National E-Health and Data Management Strategy

Final Draft for Ministerial Approval

Qatar National E-Health & Data Program (QNeDP)

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Revision Log

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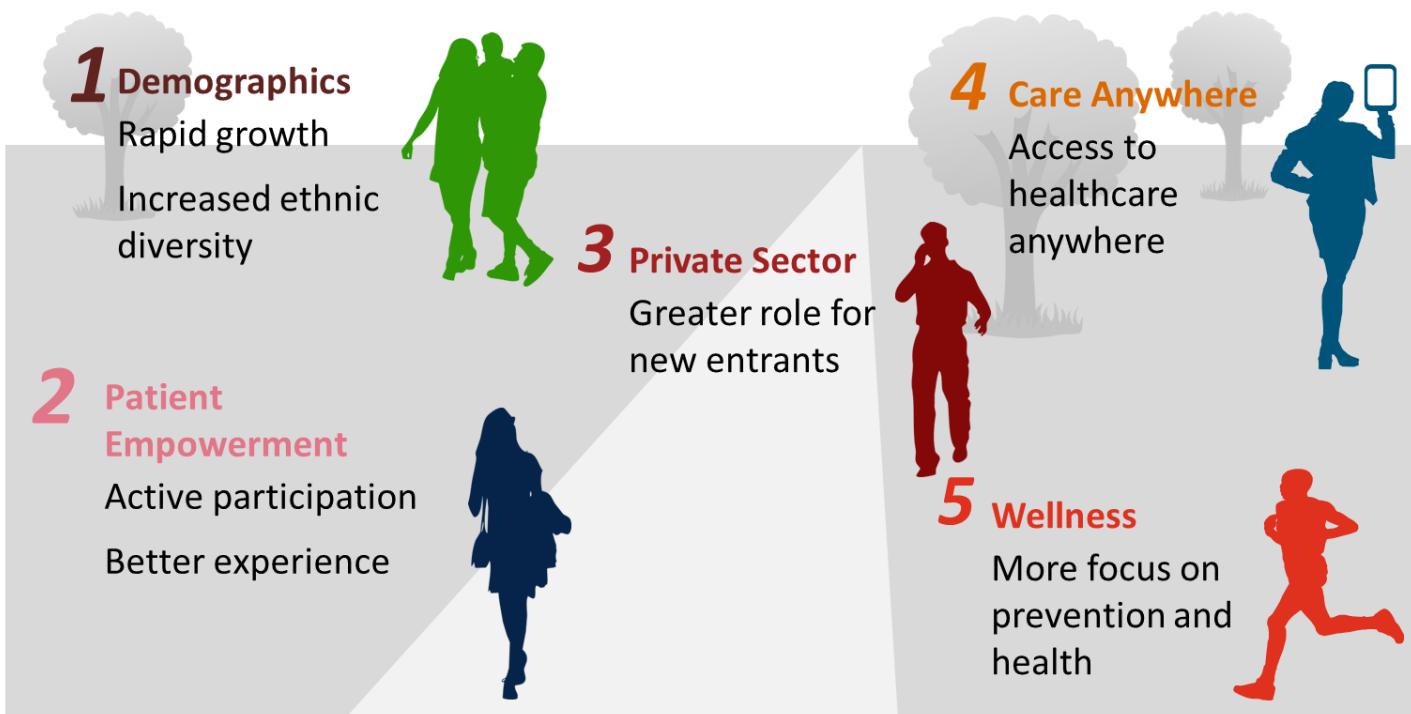
…what they have in common is the need for E-Health!

BACKGROUND

In the past decade, the Information Technology (IT) industry has witnessed the emergence of several new concepts on the health domain, among them: E-Health (or eHealth), Health 2.0, digital or electronic health, electronic health record, digital hospital and many others. Although each of these terms has brought its own unique definition and perspectives, they all share the recognition that health care and wellness management are inherently dependent on having access to the right data at the right time to the right people through effective use of technology for enhanced patient care and reduction of medical errors.

