WHO GUIDELINE

RECOMMENDATIONS ON DIGITAL INTERVENTIONS FOR HEALTH SYSTEM STRENGTHENING

EXECUTIVE SUMMARY

World Health Organization

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EXECUTIVE SUMMARY

Background

Digital health, or the use of digital technologies for health, has become a salient field of practice for employing routine and innovative forms of information and communications technology (ICT) to address health needs. The term digital health is rooted in eHealth, which is defined as "the use of information and communications technology in support of health and health-related fields". Mobile health (mHealth) is a subset of eHealth and is defined as "the use of mobile wireless technologies for health". More recently, the term digital health was introduced as "a broad umbrella term encompassing eHealth (which includes mHealth), as well as emerging areas, such as the use of advanced computing sciences in 'big data', genomics and artificial intelligence".

The World Health Assembly Resolution on Digital Health unanimously approved by WHO Member States in May 2018 demonstrated a collective recognition of the value of digital technologies to contribute to advancing universal health coverage (UHC) and other health aims of the Sustainable Development Goals (SDGs). This resolution urged ministries of health "to assess their use of digital technologies for health [...] and to prioritize, as appropriate, the development, evaluation, implementation, scale-up and greater use of digital technologies,... Furthermore, it tasked WHO with providing normative guidance in digital health, including through the promotion of evidence-based digital health interventions.

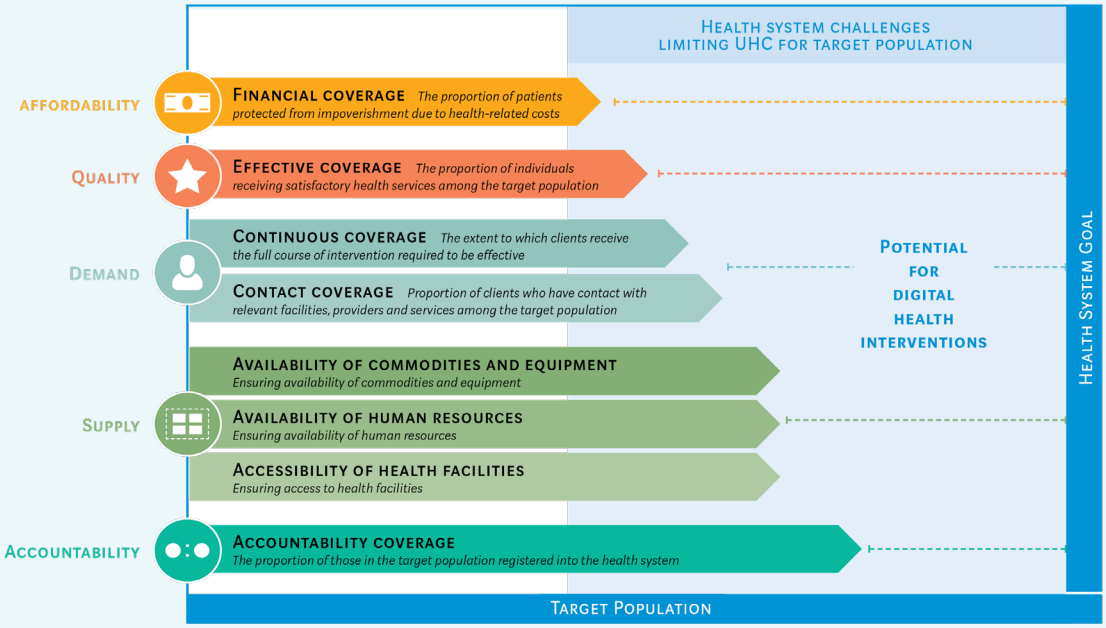
Amid the heightened interest, digital health has also been characterized by implementations rolled out in the absence of a careful examination of the evidence base on benefits and harms. The enthusiasm for digital health has also driven a proliferation of short-lived implementations and an overwhelming diversity of digital tools, with a limited understanding of their impact on health systems and people's well-being. This concern was highlighted most notably in the consensus statement of the WHO Bellagio eHealth Evaluation Group, which opened by stating: "To improve health and reduce health inequalities, rigorous evaluation of eHealth is necessary to generate evidence and promote the appropriate integration and use of technologies." While recognizing the innovative role that digital technologies can play in strengthening the health system, there is an equally important need to evaluate their contributing effects and ensure that such investments do not inappropriately divert resources from alternative, non-digital approaches.

