 material for morbidity and mortality coding
3. human and financial resources
 - (i) awareness of the WHO ICD-10 system of recording and reporting
 - (ii) personnel with adequate expertise in using the ICD-10 material
 - (iii) funds for training, manuals, etc.
 - (iv) graded introduction of the ICD-10 into the public and/or private healthcare systems
 - (v) in-built system of querying (by nosologists) of incorrectly/poorly written statements

TABLE II. International form of medical certificate of cause of death

Medical certificate of death			
Part I		I	
Immediate cause of death	(a)	Approximate interval	
Antecedent causes, if any, giving rise to the immediate cause (a), above	(b)	between onset and death	
	(c)		
Cause of death	stating the cause underlying last		
Part II		II	
Other significant conditions contributing to the death but not causally related to the immediate cause (a) above

- (vi) commitment to the enhanced use of coded information in decision-making.

4. Supporting the use of informatics.

In India, the ICD is being used in public health research as well as hospital information systems. Population-based epidemiological studies in Tamil Nadu⁷ and Andhra Pradesh⁸ have utilized verbal autopsy along with clinical coding to depict the ongoing epidemiological transition in southern India where cardiovascular diseases, injuries, cancers, tuberculosis and chronic respiratory illness are the major causes of death. The Million Death Study conducted jointly by the Registrar General of India and the Centre for Global Health Research at the University of Toronto, Canada, has provided information on maternal mortality in India⁹ and will soon provide reliable estimates of the main causes of child and adult deaths representative of the entire country.¹⁰ Similar cause-of-death studies using the ICD are also being conducted in other developing countries such as China, Tanzania and South Africa.^{11,12} In another investigation in Mumbai using the ICD, it was possible to study mortality attributable to the use of tobacco for furthering public health action.¹³

However, morbidity and mortality coding is yet to be implemented in a uniform manner throughout India. A 'National List of Diseases', based on the ICD-10, is being used in hospitals through the Medical Certification of Cause of Death (MCCD) system for mortality coding and for morbidity statistics in some hospitals.^{14,15} Few instances of effective use of hospital data using the ICD coding systems for auditing clinical care are available from India.¹⁶ In the private sector, the ICD-10 is used mainly for medical coding and billing work for insurance purposes, and also as outsourced work by firms for clients in developed countries.¹⁷

Where coding is done in hospital settings, the main problem seems to be inadequate training of practising physicians and coders. The importance of writing up the cause-of-death report is not adequately emphasized and taught to medical practitioners. Most physicians ascribe the cause of death to the mechanism of death (e.g. cardiorespiratory arrest) rather than the underlying cause of death. In other instances, faced with a situation of inadequate information in case records of patients, the physician writing the cause of death report tends to assign the death to the 'unclassifiable' category or to some miscellaneous codes. Poor maintenance of medical records also contributes to inaccurate assignment of the cause of death.¹⁸ However, this problem is not unique to India; it appears to be a problem in both developed and developing countries.¹⁹⁻²³ While the problem is almost universal, the fact that it can be minimized has been shown through simple educational interventions aimed at medical students and residents.^{19-21,23,24} In some instances, the obligation of statutory requirements may also be effective.²⁴

The Ministries of Health, Home Affairs and Information Technology of the Government of India have identified the ICD-10 as the most suitable coding system for India compared with other systems.^{4,25,26} The Directors of Health Services of all states/ Union Territories have been advised to adopt the ICD-10 classification system for coding morbidity and mortality records. The Central Bureau of Health Intelligence (CBHI), the national nodal institution for health statistics in the Ministry of Health and Family Welfare, Government of India, has introduced an 'Orientation training course on ICD-10' to build capacity among officials engaged in preparation, handling and maintenance of health data.⁴ More such training programmes are needed to improve knowledge and skills in the fields of disease classification,

coding and medical record-keeping and thereby improve the quality of health information generated by hospitals and surveys. Similar courses should be of benefit to health managers, hospital administrators, practising physicians and medical coders. For medical coders, additional inputs on medical terminology, anatomy and physiology would also be required. Results of coding activities should be fed back to clinicians and coders for continuous improvement in quality. Technical support in information technology is also required for successful implementation of the health information system.

In summary, recording and reporting systems need to be strengthened in India through human, financial and technological inputs for improved morbidity and mortality statistics, which are essential for evidence-based decision-making.