Until recently, the ability to collect, process and share health data was constrained by the lack of comprehensive digital capabilities, high cost of technologies and the lack of mature policies, standards and legislation that would facilitate the use of health information to its full potential. Today's technologies makes it is now possible to envision and deliver on new solutions that address previous limitations. In addition, there are many opportunities to leverage best implementation practices and modern public policies from several E-Health experiences from around the world.

It is with this purpose and understanding that the Supreme Council of Health in Qatar, under the leadership of His Excellency, Minister of Public Health Abdulla bin Khalid Al Qahtani, has taken the first concrete steps in an exciting E-Health journey that will promote significant changes on how healthcare services are delivered, and more importantly, how every individual can be empowered to become an active partner in the management of their own health.

This journey starts with a simple understanding of what E-Health is trying to achieve and its scope of influence. For the purpose of this Strategy and all subsequent projects in Qatar, E-Health is defined as the:

E-Health Definition

"Transformative and continuous improvement of healthcare through the use of information and technologies that support the delivery of healthcare and clinical research."

E-Health is about providing better healthcare outcomes to patients and about better effectiveness for the providers.

Under this definition, E-Health includes most of the information systems, digital devices, and data analytics solutions that at some point in time process health data. This definition also highlights the fact that E-Health is not just about the technologies themselves, but rather positions technology as an enabler for positive changes in the healthcare system. In summary, E-Health brings together people, processes and health services in a collaborative union with a common goal of improving patient care.

Improving healthcare services requires the coordination of many moving parts, including well trained people who provide the services, modern and efficient processes to make the best use of existing resources, the participation of patients in managing their health and the information systems and technologies that bring them all together.
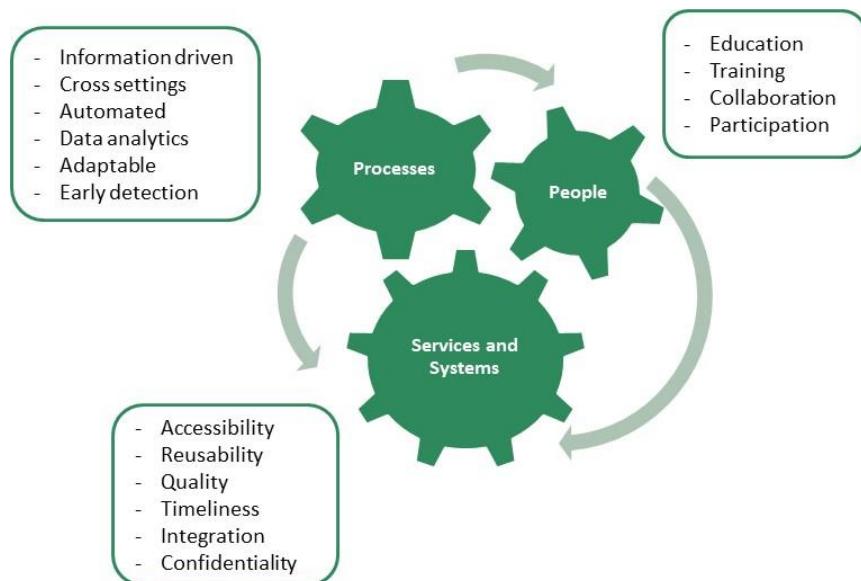
CURRENT STATE ASSESSMENT

Qatar has a well-developed healthcare infrastructure, comprising both the public and private sectors. Key aspects of the healthcare services in the country include:

- The Supreme Council of Health (SCH), as regulator, leading an E-Health agenda to improve the health outcomes through the integration of the public and private providers and a greater participation of patients in their wellness management;

- A significant participation of the eight government hospitals in the delivery of healthcare services managed by Hamad Medical Corporation (HMC);

- More than 30 government clinics managed by Primary Health Care Corporation (PHCC) that are being re-designed to be the cornerstone of a new Integrated Health Model for health care;

- A recently established and evolving health insurance scheme that is transforming how services are funded in the country; and

- World renowned specialist centers and hospitals including Aspetar and Sidra.