Role of digital health in health system strengthening and Universal Health Coverage

The goal of UHC is to ensure the quality, accessibility and affordability of health services. However, shortfalls remain in ensuring access to all who need health services and in ensuring that they are delivered with the intended quality without causing financial hardship to the people accessing them. The Tanahashi framework published by WHO in 1978 provides a time-tested model for understanding health system performance gaps and how they prevent the intended coverage, quality and affordability of health services. This cascading model illustrates how health systems lose performance because of challenges at successive levels, each dependent on the previous level. Health system challenges – such as geographical inaccessibility, low demand for services, delayed provision of care, low adherence to clinical protocols and costs to individuals/patients – contribute to accumulated losses in health system performance. These shortfalls limit the ability to close the gaps in coverage, quality and affordability, and undermine the potential to achieve UHC.

This adapted Tanahashi model illustrates that each health system performance layer builds on the components below it but also falls short (dotted lines) of the optimal, desired level (Figure 1). Digital health interventions could contribute to efforts to address challenges that limit achievement of that health system goal.

Figure 1 Layers of UHC achievement affected by health system performance



Source: adapted from Tanahashi, 1978.

Digital technologies provide concrete opportunities to tackle health system challenges, and thereby offer the potential to enhance the coverage and quality of health practices and services. Digital health interventions may be used, for example, to facilitate targeted communications to individuals in order to generate demand and broaden contact coverage. Digital health interventions may also be targeted to health workers to give them more immediate access to clinical protocols through, for example, decision-support mechanisms or telemedicine consultations with other health workers. The range of ways digital technologies can be used to support the needs of health systems is wide, and these technologies continue to evolve due to the inherently dynamic nature of the field. A starting point for categorizing the different ways that digital technologies are being used to overcome defined health system challenges is provided by WHO's *Classification of digital health interventions v1.0*.

A digital health intervention is defined here as a discrete functionality of digital technology that is applied to achieve health objectives and is implemented within digital health applications and ICT systems, including communication channels such as text messages.

Objectives of the guideline

The key aim of this guideline is to present recommendations based on a critical evaluation of the evidence on emerging digital health interventions that are contributing to health system improvements, based on an assessment of the benefits, harms, acceptability, feasibility, resource use and equity considerations. For the purposes of this version of the guideline, the recommendations examine the extent to which digital health interventions, primarily available via mobile devices, are able to address health system challenges along the pathway to UHC. By reviewing the evidence of different digital interventions against comparative options, as well as assessing the risks, this guideline aims to equip health policy-makers and other stakeholders with recommendations and implementation considerations for making informed investments into digital health interventions.

This guideline urges readers to recognize that digital health interventions are not a substitute for functioning health systems, and that there are significant limitations to what digital health is able to address. Digital health interventions should complement and enhance health system functions through mechanisms such as accelerated exchange of information, but will not replace the fundamental components needed by health systems such as the health workforce, financing, leadership and governance, and access to essential medicines. An understanding of which health system challenges can realistically be addressed by digital technologies, along with an assessment of the ecosystem's ability to absorb such digital interventions, is thus needed to inform investments in digital health. Additionally, the adoption of the recommendations in this guideline should not exclude or jeopardize the provision of quality non-digital services in places where there is no access to the digital technologies or they are not acceptable or affordable for target communities.

The recommendations in this guideline represent a subset of prioritized digital health interventions accessible via mobile devices, and this guideline will gradually include a broader set of emerging digital health interventions over subsequent versions. This includes recommendations on the following topics:

- **birth notification via mobile devices**
- **death notification via mobile devices**
- **stock notification and commodity management via mobile devices**
- **client[1]-to-provider telemedicine**
- **provider-to-provider telemedicine**
- **targeted client communication via mobile devices**
- **digital tracking of patients'/clients' health status and services via mobile devices**
- **health worker decision support via mobile devices**
- **provision of training and educational content to health workers via mobile devices (mobile learning-mLearning)**

The systematic reviews included accessibility via mobile devices to ensure that these digital interventions are applicable in low resource settings where extensive computerized systems may not be available or feasible. However, the recommended interventions can be deployed through any digital device, including stationary devices, such as desktop computers, and does not preclude them from being used on non-mobile digital devices.

