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MINISTRY OF HEALTH·ETHIOPIA

NATIONAL SPECIALTY AND SUB-SPECIALTY SERVICE ROAD MAP

. 2020 – 2029 G.C.

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PREFACE

Every decade since the 1940s, health policymakers, professionals, and providers have launched new global and national initiatives to address the health challenges and needs of populations, particularly those living in sub-Saharan Africa. However, few reforms have been successful. Recent debates have emphasized how to make progress in strengthening the health systems, achieving universal health coverage, and making progress towards meeting the Sustainable Development Goals.[1]

Remarkable gains have been made in health in the past few decades, but progress has not been consistent. Mortality and morbidity from common conditions needing specialty care services have grown in the world's poorest regions and incidence of cancer, road traffic injuries, and cardiovascular and metabolic diseases will continue to rise substantially.

However, in countries like Ethiopia, policies related to primary care and communicable diseases still drive many discussions with little attention to specialized care. While it remains essential in many sub-Saharan African countries to continue advocacy for non-communicable diseases, it is now a crucial time to invest in specialty and subspecialty care.

To begin to tackle these gaps in health services, the Ministry of Health (MOH) of Ethiopia has engaged in different initiatives including maternal and child health service reform, HIV and TB services reform, hospital reform implementation, and others to address the needs of the population in-hospital services throughout the country.

Despite these initiatives, there is still dissatisfaction amongst the public resulting from inadequate access to specialty/subspecialty care services, inadequate clinical care standards affecting the quality of health services, shortage of healthcare professionals in specialty and subspecialty services, weak hospital management capacity resulting in inefficient management of scarce resources, a fragmented health care system with weak referral services and limited financial support to ensure optimal coverage of services.

As a result, the Ministry decided to put forward a roadmap that will be used as a guiding document to expand and strengthen specialty/subspecialty services in the country and focuses on a strong, sequential referral system to the tertiary level.

FOREWORD

Ethiopia has implemented four phases of health sector development plans from 1997-2015 G.C. During this period, remarkable achievements in improving access to health services and health outcome improvements have been recorded. The first phase of the Health Sector Transformation Plan (HSTP) in line with the national Growth and Transformation plan (GTP-2) is being implemented to ensure the highest possible level of health and quality of life for all citizens through the provision of promotive, preventive, curative and rehabilitative health services of the highest possible quality in an equitable manner. To support the realization of such ambitious HSTP goals, a roadmap for specialty and subspecialty service with the aim of expansion of and improved quality of health service delivery is critically important and timely.

I believe that Ethiopia can do more to enhance hospital services to achieve universal health coverage. The next phase of the health sector transformation plan—HSTP-2—includes transforming hospital services as one of the pillar transformation agendas. The national specialty and subspecialty service roadmap will ultimately pave the way to realize the HSTP pillars addressing access to and quality of health services with appropriate investment for excellence in hospital services.

The national specialty and subspecialty service roadmap was prepared considering the alignment of investment for human resources, infrastructure, and pharmaceutical supplies and medical devices for the coming ten years. Prioritization criteria of specialty and subspecialty services include the burden of diseases, the impact of interventions in people's health, cost-effectiveness, and sustainability of the interventions in time.

Successful implementation of the specialty and subspecialty roadmap needs not only integration within different building blocks of the health system but also demands integration across different sectors. With the unwavering commitment of our government, enthusiastic service by health workers, community engagement, and entrusted support of our development partners, I do not doubt that we will prevail in succeeding to meet the targets set out in the national specialty and subspecialty service roadmap.

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ACRONYMS AND ABBREVIATIONS

AKI	Acute kidney injury
CKD	Chronic kidney injury
CHD	Congestive heart disease
CPAP	Continuous positive airway pressure
CSD	Clinical Services Directorate
Dx	Diagnosis
EEG	Electroencephalography
EHSP	Essential health service package
EMG	Electromyography
EPSA	Ethiopian Pharmaceutical Supply Agency
ERCP	Endoscopic retrograde choleangiocreatography
FFR	Fractional flow reserve
GBD	Global Burden of Disease
HMIS	Health management information system
HR	Human resources
HSTP	Health Sector Transformation Plan
ICU	Intensive care unit
IPLS	Integrated pharmaceutical and logistics supply
IVF	In vitro fertilization
IVUS	Intravascular ultrasound
ME	Medical equipment
Mgt	Management
MIBG	Meta - iodobenzylguanidine
MOH	Ministry of Health
MoSHE	Ministry of Science and Higher Education
NCD	Non-communicable diseases
NCDIs	Non-communicable diseases and injuries
OCT	Optical coherence tomography
PCCM	Pulmonary and critical care medicine
PCR	Polymerase chain reaction
PPP	Public private partnership
RTT	Radiotherapy technicians
TEE	Transesophageal endoscopy
Tx	Therapy
UHC	Universal Health Coverage

EXECUTIVE SUMMARY

This national specialty and subspecialty service roadmap was prepared to improve access to and ensure the quality of specialty/subspecialty services as appropriate all the levels of tier system. The demand for specialty/subspecialty services considering the economic, social, and epidemiological realities which face Ethiopia today and, in the next 10 years. The road map has taken over 4 years to develop and has involved extensive consultations with professional associations of specialty/subspecialty disciplines, Ministry of Health experts from different directorates, and experts from the Ministry of Science and Higher Education (MoSHE).

Four strategic focus areas of the roadmap service expansion, human resources, equipment, drugs and technology, and health care financing where prioritized services have been defined. The investment for the focus areas is basic strengthening, significant deepening, and expansion sites where the former shows minimal capital investment with a major shift in modifying the culture and trends of service provision while expansion sites need the highest capital for implementation.

The prioritized services in primary hospitals brings comprehensive chronic to follow up, pediatric developmental conditions, emergency and elective surgical and gynecologic services requiring general surgeons, gynecologist/obstetrician specialists, emergency specialists, family medicine specialists to work at the primary hospital level.

In general hospitals, prioritized services such as psychiatry services received due attention in addition to the other specialty services. Prioritized subspecialty services such as neurosurgery, uro-surgery, nephrology, and others got a significant deepening investment criteria. Tertiary hospitals prioritized services are expected to include the highest focus to give the highest quality health services as this level is the highest in the tier system. Finally, the other highest capital demanding services such as specific subspecialty centers are prioritized to be given in selected tertiary hospitals with defined standards and numbers to be implemented in different geographic locations to reach the population at large with different prioritization criteria.

1. BACKGROUND

Ethiopia is the oldest independent and second-most populous country in Africa with a population of about 112,078,730 of whom 20.9% live in urban areas.[2] There are 10 regional states and 2 administrative city councils. The country is structured into four levels of government: federal, regional, district (“woreda"), and municipal ("kebele"). This decentralization means that each federal state is responsible for implementing national policies.

Ethiopia is one of the poorest countries in the world, with a per capita income of $790.[3] Foreign aid is one of the main contributors to Ethiopia's GDP, with Ethiopia among the top 10 largest aid recipients worldwide. Total health expenditure is among the lowest in Africa (bottom 10 ranking). According to the recent National Health Accounts (NHA-7), the per-capita health expenditure in Ethiopia in 2016/17 was$33.2USD, far less than the recommended $86 USD required to deliver a package of basic services in low-income countries.[4]

The Federal Democratic Republic of Ethiopia put in place a National Health Policy and Strategy in 1993. The development of the Health Sector Development Plan (HSDP) of the National Growth and Transformation Plan (GTP) and Health Sector Transformation Plan (HSTP) implemented the policy throughout the country. In the last two decades, different initiatives including hospital reforms have been implemented to improve services as well as pro-poor interventions to reorient health services towards health promotion, disease prevention, curative services throughout the country.

Because of these endeavors, currently, the country is well-positioned to attain primary health care coverage and has achieved substantial progress in improving many key health indicators during the past two decades. These achievements were made possible mainly due to the scale-up of primary health care services through the full-scale implementation of the Health Extension Program (HEP) since 2003 (1997 EFY).

However, Ethiopia is facing an epidemiology shift related to urbanization, climate change, lifestyle changes, and unrest due to political disruptions and natural disasters such as drought and disease outbreaks. The country has high morbidity and mortality from the triple burden of diseases. Data from the Global Burden of Disease (GBD) study shows that 52% of the total mortality in Ethiopian 2016 was due to non-communicable diseases and injuries (NCDIs).[5]

The prevention and control of non-communicable diseases (NCDs) first appeared in the Health Sector Development Programs (HSDP) III from 2005-2010, though there was no meaningful implementation of the NCD program at that time, and in the subsequent HSDP IV from 2010-2015 some NCD prevention and control efforts were initiated at a national level. NCDs were considered as one of the major disease control priorities in the Health Sector Transformation Plan 2015/16-2019/20, with elaborate strategies and costed interventions. It addressed four major NCDs namely cardiovascular disease, chronic respiratory disease, diabetes mellitus, and cancer. Despite all efforts, the health system is still facing many challenges which result from:

- Inadequate access to specialty/subspecialty care services;
- Inadequate human resources for health; especially in the area's specialty and subspecialty services
- Inadequate clinical care standards affecting the quality of health services;
- Weak hospital management capacity resulting in inefficient management of scarce resources;
- Poor intra and/or inter facilities communication/ coordination of care and referral linkage;
- Increased public demand and/or loss of trust leading to increased overseas referrals.
- Limited financial support to ensure optimal coverage of services and sustainability;

The above-mentioned problems are attested by the increasing number of patients going abroad to access tertiary care. The impact of this problem on the socio-economic situation of the society and the country at large cannot be overlooked. Given the Ministry's commitment to quality and equity and the increasing awareness of the public and their demand for services improving access and/or quality of specialty/subspecialty services is timely. This roadmap outlines strategies for increased specialty/subspecialty services in the country and thereby accelerating the achievement of Ethiopia's health goals.

2. SITUATIONAL ANALYSIS

The 6th report of the National Health Accounts indicates that most of the out-of-pocket expenditure in health is 23% in Ethiopian households for non-exempted services, like NCDIs. While observing epidemiology shifts, burden, and the health impact; the economic impact of NCDIs is also dramatic and increasing. In addition, only 10% of health spending has been allocated to the prevention and care of NCDIs.[5]

Evidence suggests that a growing number of Ethiopians are traveling abroad seeking tertiary health care services that are not available in the country. Although the exact number who travel for health reasons is not known, estimates put it well above 10,000 per year out of which many opt for medical checkups and treatment. For example, patients seen at government institutions who are referred overseas for medical services have been registered by Clinical Services Directorate (CSD) from July 2004 E.C.to June 2010 E.C. From those, only 1102 patients have complete data for analysis. Of 1102 the major reason for referrals includes cardiac conditions, orthopedics, cancer, and renal diseases. Similarly, Rak Hospital in Dubai, U.A.E. treats up to 240 people from Ethiopia every year for different cases; Bangkok Hospital in Thailand treated more than 6,000 Ethiopians in 2011 alone. Consequently, such travel involved an estimated average cost of about US $20,000 per trip. These figures are most likely the tip of the iceberg. There are others who are not captured through this data who may have access payments from relatives residing abroad and main causes of medical tourism were cancer treatment, joint replacement, interventional cardiology, cardiac surgery, laparoscopic treatment, orthopedic treatment, neurological treatment, fertility treatment, bariatric surgery, and ophthalmologic, kidney, and liver transplants.[6]

Based on this, a conservative estimate of the cost of annual outflow in lieu of medical tourism from Ethiopia exceeds US $100 million and implies a higher degree of opportunity cost that could be saved and otherwise brought into the country by availing high-end tertiary health services.[6]

Bearing in mind this fact, the national Health Sector Transformation Plan (HSTP) I prioritizes the creation of centers of excellence for each specialty, with fair geographical distribution to meet the increasing demand for specialty services linked with economic and population growth and increasing health-seeking behavior of the public. With this regard, centers are being fostered, which combine medical, surgical, diagnostic, and therapeutic specialties: trauma center, cardiac center, transplant center, an oncology center, etc...

A survey was conducted on selected 106 hospitals where all regions are addressed. The purpose of this survey was to assess the current status of specialty and subspecialty services on selected areas of service delivery, human resource, and medical equipment. Of those selected hospitals, 8 were primary, 72 general, and 26 were tertiary. In addition, the situational analysis was framed around the six WHO building blocks.

2.1 Leadership and governance

The Federal Ministry of Health has emphasized the HSTP where there is encouraging commitment toward training, service expansion, and construction of tertiary health facilities. In the last four years, the country has committed substantial resources to construct tertiary hospitals and specialized care centers in different parts of the country such as international standard cardiac and cancer centers, infertility treatment, renal care, forensic, trauma, and toxicology treatment in Addis Ababa, in Jimma, Gondar, etc.

2.2 Health service delivery

The national health service delivery performance from DHIS-2 displaying the efficiency of selected services in public hospitals in 2011 E.F.Y is shown in the table below.

Table 1.Key performance indicators of efficiency and outcome

S/No	Efficiency and outcome measurement indicators	National performance for 2011 E.F.Y.
1	Surgical volume	198,251
2	Delay for elective surgery	68.6 days
3	Inpatient mortality rate	2.1 %
4	OPD visits per capita	0.5

According to Ethiopian Service Provision Assessment Plus 2014, among all health facilities that offer services for non-communicable diseases, the proportion of facilities offering services specifically for chronic respiratory disease, cardiovascular diseases, diabetes, and cancer were 76, 73, 59, and 23 percent respectively.[7] While Ethiopian Service Availability and Readiness Assessment (SARA) 2018 Final Report showed that nationally 36, 49, 53, and 9 percent of facilities excluding HP offered a diagnosis and/or management of; diabetes, cardiovascular disease, chronic respiratory disease, and cervical cancer respectively.[8] In addition, the Ethiopia NCDI

Commission report showed that there exists a lack of access to quality health services for NCDIs, with only 54% of all health facilities ready to provide general NCD services, and even lower availability of specific services for diabetes(22%), cardiovascular (41%), chronic respiratory disease (45%) and cervical cancer (2%).[9]

Despite the presence of professionals on the specific specialty subspecialty services, there is no full-scale delivery of specific specialty services following a shortage of supply, equipment, and infrastructure. Services like ear, nose, and throat (ENT), plastic surgery, orthopedics, and neurology are delivered in a limited range from the scope of the field (See Annex I *)*.

2.3 Pharmaceuticals, Medical Equipment and Technology

For most products surveyed at facilities implementing integrated pharmaceutical and logistics system (IPLS), availability was above 90% from the Ethiopian Pharmaceutical Supply Agency (EPSA) drug list. The availability of essential commodities is 40-70% in the public sector. On the other side, there is inefficient supply chain management for example uninstalled medical equipment in health facilities among all regions due to unplanned procurement leading to a reserve and unsuitable infrastructure for installation, inadequate knowledge on how to manipulate, install and maintain, supplier/agent's failure to meet their arrangements were the major problems.

The survey done for this road map showed that the major medical equipment assessed are available in less than 50% of hospitals surveyed. Mechanical ventilators were available in 42 hospitals, ophthalmoscope in 37 hospitals and slit lamp in 56 hospitals. Equipment such as electro-corporal shock lithotripsy, electromyography, arthroscope, cat lab, spirometer, bone marrow biopsy set, microtome are available in a limited number of hospitals. The findings illustrate that there is a significant gap in availing medical equipment at the national level (see Annex II).

