

Clinical Significance of Medical Imaging Modalities in Different Health Care Levels

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**World Health
Organization**

WHA 60.29 Health Technologies Resolution

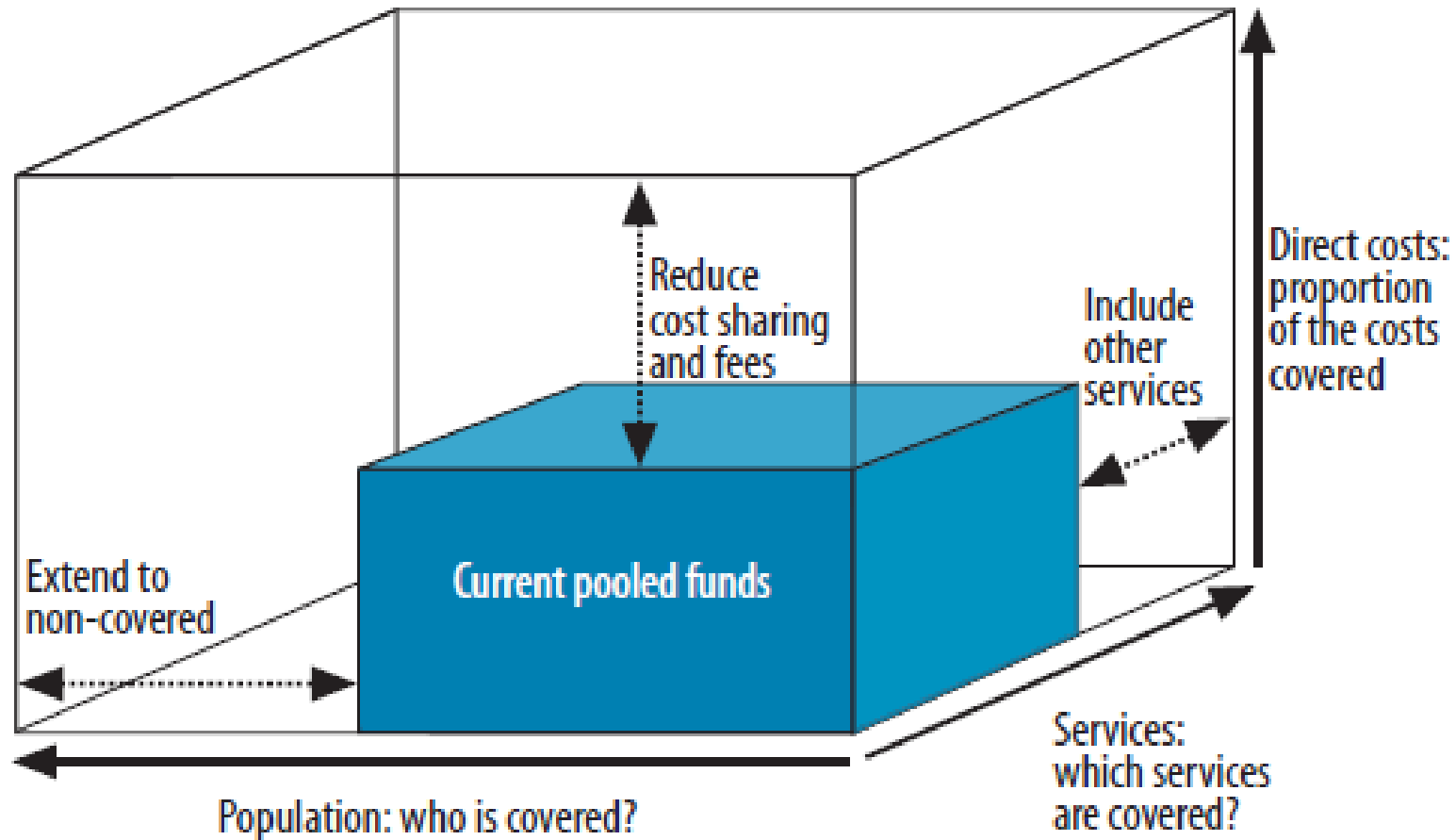
Request the Director General to:

- Work in the development of guidelines, tools, norms and standards and glossary of definitions of medical devices.
- Assess national needs for health technologies and assure their availability and use.
- Develop methodological tools to analyse their needs for medical devices.
- To provide technical guidance to implement policies on health technologies.
- To work with other UN organizations to provide support for prioritization, selection and use of health technologies.
- To establish a web based health technologies database.
- To support provision of appropriate health technologies for primary health care.