Target audience

The primary target audiences for this guideline are decision-makers in ministries of health, public health practitioners and other stakeholders who will benefit from an understanding of which digital health interventions have an evidence base to address health system needs. This guideline may also prove beneficial to organizations that invest resources into digital health as implementation and development partners. This document aims to strengthen evidence-based decision-making on digital approaches by governments and partner institutions, encouraging the mainstreaming and institutionalization of effective digital interventions.

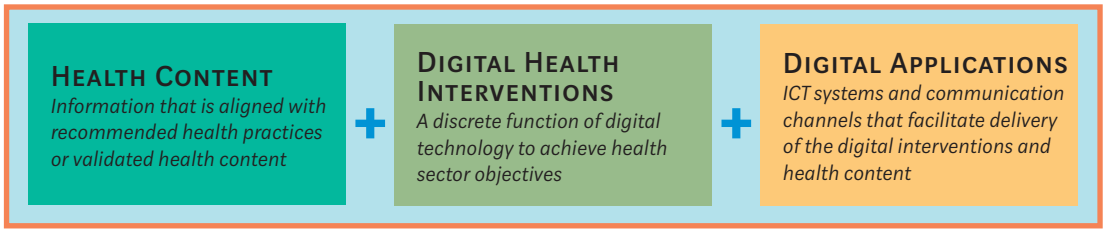
1 Although WHO's *Classification of digital health interventions v1.0* uses the term "client", the terms "individual" and "patient" may be used interchangeably, where appropriate.

Implementation context

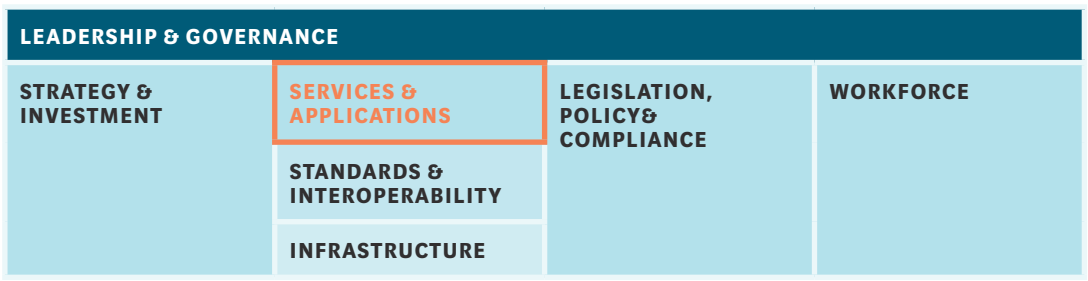
Digital health has the potential to help address problems such as distance and access, but still shares many of the underlying challenges faced by health system interventions in general, including poor management, insufficient training, infrastructural limitations, and poor access to equipment and supplies. These considerations need to be addressed in addition to the specific implementation requirements introduced by digital health.

Digital health interventions are applied within a country context and a health system, and their implementation is made possible by a number of factors including: (i) the health domain area and associated content; (ii) the digital intervention or functionality provided; (iii) the software and communication channels for delivering the digital health intervention; and mediated by (iv) a foundational layer of the ICT and the enabling environment (see Figure 2). Furthermore, these components need to be made appropriate to the local context and ensure effective implementation through reflection on the behaviour and organizational changes that would also be required. Lastly, digital health interventions are intended to fit into an overall digital health architecture. While the unit of analysis for this guideline focuses on the value of specific digital interventions, there is an equally important need to support a cohesive approach to implementation, in which different digital interventions can leverage one another, as opposed to operating as isolated initiatives.

