

Learning Objectives

1. List and define the components of a well-functioning health system
2. Explain the relationship between the WHO's components of a well-functioning health system, the 4S model, and the 5S-5C-5M models
3. Explain the relationship between the surgical system and the overall health system
4. Define health systems strengthening and explain why it is an important intervention in LMICs

Materials

Read

1. WHO, “Key Components of a Well-Functioning Health System” (pages 2-3)
2. WHO, “[Everybody’s Business: Strengthening Health Systems to Improve Health Outcomes](#)”, the **Executive Summary**, the **Introduction**, and **Health System Challenges and Opportunities** (pages 4-18)
3. Bitton, “The 5S-5M-5C Schematic” (pages 19-22)
4. Farmer, “Diary – Ebola” (pages 23-29)
5. Bill Gates, “Responding to Covid-19” (pages 30-32)
6. DCP3, Essential Surgery volume, “Chapter 12: Organization of Essential Services and the Role of First-Level Hospitals” (pages 33-50)
7. WHO, “[Surgical Care Systems Strengthening](#): Part 2–Case Studies –Vietnam” (pages 51-57)

Watch

1. Components of Health Care Systems Module summary video

Things to Think About

- How do you define “health system”? How does this differ from the World Health Organization’s definition?
- Do you think there is anything missing from the WHO components of a health system?
- How do surgical systems relate to a health system? Can you have one without the other?
- What is health systems strengthening? Can you name any examples of successful and unsuccessful health systems strengthening projects?



Key components of a well functioning health system

A well functioning health system responds in a balanced way to a population's needs and expectations by:

- improving the health status of individuals, families and communities
- defending the population against what threatens its health
- protecting people against the financial consequences of ill-health
- providing equitable access to people-centred care
- making it possible for people to participate in decisions affecting their health and health system.

Without strong policies and leadership, health systems do not spontaneously provide balanced responses to these challenges, nor do they make the most efficient use of their resources. As most health leaders know, health systems are subject to powerful forces and influences that often override rational policy making. These forces include disproportionate focus on specialist curative care, fragmentation in a multiplicity of competing programs, projects and institutions, and the pervasive commercialization of health care delivery in poorly regulated systems. Keeping health systems on track requires a strong sense of direction, and coherent investment in the various building blocks of the health system, so as to provide the kind of services that produce results.

Leadership and governance

Each country's specific context and history shapes the way leadership and governance is exercised, but common ingredients of good practice in leadership and governance can be identified. These include:

- Ensuring that health authorities take responsibility for steering the entire health sector (not merely public sector service delivery); and for dealing with future challenges (including unanticipated events or disasters) as well as with current problems
- Defining, through transparent and inclusive processes, national health policies, strategy and plan that set a clear direction for the health sector, with:
 - A formulation of the country's commitment to high level policy goals (health equity, people-centeredness, sound public health policies, effective and accountable governance)
 - A strategy for translating these policy goals into its implications for financing, human resources, pharmaceuticals, technology, infrastructure and service delivery, with relevant guidelines, plans and targets
 - Mechanisms for accountability and adaptation to evolving needs

- Effective regulation through a combination of guidelines, mandates, and incentives, backed up by legal measures and enforcement mechanisms;
- Effective policy dialogue with other sectors.
- Mechanisms and institutional arrangements to channel donor funding and align it to country priorities.

Health information systems

Good governance is only possible with good information on health challenges, on the broader environment in which the health system operates, and on the performance of the health system.

This specifically includes timely intelligence on:

- Progress in meeting health challenges and social objectives (particularly equity), including but not limited to household surveys, civil registration systems and epidemiological surveillance
- Health financing, including through national health accounts and an analysis of financial catastrophes and of financial and other barriers to health services for the poor and vulnerable
- Trends and needs for HRH; on consumption of and access to pharmaceuticals; on appropriateness and cost of technology; on distribution and adequacy of infrastructure
- Access to care and on the quality of services provided.

This, in turn, requires a variety of institutional mechanisms:

- A national monitoring and evaluation plan that specifies core indicators (with targets), data collection and management, analyses and communication and use
- Arrangements to make information accessible to all involved, including communities, civil society, health professionals and politicians

Health financing

Health financing can be a key policy instrument to improve health and reduce health inequalities if its primary objective is to facilitate universal coverage by removing financial barriers to access and preventing financial hardship and catastrophic expenditure. The following can facilitate these outcomes:

- A system to raise sufficient funds for health fairly
- A system to pool financial resources across population groups to share financial risks
- A financing governance system supported by relevant legislation, financial audit and public expenditure reviews, and clear operational rules to ensure efficient use of funds

Human resources for health

The health workforce is central to achieving health. A well performing workforce is one that is responsive to the needs and expectations of people, is fair and efficient to achieve the best outcomes possible given available resources and circumstances. Countries are at different stages of development of their health workforce but common concerns include improving recruitment, education, training and distribution; enhancing productivity and performance; and improving retention. This requires:

- Arrangements for achieving sufficient numbers of the right mix (numbers, diversity and competencies)
- Payment systems that produce the right kind of incentives
- Regulatory mechanisms to ensure system wide deployment and distribution in accordance with needs
- Establishment of job related norms, deployment of support systems and enabling work environments
- Mechanisms to ensure cooperation of all stakeholders (such as health worker advisory groups, donor coordination groups, private sector, professional associations, communities, client/consumer groups).

Essential medical products and technologies

Universal access to health care is heavily dependent on access to affordable essential medicines, vaccines, diagnostics and health technologies of assured quality, which are used in a scientifically sound and cost-effective way. Economically, medical products are the second largest component of most health budgets (after salaries) and the largest component of private health expenditure in low and middle income countries. Key components of a functioning system are:

- A medical products regulatory system for marketing authorization and safety monitoring, supported by relevant legislation, enforcement mechanisms, an inspectorate and access to a medical products quality control laboratory
- National lists of essential medical products, national diagnostic and treatment protocols, and standardized equipment per levels of care, to guide procurement, reimbursement and training
- A supply and distribution system to ensure universal access to essential medical products and health technologies through public and private channels, with focus on the poor and disadvantaged
- A national medical products availability and price monitoring system
- A national programme to promote rational prescribing.

Service delivery

Health systems are only as effective as the services they provide. These critically depend on:

- Networks of close-to-client primary care, organized as health districts or local area networks with the back-up of specialized and hospital services, responsible for defined populations
- Provision of a package of benefits with a comprehensive and integrated range of clinical and public health interventions, that respond to the full range of health problems of their populations, including those targeted by the Millennium Development Goals
- Standards, norms and guidance to ensure access and essential dimensions of quality: safety, effectiveness, integration, continuity, and people -centeredness
- Mechanisms to hold providers accountable for access and quality and to ensure consumer voice.

EVERYBODY'S BUSINESS

STRENGTHENING HEALTH SYSTEMS TO IMPROVE HEALTH OUTCOMES

WHO'S FRAMEWORK FOR ACTION



LIST OF ABBREVIATIONS

ACRONYM	FULL TITLE
AU	African Union
CCS	WHO Country Cooperation Strategies
EURO	WHO, Regional Office for Europe
GATS	General Agreement Trade in Services
GAVI	Global Alliance on Vaccines Initiative
GAVI-HSS	GAVI Health System Strengthening
GDP	Gross Domestic Product
GHPs	Global Health Partnerships
GOARN	Global Outbreak And Response Network
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
HSAN	Health Systems Action Network
IMAI	Integrated Management of Adult Illness
IMCI	Integrated Management of Child Illness
LHW	Lady Health Worker
MDG	Millennium Development Goal
MOH	Ministry of Health
MTSP	Medium-Term Strategic Plan
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
OECD	Organisation for Economic Co-operation and Development
SARS	Severe Acute Respiratory Syndrome
TB	Tuberculosis
TTR	Treat, Train and Retain initiative
UN	United Nations
UNITAID	International Drug Purchasing Facility
WHO	World Health Organization

EXECUTIVE SUMMARY

It will be impossible to achieve national and international goals – including the *Millennium Development Goals* (MDGs) – without greater and more effective investment in health systems and services. While more resources are needed, government ministers are also looking for ways of doing more with existing resources. They are seeking innovative ways of harnessing and focusing the energies of communities, non-governmental organizations (NGOs) and the private sector. They recognize that there is no guarantee the poor will benefit from reforms unless they are carefully designed with this end in mind. Furthermore, they acknowledge that only limited success will result unless the efforts of other sectors are brought to bear on achieving better health outcomes. All these are health systems issues.

The World Health Organization (WHO) faces many of the same challenges faced by countries: making the health system strengthening agenda clear and concrete; creating better functional links between programmes with mandates defined in terms of specific health outcomes and those with health systems as their core business; ensuring that the Organization has the capacity to respond to current issues and identify future challenges; and ensuring that institutional assets at each level of the Organization (staff, resources, convening power) are used most effectively.

The primary aim of this Framework for Action is to clarify and strengthen WHO's role in health systems in a changing world. There is continuity in the values that underpin it from its constitution, the Alma Ata Declaration of Health For All, and the principles of Primary Health Care. Consultations over the last year have emphasized the importance of WHO's institutional role in relationship to health systems. The *General Programme of Work (2006-2015)* and *Medium-term Strategic Plan 2008-2013* (MTSP) focus on what needs to be done. While reaffirming the technical agenda, this Framework concentrates more on how the WHO secretariat can provide more effective support to Member States and partners in this domain.

There are four pillars to WHO's response, each with its set of strategic directions:

A single Framework with six building blocks

A key purpose of the Framework is to promote common understanding of what a health system is and what constitutes health systems strengthening. Clear definition and communication is essential. If it is argued that health systems need to be strengthened, it is essential to be clear about the problems, where and why investment is needed, what will happen as a result, and by what means change can be monitored. The approach of this Framework is to define a discrete number of "building blocks" that make up the system. These are based on the functions defined in World health report 2000. The building blocks are: **service delivery; health workforce; information; medical products, vaccines and technologies; financing; and leadership and governance (stewardship).**

The building blocks serve three purposes. First, they allow a definition of desirable attributes – what a health system should have the capacity to do in terms of, for example, health financing. Second, they provide one way of defining WHO's priorities. Third, by setting out the entirety of the health systems agenda, they provide a means for identifying gaps in WHO support.

While the building blocks provide a useful way of clarifying essential functions, the challenges facing countries rarely manifest themselves in this way. Rather, they require a more integrated response that recognizes the inter-dependence of each part of the health system.

THE SIX BUILDING BLOCKS OF A HEALTH SYSTEM

- Good **health services** are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources.
 - A well-performing **health workforce** is one that works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances (i.e. there are sufficient staff, fairly distributed; they are competent, responsive and productive).
 - A well-functioning **health information** system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status.
 - A well-functioning health system ensures equitable access to essential **medical products, vaccines and technologies** of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use.
 - A good **health financing** system raises adequate funds for health, in ways that ensure people can use needed services, and are protected from financial catastrophe or impoverishment associated with having to pay for them. It provides incentives for providers and users to be efficient.
 - **Leadership and governance** involves ensuring strategic policy frameworks exist and are combined with effective oversight, coalition-building, regulation, attention to system-design and accountability.
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Health systems and health outcome programmes: getting results

WHO's involvement in all aspects of health and health systems constitutes a comparative advantage. Nevertheless, it is clear that, in too many instances, WHO's support can be fragmented between advice focusing on particular health conditions (that may not always take systems or service delivery issues into account) and advice on particular aspects of health systems provided in isolation. While there are good examples of how both streams of activity can work together, the challenge is to develop a more systematic and sustained approach that responds better to the needs of Member States.

Several productive relationships have been established, bringing together “programme” and “systems” expertise. These include work on costing and cost-effectiveness; the *Treat, Train and Retain (TTR)* initiative linking systems work on health service staffing with improving access to HIV/AIDS care and treatment, and the work across WHO stimulated by the Global Alliance on Vaccines Initiative (GAVI) Health Systems Strengthening window.

Three complementary directions to a more strategic response are proposed: extending existing interactions; better and more systematic communication and awareness among all WHO staff on how to think systematically about health system processes, constraints and what to do about them; greater consistency, quality and efficiency in the production of methods, tools and data reporting across WHO. Attention to institutional incentives is also needed.

A more effective role for WHO at country level

Countries at different levels of development look for different forms of engagement with WHO as they seek to improve their health systems' performance. Some are primarily interested in exchanging ideas and experiences in key aspects of policy (such as health worker migration); getting wider international exposure for important domestic agendas (such as patient safety or the health of indigenous populations); and developing norms and standards for measuring performance. Countries at all levels of development look to WHO for comparative experience in relation to different aspects of reform. But it is countries at a lower level of income – as evidenced increasingly in WHO Country Cooperation Strategies (CCS) – that seek more direct involvement in overall policy and health systems development.

Four strategic directions are proposed. First, there is a need to improve capacity to diagnose health systems constraints. Second, WHO should seek more active and consistent engagement in overall sector policy processes and strategies. In this context, engagement in key policy events should involve all levels of the Organization. Third, WHO's efforts should be directed towards building national capacity in policy analysis and management. Lastly, tracking trends in health systems performance needs to be geared first and foremost towards national decision making.

The role of WHO in the international health systems agenda

In addition to supporting health systems strengthening in individual Member States, WHO has an international role. The international health environment is increasingly crowded. There are three main directions for WHO. First, the Organization continues to produce global norms, standards and guidance. These include health systems concepts, methods and metrics; synthesizing and disseminating information on “what works and why”, and building scenarios for the future. The second direction concerns the building or shaping of international systems that impact on health. These include systems and networks for identifying and responding to outbreaks and emergencies. They also include WHO's role as a key actor in influencing aid architecture as it affects health systems. The third direction concerns how WHO is working more directly with other international partners on their support for health systems strengthening. This can be through global health partnerships (GHPs), such as the Global Fund to Fight HIV/AIDS, Tuberculosis and Malaria and GAVI, the larger philanthropic foundations, the World Bank and regional development banks and bilaterals, as well as stakeholders in the non-government and corporate sector.

Success will depend on how well WHO uses its institutional assets and instruments. WHO must make greater use of existing staff: by strengthening their capacity in health sector policy and strategy development; by developing a professional network of staff working on health systems; and by getting a better match between supply and demand in specific policy areas. It must look at the business rules that govern planning and budgeting, and explore ways in which the integrity of WHO's MTSP can be maintained, while promoting joint work across different programmes. Several health systems specific partnerships have been launched in the last two years, including the Global Health Workforce Alliance and the Health Metrics Network. WHO needs to leverage the benefits these partnerships offer to countries and international partners, and negotiate ways for partnerships to support WHO core functions. In terms of judging results, the MTSP defines specific results for WHO's activities in health systems development.

INTRODUCTION

Health outcomes are unacceptably low across much of the developing world, and the persistence of deep inequities in health status is a problem from which no country in the world is exempt. At the centre of this human crisis is a failure of health systems. Much of the burden of disease can be prevented or cured with known, affordable technologies. The problem is getting drugs, vaccines, information and other forms of prevention, care or treatment – on time, reliably, in sufficient quantity and at reasonable cost – to those who need them. In too many countries the systems needed to do this are on the point of collapse, or are accessible only to particular groups in the population. Failing or inadequate health systems are one of the main obstacles to scaling-up interventions to make achievement of internationally agreed goals such as the MDGs a realistic prospect.

There is widespread acceptance of the basic premise underlying this Framework – that only through building and strengthening health systems will it be possible to secure better health outcomes. The key question is what does this mean in practice? The growing recognition of the importance of health systems increases the urgency of this question.

Objectives

- **Promote common understanding**
We need a common understanding of what a health system is, and what activities are included in health systems strengthening – in countries at different levels of development and with different social, institutional and political histories.
- **Address new challenges and set priorities**
Health systems worldwide are having to cope with a changing environment: epidemiologically, in terms of changing age structures, the impact of pandemics and the emergence of new threats; politically, in terms of changing perceptions about the role of the state and its relation with the private sector and civil society; technically, in terms of the growing awareness that health systems are failing to deliver – that too often they are inequitable, regressive and unsafe, and so constitute one of the rate limiting factors to achieving better development outcomes; institutionally, especially in low-income countries, in having to deal with an increasingly complex aid architecture. Some of the main challenges and priorities, both old and new, are discussed in the next section.
- **Address questions of health system financiers**
For those who finance healthcare – from the general public, through national ministries of finance, development banks, bilateral agencies and global funds – the issue is not just one of refining definitions and concepts. If health systems are to be strengthened, where is more spending most needed? How and by whom should it be financed and how can that financing be sustained? How can financiers monitor the progress of change? What indeed are the characteristics of a “strengthened system” and how can they be measured?
- **Strengthen WHO's role in health systems, in a changing world**
There is a growing demand for WHO to do more in health systems. While this may include greater levels of investment, it will also require a consideration of whether WHO could use its resources more effectively, either through different patterns of allocation or different ways of working.

The importance of health systems as part of the global health agenda and in terms of WHO's response is reflected in the *11th General Programme of Work (2006-2015)* and the *Medium-term Strategic Plan (2008-2013)*. This Framework spells out in more detail the policy challenges faced by countries, and the steps for a more effective institutional response by the WHO Secretariat.

How will the Framework for Action add value to WHO's work? Support for health systems strengthening is the most frequently mentioned priority in WHO Country Cooperation Strategies¹ (CCSs). Two sorts of expertise are wanted from WHO: first, in specific technical areas of health systems; second, in strategic support to governments as they strive to reconcile competing priorities and sources of advice. That said, however, establishing WHO's position as a key provider of health systems support at country level – given the many actors in this area – needs to be based on a clear understanding of priorities, capacity and comparative advantage.

Several regional offices have defined regional health systems strategies and/or technical strategies in specific areas such as health financing. Similarly, several technical programmes in WHO are developing work programmes on systems strengthening. This document sets them within a Framework for Action for the Organization as a whole.

The Framework is about ways of working in WHO. Two sets of issues are particularly important. How can we develop more synergistic working relationships between the technical programmes, which focus on particular health outcomes, and the specialist health systems groups in the organization? And, how can we ensure better links between WHO's engagement in policy processes at country level and the health systems strengthening activities that flow from them? The importance of working in new ways gives the Framework for Action its title. **Health systems strengthening is "everybody's business"**.

Health system basics

Any strategy for strengthening health systems needs a basic shared perception of what a health system is, what it is striving to achieve, and how to tell if it is moving in the desired direction.

- **What is a health system?**

A health system consists of all organizations, people and actions whose *primary intent* is to promote, restore or maintain health². This includes efforts to influence determinants of health as well as more direct health-improving activities. A health system is therefore more than the pyramid of publicly owned facilities that deliver personal health services. It includes, for example, a mother caring for a sick child at home; private providers; behaviour change programmes; vector-control campaigns; health insurance organizations; occupational health and safety legislation. It includes inter-sectoral action by health staff, for example, encouraging the ministry of education to promote female education, a well known determinant of better health.

- **Guiding values and principles**

The directions set out for WHO in this document are determined by the values and goals enshrined in the **Alma Ata Declaration**; WHO's commitments on gender and human rights³ and the World health report 2000.

- **Health system goals**

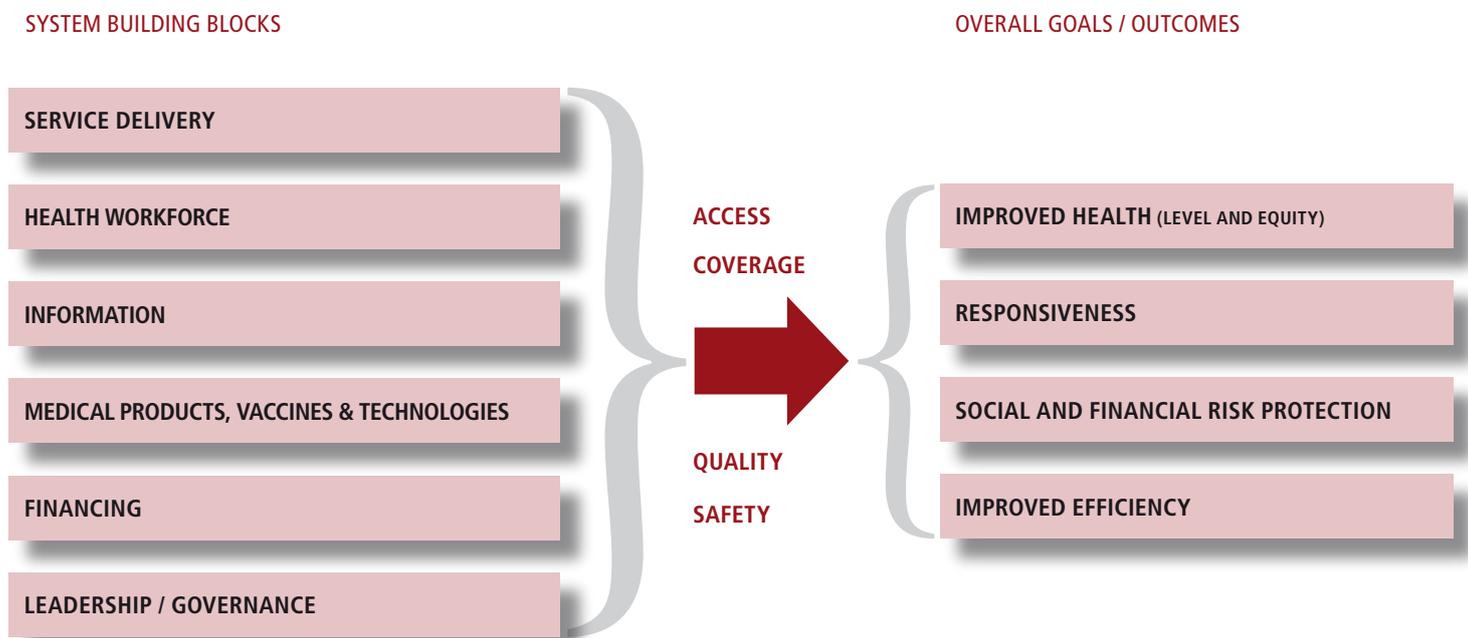
Health systems have multiple goals. The World health report 2000 defined overall health system outcomes or goals as: improving health and health equity, in ways that are responsive, financially fair, and make the best, or most efficient, use of available resources. There are also important intermediate goals: the route from inputs to health outcomes is through achieving greater access to and coverage for effective health interventions, without compromising efforts to ensure provider quality and safety.