Use Health Technology to Strengthen Health Systems



Three Dimensions to Consider When Moving Towards Universal Coverage



Health systems financing: the path to universal coverage. Executive Summary,
The World Health Report, WHO/IER/WHR/10.1, 2010

Levels of Health Care

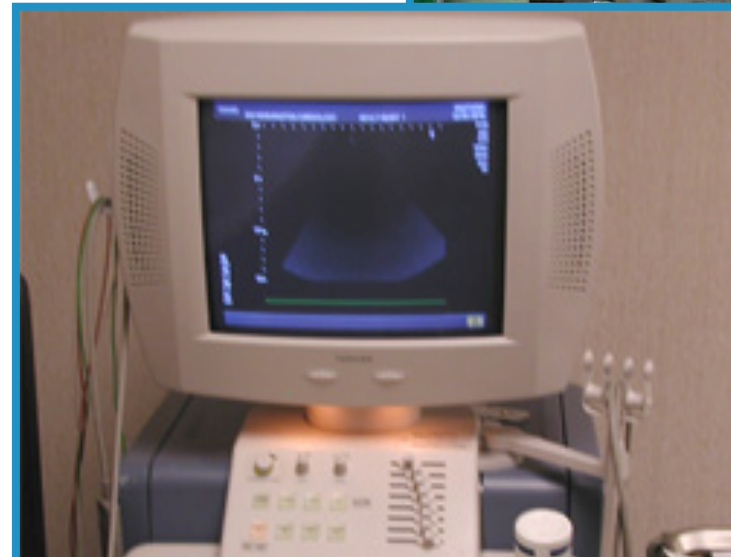
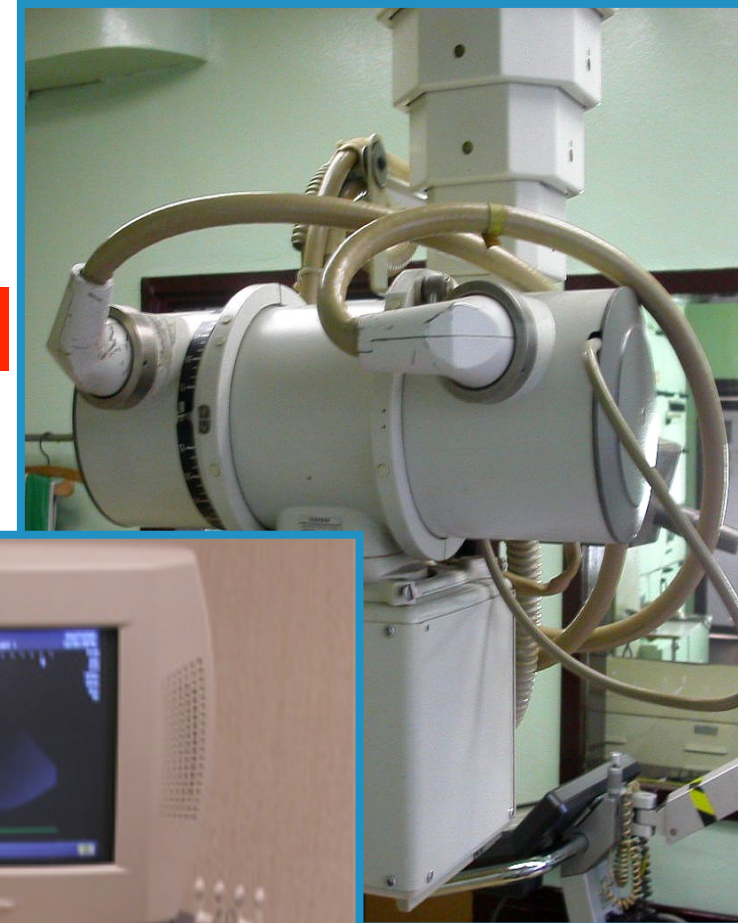
Primary Health Care – Level I

Basic level of health care includes promotion of health, early diagnosis of disease or disability, and prevention of disease.

Majority of patients can be

Primary health care should be “based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development.”

International Conference on Primary Health Care, Alma Ata Declaration, 1978



Levels of Health Care

Secondary Health Care – Level II

- ✓ Intermediate level of health care that includes diagnosis and treatment, performed in a hospital having specialized equipment and laboratory facilities.
- ✓ Local or regional hospital.
- ✓ Radiological and laboratory facilities provided by hospitals are available directly to the family doctor, thus improving and increasing range of his service.