Many of these organizations are still providing healthcare supported by paper-based processes and lack the required systems to connect to one another. Without focused investment to transform its services through the introduction of information and communications technology, Qatar will be unable to meet the expectations and demands for excellent health care. The impacts of an ageing population, chronic and complex conditions, and workforce constraints are all putting pressure on health services to deliver more effective healthcare with the current resources.
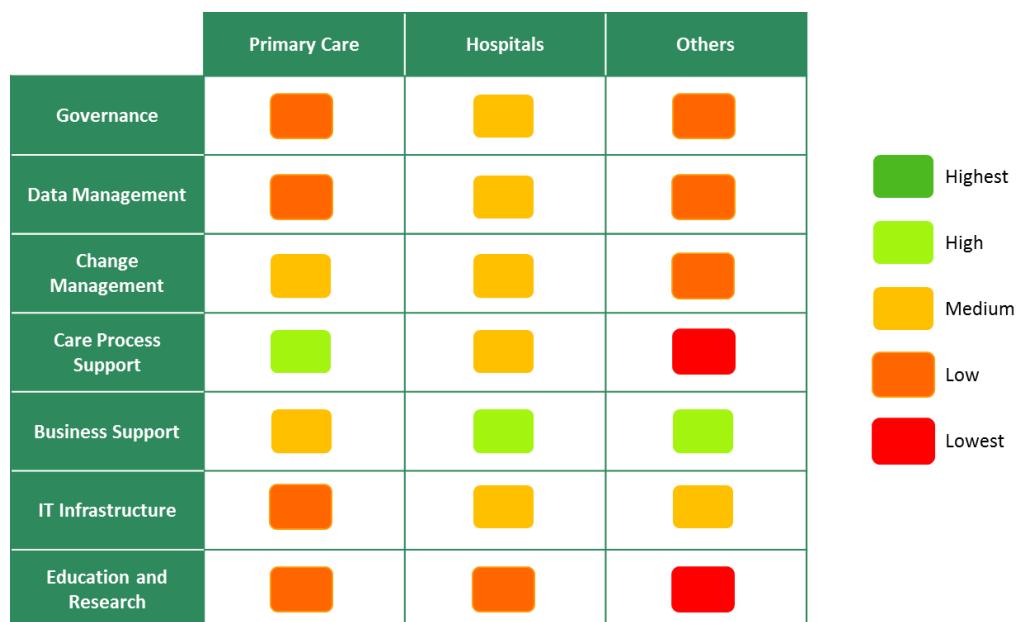
Qatar's strategy to deliver a world-class health care has been impacted by the following key issues which have been identified as typically affecting clinical service delivery in paper-based environments:

1. *Safety and Quality:* Paper based records, poor integration of systems and lack of information exchanges put at risk the patient's safety and hinder health service quality;

2. *Effectiveness:* Lack of digital data results delays or prevents access to the health data needed for clinical care and incurs significant overhead costs as a result of the time wasted looking for information;

3. *Decision Support and Research:* Questionable data quality and absence of data analytics capabilities at a national level result in limited evidenced based decision support and lack of health data for research;

4. **_Access and Capacity:_** The lack of integration between facilities and external services has a negative impact to service access and capacity; and

5. **_Credibility_**_:_ The lack of trust or credibility in the underlying paper records themselves.

A recent study commissioned by the SCH on the current state of E-Health in Qatar shows that while there are indeed some areas where E-Health has been successfully used as a key enabler in the delivery of healthcare, a broad, cohesive, national agenda and capability are still lacking.

