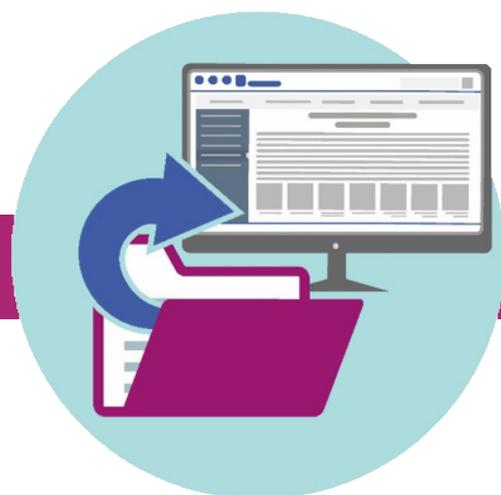# Health Information System Strengthening:
Standards and Best Practices for Data Sources

MODULE 1:

Individual Records

This module is one of 12 HIS data source modules in *Health Information System Strengthening: Standards and Best Practices for Data Sources.* The full series of modules (available at https://www.measureevaluation.org/resources/publications/tr-17-225) is intended to provide health authorities and other health information stakeholders with a reference guide that, along with other sources, can help align the HIS data sources with international standards and best practices.

Type of Data Generated:
Morbidity Diagnoses and Health Interventions

Description

Individual records contain sociodemographic and medically relevant information on healthcare clients. Clinicians use the information in records to manage patients' care and coordinate integrated services. Hospital administrators use summary indicators to monitor patient safety and quality of care. Policymakers track the incidence and prevalence of health conditions, and quantity of service consumption, to efficiently finance the health system.

The format of health records varies widely between countries and even between health facilities within a country. In general, service providers in many countries use paper-based records in the form of patient charts or registries, and many are also transitioning to electronic records. Electronic patient records have numerous advantages for accurately recording, efficiently storing and retrieving, and transferring information between healthcare providers.[3]

As electronic records evolve, there must be a joint effort between IT, clinicians, and coders so that information in patient health records and disease registries is transformed into useful data. The electronic environment should allow for clinicians to document patient diagnoses as accurately as possible, and coders to transform the diagnoses into unique codes. This synergy is only possible if all parties are working according to standards that provide terminology and definitions, a set of rules and instructions for their use, and common classification and coding mechanisms. These conditions alone allow for patient diagnoses and clinical procedures to be transcribed into a statistically analyzable format.

This module introduces standard classifications for generating comparable data on morbidity diagnoses and healthcare interventions. It focuses on information in individual records managed by hospitals or ambulatory providers, in the form of patient records or registries.

Types of Indicators

Morbidity diagnoses. The diagnosis or condition used for morbidity tabulation is the main one, defined as "the condition, diagnosed at the end of the episode of healthcare, primarily responsible for the patient's need for treatment or investigation" (WHO, 2011).

Table 2 shows selected patient morbidity indicators derived from individual records. Maternal, newborn, and communicable diseases are the leading causes of disease burden in many low-income countries, so these countries place an emphasis on monitoring prevalence and incidence indicators related to these mainly infectious conditions (World Health Organization [WHO], 2008).

Many countries also monitor, or are starting to monitor, chronic conditions as indicators of the quality of healthcare (Department of Health and Human Services, 2001; Organisation for Economic Co-operation and Development [OECD], 2015; WHO, 2016d). For example, monitoring the rates of asthma, diabetes, chronic obstructive pulmonary disease, and congestive heart failure cases admitted to the hospital, by the type of patient,[4] is an indicator of the efficiency of the health system because it measures hospital admissions that might be avoidable if adequate primary care interventions were available. These conditions are referred to as avoidable hospital admissions.

---

[3]   The OpenMRS, for example, is a free and open-source medical record system that can be adapted to customize patient records. It is used in countries worldwide and has an active community of experts that support its adaptation and implementation (OpenMRS, n.d.).

[4]   There are three types of patients: (1) inpatients admitted to the hospital and discharged alive, (2) outpatients accessing ambulatory care, and (3) day cases receiving the range of hospital services, without spending the night.