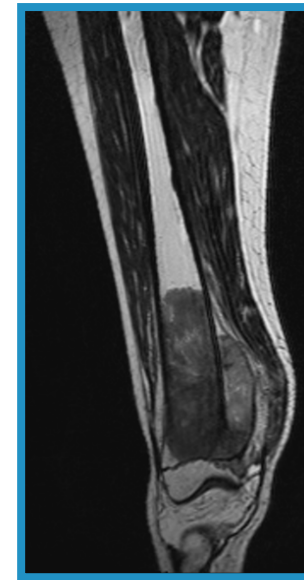
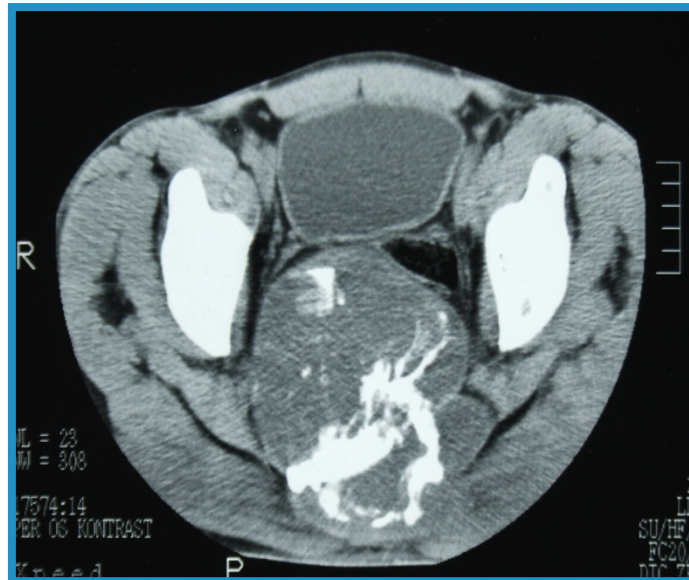
Levels of Health Care

Tertiary Health Care – Level III

- ✓ Specialized, highly technical level of health care
- ✓ Specialized intensive care units, advanced diagnostic support services, and highly specialized personnel
- ✓ Highly centralized care to the population of a large region

Cost of treatment at the various levels is a matter of particular importance in developing countries

Cost of treatment at the primary health-care level is usually only a small fraction of that at the third level



Primary Health Care

Primary Health Care – Level I

Basic Radiological System (BRS)

Serving a small rural (or suburban) hospital or health centre

Effective choices for diagnostic imaging in clinical practice
Report of a WHO Scientific Group
World Health Organization
Technical Report Series 795

Future Use of new imaging technologies in developing countries
Report of a WHO Scientific Group
Technical Report Series, 723

BRS - 1980 WHO

X-RAY UNIT - SPECIFICATIONS FOR EQUIPMENT

Battery powered generators
Manual for radiographers and darkroom techniques
Radiographic interpretations

ULTRASOUND UNIT

General Purpose Ultrasound Unit
Manual of Ultrasound



Health Care Levels

Secondary Health Care – Level II

Equipment

ALL LEVEL I TECHNIQUE AND:

Sophisticated radiography
Sophisticated ultrasonography
including Doppler
Mammography
Angiography
Digital subtraction angiography (DSA)
and macro-radiography
Computed tomography (CT)
Radionuclide scintigraphy, including
single photon emission computerized
tomography (SPECT)
Thermography (of limited use)

General Purpose Radiological System

In secondary care hospital with 100 – 500 beds and a
number of medical specialists (surgery, medicine,
obstetrics, gynaecology, paediatrics)

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Health Care Levels

Tertiary Health Care – Level III

Equipment

ALL LEVEL II AND III TECHNIQUES AND:

Magnetic resonance imaging (MRI)
Positron emission tomography (PET)
Advanced radionuclide scanning:
labelling by means of monoclonal
antibodies (immunoscintigraphy)

Specialized Radiological System

**Tertiary care hospital - usually the top-level referral
hospital, often a university hospital)**

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Characteristics of BRS

Two thirds of the population in developing countries live in rural areas
Most frequent conditions
Trauma (limb, chest)
Chest disease
Acute abdominal pain

Simplicity
Flexibility
Solid and robust construction
Efficiency
Effectiveness
Economy
Overall capabilities
Radiation dose