E-Health and data management maturity levels of health-related organisations in Qatar

(PwC Report, 2015)

	Primary Care	Hospitals	Others
Governance	Low	Medium	Low
Data Management	Low	Medium	Low
Change Management	Medium	Medium	Low
Care Process Support	High	Medium	Lowest
Business Support	Medium	High	High
IT Infrastructure	Low	Medium	Medium
Education and Research	Low	Low	Lowest

Legend:
- Highest (green)
- High (light green)
- Medium (yellow)
- Low (orange)
- Lowest (red)

On a very positive note, there is a strong interest and willingness to pursue a national E-Health agenda among most healthcare providers in the country. This suggests that most stakeholders in the health sector have a very positive view towards accelerating the adoption of a formal national E-Health Strategy.

However, a common observation throughout the survey is the lack of ability for many organizations to implement E-Health solutions effectively. This is largely due to limited access to skilled and seasoned resources with experience and expertise in system implementation and change management practices. The focus, however, should not be solely on technical resources, but to invest in clinical expertise to ensure clinical buy-in and to assist in change management and adoption in the healthcare sector.

Challenges within population and public health, as an example, identify organizational, lack of systems and policy barriers that constrain the effective linking of patient information to support public health programs. This also impedes the ability to study health behaviors and other factors that influence the health of the people of Qatar.

The current state of data management across the health sector in Qatar also presents other challenges and is a key focal area for improvement. In general, organizations have only recently begun to look at the various concerns that impact the full data life cycle, including a greater focus on data quality, data stewardship, data sharing, audit and retention.

E-Health has an ability to transform how health care is delivered, but it also requires strong organizational adoption to be successful. Experience from other countries suggests that clear focus needs to be equally placed on clinical, technical, and patient perspectives to ensure that the full benefits can be realized.

The specific observations from the report have been grouped according to the four pillars that will be used in defining the E-Health strategy:

Policy and Governance: Covers aspects of organizations, policies and standards that will need to be established to support the E-Health vision;

Technology and Services: Covers the actions required to prepare the technical services, systems and telecommunication networks required;

People and Training: Covers the plans to ensure that there will be sufficient qualified people to implement, maintain and enhance the E-Health Vision; and

Communications and Adoption: Covers the communication activities, channels and incentives that will be used to promote the awareness and adoption of E-Health solutions.

Governance changes are needed to support a national E-Health Program	*General lack of E-Health awareness*	*Market awaits national standards and mandates*
Data management policies are mostly absent	*Limited attention to health data quality standards*	*International data standards have not been adopted*
Little data sharing occurs between organisations outside the public sector	*IT infrastructure in the private sector is a challenge*	*Overall E-Health resource capacity is limited*
Few health informatics diploma, as offered by HMC/PHCC, are available	*Growing shortage of skilled E-Health professionals is a great concern*	*Lack of specific E-Health academic programs and little interest among nationals*
Lack of specific E-Health research programs	*E-Health maturity level is still evolving*	*Change management practices exist but need improvement*
Collaboration amongst organisations is not common place	*Use of technology is improving with new hospital systems, but lacks national coordination*	*Adoption of innovation is constrained by the lack of formal incentives*

Overall, the healthcare system in Qatar seems prepared and willing to begin the transformation from a mostly paper-based, non-integrated care to a new model of integrated care that leverages innovation, quality data and advanced technology solutions.

QATAR E-HEALTH VISION

As the State of Qatar begins its E-Health journey, it is essential that everyone involved share a common vision to help guide investments and activities in the sector. The vision must reflect the needs and expectations of the various people and organizations that will be affected, at all levels, by the E-Health solutions that will be adopted in the country.

After consultation with key health stakeholders, the vision statement for E-Health in the State of Qatar has been defined as:

A world-class, sustainable, integrated and secure national E-Health ecosystem for the State of Qatar.