2.4 Health Workforce

From a total of 106 hospitals surveyed most hospitals reported their human resources (HR) in type and numbers with the listed areas of services. Some hospitals did not report the number of HR despite the availability of services and few hospitals were found with only medical equipment to provide the services. There were ophthalmologists in only 33 hospitals, pathologists in 28 hospitals, dermatologists in 26 hospitals, and trauma orthopedic surgeons in 25 hospitals. The majority of the professionals were found at facilities in the capital city; Addis Ababa (see Annex III*)*. Specialists found at each hospital level were also inconsistent indicating a need for improved HR distribution.

The distribution of available specialty health professionals is confined to urban areas where rural areas are underserved. In the last five years, there were initiatives to decrease inter and intra- region inequity of health workers' distribution. These initiatives included expansion of health care professionals' training institutions (pre-service) in all regions, improved health workers recruitment and development based on local needs, compulsory service.

In 2017 G.C., the Ministry of Health initiated the coordination of the Ethiopian residency matching program to guide the training institutions. The following table shows the training being given in universities with their enrolment of multiple disciplines of clinical residency programs from 2010-2012 EFY.

Table 2. Summary of Residency Training Program from 2010-2012 EFY

Specialty program	Number	Specialty program	Number	Specialty program	Number
General surgery	449	Family medicine	70	Nuclear medicine	14
OBGYN	506	Forensic medicine	25	Pediatric surgery	17
Internal medicine	548	Pathology	76	Plastic surgery	21
Pediatrics	474	Psychiatry	84	Uro-surgery	23
Orthopedics	122	Anesthesiology	110	Neurology	40
Ophthalmology	96	Dermatology	76	Neurological surgery	48
Emergency medicine	110	Oncology	28	**Total**	**3150**
Radiology	181	ENT	32		

The yearly enrolment capacity of the universities is nearly 1050 residents with training duration from 3 to 5 years. A total of 3524 general specialists and subspecialists are available in the country.[5]

2.5 Health Financing

From Ethiopia national health accounts (NHA-7) 2016/17 report shows us that total health spending during 2016/17 was ETB72.1 billion (US$3.1 billion). The 2016/17 health spending accounted for 4.2% of Ethiopia's GDP, which slightly decreased compared with the figure reported in 2013/14 (4.7%) and is lower than the globally recommended share of 5% of GDP.[3]

Over half (51%) of total health spending was on the prevention, control, and treatment of infectious and parasitic diseases. Within this category, HIV/AIDS took a significant share, accounting for 17% of total health spending on infectious and parasitic diseases. This was followed by neglected tropical diseases and malaria, each taking 16%, and vaccine-preventable diseases (12%). Spending on nutritional

deficiencies accounted for 11% of total health expenditure. Reproductive health took 8% of the total health spending, while NCDs accounted for 12% of the total spending. This shows that health spending on infectious diseases is much higher than that of NCDs, although mortalities arising from the latter are about the same or even higher.[6]

Ethiopia endorsed the National Health Care Financing Strategy (2017-2025(HCFS), which includes revenue retention by health facilities, systematizing the fee waiver system, standardizing services, outsourcing non-clinical services, user setting, and revision, initiation of compulsory community-based health insurance and social health insurance, the establishment of a private wing in public hospitals, and health facility autonomy. However, the implementation of this strategy is very low.[10]

2.6 Health Information and Research

The national health management information system (HMIS) does not currently assess the level of specialty sub-specialty service.

3. OBJECTIVES

3.1 General objective

The main objective of the road map is to outline strategies to improve access to and ensure the quality of specialty/subspecialty services appropriate to the levels of tier system; considering the economic, social, and epidemiological realities which face Ethiopia today and, in the next 10 years.

3.2 Specific objective

This specialty/subspecialty roadmap will have the following specific objectives:

1. To prioritize specialty/subspecialty service availability at primary, general, and tertiary hospitals
2. To define and prioritize subspecialty services which demand special investment in selected tertiary hospitals
3. To give strategic guidance on specialty/subspecialty human resources for health; pharmaceuticals, equipment, and technologies

4. DEVELOPMENT PROCESS AND METHODOLOGY

4.1 The development process of the roadmap

The road map has taken over 4 years to develop and has involved extensive consultations with professional associations of specialty/subspecialty disciplines, Ministry of Health experts from different directorates, and experts from the Ministry of Science and Higher Education (MoSHE). The development of the road map has involved eight interlinked steps as shown in the figure below.

Figure 1. Process of road map development

4.2 Methodology

- **Secondary Data**-Specialty/subspecialty service provision was assessed using a semi-structured checklist indicating the selected areas of specialty in three categories: Availability of specialty and subspecialty services, human resources, and major medical equipment.
- **Desk review** -After gathering all relevant documents, significant and pertinent data was used to construct the road map. These documents were also used for the situational analysis, which uses the WHO six building blocks of health systems strengthening as a framework. Taking the six building blocks as a perspective, a SWOT analysis was conducted, and the existing situation was narrated under each block. Following the SWOT analysis, each perspective was written in detail backing with the local and international available evidence (see Annex IV*)*.
- **Expert opinion**- Data was collected from professional associations after a template was prepared which consists of services to be provided, human resources required, materials/infrastructure, and cross-sectional human resources/services at each tier level in an ideal scenario. Then this data was used in the priority matrix.

Prioritization Techniques

To prioritize specialty/subspecialty interventions for the road map the following directions/principals were used;

- Specialty/subspecialty service which is effective and will have a high impact on people's health.
- Diseases that have imposed (will impose) a heavy burden on the Ethiopian population
- Services and interventions that are cost-effective in addressing the problems.
- Sustainability of the interventions

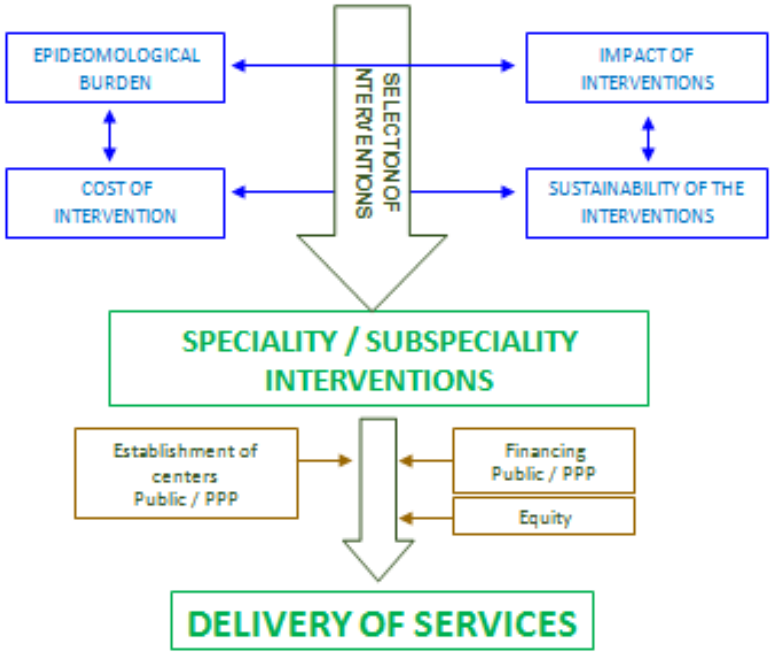

Figure 2. Prioritization Technique

Essential health service package (EHSP) - The goal of the Ethiopian EHSP was to focus on the delivery of priority health interventions that can improve equitable coverage of efficient and quality health services that the country can afford. These services encompass the delivery of a comprehensive range of health services appropriate to the primary-level of care. The prioritization criteria of service interventions for EHSP has been used in this specialty and subspecialty services.

The Ministry of Health initiated a process to revise the EHSP, as a result, is not only a guide for the development of other important strategic and operational documents that can improve health services delivery in Ethiopia, but also can serve as a guiding framework to progressively realize universal health coverage (UHC) in the country.

4.3 Guiding Principles

1. Equity in all its dimension
2. Efficient use of resources
3. Accountability and transparency
4. Innovation and use of technology
5. Evidence-based decision-making
6. Quality
7. Human right
8. Community engagement
9. Inter-sectoral collaboration
10. Responsiveness to the current status national specialty and subspecialty services

5. STRATEGIC FOCUS AREAS

The following are the four strategic focus areas identified in the Specialty and subspecialty road map:

- Service expansion
- Human resources
- Equipment, drugs and technology
- Health care financing

5.1 Prioritization and Expansion of Service

The Ethiopian population is under-served with specialty and subspecialty care relative to the need. Based on the national disease burden, the country currently meets only a fraction of the expected services in various specialties. To tackle this problem there is a need for explicit guidance on difficult clinical rationing decisions in expansion and opening of the higher-level center. Since it would be difficult to solve this gap in the short term, it seems likely that a policy mechanism by which to support prioritization will need to be established as an adjunct to the planning and implementation process. This mechanism would need to address certain themes, such as:

- Prioritizing access to treatment (both at the individual and the population level)
- Considering NCDI care as an emerging priority

The principles/rationale behind this prioritization and expansion of specialty/subspecialty includes, but is not limited to:

- Specialty/subspecialty services address targeted diseases that have imposed (will impose) a heavy burden on Ethiopian people currently (in the future), considering the social impact of the disease (such as epidemics and adverse economic effects),
- Specialty/subspecialty service which is effective and will have a high impact on people's health,
- Services and interventions which are cost-effective in addressing the problems faced by many people,
- Services and interventions will improve specialty/subspecialty service access to the poor, in the rural and urban populations of the country (if not equally),
- Sustainability of the services in the long-term (through government financing or use of PPP model)

Below are the growth expansion categories for existing specialty and subspecialty care services and new proposed initiatives (investment). These categories define the major scope of work to be done in both the short and long term depending on resources available for the work

1. **Basic strengthening (BS):** Specialties and subspecialties which are well established have a clear direction/path on the national HRH strategy and are addressed on the FDA's minimum requirement at each hospital tier level. The main effort in planning the future for these services will be improvements in HR recruitment and retention, medical equipment management, availing the right drugs and technology which will require quite significant additional investment over time, but they do not require a fundamental change of current patterns of direction/path[11].

2. **Significant deepening (SD):** These are specialties and subspecialties that need further input beyond FDA's minimum requirement and require very significant upgrading of their current capabilities in situ. These specialties and subspecialties are greatly capital-intensive requiring a level of investment in addition to significant equipping, highly specialized personnel, drugs, and ongoing up-keepexpenditures[11].

3. **Expansion of sites (EX):** These are sub-specialized centers within tertiary hospitals (new concept) that deliver services that are cost-effective and will have a high impact on people's health, but they require very high capital investment. These services were not a priority but have become fundamental due to the shifting epidemiology. These sub-specialized centers require geographical expansion of new sites taking equity into account.

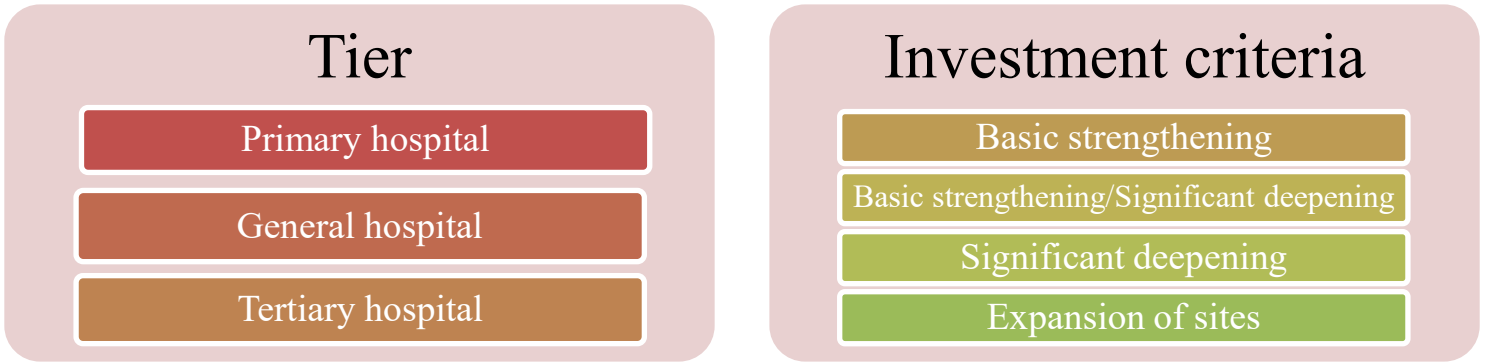

Figure 3. Health tier system and criteria used for investment

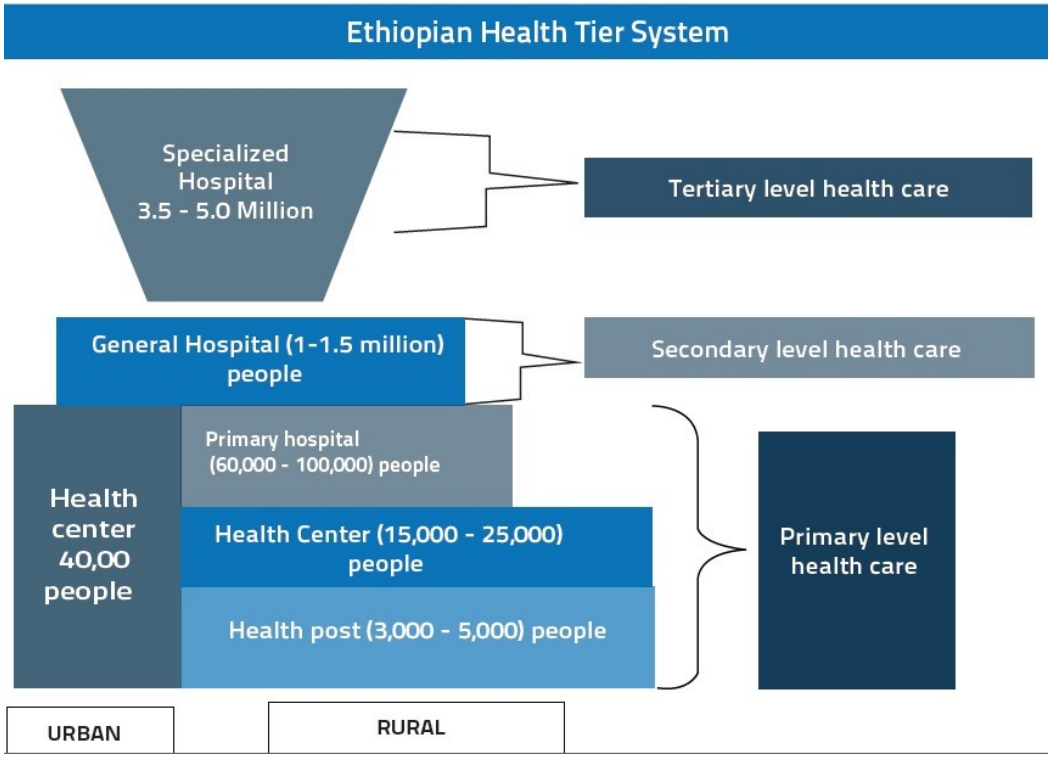

Figure 4. Health tier system of Ethiopia

5.2 Prioritized Interventions for Primary Hospitals

The specialty and subspecialty services, human resource and equipment mentioned in the table below are additions to the existing minimum standard requirements set for Primary hospitals to enhance quality clinical services.