1 WHO Country Presence 2005: CCSs provide the medium-term strategic framework for WHO's work at country level.

2 This is an expanded version of the definition given in the World health report 2000 Health Systems: Improving Performance.

3 Declaration of Alma Ata, 1978; Universal Declaration on Human Rights 1948; WHO Gender Policy 2002. The Right to Health and other human rights instruments institutionalise in law many aspects of Primary Health Care.

THE WHO HEALTH SYSTEM FRAMEWORK



THE SIX BUILDING BLOCKS OF A HEALTH SYSTEM: AIMS AND DESIRABLE ATTRIBUTES

- Good **health services** are those which **deliver** effective, safe, quality personal and non-personal health interventions to those who need them, when and where needed, with minimum waste of resources.
- A well-performing **health workforce** is one which works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances. I.e. There are sufficient numbers and mix of staff, fairly distributed; they are competent, responsive and productive.
- A well-functioning **health information system** is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health systems performance and health status.
- A well-functioning health system ensures equitable access to essential **medical products, vaccines and technologies** of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use.
- A good **health financing** system raises adequate funds for health, in ways that ensure people can use needed services, and are protected from financial catastrophe or impoverishment associated with having to pay for them.
- **Leadership and governance** involves ensuring strategic policy frameworks exist and are combined with effective oversight, coalition-building, the provision of appropriate regulations and incentives, attention to system-design, and accountability.

- **Health system building blocks**
To achieve their goals, all health systems have to carry out some basic functions, regardless of how they are organized: they have to provide services; develop health workers and other key resources; mobilize and allocate finances, and ensure health system leadership and governance (also known as stewardship, which is about oversight and guidance of the whole system). For the purpose of clearly articulating what WHO will do to help strengthen health systems, the functions identified in the World health report 2000 have been broken down into a set of six essential 'building blocks'. All are needed to improve outcomes. This is WHO's health system framework.
- **Desirable attributes**
Irrespective of how a health system is organized, there are some desired attributes for each building block that hold true across all systems.

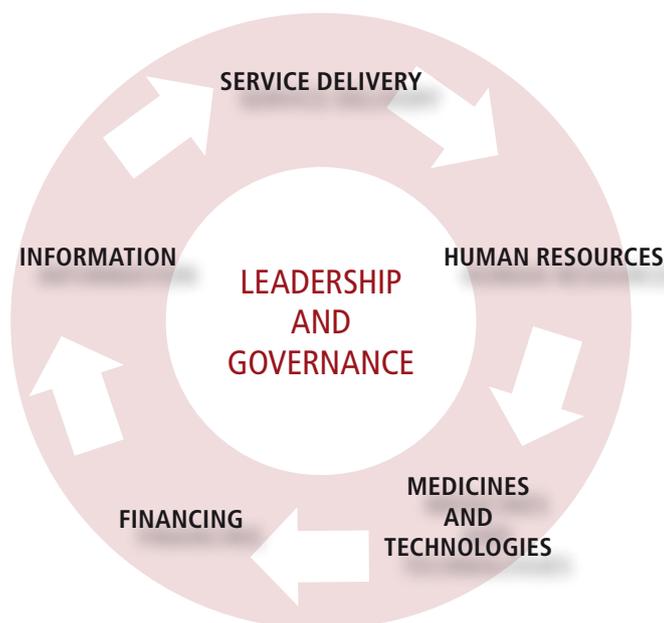
- **Multiple, dynamic relationships**
A health system, like any other system, is a set of inter-connected parts that must function together to be effective. Changes in one area have repercussions elsewhere. Improvements in one area cannot be achieved without contributions from the others. Interaction between building blocks is essential for achieving better health outcomes.
- **Health system strengthening**
Is defined as improving these six health system building blocks and managing their interactions in ways that achieve more equitable and sustained improvements across health services and health outcomes. It requires both technical and political knowledge and action.
- **Access and coverage**
Since notions of improved access and coverage lie at the heart of this WHO health system strengthening strategy, there has to be some common understanding of these terms.
- **Is progress being made?**
A key concern of governments and others who invest in health systems is how to tell whether and when the desired improvements in health system performance are being achieved. Convincing indicators that can detect changes on the ground are needed.

'ACCESS' AND 'COVERAGE': UNDERSTANDING CURRENT USAGE

Throughout the world, countries try to protect the health of their citizens. They may be more or less successful, and more or less committed, but the tendency is one of trying to make progress, in three dimensions. First, countries try to broaden the range of benefits (programmes, interventions, goods, services) to which their citizens are entitled. Second, they extend access to these health goods and services to wider population groups, and ultimately to all citizens: the notion of universal access to these benefits. Finally, they try to provide citizens with social protection against untoward financial and social consequences of taking up health care: of particular interest is protection against catastrophic expenditure and poverty. In health policy and public health literature the shorthand for these entitlements of universal access to a specified package of health benefits and social protection is universal coverage.

The words access and coverage are also used to denote measurable targets, as well as aspirational goals. For example, many epidemiologists and

disease control programme managers use the term "coverage" to measure the proportion of a target population that benefits from an intervention. On the other hand, when policy makers or health economists in Thailand, France or the USA talk about moving towards universal coverage, they are striving for access to a broadening range of benefits, for all citizens without exclusion, and with the necessary social protection. Depending on the context, the accent may be primarily on broadening the package; or on extending coverage in excluded groups; or on improving social protection. In all cases though, what is at stake is the public responsibility for ensuring all citizens' entitlements to the protection of their health – the political idea that led WHO to promote Health For All. These differences in usage are a fact of life in the multi-disciplinary field of health. What is important is that the differences are understood.



WHAT CAN WE LEARN FROM THE PRIMARY HEALTH CARE VALUES AND APPROACH?

Primary Health Care, as articulated in the **Alma Ata Declaration** of 1978, was a first international attempt to unify thinking about health within a single policy framework. Developed when prospects for growth in many countries were bright, Primary Health Care remains an important force in thinking about health care in both the developed and developing world. Although often honoured more in the breach than in the observance, its **underpinning values – universal access, equity, participation and intersectoral action** – are central to WHO's work and to health policies in many countries today. The Primary Health Care approach also emphasizes the importance of health promotion and the use of appropriate technology. As the non-communicable disease burden rises and the menu of diagnostic and therapeutic technologies expands, these principles – backed up by an increasing body of evidence on intervention cost-effectiveness – are as important for health policy makers to keep in mind today as they were thirty years ago.

The term Primary Health Care is important in a second way. The term signifies an important approach to health care organization in which the **primary, or first contact, level** – usually in the context of a health district – acts as a driver for the health care delivery system as a whole. Again, while the language may have changed – for example the term 'close-to-client' care is

also used, and a wide range of service delivery models have evolved – the principle of providing as much care as possible at the first point of contact **effectively backed up by secondary level facilities that concentrate on more complex care**, remains a key aim in many countries. The concept of **integrated** Primary Health Care is best viewed from the perspective of the individual: the aim being to develop service delivery mechanisms that encourage continuity of care for an individual across health conditions, across levels of care, and over a lifetime.

The values and principles of Primary Health Care remain constant, but there are lessons from the past, which are particularly important when looking ahead. First, despite increased funding, resources for health will always be limited, and there is a responsibility to achieve the maximum possible with available resources. Second, past efforts to implement a Primary Health Care approach focused almost exclusively on the public sector. In reality, for many people – poor, as well as rich – private providers are the first point of contact, and responsible health system oversight involves taking account of private as well as public providers. Third, while keeping its focus on the community and first contact care, Primary Health Care needs to recognize the problems associated with relying on voluntarism alone.

HEALTH SYSTEMS CHALLENGES AND OPPORTUNITIES

Health systems have to deal with many challenges. As the spectrum of ill-health changes, so health systems have to respond. Their capacity to do so is influenced by a variety of factors. Some operate at a national or sub-national level, such as the availability of financial and human resources, overall government policies in relation to decentralization and the role of the private sector. Some operate through other sectors. Increasingly, however, national health systems are subject to forces that affect performance, such as migration and trade factors, operating at an international level.

Some health policy challenges are primarily of concern to low-income countries. However, despite national differences, *many policy issues are shared across remarkably different health systems*. Concerns such as the impact of aging populations, the provision of chronic care or social security reform are no longer the concern of industrialized countries alone. Similarly, the threat posed by new epidemics, such as avian or human pandemic influenza, requires a response from all countries rich and poor. The differences lie in the relative severity of challenges being faced, the way a particular health system has evolved, and the economic, social and political context – all of which determine the nature and effectiveness of the response.

Given the size of global spending on health and concerns about health systems performance, the question is, “Why aren’t health systems working better?”

Managing multiple objectives and competing demands

In the face of fierce competition for resources, governments worldwide have to manage multiple objectives and competing demands. As they strive for greater efficiency and value for money, they must seek ways to achieve more equity in access and outcomes and to reduce exclusion. They are under pressure to ensure that services are effective, of assured quality and safe, and that health providers are responsive to patients’ demands. Progress in one direction may mean compromise in another. For example, the pressure to increase access to HIV/AIDS care and treatment, which has helped bring visibility to the human resources crisis in Africa, brings its own pressures on the capacity of the health system to handle other causes of ill-health. Progress in increasing staff retention in the public sector through better pay packages may mean compromise in containing costs.

Competition for resources may be between hospitals and primary level care; between prevention and treatment; between professional groups; between public and private sectors; between those engaged in efforts to treat one condition versus another; between capital and recurrent expenditures. This means health system strengthening requires careful judgement and hard choices. It can be better informed by evidence and by the use of technical tools, but ultimately it is a political process and reflects societal values.

A national health sector strategy is one way to reconcile multiple objectives and competing demands. To be robust, a sector strategy requires sound logic and sufficient support. Plans need to be costed; budgets have to balance ambition with realism. The necessary processes have to be managed in an inclusive way, and linked with national development planning processes such as poverty reduction strategies. These, together with transparent systems to track effects, are the key to unlocking more resources.

A significant increase in funding for health

Health systems are a means to the end of achieving better health outcomes. In many countries, resources for health have increased from both domestic budgets and, in lower- and middle-income countries, from external development partners as well.

There is growing interest in the array of domestic financing mechanisms that can be drawn upon to move towards universal coverage, including tax-based funding, social health insurance, community or micro-insurance, micro-credit and conditional cash transfers. All of these mechanisms make major demands on managerial capacity. On the other hand, where providers depend largely on out-of-pocket payments for their income, there is over-provision of services for people who can afford to pay, and lack of care for those who cannot.

Much of the increase in investment by external partners has focused on particular diseases or health conditions. The global health landscape has been transformed in the last ten years with the emergence of multiple, billion-dollar global health partnerships such as the Global Fund and the GAVI Alliance. These have helped generate growing political support for increasing access to care and treatment for many critical health conditions, and have also thrown a spotlight on longstanding systems issues such as logistics, procurement and staffing. Moreover the growing demands for provision of lifelong treatments highlights the need for policies that protect people from catastrophic spending.

'Scaling-up' is not just about increasing spending

It is increasingly recognized that scaling-up is not just about increasing investment. Close scrutiny of what is involved points to a set of health systems challenges, most of which are equally pertinent in higher as well as low-income settings.

Countries both rich and poor are looking for ways of doing more with existing resources. In many health systems, existing health workers could be more productive if they had access to critical material and information resources, clearly defined roles and responsibilities, better supervision and an ability to delegate tasks more appropriately. Changes in overall intervention-mix and skill-mix could create efficiencies.

In many instances, extending coverage or quality cannot be achieved simply by replicating existing models for service delivery or focusing only on the public sector. In addition, decision-makers seek innovative ways to engage with communities, NGOs and the private sector. Promising experiences, such as working with informal providers to expand TB care, the social marketing of bed-nets or contracting with NGOs, need to be shared. It is important to take note of what did and did not work in the past. Careful analysis is needed about which local initiatives are genuinely amenable for replication and expansion. Multiple barriers cannot all be addressed or overcome at once. Judgements have to be made between pushing to quickly get specific outcomes and building systems and institutions. Managing the tension between saving lives and livelihoods and starting the process of re-building the state is a particular challenge in fragile states.

There is no guarantee that the poor will benefit from reforms unless they are carefully designed with this end in mind. It is well-known that the child health MDG target can be reached with minimal gains among the poorest. And in many countries, groups such as the poor – and too often women more than men – migrants and the mentally ill are largely invisible to decision-makers. These require specific attention, but introducing strategies that promote equity rather than the converse is not straightforward, as the debates around rapidly scaling-up HIV/AIDS treatment showed. Demand-side factors also determine use, so understanding the incentives and disincentives for seeking care is also important.

HEALTH SYSTEMS: A SHORT HISTORY

Health systems of some sort have existed as long as people have tried to protect their health and treat disease, but organized health systems are barely 100 years old, even in industrialized countries. They are political and social institutions. Many have gone through several, sometimes parallel and sometimes competing, generations of development and reform, shaped by national and international values and goals. **Primary Health Care** as articulated in the **Alma Ata Declaration** of 1978 was a first attempt to unify thinking about health within a single policy framework. Developed when prospects for growth in many countries were bright, Primary Health Care remains an important force in thinking about health care in both the developed and developing world. The financial optimism of the 1970s was soon dispelled in many parts of the world by a combination of high oil prices, low tax revenues and economic adjustment. Countries seeking to finance essential health care were faced with two difficult prescriptions: focus public spending on interventions that are both cost-effective and have public good characteristics (the message of the World Development Report 1993), and boost financing through charging users for services. Whilst many governments started to levy fees, most recognized the political impossibility of focusing spending on a few essential interventions alone. The results were predictable. The poor were deterred from receiving treatment and user fees yielded limited income. Moreover, maintaining a network of under-resourced hospitals and clinics, while human and financial resources were increasingly pulled into vertical programmes, increased pressures on health systems sometimes to the point of collapse.

As the crisis in many countries deepened in the 1990s, so many governments looked to the wider environment for new solutions. If the health district was

not working well it was because insufficient power was decentralized within government. If health workers were unproductive, then look to civil service reform. If hospitals were a drain on the budget, reduce capacity in the public sector. Infused with ideas from market-based reforms in Europe's public services, and with new experiences emerging from transitional economies, **health sector reform** focused above all on doing more for less. Efficiency remained the watchword. It was not until towards the end of the decade that the international community started to confront the reality that running health systems on \$10 per capita or less is just not a viable proposition. In this regard, the work of the Commission on Macroeconomics and Health and costing the global response to the HIV/AIDS pandemic finally broke the mould, making it acceptable to talk more realistically about resource needs.

In the first decade of the 21st Century, many of the pressures remain. In the developed world, the public looks for signs that increased spending delivers results, while planners look nervously at the impact of ageing populations. In the developing world, there are more resources for health but most are linked to specific programmes. But there are also signs of change. There is a wider recognition of inter-dependence and the importance of wider policy choices on health systems, particularly the impact of migration and trade. Similarly, it is clear that governments do not have all the answers. Productive relations with the private sector and voluntary groups are both possible and desirable. Governments have a much wider range of policy levers at their disposal. The challenge for WHO as their adviser, is to understand the whole menu and know when and how to mix the right combination of ingredients.

HEALTH SYSTEM CHALLENGES: A FEW FACTS AND FIGURES

- Globally, health is a US\$3.5 trillion industry, or equal to 8% of the world's GDP.
 - Large health inequalities persist: even within rich countries such as USA and Australia, life expectancy still varies across the population by over 20 years.
 - Recent essential medicines surveys in 39 mainly low- and low-middle-income countries found that, while there was wide variation, average availability was 20% in the public sector, and 56% in the private sector.
 - Each year, 100 million people are impoverished as a result of health spending.
 - Extreme shortages of health workers exist in 57 countries; 36 of these are in Africa.
 - In over 60 countries, less than a quarter of deaths are recorded by vital registration systems.
 - An estimated 50% of medical equipment in developing countries is not used, either because of a lack of spare parts or maintenance, or because health workers do not know how to use it.
 - Private providers are used by poor as well as rich people. For example, in Bangladesh, around ¾ of health service contacts are with non-public providers.
 - In 2000, less than 1% of publications on Medline were on health services and systems research.
 - Globally, about 20% of all health aid goes to support governments' overall programmes (i.e. is given as general budget or sector support), while an estimated 50% of health aid is off budget.
 - There has been a rapid increase in global health partnerships. More than 80 now exist, of which WHO houses over 30.
-

Success will be limited unless efforts of other sectors are brought to bear on achieving health outcomes. Scaling-up requires the following: working with ministries of finance to justify budget demands in the context of macroeconomic planning, and ensuring health is well reflected in poverty reduction strategies and medium-term expenditure frameworks; working with ministries of labour, education and the civil service on issues of pay, conditions, health worker training and retention; working with ministries of trade and industry around access to drugs and other supplies; and, with increasing decentralization, working with local government. Attention to health determinants must be maintained, as investments in education, housing, transport, water and sanitation, improved governance or environmental policy can all benefit health. Actions by other sectors can also have adverse effects on health, something that is recognized by the growing requirement for health impact assessments.

The health systems agenda is not static

Patterns of disease, care and treatment are changing. Eighty per cent of non-communicable disease deaths today are in low- and middle-income countries. Systems for managing the continuum of care – be it for HIV/AIDS or hypertension – pose different demands from those needed for acute intermittent care. New delivery strategies may create new demands on the health system. For example, the shift from traditional birth attendants to skilled birth attendants has implications for staffing, for referral systems, and in terms of upgrading facilities to deliver emergency obstetric care. New approaches to mental health and non-communicable diseases emphasize primary prevention, community care and well informed patients, all of which entail shifts from the traditional focus of institutional care.

The introduction of new drugs, vaccines and technologies have an impact on staffing and training, but equally on health financing and service delivery. For example, some hospital-based treatments can now be delivered through day care centres. This is leading to a reappraisal of traditional service delivery models and strategies for increasing efficiency.

Health systems are at the heart of how countries respond to new disease threats such as Severe Acute Respiratory Syndrome (SARS), avian flu, pandemic human influenza. International networks for identifying and responding to such security threats depend for their effectiveness on the 'weakest link'. Accordingly, disease control efforts must be internationally coordinated. As well as testing the alert and response capacity of weak health systems, the attention such outbreaks generate presents important opportunities to catalyse and orchestrate support for improving them: by building epidemiological and laboratory capacity in the context of revised International Health Regulations, addressing patents and intellectual property rights, improving supply chain management and so forth.

An estimated 25 million people are displaced today as a result of conflict, natural or man-made disasters. In such situations, local health systems become rapidly over-whelmed and multiple agencies often move in to assist. This leads to the paradoxical situation in which leadership is weaker than usual because it has been disrupted or divided, but the need for leadership is even greater. The continuing search for ways to strengthen leadership at such times includes emergency preparedness programmes, norms and standards, creating contingency funds and more interaction between UN agencies and other actors.

Changes in public policy and administration, particularly decentralization, makes new demands on local authorities and may change fundamentally the role of central ministries. After years of relative inattention, there is now a resurgent interest in the role of the state. However, the emphasis is on 'good governance' and effective stewardship, rather than a return to earlier 'command and control' models. The public in most countries no longer accepts a passive role and rightly demands a greater say in how health services are run, including how health authorities are held accountable for their work. The information technology revolution has accelerated this change.

There is a major emphasis on demonstrating results and value for money, not just in terms of health outcomes but also in being able to demonstrate progress in systems strengthening. There is also greater focus on corruption in the health sector, with distinctions being made between grand larceny, mismanagement and behaviours such as salary supplementation through informal payments.

Development partners have their impact on health systems

Development partners impact health systems through support for the new global health partnerships – as well as through measures that can increase the predictability of aid – ideally making it easier for finance ministries to finance the long-term recurrent costs of salaries or life-saving medicines.

Perhaps most importantly, the barriers to more rapid progress at country level observed by GHPs have helped to dispel the simple notion that health systems can be built around single diseases or interventions. At the same time, the emergence of new funds has highlighted challenges already faced by countries in managing multiple sources of finance. Multiple parallel policy processes or reporting systems have led to unnecessarily high transaction costs, and a concern that narrowly focused support is drawing scarce personnel away from other essential services and compromising a healthy balance of health services. As a result, many GHPs, along with bilateral agencies, are searching for ways to better harmonize and align their activities with national policies and systems.