Table 2. Morbidity indicators derived from individual records

Global Reference List of Health Indicators [*]	Sustainable Development Goal Indicators [†]	OECD Health Care Quality Indicators [∞]
New cases of vaccine-preventable diseases	Number of new HIV infections per 1,000 (Indicator 3.3.1)	Avoidable hospital admissions (asthma, chronic obstructive pulmonary disease, congestive heart failure, diabetes)
New cases of International Health Regulations notifiable diseases and other notifiable diseases	Number of new and relapsed TB cases per 1,000 (Indicator 3.3.2)	Surgical complications (following hip or knee surgery, abdominal surgery, or foreign body left in during procedure)
HIV incidence rate	Malaria cases per 1,000 (Indicator 3.3.3)	Mental health disorders (suicide, schizophrenia, bipolar disorder)
HIV prevalence rate	Hepatitis B incidence (per 100,000) (Indicator 3.3.4)	Survival rates for cervical cancer, breast cancer, colorectal cancer
Hepatitis B surface antigen prevalence	Prevalence of neglected tropical diseases (per 100,000) (Indicator 3.3.5)	Obstetric trauma
Sexually transmitted infection incidence rate		
Tuberculosis (TB) incidence rate		
TB notification rate		
TB prevalence rate		
Malaria parasite prevalence among children ages 6–59 months		
Malaria incidence rate		
Cancer incidence, by type of cancer		

[*] WHO, 2015

[†] United Nations, 2016

[∞] OECD, 2015

Health interventions. A health intervention is an action performed for, with, or on behalf of a person or population whose purpose is to assess, improve, maintain, promote, or modify health, functioning, or health conditions (International Classification of Health Interventions [ICHI] Alpha, 2016).

Table 3 shows selected health intervention indicators derived from individual records. As with morbidity indicators, low-income countries place an emphasis on monitoring the coverage of health interventions for people with infectious diseases including HIV, tuberculosis, malaria, and selected tropical diseases (WHO, 2015).

Many countries also monitor some or all of the 30 common hospital interventions defined by the Hospital Data Project (OECD/Eurostat/WHO-Europe, 2013).[5] Although international comparisons of these interventions are complicated by the use of different classification systems across countries,[6] countries with a national intervention classification can make valid subnational comparisons with their local codes (Hospital Data Project, 2003).

---

[5] These interventions include, among others, cataract surgery, tonsillectomy, Caesarean section, coronary angioplasty, coronary bypass, appendectomy, hysterectomy, kidney transplant, and knee and hip replacement.

[6] An international procedure list is not yet available, and several countries have adopted the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) developed by the United States. Other countries use a variety of national procedure coding classifications and map their local codes to the ICD-9-CM sentinel list (comprising 18 codes). The ICD-9-CM was the U.S.-developed standardized list of codes for diagnoses and procedures. In 2015, the United States transitioned to a new classification based on an International Classification of Diseases, Tenth Revision (ICD-10) adaptation (ICD-10-CM) for diagnoses and ICD-10 Procedure Coding System (ICD-10-PCS) for procedural codes.

Table 3. Health intervention indicators derived from individual records

Global Reference List of Health Indicators[*]	Sustainable Development Goal Health Intervention-Related Targets[†]	OECD Health Care Quality Indicators[∞]
	Treatment for mental health and well-being (Target 3.4)	Medical technology (magnetic resonance imaging exams, computed tomography exams)
Prevention of mother-to-child transmission	Universal access to sexual and reproductive healthcare services (Target 3.7)	Coronary procedures
HIV care coverage	Access to quality essential healthcare services (Target 3.8)	Hip and knee replacements
Antiretroviral therapy (ART) coverage	Tobacco control (Target 3.a)	Caesarean sections
HIV viral load suppression	Ending malnutrition (Target 2.2)	Ambulatory surgery (cataracts, tonsillectomy)
Tuberculosis preventive therapy for HIV-positive people newly enrolled in HIV care		
HIV test results for registered new and relapse TB patients		
HIV-positive new and relapse TB patients on ART during TB treatment		
Treatment of confirmed malaria cases		
Coverage of preventive chemotherapy for selected neglected tropical diseases		
Coverage of services for severe mental health disorders		
Immunization coverage rate by vaccine for each vaccine in the national schedule		
Percentage of people living with HIV who have been diagnosed		
Intermittent preventive therapy for malaria during pregnancy		

[*] WHO, 2015 add indicators from WHS

[†] United Nations, 2016

[∞] OECD, 2015

Standards

Standards are designed to provide comparable data not just on priority diseases and services, but also evidence of emerging conditions and the use of new technologies. As populations move through an epidemiological transition—shifting from mainly maternal, newborn, and communicable diseases to chronic conditions—decision makers need data on the breadth of conditions and treatments being sought. The WHO developed the Family of International Health Classifications for this purpose.