Comprehensive Specialty Services	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
- Chronic care services (asthma, COPD, DM, hypertension, dyslipidemia, cardiac problems) - Diagnostic services: Cytopathology (telepathology services), Ultrasound imaging service (tele-radiology services), - Service for common mental health problems, neurologic and behavioral problems (ataxia, gate, seizure, epilepsy, stroke) - Pediatric developmental disorders, nutritional disorders, burn and its complications, endocrine problems - Neonatal care [routine, level one and two intensive care unit (ICU) care], neonatal sepsis, asphyxia, jaundice, congenital problems - Palliative care service - Rehabilitation care service	Basic strengthening		Family medicine specialist	- Office spirometer - ECG machine - Nebulizer - IV fluid perfusor - Electronic continuous positive airway pressure (CPAP), bi-level CPAP - Phototherapy machines - Tele-radiology and Tele-pathology devices

- Comprehensive services: ophthalmic, dermatology - Obs/Gyn (elective gynecologic surgeries, infertility, advanced obstetric care) - General surgical services (emergency surgical procedures, elective surgeries, common orthopedic procedures) - Emergency, trauma and critical care services	Significant deepening		- Obs/Gyn specialist - General surgeon - Emergency medicine and critical care specialist - Family medicine specialist	- Coagulation and electrolyte analyzers - Defibrillator, monitor - Continuous cardiotocography (CTG) machines - Portable ultrasound, high-resolution ultrasound - Mechanical ventilator

5.3 Prioritized Interventions for General Hospitals

The specialty and subspecialty services, human resources and equipment mentioned in the table below are additions to the existing minimum standard requirements set for General hospitals to enhance quality clinical services.

Specialty and Subspecialty	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
Obstetrics & Gynecology services	Basic strengthening	- Screening and fetal testing amniocentesis, - Fetal cardiology services - Menopause - Screening for and treatment of - Preeclampsia screening with uterine artery Doppler - Tele consultation services - Management of sexual dysfunction - Gynecologic malignancy	Obstetrician and Gynecologists	- Doppler capable high-resolution ultrasound - Multipara-meter monitors - Laparoscope - Hysteroscope - Colposcope - Loop electrosurgical excision procedure (LEEP) - Tele-medicine devices
Internal medicine services	Significant deepening	- Coronary Care - Neurophysiology test - Dialysis for AKI - Oncology- Chemo. Services, Palliative care - Diagnosis and treatment of chronic kidney disease (CKD)	- Internist (endoscopy trained) - Electroencephalography (EEG) technician - Dietitian	- Laboratory (Hormonal assay, body fluid - Analysis, trace elements, tumor marker) - EEG, Echocardiography, ECG machine - Ultrasound with vascular Doppler - Exercise treadmill machine - Fiberoptic Spirometer - Point of care arterial blood gas (ABG) analyzer
Surgical services		- Level II Trauma Service - Craniotomy for excision brain tumors - Management of hydrocephalus, Neural Tube Defects, etc.… - Spine and/or spinal cord surgeries - Common cardio-thoracic procedures - General urologic services	- General surgeon - Neurosurgeon - Cardiothoracic surgeon - Urologist	- Advanced Craniotomy - Trans-sphenoidal set - Basic laminectomy set - Neurosurgical procedures equipment - Neurosurgical operation microscope - Optical urethrotomy set
Pediatric services	Basic strengthening	- Emergency pediatrics and PICU Service - NICU service (level II) - Management of developmental disorder - Manage common pediatric oncologic cases	- Pediatrician - ECCD nurses - Neonatal nurses	- Portable Mechanical ventilator - Spirometer - NICU level II equipment
Psychiatric services		- Psychiatric Service (inpatient and out-patient services)	- Psychiatrist	

Radiology services	Significant deepening	- General radiography - Ultrasound services - Teleradiology services	- Radiologist	- X-Ray - High-resolution u/s - Teleradiology devices
Orthopedic services	Significant deepening	- General Orthopedic service - Orthopedic Trauma service - Pediatric Orthopedics service	- Orthopedic surgeon - Orthopedic Trauma surgeon	- Orthopedic instrument sets - Arthroscope instrument set - Dermatome for skin graft, Skin graft - Orthopedic materials
ENT services			- ENT Surgeon - Audiology technician - ENT nurse	- Basic ENT surgical equipment - Audiometry /Audiology
Pathology services		- Cytopathology / FNAc superficial, exfoliative and abrasive - Hematopathology - Clinical pathology - Histopathology - Tele-pathology services	- Pathologist - Lab tech and/or histo-technologists	- Microtome (Microtome saw) - Tissue processor - Microscope with 5MP - Tele-pathology devices
Dermatology services		- General Management of skin, mucous membrane, hair and nail disorders - Detect Dermatologic Emergencies - Tele-dermatology services	Dermatovenereologist	- Diascopy - Skin biopsy punch - Cryo-surgical and electrosurgical unit - Tele-dermatology devices
Emergency trauma and Critical care service	Basic strengthening	- Emergency and ICU Care level II - Procedural sedation with airway care - Burr hole, craniotomy, and elevation of depressed skull fractures	Emergency specialist	- Emergency and critical care basic and advanced equipment - Advanced procedure sets - Emergency drugs
Rehabilitation services		Physiotherapy, Occupational Therapy, Speech Therapy	- Physiotherapist - Speech therapist - Occupational therapist	- Occupational therapy equipment - Speech therapy equipment
Anesthesia, Ophthalmology, Dental		According to Ethiopian Standard Agency General Hospital requirements		

5.4 Prioritized interventions Tertiary Hospital

The specialty and subspecialty services, human resource and equipment mentioned in the table below are additions to the existing minimum standard requirements set for tertiary hospitals to enhance quality clinical services.

Specialty and subspecialty	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
Pulmonary and critical care medicine (PCCM)	Significant deepening	- Diagnosis (Dx) and Care for: difficult asthma &frequent exacerbating COPD, pulmonary function test, Pleurodesis, Fiberoptic and Rigid bronchoscopy service - Management (Mgt) of: interstitial lung disease, pulm-hypertension, airway disease and immunology	- PCCM Subspecialist - Respiratory therapist - Sleep technician	- Spirometer, fiberoptic and rigid bronchoscope - ABG analyzer
Gastroenterology		- Screening, diagnosis, management of common GI malignancies - Advanced management of chronic liver diseases (CLD, schistosomiasis, diarrheal diseases, HBV & HCV) and their complications.	Gastroenterologist	- Enteroscope - Colonoscope
Nephrology		- Mgt of Cxns of CKD (Anemia, Calcium phosphate, Nutrition) - Hemodialysis for chronic kidney failure - Peritoneal dialysis for chronic kidney failure	Nephrologist	- Reteroscope - Ureter-scope - Dialysis machine
Hematology		- Iron Metabolism Disorder Screening - Blood Cancer Screening and treatment	Hematologist	BM biopsy set
Cardiology		- Advanced management of Hypertension, Arrhythmia, Heart failure and myocardial infarction. - Procedures: Angiography, cardioversion, pacemaker implantation congestive heart disease (CHD) assessment and management - Cardiology telemedicine consultation services	- General cardiologist - Interventiona l Cardiologist - MSc Nurse in cardiovascular nursing (interventional and preventive)	- Coronary CT, Coronary & Vascular angiography - MRA, cardiac catheterization - Teleconsultation devices
Neurology		- Acute ischemic stroke management - Complicated epilepsy and/or refractory SE: Dx & mgt - Neuro-oncology: Dx & chemo/radio TX - Complicated CNS infection Dx & mgt	- Physiatrist - Neurophysiologist - Neurophysiotherapist	- EEG, MMG - Serum and neuro- radiology tests
Endocrinology		Diagnosis/management of advanced endocrinology disorders	Endocrinologist	

Specialty and subspecialty	Type of investment	Expected Services	Required HR	Medical Equipment Needs
Feto-maternal medicine	Significant deepening	- Genetic testing and counseling - Assessment and management of pregnancy complicated by fetal abnormality - Advanced obstetric procedures - Feto-maternal telemedicine consultation services	Maternal and fetal medicine Subspecialist	- Fetal MRI - Embryo-scope - Advanced fetal Echocardiography - Tele consultation devices
Gynecology Oncology		- Diagnosis & management of Gynecologic malignancies (screening, surgical management, chemotherapy, and palliative care)	Gynecology oncology specialist	- High resolution u/s - Hysteroscope - Laparoscope
Reproductive endocrinology and infertility		- Reproductive endocrinologic assessment and care - Assisted reproductive technology - Female genital reconstructive surgeries, non-invasive - Mgt of reproductive endocrinology and infertility (REI) problems	Reproductive endocrinology and infertility subspecialist	- Hysterosalpingography - Hysteroscope - Laparoscope
Urogynecology		- Common uro-gynecologic reconstructive and obliterative surgeries	Urogynecologist	- Basic urogynecology set - Cystoscope - Urodynamic machine
Infectious disease pediatrics		- Complicated HIV and TB treatment - Mgt of congenital infections - Definite case mgt of complicated infectious diseases - Antimicrobial	Pediatrics ID specialist	
Pediatrics Emergency		- Portable ventilation - Advanced mgt of circulatory failure	Pediatrics emergency physician	- Portable mechanical ventilator
Neonatology		- Advanced neonatal care level III	Neonatologist	- NICU level III equipment
Pediatric endocrinology		- Diagnosis and management of advanced Pediatrics endocrinology disorders	Pediatric endocrinologists	- Microfilament
Pediatric pulmonology		- Advanced diagnosis and management of respiratory Disorders	Pediatric Pulmonology and critical care specialist	- Flexible pediatric Bronchoscope - Spirometer - Full body plethysmograph

Specialty and Subspecialty	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
Pediatric cardiology	Significant deepening	Advanced diagnosis & management of heart failure and CHD	Pediatric cardiologist	- Holter monitor - Portable X-ray - Transesophageal endoscopy (TEE)
Pediatric gastroenterology		- Advanced screening, diagnosis, and management of GI disorders.	Pediatric gastroenterologist	Portable Fluoroscope
Pediatric nephrology		- Advanced diagnosis & management of congenital and acquired renal disorders - Peritoneal dialysis for AKI - Hemodialysis - Long term post-renal transplant follow-up	Pediatric nephrologist	- Haemodialysis machine and accessories - Peritoneal dialysis set - Portable mechanical ventilator
Pediatric neurology		- Advanced diagnosis & management of refractory seizure, neuromuscular disorders (NMD), Neuropathy, attention deficit hyperactivity disorder (ADHD), mental, neurological, substance use (MNS) disorders and emotional disorders	- Pediatric neurologist - Developmental pediatrics subspecialist	- Electromyography (EMG) - EEG - Microfilament
Pediatric Hematology& Oncology		- Advanced diagnosis & management of hematology disorders, malignancy - Total parenteral nutrition	Pediatric hematologist/oncologist	- Bone marrow biopsy set - Flow cytometer - Apheresis machine
Plastic surgery		- Skin Surgery - Head and neck reconstructive surgery - Breast and trunk reconstructive surgery - Hand and lower extremity reconstructive surgery - Urogenital surgery	General plastic and reconstructive surgeon	- Microsurgery set - Hand surgery set - Nerve stimulator and defector - EMG
Urology surgery		Advanced management of common urologic disorders	- Urologist surgeon - Urology oncologist	- Transurethral resection of the prostate (TURP)/ Transurethral resection of bladder tumor (TURBT) set - Ureteroscopy set
Cardiothoracic surgery		- Mgt of all thoracic disorders with comorbid conditions - Surgery for posterior mediastinal mass - Major shunts, Pacemaker implantation	- Pediatrics and adult cardiothoracic surgeon - Perfusion technologist	- Cardiopulmonary bypass machine - Cardiac Lab
Emergency medicine		- Advanced and life support/ALS - Advanced management of cardiopulmonary, GI, neurologic and endocrine emergencies - Burn and poisoning mgt - Perform emergency procedures - Emergency care telemedicine consultation services - Mass casualty and disaster response	- Emergency medicine and pediatrics emergency specialist - Trauma Surgeon	- Defibrillator - Mechanical ventilators - Portable x-ray and U/S - Telemedicine devices

Specialty and Subspecialty	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
Critical care medicine	Significant deepening	- ICU management of major burn and electrical injuries, traumatic spine injury - ICU Dialysis for AKI - Pleurodesis - Elective pericardiocentesis - Critical care telemedicine consultation services - Deceased organ donation	- Pediatrics and Adult Critical care subspecialist(intensivist) - Respiratory therapist	- Mechanical Ventilators - Dialysis machine - Portable x-ray and U/S. - Telemedicine devices
Psychiatry		- Advanced management of substance abuse - Pediatrics Psychiatry services - Forensic Psychiatry services - Management of refractory psychiatric disorders	- Forensic Psychiatrist - Pediatrics Psychiatrist - Addiction Psychiatrist - Neuropsychiatrist	Electroconvulsive therapy (ECT)
Radiology		- Diagnostic service: CT scan, MRI - Radiology telemedicine consultation services	- Interventional radiologist - Body imaging subspecialist - Neuro-radiologist	- Doppler U/S - CT scan - MRI - Tele health devices
Pediatric Dermatology Service		- Advanced management and follow up of skin, mucous membrane, hair and nail disorders in the pediatric age group - Dermatology telemedicine consultation services	Pediatric dermatologist	- Cryosurgical and Electrosurgical unit - Camera for documentation - Diascopy
Dermato- pathology Service		- Grossing of biopsy samples from skin, mucous membrane, nail and hair samples including HE, - Dermatology telemedicine consultation services	Dermato-pathologist	- Immunohistochemical stains - Immunofluorescence - Electron microscopy

Specialty and subspecialty	Type of investment	Expected Services	Required HR	Medical Equipment Needs
Dermato-surgery Service	Significant deepening	- Radiofrequency, Excision, and repair - Skin graft and flaps - Complex excision and repair - Nail surgical procedures, MOH's micrographic surgery	Dermato-surgeon	- Vitiligo and sclerotherapy set - Set up for MOH micrograph surgery - Skin graft set
Allergic dermatology		- Management and follow up of referred/selected patients with skin allergic conditions - Patch testing, Provocation tests - Photo-patch testing, - Prick testing, food challenge tests, desensitization - Dermatology telemedicine consultation services	Dermato-allergiologist	- Sclerotherapy set - Set up for MOH micrograph surgery
Photo-dermatology Service		- Management and follow up photo related conditions, - Photo patch testing, MED determination, Phototherapy/ photo-chemotherapy, Photodynamic therapy, Extracorporeal Photopheresis - Dermatology telemedicine consultation services	Photo-dermatology Subspecialist	- Photo patch test setup - MED determination setup - Excimers laser - Ultraviolet A/B (UVA/UVB) phototherapy setup
Dermato-oncology		- Diagnosis and management of skin cancer - Dermatology telemedicine consultation services	Dermato-oncologist	- Set up for lymphoscintigraphy - Extracorporeal photopheresis
Dentistry		- Maxillofacial surgery service - Periodontics dental service - Conservative dental service	- Maxillofacial surgeon - Periodontist	- Dental x-ray (panoramic, cephalometry)
Anesthesiology		- Advanced Neuro-anesthesiology service - Advanced pediatrics-anesthesiology service	Pediatrics and Neuro anesthesiologist	Monitors with highly advanced function
ENT		- Advanced diagnosis and management of ear, nose and throat conditions - ENT telemedicine consultation services - Fiber optic endoscopic evaluation of swallowing (FEES)	- Otologist/neuro-Otologist - Head and neck surgeon - Skull base surgeon	- Tympanometry - Auditory brainstem responses test (ABR/BERA) - Vestibular function tests - Laryngoscope