In short, countries face many challenges: making the case for more effective investment in health systems in a competitive funding environment; creating better functional links between programmes with mandates defined in terms of specific health outcomes and those with health systems as their core business; ensuring capacity to respond to current issues and identify future challenges; and ensuring that resources are used as effectively as possible. WHO faces these same challenges.

REDUCING HEALTH INEQUALITIES IN THAILAND

Between 1990 and 2000, Thailand significantly reduced its level of child mortality and at the same time halved inequalities in child mortality between the rich and the poor. These impressive results can be explained partly by substantial economic growth and reduced poverty over this period. However there were a number of other important strategies that contributed, many of which began to be put in place before 1990 but which were extended and maintained. These include improved insurance coverage and more equitable distribution of primary health care infrastructure and intervention coverage.

From the 1970s onwards, a series of pro-poor health insurance schemes improved health service coverage. The initial step was to waive user charges

for low-income families. This was followed by subsidized voluntary health insurance, then the extension of the government welfare scheme in the 1990s to all children under 12, the elderly and disabled, and to universal coverage from 2001. Also from the 1970s, health infrastructure and services were scaled up with a particular focus on Primary Health Care and community hospitals targeting the poorer, rural populations. Increased production, financial incentives and educational strategies led to a more equitable allocation of doctors in rural areas in the 1980s. This combination led to increased utilization of health services. For example, vaccination coverage rose from 20%-40% in the early 1980s to over 90% in the 1990s; skilled birth attendance rose from 66% to 95% between 1987 and 1999.

Sources (see Annex 2, References): Vapattanawong P et al, 2007; Tangcharoensathien V et al 2004.

The 5S-5M-5C schematic: transforming primary care inputs to outcomes in low-income and middle-income countries

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INTRODUCTION

High-quality primary healthcare (PHC) is the most effective way to deliver person-centred, promotive, preventive and curative services to meet the majority of a population's health needs.¹ PHC is critical to improving population health, making health systems more equitable and resilient and promoting global health security. Furthermore, PHC is instrumental to achieving quality universal health coverage (UHC) and meeting the Sustainable Development Goals. However, as the global community marks the 40th anniversary of the Alma Ata Declaration in 2018,² a significant gap remains between the original Declaration's aspirational vision and the current reality of PHC throughout the world. PHC remains a neglected area of investment in most low-income and middle-income countries (LMICs), with limited prioritisation in public sector spending, poor integration with other sectors and alarming deficiencies in the quality of primary care (PC) clinical services delivered.³ Visits in PC are short, diagnoses frequently incorrect and treatments often unnecessary or harmful.⁴ Community priorities around healthcare needs are often not elicited within PHC and feedback from patients and communities is rarely sought.

To support PHC strengthening and improvement globally, the Primary Health Care Performance Initiative (PHCPI) was launched in 2015.³ This initiative works to catalyse PHC improvement in LMICs through better measurement, knowledge dissemination, country engagement and advocacy.⁵ With input from a variety of stakeholders, PHCPI has developed a conceptual framework to guide this work, outlining the key systems, inputs and service delivery components needed to produce better PC-related outputs and outcomes.^{5 6}

Summary box

- ▶ High-quality primary healthcare (PHC) is critical to achieving universal health coverage (UHC).
- ▶ Primary care (PC) clinical services make up an important part of the value that a PHC approach offers.
- ▶ There is a dearth of understanding about how to transform system inputs into the desired PHC outcomes.
- ▶ We propose a schematic detailing the mechanisms and system-level functions required to transform inputs into better outcomes in PC clinical systems.
- ▶ This schematic has important implications for the global research and policy agendas needed to achieve UHC by 2030. Particular emphasis should be placed on better measurement of the mechanisms described here, stronger data systems to translate measurement into improvement and private sector engagement and innovation to scale improvements in PC service delivery.

Central to the PHCPI framework are the four functions of high-quality PC services, described by Barbara Starfield in 1994: first-contact accessibility, continuity, comprehensiveness and coordination or 'the 4C's'.⁷ Two decades later, in the midst of the Ebola epidemic, Paul Farmer identified four critical inputs that were lacking in Ebola-affected countries and many other LMICs, and which are also foundational components of the PHCPI framework: systems, space, staff and stuff or 'the 4S's'.⁸ Despite decades of investments into these inputs, there has been limited success in converting these 4S's into equitable, effective PC systems that provide the 4C functions, a shortcoming that has contributed greatly to PC's unfulfilled potential.

In this paper, we build on this previous work to present a simplified schematic derived from the PHCPI framework—termed '5S-5M-5C' (figure 1)—which describes essential

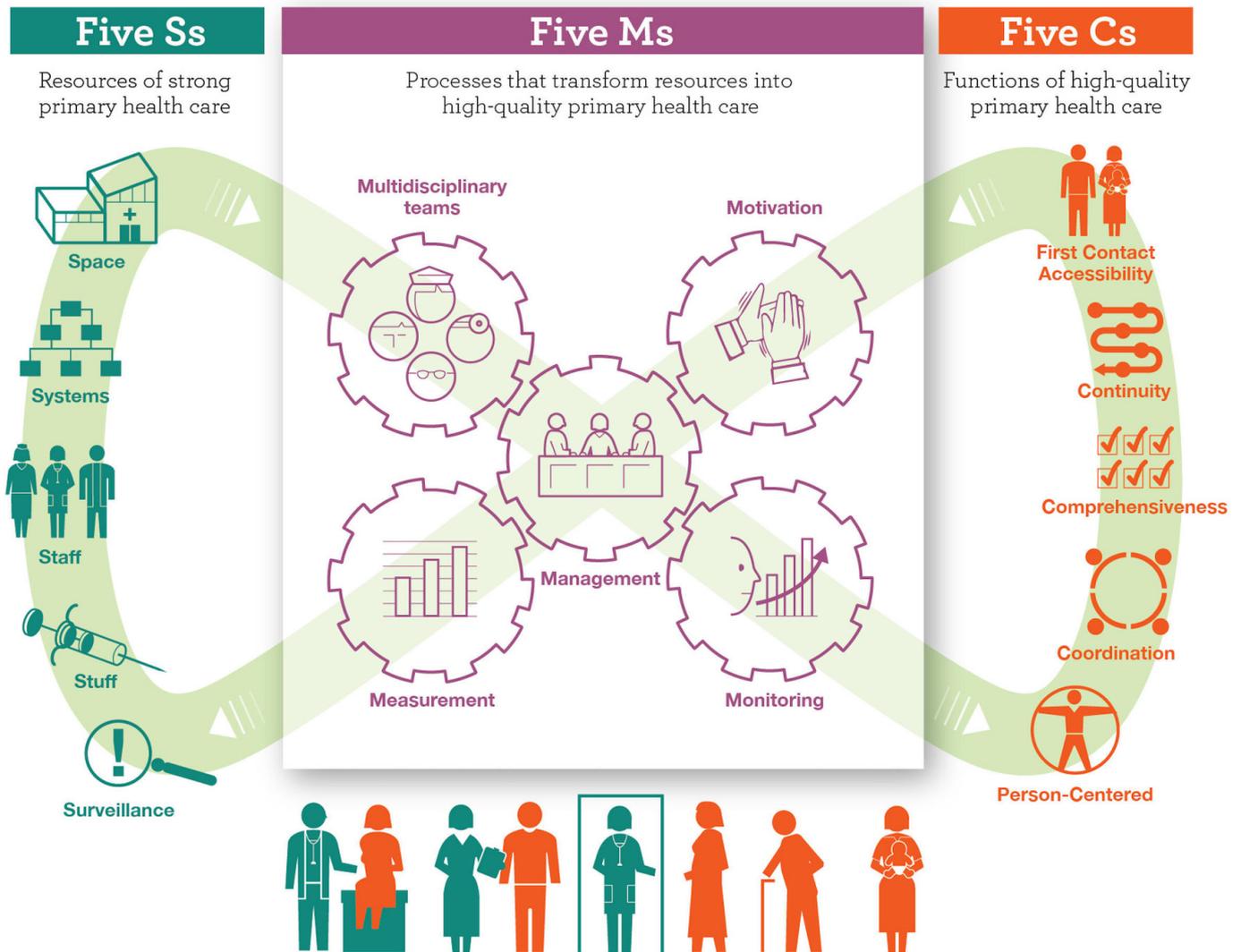


Figure 1 The 5S-5M-5C schematic.

service delivery mechanisms for transforming key inputs into functional and equitable PC systems. Recognising the importance of these often-undervalued mechanisms and better understanding how to measure and improve them, will be critical for making progress towards the goal of quality UHC for all.

TRANSFORMING INPUTS INTO BETTER HEALTH

The 5S's

Traditional health system strengthening efforts have focused on ensuring that healthcare providers are available, equipped with needed medications and supplies, appropriately trained, sufficiently financed, effectively governed and have the information systems required to deliver care—Farmer’s ‘4S’s’.⁸ In addition, the Ebola epidemic highlighted the need for stronger *surveillance* within PC, including the capacity to identify emerging threats and continuously assess and respond to communities’ needs over time. We have incorporated surveillance as a fifth ‘S’ in our schematic.

The 5C's

Successful PC systems, by definition, deliver Starfield’s 4C functions. They ensure that services are accessible when and where people need them and in an affordable manner, that continuous, longitudinal patient–provider relationships are fostered and that health information is effectively transferred across time and system levels. They coordinate an individual’s journey through a complex health system, optimising the provision of preventative, chronic management and acute curative services to meet the healthcare needs of families and communities.⁷ Our schematic highlights a fifth ‘C’—that PC must be *person-centred*, meaning that people should be known as a whole person by their regular care provider, feel that their needs and preferences are respected and that their care is effective in meeting expectations and building trust in the PC system.⁹

The 5M's

To bridge the gap between the ‘S’s’ and ‘C’s’ and ensure that all people, everywhere receive equitable and

high-quality PC services, our schematic defines five critical service delivery mechanisms, termed the 5M's: *multi-disciplinary teams*, *motivation*, *measurement*, *monitoring and facility and population health management*.

In order to meet the range of individual and population health needs demanded of PC, effective *multi-disciplinary teams* must be established, trained and supported. High-quality PC requires not just individual doctors, but rather teams of providers—including nurses, community health workers, mid-level practitioners and other disciplines such as mental health, nutrition and pharmacy—working together with communities to maintain health.¹⁰

These multi-disciplinary teams need sufficient *motivation* to function effectively.¹¹ Motivation levers can be extrinsic, such as payment systems that remunerate teams with adequate and reliable salaries or performance-based incentives linked to improved health outcomes. Staff members also need supportive supervision to produce intrinsic motivation to sustain the provision of competent, empathic, continuously improving and effective care.

Care teams require continuous *measurement* to inform and drive improvement. Current measurement efforts can be made more effective by reducing the plethora of required but often highly disease-specific indicators, strategically including selected novel indicators and leveraging advances in health information systems to strengthen data quality.

But without active and regular *monitoring* to review and use these data, measurement is an exercise in futility. Empowering teams and managers with data and iterative review processes can drive continuous quality improvement, leading to higher quality PC services.¹²

Finally, *facility and population health management* systems must be in place to coordinate effective, efficient care at the facility and community levels. Strong PC needs well-trained, experienced managers and effective management systems, without which care delivery will be insufficiently resourced and planned to translate inputs into functions. Population health management, the proactive ascertainment, assessment and improvement of entire populations' health, is imperative for planning and linking services between communities and facilities. Community health workers linked to empanelment or rostering mechanisms are a critical component of PC systems in this regard, facilitating strategic resource deployment to address specific health needs and ensuring that no one is left behind.¹³

INSIGHTS FOR PRIMARY HEALTHCARE DEVELOPMENT

The 5S-5M-5C schematic and the underlying conceptual framework on which it is based provide insights for developing PC systems capable of equitably meeting the needs of populations, communities and individuals across the globe. We propose that the presence of the 5S inputs and their effective utilisation through the 5M mechanisms will produce the 5C functions, ensuring effective coverage of

Box 1 Effective 5S-5M-5C implementation in Costa Rica¹⁶

In Costa Rica, healthcare is a human and legal right enshrined in the constitution. Over the past 30 years, a robust public primary care (PC) system has been built and financed to meet the changing health needs of the population. Each person has financial and geographic access to public PC services in their community. Members of community-based PC teams known as *EBAIS* take care of a defined, empaneled population of approximately 4500 people. The *EBAIS* teams send a community health worker to every household in a given catchment area at least once a year to collect basic information on demographics, health risks and opportunities for health promotion. People deemed at risk of chronic diseases, or who have gaps in care, are encouraged to seek facility-based treatment at their local *EBAIS* PC facilities staffed by doctors, nurses and pharmacists. Health and quality data are collected using standardised forms and shared with local health area managers, who aggregate the data for national planners. *EBAIS* staff are regularly measured on the performance outcomes for their catchment area and the results are fed back to them for improvement. Health areas with major equity gaps in performance are prioritised for further investment with more *EBAIS* teams or other resources in order to narrow those gaps. The system aims to provide not just basic preventive services and promotive education at a community level, but also more comprehensive, accessible care for the chronic non-communicable diseases that make up the largest proportion of disease burden in Costa Rica. The *EBAIS* coordinate and track referrals to hospital and specialty care. The *EBAIS* also link up with other social service sectors to promote a comprehensive approach to health within and around the formal health system.

high-quality PC services and producing better population health. By logically grouping the service delivery mechanisms required to transform inputs into higher PC functions, the '5S-5M-5C' schematic also lays out an agenda for prioritising investments and research in PC systems, both in the public and private sectors. To be effective, the use of the schematic must be locally adapted to reflect relevant social determinants of health as well as the structure and goals of the national health system. **Box 1** provides a country example of successful implementation of key areas in this schematic.

Historically, efforts to strengthen health system performance have overly focused on input-driven initiatives that fund the 4S's, often through disease-specific vertical programmes. However, adopting a business-as-usual approach will be insufficient to achieve the global goal of UHC in a sustainable, efficient and equitable manner. The path towards UHC is dependent on strong, high-quality PC to support overall PHC goals. In turn, the path towards improving PC systems involves first acknowledging the centrality of the 5M mechanisms for effective service delivery. A research and policy agenda focused on better measuring and strengthening the 5M mechanisms is necessary to discern new ways to drive improvement in PC service delivery, coupled with meaningful support to LMICs to build evidence-informed systems. To address these gaps, PHCPI has launched a research consortium

dedicated to developing actionable knowledge and policy recommendations to achieve these goals.³

In addition to further clarifying how and what to measure to strengthen PHC, further investments in stronger data and performance monitoring systems are needed as well as analytical tools to use this information to drive improvement. This requires more robust health information systems capable of aggregating data from multiple sources, including both public and private care delivery systems and providing timely and actionable data to decision makers and health workers to modify services at the local level. Initiatives such as the Health Data Collaborative¹⁴ have started this important work, but there is still much progress to be made.

Finally, while much of PC in LMICs is provided by the public sector, there is a large role for private sector engagement and innovation, both as direct service providers and through public–private partnerships.¹⁵ There are many insights to be taken from private sector systems' design and management, particularly related to the 5M mechanisms, that can improve efficiencies and scale strategies, while also ensuring that equity is prioritised in both public and private sector service delivery. Without incorporating these lessons and innovations and directly including private sector partners in the delivery of PC, the goal of UHC will likely be unachievable.

CONCLUSION

The 5S-5M-5C schematic derived from the PHCPI framework provides a simplified, structured approach to understanding how investments in essential inputs (5S's) must be accompanied by investments in the key service delivery mechanisms (5M's), to enable the equitable delivery of person-centred, high-quality PC (5C's) to populations, communities and individuals. As the world celebrates 40 years since the Alma Ata Declaration and embarks on the path towards quality UHC by 2030,¹⁰ we believe that this schematic can help guide the policy and implementation conversations necessary to achieve this important global goal.

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REFERENCES

1. Macinko J, Starfield B, Erinosh T. The impact of primary healthcare on population health in low- and middle-income countries. *J Ambul Care Manage* 2009;32:150–71.
2. Beard TC, Redmond S, Alma-Ata Dof. Declaration of Alma-Ata. *Lancet* 1979;313:217–8.
3. Primary health care performance initiative. www.phcperformanceinitiative.org
4. Das J, Hammer J. Quality of primary care in low-income countries: facts and economics. *Annu Rev Econom* 2014;6:525–53.
5. Veillard J, Cowling K, Bitton A, et al. Better measurement for performance improvement in low- and middle-income countries: the primary health care performance initiative (phcpi) experience of conceptual framework development and indicator selection. *Milbank Q* 2017;95:836–83.
6. Bitton A, Ratcliffe HL, Veillard JH. Primary health care as a foundation for strengthening health systems in low- and middle-income countries. *J Gen Intern Med* 2017;32:566–71.
7. Starfield B. Is primary care essential? *Lancet* 1994;344:1129–33.
8. Farmer P. Diary: Ebola. *London Rev Books* 2014;36:38–9.
9. World Health Organization. Framework on integrated, people-centred health services 2016.
10. WHO. Global strategy on human resources for health: Workforce 2030: 2010.
11. Dugani S, Afari H, Hirschhorn LR, et al. Prevalence and factors associated with burnout among frontline primary health care providers in low- and middle-income countries: a systematic review. *Gates Open Res* 2018;2:4.
12. World Health Organization. *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies*. Geneva: World Health Organization, 2010.
13. Ballard M, Schwarz R. Employing practitioner expertise in optimizing community healthcare systems. *Healthcare* 2018. doi: 10.1016/j.hjdsi.2018.08.003. [Epub ahead of print: 23 Aug 2018].
14. Health data collaborative. <https://www.healthdatacollaborative.org/>
15. Wadge H, Roy R, Sripathy A, et al. How to harness the private sector for universal health coverage. *Lancet* 2017;390:e19–e20.
16. Pesec M, Ratcliffe HL, Karlage A, et al. Primary health care that works: the Costa Rican Experience. *Health Aff* 2017;36:531–8.

London Review of Books

Diary

Paul Farmer

I have just returned from Liberia with a group of physicians and health activists. We are heading back in a few days. The country is in the midst of the largest ever epidemic of Ebola haemorrhagic fever. It's an acute and brutal affliction. Ebola is a zoonosis – it leaps from animal hosts to humans – which is caused by a filovirus (a thread-like virus that causes internal and external bleeding). It was first described in 1976 in rural Congo, not far from the Ebola River, as an acute-onset syndrome characterised by complaints of weakness, followed by fever and abdominal pain. Patients became dehydrated as a consequence of fever, vomiting and diarrhoea. Many became delirious and started to haemorrhage from the mouth, nose, vagina, at sites where intravenous lines had been placed, even from the eyes.

The Ebola virus is terrifying because it infects most of those who care for the afflicted and kills most of those who fall ill: at least, that's the received wisdom. But it isn't clear that the received wisdom is right. It's true that many of those who have died were medical professionals. The 1976 epidemic, for example, started in a mission hospital where Belgian nuns worked as nurses alongside Congolese colleagues. But even then it was known that the virus could be transmitted as the result of a failure to follow the rules of modern infection control: the nurses reused needles and did not wear gloves, gowns or masks, which were all in short supply. Nor did the nurses, still less their patients, receive what in Brussels, Boston or Paris would count as modern medical care.

Even without a specific antiviral therapy, the treatment for hypovolaemic shock – which occurs when there isn't enough blood for the heart to pump through the body and is the end result of many infections caused by bacteria and some caused by haemorrhagic viruses – is aggressive fluid resuscitation. For those able to take fluids by mouth, shock can often be forestalled by oral rehydration salts given by the litre. Patients who are vomiting or delirious are treated with intravenous fluids; haemorrhagic symptoms are treated with blood products. Any emergency room in the US or Europe can offer such care, and can also treat patients in isolation wards.

Both nurses and doctors are scarce in the regions most heavily affected by Ebola. Even before the current crisis killed many of Liberia's health professionals, there were fewer than fifty doctors working in the public health system in a country of more than four million people, most of whom live far from the capital. That's one physician per 100,000 population, compared to 240 per 100,000 in the United States or 670 in Cuba. Properly equipped hospitals are even scarcer than staff, and this is true across the regions most affected by Ebola. Also scarce is personal protective equipment (PPE): gowns, gloves, masks, face shields etc. In Liberia there isn't the staff, the stuff or the space to stop infections transmitted through bodily fluids, including blood, urine, breast milk, sweat, semen, vomit and diarrhoea. Ebola virus is shed during clinical illness and after death: it remains viable and infectious long after its hosts have breathed their last. Preparing the dead for burial has turned hundreds of mourners into Ebola victims.

Many of the region's recent health gains, including a sharp decline in child mortality, have already been reversed, in large part because basic medical services have been shut down as a

result of the crisis. Most of Ebola's victims may well be dying from other causes: women in childbirth, children from diarrhoea, people in road accidents or from trauma of other sorts. There's little doubt that the current epidemic can be stopped, but no one knows when or how it will be reined in. As Barack Obama said, speaking at a special session of the United Nations, 'Do not stand by, thinking that somehow, because of what we've done, that it's taken care of. It's not.' Preventing the next eruption is an even more distant goal.