The WHO Family of International Health Classifications (WHO-FIC) facilitates the coding of primary data in individual records to enable a comprehensive and comparable analysis of morbidity diagnoses and health service delivery. It does so by developing and maintaining three standard classifications that take into account the range of possible health conditions, health interventions, and areas of bodily functioning and disability.

> ### WHO-FIC reference classifications
>
> As the coordinating authority on international health work, the WHO establishes international reference classifications on health that are endorsed by member states. The WHO-FIC coordinates three main health-related classifications (WHO, 2016a):
>
> - International Classification of Diseases (adopted by the World Health Assembly in 1967)
>
> - International Classification of Functioning, Disability and Health (adopted by the World Health Assembly in 2001)
>
> - International Classification of Health Interventions (adopted as a WHO project in 2012)

Two of these classifications, the International Classification of Diseases (ICD) and the ICHI, are most relevant to monitoring health system performance and population health status.[7]

Standards for Morbidity Diagnoses

The ICD is the global standard for mortality and morbidity. It provides an international classification and corresponding coding system for all possible diagnoses. International Classification of Diseases, Tenth Revision (ICD-10) is the current version that has been in effect since 1990.[8] The ICD-10 conditions are grouped in a way that is conducive to monitoring epidemiology trends in the population. To initiate coding using ICD, the clinician records an accurate medical diagnosis of the patient's conditions. Then, a records clerk or other designated person systematically codes the information according to the ICD list of morbidity conditions.

Healthcare clients may present multiple health problems. The condition used for morbidity tabulation is the *main* condition (WHO, 2011). If there is more than one such condition, then the one considered responsible for the greatest use of resources should be selected. If no diagnosis was made, then the main symptom, abnormal finding, or problem should be selected as the main condition.

---

[7]   The other classification, International Classification of Functioning, Disability, and Health (ICF), was endorsed by the WHO member states in 2001. This classification is used in clinical settings to assess the functioning and disability of an individual on a small scale, and the process of implementing it in national legislation and health and social reporting systems is being piloted in rehabilitation, home care, and disability evaluation activities in several countries.

[8]   ICD-11 will be adopted by the World Health Assembly in 2018, but countries should proceed with implementing ICD-10 because it will likely take many years for the first countries to implement ICD-11.

ICD-10 Tabulation Lists for Morbidity

ICD-10 has approximately 70,000 diagnosis codes. In an effort to simplify tabulations and comparisons of diagnostic groups, the ICD-10 Volume 1 provides a special tabulation list for morbidity diagnoses that consists of a greatly reduced set of 298 principal diagnosis groups defined by their ICD-10 codes (WHO, 2016b). If this number of diagnoses is still too large for a country's needs or capacity, then the International Shortlist for Hospital Morbidity Tabulation (ISHMT), which is a shorter list consisting of 130 diagnostic groups defined by ICD-10 codes, may be most appropriate. The International Shortlist for Hospital Morbidity Tabulation was adopted by the OECD, Eurostat, the Nordic Medico-Statistical Committee, and the WHO in 2005 (WHO, 2016c).

ICD-10 Adaptations for Morbidity

The WHO has approved several official ICD adaptations that permit more detailed classifications of cancers, external causes of death, primary care, and mental and behavioral disorders (WHO, 2016a). These adapted classifications, which provide more detail than the corresponding ICD chapters,[9] are useful for maintaining specific disease registries. Disease registries contain detailed data on individuals with specific diagnoses and are useful in tracking patients' clinical care and outcomes. They are often established for research purposes and may not be maintained on a national level.

Standards for Health Interventions

Data on patient services provide powerful indicators of the efficiency of the healthcare system when used in association with data on diagnoses. The services recorded in the patient record or disease registry constitute the primary data that can be classified as unique and quantifiable interventions reflecting the quantity and type of healthcare consumed.

No such international classification exists yet, though the WHO has been working toward a classification of interventions and procedures since the 1970s. In 1978, the WHO produced the first International Classification of Procedures in Medicine to be used for trials. Additional international work to adapt and expand the classification was postponed, beginning in 1989, during two decades of rapid new developments in procedures. In 2012, the WHO approved the ICHI Development Project. The ICHI can be adopted by countries that do not have national intervention classification, or it can be used to map local classifications to a common intervention classification.

International Classification of Health Interventions

The WHO ICHI Development Project leads the development of one of the three classifications in the WHO-FIC. The ICHI takes into account all types of health services, including acute, primary care, rehabilitation, assistance with functioning, prevention, public health, and ancillary services by all types of providers. The only area not included is traditional medicine interventions. The ICHI is designed so that additional country adaptation is not necessary, but adding more detail is possible.