FIGURE 2 COMPONENTS CONTRIBUTING TO DIGITAL HEALTH IMPLEMENTATIONS



FOUNDATIONAL LAYER: *ICT and Enabling Environment*



As the context may drive the eventual impact of the digital health interventions, the broader health system and enabling environment become especially critical. There is considerable value in assessing the ecosystem in a given context or country, in reviewing health system needs and tempering expectations based on the ICT and enabling environment available within a setting. In the absence of a robust enabling environment, there is the risk of a proliferation of unconnected systems and a severe impact on the effectiveness and sustainability of the health intervention.

Methods

The development of this guideline followed the methods described in the second edition of the *WHO handbook for guideline development*. This institution-wide process at WHO entailed the identification of critical questions and outcomes, retrieval of the evidence, assessment and synthesis of that evidence, the formulation of recommendations, and planning for the implementation, dissemination, impact evaluation and updating of the guideline.

The guideline development process also included two rounds of online surveys and three in-person consultations. These consultations included (i) an advisory meeting in February 2016 to establish the goal of the guideline in light of other WHO resources and to determine underlying framework; (ii) a scoping meeting in September 2016 to prioritize and draft the critical questions and outcomes; and (iii) a final meeting in June 2018 to review the synthesized evidence and formulate recommendations. Online surveys were used before and after the September scoping meeting to inform the refinement and prioritization of the questions.

Scope of interventions and outcomes

The scoping process resulted in priority questions across the following digital health interventions prioritized for evidence review within the guideline (included in Annex 2). The definitions of the interventions included in this guideline are provided in Table 1.