Specialty and Subspecialty	Type of Investment	Expected Services	Required HR	Medical Equipment Needs
Ophthalmology	Significant deepening	- Pediatric ophthalmologic service - Vireo-retinal eye care - Uveitis eye care - Ophthalmology telemedicine consultation services	- Pediatric ophthalmologist - Vitreo-retinal subspecialist - Anterior segment sub-Specialist	Telemedicine devices
Orthopedics Surgery		- Orthopedic trauma services - Pediatric orthopedics services - Arthroscopy and orthopedic sport surgery services - Orthopedic oncology surgical services - Orthopedic spine surgical services	- Arthroscopy and orthopedic sports surgeon - Pediatric orthopedic surgeon - Orthopedic spine surgeon - Orthopedic oncologist	- Spine reconstruction and fixation implants - Tumor reconstruction - Prosthesis - Arthroscope instrument set
Oncology		Advanced management of oncologic conditions Palliative care	- Pediatric oncologist - Medical physicists - Radiotherapy technicians (RTT)	- Immunotherapy agent - Conventional simulator
Neurosurgery		- All skull base surgical services - All pediatrics brain tumor surgical services - Neurovascular surgical services - Advanced spinal vertebral surgical services - Stereotactic radiosurgery for neurological tumors	- Skull base neurosurgeon - Pediatric neurosurgeon - Neurovascular neurosurgeon - Spine neurosurgeon	- Vascular set for aneurism clipping - Neuro-endoscope - Neuro-navigator - Intra-op neuro monitors
Pathology		- Cytopathology/FNAc deep (U/S and CT – guided) - Gyneco-pathology service - Dermato-pathology services - GI pathology services - Autopsy - Pathology telemedicine consultation services	- Forensic pathologist	- Advanced Digital microscope - Microtome - Tissue processor - Tele health devices

Rehabilitation	Significant deepening	- Plan physiotherapy, speech-language therapy, and occupational therapy interventions. - Prescribe prosthetic - Provide maintenance and major repairs for prostheses, orthoses and mobility aid.	- Physiotherapist - Speech therapist - Orthotic prosthetic specialist - Occupational therapist	- Orthopedic workshop with full machinery tools and equipment. - Physiotherapeutic, occupational and speech therapy equipment.
Forensic medicine and Toxicology	Significant deepening	- Psychosocial support	- Forensic psychologist	- Manual Rotary Microtome - Stereo microscope - Tissue Embedding Station(set), 230V (includes both paraffin and cooling units) - TEU-P Tissue Embedding Unit-Paraffin, 115V, 60Hz, 5A - Programmable Tissue Floating Bath - Paraffin Dispenser, 2.5 Gallon Capacity - Block Wax Trimmer - Step Up™ Slide Warmer - Large Slide Warmer Slide Dryer II - Hearse van for transportation of body - Body viewer with inbuilt refrigerator - Mortuary Table - Autopsy instrument set - Camera stand - Head opening saw with blades - Portable x-ray machine - RNASE-free tubes (2, 1.5,0.5, 0.2 ml) - Genetic Analyzer AB 310
		- Performs confirmation and quantitation of drugs and poisons from biological & environmental samples, analyze human remains	- Forensic toxicologist, - Forensic anthropologists	
		- Identifying and analyzing samples of DNA, such as blood, hair follicles, or other bodily fluids,	- Forensic DNA analysts	
		- Assisting with autopsies, collecting specimens and performing clerical duties	- Forensic pathology assistants	
		- Identifying, collecting and analyzing physical evidence related to crimes - Examine and diagnose bodily fluids, such as blood and urine, or tissues from biopsies from autopsy samples and examining evidence collected in sudden, unexplained deaths, such as homicides and accidents. - Establish a person's identity - Gather and analyze specimens and data to give expert advice in a criminal investigation and post-mortem interval - Evaluating and caring for victims of assault, domestic abuse, child and elder abuse, neglect, and sexual crimes.	- Forensic scientist (including forensic Dactylographist) - Forensic pathologist - Forensic odontologist - Forensic entomologist - Forensic nurse - Certified toxicologist	

5.4 Prioritized Interventions for Centers

All services cannot be made available in tertiary care hospitals due to resource limitations. Hence, in this roadmap priority has been given to expand selected specialty and sub-specialty services to limited centers that can be located in some of the existing tertiary hospitals or stand-alone. The centers were selected from lists drafted by different professional societies and based on the prioritization criteria such as existing infrastructure, human resources for health, disease burden, cross-cutting human resources, and services. Services with significant overlap in relation to the clients, human resources, equipment, and infrastructure are grouped together in one center.

1. Epidemiology of disease burden: The mortality and morbidity pattern of hospitals for the provision of care with maximal utilization, the case fatality of certain diseases that require ICU services and children and reproductive health services have got priority. Attention was given to emerging diseases like CHD, diabetes, cancer.
2. Hospital management and human resources: The current status of tertiary care hospital management experience and the number of doctors (specialty), allied health professionals, specialty nurses, and supporting staff have been considered. Both domestic and abroad support and partnership from donors and private sectors for expansion, transfer of knowledge and experience were given due consideration.
3. Infrastructure and medical supplies:

   The major cross-cutting setups like ICU equipped with appropriate equipment (medical supplies and drugs), diagnostic facilities (scan, imaging), laboratory services and skill labs have been well addressed.
4. During the selection of sites, the following should be considered:
   a. The presence of an efficient procurement service and timely forecasting for supplies to run without interruption.
   b. Other cross-cutting services like laundry, autoclaves, sewerage services, and proper waste management.
   c. The geographical location accessibility for transportation and service to population size have to be analyzed.

d. ICT facilities are very vital.

5. Budget: It is very important to cost all these huge activities and indicate capital and running costs for the service to proceed. Federal budget commitment, community participation, national investors and external donors can be explored. Again, this is an important criterion for the selection of stating the services.

Finally taking these all together and the existing specialty and subspecialty care services in Ethiopia the following specialty and subspecialty centers with forecasted ten-year expansion have been proposed for this roadmap to be implemented in short and long terms depending on resources available. There is also a policy directive to engage public-private partnerships to make some of these specialty services accessible and attainable. It is also considered to work towards reversing medical tourism as a considerable number of patients are traveling abroad (India, and Thailand).

SELECTED LISTS OF CENTRES

For each selected center a standard human resource and infrastructure and medical equipment standard will be developed

Type of Center and Investment Criteria	Expected services	Required HR	Medical Equipment Needs
Infertility	- Genetic counselling and genetic screening - Reproductive endocrinologic assessment & care - Laparoscopic and hysteroscopic Dx &Tx surgical procedures - Micro-invasive surgical procedures, assisted reproduction - Cryopreservation Advanced fertility-enhancing/reproductive surgeries - Female genital reconstructive surgeries, non-invasive and invasive Hysterosalpingography, Ultrasonography guided procedures - Permanent contraception and reversal surgeries	- Embryologist - Reproductive endocrinologist	- Laparoscope - High-resolution Doppler US - High fidelity training simulators and manikins, Audio-visual aids - Invitro fertilization (IVF)/IUI/fertility units - Andrology lab units - Hysteroscope

Type of Center and Investment Criteria	Expected Services	Required HR	Materials Required
Cardiac	- Definitive Mgmt. of 2° causes of Hypertension - Perform advanced Mgmt. of acute coronary syndrome - Perform FFR, IVUS, OCT - Utilize Intra-Aortic Balloon Pump, utilize ECMO, perform implantable cardioverter defibrillator (ICD), perform left ventricular assist device implantation - Advanced evaluation and Mgmt. of peripheral arterial disease (PAD), catheter-based intervention, vascular surgery - Percutaneous mitral balloon commissurotomy (PMBC), transcatheter aortic valve implantation (TAVI), Cardiac electrophysiology - Advanced Mgmt. of cardiogenic heart failure and shock, cardiac resynchronization therapy with defibrillator (CRT-D), valvuloplasty - Pacemaker insertion and interrogation, myocardial biopsy, open heart surgery diagnostic and ablation	- Cardiologist (General, Cardiac, Interventional, Electrocardiologist & Vascular surgeon) - Pediatric cardiologist team (interventionist, cardiac surgeon) - Biomedical technician - Radiology technician - Cardiovascular & Cardiac ICU nurse - Perfusionist - Electro-physiologist - Cardiac Anesthesiology - Cardiac Technicians - Physiotherapist (Respiratory) - Echocardiographer/technician	- Cath lab (biplane): coronary, electrophysiology, structural - Cardiac MRI, fractional flow reserve (FFR), intravascular ultrasound (IVUS), optical coherence tomography (OCT), Perfusion Imaging - Cardiac OR, ICU - Portable x-ray - Holter monitor, Event recorder - Treadmill, Echocardiography with TEE - Pediatric Cardiac ICU - Prosthetic valves - Closing devices

Type of Center and Investment Criteria	Expected Services	Required HR	Medical Equipment Needs
Trauma and reconstructive surgery center	- Skin substitute technology - Major burn management - MOH's microsurgery - Microsurgery for reconstruction - Extensive and complex deep malformation management - Microvascular surgery - Multidisciplinary diagnostic and therapeutic services for complex polytrauma patients - Scene management of regional and national emergencies and major disasters - Emergency thoracotomy - Neck exploration for severe neck injuries - Vascular exploration and repair and - Anatomises for trauma - Management of hand trauma - Complex orthopedic trauma surgery	- GPRS and Ultra specialist Plastic and Reconstructive Surgeons - Specialized Nurses - Emergency and critical care specialist - Neurosurgeon - Orthopedic surgeon - Cardiothoracic surgeon - Maxillofacial surgeons, - Ophthalmic Surgeon - Anesthesiologist - Intensivist - Trauma Surgeon - Traumatologist	- Burn unit with OR, Plastic trauma unit - Hand and peripheral nerve unit - Microvascular surgery unit - Craniofacial unit, hand and neck surgery unit, maxillofacial unit, aesthetic surgery unit, plastic, and reconstructive tissue culture unit - Burn surgery set, cleft lip and palate set, hand surgery set, hydrotherapy equipment, craniofacial set, rhinoplasty set, microsurgery set, laser machine, operating microscope, wrist arthroscope, C-arm fluoroscope, a nerve stimulator, and defector, complete pneumatic tourniquet set, electrosurgical and electrocautery units - k-wire, skin substitute, silicon rods, silicon sheet, implants including titanium mesh - Digital x-ray, mobile x-ray, CT scan, bedside ultrasound, CPAP, mechanical ventilators, trauma resuscitation beds, trauma dedicated OR,

Type of Center and Investment Criteria	Expected Services	Required HR	Medical Equipment Needs
Oncology	- Training - Oncologists, MP, RTT, oncology nurses - Diagnosis, - Treatment (chemo, surgery and radiation therapy), Radiosurgery - Palliative care - Follow-up - Research - Marrow & organ transplant	- Oncologist/medical and radiation/ - Radiotherapy technologist - Dietitian - Physiotherapist - Oncology pharmacist - Oncology nurse - Psychologist/psycho-oncologist - Speech therapist	- Radiotherapy unit with different rooms - Brach therapy room - Chemotherapy unit with different rooms
Toxicology /Environmental emergencies response center	- Training center for toxicology - Toxicology consultation center - Toxicology call center - Toxicology research unit	- Certified toxicologist - Call agents	Call center technology

Type of Center and Investment Criteria	Expected Services	HR Required	Materials Required
Nuclear medicine	- WBC, HIDA, Gallium Scan - Thyroid Iodine Uptake, Thyroid Scan - Whole Body Scan Sodium Iodine-131, Parathyroid Scan - Meckel's Scan, GI Bleeding Scan, - Liver Hemangioma Scan - Whole Body Bone Scan -MDP - 3 Phase Bone Scan, density scan, Bone marrow imaging - Ventilation & Perfusion lung scan - DMSA Renal Scan, Renal Scan with Lasix, Captopril, cystogram, Testicular Scan - Radionuclide, Myocardial Perfusion Scan, Thallium-201 chloride IV Gated Cardiac Blood Pool (MUGA scan), Cardiac PET viability & perfusion, Cardiac SPECT perfusion - Brain Death Study, cerebral blood flow, Cerebral Perfusion Scan, Cistern gram - Lymphoscintigraphy - Ga67 tumor imaging, SPECT Monoclonal antibody imaging Peptide imaging - Meta-iodobenzylguanidine (MIBG) Scan Iodine-123 MIBG IV OctreoScan (somatostatin receptor imaging) - hormone determination and various tumor markers determination by RIA	- Nuclear medicine specialists - Nuclear cardiologist - Nuclear endocrinologist - Nuclear oncologists - Nuclear medicine - Technologists - Radio-pharmacist - Medical physicist - Medical engineers - Physics for radiation safety - Medical technologist for radioimmunoassay - Chemist - Radiologists - Five cyclotron operators	- Single photon emission computed tomography (SPECT–CT) Gamma Treadmill - ECG machine - Infusion pump - Defibrillator - For Radiopharmacy - Dose Calibrator - Laminar airflow Cabinet - Fume Hood - Survey meter - Radiochromatogram Scanner - Molybdenum breakthrough canister - Lead glass syringe shield - Forceps - Monitoring devices hand feet vest - Monitoring device potable contamination monitor - Radioactive decay system - Technetium dispensing isolator - Lyophilizer - Tray oven drier - Centrifuge machine - Blood cell labeling isolator - High-density lead glass vial - Decontamination kit - Lead-lined generator and storage cabinet - Polymerase chain reaction (PCR) cabinet - Refrigerator and freezer - Cyclotron Operation - Radiation protection and measurement equipment

Type of Center and Investment Criteria	Expected Services	Required HR	Materials Required
Rehabilitation (Physical and Mental rehabilitation)	- Provide appropriate treatment for patients with sensory, motor, and cognitive impairments and disabilities - Provide clients with upper and lower limb orthotics and prosthetics. Spinal orthotic rehabilitative service needs - Perform spine injections procedures including facet joint injection, caudal injection, and trigger point injections, perform trial and maintenance intrathecal baclofen pump impanation - Perform discography, disc decompression, ablative procedures, and vertebroplasty/ kyphoplasty - Assess clients for and perform prolotherapy. aquatics therapy, hydrotherapy treatments, physiotherapy - Assess clients for sport and sport-related injuries, Provide an advanced level of treatment for complicated cases - Provide service assistant to sport teams	- Physical rehabilitation HR standard - Mental rehabilitation HR standard	- Occupational therapy materials - Art therapy materials - Infrastructure and materials for indoor and outdoor games - Infrastructure should be designed based on standard psychiatric architectural design - Maximum security center should meet forensic security requirements