Yemen, Sana's General Hospital

Core Conditions Utilizing X-Ray in Resource-Poor Settings

Type	Condition	Intervention	Skill Level	Necessity
Chest	Pneumonia	Medical management	Basic	High
	Tuberculosis	Medical management	Basic	High
	Pneumothorax	Chest tube placement	Advanced	High
	Pleural effusion	Thoracentesis	Advanced	High
	Cardiac failure	Medical management	Advanced	Moderate
	Hemothorax	Thoracentesis	Advanced	High
	Chronic obstructive pulmonary disease	Medical management	Basic	Moderate
	Asthma	Medical management	Basic	Moderate
	Lung abscess	Medical management	Advanced	High
	Occupational lung diseases	Medical management	Basic	Moderate
Limb	Long bone fracture	Reduction and fixation	Advanced	High
	Small bone fracture	Reduction and fixation	Advanced	High
	Osteomyelitis	Medical and surgical management	Basic	Moderate
	Dietary deficiency diseases (scurvy, rickets)	Nutrient supplementation	Basic	Moderate



THE SIMAVI/BRS PROJECT
A SUCCESSFUL WHO APPROACH

Maru DSR, et al. Globalization and Health 2010;6:18.

Core Conditions Utilizing Ultrasound in Resource-Poor Settings

Type	Condition	Intervention	Skill Level	Necessity
Abdominal	Cephalopelvic disproportion	Cesarean section	Advanced	Moderate
	Ectopic pregnancy	Surgical management	Advanced	Moderate
	Retained products of conception	Dilation and Curettage	Advanced	High
	Abruptio placentae	Medical and surgical management	Advanced	High
	Peripartum hemorrhage	Medical management	Basic	Moderate
	Cholecystitis	Medical and surgical management	Advanced	High
	Tuberculosis (intra-abdominal)	Medical management	Basic	High
	Hydronephrosis	Medical and surgical management	Basic	High
	Abdominal trauma	Medical and surgical management	Advanced	High
	Abdominal masses	Medical and surgical management	Basic	High
Chest	Pleural effusion	Thoracentesis	Advanced	High
	Pneumothorax	Chest tube	Advanced	Moderate
	Hemothorax	Thoracentesis	Advanced	High
Cardiovascular	Deep vein thrombosis	Anticoagulation	Basic	High
	Cardiac failure	Medical management	Basic	Moderate
	Cardiac valve disease	Medical and surgical management	Advanced	High
	Pericardial effusion	Medical management and pericardiocentesis	Advanced	High
Orthopedic	Spine, skull trauma	Surgical management	Advanced	Moderate
	Pediatric Osteomyelitis	Medical management	Basic	Moderate
	Rib, pelvis trauma	Surgical management	Advanced	Moderate
Neurological	Neonatal hemorrhage	Medical management	Advanced	High
	Neonatal infection	Medical management	Advanced	Moderate
Procedural	Intravenous Access	Procedural guidance	Basic	Moderate
	Abscess	Procedural guidance	Basic	Moderate
	Arthrocentesis	Procedural guidance	Basic	Moderate
	Paracentesis	Procedural guidance	Advanced	High
	Thoracentesis	Procedural guidance	Advanced	High
	Pericardiocentesis	Procedural guidance	Advanced	High
	Foreign Body	Procedural guidance	Basic	Moderate
	Lumbar Puncture	Procedural guidance	Basic	Moderate

Maru DSR, et al. Globalization and Health 2010;6:18.



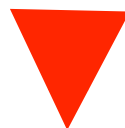
Radiology Service in Low-resource Setting

Special Needs of Equipment



- Robust in harsh environments
- Functions reliably in areas without reliable electricity
- Minimize radiation dangers to staff and patients
- Operable by non-specialists
- Product high-quality images that are at least minimum necessary for diagnosis

Current Problems



- Transportation
- Maintenance
- Procurement consumables for image processing
- Regular quality control and monitoring
- More research needs to be done on the use of these modalities in rural, resource-poor settings (obstetrics)
- Prefer digital processing
- Frequent and high staff turnover



Maru DSR, et al. Globalization and Health 2010;6:18.