This vision describes desired characteristics of the E-Health destination. It brings to light Qatar's desire to become a *world leader* in the adoption, use and development of innovative solutions.   It also highlights that the entire ecosystem be *sustainable*, allowing organizations to plan effectively and with confidence, knowing that a national E-Health capability will be supported for generations. Additionally, the vision establishes that E-Health is not about a single system or solution, but is a national ecosystem that provides a secure backdrop for the *integration of systems* and health data across the country for all participants, including achieving a "Personal Health Account" to provide patient access to their health data. It is not possible to build a modern, integrated health system without a fully connected environment, where information can be shared and flow *securely* across all care settings, whether at a hospital, clinic, and laboratory or even at our homes.

BENEFITS OF E-HEALTH

Change to existing methods and practice comes at a price, but also comes with expected benefits that will help increase patient safety, reduce overall system costs and provide better accountability to health system participants. More succinctly, benefits are expected in five key areas as outlined below.

| Better health outcomes for the people in Qatar | Increased patient safety by evidence based decisions | Healthcare system that is more effective and integrated | Access to quality data to measure and improve services | Development of a new knowledge industry |

Better Health Outcomes

Better health outcomes starts with activities that can occur to prevent entering the medical system in the first place. This can range from wellness programs, education, prevention and eLearning initiatives focused on target populations (e.g. children). An emphasis on these activities, managed through an E-Health lens will help reduce high costs of patients seeking medical treatment.

Access to quality data in a timely fashion will allow health care providers to better assess and treat their patients. Today, digital data is not readily available outside of the organizations that collected them, and even within organizations, the use of paper leads to significant and potentially fatal errors. Sharing this data electronically internally and across organizations will provide a more fulsome account of a patient's condition, where and why they were treated, and an ability to better avoid errors and to manage treatment plans and outcomes.

A focus on data quality will also increase the amount of coded data available to the E-Health ecosystem. This coded data will provide better insights into a patient's health status and allow the use of new, advanced decision support tools. Moreover, coded data will support advanced analytics and key performance indicators that will allow health regulators to gain critical

knowledge on patient treatment plans and outcomes, directing treatments that will better serve patients and improve health outcomes, while driving greater efficiency in the system.

Better health outcomes are not just achieved by having more informed healthcare providers. Patients will have access to important aspects of their health services through a Personal Health Account. This service will empower patients to take better care of themselves through views tailored to their condition.

With the proliferation of personal health monitoring devices in the marketplace, a patient will also have an ability to upload data such as exercise regimes and heart rate readings to their Personal Health Account. Their health care providers will then be able to combine this data with other data already present in their records and shared through the national systems to monitor progress against fine-tuned treatment plans.

Increased Patient Safety

Medical errors are often too common due to the lack of timely and quality health data. As a consequence, patients routinely suffer from duplicate therapy, drug overutilization and improper procedures. Aggregating and analyzing this data at a national level will help promote improved patient safety and a reduction in avoidable medical errors.

This benefit is especially true for medication related errors, which have been shown in international research (e.g. Singapore and Australia) to represent between 50%-70% of savings created by national E-Health programs. The main reason is that avoiding adverse drug events directly results in a fewer number of patients being admitted or readmitted to hospitals.

A high priority is therefore the establishment of a national medication record for each individual. Also known as an "all drugs, all people" solution, this capability allows for drug interaction checking for prescribed medication against the patient's existing drug regimen. When a patient presents at a health care institution, a medication profile can be obtained to provide insights into the patient's health status. Over the counter and out of country drugs taken by the patient can also be collected by the solution to further reduce the number of adverse events.

Another E-Health example that increases patient safety is a consolidation of patient identity management capabilities. Medical errors are made when a patient's previous medical history cannot be obtained. This often is the result of multiple identifiers for a patient that are not properly cross-referenced, resulting in some records being missed when aggregating health data for treatment. A national person registry for health provides a reliable cross reference and helps ensure that all patient records are properly linked. Having a national personal identifier helps greatly this task and fortunately that is already available in Qatar.