The ICHI is available as an Alpha (2016) application and is expected to be adopted by the World Health Assembly WHA in 2019. Countries are encouraged to install the ICHI Alpha application on computers, especially in hospital settings, and to assess its usability through the current procedures for recording interventions.

In countries where the full classification of health interventions is not feasible, health authorities may choose to monitor selected indicators of interventions that are meaningful in the national context. A meaningful indicator for all countries, for example, is caesarean section, because very high or very low proportions of these deliveries are associated with increased maternal mortality, maternal and infant morbidity, and complications for subsequent deliveries.

---

[9]   ICD-10 has 21 chapters. Chapter 2 corresponds to neoplasms (cancers), Chapter 5 corresponds to mental, behavioral and neurodevelopmental disorders, and Chapters 21 and 22 correspond to external causes of morbidity and mortality.

Diagnosis and Procedural Classifications

Several countries with a more evolved HIS have developed country-specific modifications of the ICD-10 that includes both diagnostic and clinical procedure codes (Table 4). The WHO, which owns the ICD copyright, limits the modifications it approves, in order to prevent changes in the meaning of the categories and thereby retain a level of comparison between groups of conditions. The motivation for a country to develop its own ICD modification is to combine diagnostic information with information on health interventions—a casemix system— as the basis for a nationally tailored reimbursement system. The U.S. ICD-9-CM classification was adopted and adapted by several European countries for coding diagnoses and/or procedures: Belgium, Ireland, Italy, Netherlands, Portugal, and Spain (Hospital Data Project, 2003).

Table 4. Examples of national ICD-10 modifications

Country	Diagnoses	Procedures
Australia	ICD-10-AM	Australian Classification of Health Interventions
Canada	ICD-10-CA	Canadian Classification of Health Interventions
France	Not available	Classification Commune des Actes Médicaux
Germany	German version	Not available
Nordic countries	Nordic version	The Nordic Medico-Statistical Committee: Classification of Surgical Procedures
United Kingdom	Not available	Office of Population Censuses and Surveys (OPCS) Classification of Interventions and Procedures (OPCS-4)
United States	ICD-10-CM (previously ICD-9-CM, Volumes 1 and 2)	ICD-10-PCS (previously ICD-9-CM, Vol 3)
WHO-FIC Reference Classification	ICD	Classification of Procedures in Medicine) (never updated) ICHI forecasted to have WHA approval in 2019 (developed from the Australian Classification of Health Interventions)

These diagnostic and procedural classifications allow for a second grouping of a patients' conditions and the health services delivered to the patient, which is the basis for grouping patient episodes into a clinically relevant, resource-homogenous, casemix reimbursement system, such as the diagnosis-related group. The ICHI provides the basis for countries to develop a clinical classification for their own casemix requirements, rather than starting from scratch or having to adapt another country's system.

Health Information System Strengthening: Standards and Best Practices for Data Sources

Best Practices

- **Facilities maintain individual patient records** that include the patient's main diagnosis and the primary intervention received.

- A **transition to electronic medical records and disease registries** is underway or planned to facilitate recording and coding of the main diagnosis and primary medical health intervention for all healthcare clients.

- The **main diagnosis** of each hospital patient (inpatients and admitted day patients) is tabulated according to the ICD-10 special tabulation list for morbidity or the ISHMT or can be mapped to those tabulations.

- The **primary medical procedure** recorded on each individual record can be uniquely classified according to a **national classification of intervention procedures.**

- The country has in place or is exploring possibilities for developing a **casemix system** based on a patient's main condition and the primary intervention received.

Casemix classification system: diagnosis-related group (DRG)

The DRG system is the best-known casemix classification system for reimbursing healthcare services. For an inpatient episode, the diagnosis and mix of interventions provided to the patient during the admission period are classified into a DRG category that determines a predefined amount for hospital reimbursement.

The DRG mechanism was first introduced in the United States in the early 1980s to contain costs and increase efficiency. In the following decade, most high-income countries had implemented similar payment systems, each with specifically defined casemix groups (Busse, Geissler, Quentin, & Wiley, 2011). By the end of 2012, a dozen countries in Eastern Europe and the former Soviet Union had established a system, and 17 others, including Ghana and the Philippines that represent lower-middle-income countries, are also exploring or piloting DRG as a provider payment system (Mathauer & Wittenbecher, 2013).