As of 1 October, a third of all Ebola cases ever documented were registered in September 2014. More than seven thousand cases have been recorded since March, more than half of them fatal. In epidemiological terms, the doubling times of the current Ebola outbreak are 15.7 days in Guinea, 23.6 days in Liberia and 30.2 days in Sierra Leone. The US Centers for Disease Control and Prevention suggested at the end of September that unless urgent action is taken, more than a million people could be infected in the next few months.

The worst is yet to come, especially when we take into account the social and economic impact of the epidemic, which has so far hit only a small number of patients (by contrast, the combined death toll of Aids, tuberculosis and malaria, the 'big three' infectious pathogens, was six million a year as recently as 2000). Trade and commerce in West Africa have already been gravely affected. And Ebola has reached the heart of the Liberian government, which is led by the first woman to win a presidential election in an African democracy. There were rumours that President Ellen Johnson Sirleaf was not attending the UN meeting because she was busy dealing with the crisis, or because she faced political instability at home. But we knew that one of her staff had fallen ill with Ebola. A few days ago, we heard that another of our Liberian hosts, a senior health official, had placed herself in 21-day quarantine. Although she is without symptoms, her chief aide died of Ebola on 25 September. Such developments, along with the rapid pace and often spectacular features of the illness, have led to a level of fear and stigma which seems even greater than that normally caused by pandemic disease.

But the fact is that weak health systems, not unprecedented virulence or a previously unknown mode of transmission, are to blame for Ebola's rapid spread. Weak health systems are also to blame for the high case-fatality rates in the current pandemic, which is caused by the Zaire strain of the virus. The obverse of this fact – and it is a fact – is the welcome news that the spread of the disease can be stopped by linking better infection control (to protect the uninfected) to improved clinical care (to save the afflicted). An Ebola diagnosis need not be a death sentence. Here's my assertion as an infectious disease specialist: if patients are promptly diagnosed and receive aggressive supportive care – including fluid resuscitation, electrolyte replacement and blood products – the great majority, as many as 90 per cent, should survive.

Ebola's more general effects also damage the effort to treat the disease. The closure of national borders means, among other things, that it's more difficult for the staff and the staff to reach those most in need. Many airlines have halted services. Schools have been shut down, including medical and nursing schools. Food and fuel, much of it imported, are becoming scarce. Exxon has announced that it is delaying offshore drilling plans. Supply chains have been cut off. Hospitals and clinics have been closed.

There have been incidents of violence linked to fear and stigma. In Liberia – where we were warmly welcomed – my colleagues and I heard that seven Ebola workers, apparently including two local public-health officials, had been murdered with machetes in rural Guinea. Their bodies were discovered in the septic tank of a local primary school. Eleven years ago, four Congolese schoolteachers engaged in Ebola-awareness campaigns were also killed. The complex relationship between contagion, lethality, stigma and long neglect – most people in rural West Africa have never had access to comprehensive medical care – has yet to be laid out.

I've been asked more than once what the formula for effective action against Ebola might be. It's often those reluctant to invest in a comprehensive model of prevention and care for the

poor who ask for ready-made solutions. What's the 'model' or the 'minimum basic package'? What are the 'metrics' to evaluate 'cost-effectiveness'? The desire for simple solutions and for proof of a high 'return on investment' will be encountered by anyone aiming to deliver comprehensive services (which will necessarily include both prevention and care, all too often pitted against each other) to the poor. Anyone whose metrics or proof are judged wanting is likely to receive a cool reception, even though the Ebola crisis should serve as an object lesson and rebuke to those who tolerate anaemic state funding of, or even cutbacks in, public health and healthcare delivery. Without staff, stuff, space and systems, nothing can be done.

If such things were thin on the ground in Monrovia and Freetown, they were all but absent in rural regions. Zwedru is the capital of Grand Gedeh County in south-eastern Liberia, a region mostly covered by rainforest. Flying from Monrovia to Zwedru reminds you how vast and green – and rainy – much of the country is, especially in September. Outside the capital, paved roads are as scarce as electricity: in 2013, it was estimated that less than 1 per cent of Liberia was electrified. As Sirleaf recently pointed out, the Dallas Cowboys football stadium consumes more energy each year than the whole of Liberia. It is very difficult to take care of critically ill patients in the dark; fluid resuscitation depends on being able to place and replace intravenous lines.

In Zwedru, we visited the Grand Gedeh's only hospital. Although there have been stories of doctors and nurses fleeing their posts, the fact is that many remain. But without personal protective equipment or other supplies, there isn't a lot they can do. We didn't see any Ebola patients in the hospital. Rumour had it that the hospital administration had just sent away a carload of suspects. In Ziah Town, a small village a couple of hours away, we met some community health workers. They were a well-informed group of mostly young men and women. Kru was their native language; they spoke English just fine. They were the front line in the struggle against Ebola, the ones who could bring information and services to the rural poor. But they were isolated and badly equipped. The sun beat down on the immense forest and the dirt roads cutting through it. We were slated to leave Monrovia the following afternoon. Thunderheads blackened the eastern sky, and it wasn't clear we'd make the plane; the four-wheel-drive vehicles were having a hard time. Stuck in the mud, we wondered how the community health workers would be able to get sick patients to Ebola care centres, a series of planned but not yet constructed halfway houses.

Although the Grand Gedeh had been declared Ebola-free, it was also free of diagnostic tests. And electricity and surfaced roads. But the community health workers, like the people in Ziah Town, were plugged into the cash economy: people had cell phones (if little signal) and wore T-shirts (one of them emblazoned with the shield of a small Midwestern college); children were kicking a football around; one boy was nursing a can of Red Bull. 'How do they make a living?' I asked one of the young American volunteers. She hesitated, although she'd lived and worked in Zwedru for more than a year. 'They're great hunters,' she said. After listening patiently to our halting conversation, the driver of the jeep – we were waiting for our convoy to emerge from the mud – helped out. He was from Monrovia, he said. He'd been working in the Grand Gedeh for more than ten years, first as an officer in the disarmament programme, and then as a driver and logistician. 'It's not just hunting and small-scale farming,' he said. There were also mining, remittances from abroad and international trade. Many of the shopkeepers in town were from Guinea, Sierra Leone or Côte d'Ivoire. It may have looked like isolated rainforest, but the place is connected to the rest of West Africa.

That means it's connected to the rest of the world too. And however the epidemic started – whether through the ingestion of bush meat or an infected bit of fruit dropped by a clumsy fruit bat – it's clear enough that attempts to seal national borders won't stop it. There are no checkpoints or barriers in the forests. The day when enclosure might have worked is long gone. A CNN interviewer asked me if Ebola might spread to Europe and North America. 'Of course it will,' I replied. 'We live in a global economy.'

On 30 September, the US Centers for Disease Control and Prevention confirmed the first diagnosis of the disease in the United States. A traveller from Liberia, asymptomatic (by self-report) on boarding a flight from Monrovia to the United States on 19 September (as our team left Zwedru for Monrovia), fell ill in Dallas a few days later. His symptoms were similar to those described in every Ebola case: a fever of 40°C, weakness, abdominal pain. He had a history of exposure, having driven a young woman, pregnant and bleeding, to a hospital in Monrovia; she was turned away and later died. But on his first visit to an emergency room, his symptoms were judged 'non-specific' and the diagnosis was missed even though he had come from Liberia. Two days later, highly infectious and critically ill, he was taken by ambulance back to the same hospital and admitted to intensive care. Within hours, the cause of his illness was confirmed as Ebola, Zaire strain. He is now dying. It's unlikely that the American subplot is over. The cycle of fear and stigma, amped up by the media, will continue to spiral, even though there's little doubt that the epidemic will be contained in the US, which has the staff, stuff, space and systems.

Ebola is more a symptom of a weak healthcare system than anything else. But until this diagnosis is agreed on, there's plenty of room for other, more exotic explanations. The palaver (as Liberians say) includes a lot of talk about the 'cultural beliefs and behaviours' said to propagate the outbreak. The list usually includes activities that are not really 'behaviours', such as hunting and eating bush meat, taking part in strange funerary practices or the bizarre rituals of 'secret societies' like the Poro or the Human Leopard Societies. An obsession with funerary rituals – the more lurid the better – was characteristic of anthropology from the late 19th century on. *Tribes of the Liberian Hinterland* (1947), written in the passive voice and matter-of-fact tone typical of the genre, contains more than five hundred pages of this sort of stuff:

Formerly, only chiefs and big men were washed after they died. In Half-Grebo the corpse of a warrior who died from the effects of a gunshot wound was taken to a stream and washed. In both Grebo and Sapa, the shot was extracted in order to prevent his being reincarnated with a wound.

Now, all the dead are washed. The corpse is then laid on a mat and rolled up in it. With the corpse are put some cloths, the number varying with the rank of the person.

Despite anthropologists' fondness of recounting such practices, these rites are not suspected of having played a major role in outbreaks of Ebola in Congo, Uganda and Sudan over the last forty years. The inhabitants of coastal West Africa have eaten bush meat for centuries and they have prepared the dead for burial without taking precautions to stop transmission of a pathogen like Ebola. Even so, it isn't improbable that these practices helped to spark and then fan this outbreak, which began in the Upper Guinea Rainforest.

What accounts for Ebola's spread from Guéckédou to Monrovia and Freetown and now to Dallas? As Larry Brilliant, who helped to eradicate smallpox almost forty years ago, just as Ebola was being discovered, and now heads the Skoll Foundation's Global Threats Fund, has observed, 'Outbreaks are inevitable. Pandemics are optional.' The eating of bush meat can't possibly explain the epidemic, but grotesque and growing disparities in access to care – in the context of a globalised political economy – can. The attempt to treat Ebola patients in a weak health system – or at home – has been strongly linked to the transmission of the virus. In several West African hospitals, Ebola has ripped through the professional staff: health professionals, nurses' aides, morgue attendants. Understaffed and undersupplied, front-line health workers in West Africa have good reason to be afraid. We who aim to help them, though better equipped, are afraid too.

The others at great risk, obviously enough, are the primary caregivers of the sick: not health professionals but family members, especially women. Associated Press reported the story of a

14-year-old Liberian boy: "Too weak to stand, they bundled him into a taxi with his backpack and a yellow plastic bucket for his vomit ... "He's been sick for a week with a runny stomach," says his distressed mother, wiping the sweat off the boy's brow with bare hands. "We tried calling an ambulance days ago, but nobody ever came."

Who will come when we call? Who will show up not just if it's convenient or cost-effective or already budgeted? It isn't clear that all such responsibilities should be handed out to contractors or NGOs. The three countries most afflicted by Ebola are those with some of the lowest public investment in healthcare and public health in Africa. They have been wracked by war, and by extractive industries, which have never failed to turn a profit. This is one of the reasons that Liberia could boast, only a few years ago, the fastest growing GDP in the world.

For most of a century, the Firestone Rubber Company has been the largest taxpayer in Liberia. In 1926 it negotiated a million-acre concession at six cents an acre, for ninety years. By the Second World War, there was a little bit of the Liberian forest in many, if not most, American cars. Firestone is still in Liberia. It promised 350,000 jobs, but never created more than a quarter of that number. For decades, plantation workers demanded better pay, a high school and medical care. In recent years, they achieved some measure of success. But the epidemic has affected them too. At the end of March, the wife of a Firestone employee left Lofa County, which borders Guinea, not far from where the first case was recorded. She had a sudden-onset generalised weakness and fever. Eight times out of ten, the pathogens responsible would be those that cause malaria, pneumococcal pneumonia, typhoid fever, influenza or a complication of Aids. Lassa, another haemorrhagic fever, would be on the list in Liberia, but Ebola was then unknown in the region. On 31 March, the woman travelled by taxi to Monrovia with five other passengers, including her infant, but was referred back to the Firestone plantation, to Duside Hospital. By then, sick with profuse diarrhoea and vomiting, she was diagnosed with Ebola. She continued to lose vital fluids and electrolytes, and slipped into hypovolaemic shock. As her blood pressure dropped, nurses did their best to resuscitate her. Within an hour, it was all over.

Except that it wasn't. Four months later, 72 cases of Ebola were diagnosed in rapid succession at Duside; only 18 patients survived. Yet the Firestone response was considered a success, since infection control was improved during those months and transmission within the hospital declined rapidly.

Such back and forth is how Ebola got to the city and into its clinical facilities. St Joseph's Catholic Hospital, in a Monrovia slum, has lost many of its caregivers and most of its patients. Within two weeks of its first cases, the hospital director fell ill with similar symptoms. This time, they knew what was coming. But even for its most valued professionals, the hospital could not conjure proper medical care out of nothing. Two more nurses, two laboratory technicians and a social worker were all dead within a couple of months of the city's first two cases. So too were several of the nuns and priests working there. Father Miguel Pajares was airlifted home to Spain; so, later, was Father García Viejo, working in a small town in Sierra Leone. Both died in Madrid. It is unlikely that we have heard the last from Spain either.

What is to be done? The only formula we've come up with is the following: you can't stop Ebola without staff, stuff, space and systems. And these need to reach not only cities but also the rural areas in which most people in West Africa still live. First, we need to stop transmission. The source of the first human cases is no longer the primary concern. Transmission is person to person, and in the absence of an effective medical system, it occurs wherever care is given: in households, clinics and hospitals, and where the dead are tended. Infection control must be strengthened in all of these places, and during burials, which requires not only training and exhortations (which are already given in cities throughout West Africa, on billboards and radio, and in community meetings) but also uninterrupted supplies of personal protective equipment. Community health workers, too, need to be better

equipped, trained and paid if they are to play a role in contact-tracing and early diagnosis, as well as trying to address the mounting number of deaths caused by other conditions.

Second, we need to avoid pitting prevention against treatment. Both are necessary. Adam Levine helped to open the first Ebola Treatment Unit in Bong county, Liberia, after working in an ETU in Monrovia. An emergency medicine specialist, he describes what it feels like to be working without the right therapies, while wearing a stifling shroud:

On my third day of training, I come across an older man, also lying motionless on his mattress. At first I think he might be dead, but as I lay my double-gloved hand gently on his shoulder, he turns his head to look up at me. His eyes are sunken and his lips parched, his skin flattening only slowly when pinched. He is severely dehydrated from the profuse diarrhoea common with Ebola. Usually a drip of intravenous fluids would be started, but the [ETU] lacks sufficient staff to safely place intravenous catheters for patients. So instead I turn the patient slowly onto his back, grab the full bottle of oral rehydration solution lying by his side, and pour a tiny capful into the man's slightly open mouth. Surprisingly, he swallows it. I pour another capful, and then another, and he keeps swallowing. Only a few hundred more capfuls to rehydrate him, but I know that in the stifling heat I am not going to last much longer in my full PPE.

Most experts don't think staff should spend more than two or three hours in PPE. Dizzied by heat, even the most cautious professionals start to make mistakes.

Equality of access to care is important if we are to encourage the sick into quarantine. Two weeks ago, a Liberian physician told me a story I won't soon forget. He and some Liberian and Ugandan colleagues were planning on opening an ETU in Monrovia after the other clinics had stopped giving intravenous fluids; patients were dying of untreated shock. When one of the European caregivers at his ETU fell ill and was about to be airlifted home, the ETU director asked him to find an infusion pump. He spent hours looking, and eventually found one, but not before the non-national was airlifted away. She survived.

Third, the rebuilding of primary care must be informed by what has been learned from the response to this outbreak. The hospital we visited in Zwedru, which has 140 beds, was technically open; staff, including the sole attending physician, were present. But there weren't many patients in the wards, or outpatients. The pharmacy had no drugs or supplies, including PPE. The laboratory was short of reagents; the recently donated digital radiography unit hadn't been installed because there weren't any batteries. There was no infection control, which was why the five Ebola suspects had been sent away (two of them died shortly afterwards of confirmed Ebola).

Fourth, the knowledge gained from the response must be built on. Every attempt to prevent the spread of Ebola should involve proper care for quarantined patients. Even without a vaccine or Ebola-specific therapies, it's possible to imagine this bringing a marked drop in case-fatality rates. But we need specific therapy, better and faster diagnosis, and effective vaccines. The vaccines and drugs required to treat so-called 'emerging infectious diseases' do not exist because of what James Surowiecki has called 'Ebolonomics'. 'When a disease's victims are both poor and not very numerous,' he says, 'that's a double whammy. On both scores, a drug for Ebola looks like a bad investment.' The *Onion* recently ran the headline: 'Experts: Ebola vaccine at least fifty white people away.'

It needn't be this way. Several vaccines are ready for clinical trials; a number of treatments – including ZMapp, a combination of monoclonal antibodies developed by a pharmaceutical and a biodefence company, and RNA interference agents – are also ready for trial. The process should be fast-tracked, and willing Ebola survivors (who should be immune) recruited by the thousand into this work as well as into providing clinical care.

Fifth, formal training programmes should be set up for Liberians, Guineans and Sierra Leoneans. Vaccines and diagnostics and treatments will not be discovered or developed without linking research to clinical care; new developments won't be delivered across West Africa without training the next generation of researchers, clinicians and managers. West Africa needs well-designed and well-resourced medical and nursing schools as well as laboratories able to conduct surveillance and to respond earlier and more effectively. Less palaver, more action.

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Responding to Covid-19 — A Once-in-a-Century Pandemic?

Bill Gates

In any crisis, leaders have two equally important responsibilities: solve the immediate problem and keep it from happening again. The Covid-19 pandemic is a case in point. We need to save lives

now while also improving the way we respond to outbreaks in general. The first point is more pressing, but the second has crucial long-term consequences.

The long-term challenge — improving our ability to respond to outbreaks — isn't new. Global health experts have been saying for years that another pandemic whose speed and severity rivaled those of the 1918 influenza epidemic was a matter not of *if* but of *when*.¹ The Bill and Melinda Gates Foundation has committed substantial resources in recent years to helping the world prepare for such a scenario.

Now we also face an immediate crisis. In the past week, Covid-19 has started behaving a lot like the once-in-a-century pathogen we've been worried about. I hope it's not that bad, but we should as-

sume it will be until we know otherwise.

There are two reasons that Covid-19 is such a threat. First, it can kill healthy adults in addition to elderly people with existing health problems. The data so far suggest that the virus has a case fatality risk around 1%; this rate would make it many times more severe than typical seasonal influenza, putting it somewhere between the 1957 influenza pandemic (0.6%) and the 1918 influenza pandemic (2%).²

Second, Covid-19 is transmitted quite efficiently. The average infected person spreads the disease to two or three others — an exponential rate of increase. There is also strong evidence that it can be transmitted by people who are just mildly ill or even presymptomatic.³ That means Covid-19 will

be much harder to contain than the Middle East respiratory syndrome or severe acute respiratory syndrome (SARS), which were spread much less efficiently and only by symptomatic people. In fact, Covid-19 has already caused 10 times as many cases as SARS in a quarter of the time.

National, state, and local governments and public health agencies can take steps over the next few weeks to slow the virus's spread. For example, in addition to helping their own citizens respond, donor governments can help low- and middle-income countries (LMICs) prepare for this pandemic.⁴ Many LMIC health systems are already stretched thin, and a pathogen like the coronavirus can quickly overwhelm them. And poorer countries have little political or economic leverage, given wealthier countries' natural desire to put their own people first.

By helping African and South Asian countries get ready now, we can save lives and slow the global circulation of the virus.

(A substantial portion of the commitment Melinda and I recently made to help kickstart the global response to Covid-19 — which could total up to \$100 million — is focused on LMICs.)

The world also needs to accelerate work on treatments and vaccines for Covid-19.⁵ Scientists sequenced the genome of the virus and developed several promising vaccine candidates in a matter of days, and the Coalition for Epidemic Preparedness Innovations is already preparing up to eight promising vaccine candidates for clinical trials. If some of these vaccines prove safe and effective in animal models, they could be ready for larger-scale trials as early as June. Drug discovery can also be accelerated by drawing on libraries of compounds that have already been tested for safety and by applying new screening techniques, including machine learning, to identify antivirals that could be ready for large-scale clinical trials within weeks.

All these steps would help address the current crisis. But we also need to make larger systemic changes so we can respond more efficiently and effectively when the next epidemic arrives.

It's essential to help LMICs strengthen their primary health care systems. When you build a health clinic, you're also creating part of the infrastructure for fighting epidemics. Trained health care workers not only deliver vaccines; they can also monitor disease patterns, serving as part of the early warning systems that alert the world to potential outbreaks.

We also need to invest in disease surveillance, including a case database that is instantly accessible to relevant organizations, and rules requiring countries to share information. Governments

should have access to lists of trained personnel, from local leaders to global experts, who are prepared to deal with an epidemic immediately, as well as lists of supplies to be stockpiled or redirected in an emergency.

In addition, we need to build a system that can develop safe, effective vaccines and antivirals, get them approved, and deliver billions of doses within a few months after the discovery of a fast-moving pathogen. That's a tough challenge that presents technical, diplomatic, and budgetary obstacles, as well as demanding partnership between the public and private sectors. But all these obstacles can be overcome.

One of the main technical challenges for vaccines is to improve on the old ways of manufacturing proteins, which are too slow for responding to an epidemic. We need to develop platforms that are predictably safe, so regulatory reviews can happen quickly, and that make it easy for manufacturers to produce doses at low cost on a massive scale. For antivirals, we need an organized system to screen existing treatments and candidate molecules in a swift and standardized manner.