Type of Center and Investment Criteria	Expected Services	Required HR	Materials Required
Transplant (Renal, Liver, Stem cell, Lung, Joint)	- Screening, collecting, transplant and post-transplant care and follow up. - Allografts and advanced limb reconstructions, or - Decompression or Prosthetic or - Biologic resurfacing of the joints.	- Respiratory therapist - Nephrologist, urologist - Thoracic, lung, & GI surgeon - Gastroenterologist, Hepatologist - Hematologist, Hemato-oncologist - Stem cell transplant subspecialist - Hematology nurses - Aphaeresis technician - Clinical Hematology laboratory experts - Genetic Experts - Internists - Hemato-pathologists - Transfusion specialist - Orthopedist	- Haemodialysis, Lithotripsy, Transplant unit - Ureteroscope, Cystoscope - Lithotripsy, Organ freezer - Dialysis machine, transplant set - Equipment for PCR testing, tissue typing instrument - An instrument for fluorescence in situ hybridization stent - Endoscope, Fibroscan, enteroscope, colonoscope, ultrasound, endoscopic ultrasound (EUS) - Biopsy forceps, Liver biopsy needle, Open GI surgery facilities - Apheresis Machine - Flow Cytometry, fluorescence in situ hybridization (FISH), Stem cell laboratory, Immunohistochemistry, Serum drug level analyzer - Full pulmonary function test (PFT), endobronchial ultrasound (EBUS), bronchoscopy, thoracic surgery OR - Artificial joint of different types

5.5 Human resources for prioritized specialty and sub-specialty services

The health workforce is an essential cornerstone of quality health care delivery when it is guided and monitored based on demand and supply principles. The efficient use of available health care workers for resource-limited countries like Ethiopia is essential in all circumstances. The government of Ethiopia has made great progress in the expansion of higher education by enrolling more than 20,000 health science students per year.[12] The human resource roadmap mainly should focus on interventions prioritized to improve the availability and efficient use of specialists and subspecialists in the following intervention areas.

- Train and deploy Family Medicine specialists at primary hospitals
- Provision of General Surgical and obstetrics and gynecology services at primary hospitals
- Initiate coordination of demand-based sub-specialty training programs
- Future perspectives of specialty and subspecialty training plan
- Improve retention and motivation mechanisms for specialist and sub-specialist
- Use the private sector resource in effective and efficient utilization of human resource through dual employment strategy.

5.6 Equipment, drug, supply and technology

5.6.1 Medical equipment, supply and drug management improvement

Health technologies are essential for a fully functioning health system. Medical equipment/devices, in particular, are crucial in the prevention, diagnosis, treatment and palliative care of illness and disease, as well as patient rehabilitation. As health institutions expand and advance, an increasing number of sophisticated medical equipment is introduced, a system capable of supporting and managing these medical technologies must be in place to avoid interruption of services.

It is very crucial to implement Medical Equipment Management in the hospitals to manage and coordinate the medical equipment cycle which includes planning and assessment of needs, procurement, training, operation, maintenance, decommission and disposal. The implementation of this focus area strongly depends on its integration with the Ministry of Finance, Ethiopian pharmaceutical supply agency, Regional Health Bureaus and the private sector. Taking the existing medical equipment and infrastructure into consideration it is important to avail the equipment

listed in the national standard under the specialties for the level hospital.

Prioritized Interventions

- **Define and update essential equipment and drug/supplies list for specialty and subspecialty services**
  - Define national essential equipment list
  - Ensure that all health facilities especially tertiary level facilities have specific essential equipment list
  - Update the current national essential drug list
- **Develop medical equipment management policy**
- **Develop a national medical equipment management policy**
  - Always ensure adequate funding for the hidden costs
  - Private sector engagement
  - Invest in biomedical engineering professionals and workshops
- **Improve logistics and supply chain management**
  - Innovation
  - Strengthen logistic management information systems/LMIS
  - Improve inventory management process
- **Support the utilization of technology in healthcare**
  - Advance the implementation of information technology in healthcare/digital(film-free) imaging and data transmission, electronic patient records, telemedicine for remote diagnosis and consultation
  - Invest in and empower technological innovation
  - Promote local production of medical drugs, devices and supplies

5.6.2 Telemedicine and healthcare

Healthcare delivery is set for a paradigm shift in the coming years. There is a distinct unfulfilled need to create new delivery models for providing affordable and prompt healthcare services to an ever-increasing population. Augmentation of the traditional clinic and hospital-based model of healthcare with models that incorporate new technologies is the need of the hour. The deployment of information and communications technology

for improving the reach of healthcare services, in the form of telemedicine is a potential solution to mitigate strains faced by the healthcare system. However, the implementation of such solutions is hampered by several challenges. Policymakers in the domain of healthcare are often challenged by situations of insufficient human and capital deficiencies. Core drivers of healthcare demand such as patient demography changes, health awareness, shortage of workforce, expensive medical technology, limited penetration and uneven distribution of market power in the healthcare sector, all acting in concert, are increasing the pressure to change healthcare service delivery modes. The focus, therefore, has shifted to advanced information and communication technology (ICT) applications as an enabler of safe, efficient, well-coordinated and integrated health service delivery processes.[13]

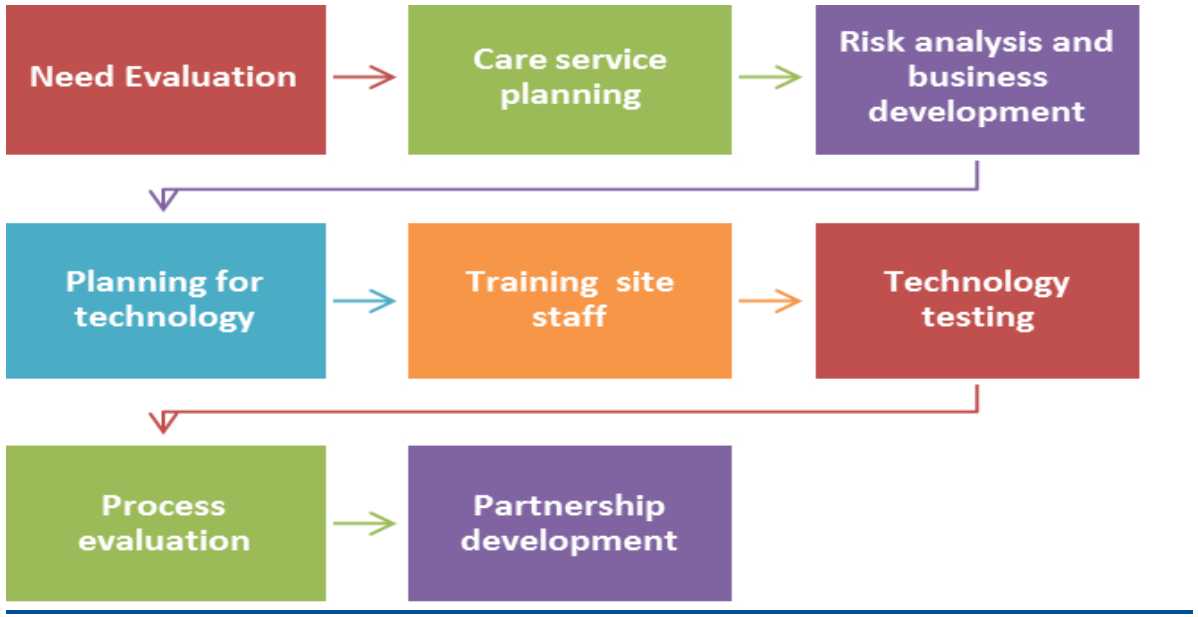

Figure 5. Major steps in the implementation process

5.6.3 Healthcare Financing Strategy

Specialty and sub-specialty services require very expensive and resource-intensive infrastructure, medical equipment and technology, high skilled manpower and modernized and digitalized health information technology to provide quality medical care and to reduce abroad referral of patients for medical treatment.

To increase health sector resources and to fill the healthcare financing (HCF) resource gap that Ethiopia is likely to face in the coming years the Ministry has developed a new Health Care Financing Strategy (HCFS). The overall objective of the HCFS is to accelerate Ethiopia's progress toward UHC by defining a new "framework for strategic actions' to enable Ethiopians to achieve the best health outcomes, financial protection against catastrophic illness, and satisfaction in the health system that is comparable to low and middle-income countries (LMICs) by 2025, and upper-middle-income countries by 2035.

To do this, the HCF strategy has five strategic objectives, which will be prioritized interventions for implementation for the road map. The five strategic objectives are:

- Mobilize adequate resources, through traditional and innovative approaches, from domestic and external sources
- Reduce Out of Pocket spending at the point of use
- Enhance efficiency and effectiveness/ Outsources clinical services
- Strengthen public-private partnership
- Develop capacity for improved HCF
- CBHI/SHI
- Health Facility Autonomy

Funding Options

These include:

- Government: National and Regional
- Private sector/PPP
- Charities/Donations

Public-private partnership

The Ministry of Health believes that Public-Private Partnerships can contribute to improving the health care delivery system in the country but since Public-Private Partnership is a new concept in our healthcare system we do not have a strong understanding of the factors/interventions that can make the private investment successful or unsuccessful in the long run. As a result, we need to develop our skills on the optimal utilization of private investment and infrastructure in our health care system.[14]

The government/public sector accounts for the majority of investment and remains as the main provider of healthcare services in the country. But government-funded/run health services have proven to be inefficient and inadequate. Although there is a clear rational for multi-sector partnerships, experience shows that public-private partnerships are lowest in poor countries.

We believe that the private sector has untapped capacity to support specialty and subspecialty services scale-up. Overall, effective partnerships could improve affordability, availability, and quality assurance; and multi-sector engagement is a promising opportunity to accelerate the safe delivery of quality clinical service in Ethiopia.[14]

In addition, the private sector can play a key role in health service optimization in areas where the public sector cannot avail services. This, in turn, helps to cut off huge currency where an estimated 120 million USD spend for medical tourism that will help to avail better and affordable health care to the community of Ethiopia by preventing unnecessary indirect costs related to accommodation, travel for patients and escort.

The Ministry's guide for investment in the health sector 2019, states that there are many favorable factors to invest in the health sector in Ethiopia and has identified tertiary health services or specialty and sub-specialty services as a priority area for investment in the health sector. To address this inadequacy, the Ministry has recognized it needs to work with different partners and private sectors to achieve its goals by drawing on these partners' resources. The Ministry needs to collaborate with them by joint planning and experience sharing to implement this plan with the partners for greater scale-up, sustainability, and effectiveness of development.[14]

The Ministry of Health has initiated and coordinated the development of the Public-Private Partnerships in Health (PPPH) Implementation Guidelines[14]. The objectives of PPH in Ethiopia are set out as follows.[14]

- Improve access to quality and affordable health services to the citizens of Ethiopia by allowing and enabling the private health sector to operate in policy supported partnerships with the public health sector.
- Create effective platforms to nurture untapped opportunities, facilitate the exchange of technology, knowledge and practices between the public and private sectors;
- Avail comprehensive tertiary health services for the short term and long terms redirection and attraction of medical tourism respectively
- Encourage the private sector for a high-end diagnostic service (laboratory and imaging services); high-end clinical services such as organ transplantation, cardiac and orthopedic care; hemodialysis, radiotherapy, neurosurgery and rehabilitation medical service and other unmet needs driven by PPPH projects in the premised of private health facilities;

- Guide the existing partnership to fully complement government public health programs in terms of coverage, standardization of services, and improvement of service quality

There are different forms of facility-based PPPs presented in the PPP legal framework. Government's decision of which model to pursue is driven largely by local health needs and environmental (e.g. political, social) factors. The threshold of risk and responsibility that the government seeks to allocate and that the private partner is willing to accept are also determining factors.[14]

6. IMPLEMENTATION OF THE ROAD MAP

FACILITY/CENTER	BASELINE	SHORT-TERM (3 YEARS)	MID-TERM (5 YEARS)	LONG-TERM (10YEARS)
STRENGTHENING EXISTING HOSPITALS				
Primary hospitals		Basic strengthening	Significant deepening (provision of surgical and obstetric/gynecologic service by General surgeons and Obstetricians & Gynecologists)	
General hospitals		Basic strengthening	Significant deepening	
Tertiary hospitals			Significant deepening	

FACILITY/CENTER	BASELINE	SHORT-TERM (3 YEARS)	MID-TERM (5 YEARS)	LONG-TERM (10 YEARS)
CENTER SPECIFIC HOSPITAL BASED INVESTMENTS				
Dialysis service (15 centers)	6 Dialysis centers	Preparatory phase for all newly established centers	Service started at least 75% of newly established centers	Fully functional 15 tertiary hospital-based dialysis centers
Cardiac centers (4 centers)	3 Cardiac centers	Preparatory phase for all newly established centers	Significant deepening (enable existing 3 Cath labs to perform open-heart surgery)	Fully functional 4 tertiary hospital-based cardiac centers
Oncology centers (7 centers)	7 Oncology centers	Significant deepening (preparatory phase service initiation of all the 7 oncology centers which are under construction	Fully functional 7 tertiary hospital-based oncology centers	Fully functional 7 tertiary hospital-based oncology centers
Transplant center (3 centers)	1 Transplant center (Renal)	Significant deepening (Strengthen existing renal transplant center in SPHMMC to make it capable of performing other transplant services– liver/lung/stem cell transplant)	Service started in 3 tertiary hospital-based transplant centers	Fully functional 3 tertiary hospital-based transplant center
IVF (2 centers)		Significant deepening (existing IVF center in SPHMMC)		Establish 1 more tertiary hospital-based IVF centers

CENTER SPECIFIC HOSPITAL BASED INVESTMENTS				
Trauma and reconstructive surgery center (6 centers)	2 centers for trauma and reconstructive surgery center	Significant deepening (existing 2 centers) -Preparatory for the newly establishing 4 centers	Service started in 6 tertiary hospital-based Trauma and reconstructive surgery center	Fully functional tertiary 6 hospital-based Trauma and reconstructive surgery center
Nuclear medicine centers (4 centers)	1 Nuclear medicine center	Significant deepening (existing center in TASH)	-Service started in 3 tertiary hospital-based nuclear medicine centers	Fully functional 4 tertiary hospital-based nuclear medicine centers
Rehabilitation center (13 centers)	9 Rehabilitation centers	Significant deepening (existing 9 centers) Preparatory phase for 4 newly establishing rehab centers	Fully functional 13 rehabilitation centers	Fully functional 13 rehabilitation centers
Toxicology /Environmental emergencies response center (5 centers)	1 toxicology center	Significant deepening (existing 1 center)	Establish 4 more tertiary hospital-based toxicology centers	Fully functional 5 toxicology centers

NOTE The number of centers written above shows the actual number that will be able to construct within the next 10 years taking into our resources into account. But the actual number of centers to meet the demand of the population is more (1 specialty or sub-specialty for every 5 million population).