Main Indications for Computed Tomography and Magnetic Resonance Imaging

Computed Tomography



Brain Study
Total Body
Not obstetrics
Special Programs
 Dynamic scanning
 Gated cardiac computed tomography

Magnetic Resonance Imaging

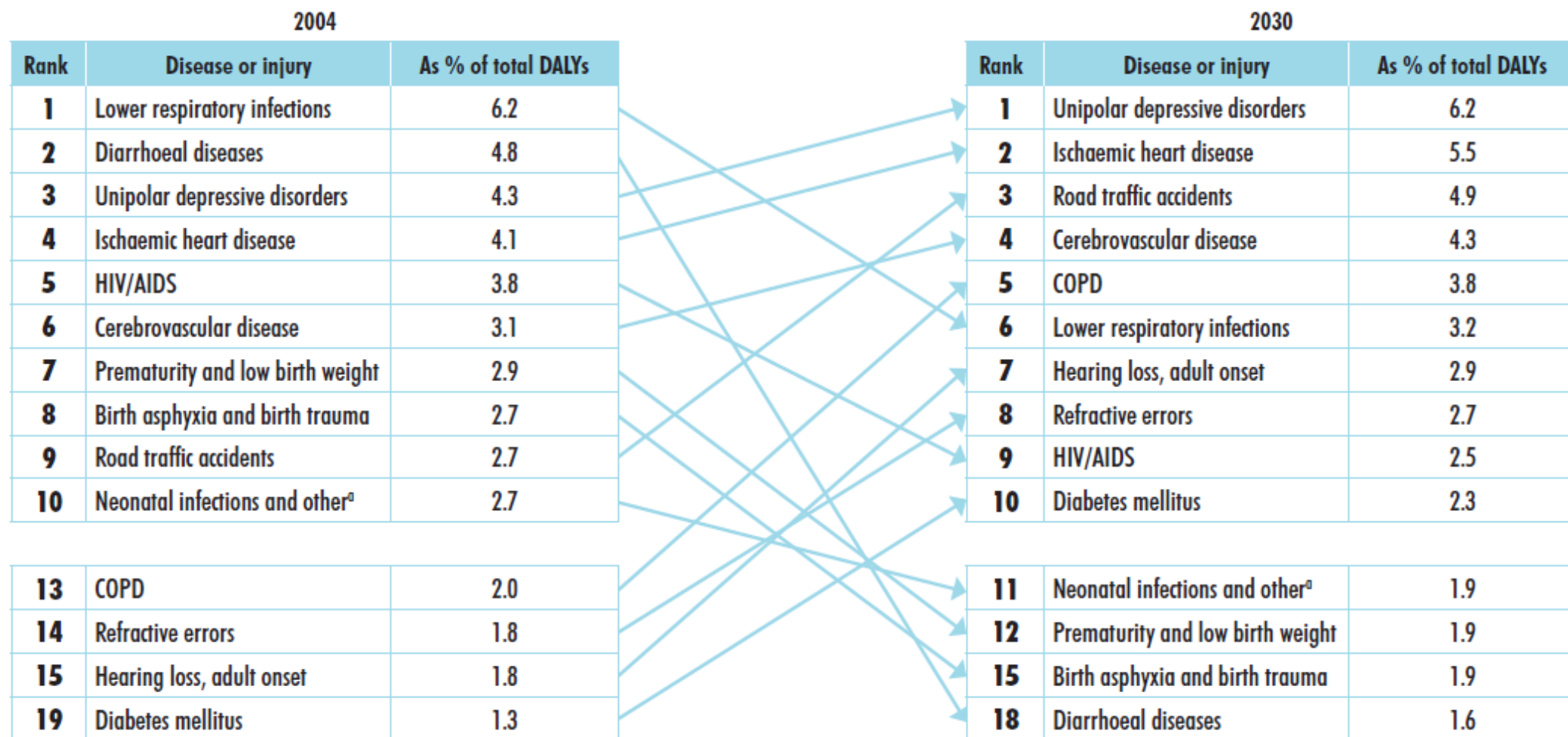
Brain Study
Total Body
Special Programs
 Dynamic scanning
 Functional scanning
 Diffusion weighed imaging