Another technical challenge involves constructs based on nucleic acids. These constructs can be produced within hours after a virus's genome has been sequenced; now we need to find ways to produce them at scale.

Beyond these technical solutions, we'll need diplomatic efforts to drive international collaboration and data sharing. Developing antivirals and vaccines involves massive clinical trials and licensing agreements that would cross national borders. We should make the most of global forums

that can help achieve consensus on research priorities and trial protocols so that promising vaccine and antiviral candidates can move quickly through this process. These platforms include the World Health Organization R&D Blueprint, the International Severe Acute Respiratory and Emerging Infection Consortium trial network, and the Global Research Collaboration for Infectious Disease Preparedness. The goal of this work should be to get conclusive clinical trial results and regulatory approval in 3 months or less, without compromising patients' safety.

Then there's the question of funding. Budgets for these efforts need to be expanded several times over. Billions more dollars are needed to complete phase 3 trials and secure regulatory approval for coronavirus vaccines, and still more funding will be needed to improve disease surveillance and response.

Government funding is needed because pandemic products are extraordinarily high-risk investments; public funding will minimize risk for pharmaceutical companies and get them to jump in with both feet. In addition, governments and other donors will need to fund — as a global public good — manufacturing facilities that can generate a vaccine supply in a matter of weeks. These facilities can make vaccines for routine immunization programs in normal times and be quickly refitted for production during a pandemic. Finally, governments will need to finance the procurement and distribution of vaccines to the populations that need them.

Billions of dollars for antipandemic efforts is a lot of money. But that's the scale of investment

required to solve the problem. And given the economic pain that an epidemic can impose — we're already seeing how Covid-19 can disrupt supply chains and stock markets, not to mention people's lives — it will be a bargain.

Finally, governments and industry will need to come to an agreement: during a pandemic, vaccines and antivirals can't simply be sold to the highest bidder. They should be available and affordable for people who are at the heart of the outbreak and in

greatest need. Not only is such distribution the right thing to do, it's also the right strategy for short-circuiting transmission and preventing future pandemics.

These are the actions that leaders should be taking now. There is no time to waste.

Disclosure forms provided by the author are available at NEJM.org.

From the Bill and Melinda Gates Foundation, Seattle.

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1. Gates B. The next epidemic — lessons from Ebola. *N Engl J Med* 2015;372:1381-4.
2. The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of an outbreak of 2019 novel coronavirus disease (COVID-19) — China, 2020. *China CDC Weekly* 2020;2:1-10.
3. Hoehl S, Rabenau H, Berger A, et al. Evidence of SARS-CoV-2 infection in returning travelers from Wuhan, China. *N Engl J Med* 2020;382:1278-80.
4. Frieden TR, Tappero JW, Dowell SF, et al. Safer countries through global health security. *Lancet* 2014;383:764-6.
5. Gates B. Innovation for pandemics. *N Engl J Med* 2018;378:2057-60.

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Virtually Perfect? Telemedicine for Covid-19

Judd E. Hollander, M.D., and Brendan G. Carr, M.D.

Recognizing that patients prioritize convenient and inexpensive care, Duffy and Lee recently asked whether in-person visits should become the second, third, or even last option for meeting patient needs.¹ Previous work has specifically described the potential for using telemedicine in disasters and public health emergencies.² No telemedicine program can be created overnight, but U.S. health systems that have already implemented telemedical innovations can leverage them for the response to Covid-19.

A central strategy for health care surge control is “forward triage” — the sorting of patients before they arrive in the emergency department (ED). Direct-to-consumer (or on-demand) telemedicine, a 21st-century approach to forward triage that allows patients to be efficiently screened, is both patient-centered and conducive to self-quarantine, and it protects patients, clinicians, and the community from exposure. It can allow physicians and patients

to communicate 24/7, using smartphones or webcam-enabled computers. Respiratory symptoms — which may be early signs of Covid-19 — are among the conditions most commonly evaluated with this approach. Health care providers can easily obtain detailed travel and exposure histories. Automated screening algorithms can be built into the intake process, and local epidemiologic information can be used to standardize screening and practice patterns across providers.

More than 50 U.S. health systems already have such programs. Jefferson Health, Mount Sinai, Kaiser Permanente, Cleveland Clinic, and Providence, for example, all leverage telehealth technology to allow clinicians to see patients who are at home. Systems lacking such programs can outsource similar services to physicians and support staff provided by Teladoc Health or American Well. At present, the major barrier to large-scale telemedical screening for SARS-CoV-2, the nov-

el coronavirus causing Covid-19, is coordination of testing. As the availability of testing sites expands, local systems that can test appropriate patients while minimizing exposure — using dedicated office space, tents, or in-car testing — will need to be developed and integrated into telemedicine workflows.

Rather than expect all outpatient practices to keep up with rapidly evolving recommendations regarding Covid-19, health systems have developed automated logic flows (bots) that refer moderate-to-high-risk patients to nurse triage lines but are also permitting patients to schedule video visits with established or on-demand providers, to avoid travel to in-person care sites. Jefferson Health's telemedical systems have been successfully deployed to evaluate and treat patients without referring them to in-person care. When testing is needed, this approach requires centralized coordination with practice personnel as well as federal and local testing agen-

Chapter 12



Organization of Essential Services and the Role of First-Level Hospitals

Colin McCord, Margaret E. Kruk, Charles N. Mock, Meena Cherian, Johan von Schreeb, Sarah Russell, and Mike English

INTRODUCTION

Every country has some sort of system to provide surgical and other health services at various levels, with a progressive increase in the capacity to treat more complicated problems. Reliable evidence indicates that properly functioning small hospitals and health centers can deliver effective basic surgical services at very low cost; these surgical services can be one of the most cost-effective components of the public health system in low- and middle-income countries (LMICs) (Alkire and others 2012; Debas and others 2006; Gosselin, Maldonado, and Elder 2010; Gosselin, Thind, and Bellardinelli 2006; McCord and Chowdhury 2003). *Properly functioning* is a key phrase; a hospital lacking personnel trained in surgery and in the administration of anesthesia cannot provide major surgical procedures. Even minor surgery requires trained personnel. More than 50 percent of the disability-adjusted life years (DALYs) averted in a small hospital can derive from surgical treatment, (McCord and Chowdhury 2003) so the cost-effectiveness of these units is drastically reduced if this treatment is not available. Box 12.1 defines the three levels of hospital care.

Recommended Skills and Services

The World Health Organization (WHO) and others have provided descriptions of what services would be available at properly functioning first-, second-, and third-level

facilities, and how such systems could function (Debas and others 2006; WHO 1992, 2003, 2010). The WHO has assisted countries in analyzing their current systems and asked them to make realistic plans to get from where they are to a point closer to the ideal. Chapter 67 in *Disease Control Priorities in Developing Countries*, second edition (DCP2), presents a detailed outline of what skills, services, and infrastructure would be available in an ideal district hospital and calculates the cost in 2004 U.S. dollars (Debas and others 2006).

This chapter considers, and generally follows, the recommendations of DCP2 and the WHO, discusses what is actually available in LMICs, and considers how to move from the current situation to an achievable improvement. The emphasis is on first-level hospitals—the lowest level hospital that provides major surgery—and the systems to support them.

Referral Systems

Referrals of surgical patients from lower levels such as clinics to first-level hospitals, as well as from first-level facilities to second- and third-level facilities, is an essential part of any system; however, in LMICs, the transport of referred patients is a major problem for families with low incomes. If surgical care is not available at an accessible first-level hospital, it is effectively beyond the reach of at least 1 billion people (Weiser and others 2008). This group includes 80 percent of the population

Box 12.1

Levels of Hospital Care in Low- and Middle-Income Countries

Crucial treatment for surgical conditions can be available in clinics and dispensaries, especially treatment for surgical infections and simple trauma. However, the lack of trained staff, limited supplies, and unavailability of anesthesia seriously restrict the services that can be offered in these facilities, so most patients with important problems need to find hospitals (table B12.1.1).

The principal function of second- and third-level hospitals is to provide more complex clinical care to patients referred from lower levels; however, no agreed-on international definition determines which specific services should be provided at hospitals at the three levels in these settings. The range of services offered tends to vary substantially, even between third-level hospitals within the same country, as much because of historical accident as deliberate design. Also, almost all second- and third-level hospitals provide emergency services for local areas and thereby function as first-level hospitals to varying degrees.

Important differences exist among regions:

- In Sub-Saharan Africa, first-level hospitals are usually small facilities, serving populations of fewer than 500,000. They rarely have specialized physicians on staff. Surgical services are provided by general practitioners, often recent medical school graduates. In some countries (notably Malawi, Mozambique, Tanzania, and Zambia), nonphysician clinicians (NPCs) have been trained to do major surgery.
- In South Asia, first-level hospitals are larger and commonly serve much larger populations of 1 million to 2 million or more. They usually have several specialists on staff. Nonphysicians rarely perform major surgery.
- In Latin America and the Caribbean, small hospitals often provide first-level surgical services to populations of fewer than 100,000. They usually have a surgeon and an obstetrician, and nonphysicians do not perform major surgery.

Table B12.1.1 Definitions of Levels of Hospital Care

Level of care	Alternative terms commonly found in the literature
<i>First-level hospitals:</i> Few specialties—mainly internal medicine, obstetrics and gynecology, pediatrics, and general surgery; often only one general practice physician or a nonphysician practitioner; limited laboratory services available for general but not specialized pathological analysis; from 50 to 250 beds.	Primary-level hospital District hospital Rural hospital Community hospital General hospital
<i>Second-level hospitals:</i> More differentiated by function with as many as 5 to 10 clinical specialties; from 200 to 800 beds.	Regional hospital Provincial hospital (or equivalent administrative area such as county) General hospital
<i>Third-level hospitals:</i> Highly specialized staff and technical equipment—for example, cardiology, intensive care unit, and specialized imaging units; clinical services highly differentiated by function; could have teaching activities; from 300 to 1,500 beds.	National hospital Central hospital Academic or teaching or university hospital

Source: Adapted from Mulligan and others 2003.

of Sub-Saharan Africa and 60 percent of the population of South Asia, as well as large parts of the populations of Latin America and the Caribbean and middle-income countries (MICs) in other regions.

Distance and lack of transportation restrict patient travel outside of local areas, but the real barrier is cost.

Transportation can generally be found, but the cost usually falls on the patient. Additional high costs include transportation of and accommodations for family members to accompany patients, the opportunity costs of family members taken away from work, medical supplies not provided by hospitals, and often “informal payments”

to hospital staff. Moreover, many patients are not in any condition to withstand a long trip, even if they can afford it.

The need for first-level hospitals is not limited to rural areas. In cities, population growth can overwhelm the third-level central hospitals; smaller urban hospitals are too often unable to provide 24-hour emergency services, except in private facilities that are too costly for most urban residents in LMICs.

Capacity Constraints

These issues place first-level hospitals at the center of any system to provide surgery in LMICs (Kushner and others 2010). Major constraints limit their capacity. These constraints reflect the extremely low budgets within which these hospitals must function—usually less than US\$30 per day per patient in Sub-Saharan Africa (Kruk and others 2010)—and include the following:

- Lack of trained staff
- Inadequate supplies
- Inadequate maintenance of basic equipment
- Poor condition of buildings and intermittent or absent water and electricity
- Transportation challenges that restrict the effectiveness of a functioning referral system

FIRST-LEVEL HOSPITALS: POTENTIAL VERSUS REALITY

The Ideal

Although most health systems are organized as a pyramid, with primary care facilities at the base and national third-level hospitals at the apex, the specifics vary among countries (Chatterjee, Levin, and Laxminarayan 2013; Galukande and others 2010; Lebrun and others 2013; Zafar and McQueen 2011). In most of Sub-Saharan Africa, dispensaries and health centers provide primary care, deliver newborns, and usually perform minor surgery. When patients need major surgery, they are meant to be referred to a district (first-level) hospital, usually with 100 to 200 beds, serving a population of 100,000 to 500,000 (Galukande and others 2010). In Bangladesh, India, and Pakistan, the smallest unit regularly providing major surgery is also called a *district hospital*, but the districts are much bigger, usually with a population of 2 million or more (Chatterjee, Levin, and Laxminarayan 2013; Lebrun and others 2013; Zafar and McQueen 2011). In Latin America and the Caribbean, many quite small “basic hospitals” provide first-level surgical functions for populations of fewer than 100,000, and

refer patients to a fairly extensive network of second- and third-level hospitals (Lebrun and others 2012; Solis and others 2013).

However the pyramid is structured, the constraints listed previously seriously limit the way it can function. The two most important and difficult of these constraints are the shortage of trained staff, which limits the services that can be provided, especially in first-level hospitals, and the weakness of the referral system, which often makes it impossible to send patients to a higher level, where more highly trained staff may be available. Clearly, the two problems work against each other. If trained staff are not available, patients should be referred. If they cannot be referred, they often do not receive appropriate treatment, which can lead to death or serious disability. Although the emphasis today needs to be on initiatives to increase the capacity of peripheral first-level hospitals, access to transportation and referral can reduce the need for this expansion of capacity and lead to a more efficient system.

In DCP2, Debas and others (2006) list the resource requirements for surgical services in ideal LMIC clinics and hospitals, based on their own estimates and those of the WHO (table 12.1).

The Reality

Table 12.2 presents the actual situation in 3 first-level hospitals in Tanzania, as well as the averages for 11 hospitals in Bolivia and 7 in Bangladesh.

- The Kasulu District Hospital is typical of the second-level hospitals in Tanzania and most other Sub-Saharan African countries, except that the population served is more than twice the national average. The one physician also serves as the district medical officer, an administrative job that occupies most of the physician’s time. No specialists and no one fully qualified in surgery or obstetrics is on staff. Assistant medical officers (NPCs with six months of formal surgical and obstetrical training) perform the surgery.
- The Maweni Regional Hospital serves as the first-level hospital for two districts and receives few patients as referrals for higher-level care, a common situation in Tanzania. There are six physicians, including one academically qualified pediatrician, but no qualified surgeon or obstetrician. NPCs perform all of the surgery.
- The St. Francis Designated District Hospital is a large, faith-based hospital that serves as a designated first-level hospital for two districts. Although it has been named a regional referral hospital, it still serves a first-level function because a new first-level hospital has not yet been created. The six qualified specialists

Table 12.1 Resource Requirements for Surgical Services by Level of Care: The Ideal

Category of requirement	Community clinic	100-bed district (second-level) hospital	Third-level hospital
Infrastructure	Weatherproof building (100 square meters) Storage space Clean water supply Power supply	Inpatient facility of 100 beds, including several wards and an isolation ward Outpatient facility including an emergency room; operating rooms (at least two: one clean, one contaminated) Labor and delivery rooms Recovery room or intensive care unit Blood bank Pharmacy Clinical laboratory Radiology and ultrasonography suite	A major facility providing <ul style="list-style-type: none"> • Full emergency services with advanced diagnostic services • Inpatient wards for complex general medical and surgical care • Various types of specialty services • Several delivery rooms and operating rooms • One or more recovery rooms and intensive care units • Rehabilitation and occupational therapy facilities
Equipment and supplies	Furniture Refrigerator Blood pressure machine Minor surgical trays Sterile and burn dressings Autoclave Intravenous sets and solutions Bandages and splints Drugs: local anesthetics, nonsteroidal anti-inflammatory drugs, antibiotics, tetanus toxoid, silver nitrate ointment, oxytocin, magnesium sulfate Wireless communication equipment Materials for recordkeeping	Anesthetic machines and inhalation gases Monitors (electrocardiogram, blood pressure, pulse oximetry) Fully equipped operating room Fully equipped delivery room Fully equipped recovery room or intensive care unit Respirators and oxygen supply Blood products and intravenous fluids Basic microbiology equipment Pharmaceuticals, (anesthetics, analgesics, antibiotics) Surgical materials (drapes, gowns, dressings, gloves), and other consumables (disposable equipment and devices)	Equipment and supplies as for the 100-bed (first-level) hospital, plus all required equipment and supplies to undertake the range of routine and complex services provided
Human resources ^a	Nurse or nurse equivalent Skilled birth attendant Orderly	Nurses (50+) Midwives (5+) Anesthetists (2–3) Anesthesiologist (1) ^b Primary care physicians (4) ^c Obstetrician/gynecologist (1 or 2) General surgeons (2) Pharmacy assistants (2) Pharmacist (1) ^b Radiology technician (1) Radiologist (1) Physiotherapist (1)	Nurses (100+) Midwives (20+) Anesthetists (5) Anesthesiologists (3) Primary care physicians (10) Obstetricians and gynecologists (5) General surgeons (5) Orthopedic surgeon (1) Pharmacy assistants (2) Pharmacist (1) Radiology technicians (5)

table continues next page

Table 12.1 Resource Requirements for Surgical Services by Level of Care: The Ideal (continued)

Category of requirement	Community clinic	100-bed district (second-level) hospital	Third-level hospital
			Radiologists (2)
			Physiotherapists (5)
			Neurosurgeon (1) ^b
			Cardiac surgeon ^b
			Reconstructive surgeon ^b

Source: Debas and others 2006.

a. The variability in the size and the complexity of services provided by third-level hospitals makes it difficult to describe a standard third-level hospital; the human resource needs given in the table represent what is thought to be minimally adequate.

b. Desirable but not absolutely necessary.

c. May be a general internist, general practitioner, or general pediatrician.

Table 12.2 Human Resources and Infrastructure at Selected First-Level Hospitals in Three Regions: The Reality

	Kasulu District Hospital, Tanzania, 2010	Maweni Regional Hospital, Tanzania, 2013	St. Francis Designated District Hospital, Tanzania, 2013	11 "basic" (first-level) hospitals Bolivia, ^a 2012	7 district (first-level) hospitals, Bangladesh, ^a 2013
Population served	677,000	850,000	500,000+	134,000	1,879,000
Beds	200	256	372	54	140
Admissions per year	12,900	25,800	18,140	3,644	20,000
Operating rooms	3	3	3	2.1	2.4
Physicians	1	6	14	29.4	29.3
General surgeons	0	0	2	3.4	1.6
Obstetricians and gynecologists	0	0	3	3.5	1.4
Orthopedic surgeons	0	0	1	1.4	1.1
Anesthesiologists	0	0	2	3	1
Nurses	61	57	126	24.5	50.5
Beds per nurse	3.3	4.5	3.0	2.2	2.8
Nonphysician clinicians	23	29	8	0	0
Physicians and nonphysician clinicians per 100 beds	12	14	6	54	21

Sources: Kruk and others 2010; Lebrun and others 2012, 2013.

a. Average for all hospitals reviewed.

provide approximately 50 percent of the surgery, and NPCs provide the remainder.

- Bolivia, a lower-middle-income country with a large, very poor population, has trained enough physicians to be able to staff its first-level hospitals with qualified specialists.
- In Bangladesh, as in India, Pakistan, and Sri Lanka, districts are much larger (usually 2 million people or more); first-level surgery is rarely available below the level of the district hospital. Qualified surgeons, obstetricians, and orthopedists are usually present.

Data are not available from these hospitals to permit a calculation of nursing hours per patient-day. One staff nurse per bed is normally required to achieve the usually recommended five to six hours per patient per day for an average hospital (Coffman, Seago, and Spetz 2002; McHugh, Berez, and Small 2013; Needleman and others 2011). The number of beds per nurse far exceeds this level in all of these hospitals.

Surgical and obstetrical specialists are rarely available in Sub-Saharan African first-level hospitals, which typically have one or two general practitioners

(often a recently graduated doctor) for whom surgery is one of many clinical and administrative responsibilities. Tanzania is one of several Sub-Saharan African countries that have trained NPCs to provide basic surgery at this level, especially for obstetrical emergencies. In Mozambique, this training is a three-year program focused on all types of basic emergency surgery; but in most countries with these cadres, surgery and obstetrics are part of a course designed to produce general practitioners (see chapter 17).

Virtually every country has a private health sector, which is often divided into charitable facilities (usually faith based) and for-profit facilities. In much of Latin America and the Caribbean, multiple systems work in parallel: a public system for the poorest; a system serving those with insurance usually derived from salaried employment; and a private sector for the more affluent segment of the population (Lebrun and others 2012; Solis and others 2013).

In India, where the private sector accounts for 78 percent of health expenditure (Kumar and others 2011), the supply of medical school graduates is large, and in some places, excessive. In Sub-Saharan Africa the private health sector is much smaller but is growing rapidly, as is the supply of graduate doctors. In both South Asia and Sub-Saharan Africa, no matter how large the supply of doctors, persuading physicians, especially specialists, to work in rural areas or to serve the poor majority in the cities has been difficult. In Latin America and the Caribbean, the number of physicians is much higher, and many first-level hospitals, even

in lower-middle-income countries such as Bolivia and Nicaragua, have specialists (Lebrun and others 2012; Solis and others 2013).

In many Sub-Saharan African countries, mission hospitals (faith-based) can offer to serve as the district (first-level) hospital for a specified area. In Tanzania, for example, if accepted as a “designated district hospital,” these faith-based hospitals receive government support for salaries and supplies, and the government does not provide another first-level hospital for that area.