TABLE 1 DEFINITIONS OF INCLUDED DIGITAL HEALTH INTERVENTIONS

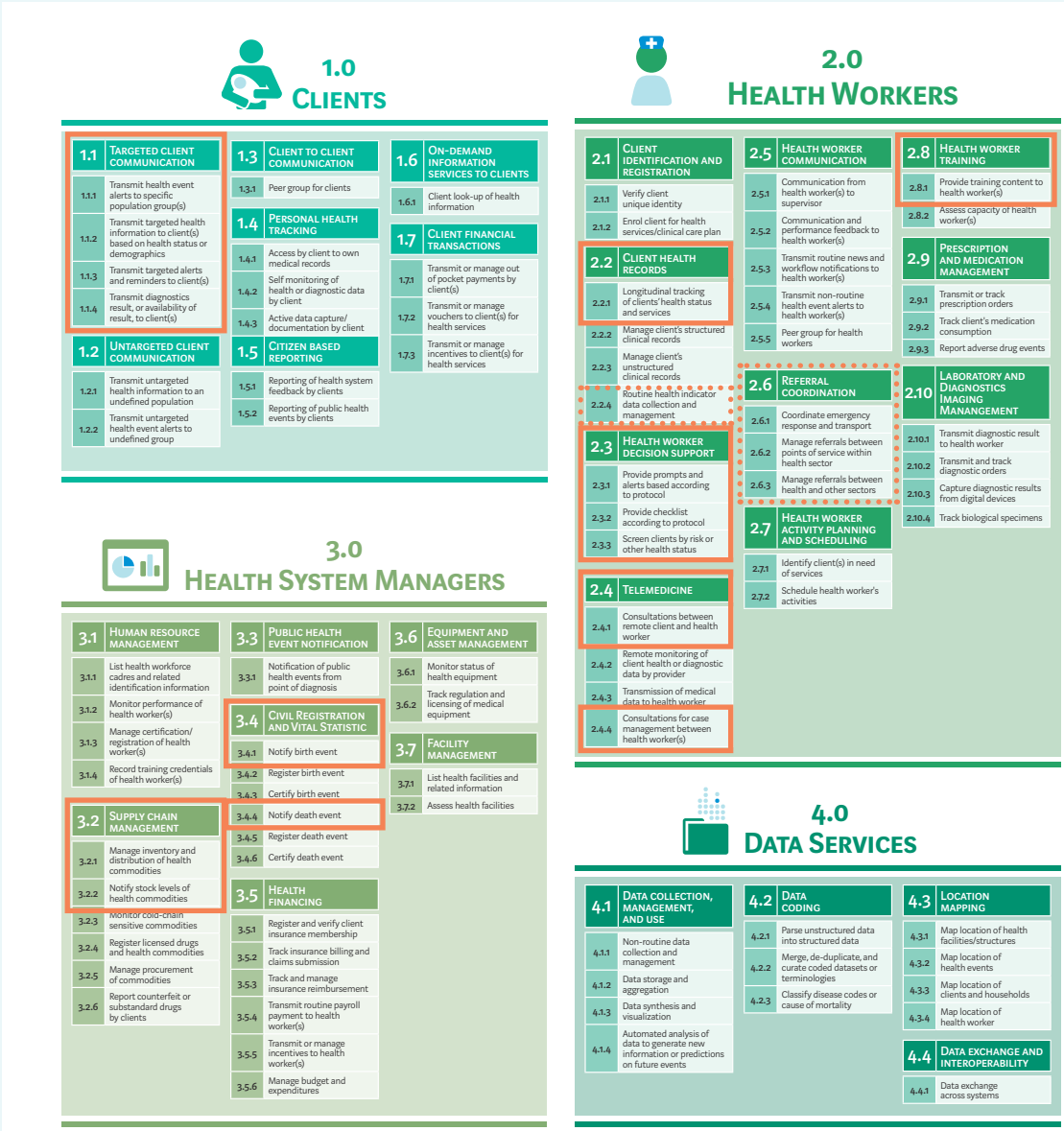
DIGITAL HEALTH INTERVENTION	DEFINITION	SYNONYMS AND OTHER DESCRIPTORS
BIRTH NOTIFICATION VIA MOBILE DEVICES	Digital approaches to support the notification of births, to trigger the subsequent steps of birth registration and certification, and to compile vital statistics	▸ Birth event alerts ▸ Enabling health workers and community to transmit alerts/ notifications when a birth has occurred
DEATH NOTIFICATION VIA MOBILE DEVICES	Digital approaches to support the notification of deaths, to trigger the subsequent steps of death registration and certification, and to compile vital statistics, including cause-of-death information	▸ Death surveillance ▸ Death event alert ▸ Enabling health workers and communities to transmit alerts/ notifications when a death has occurred
STOCK NOTIFICATION AND COMMODITY MANAGEMENT VIA MOBILE DEVICES	Digital approaches for monitoring and reporting stock levels, and consumption and distribution of medical commodities. This can include the use of communication systems (e.g. SMS) and data dashboards to manage and report on supply levels of medical commodities	▸ Stock-out prevention and monitoring ▸ Alerts and notifications of stock levels ▸ Restocking coordination ▸ Logistics management and coordination
CLIENT-TO-PROVIDER TELEMEDICINE	Provision of health services at a distance; delivery of health services where clients/patients and health workers are separated by distance	▸ Consultations between remote client/ patient and health worker ▸ Clients/patients transmit medical data (e.g. images, notes and videos) to health worker
PROVIDER-TO-PROVIDER TELEMEDICINE	Provision of health- services at a distance; delivery of health services where two or more health workers are separated by distance	▸ Consultations for case management between health workers ▸ Consulting with other health workers, particularly specialists, for patient case management and second opinion

Digital health intervention	Definition	Synonyms and other descriptors
Targeted client communication via mobile devices (targeted communication to individuals)	Transmission of customized health information for different audience segments (often based on health status or demographic categories). Targeted client communication may include: i. transmission of health-event alerts to a specified population group; ii. transmission of health information based on health status or demographics; iii. alerts and reminders to clients; iv. transmission of diagnostic results (or of the availability of results).	▸ Notifications and reminders for appointments, medication adherence, or follow-up services ▸ Health education, behaviour change communication, health promotion communication based on a known client's health status or clinical history ▸ Alerts for preventive services and wellness ▸ Notification of health events to specific populations based on demographic characteristics
Health worker decision support via mobile devices	Digitized job aids that combine an individual's health information with the health worker's knowledge and clinical protocols to assist health workers in making diagnosis and treatment decisions	▸ Clinical decision support systems (CDSS) ▸ Job aid and assessment tools to support service delivery, may or may not be linked to a digital health record ▸ Algorithms to support service delivery according to care plans and protocol
Digital tracking of patients'/ clients' health status and services within a health record (digital tracking)	Digitized record used by health workers to capture and store health information on clients/patients in order to follow-up on their health status and services received. This may include digital service records, digital forms of paper-based registers for longitudinal health programmes and case management logs within specific target populations, including migrant populations.	▸ Digital versions of paper-based registers for specific health domains ▸ Digitized registers for longitudinal health programmes, including tracking of migrant populations' benefits and health status ▸ Case management logs within specific target populations, including migrant population
Provision of training to health workers via mobile devices (mobile learning/ mLearning)	The management and provision of education and training content in electronic form for health professionals. In contrast to decision support, health worker training does not need to be used at the point of care.	▸ mLearning, eLearning, virtual learning ▸ Educational videos, multimedia learning and access to clinical and non-clinical guidance for training reinforcement

