

# Interoperability Considerations in the Design, Development, and Implementation of mHealth Projects

**Interoperability** describes the extent to which systems and devices can exchange data and interpret that shared data. For two systems to be interoperable, they must be able to exchange data and subsequently present that data in a way that can be understood by a user.<sup>1</sup>

For example, if a community health worker collects information about a pregnant woman on a mobile phone during a home visit and refers the woman to a clinic for antenatal care, the nurse at that antenatal clinic should be able to easily access the pregnant woman's information on the clinic system. This can only happen if the data collection application used by the community health worker is *interoperable* with the antenatal clinic's information system.

In order for electronic health (eHealth) systems to be interoperable, they must adhere to common **standards** for exchanging data. Standards provide a common framework for communicating, which enables system interoperability. Standards are generally established by consensus and approved by a recognized body.<sup>2</sup>

There are five types of standards within eHealth:

1. **Data interchange:** clinical and administrative messages for system and device interoperability. For example, if one system uses *1* for yes and *2* for no, and another uses *Y* for yes and *N* for no, they will not understand each other. Data interchange standards ensure that both systems use a common, agreed-upon way of communicating.
2. **Semantic content:** standards for the representation of terminology, such as health concepts and data. Terminology should mean the same thing across systems. For example, the term "condition" should not have different meanings in different systems.



3. **Security, safety, and privacy:** standards for confidentiality, integrity and availability, accountability, security management, and information systems safety. For example, there should be standards around password authentication, permissions-based access, etc. If one system restricts data access based on the type of user, then another system should not let all users access that same data.
4. **Pharmacy and medicines:** standards for interoperability of e-pharmacy systems and other medicines applications. For example, if a medicine has more than one name (e.g., *Panadol* and *paracetamol*), there should be standards for referring to the medicine by a common name across systems.
5. **Architecture:** the functions and conformance criteria associated with a system that is platform agnostic. For example, systems should conform to standards for exporting data in machine-readable format so that other systems can read the data regardless of whether they have the same operating system or physical architecture.<sup>3</sup>

<sup>1</sup> Healthcare Information and Management Systems Society (HIMSS); <http://www.himss.org/library/interoperability-standards>

<sup>2</sup> HIMSS; <http://www.himss.org/ResourceLibrary/genResourceFAQ.aspx?ItemNumber=34366>

<sup>3</sup> Jonathan D Payne, The State of Standards and Interoperability for mHealth among Low- and Middle-Income Countries; mHealth Alliance; March 2013.

## Benefits of Interoperability

Adopting common standards for health information systems improves access to information, and creates efficiencies for those who interact with the public health system, in several ways:

**For health professionals** — improves access to health record data and health information anytime, anywhere.

**For patients** — reduces the chance of treatment errors by improving data exchange, the quality of data flow, and health professionals' access to information.

**For health managers** — improves data collection and facilitates statistical and economic analysis.

**For health researchers** — improves and increases the availability of health data.

**For the healthcare technology industry** — improves access to the healthcare market for more companies desiring to develop new technologies that can interface with existing systems.<sup>4</sup>



## Health Information Exchange

A health information exchange (HIE) is the electronic movement of health-related information among organizations according to nationally recognized standards. An HIE provides the capability to electronically move clinical information among disparate healthcare information systems, while maintaining the meaning of the information being exchanged. The goal of HIE is to facilitate access to and retrieval of clinical data to provide **safe, timely, efficient, effective, equitable, patient-centered care**.<sup>5,6</sup>

## Interoperability in South Africa's mHealth Landscape

In March 2014, South Africa's National Department of Health (NDoH) released the National Health Normative Standards Framework (HNSF) for Interoperability in eHealth to provide guidance on standards that should be used for all electronic health systems in the country. As a subset of eHealth, mHealth systems also need to adhere to standards and provide for interoperability, which was

made clear in South Africa's mHealth Strategy 2015-2019, released in August 2015: "The mobility of personal information on mobile ICT (information and communications technology) devices makes the requirement for standards an urgent and essential part of realisation of the mHealth strategy," as "interoperability will ensure a seamless flow of information between disparate devices over different networks and from different recipients."<sup>7</sup>

The mHealth Strategy states that "for effective interoperability, there will need to be a health information exchange, patient master index, and a shared electronic health record, which will be managed within the Department of Health."<sup>4</sup> The strategy, therefore, mandates the implementation of several projects to form the basis for the practical implementation of standards-based interoperability in South Africa. These are:

1. Provide a patient master index.
2. Develop an mHealth patient registration standard operating procedure (SOP), with ways of linking to a unique patient identifier.
3. Provide a master facility/provider index.<sup>4</sup>

<sup>5</sup> <http://www.hrsa.gov/healthit/toolbox/>

RuralHealthIT/toolbox/Collaboration/whatishie.html  
<sup>6</sup> Health Information and Management Systems Society (HIMSS); <http://www.himss.org/library/health-information-exchange>.