7. MONITORING AND EVALUATION INDICATORS

7.1 Introduction

The national specialty/subspecialty road map has set out an ambitious plan to expand specialty and subspecialty services in the country over the coming decade. It is developed with the basic idea of increasing access to services which usually are provided in a few institutions high on the tier system which are mostly tertiary and teaching institutions. Specialty services will be brought down to general and primary hospitals and new subspecialties and specialty centers will be established in tertiary facilities. Most of these new services are currently unavailable in the country and quite a lot of patients are referred to get treatment abroad with some patients unable to attend due to the huge financial cost it incurs. Hence, the road map will pave the way for the provision of new specialized and sub-specialized services in more hospitals than currently it is. The implementation of the roadmap will be in a phased manner over the years and it is assumed that the Ethiopian population will gradually get more and more access to these services as it descends to facilities situated close to them.

The implementation of the road map will be finance intensive as the expansion requires a large amount of resource for building infrastructure, training and deploying the required human resources and equipping facilities with the necessary technologies, medical equipment, drugs, and supplies. Hence, it is necessary to closely monitor the implementation of the road map and conduct periodic evaluations to make sure the progress is as intended and to see if the desired outcomes are being achieved. Process or activity indicators are developed to monitor the availability of necessary inputs, establishment, and initiation of specialty/subspecialty services, provision of the services in a standardized manner and in a way that meets or exceeds patients'/ clients' expectations. These indicators will show areas where there are gaps in implementation which will help to quickly act upon. Similarly, outcome and impact indicators are developed to assess whether the desired outcomes are happening and to understand whether the benefits from such services are worth the investment.

A regular monitoring system will track the regular performance of key activities and milestones shown on the roadmap. A routine data which will be collected through the existing health information data collection mechanism and will be used to evaluate the implementation status of the roadmap. A regular joint and integrated supportive supervision in collaboration with partners will be conducted to identify problems early on and take immediate remedial action. Review meetings (national and regional) with implementing partners and stakeholders will be also conducted regularly. Service facilities are expected to generate reliable routine data at various levels. Operation research and documenting best practices and lessons learned also part of the routine monitoring activities.

7.2. Monitoring indicators and targets

The following sets of indicators will be used to monitor and evaluate the implementation process of the developed national specialty and subspecialty expansion program. Most of the indicators are aggregated at the regional or national level but data collection and reporting templates will be developed for use at an institutional level. Hence, institutions/healthcare facilities will also be able to measure their progress using the indicators. These indicators may not be reported frequently like HMIS indicators but majority of them should be reported every six months or annually. Hospitals may develop additional indicators as necessary to track their performance and evaluate outcomes. Similarly, additional regional-level indicators could be developed and used. However, the indicators listed here are mandatory to be collected and tracked and reported to both regional and national levels. For description of the indicators (see Annex VI).

Table 3. Monitoring indicators for specialty/subspecialty services

S.N.	Indicators	Indicator type	Baseline	Target			Reporting Frequency	Data sources
				3yr	5yr	10yr		
1	Proportion of primary hospitals declared green for staffing as per regulatory standard	Output	0	30%	55%	100 %	Annual	Reporting template /annual hospital assessment
2	Proportion of primary hospitals declared green for equipment as per regulatory standards	Output	0	30%	75%	100 %	Annual	Reporting template / annual hospital assessment
3	Proportion of general hospitals declared green for staffing as per regulatory standard	Output	0	30%	50%	100 %	Annual	Reporting template/ annual hospital assessment
4	Proportion of primary hospitals declared green for equipment as per regulatory standards	Output	0	45%	75%	100 %	Annual	Reporting template/ annual hospital assessment
5	Proportion of tertiary hospitals declared green for staffing as per regulatory standard	Output	0	25%	50%	100 %	Annual	Reporting template / annual hospital assessment

S. N.	Indicators	Indicator type	Baseline	Target			Reporting Frequency	Data sources
				3yr	5yr	10yr		
6	Proportion of tertiary Hospitals declared green for equipment as per regulatory standards	Output	0	30%	75%	100 %	Annual	Reporting template/ annual hospital assessment
7	Proportion of fully functional newly established centers	Output	0	20%	60%	100 %	Annual	Reporting template
8	Proportion of general hospitals with at least 4 sub-specialty services	Output	N/A	50%	75%	100 %	Annual	Reporting template
9	Proportion of tertiary hospitals providing telemedicine consultation services [hub]	Outcome	11%	50%	100 %	100 %	Annual	Reporting template
10	Proportion of hospitals providing telemedicine services [spoke]		6%	50%	50%	50%		
11	Number of specialty/sub-specialty centers structured using public private partnerships	Outcome	0	10	15	20	Annual	Reporting template
12	Number of clients who are referred from other countries for a specialty/subspecialty service	Outcome	N/A	10,000	500000	100,000	Biannual	Reporting template
13	Number of subspecialty/specialty services established by private and NGO firms	Outcome	N/A	5	8	10	Annual	Reporting template

S. N.	Indicators	Indicator type	Baseline	Target			Reporting Frequency	Data sources
				3yr	5yr	10yr		
14	Number of open cardiac surgeries done	Outcome	N/A	5000	20000	100000	Biannual	Reporting template
15	Number of organ transplants performed	Outcome	142(kidney transplant)	1000	10000	50000	Biannual	Reporting template
16	Number of pregnancies conceived after IVF	Outcome	N/A	5000	20000	50000	Biannual	Reporting template
17	Dialysis days per month	Outcome	N/A	50,000	200,000	500,000	Biannual	Reporting template
18	Cost incurred by medical tourism	Impact	N/A	300 m $	50 m $	5 m $	Annual	Financial reports from Banks providing foreign currency services for patients
19	Cost saved (in foreign currency) per annum through initiation of specialty/sub-specialty services in the country	Impact	N/A	5 m $	20 m $	100 m $	Annual	Reporting template

7.3. Evaluation of the Implementation of Specialty/Subspecialty Roadmap

Evaluations at key milestones in the implementation of the road map preferably at middle and end would help evaluate the progress and impact of the road map and would inform revision of the road map and development of the next phase of the road map. The evaluation can be conducted by recruiting and deploying external independent consultants or through internal consultants in collaboration with partners. The end line evaluation will mainly focus on the impact and outcome indicators. The evaluation is conducted using survey with selected facilitates of each type, clients and others. Document review, observation of facilities and review of regular monitoring data, supportive supervision and other data sources will be conducted. The following graph shows the overall monitoring and evaluation (M&E) activities.

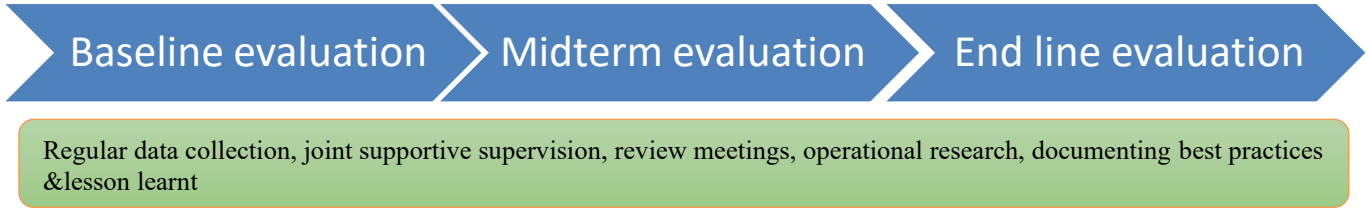

Figure 6. Overall M&E activities

8. COSTING OF NATIONAL SPECIALTY AND SUBSPECIALTY ROADMAP

8.1 Costing Approach

The approach used to estimate the cost of implementing the national specialty and subspecialty roadmap primarily involves gathering unit costs of providing those services identified in the roadmap, quantifying the number of services to be provided per year, and making assumptions regarding the current level of service availability. After gathering the necessary information, a costing tool was developed to produce estimates of the investment needed. All cost elements, unit costs, quantities, and other inputs are editable in the costing tool based on changes in the plan.

The subsections below summaries the costing activities followed in order to come up with the cost estimates given in this document.

8.1.1 Identification of cost items

The specialty services under each investment criteria were used as cost item for the costing exercise of the roadmap. For primary hospitals, these are broadly classified as specialty services which require basic strengthening and significant deepening while in general and comprehensive hospitals each type specialty services are used as cost items. On the other hand, each of the nine types of specialty centers are considered as cost elements.

8.1.2 Determine unit costs

Unit costs were gathered from various sources and include standards and reports provided by the MOH and implementing partners such as user fee study report which provides cost of service provision using normative approach. If specific costs for items were not available (e.g., if an activity has yet to be implemented in Ethiopia), the costing data were drawn from an African regional or international source and noted as such in the costing tool. In doing so, unit costs computed using normative approaches are preferred compared to those derived using expenditure approach. The unit costs of specialty services in primary, general and comprehensive hospitals, are costs to the unit costs of providing the service to a given beneficiary while the unit costs of specialty centers compiled are total startup costs in order to establish and make the respective services fully operational at one specific center. This is because the majority of specialty centers are supposed to be newly established during the roadmap implementation period. All unit costs complied are disaggregated by service inputs such as medical equipment, human resource, drug and supply, infrastructure and other overhead costs.

8.1.3 Target population and population in need

The target population and population in need of the specialty services were taken from the OneHealth tool with some adjustment on the total population size and age structure using projected data from CSA. Further additional assumptions are made on the population in need of certain specialty services by reviewing similar documents from South Africa and India.

8.1.4 Assumptions regarding the status of specialty service provision

A team of experts have evaluated the specialty and subspecialty service provision status in the country in terms of different dimensions such as medical equipment, infrastructure, human resource and drug and supply based on their experience and provided a rating of the services under each facility type and investment criteria. These rating were used as baseline coverage of the specialty services in the respective facilities. It was further assumed that after the implementation of the roadmap the status of these services provision would be 100 percent. In order to reach at 100 percent service coverage after 10 years, the coverages over the intermediate years were assumed to grow linearly and the coverages for these years were determined by interpolation.

8.1.5 Estimation of total cost

Based on the assumptions and unit cost set as above, the total cost of required to deliver the services under each facility type (primary, general and comprehensive hospitals) and investment criteria was determined as follows:

$$TC_i = UC_i * TP_i * PN_i * SC_i$$

Where TC, UC, TP, PN, and SC denote total cost, unit cost, target population, the population in need and service coverage respectively.

In the case of specialty center, the total cost will be the product of total cost of establishing one center and the respective number of specialty center to be established factored by the annual incremental change in service coverage. That is:

$$TC_i = UTC_i * NSC_i * SIC_i$$

where UTC, NSC and SIC are total unit cost of establishing a specific center, number of specialty center and annual incremental change in service coverage of that specialty center respectively.

In all cases, costs have been automatically adjusted for a base rate of inflation of 3 percent over time. The inflation rate can be adjusted to accommodate changing conditions. All costs have been calculated in local currencies and converted to U.S. dollars (USD) with the exchange rate

indicated in the tool. Depreciation of medical equipment are calculated at a rate of 10 percent while depreciation of other infrastructure is taken at 3 percent.

8.2 Costing summary of results

Using the approach stated above, the total cost of implementing the roadmap is estimated to be $18.1 Billion where $7.6, $4.1 and $6.4 Billion are the investment need in the short-term, mid-term and long-term period of the roadmap. On average, this is equivalent to a per capita expenditure of $14.35 which is about 43 percent of the total per capita health expenditure based on the 7th national health account (NHA) report. On the other hand, the average annual investment required would be more than 1.8 Billion USD. This figure is equivalent to 58 percent of the total annual health sector expenditure of the country as the latest NHA report indicated that the total health expenditure was $3.102 Billion in 2016/17.

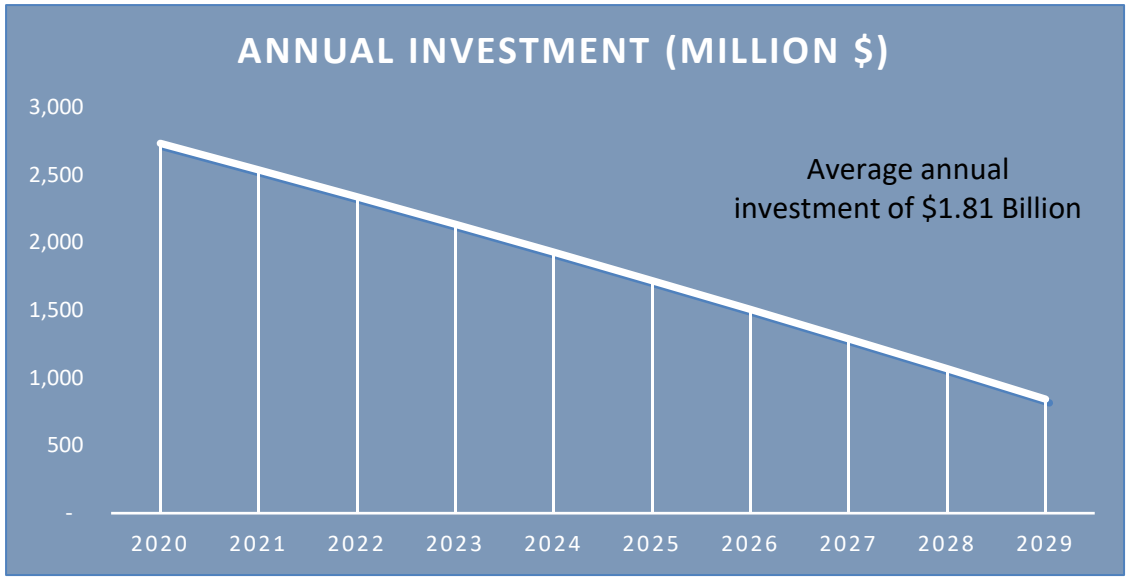

Figure 7: Annual total cost of implementing the roadmap

The short-term, medium and long-term investment requirements under each type of facility and investment criteria are shown below in the table below while the percent distribution of costs for each facility are indicated under Figure 8. The majority of the investment (58%) would be utilized by comprehensive hospitals while specialty centers, general and primary hospitals would consume about 20, 12 and 10 percent of the total investment.