Everywhere, almost all of the second- and third-level hospitals act as first-level hospitals for local emergencies.

Table 12.3 presents the surgical volume and procedures in the same hospitals described in table 12.2. The detailed information presented in these tables is not available on a national scale for any of these countries, but the selected hospitals are probably typical for Latin America and the Caribbean, South Asia, and Sub-Saharan Africa. In Tanzania, private (usually faith-based) hospitals that have become designated district hospitals often have several surgical specialists on staff, and some of them have a larger number of nurses. Second-level hospitals are meant to be referral hospitals, but many in Sub-Saharan Africa have few or no surgical specialists and primarily function as larger first-level hospitals (Sanders and others 1998; Siddiqi and others 2001). South Asia has more physicians and specialists for a given population than Sub-Saharan Africa and Latin America and the Caribbean countries usually have many more than other LMIC regions. In Latin America and the Caribbean, this larger professional force is reflected

Table 12.3 Current Surgical Volume and Major Procedures Performed at Selected First-Level Hospitals in Three Regions

	Kasula District Hospital, Tanzania, 2010	Maweni Regional Hospital, Tanzania, 2013	St. Francis Designated District Hospital, Tanzania, 2013	11 “basic” (first-level) hospitals, Bolivia,^a 2012	7 “district” (first-level) hospitals, Bangladesh,^a 2013
Total operations per year	893	915	2,034 ^c	730	3,215
General surgery	99 (11%)	119 (13%)	252 (12%)	284 (39%)	845 (26%)
Obstetrics and gynecology	635 (71%)	499 (55%)	1,386 (68%)	311 (43%) ^b	1,077 (33%)
Other	159 (18%)	297 (32%)	396 (19%)	135 (18%)	1,293 (40%) ^c
Population served	677,000	850,000	500,000	134,000	1,879,000
Operations per specialist	n.a.	n.a.	339	88	784
Operations per 100,000 population	132	108	407	545	171

Sources: Kruk and others 2010; Lebrun and others 2012, 2013.

Note: % = percentage of total annual operations that fall within a category; n.a. = not applicable (no specialist surgeons).

a. Average for all hospitals reviewed.

b. Average for hospitals in towns with no maternity hospital.

c. Includes 717 orthopedic operations; 349 ocular operations; and 199 ear, nose, and throat operations.

in adequate (even excessive) numbers of physicians and specialists in small first-level hospitals (Lebrun and others 2012; Solis and others 2013).

In Bangladesh as well as Pakistan, Sri Lanka, and much of India, most major surgery is provided at the district level or above. District hospitals in these countries serve populations of 1 million to 2 million people. These hospitals have specialists available, but the populations served are so large that the numbers of major operations per 100,000 people is comparable to those in Sub-Saharan Africa (Chatterjee, Levin, and Laxminarayan 2013; Lebrun and others 2013; Zafar and McQueen 2011).

The “population served” by these five hospital groups is an approximation given that patients often move in and out of an area to seek hospital care. In some places, such as Kasulu in tables 12.2 and 12.3, transportation is so difficult that practically no movement of patients to other districts occurs, so the population cited is the true catchment area.

In all three regions, operations for obstetrical emergencies are the largest single component of surgical activity; in Tanzania they are by far the most common kind of surgery. All over the world women are aware that these

operations can prevent maternal, fetal, and newborn death. The demand for emergency obstetrical surgery is limited primarily by persistent restricted access to hospitals that can provide surgical care. Because the operations are common, relatively safe, and uncomplicated, general practitioners and NPCs have been trained to perform them with considerable success (McCord and others 2009; Pereira and others 1996). Still, met need for obstetrical surgery is 25 percent or less in most of Sub-Saharan Africa and much of South Asia (Paxton, Bailey, and Lobis 2006; Pearson and Shoo 2005). Latin America and the Caribbean have a much larger supply of obstetrical specialists working in first-level hospitals and a correspondingly higher met need and lower maternal mortality, even in very poor countries (Bailey 2005; Hogan and others 2010).

More general surgical operations (including trauma, acute abdomen, and other surgical emergencies) are performed in hospitals that have specialists available, but estimates indicate that in all regions, the met need for these emergencies is even lower than the met need for obstetrical care (chapters 5 and 6). The list of operations actually performed in one year in eight first-level hospitals in Sub-Saharan Africa (table 12.4) shows

Table 12.4 Annual Major Operations at Eight First-Level Hospitals in Sub-Saharan Africa
Percent, except as noted

Procedure	Tanzania, 2007		Mozambique, 2007		Uganda, 2006			
	Bagamoyo	Kasulu	Chokwe	Catandica	Mityana	Kiryandongo	Buluba	Iganga
Major nonobstetric (number)	428	242	171	133	456	80	125	711
Amputation	0	3	2	8	0	1	10	1
Appendectomy	11	2	6	2	2	0	1	4
Circumcision	0	1	13	18	1	68	1	0
Excision	0	10	0	5	0	0	0	0
Herniorrhaphy	22	24	17	20	41	16	24	29
Hydrocelectomy	13	8	4	20	2	1	4	0
Hysterectomy (elective)	6	2	9	0	5	1	2	17
Laparotomy	6	26	20	10	3	5	10	43
Open fracture reduction	3	0	2	0	31	0	0	0
Other	9	24	29	17	15	8	48	5
Obstetric (number)	431	883	377	110	754	35	100	915
Tubal ligation	6	11	7	4	10	14	0	0
Cesarean	61	62	80	73	63	74	88	88
Evacuation of uterus	30	22	0	1	19	0	0	0
Other	3	5	13	23	8	11	12	12

Source: Galukande and others 2010.

Note: Data are based on annual aggregate hospital statistics extracted from hospital information systems.

Table 12.5 Surgical Procedures That Could Be Managed at First- and Second-Level Hospitals

First-level hospitals with general practitioner surgeon or nonphysician clinician surgeon	Second-level hospitals with qualified specialist available (all first-level operations, as well as the following)
Emergency obstetrical surgery (including repair of ruptured uterus and emergency hysterectomy)	Elective major gynecological surgery
Salpingectomy for ruptured ectopic pregnancy	
Evacuation of the uterus	
Appendectomy	Gall bladder and biliary tract
Herniorrhaphy (elective repair and emergency)	Intestinal resection and repair
Intestinal obstruction	
Suture of intestinal perforation	
Plication of perforated ulcer	Operation for bleeding peptic ulcer
Colostomy	
Tube thoracostomy	
Cricothyroidotomy	
Closed fracture reduction and stabilization	
Open fracture management	
Amputation	
Minor burn care	Major burn care
Conservative management of head injury	Drainage of epidural and subdural hematoma
Wound care and repair	
Surgical infections	

that many of the problems in table 12.5 that could be addressed in these facilities were not treated at all. Wide variations exist among hospitals; in some cases, there was complete omission of operations that are urgently needed, not complicated, and within the competence of general practitioners with brief surgical training (for example, open reduction of compound fractures). Such omissions can lead to a major loss of cost-effectiveness in these hospitals.

Closed fracture treatment and some uterine evacuations may not have been recorded in the operating room logbooks (the source of data for this study) because they are not always carried out in the main operating rooms. Trauma is not listed separately, but the very small number of open fracture reductions (with the exception of Kiryandongo) indicates that major trauma either is not being seen or is being referred elsewhere.

If general anesthesia and a qualified surgeon are available in a first-level hospital, all of the procedures in table 12.5 can be done at this level, which would be ideal, since referral often is not possible or practical. If all of the procedures in the first-level hospitals column

could be mastered by the staff available at this level, few patients would need to be referred. The ideal will be to put fully qualified surgeons and obstetricians in all hospitals, but better training of the general practitioners and NPCs now serving as the only surgeons in many first-level hospitals could bring these facilities closer to the ideal.

HEALTH CENTERS AS A SURGICAL PLATFORM

Health centers (clinics, usually without inpatient beds except for normal deliveries) deliver babies, suture small lacerations, and drain small abscesses, but very few provide more comprehensive services. The primary reason for the limited range of services is the limited training available to health care personnel; another reason is the shortage of medical personnel of all kinds, which results in heavy workloads and makes additional responsibilities and skill acquisition a problem.

As these issues are resolved, it will be important to ensure that basic surgical training is provided. The list of

services that could be provided at the health center level is substantial and includes the following:

- Treatment of simple fractures, burns, and other injuries
- Resuscitation of major trauma patients: control of bleeding, airway maintenance, fluid replacement, and shock prevention and treatment
- Tubectomy, intrauterine device insertion, and other contraceptive procedures
- Early management of postpartum bleeding, eclampsia, and prolonged labor; suture of perineal lacerations; extraction of retained placentas
- Uterine curettage for incomplete abortion
- Circumcision
- Removal of foreign bodies in eyes, ears, and noses

A functioning referral system with patient access to transportation will increase the efficiency and the effectiveness of these services.

BURDEN OF SURGICALLY TREATABLE DISEASE AND THE UNMET NEED

This volume has shown that universal provision of a package of essential surgical services would avert an estimated 1.5 million deaths per year, or 6–7 percent of all avertable deaths in LMICs (Debas and others 2006; Mock and others 2015). For many of the conditions treated by this package, surgical care is the only option. There are no preventive strategies for many pregnancy-related complications or for most general surgical emergencies. Similarly, road traffic crashes and other injuries are increasing in LMICs, and there is a substantial and growing burden of chronic, congenital, and acquired conditions that can be treated surgically.

Surgery for Obstetrical Emergencies

The need for emergency obstetrical surgery is relatively easy to calculate because the birth rate is almost always known, and it is generally accepted that 10 percent to 15 percent of births are likely to have complications, most of them requiring surgical treatment, that threaten the lives of the mothers or newborns. There are important exceptions: El Salvador, Honduras, and Sri Lanka, for example, have reduced the unmet obstetrical need to 25 percent or lower, with a corresponding drop in the maternal mortality ratio to well below 100 per 100,000 births (AMDD Working Group 2003; Paxton and others 2005).

Surgery for Trauma and General Surgical Emergencies

The surgical burdens due to trauma and general surgical emergencies are harder to estimate, but the burdens are

unquestionably high; for trauma, the estimated burden is much higher than that due to obstetrical emergencies, even though trauma has been found to be a relatively small part of surgical activities in hospitals in LMICs (Canoodt and others 2012; Mock and others 2012; Mock and others 1998). The reason for this discrepancy in met need between traumatic and obstetrical emergencies seems clear: childbirth is a predictable event; when emergencies occur, there is usually enough time to bring patients to hospitals, even distant ones. That the unmet need for emergency obstetrical care is still greater than 80 percent in most of Sub-Saharan Africa is a measure of the very serious deficiencies in the health systems in the region. That the unmet need has been less than 25 percent in Sri Lanka for more than 20 years shows that these deficiencies can be corrected, even in LMICs.

Most of the causes of the unmet need for trauma care lie outside of the hospitals. Immediate emergency assistance and prompt transfer for definitive care are often needed and rarely available in LMICs; 21 percent of serious vehicle accident victims die before reaching a hospital in the United States compared with 51 percent in Ghana (Henry and Reingold 2012; Mock and others 1998). Emergency resuscitation is usually not well organized in LMICs, neither before nor after arrival at hospitals. Furthermore, the general practitioners or NPCs available for emergencies at most first-level hospitals are not well trained for trauma care after resuscitation.

Surgery for Disabling Conditions

Most LMICs have a high burden of surgically treatable disabling conditions (Beard and others 2013; Petroze and others 2013; Wu, Poenaru, and Poley 2013). Specialists visiting first-level hospitals can effectively treat cataracts, complicated fractures, burn contractures, congenital anomalies, vesico-vaginal fistulas, and many other conditions that are beyond the capacity and skills of the permanent staff of first-level hospitals; during the same visit, the specialists can provide in-service training and supervision. Many successful programs bring specialists to these hospitals, but too often the visits are sporadic and uncoordinated. Regular visits to provide continuity and follow-up can greatly increase the effectiveness of these programs (see chapter 13).

SURGICAL OUTCOMES AT FIRST-LEVEL HOSPITALS

Of the surgical patients seen in first-level hospitals, 50 percent to 80 percent present with emergencies. Problems with transportation to a higher-level facility

and the attendant costs of families' travel place a very high premium on managing these cases at first-level facilities. Fortunately, the surgical treatment needed for these emergencies is usually straightforward, relatively simple, and well standardized. Outcomes are remarkably good, given reasonable training to manage a relatively short list of problems, even when a fully qualified surgeon is not available.

Surgery for Obstetrical Emergencies

Obstetrical emergency surgery is the most common surgical problem presenting in first-level hospitals. The standard established in the United Nations process indicators (Paxton, Bailey, and Lobis 2006) calls for case fatality rates of 1 percent or less for mothers with obstetrical complications requiring hospital treatment. Many hospitals in LMICs, including those in which this work is usually done by NPCs, come close to this target, with mortality rates less than 2 percent (McCord and others 2009; Pereira and others 1996).

Surgery for General Emergencies

General surgical emergencies, including acute abdominal conditions, surgical infections, thoracic emergencies, and airway obstruction, can almost always be managed at first-level hospitals, with overall mortality rates of less than 5 percent (see chapter 4).

Surgery for Trauma Emergencies

Trauma can lead to very serious and complicated problems. Unfortunately, most seriously injured patients die before arrival, leaving first-level hospitals with patients who usually have treatable problems and a smaller group that can be stabilized and transferred. Because the number of accident victims is so high, caring for patients with manageable problems and treating them with straightforward procedures to prevent death and disability should be the most important surgical activity in first-level surgical systems. This potential is not realized in most LMICs, primarily because transportation systems to bring injured patients to hospitals safely are so poorly developed.

Postsurgical Treatment Needs

Successful operations will cure most patients requiring emergency surgery at first-level hospitals, and these patients usually will not need further treatment. A few exceptions exist: patients with peptic ulcers will need medical treatment for ulcer disease; many fractures will

not have a positive outcome without follow-up basic physiotherapy; and patients with emergency relief of sigmoid volvulus will need resection of the sigmoid intestine to prevent recurrence, which is common.

Serious operative complications are also relatively rare. Infections are usually minor, and the proper use of anesthetics for these short operations is safe and effective. This surgical capacity relies on medical personnel, usually nurses, who have been trained to administer anesthesia, and surgeons who know when to take simple measures to prevent major infections, such as leaving the skin open with subsequent secondary closure in heavily contaminated operations, and using antibiotics appropriately.

SURGICAL COST AND COST-EFFECTIVENESS

When DALYs averted were calculated for all patients discharged from a first-level nongovernmental hospital in Bangladesh, surgical and obstetrical patients contributed the largest share by far: 80 percent of 3,309 DALYs averted in three months. The cost per DALY averted for the whole hospital was US\$11, which was comparable to the cost per DALY of many public health interventions at that time (McCord and Chowdhury 2003).

Debas and others (2006) estimate a cost per DALY averted of the surgical services in the ideal first-level hospital described in table 12.1 at US\$33 in Sub-Saharan Africa, US\$38 in South Asia, and US\$95 in Latin America and the Caribbean. Gosselin, Thind, and Bellardinelli (2006); Gosselin and Heitto (2008); and Gosselin, Maldonado, and Elder (2010) calculate US\$32.78 per DALY averted for surgical services in a nongovernmental hospital in Sierra Leone, and US\$172, US\$223, and US\$77 in nongovernmental trauma centers in Cambodia, Haiti, and Nigeria, respectively. These directly observed cost-per-DALY averted estimates, all of them in nongovernmental facilities (and three of the four were hospitals that did not provide obstetrical care), need to be supplemented by other studies in LMICs, with a focus on government hospitals, local private hospitals, and hospitals unable to provide major surgical services. It is likely that small, Sub-Saharan African government hospitals with active surgical services will have costs per DALY averted comparable to the Bangladesh hospital, given that hospital costs in these government hospitals are comparable (table 12.6). Government third-level hospitals and private hospitals are more costly and probably will be less cost-effective (Barnum and Kutzin 1993; Chatterjee, Levin, and Laxminarayan 2013).

Conducting cost analysis in hospitals in LMICs, especially in public hospitals, is difficult, and not many

Table 12.6 Hospital Costs and Surgical Services Costs at Hospitals in Sub-Saharan Africa (2010) and India (2012)*U.S. dollars*

	Bagamoyo District Hospital, Tanzania	Kasulu District Hospital, Tanzania	Chokwe District Hospital, Mozambique	Hospital Catandica, Mozambique	Mityana Hospital, Uganda	Kiryandongo Hospital, Uganda	Private Hospital, India	District Hospital, India	Private Teaching hospital, India	Third-level Hospital, India
Total annual expenditures	329,716	800,662	286,593	155,908	251,448	369,419	13,758,650	2,315,165	4,606,788	10,152,380
Surgery annual expenditures	31,700 (9.6%)	84,492 (10.6%)	19,358 (6.7%)	11,376 (7.3%)	33,980 (13.5%)	33,470 (9.1%)	1,158,319 (8.4%)	181,468 (7.8%)	915,350 (19.9%)	517,657 (5.1%)
Beds	125	135	214	91	100	100	200	400	655	778
Admissions	6,545	10,296	8,089	3,861	9,106	5,713	5,925	25,871	19,139	205,949
Expenditure per bed	2,640	5,933	1,341	1,714	2,510	3,690	68,795	5,788	7,034	13,049
Expenditure per admission	53.02	85.24	43.33	42.11	39.96	68.81	134.54	7.58	6.63	11.81
Expenditure per day	17.70	26.84	10.79	18.16	11.22	22.05	n.a.	n.a.	n.a.	n.a.
Operations	980	2,045	601	256	1,484	248	2,508	3,623	2,768	3,219
Expenditure per operation	56.41	98.82	41.54	49.03	55.34	304.28	461.85	50.10	330.69	160.81

Source: Chatterjee, Levin, and Laxminarayan 2013; Galukande and others 2010; Kruk and others 2010.*Note:* % = annual surgical expenditure as a percentage of total annual expenditure; n.a. = data not available.

comprehensive cost reports dealing with LMIC hospitals are available. Government funds come from different sources; there are nongovernmental gifts, grants, and programs; supplies and equipment may be provided in kind; the contribution of “cost recovery” (patient payments to the hospital) is often not well documented; and “informal payments” are usually not documented at all. Table 12.6 summarizes some of the findings in three analyses of annual recurrent cost, including depreciation of buildings and equipment, for several hospitals in India and Sub-Saharan Africa. No estimates of DALYs averted were available. Cost per surgical operation for most of the second-level hospitals in both regions was low and comparable. In the one Sub-Saharan African second-level hospital with high cost per operation, surgical activity was very low. The cost per operation in the single Indian third-level hospital was three times higher than the average for the six low-cost second-level hospitals; in the Indian private hospitals, it was seven times higher. There are some inconsistencies in these reports; the very high number of admissions to the Indian third-level hospital probably includes both inpatient admissions and outpatient visits.

In all public hospitals, personnel costs were considerably higher than those of any other cost centers within the hospital. Salaries were low, and staff shortages were pervasive, so relatively high personnel costs probably reflect inadequate funding for supplies, maintenance, and transportation, and certainly not large numbers of staff or excessive salaries. More analysis of this kind is urgently needed and could be combined with estimates of DALYs averted to better define the true cost and cost effectiveness of properly functioning hospital systems in LMICs.

Reasons for the Cost-Effectiveness of First-Level Hospitals

The high cost-effectiveness of surgery in a small first-level hospital is due to three factors: self-selection, effective and inexpensive technology, and efficient use of limited resources. Furthermore, the most common operations performed in first-level hospitals are very effective and low-cost procedures, including cesarean sections, acute abdominal emergencies, and herniorrhaphies.

- *Self-selection:* Few people want to be in a hospital, but the resource-starved hospitals in LMICs can be especially unpleasant places. People quickly come to know what services a hospital can and cannot provide, and they generally make intelligent choices with respect to the places where service provided is

worth the cost in time, money, and discomfort. Very few patients with cancer select first-level hospitals for treatment in LMICs, but many women experiencing pregnancy-related complications will seek competent obstetrical care, if available. If the outcomes are suboptimal at a particular facility, patients will find better ones (Kruk and others 2009). The end result is a patient population that has self-selected itself so that individuals who seek treatment can be effectively treated.

- *Effective, inexpensive technology:* Operating rooms are not expensive; affordable antibiotics, anesthesia, and other supplies are usually effective. Training and mobilizing staff members is the largest expense. The total hospital cost in a first-level hospital is usually less than US\$30 per patient-day (Kruk and others 2010), compared with US\$1,000 per day or more in high-income countries (HICs), and surgical services cost is a fraction of total hospital costs (table 12.6).
- *Resource-limited hospitals:* Hospital budgets, even though they are a major part of total health budgets in LMICs, are low by any international standard. Despite this limitation, these hospitals are able to achieve good results in patient care. Undoubtedly, they could do better with more resources, but this relative starvation keeps costs down. One of the most important reasons for further analysis of the cost-effectiveness of different levels of hospitals in different places is to determine the most efficient ways to improve and expand services delivery with minimum increases in cost.