<sup>7</sup> mHealth Strategy 2015-2019; South Africa National Department of Health; August 2015.

<sup>4</sup> Open Clinical; <http://www.openclinical.org/interoperability.html>

Central coordination of mHealth projects is also necessary to ensure interoperability.

The HNSF specifies an *Integrating the Healthcare Enterprise* (IHE) profile that will be fundamental to mHealth in South Africa going forward. The *Mobile Access to Health Documents* (MHD) profile “specifies a single standard interface to health documents that are accessed through mobile devices, such as smart phones, tablets, and embedded devices.”<sup>8</sup>

The MHD profile defines simplified transactions for submitting, finding, and retrieving documents, thereby allowing mobile devices, or other systems with similar resource constraints (screen size, character limits and storage space) to access document-based health information exchanges.<sup>9</sup>

## Challenges to Achieving Interoperability in mHealth

Achieving standards-based interoperability in mHealth

<sup>8</sup> National Health Normative Standards Framework for Interoperability in eHealth; South Africa National Department of Health, Council for Scientific and Industrial Research (CSIR); March 2014.

<sup>9</sup> Integrating the Healthcare Enterprise wiki; [http://wiki.ihe.net/index.php?title=Mobile\\_access\\_to\\_Health\\_Documents\\_\(MHD\)](http://wiki.ihe.net/index.php?title=Mobile_access_to_Health_Documents_(MHD))

projects faces unique challenges due to the constraints of using a mobile device. Many mobile-based initiatives use phone numbers as patient identifiers—however, phones are often shared among family members, so a phone number cannot serve as a unique identifier. Additionally, users often switch phone numbers, or have more than one phone number with one or more mobile carriers, which makes using phone numbers for identification ineffective. For those mHealth projects that collect more than a phone number as identifying information, often only a subset of possible identifying information is collected, which may lead to challenges in matching information. For example, an mHealth project might collect a person’s name and date of birth, but might not collect their address, ID number, or gender.

The lack of a full set of identifying information on a patient will present challenges when trying to link the client with the rest of their shared health record (SHR), as a search of the patient master index might not produce a match. Matching between mHealth initiatives and the national health information exchange might therefore need to include probabilistic methods, which look for approximate matches instead of an exact match. Probabilistic searches typically produce several possible matches, which would then need an extra step to verify the correct match.

## Case Study: MomConnect

MomConnect is a South Africa NDoH initiative to provide stage-based messaging to pregnant mothers on their mobile phones. Supported by multiple partner organisations, MomConnect was launched in August 2014, and is currently South Africa’s first and only large-scale public mHealth project addressing maternal health.<sup>1</sup> The initiative is also planned to be used as a backbone for the National Pregnancy Registry.

Women sign up to MomConnect during their first antenatal care clinic visit, using their mobile phone number, their South African ID number or passport number, and their estimated due date. The system also allows for registration without identification if the woman does not have any documentation with her—in which case, her date of birth is used.

As the proposed backbone for the National Pregnancy Registry, MomConnect will need to be interoperable with South Africa’s patient master index, and to make sure that women are being matched to the correct health records.

<sup>1</sup> MomConnect. One Year of Operation: A Case Study; Health Enabled; August 2015.

Unlike many other mHealth projects, MomConnect uses more than the phone number to identify a woman. Where women register with their South African ID or passport number, this number provides a unique identifier that can be used to link the woman to her SHR. However, in cases where a woman registers with her date of birth, matching will be more challenging, perhaps impossible.

Additionally, registration using an ID or passport number that is not verified or authenticated presents problems of its own, in that an incorrect number or another person's details may be given. If more than one person uses the same identifier, this may cause incorrect medical information to be stored and incorrect medical decisions to be taken. The unique identifier should, therefore, always be verified before registration or as events are recorded against a medical record. This highlights the need for a standard patient registration procedure (and events-recording procedure) as specified in the mHealth strategy.

A unique national health system identifier, health cards, and/or biometrics (including fingerprints, face, and iris recognition) are potential methods for addressing the challenges of identity. The HNSF has outlined specific standards for these methods, but policy decisions first need to be taken with respect to what should be used.

## Next Steps

As more mHealth initiatives are implemented at national scale in South Africa, it is important that interoperability is a cornerstone of their deployment. The government will need to take the lead and ensure that these projects design and implement systems that are interoperable with the rest of the health information system, by taking the following steps:

1. Establish a national eHealth standards board that pays attention to mHealth-specific issues.
2. Provide guidance to new mHealth initiatives about what standards have been established for use in South Africa.
3. Develop governance procedures to ensure that mHealth implementers are adhering to the established standards.
4. Provide education and capacity-building support for mHealth stakeholders to understand and align their work to the HNSF, possibly through building communities of practice around the HNSF to provide learning opportunities for implementers.

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