Table 4. Cost estimates by facility type and investment criteria (Million $)

Facility	Investment Criteria	Short-term	Mid-Term	Long-Term	Total
Primary Hospital	Basic strengthening	349.62	172.93	206.08	728.6
	Significant deepening	532.76	263.52	314.02	1,110.3
General Hospital	Basic strengthening	560.06	277.02	330.11	1,167.2
	Significant deepening	496.98	245.82	292.93	1,035.7
Comprehensive Hospital	Significant deepening	5,044.28	2,495.01	2,973.20	10,512.5
Specialty Center	Infertility	10.49	9.56	34.28	54.3
	Cardiac	34.08	31.88	116.91	182.9
	Plastic surgery	37.70	36.29	136.08	210.1
	Oncology	275.43	265.16	994.29	1,534.9
	Dialysis	115.22	118.21	464.12	697.6
	Nuclear medicine	38.61	37.17	139.38	215.2
	Rehabilitation	77.15	74.28	278.52	429.9
	Transplant	26.87	28.57	114.85	170.3
	Toxicology	7.64	7.84	30.79	46.3
Total Cost		7,606.90	4,063.25	6,425.55	18,095.71

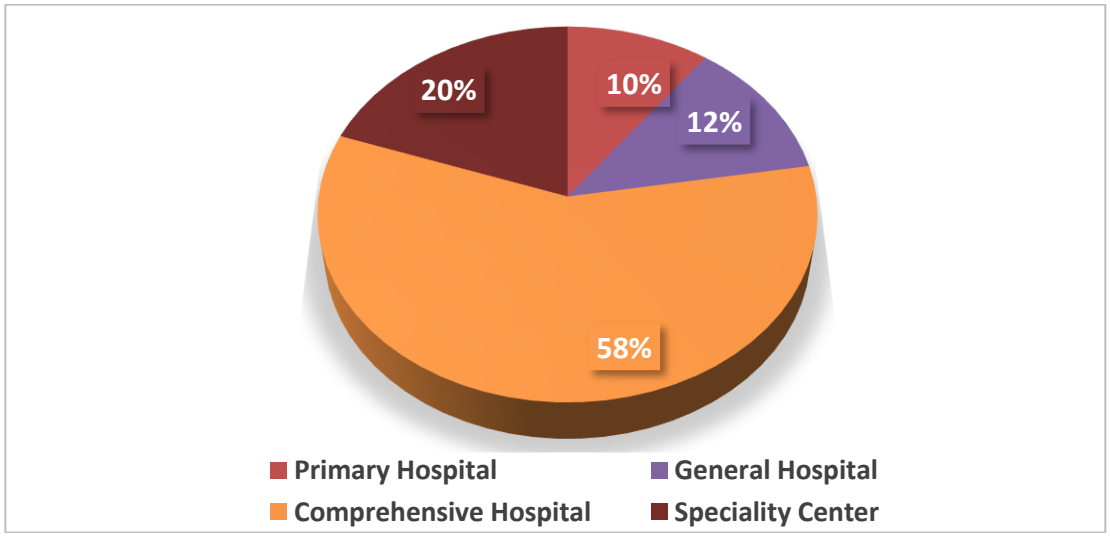

Figure 8: Distribution of total cost under facility type

When we look at the breakdown of estimated costs, infrastructure, medical equipment, human resource, drug and supply and overhead cost would on average constitute about 7, 37.7, 31.7, 12.1 and 11.5 percent of the total investment respectively. Note that the overhead costs primary, general and comprehensive hospitals include the cost of acquiring telemedicine equipment and software licenses in addition to the other miscellaneous costs required to provide the intended services. On the other hand, the cost of the infrastructure of primary hospitals includes the investment required to upgrade the existing type-A health center to primary hospitals.

Table 5: Breakdown of estimated costs (Million $)

Facility	Investment Criteria	INF	ME	HR	DS	OH	Total
Primary Hospital	Basic strengthening	143.54	165.57	213.59	86.21	119.72	728.63
	Significant deepening	218.73	252.30	325.46	131.37	182.43	1,110.30
General Hospital	Basic strengthening	68.86	379.62	365.49	149.78	203.45	1,167.20
	Significant deepening	61.11	336.86	324.32	132.91	180.53	1,035.73
Comp Hospital	Significant deepening	641.26	3,787.01	3,396.93	1,401.54	1,285.75	10,512.49
Specialty Center	Infertility	3.81	22.16	22.81	4.43	1.11	54.33
	Cardiac	7.90	99.98	54.99	15.00	5.00	182.87
	Plastic surgery	11.72	120.85	76.18	0.98	0.33	210.07
	Oncology	24.40	1,057.33	226.57	151.05	75.52	1,534.87
	Dialysis	27.26	295.55	321.61	42.51	10.63	697.56
	Nuclear medicine	17.04	105.36	66.42	21.07	5.27	215.16
	Rehabilitation	25.39	102.72	259.03	34.24	8.56	429.94
	Transplant	11.24	89.93	56.69	7.94	4.50	170.29
	Toxicology	6.69	15.46	19.49	3.86	0.77	46.28
Total Cost		1,269	6,831	5,730	2,183	2,084	18,096

Note: INF: Infrastructure; ME: Medical Equipment; HR: Human Resource; DS: Drug and Supply; OH: Overhead costs

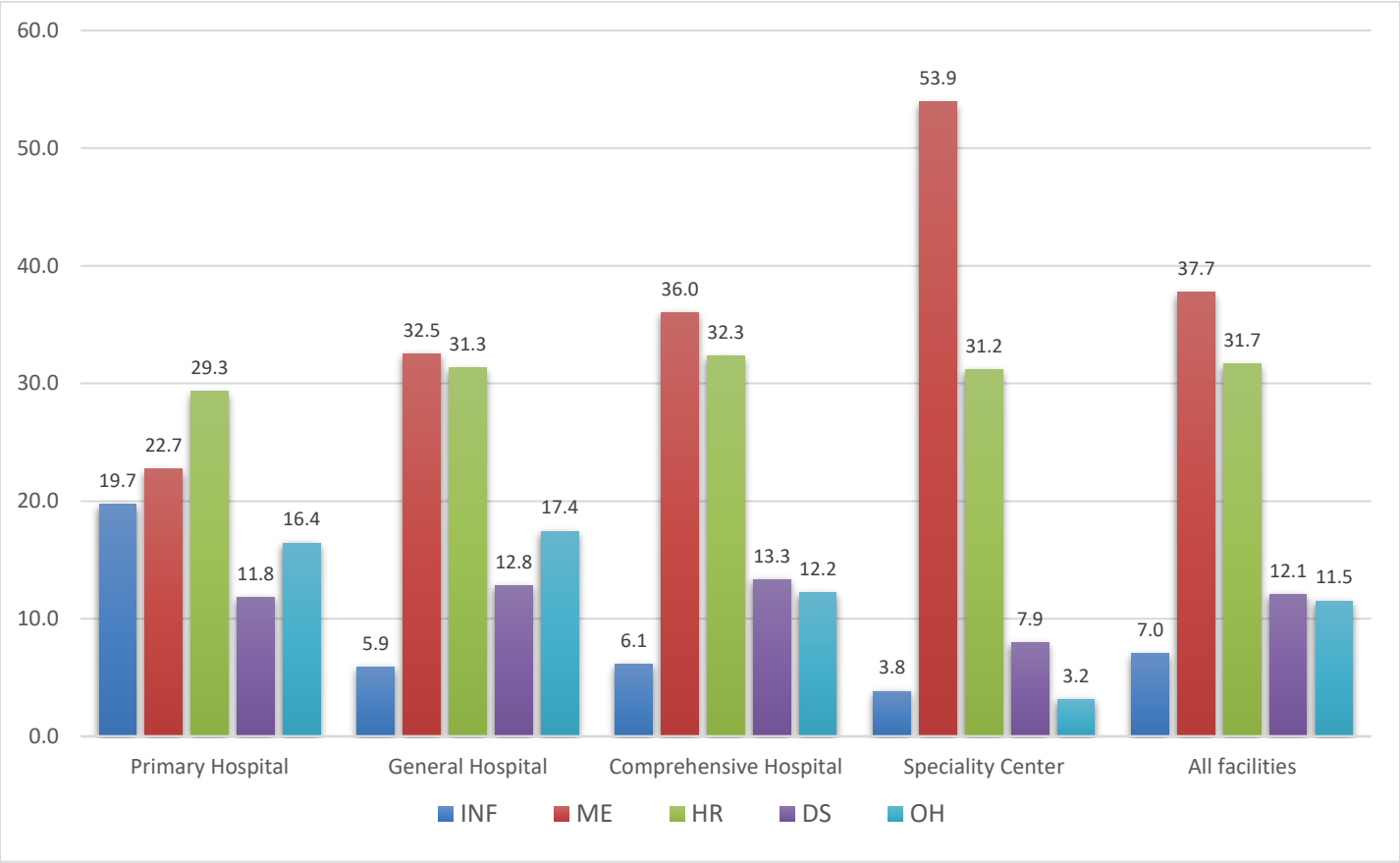

Figure 9: Distribution of costs by facility and input types

8.3 Investment Scenarios

Two investment scenarios are considered in order to see the possible options for financing the roadmap. The potential funding sources could be government, donors/NGOs, private sector including household, and public-private partnership (PPP). The mix of these four sources would produce different scenarios. In this regard, it's expected that the private sector and PPP modalities should have greater contribution as they are more sustainable, and the government has limited capacity. The first scenario gives greater weight to private and PPP while the second scenario considers increased government and donor funding and decreased private and PPP funding.

Table 6: Investment Scenarios

Source of finance	Scenario 1			Scenario-2		
	Expected investment (Million $)			Expected investment (Million $)		
	Share	Total	Annual	Share	Total	Annual
Government	10%	1,809.6	181.0	20%	3,619.1	361.9
Donor	20%	3,619.1	361.9	30%	5,428.7	542.9
Private	30%	5,428.7	542.9	20%	3,619.1	361.9
PPP	40%	7,238.3	723.8	30%	5,428.7	542.9
Total	100%	18,095.7	1,809.6	100%	18,095.7	1,809.6

The two scenarios together can give us the information that how each source of funds could possibly range in financing the roadmap. For instance, government funding could range from $1.81 billion to $3.62 billion if its contribution varies from 10 to 20 percent. Similar information for the other sources of financing can be extracted from the figure below.

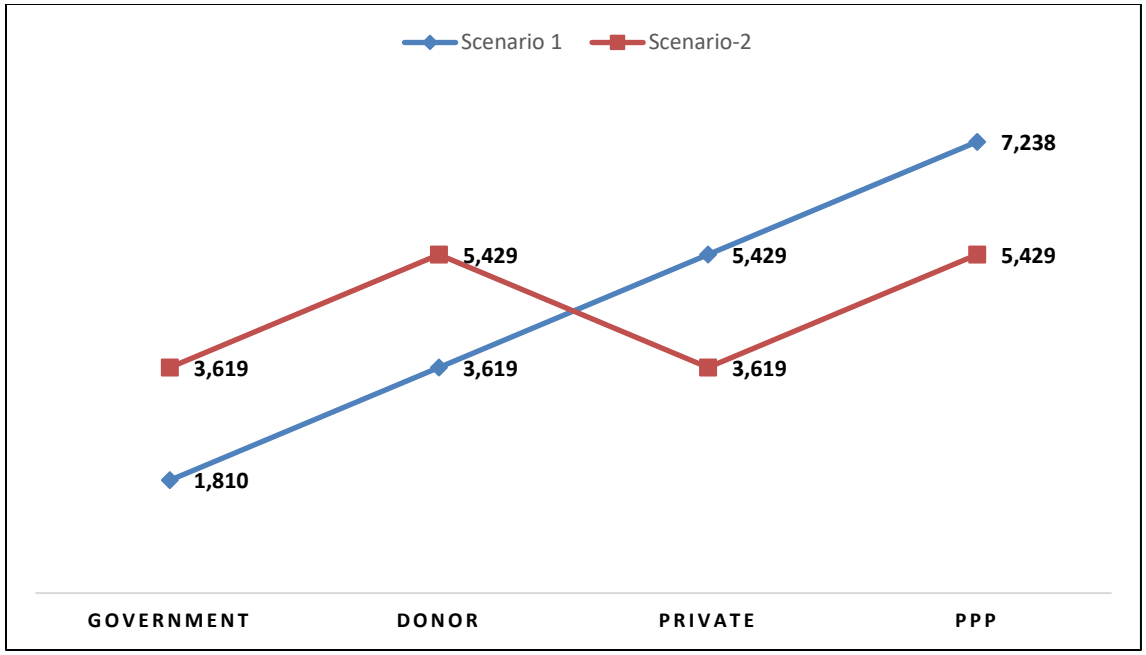

Figure 10: Minimum and maximum investment required (Million $) based on scenario 1 & 2

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10. ANNEX

Annex I. Specialty and sub-specialty services' availablity survey report

This table is a summary of findings conducted through a rapid assessment of hospital representatives and the information provided has not been validated.

	Areas of Specialty Services	No. of Hospitals	List of Hospitals with Specialty/sub-specialty Services
1	Dialysis	11	Armed Forces, Black Lion, Menelik, St. Paul, St. Peter, Zewditu Memorial Hospital (ZMH); Gondar, Felege Hiwot Referral Hospital (FHRH); Ayder; Jimma; Jigjiga
2	ECSL	5	Jimma; Nekemt; Black Lion, St. Paul, Ayder,
3	Laminectomy	13	Jimma, Adama; Tibebe Ghion; Hiwot Fana; Armed Forces; Black Lion, ALERT, St. Paul, ZMH, Ayder; Jigjiga; Tirunesh Beijing Hospital (TBH); Dessie;
4	Electromyography	7	Jimma; Gondar; TBH; Dessie; St. Paul, Black Lion; Ayder
5	Arthroscopy	2	Jimma; Nekemt; Black Lion; St Paul;
6	CARM/Fluoroscopy	6	Jimma; Nekemt; Gondar; FHRH; Armed Forces; Black Lion; St Paul; Ayder
7	Chemotherapy	7	Jimma; Adama; Gondar; FHRH; Debre Birhan Referral Hospital; Dessie; Armed Forces; St Paul; Black Lion; Zewditu MH Hawassa; Ayder
8	IVF	1	St Paul
9	Cardiac surgery	1	Black Lion
10	Cardiothoracic surgery	4	Black Lion; St Paul; Menelik; Ayder,
11	Open heart surgery	1	Black Lion
12	Bronchoscopy	4	Gondar; Black Lion; St. Paul; Ayder;
13	Interventional pulmonology	2	Black Lion; Ayder

14	Right heart catheterization	1	Black Lion; St. Paul
15	Sleep medicine/Allergy	0	0
16	Infectious Disease Subspecialty	4	Gondar; Armed Forces; Black Lion; St. Peter
17	Endoscopic retrograde choleangiocreatography (ERCP)	2	Gondar; Black Lion; St. Paul
18	Hepatobiliary surgery	27	
19	Endoscopic biopsy	6	Gondar; Nekemt; Army Forces; Black Lion; Yekatit 12; St. Paul; Ayder;
20	Rehabilitation	28	
21	Plastic surgery	9	Jimma; Hawassa; Ayder; ALERT; Yekatit 12; Black Lion; St. Peter; St. Paul; Bulehora
22	Dermatology	35	
23	Bone marrow biopsy	10	Jimma; Adama; Hiwot Fana; Armed Forces; Worabe; Hawassa; Black Lion; ZMH; St. Paul Ayder
24	Biopsy	37	
25	Emergency and critical care	73	
26	ICU	50	
27	Neonatology	79	
28	Pulmonary critical care physician	8	Gondar, FHRH; Armed Forces, Black Lion, St Paul; Ayder; Bona; Tirunesh Beijing Hospital (TBH);
29	Retinal surgery	12	Jimma, Adama; Debre Markos; Hawassa; Aksum, Adigrat GH; Bona; Menelik; Yirgalem GH; Hiro; Bisdimo; Shashemene; Debre Markos
30	Tempro mandibular joint reconstruction	8	Gondar, Tibebe Ghion; Nekemt; Black Lion; Ayder; Sawla; Adigrat GH; Suhul General Hospital; Shire; Sawula