References: Module 1

Busse, R., Geissler, A., Quentin, W., & Wiley, M. (2011). *Diagnosis-related groups in Europe: Moving towards transparency, efficiency and quality in hospitals.* European Observatory on Health Systems. Berkshire, England: Open University Press. Retrieved from http://www.euro.who.int/__data/assets/pdf_file/0004/162265/e96538.pdf

Department of Health and Human Services. (2001). *Guide to prevention quality indicators: Hospital admission for ambulatory care sensitive conditions.* Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from http://www.ahrq.gov/downloads/pub/ahrqqi/pqiguide.pdf

International Classification of Health Interventions Alpha. (2016). *International classification of health interventions Alpha 2016.* Retrieved from https://mitel.dimi.uniud.it/ichi/#

Hospital Data Project. 2013. *Surgical procedures (shortlist): Mapping with ICD-9-CM, Table 1. Common surgical procedures.* Version 2007-07-22, November 2013 update. Retrieved from http://stats.oecd.org/HEALTH_QUESTIONNAIRE/Surgical%20procedures/JQNMHC_MAPPING%20ICD-9-CM.pdf

Hospital Data Project. 2003. *Hospital Data Project final report.* Retrieved from https://ec.europa.eu/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_09_en.pdf

Mathauer I., & Wittenbecher, F. (2013). Hospital payment systems based on diagnosis-related groups: Experiences in low- and middle-income countries. *Bulletin of the World Health Organization, 91,* 746–756A. Retrieved from http://www.who.int/bulletin/volumes/91/10/12-115931/en/

OECD/Eurostat/WHO-Europe Joint Data Collection on Non-Monetary Health Care Statistics. 2013. Surgical procedures (shortlist): Mapping with ICD-9-CM. Version 2007-07-22 (including minor updates in November 2013). http://stats.oecd.org/HEALTH_QUESTIONNAIRE/Surgical%20procedures/JQNMHC_MAPPING%20ICD-9-CM.pdf

Organisation for Economic Co-operation and Development (OECD). (2015). *Health at a glance 2015. OECD indicators.* Paris: OECD Publishing. Retrieved from http://www.oecd-ilibrary.org/social-issues-migration-health/health-at-a-glance-2015_health_glance-2015-en

OpenMRS. (n.d.). OpenMRS website. Retrieved from http://openmrs.org/

Rusnak, J. (1987). *Case mix management systems: An opportunity to integrate medical records and financial management system data bases.* Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2245163/pdf/procascamc00019-0685.pdf

United Nations Economic and Social Council. (2016). *Report of the inter-agency and expert group on sustainable development goal indicators.* Statistical Commission Forty-seventh session, March 8–11, 2016. Retrieved from https://unstats.un.org/unsd/statcom/47th-session/documents/2016-2-IAEG-SDGs-Rev1-E.pdf

World Health Organization (WHO). (2008). *The global burden of disease: 2004 update.* Geneva, Switzerland: WHO. Retrieved from http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf?ua=1

World Health Organization (WHO). (2011). *International statistical classification of diseases and related health problems.* 10th Revision. Volume 2, Instruction manual. 2010 edition. Geneva, Switzerland: WHO. Retrieved from http://www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf?ua=1

World Health Organization (WHO). (2013). *How to use ICF: A practical manual for using the International Classification of Functioning, Disability and Health (ICF).* Exposure draft for comment. Geneva, Switzerland: WHO. Retrieved from http://www.who.int/classifications/drafticfpracticalmanual.pdf

World Health Organization (WHO). (2015). *Global reference list of 100 core health indicators.* Geneva, Switzerland: WHO. Retrieved from http://apps.who.int/iris/bitstream/10665/173589/1/WHO_HIS_HSI_2015.3_eng.pdf?ua=1

World Health Organization. (2016a). Family of international classifications. Retrieved from http://www.who.int/classifications/en/

World Health Organization (WHO). (2016b). *International statistical classification of diseases and related health problems.* 10th Revision. Volume 1, Tabular List. Fifth edition. Geneva, Switzerland: WHO. Retrieved from http://apps.who.int/iris/bitstream/10665/246208/1/9789241549165-V1-eng.pdf

World Health Organization. (2016c). International shortlist for hospital morbidity tabulation. Retrieved from http://www.who.int/classifications/icd/implementation/morbidity/ishmt/en/

World Health Organization. (2016d). *Assessing health services delivery performance with hospitalizations for ambulatory care sensitive conditions.* Copenhagen, Denmark: World Health Organization Regional Office for Europe. Retrieved from http://www.euro.who.int/data/assets/pdf_file/0010/305875/Assessing-HSD-performance-with-ACSH.pdf