More Effective and Integrated System(s)

A great share of the health care in Qatar is provided by two government entities, Hamad Medical Corporation (HMC) and Primary Health Care Corporation (PHCC). Patients being treated by these organizations will soon enjoy the benefits of the integrated system that is being implemented jointly by the two organizations. When Sidra opens, patients will also benefit from a similar high-quality solution that will be connected to the HMC/PHCC system.

If today the majority of service is provided by the public sector, it is anticipated that in the near future an increasing share of the healthcare services will be delivered by the private sector and other companies like community pharmacies, dentists, health clinics and others. The same advantages of an integrated system environment enjoyed by the public sector should be extended to the private sector. This will need to be provided by national level services that will enable Qatar to achieve the benefits of E-Health.

Once this information exchange is established, benefits and efficiencies in the health system can be realized. This will include a reduction in the number of laboratory tests (based on previous results already being available), lower drug prescribing / dispensing requirements (based on medications a patient already has in hand) and avoidance of duplicate radiology imaging (based on access to a national diagnostic imaging repository), to name a few examples.

Consolidating other key systems at a national level will also provide for additional gains in efficiency. For example, managing consent in a central, nationally accessible solution will allow healthcare providers to quickly and accurately ensure consent is managed according to regulation. It will also allow patients the ability to easily manage their own consent decisions using their Personal Health Account applications.

Another example of integrated systems is the health insurance industry. Capturing clinical data is important to patient safety and patient care. When this same data (or a subset of this data) can automatically be attached to a health claim, it can bring efficiency to the system through a reduction in duplication of data entry. This has been proven in numerous countries where dispense data, captured to support a medication history for a patient, is used in a seamless fashion with health insurance to cover drug costs for patients.

While building national capabilities is indeed an important aspect of the E-Health program, access must be provided to as many agencies as possible that help treat patients. Some agencies that must be included are Ministry of Interior, the military, Qatar Red Crescent, among others.

Access to Better Quality Data

Aggregating data and building national E-Health services and systems will have limited impact without a focus on data quality. This attention begins with establishing a national Data Quality program based on a robust and comprehensive framework, supported by education and training of the workforce, and by implementing feedback mechanisms to ensure continual improvement. Making decisions on data of dubious quality can lead to healthcare expenses that may have little to no effect, in some extreme cases, negative impact on the patient population. It has been estimated, for example, that up to 4% of hospital visits can be avoided by enhancing best practices, data quality and guidelines in the outpatient settings.

An emphasis on standardized coded data will also enable decision support and enhanced data analytics services to help direct funding to areas of national importance and priority, measuring effectiveness of programs to deal with each condition. Literature studies suggest, for example, that data-based decision support systems for diabetes can lead to 20% reduced costs.

Quality data will also be a fundamental requisite for the establishment of advanced data analytics capabilities in the SCH, supporting the creation of a Center of Excellence (CoE) around these services.

Not only does the emphasis on data quality support directed healthcare spending, it also supports strong population health and clinical research capabilities, both of which are of national importance in Qatar.

Development of a Knowledge Industry

A systemic national approach to developing local talent in Qatar is essential to establish a sustainable E-Health program. The greater availability of trained professionals coupled with incentive programs for the R&D of E-Health innovation will create and foster a knowledge industry that can develop and bring to market solutions that will improve health care.

The implementation of a national digital healthcare infrastructure will encourage entrepreneurs and investors in Qatar to focus their efforts on the healthcare market– either by creating unique local solutions, or by importing applications that have been successfully used in other countries.

This can range from new applications to monitor a patient's health, to providing key reminders for appointments based on key indicators, to supporting better care through sharing of data across health care providers. As Consumer E-Health is expected to become a double-digit billion dollar industry very soon, creating a vibrant E-Health ecosystem that foments and rewards research and development of local technology will uniquely position Qatar to become a recognized leader in this exciting field.