OBSTACLES TO LOW COST AND HIGH COST-EFFECTIVENESS

Not every hospital is cost-effective. The third-level hospitals and the private hospitals in table 12.6 are much more expensive than the smaller, first- and second-level government or nongovernmental facilities. Anything that diverts patients from low-cost hospitals to higher-cost, third-level ones increases the costs of the whole system and lowers the effectiveness of the first- and second-level hospitals.

Fixed expenses, notably for personnel, are the major component of hospital costs, so the cost per unit of service delivery rises when utilization is low.

Training

Less-than-optimal training may be the most important contributor to a reduction in cost-effectiveness. First-level hospitals in LMICs usually do not have

a fully qualified surgeon, obstetrician, or orthopedist on staff. General practitioners or NPCs generally learn to treat obstetric emergencies, but they often refer serious trauma and acute abdominal emergencies to higher-level facilities. If patient transfer could be made efficient and inexpensive, this process might work well. However, in many places, most transferred patients never arrive at the referral hospitals (Urassa and others 2005); death en route is common. Moreover, the receiving hospitals may be no better able to provide care than the hospitals from which the patients were sent (Grimes and others 2011; Siddiqi and others 2001). Patients bypass hospitals known to refer often, reducing surgical volume to inefficient levels. The operations and surgical conditions listed for first-level hospitals in table 12.5 are all within the competence of general practitioners or NPCs, given appropriate training. A six-month program in a busy second-level facility could provide substantial benefits. If this training could be combined with follow-up in-service training and supervision, the capacity and outcomes could be further improved.

Anesthesia

Major surgery usually requires general or spinal anesthesia. Doctors, nurses, and NPCs are not routinely trained to administer anesthesia. Many first-level hospitals do not perform surgery or perform very limited surgery simply because they lack trained staff to administer anesthesia. This relatively simple staff deficiency can be readily addressed. A one- or two-year course for nurses or NPCs can produce a sufficient level of competence for the safe administration of general and spinal anesthesia; a six-month course can be enough for hospitals to make spinal and Ketamine anesthesia available.¹ The same short course can produce competency in the resuscitation of patients with severe trauma, blood loss, or respiratory insufficiency.

Poor Quality of Service and Low Utilization

Poor quality of patient care reduces the number of positive outcomes and is a common reason for low utilization. Low utilization, in turn, reduces the experience of hospital staff and can lead to even poorer outcomes.

Informal Payments

The issue of informal payments has two components. The first is that hospitals with inadequate inventories ask patients to purchase medicine and other needed supplies, which adds considerably to patients' costs.

The second component is outright corruption in the form of payments to staff for presumably better service; in some areas this abuse can more than double the costs to patients (Lewis 2007). Increased costs plus the associated loss of confidence in hospital staff can lead to further reductions in utilization and increase the cost per unit of service.

Epidemiological Transition

The epidemiological transition (from infectious to noninfectious, degenerative disease) is in full swing in MICs and among the upper classes in many low-income countries, with consequent increases in the incidence of cancer, diabetes, and complications from arteriosclerosis. Surgery for these conditions is generally more complicated and often will not be curative; the underlying disease remains and complications of the disease can recur. Costs are higher and cost-effectiveness is lower. Universal health coverage is increasing, and treatment for degenerative diseases certainly cannot be excluded, but health budgets in LMICs will not support, for example, the universal availability of cardiac surgery for coronary artery disease. Fortunately, diabetes, arteriosclerosis, and many cancers are preventable. Energetic efforts at primary and secondary prevention will pay off in lower hospital costs. The elimination of tobacco use and better management of hypertension could be the most important activities.

New Technology

New diagnostic and therapeutic technologies are usually expensive and have the further disadvantage of imposing an additional training burden to teach staff to use and maintain equipment. There are exceptions:

- Replacement lenses for cataract operations are made in India and Nepal at very low cost.
- The mesh for hernia repair greatly improves long-term results; mosquito netting seems to work well, but factories in LMICs could produce a standardized, sterile product at low cost.
- The pulse oximeter is a simple, sturdy, and relatively inexpensive electronic instrument that can greatly improve the safety of anesthesia and the control of respiration and circulation during resuscitation of severely injured patients.
- Flexible gastroscopes are expensive, but they can control bleeding from stomach and duodenal ulcers so well as to virtually eliminate the need for surgery for bleeding ulcers.

Careful evaluation, including cost analysis, of each example of new technology should be able to control a technological cost spiral, at least in the public sector. However, little is being done to make this increasingly important evaluation. The National Institute for Health and Care Excellence of the British National Health Service provides a model of how such an evaluation can be conducted (<http://www.nice.org.uk>).

FINANCING SURGICAL CARE

Financial support for surgical services delivery is discussed in chapter 18. The reality is that no matter how cost-effective it is, most people in low-income countries (LICs) and many in lower-middle-income countries, cannot afford surgery unless it is available without charge at the point of care. Although El Salvador, Honduras, and Sri Lanka, for example, have shown that free service can be made available within very low budget public health systems, most lower-middle-income countries, and many upper-middle-income countries, have hospital systems that reach only a fraction of the population, largely because of the cost barrier. Economic growth and increased government budgets for health are reducing this disparity, but progress is slow. In many LMICs, availability of trained staff and other resources has not improved at all in the past 20 years, especially in the first-level hospital network. Efforts to mobilize nongovernmental funds to support health care have had limited success.

- Although the private health sector is growing rapidly everywhere, it reaches only a fraction of the population. In India, 78 percent of health expenditures occur in the private sector, but in most Indian states, only a fraction of the population has access to private hospital care (Kumar and others 2011).
- Cost-sharing (fees for service) in public hospitals has been shown to reduce utilization, but it contributes very little to covering hospital costs (Lagarde and Palmer 2011; Robert and Ridde 2013).
- Government-run insurance systems that provide direct government financing of essential services have been shown to be possible on a large scale (Kruk 2013; Kumar and others 2011). The most common example is free emergency obstetrical care. If such plans can be successfully implemented, they will have a double benefit: they reduce the financial barrier to the use of clinical services, and they give purchasing power to patients, thereby directing income to the hospitals and clinics that provide the most popular, and it is to be hoped the best, services. The key is to direct the benefits to those who need them most

and to those services that can give the greatest public health outcome, for example, obstetrics, trauma, emergency surgery, and neonatal care. However, equitable utilization of “free surgery” is by no means guaranteed; poor people continue to face high costs for transportation, supplies, food, and informal charges (El-Khoury, Hatt, and Gandaho 2012).

Financing of surgical care is further complicated by the large number of first-level surgical procedures that are emergencies. The need for out-of-pocket user fees (especially fees required before treatment can be provided) has been found to be a major barrier to the provision of emergency care in many places (Canoodt, Mock, and Bucagu 2012).

STRENGTHENING FIRST-LEVEL SURGICAL FACILITIES

The first-level hospitals and the clinics below them described in table 12.1 are an ideal, achieved in a few LMICs but far from a reality in most. Although existing first-level hospitals are cost-effective, and their surgical services seem to be especially so, they could be doing much more, especially for trauma, general surgical emergencies, and the backlog of treatable disabling conditions. The successful development more than 20 years ago of effective hospital systems in countries such as Sri Lanka has shown that this is possible even with low budgets for health. The number of available trained health personnel is increasing rapidly in almost all countries, and health budgets are rising, so that it should be possible for all LMICs to achieve a much better level of care in the next 20 years. The question is how to accomplish this rapidly and efficiently, so that the poor majorities in these countries are not left behind.

Removing Roadblocks

The following are three major roadblocks to better care:

- *Access to well-functioning health centers and first-level hospitals is critical:* These clinics and hospitals must have better patient transport available, and the financial barriers to travel should be removed to the extent possible. All of the financial barriers for families cannot be eliminated, but the cost of transport and the cost of the hospital’s or clinic’s services are the two most important. Not enough is known about how much free transport would cost, but it would probably not be an unbearable burden. The creation and analysis of real-life models will facilitate

the raising of funds for this purpose. Hospitals with limited budgets will not be able to pay for all of this, so outside funding sources will need to be found.

- *Staffing is inadequate, both in numbers and in training.* Many years will pass before fully trained staff can be available at all levels; therefore, it is important to identify intermediate solutions. These solutions include training general physicians and NPCs to perform basic surgery; training nurses to administer anesthesia; and providing in-service training of staff at all levels in such skills as better management of nonsurgical obstetric emergencies, patient resuscitation on arrival at the clinic or hospital, and appropriate care during transport for referral. Functioning models with cost analysis are needed.
- *Logistical systems to provide supplies and maintain equipment are usually underfunded and inadequate.* Closer consideration of areas in which such systems seem to be working better, such as Sri Lanka, will help solutions for widespread implementation to be developed.

Expanding Capacity

If the roadblocks are removed, utilization will increase and it will be necessary to expand facilities, eliminate the gross inadequacies in such fundamentals as water and electricity supply, and, in some cases, create new clinics and hospitals. Upgrading health centers to provide more surgical services will help ease the burden for hospitals.

As the medical workload increases, paying attention to staff morale in health centers and hospitals will be essential. Adequate pay, decent housing, sufficient staff numbers, and professional satisfaction from supportive supervision and recognition are all important.

FUTURE DIRECTIONS FOR SURGICAL SERVICES

Research and Training

Better determination of the burden of surgical disease is needed, but retrospective population surveys produce incomplete and imprecise information, and prospective surveys are expensive. Prospective studies in places with ongoing demographic surveillance could produce more useful information.

However, enough is known to begin the implementation of programs to improve services and increase access to services. Monitoring and evaluating the effectiveness and cost of these improvements as they are implemented will be important. Monitoring can provide ongoing evidence of the effect on utilization and outcomes.

Evaluation can include the evaluation of the population impact as well as of the costs and benefits. Training, especially to increase the availability of surgical skills in first-level hospitals, will be an essential element of these programs. National professional societies could play a crucial role in this process, and qualified surgeons from HICs could provide important assistance, improving the availability of trained staff in the first- and second-level hospitals that will be the principal venues for this training.

Finance

Hospitals and the systems to support them are terribly underfunded in most LMICs, as are all of the health services for the poor segments of the population in these places. For most people in these countries, a generation or more will pass before incomes rise sufficiently to provide purchasing power for basic surgical services. LMICs are increasingly embracing universal health coverage, primarily funded through taxes, as a means of improving access to services and ensuring that medical bills do not force families into poverty. Essential and life-saving surgeries are likely to be core components of these insurance programs.

Epidemiological Transition

Controlling the inevitable increase in cost and decrease in effectiveness associated with surgery for complications of arteriosclerosis, cancer, and diabetes is an important issue. The best approach is probably through primary and secondary prevention. Investments to control tobacco use and improve the medical management of hypertension could produce significant benefits to individual health, as well as reduce inefficient hospital use. Nevertheless, surgeons still need to be prepared to address the sequelae of chronic diseases.

Technological Advances

Although new technology can improve treatment and, in some cases, reduce costs, it initially increases costs for equipment, materials, and training. The demand for video-assisted surgery, computerized tomography scanning, and coronary artery stenting is likely to increase. These advances should be carefully evaluated before they are incorporated into public programs.

Referral Systems

Patient transportation is generally available, but paying for it is difficult. The most practical approach may be to provide ambulances to hospitals and health centers, with

adequate budgets for fuel and maintenance. A realistic evaluation of the cost for provision of adequate transport is needed; the costs may be less than expected if corruption and misuse can be controlled. Monitoring by community and district government councils could help. For example, second-level health teams in Uganda have established local transport committees to manage dispatch, communications, and repair and maintenance of donated vehicles.

There should be a tradeoff between more referral and less need for surgical facilities, but how important this tradeoff will be remains unknown. It is likely that the combination of more and better trained staff in first-level units, with better transport between units, will improve service, as well as pay for itself by reducing the need for multiple hospitals delivering service.

Supervision Systems

First-level hospital surgeons and other surgeons in LMICs generally work without effective supervision, oversight, and in-service training. These shortcomings can only be corrected if enough qualified specialists can be made available to provide training and supervision, as well as direct service. In the long term, most countries will have adequate numbers of specialists, but ways need to be found to make service provision in first-level hospitals and clinics an important part of their work.

Logistical Systems

Logistical systems need to be decentralized, adequately funded, simplified, and controlled. At all hospital levels in the public system, the cost of personnel is the largest budgetary component. It makes no sense to pay for trained staff and deny them the relatively small funds needed for basic supplies that make it possible to do what they are trained to do.

Health Policy and National Health Plans

Service delivery in almost all LMIC public hospitals is a government responsibility, but delivery of emergency and essential surgical services is usually not mentioned in health plans at either the central or the local level. Attention to surgical services in these plans would help focus attention on its importance (Hedges, Mock, and Cherian 2010).

Professional Societies

National professional societies need to play a more active role in the development of robust first-level surgical care

in their countries; they have taken too little interest in first-level hospitals to date. Professional societies could take responsibility for equitable delivery of services; work with communities and government to develop the needed political will; and provide guidance in the development of programs for training, supervision, and logistical support.

Traditionally, advancement and recognition within the surgical community and within surgical organizations are based on factors such as the skills of individual surgeons; training of residents to become fully trained surgeons, and especially subspecialists; and research on basic science or operative surgical issues. Surgeons who develop and master the most difficult, complicated procedures are usually those who are most highly regarded. However, most of the burden of surgical disease could be lowered by improved access to fairly simple procedures that are both very cost-effective and very suitable to being performed in first-level hospitals. The surgical community and surgical organizations need to develop a focus on the wider population. Surgeons who choose to devote themselves to improving access to the most-needed procedures (whether through their own labor or through the training and research activities they conduct) need to be better recognized for these contributions. Professional organizations need to develop their own mechanisms for supporting and encouraging such work.

NOTES

One of the authors of this chapter is a WHO staff member. The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions or policies of the World Health Organization.

The World Bank classifies countries according to four income groupings. Income is measured using gross national income (GNI) per capita, in U.S. dollars, converted from local currency using the *World Bank Atlas* method. Classifications as of July 2014 are as follows:

- Low-income countries (LICs) = US\$1,045 or less in 2013
- Middle-income countries (MICs) are subdivided:
 - Lower-middle-income = US\$1,046 to US\$4,125
 - Upper-middle-income (UMICs) = US\$4,126 to US\$12,745
- High-income countries (HICs) = US\$12,746 or more

1. Ketamine is a relatively new and safe anesthetic agent that can induce general anesthesia without paralysis of respiration and the need for artificial respiration or a tracheal tube.

REFERENCES

- Alkire, B. C., J. R. Vincent, C. T. Burns, I. S. Metzler, P. E. Farmer, and others. 2012. "Obstructed Labor and Caesarean Delivery: The Cost and Benefit of Surgical Intervention." *PLoS One* 7 (4): e34595. doi:10.1371/journal.pone.0034595.

- AMDD Working Group (Averting Maternal Death and Disability Working Group). 2003. "Using UN Process Indicators to Assess Needs in Emergency Obstetric Services: Morocco, Nicaragua and Sri Lanka." Program note. *International Journal of Gynaecology and Obstetrics* 80 (2): 222–30.
- Bailey, P. 2005. "Using UN Process Indicators to Assess Needs in Emergency Obstetric Services: Bolivia, El Salvador and Honduras." Program note. *International Journal of Gynaecology and Obstetrics* 89 (2): 221–30. doi:10.1016/j.ijgo.2004.12.045.
- Barnum, B., and B. H. Kutzin. 1993. *Public Hospitals in Developing Countries*. Baltimore, MD: Johns Hopkins University Press.
- Beard, J. H., L. B. Oresanya, M. Ohene-Yeboah, R. A. Dicker, and H. W. Harris. 2013. "Characterizing the Global Burden of Surgical Disease: A Method to Estimate Inguinal Hernia Epidemiology in Ghana." *World Journal of Surgery* 37 (3): 498–503. doi:10.1007/s00268-012-1864-x.
- Cannoodt, L., C. Mock, and M. Bucagu. 2012. "Identifying Barriers to Emergency Care Services." *International Journal of Health Planning and Management* 27 (2): e104–20. doi:10.1002/hpm.1098.
- Chatterjee, S., and R. Laxminarayan. 2013. "Costs of Surgical Procedures in Indian Hospitals." *British Medical Journal Open* 3 (6). doi:10.1136/bmjopen-2013-002844.
- Chatterjee, S., C. Levin, and R. Laxminarayan. 2013. "Unit Cost of Medical Services at Different Hospitals in India." *PLoS One* 8 (7): e69728. doi:10.1371/journal.pone.0069728.
- Coffman, J. M., J. S. Seago, and J. Spetz. 2002. "Minimum Nurse-to-Patient Ratios in Acute Care Hospitals in California." *Health Affairs (Millwood)* 21 (5): 53–64.
- Debas, H. T., R. Gosselin, C. McCord, and A. Thind. 2006. "Surgery." In *Disease Control Priorities in Developing Countries*, 2nd ed. edited by D. T. Jamison, J. G. Breman, A. R. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills, and P. Musgrove, 1245–60. Washington, DC: World Bank and Oxford University Press.
- El-Khoury, M., L. Hatt, and T. Gandaho. 2012. "User Fee Exemptions and Equity in Access to Caesarean Sections: An Analysis of Patient Survey Data in Mali." *International Journal of Equity in Health* 11 (49). doi:10.1186/1475-9276-11-49.
- Galukande, M., J. von Schreeb, A. Wladis, N. Mbembati, H. de Miranda, and others. 2010. "Essential Surgery at the District Hospital: A Retrospective Descriptive Analysis in Three African Countries." *PLoS Medicine* 7 (3): e1000243. doi:10.1371/journal.pmed.1000243.
- Gosselin, R. A., and M. Heitto. 2008. "Cost-Effectiveness of a District Trauma Hospital in Battambang, Cambodia." *World Journal of Surgery* 32 (11): 2450–53. doi:10.1007/s00268-008-9708-4.
- Gosselin, R. A., A. Maldonado, and G. Elder. 2010. "Comparative Cost-Effectiveness Analysis of Two MSF Surgical Trauma Centers." *World Journal of Surgery* 34 (3): 415–19. doi:10.1007/s00268-009-0230-0.
- Gosselin, R. A., A. Thind, and A. Bellardinelli. 2006. "Cost/DALY Averted in a Small Hospital in Sierra Leone: What Is the Relative Contribution of Different Services?" *World Journal of Surgery* 30 (4): 505–11. doi:10.1007/s00268-005-0609-5.
- Grimes, C. E., K. G. Bowman, C. M. Dodgion, and C. B. Lavy. 2011. "Systematic Review of Barriers to Surgical Care in Low-Income and Middle-Income Countries." *World Journal of Surgery* 35 (5): 941–50. doi:10.1007/s00268-011-1010-1.
- Hedges, J. P., C. Mock, and M. N. Cherian. 2010. "The Political Economy of Emergency and Essential Surgery in Global Health." *World Journal of Surgery* 34 (9): 2003–06.
- Henry, J. A., and A. L. Reingold. 2012. "Prehospital Trauma Systems Reduce Mortality in Developing Countries: A Systematic Review and Meta-Analysis." *Journal of Trauma and Acute Care Surgery* 73 (1): 261–68. doi:10.1097/TA.0b013e31824bde1e.
- Hogan, M. C., K. J. Foreman, M. Naghavi, S. Y. Ahn, M. Wan, and others. 2010. "Maternal Mortality for 181 Countries, 1980–2008: A Systematic Analysis of Progress towards Millennium Development Goal 5." *The Lancet* 375 (9726): 1609–23. doi:10.1016/s0140-6736(10)60518-1.
- Kruk, M. E. 2013. "Universal Health Coverage: A Policy Whose Time Has Come." *British Medical Journal* 347: f6360. doi:10.1136/bmj.f6360.
- Kruk, M. E., G. Mbaruku, C. W. McCord, M. Moran, P. C. Rockers, and others. 2009. "Bypassing Primary Care Facilities for Childbirth: A Population-Based Study in Rural Tanzania." *Health Policy and Planning* 24 (4): 279–88. doi:10.1093/heapol/czp011.
- Kruk, M. E., A. Wladis, N. Mbembati, S. K. Ndao-Brumblay, R. Y. Hsia, and others. 2010. "Human Resource and Funding Constraints for Essential Surgery in District Hospitals in Africa: A Retrospective Cross-Sectional Survey." *PLoS Medicine* 7 (3): e1000242. doi:10.1371/journal.pmed.1000242.
- Kumar, A. K., L. C. Chen, M. Choudhury, S. Ganju, V. Mahajan, and others. 2011. "Financing Health Care for All: Challenges and Opportunities." *The Lancet* 377 (9766): 668–79. doi:10.1016/s0140-6736(10)61884-3.
- Kushner, A. L., M. N. Cherian, L. Noel, D. A. Spiegel, S. Groth, and others. 2010. "Addressing the Millennium Development Goals from a Surgical Perspective: Essential Surgery and Anesthesia in 8 Low- and Middle-Income Countries." *Archives of Surgery* 145 (2): 154–59. doi:10.1001/archsurg.2009.263.
- Lagarde, M., and N. Palmer. 2011. "The Impact of User Fees on Access to Health Services in Low- and Middle-Income Countries." *Cochrane Database of Systematic Reviews* (4): Cd009094. doi:10.1002/14651858.cd009094.
- Lebrun, D. G., D. Dhar, M. I. Sarkar, T. M. Imran, S. N. Kazi, and others. 2013. "Measuring Global Surgical Disparities: A Survey of Surgical and Anesthesia Infrastructure in Bangladesh." *World Journal of Surgery* 37 (1): 24–31. doi:10.1007/s00268-012-1806-7.
- Lebrun, D. G., I. Saavedra-Pozo, F. Agreda-Flores, M. L. Burdic, M. R. Notrica, and others. 2012. "Surgical and Anesthesia Capacity in Bolivian Public Hospitals: Results from a National Hospital Survey." *World Journal of Surgery* 36 (11): 2559–66. doi:10.1007/s00268-012-1722-x.