Annex II. Medical device availability survey report

Type of M/E	Number of hospitals with M/E and report the data	Number of M/Es (from reporting hospitals only)	Number of hospitals having M/E(Yes), but who did not report the quantity
Dialysis machine	12	67	2
ECSL machine	2	2	0
EEG machine	12	13	4
EMG	4	3	1
Laminectomy set	13	16	5
Arthroscope	3	0	3
Fluoroscope	9	7	4
Hysteroscope	5	4	1
Laparoscope	11	14	4
CatLab	6	6	1
Bronchoscope	7	12	2
Spirometer	6	6	1
Colonoscope	9	8	3
Endoscope	13	13	4
Physiotherapy	30	11	25
Graft blade	12	3	11
Bone marrow biopsy set	10	8	5

Microtome	11	12	5
Mechanical ventilator	42	134	13
Ophthalmoscope	37	36	16
Retinoscope	22	13	12
Slit lamp	56	44	34

Annex III. Human resources mapping survey report

Type of Specialty-subspecialty	No. of Hospitals having specialist	Reported number of available HR (Aggregate number)	List of hospitals with data on HR	Hospitals not reporting data on HR
Urologist	12	26	10	2
Trauma orthopedic surgeon	25	36	20	5
Oncologist	10	15	9	1
Infertility subspecialist	4	7	3	1
Feto- maternal specialty	4	2	2	2
Family planning specialist	1	1	1	0
Cardiac surgeon	1	8	1	0
Cardiothoracic surgery	5	10	5	0
Open heart surgeon	1	3	1	0
Pulmonologist	6	13	5	1
Infectious Disease subspecialist	4	4	2	2
Gastroenterologist	11	21	9	2
Nephrologist	8	14	7	1
Psychiatrist	19	47	15	4
Addiction rehab subspecialist	3	1	1	2
Forensic psychiatrist	3	3	2	0

Pediatric psychiatrist	2	1	1	1
Plastic surgeon	9	13	8	1
Dermatologist	26	54	22	6
Hematologist	5	8	4	1
Neurologist	15	38	14	1
Emergency and critical care specialist	16	30	16	0
Internist	3	3	2	1
Neonatologist	9	9	7	2
Anesthesiologist	12	24	12	0
Pulmonary critical care physician	3	8	2	1
Ophthalmologist	33	56	21	12
Maxilo facial surgeon	12	12	9	3
Hepatho biliary surgeon	6	8	4	2
Pathologist	28	46	21	7

Annex IV. SWOT Analysis

Perspective	Leadership and governance
Strength	Emphasis on quality, curative and rehabilitative care on the revised policy
	Encouraging commitment toward training, service expansion and construction of tertiary health facilities
	Development of various roadmaps, protocols, guidelines, and standards
	Presence of dedicated structure at MoH
Weakness	Absence and delayed decisions of comprehensive roadmaps and strategic plan
	Loss of institutional memories and high leadership turnover
	Dysfunctional governing board
Opportunity	Presence of professional societies, local and international partners
	Growing service demanding communities
	Presence of data capturing culture/practice
Threats	Role confusion between MoH and MoSHE
	Diseases epidemiology shift; political instability

Perspective	Service delivery
Strength	Presence of PPP policy
	Presence of selected standard of care &establishment of new services such as renal care, cardiac care.
	Presence of service quality assurance strategy, service standards, guidelines
	Presence of 31 Teaching/Tertiary, 115 General hospital, 260 Primary hospital, 3678 Health center, 17,162 HP and more than 4000 private facilities.
Weakness	Poor referral system, High number of referrals abroad
	Poor implementation of key national strategies such as Saving lives through safe surgery, National quality strategy.

	Inadequate and Inconvenient service delivery areas,
	Shortage of basic utilities such as light, water, sewerage system
	Insufficient number of beds for specialty and subspecialty care (e.g. only 20 beds for burn until AaBET burn center established) Bed occupancy rate (2018)
	Patients not seen same day More than 24 stays in ER, Average length of stay, Inpatient mortality, NICU death
Opportunity	Presence of local and international partners, private facilities that provide specialty care
	Emerging medical technology
	Growing private investors' interests in medical business
	Presence of diversified experts living aboard
Threats	Deteriorating public trust
	Rural to urban migration
	Minimum community awareness toward disease prevention and health promotion
	Incremental life expectancy
	Triple burden of disease (communicable diseases, NCD, and trauma)

Perspective	**Health workforce**
Strength	Presence of HRH strategy, multiple training centers
	A growing number of health professionals, Direct subspecialty training program from undergraduate
	Doctor to population ratio is 1 per 10 000 (WHO,2017)
	Allowing postgraduate programs for self- sponsors and private facilities graduates
Weakness	The training focused more on numbers than quality, More emphasis given to undergraduates
	The high attrition rate, No incentive and motivation schemes
	Training programs are not opened based on scientific evidence and needs of the country

	Absence of auxiliary staffs training curriculums in selected disciplines
	Poor effort in engaging professional societies on professional Development
Opportunity	Global commitment and interest to achieve UHC goals through HRH
	Promising interests of local and international partners
Threat	Declining on employability, Low competency of health professionals
	Absence of clear career development structure for all health professionals

Perspective	**Pharmaceutical, medical equipment, and technology**
Strength	Presence of essential drug lists (national guideline)
	Pharmaceuticals and medical equipment registration time shortened
	Pharmaceuticals and medical equipment use policy, Improving supply
	Use of technology for information sharing, Development, and utilization of health commodity information management system
	Opening of community-based model pharmacies
Weakness	Inefficient logistics supply chain management
	A severe shortage of basic medical equipment, essential drugs, laboratory reagents, and supplies
	Inadequate and inefficient biomedical engineering services
Opportunity	The growing interest of private investors interest to invest in pharmaceutical industries
Threat	Inadequate number of private investors, Exaggerated price setting by private importers
	The lengthy and stringent bidding process
	Shortage of foreign currency

Perspective	Health financing
Strength	Presence of health care financing policy, CBHI
	Establishment of private wing services
	Presence of IFMIS and other financial technology
Weakness	Poor implementation of health care financing policy, Inefficient financial utilization and management system
	Unrevised fee for service in federal hospitals
Opportunity	The private insurance company providing health insurance schemes, Donor funding
Threat	Inadequate budget allocation for the health sector

Perspective	Health information
Strength	Implementation of HMIS and DHIS-2, the due emphasis given to Health Information on HSTP
	Presence of various standard reporting formats, indicators, and registries
	Presence of research and knowledge translation wing
Weakness	Majority of current indicators did not capture key service performances related to specialty and subspecialty cares
	Data incompleteness and Under and over-reporting
	Failure to fully implement e-MR, Inadequately trained personnel
	Poor feedback mechanism
	Poor data utilization for decision and service improvement
	Absence of incentives for research
Opportunity	Presence of full-fledged training on health informatics, HIT, M&E
	Technological advancement in the health sector both locally and globally
	Significant supports, health, and health-related research from local and international partners
	Presence of technology institutes and ministry
Threat	IT infrastructure and internet access

Annex V. Stakeholder Analysis

The involvement of all stakeholders is necessary for the successful implementation of various aspects of this roadmap. The Federal Ministry of Health, international organizations, development partners, non-Governmental organizations, specialty-subspecialty societies, Faith-based-organizations (FBOs) and Civil Society Organizations (CSOs), communities and families all share a responsibility to ensure fulfillment of citizens' rights to adequate specialty-subspecialty care. Partners need to work together to achieve the objectives of this roadmap by information sharing, adopting innovative approaches, avoiding conflict of interest and duplication of efforts to maximize the use of available resources.

Stakeholders	Behaviors we desire	Their needs	Resistance issues	Institutional response
Community	• Timely seek health care, • Comply with treatment and advice; • Participation, engagement Ownership and Healthy lifestyle	• Access to health information and service empowerment, • quality of health, • care stewardship	• Dissatisfaction, • Opting for unsafe alternatives, • Underutilization, • Disengagement	• Community mobilization, • Ensure participation, • Quality and equitable service and information
Parliaments, Prime Minister's Office, Council of Ministers	Ratification of Policy proclamation,	• Proclamations, policies, etc. • Equity& quality	• Administrative measures Organizational Restructuring	• Put in place strong M&E system and comprehensive capacity building mechanisms
Regional Line Ministries	Inter-sectorial collaboration	Evidence-based plans; reports	• Disappointment, • Considering specialty-	• Collaboration, • Transparency,
Education, Finance, Construction, Environmental protection, etc.)	Consider health related to specialty-subspecialty care in all policies and strategies	• Effective and efficient use of resources and coordination, • Technical support	Subspecialty care as low priority	Advocacy
Health professional training institutions	• Knowledgeable, skilled and ethical specialty-subspecialty health professionals produced, • Maintenance of quality health care ensured, • Operational and outcome research conducted and disseminated	• Technical, policy support, guidance	• New curriculum revision, • monitoring, and evaluation, • Unidentified community health problems	Policy and leadership support
Development Partners	Harmonized and aligned	• Financial system accountable,	• Participation • More financing	• Government leadership, • Transparency,

		transparent, • Fragmentation efficient and effective Involved in planning, implementation and M&E	technical support, • place specialty-subspecialty care on the global public health agenda, • capacity building, • social harmonization, • High transaction cost, • Inefficiency and ineffective	• efficient resource use, • building financial management capacity
CSOs, specialty-subspecialty societies and other Professional Associations	• Harmonization & alignment • Resource &technical assistance • Licensing and accreditation • Promote professional code of conduct • Partnership	• Involvement in planning, implementation & M&E Participation • Transparency Direction	• Dissatisfaction, • Fragmentation	Memorandum of understanding, Good Governance leadership and Capacity building, Empowerment
Diaspora, Expat and Private for-profit	• Quality of care; • Client-oriented; • Knowledge and technology transfer, • Resource Mobilization	• Conducive environment, • Transparency, • Accountability	• Dissatisfaction, Mistrust, Rent-seeking	• Dialogue, • Knowledge sharing system, • Specialty- subspecialty care guideline
Health professionals	• Commitment, • Compassionate Respectful and Caring, • Participation, • Continuous professional development	• Conducive environment, • Transparency, • Direction, • Incentive, • Capacity building	• Dissatisfaction, • Unproductive, • Attrition	• Engagement, • Motivation package, • Leadership and good governance, • Capacity Building

Annex VI. Indicators for specialty/subspecialty services

Description of monitoring and evaluation indicators

S.N.	Indicators	Importance and scope	Formula
1.	Proportion of primary hospitals declared green for staffing as per regulatory standard	This indicator will help to monitor the staffing of primary hospitals in accordance with the regulatory standard.	[number of primary hospitals declared green for staffing as per the regulatory standard] ÷ [total number of primary hospitals in the country] x 100
2.	Proportion of primary Hospitals declared green for equipment as per regulatory standards	This indicator will help to monitor the equipping of primary hospitals in accordance with the regulatory standard.	[number of primary hospitals declared green for equipment as per the regulatory standard] ÷ [total number of primary hospitals in the country] x 100
3.	Proportion of general hospitals declared green for staffing as per regulatory standard	This indicator will help to monitor the staffing of general hospitals in accordance with the regulatory standard.	[number of general hospitals declared green for staffing as per the regulatory standard] ÷ [total number of general hospitals in the country] x 100
4.	Proportion of primary Hospitals declared green for equipment as per regulatory standards	This indicator will help to monitor the equipping of general hospitals in accordance with the regulatory standard.	[number of general hospitals declared green for equipment as per the regulatory standard] ÷ [total number of general hospitals in the country] x 100
5.	Proportion of tertiary hospitals declared green for staffing as per regulatory standard	This indicator will help to monitor the staffing of tertiary hospitals in accordance with the regulatory standard.	[number of tertiary hospitals declared green for staffing as per the regulatory standard] ÷ [total number of tertiary hospitals in the country] x 100
6.	Proportion of tertiary Hospitals green for equipment as per regulatory standards	This indicator will help to monitor the equipping of tertiary hospitals in accordance with the regulatory standard.	[number of tertiary hospitals declared green for equipment as per the regulatory standard] ÷ [total number of tertiary hospitals in the country] x 100
7.	Proportion of fully functional newly established centers	This indicator measures the functionality of newly built centers over the years.	[number of fully functional newly established specialty centers] ÷ [total number of planned specialty centers] x 100

8.	Proportion of general hospitals with at least 4 sub-specialty services	This indicator measures the subspecialty service availability in general in general hospitals.	[number of general hospitals with at least four subspecialty services] ÷ [total number of general hospitals in the country]X100
9.	Proportion of tertiary hospitals providing telemedicine consultation services [hub]	This indicator helps monitor the proportion of tertiary hospitals providing telemedicine consultation services.	[number of tertiary hospitals providing telemedicine consultation service] ÷ [total number of tertiary hospitals in the country]X100
10.	Proportion of hospitals with telemedicine services [spoke]	This indicator helps monitor the proportion of hospitals providing telemedicine services.	[number of hospitals with at least one telemedicine service] ÷ [total number of hospitals in the country] X 100
11.	Number of specialty/sub-specialty services/centers structured using public private partnerships	This indicator will help assess and/or monitor the partnership and the resulting joint venture on specialty and subspecialty services.	Number of specialty/sub-specialty centers structured using public private partnerships
12.	Number of clients who are referred from other countries for a specialty/subspecialty service	This indicator will help monitor the number of patients brought in for treatment from abroad as a result of the implementation of the roadmap.	Number of clients who are referred from other countries for a specialty/subspecialty service
13.	Number of specialty/subspecialty services established by private and NGO firms	This indicator will help monitor the engagement of private organizations and NGOs in expanding specialty and subspecialty services as per the recommendation of the national roadmap.	Number of specialty/subspecialty services established by private and NGO firms
14.	Number of open cardiac surgeries done	The is an outcome indicator that measures provision of cardiac surgery. It is expected to increase overtime and decrease patient waiting list.	
15.	Number of organ transplants performed	This outcome indicator measures provision of organ transplants. It includes renal, lung, liver and stem cell.	[number of renal transplants + number of lung transplants + number of liver transplants + number of stem cell transplants]

16.	Number of pregnancies conceived after IVF	This is another outcome measure intended to track the provision of IVF services in the country.	
17.	Dialysis days per month	This indicator will measure the total number of dialysis procedures done in a month.	[sum total of the number of dialysis procedures done in the month] ÷ [30]
18.	Cost incurred for medical tourism	This indicator estimates the amount of foreign currency spent for treatment abroad. This cost should decline overtime as more services are established and patients are aware of the availability of services in country.	Total estimated cost of patients referred abroad
19.	Cost saved per annum through initiation of specialty/sub-specialty services in the country	This indicator will help estimate the amount of foreign currency saved due to provision of specialty and subspecialty services in country without the need to refer abroad.	[total estimated cost of specialty/sub-specialty services if the patients were to be referred abroad – total local cost estimate of services in foreign currency]