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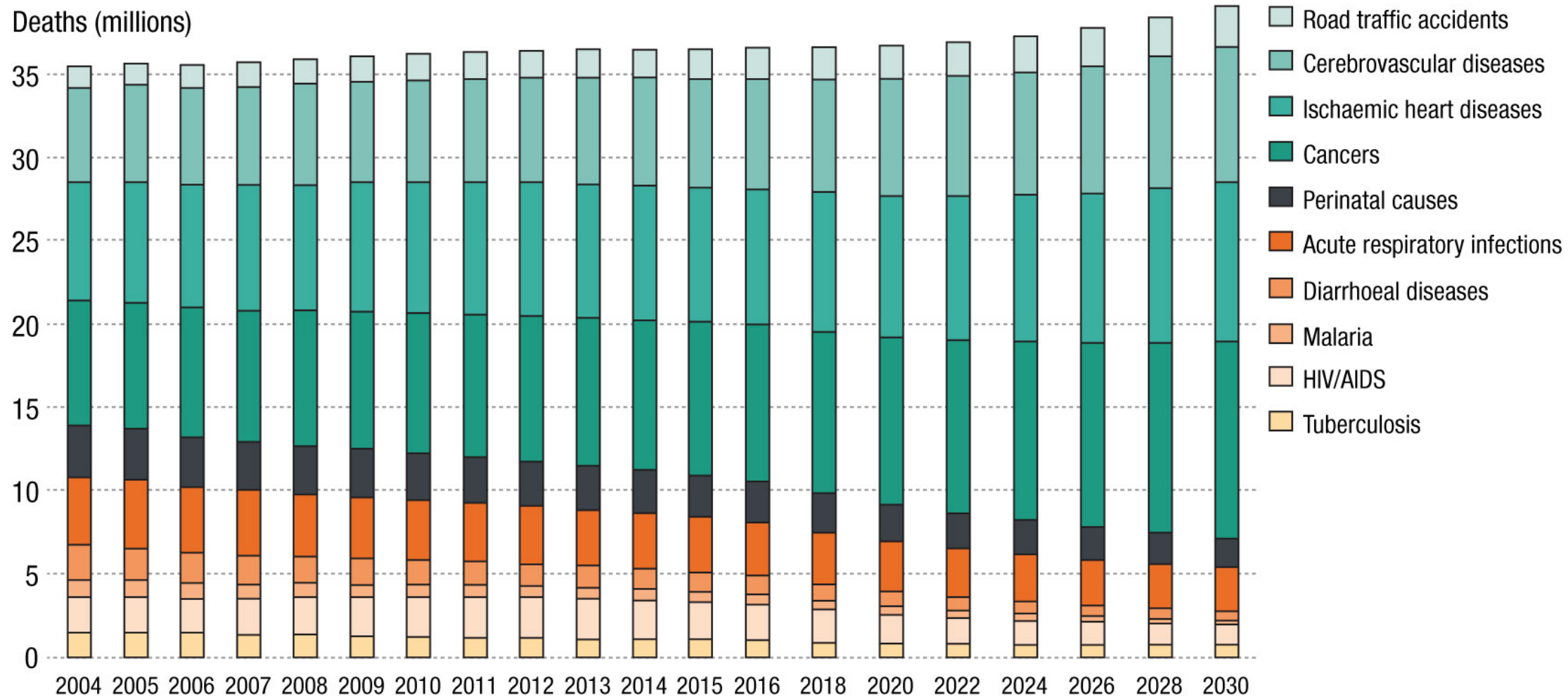
Leading Causes of Burden of Disease - World