- Lewis, M. 2007. "Informal Payments and the Financing of Health Care in Developing and Transition Countries." *Health Affairs (Millwood)* 26 (4): 984–97. doi:10.1377/hlthaff.26.4.984.
- McCord, C., and Q. Chowdhury. 2003. "A Cost Effective Small Hospital in Bangladesh: What It Can Mean for Emergency Obstetric Care." *International Journal of Gynaecology and Obstetrics* 81 (1): 83–92.
- McCord, C., G. Mbaruku, C. Pereira, C. Nzabuhakwa, and S. Bergstrom. 2009. "The Quality of Emergency Obstetrical Surgery by Assistant Medical Officers in Tanzanian District Hospitals." *Health Affairs (Millwood)* 28 (5): w876–85. doi:10.1377/hlthaff.28.5.w876.
- McHugh, M. D., J. Berez, and D. S. Small. 2013. "Hospitals with Higher Nurse Staffing Had Lower Odds of Readmissions Penalties than Hospitals with Lower Staffing." *Health Affairs (Millwood)* 32 (10): 1740–47. doi:10.1377/hlthaff.2013.0613.
- Mock, C. N., P. Donkor, A. Gawande, D. T. Jamison, M. E. Kruk, and H. T. Debas. 2015. "Essential Surgery: Key Messages of This Volume." In *Disease Control Priorities* (third edition): Volume 1, *Essential Surgery*, edited by H. T. Debas, P. Donkor, A. Gawande, D. T. Jamison, M. E. Kruk, and C. N. Mock. Washington, DC: World Bank.
- Mock, C. N., M. Joshipura, C. Arreola-Risa, and R. Quansah. 2012. "An Estimate of the Number of Lives That Could Be Saved through Improvements in Trauma Care Globally." *World Journal of Surgery* 36 (5): 959–63. doi:10.1007/s00268-012-1459-6.
- Mock, C. N., G. J. Jurkovich, D. nii-Amon-Kotei, C. Arreola-Risa, and R. V. Maier. 1998. "Trauma Mortality Patterns in Three Nations at Different Economic Levels: Implications for Global Trauma System Development." *Journal of Trauma* 44 (5): 804–12; discussion 812–04.
- Mulligan, J., J. Fox-Rushby, T. Adams, B. Johns, and A. Mills. 2003. "Unit Costs of Health Care Inputs in Low and Middle Income Regions." Working Paper 9, Disease Control Priorities Project, Fogarty International Center, National Institutes of Health, Bethesda, MD.
- Needleman, J., P. Buerhaus, V. S. Pankratz, C. L. Leibson, S. R. Stevens, and others. 2011. "Nurse Staffing and Inpatient Hospital Mortality." *New England Journal of Medicine* 364 (11): 1037–45. doi:10.1056/NEJMsa1001025.
- Paxton, A., P. Bailey, and S. Lobis. 2006. "The United Nations Process Indicators for Emergency Obstetric Care: Reflections Based on a Decade of Experience." *International Journal of Gynaecology and Obstetrics* 95 (2): 192–208. doi:10.1016/j.ijgo.2006.08.009.
- Paxton, A., D. Maine, L. Freedman, D. Fry, and S. Lobis. 2005. "The Evidence for Emergency Obstetric Care." *International Journal of Gynaecology and Obstetrics* 88 (2): 181–93. doi:10.1016/j.ijgo.2004.11.026.
- Pearson, L., and R. Shoo. 2005. "Availability and Use of Emergency Obstetric Services: Kenya, Rwanda, Southern Sudan, and Uganda." *International Journal of Gynaecology and Obstetrics* 88 (2): 208–15. doi:10.1016/j.ijgo.2004.09.027.
- Pereira, C., A. Bugalho, S. Bergstrom, F. Vaz, and M. Cotiro. 1996. "A Comparative Study of Caesarean Deliveries by Assistant Medical Officers and Obstetricians in Mozambique." *British Journal of Obstetrics and Gynaecology* 103 (6): 508–12.
- Petroze, R. T., R. S. Groen, F. Niyonkuru, M. Mallory, E. Ntaganda, and others. 2013. "Estimating Operative Disease Prevalence in a Low-Income Country: Results of a Nationwide Population Survey in Rwanda." *Surgery* 153 (4): 457–64. doi:10.1016/j.surg.2012.10.001.
- Robert, E., and V. Ridde. 2013. "Global Health Actors No Longer in Favor of User Fees: A Documentary Study." *Global Health* 9 (1): 29. doi:10.1186/1744-8603-9-29.
- Sanders, D., J. Kravitz, S. Lewin, and M. McKee. 1998. "Zimbabwe's Hospital Referral System: Does It Work?" *Health Policy and Planning* 13 (4): 359–70.
- Siddiqi, S., A. Kielmann, M. Khan, N. Ali, A. Ghaffar, and others. 2001. "The Effectiveness of Patient Referral in Pakistan." *Health Policy and Planning* 16 (2): 193–98.
- Solis, C., P. Leon, N. Sanchez, M. Burdic, L. Johnson, and others. 2013. "Nicaraguan Surgical and Anesthesia Infrastructure: Survey of Ministry of Health Hospitals." *World Journal of Surgery* 37 (9): 2109–21. doi:10.1007/s00268-013-2112-8.
- Urassa, D. P., A. Carlstedt, L. Nystrom, S. N. Massawe, and G. Lindmark. 2005. "Are Process Indicators Adequate to Assess Essential Obstetric Care at District Level? A Case Study from Rufiji District, Tanzania." *African Journal of Reproductive Health* 9 (3): 100–11.
- Weiser, T. G., S. E. Regenbogen, K. D. Thompson, A. B. Haynes, S. R. Lipsitz, and others. 2008. "An Estimation of the Global Volume of Surgery: A Modeling Strategy Based on Available Data." *The Lancet* 372 (9633): 139–44. doi:10.1016/s0140-6736(08)60878-8.
- WHO (World Health Organization). 1992. "The Hospital in Rural and Urban Districts. Report of a WHO Study Group on the Functions of Hospitals at the First Referral Level." World Health Organization Technical Report 819, WHO, Geneva.
- . 2003. *Surgical Care at the District Hospital*. Geneva: WHO.
- . 2010. "Planning Tool for Emergency and Essential Care Surgical Services." WHO, Geneva. http://www.who.int/surgery/publications/Planning_toolEESC.pdf.
- Wu, V. K., D. Poenaru, and M. J. Poley. 2013. "Burden of Surgical Congenital Anomalies in Kenya: A Population-Based Study." *Journal of Tropical Pediatrics* 59 (3): 195–202. doi:10.1093/tropej/fmt001.
- Zafar, S. N., and K. A. McQueen. 2011. "Surgery, Public Health, and Pakistan." *World Journal of Surgery* 35 (12): 2625–34. doi:10.1007/s00268-011-1304-3.

SURGICAL CARE SYSTEMS STRENGTHENING

Developing national surgical,
obstetric and anaesthesia plans



PROGRAM IN GLOBAL SURGERY
AND SOCIAL CHANGE
Harvard Medical School



World Health
Organization

Acronyms and abbreviations

ASEAN	Association of Southeast Asian Nations
FMOH	(Ethiopian) Federal Ministry of Health
FRP	financial risk protection
HSDP	(Ethiopian) Health Sector Development Plan
HSTP	(Ethiopian) Health Sector Transformation Plan
LCoGS	Lancet Commission on Global Surgery
LMIC	low- and middle-income country
MDG	Millennium Development Goal
MOH	Ministry of Health
NHPSP	national health policy, strategy and plans
NSOAF	national surgical, obstetric and anaesthesia forum
NSOAP	national surgical, obstetric and anaesthesia plan
PGSSC	Harvard Program in Global Surgery and Social Change
PISA	Pacific Islands Surgical Association
POMR	perioperative mortality rate
RACS	Royal Australasian College of Surgeons
SAO	surgical, anaesthetic and obstetric
SAT	Surgical Assessment Tool
SDG	Sustainable Development Goal
UEA	Universidade do Estado do Amazonas (Brazil)
UHC	universal health coverage
WDI	World Development Indicators
WHA	World Health Assembly
WHO	World Health Organization

Viet Nam

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Background

Viet Nam is a lower middle-income country with a per capita gross domestic product (GDP) of US\$ 2111 (1). Total health expenditure accounts for 7.1% of GDP (2), which represents an average of US\$ 142 per inhabitant (3). Over the past 20 years, Viet Nam has made significant progress in expanding social health insurance (4), illustrating the Government of Viet Nam's (GoV) commitment to universal health coverage (UHC) for the entire population (4).

In Viet Nam, over 3 million operations are performed annually (approximately one out of every 30 people), which accounts for 11% of all inpatient stays. The cost for one day of surgical treatment is 3.6 times that of non-surgical treatment, equivalent to US\$ 101.72 per day.

Of this, state subsidies average 53% and patients or health insurance companies must pay the remaining 47% (5). The proportion of people participating in health insurance is currently 81%. As a proxy for the availability of essential surgery, the percentage of caesarean sections among live births is 28% (6), which represents adequate coverage of this essential surgical service (7, 8).

Cooperation between Viet Nam MOH and Operation Smile

The Department for Medical Service Administration is a professional management department of the Ministry of Health (MoH). Its function is to consult and assist the Health Minister in managing and organizing the implementation of legal regulations, and issues regarding health examinations, treatments, rehabilitation, medical inspections, forensic examinations, and forensic psychiatric assessments nationwide.

Operation Smile is an international medical charity working in low- and middle-income countries (LMICs), that mobilizes medical volunteers from around the world to deliver free care to individuals born with cleft lip, cleft palate and other facial deformities. Operation Smile works to increase access to safe, well-timed surgery by partnering with ministries of health worldwide and training local medical personnel. Operation Smile has been present in Viet Nam since 1989, engaging more than 200 volunteers and providing surgery to over 25 000 patients since then.

Quality care delivery is a priority for the organization. Therefore, Operation Smile developed Global Standards of Care™ to represent the minimum and absolute requirements for its surgical programmes. Standards of quality are an effective way to decrease variability and establish a minimum level of quality, allowing health systems to achieve goals in patient safety and ensure that appropriate practices are implemented and quality is consistently pursued (9).

Process

The MoH in Viet Nam has identified surgical safety improvement as one of their health priorities. This was a shared area of interest with Operation Smile, so it led to the development and execution of a Memorandum of Understanding in November 2014 that mapped out objectives and partner responsibilities. The goal of the partnership was to equitably increase access to safe, timely and effective surgical care within Viet Nam, by developing and implementing quality standards.

Surgical system audit

To better understand surgical capacity in Viet Nam, a surgical system audit was conducted. Audit tools were collaboratively developed, with technical experts from both the MoH and Operation Smile, which advocated for the inclusion of the patient and provider perspectives, resulting in a more holistic picture of surgery than what would have resulted had either party pursued the audit independently. The audit was comprised of data from three sources: a facility survey, a health worker and patient survey and a “barriers to care” survey. The work done to understand barriers to care was implemented by Operation Smile and a university partner in advance of the audit and assessed issues of access among cleft lip and palate patients. A summary of data related to barriers to care was included alongside data from the facility survey and health worker and patient survey.

Assessment teams were made up of personnel from the Ministry of Health and Operation Smile. The facility survey aimed to assess surgical care capacity at hospitals nationwide, to identify specific strengths and weaknesses in the availability of resources and to inform low-cost, high-yield ways to improve the delivery of safe surgical care. The MoH and Operation Smile developed an assessment tool based on previous



Surgeons operate on a patient with a cleft in Viet Nam

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assessments of surgical care capacity (10), as well as WHO’s Surgical Safety Checklist and the WHO’s Guidelines for Safe Surgery (10 objectives), and other aspects of safe surgery (e.g., instrument sterilization policies, availability of monitoring equipment after anaesthesia, existence of patient handover protocols, etc.) (11). The tool allowed an assessment of the current state of surgical safety in line with objectives 1, 2, 3, 4, 6, 7 and 9 in the WHO Guidelines for Safe Surgery (Objective 1). The team will operate on the correct patient at the correct site; Objective 2. The team will use methods known to prevent harm from administration of anaesthetics, while protecting the patient from pain; Objective 3. The team will recognize and effectively prepare for life-threatening loss of airway or respiratory function; Objective 4. The team will recognize and effectively prepare for risk of high blood loss; Objective 6. The team will consistently use methods known to minimize the risk of surgical site infection; Objective 7. The team will prevent inadvertent retention of instruments and sponges in surgical wounds; Objective 9. The team will effectively communicate and exchange critical information for the safe conduct of the operation). The tool was adapted to be contextually appropriate for Viet Nam and was designed to be administered in a survey format, including sections on hospital metrics, surgical and anaesthesia workforce, and the availability

of essential resources. Key informants were interviewed using the structured assessment tool on the availability of resources and policies that support safe surgical care.

It is vital that surgical care capacity-building and performance improvement initiatives are designed around the most important stakeholders in surgical care – the patients. To do so, the MoH of Viet Nam and Operation Smile performed a nationwide survey of patients and providers that aimed to: i) assess surgical patient satisfaction in hospitals nationwide; ii) explore provider perceptions of the safety and quality of the surgical care being delivered; and iii) identify ways in which the safety and quality of surgical care could be improved.

Widely validated patient satisfaction surveys specific to surgery in LMICs do not exist (12, 13). Therefore, a patient satisfaction survey was created by combining questions from well-validated and commonly used patient satisfaction surveys in high-income settings, including: the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey; the National Committee for Quality Assurance (NCQA) survey; and the Press Ganey Associates Incorporated survey. Additionally, questions more pertinent to patients in facilities with fewer resources were added (e.g., questions relating to the availability of clean drinking water and adequate hygiene facilities). Patients were also asked to mark specific units (e.g., emergency unit, operating theatre, inpatient ward, toilet facilities) or overarching issues (e.g., provider-patient communication, navigation around the health care system) that they felt needed most improvement in the hospital. A complementary tool was created to broadly query providers regarding their perceptions of the safety and quality of surgical care, and determine the units and overarching issues in the hospital in need of most improvement.

Both tools included a short sociodemographic information section and used a simple Likert scale rating system for measuring satisfaction and perceptions of safety and quality (e.g., 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree); similar scales have been extensively used in LMICs with good validity, even among people with limited or no education (14, 15). In addition to the questions using the Likert scale rating system, both tools also included open-ended questions, that prompted respondents to discuss other satisfaction, safety and quality concerns, as well as ways in which the concerns might be addressed.

The study was conducted at 36 hospitals representing the socio-economic geographical regions of Viet Nam, including four central hospitals, 20 provincial hospitals and 12 district hospitals. Each hospital was evaluated in a period of one day. The research team consisted of 10-12 people, divided into 3 assessment groups according to the following objectives: Group 1: Conduct an assessment of the current status of infrastructure and Infection control; Group 2: Carry out an assessment on drug and equipment assurance – Supervise the implementation of surgical procedures - Assess the capacity of using the operating room; Group 3: Conduct surveys, consult the patients and family members after surgery.

Analysis of the audit data was jointly undertaken by MoH and Operation Smile. Data analysis represented a continued process of engagement, with several meetings taking place between the two parties to discuss the approach to analysis and interim findings.

Results

The World Health Organization's Guidelines for Safe Surgery represented a relevant framework for assembling the data collected during the audit, in terms of structure and content. The MoH was highly receptive to using these guidelines as a starting point for developing national policy given the credibility of World Health Organization.

A stakeholder meeting was convened to share findings and contextualize the Guidelines for Safe Surgery to Viet Nam and included a diverse group of stakeholders from the MoH and hospitals across the country, as well as international stakeholders from academic institutions and NGOs. Funding for the meeting was provided by Operation Smile. The meeting served as a forum for input and the development of the contextualized guidelines, and resulted in a set of contextualized guidelines for safe surgical care that will be implemented across Viet Nam.

Within each of the guidelines, essential and recommended criteria were defined and policies and procedures that needed to be developed were outlined. This work continues and it is expected that the contextualized guidelines will be ratified by the MoH and included in the national health policy, strategy and plan for surgical care in 2017.

The quality and standardization of infrastructure, equipment, and human resources in providing surgical services within Viet Nam are expected to increase due to the implementation of this policy, although it is unlikely that the effect will be universal.

With the procurement of material and equipment decentralized to the facility level, Viet Nam struggles with national priorities related to critical equipment and infrastructure. Even if all material and equipment defined as necessary by the policy were available, implementation would likely still be challenging. As a result, both partners are committed to developing a pilot hospital where stakeholders could come to observe standards in action and identify possible pathways for implementation in their home hospitals.

Additionally, leadership at the facility level is important, both regarding management of the facility and in surgical health service delivery; these are critical components for improving quality.

Conclusion

The generation of consensus-based guidelines for safe surgery and subsequent adoption of a national surgical care policy represent important steps towards increasing the quality of surgical care in Viet Nam. As demonstrated in Viet Nam, NGOs can play a significant role in supporting the development of national policy on surgery.

Key successes/tips

1. The co-creation of the assessment tools led to joint ownership and a diversity of data points that would not have been obtained had either party undertaken the assessment alone.
2. The process of building consensus is as important as reaching the consensus itself, because of the inclusion and level of engagement it creates.
3. A key role of civil society is leveraging the available resources, both human and financial, to support ministries of health in surgical system strengthening.

Key challenges

1. Implementation: Surgical quality and standardization of infrastructure, equipment, and human resources in providing surgical services within Viet Nam are expected to increase due to the implementation of this policy, although it is unlikely that the effect will be universal.
2. Role modeling: Role modeling is expected to be a necessary component of surgical system strengthening. Immersive experiences into environments where quality standards are consistently applied and mapping pathways for implementation at a facility level are likely to be important.
3. Partnerships: Partnerships between NGOs and ministries of health represent significant opportunities for surgical system strengthening and while this represents an example of success, true collaboration is time-intensive and can be difficult. Trusting relationships are a critical mechanism for navigating these and other challenges.

References

1. The World Bank, World Development Indicators. (2015). GDP per capita current US\$ [Data file]. Retrieved from <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
2. The World Bank, World Development Indicators. (2014). Health expenditure, total as % of GDP [Data file]. Retrieved from <http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS>
3. The World Bank, World Development Indicators. (2014). Health expenditure per capita current US\$ [Data file]. Retrieved from <http://data.worldbank.org/indicator/SH.XPD.PCAP>
4. Somanathan A, Tandon A, Dao HL, Hurt KL, Fuenzalida-Puelma HL. 2014. Moving toward Universal Coverage of Social Health Insurance in Vietnam: Assessment and Options. Directions in Development. Washington, DC: World Bank.
5. Vuong DA, Flessa S, Marschall P, et al. Determining the impacts of hospital cost-sharing on the uninsured near-poor households in Vietnam. *International Journal for Equity in Health* 2014, 13:40.
6. General Statistics Office and UNICEF, 2015. Viet Nam Multiple Indicator Cluster Survey 2014, Final Report. pp 156-157. Ha Noi, Viet Nam, from http://mics.unicef.org/news_entries/21.
7. Appropriate technology for birth. *Lancet*. 1985;2(8452):436-7.
8. World Health Organization, UNFPA, UNICEF, & AMDD. (2009). Monitoring Emergency Obstetric Care: A Handbook. (pp 35). Retrieved March 20, 2017, from http://www.unfpa.org/sites/default/files/pub-pdf/obstetric_monitoring.pdf.
9. A Standards-driven Approach to Improve the Quality of Health-care Services for Adolescents. Issue brief no. 15.06. World Health Organization, n.d. Web. http://apps.who.int/iris/bitstream/10665/184035/1/WHO_FWC_MCA_15.06_eng.pdf
10. Carlson LC, Lin JA, Ameh EA, Mulwafu W, Donkor P, Derbew M, et al. Moving from Data Collection to Application: A Systematic Literature Review of Surgical Capacity Assessments and their Applications. *World journal of surgery*. 2015;39:813-21.
11. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *The New England journal of medicine*. 2009;360:491-9.
12. Onwujekwe A, Etiaba E, Oche A. Patient satisfaction with health care services: a case study of the federal medical centre Makurdi, north central Nigeria. *International Journal of Medicine and Health Development*. 2013;18.
13. Bernhart MH, Wiadnyana IG, Wihardjo H, Pohan I. Patient satisfaction in developing countries. *Social science & medicine*. 1999;48:989-96.
14. Gopichandran V, Wouters E, Chetlapalli SK. Development and validation of a socioculturally competent trust in physician scale for a developing country setting. *BMJ open*. 2015;5:e007305.
15. Sheferaw ED, Mengesha TZ, Wase SB. Development of a tool to measure women's perception of respectful maternity care in public health facilities. *BMC pregnancy and childbirth*. 2016;16:67.