Source: adapted from *Classification of digital health interventions v1.0* (WHO, 2018).

The interventions included in this guideline are those prioritized through the process described above from the wider range of digital interventions available. Figure 3 depicts which interventions were reviewed in this guideline, as well as interventions that were excluded at the scoping stage.

FIGURE 3 INTERVENTIONS TARGETED IN THE GUIDELINE



Key: solid orange outline = full inclusion; dotted orange outline = partial inclusion

Source: WHO *Classification of digital health interventions v1.0*

Scoping considerations regarding health domains and delivery channels

Considering the diversity of the uses of ICT in health, the guideline process established that it was also necessary to define the scope of the prioritized questions in relation to (i) health domains; (ii) types of digital device (i.e. mobile devices); and (iii) delivery channels for the interventions (e.g. SMS text messaging, multimedia applications, voice calls, interactive voice response).

Health domains

During the scoping consultations described above, the domains to be covered by the guideline were determined, and they are presented in Table 2.

Table 2 Health domains covered by the guideline

Digital health intervention	Health domains included in systematic review
Birth notification via mobile devices	All – no restrictions
Death notification via mobile devices	All – no restrictions
Stock notification and commodity management via mobile devices	All – no restrictions
Client-to-provider telemedicine	All – no restrictions
Provider-to-provider telemedicine	All – no restrictions
Targeted client communication via mobile devices (targeted communication to individuals)	Sexual, reproductive, maternal, newborn, child and adolescent health
	Targeted client communication for noncommunicable diseases was not included in this version but has been prioritized for the next update of this guideline
Health worker decision support via mobile devices	All – no restrictions
Digital tracking of patients'/clients' health status and services (digital tracking)	All – no restrictions
Provision of training to health workers via mobile devices (mLearning)	All – no restrictions

Devices

Mobile devices are now used widely in almost all settings, and this has been the primary driver for research and investment in digital health efforts across low- and middle-income countries. The mobile nature of these devices also offers unique opportunities for service delivery. Given the current and growing importance of mobile devices for delivering digital health interventions, particularly in low- and middle-income countries, it was decided that this guideline would focus on digital health interventions that were accessible via mobile devices. This decision was also based on the need to define clear parameters for the systematic reviews.

Presentation of the guideline

For each recommendation, a summary of the evidence is given in Chapter 3 on the positive and negative effects of the intervention, its acceptability and feasibility, the equity, gender and human rights impacts, resource use, and on any other considerations reviewed at the GDG meeting. The language that was used to interpret the evidence on effects is consistent with the approach recommended by the Cochrane EPOC Group. Where the WHO team identified any existing WHO recommendations relevant to this guideline, these were integrated into the text, and in all instances transcribed exactly as published in the respective source guidelines. Where needed, additional remarks are included to contextualize these recommendations, and citations for the source documents are given for more details.