Majority Could be Prevented and Diagnosed at the Level I



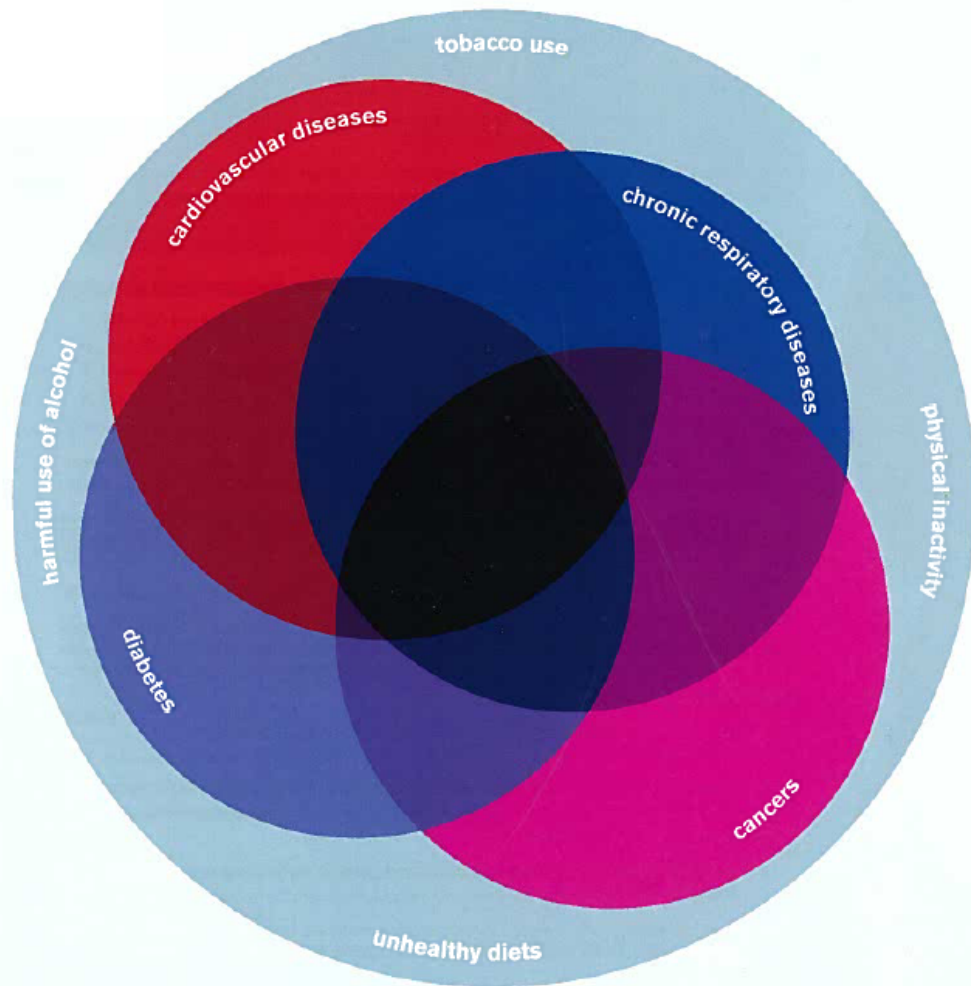
Medical Devices: Managing the Mismatch
WHO/HSS/EHT/DIM/10.8, 2010