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Erratum

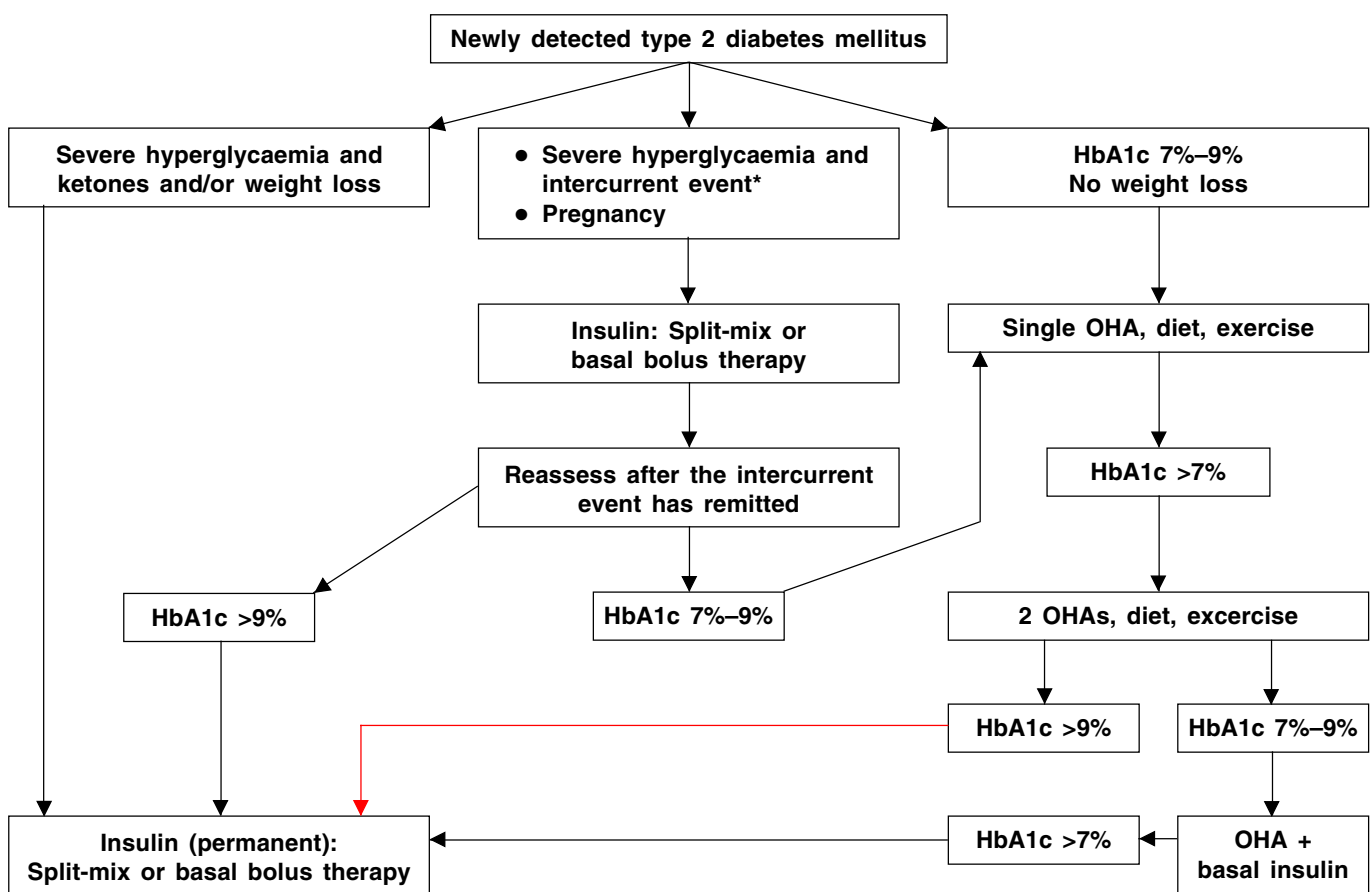


FIG 3. Flow chart for insulin use in patients with type 2 diabetes mellitus

*Intercurrent event: Infection, major surgery and stress; severe hyperglycaemia: HbA1c >10% and fasting blood sugar >300 mg/dl; when the HbA1c levels are <7% on a particular treatment, continue the same and monitor HbA1c levels once in 6 months. OHA oral hypoglycaemic agent

Figure 3 in the article ‘Insulin therapy for type 2 diabetes mellitus’ by Nisha R. S. and E. Bhatia, published in the September/October 2007 issue of the *Journal (Nat Med J India)* 2007;**20**:245–9, had an error. The arrow showing the option of going to insulin (permanent) on the right hand side, after failure of 2 OHAs (oral hypoglycaemic agents) was missing. The corrected figure above shows the arrow in red colour.

We regret the error.

—Editor