Summary of recommendations

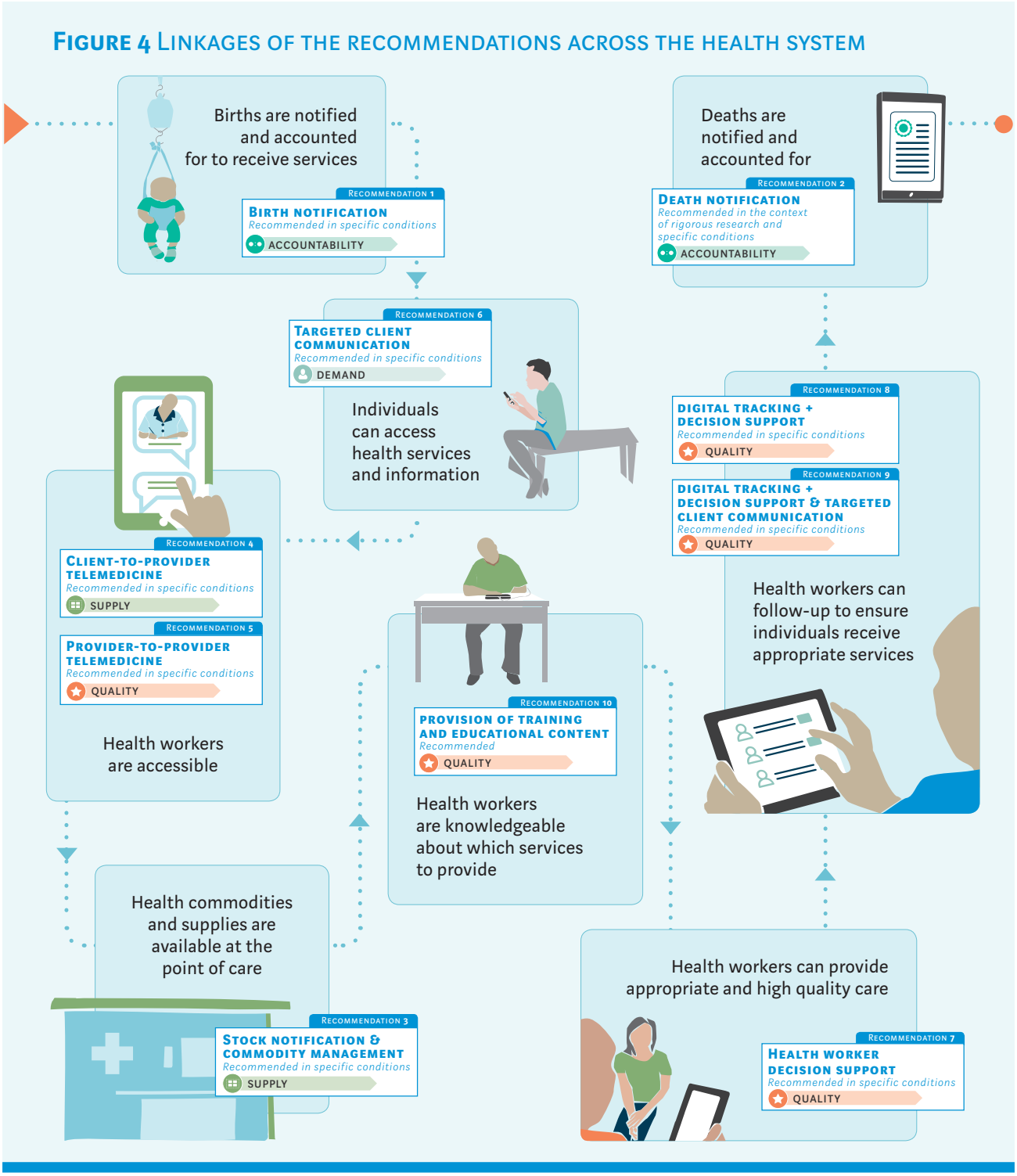
Expected Contribution to Universal Health Coverage (UHC)	Digital health intervention	Recommendation
Accountability coverage	**Recommendation 1** Birth notification via mobile devices	WHO recommends the use of birth notification via mobile devices under these conditions: • in settings where the notifications provide individual-level data to the health system and/or a civil registration and vital statistics (CRVS) system, and • the health system and/or CRVS system has the capacity to respond to the notifications. *(Recommended only in specific contexts or conditions)* Responses by the health system including the capacity to accept the notifications and trigger appropriate health and social services, such as initiating of postnatal services. Responses by the CRVS system include the capacity to accept the notifications and to validate the information, in order to trigger the subsequent process of birth registration and certification.