Epidemiological Changes



2008 – 2013 Action Plan

Global Strategy for the Prevention and Control of Noncommunicable Diseases

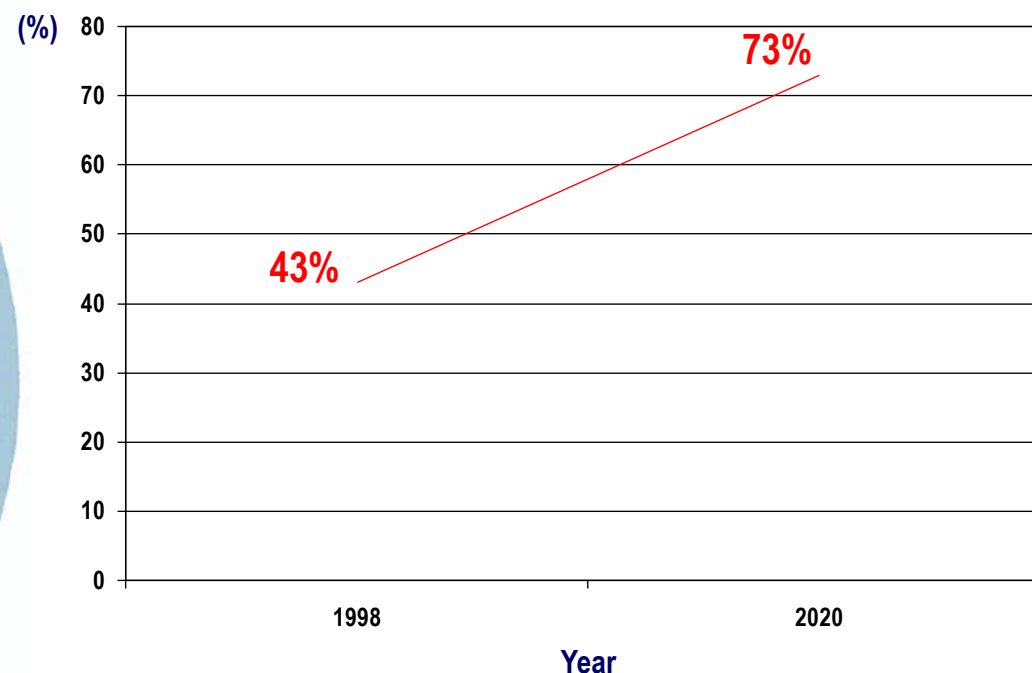
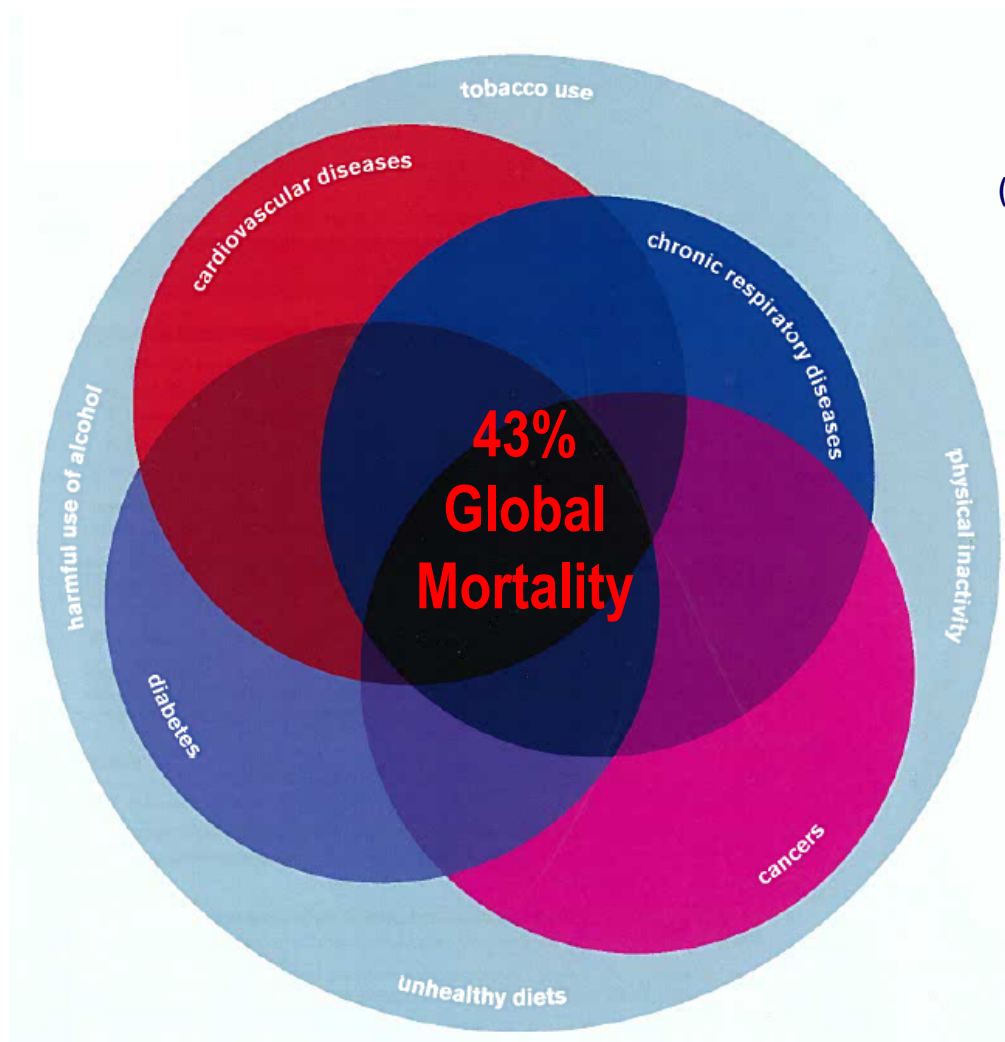


Diseases That are Largely Preventable

	Tobacco Use	Unhealthy Diets	Harmful Use of Alcohol	Physical Inactivity
CVD	✓	✓	✓	✓
CRD	✓	✓	✓	✓
Cancers	✓	✓	✓	✓
Diabetes	✓			

CVD - Cardiovascular Diseases
CRD – Chronic Respiratory Diseases

Frequency of Noncommunicable Diseases



Assessment of National Capacity For Noncommunicable Disease Prevention and Control, WHO/MNC/01.2

Conclusions

- Primary health care centers can meet over 90% of the imaging needs of the population
- Increasing need at the primary health care centers to prevent noncommunicable diseases
- Define strategy to improve access, quality and use of radiological equipment at different health care levels
- Careful planning is necessary when considering radiological equipment

Capacity

Education of the staff

Maintenance costs of this equipment

Trained service engineers



e-Documentation Centre

- Searchable database of WHO documentation on medical devices and health technologies
- Available on www.who.int/medical_devices
- More than 300 documents currently available in 15 languages



www.who.int/medical_devices

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