Expected Contribution to Universal Health Coverage (UHC)	Digital Health Intervention	Recommendation
Accountability coverage	**Recommendation 2** Death notification via mobile devices	WHO recommends the use of death notification via mobile devices under these conditions: - in the context of rigorous research, and - in settings where the notifications provide individual-level data to the health system and/or a CRVS system, and - the health system and/or CRVS system has the capacity to respond to the notifications. *(Recommended only in the context of rigorous research and in specific contexts or conditions)* Responses by the health system include the capacity to accept the notifications and trigger appropriate health and social services. Responses by the CRVS system include the capacity to accept the notifications and to validate the information, in order to trigger the subsequent process of death registration and certification.
Availability of commodities and equipment	**Recommendation 3** Stock notification and commodity management via mobile devices	WHO recommends the use of stock notification and commodity management via mobile devices in settings where supply chain management systems have the capacity to respond in a timely and appropriate manner to the stock notifications. *(Recommended only in specific contexts or conditions)*
Availability of human resources for health	**Recommendation 4** Client-to-provider telemedicine	WHO recommends the use of client-to-provider telemedicine to complement, rather than replace, the delivery of health services and in settings where patient safety, privacy, traceability, accountability and security can be monitored. *(Recommended only in specific contexts or conditions)* In this context, monitoring includes the establishment of standard operating procedures that describe protocols for ensuring patient consent, data protection and storage, and verifying provider licensing and credentials.
Availability of human resources for health **Effective coverage**	**Recommendation 5** Provider-to-provider telemedicine	WHO recommends the use of provider-to-provider telemedicine in settings where patient safety, privacy, traceability, accountability and security can be monitored. *(Recommended only in specific contexts or conditions)* In this context, monitoring includes the establishment standard operating procedures of that describe protocols for ensuring patient consent, data protection and storage, and verifying provider licensing and credentials.

Expected Contribution to Universal Health Coverage (UHC)	Digital Health Intervention	Recommendation
Contact coverage **Continuous coverage**	**Recommendation 6** Targeted client communication via mobile devices	WHO recommends targeted client communication via mobile devices for health issues regarding sexual, reproductive, maternal, newborn, and child health under the condition that potential concerns about sensitive content and data privacy can be addressed *(Recommended only in specific contexts or conditions)*
Effective coverage	**Recommendation 7** Health worker decision support via mobile devices	WHO recommends the use of decision support via mobile devices for community and facility-based health workers in the context of tasks that are already defined within the scope of practice for the health worker. *(Recommended only in specific contexts or conditions)*
Effective coverage **Accountability coverage**	**Recommendation 8** Digital tracking of clients' health status and services (digital tracking) combined with decision support	WHO recommends digital tracking of clients' health status and services, combined with decision support under these conditions: • in settings where the health system can support the implementation of these intervention components in an integrated manner; and • for tasks that are already defined as within the scope of practice for the health worker. *(Recommended only in specific contexts or conditions)*
Effective coverage **Accountability coverage** **Continuous coverage**	**Recommendation 9** Digital tracking combined with: (a) decision support and (b) targeted client communication	WHO recommends the use of digital tracking combined with decision support and targeted client communication under these conditions: • where the health system can support the implementation of these intervention components in an integrated manner; • for tasks that are already defined as within the scope of practice for the health worker; and • where potential concerns about data privacy and transmitting sensitive content to clients can be addressed. *(Recommended only in specific contexts or conditions)*
Effective coverage	**Recommendation 10** Digital provision of training and educational content to health workers via mobile devices/ mobile learning (mLearning)	WHO recommends the provision of learning and training content via mobile devices /mLearning to complement, rather than replace, traditional methods of delivering continued health education and post-certification training *(Recommended)*

While the recommendations included in this guideline are based on distinct digital interventions, they all contribute to the health systems' needs in different but interlinked ways. For health system managers, the recommendation on digital stock notification aims to drive availability of commodities at the point of services. From the clients' and patients' perspectives, this would include ability to access health information and services more immediately, such as through client to provider telemedicine and targeted client communication. Likewise, health workers need to be accessible and adhere to practices for delivering high-quality care, through interventions such as decision support and mLearning. Figure 4 illustrates the linkages across the different recommendations and the interlinked ways that these digital interventions can cohesively address health system needs.

FIGURE 4 LINKAGES OF THE RECOMMENDATIONS ACROSS THE HEALTH SYSTEM



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