GUIDING PRINCIPLES

The implementation of the E-Health Strategy will involve dozens of decisions and compromises. In order to ensure that these are consistently aligned with the essential goals of this Strategy, it is necessary to define key guiding principles, for both E-Health and Data Management future project as described below.
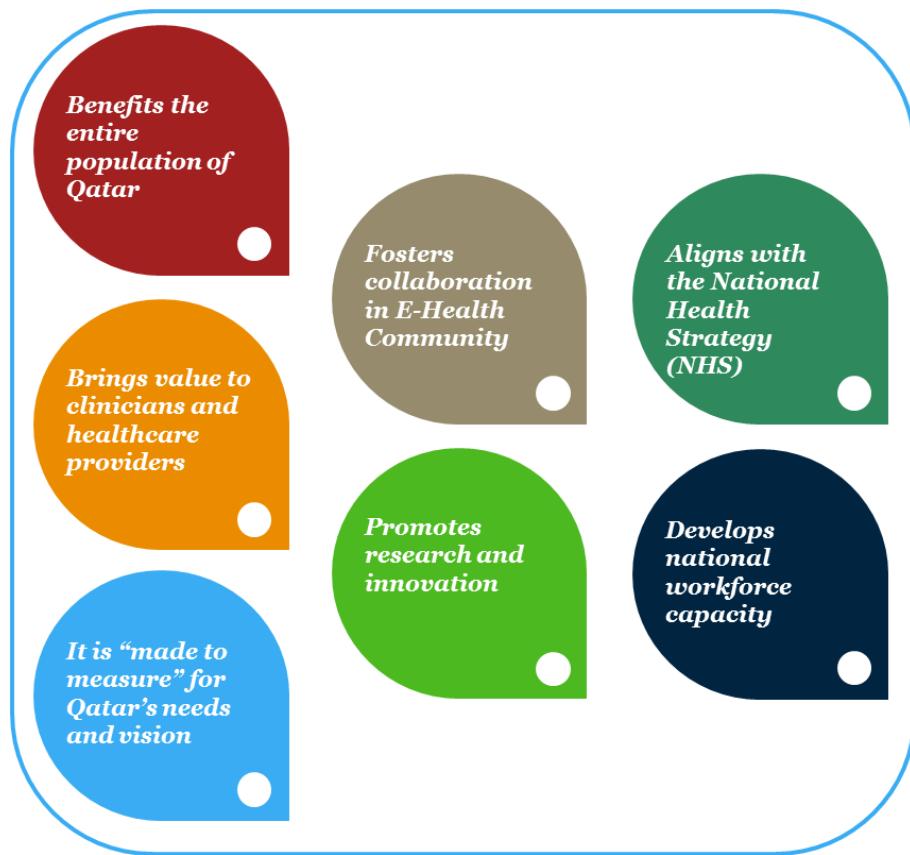

Seven key guiding principles that guide and frame the National E-Health Program:

1. It is important to demonstrate benefits to individuals, showing how E-Health can help them to be healthy, how to access the healthcare system, and how to be informed about things that are important to their overall wellness.

2. Generating positive value to healthcare practitioners and provider organizations recognizes the vital role these professionals play in delivering quality health care. Providing visible benefits to these stakeholders is an important pre-requisite to promote interest, adoption and change.

3. Promoting solutions that are right for Qatar's need, recognizing the size and capabilities of the country, leveraging existing organizations and solutions and respecting the unique cultural characteristics of its population.

4. Enabling strong collaboration across all members of the health community will help promote and accelerate the adoption of standards and solutions

5. The Qatar National Vision 2030 includes a significant focus on developing local knowledge and expertise through research and innovation. E-Health can play a significant role in this goal if the right incentives are made available to entrepreneurs and health researchers.

6. In order to ensure sustainability of the E-Health program, the Strategy needs to develop the required E-Health skills among healthcare practitioners and for attracting qualified professionals.

7. Finally, E-Health is not an end in itself, rather it is a supportive technological fabric that will help and accelerate the achievement of national health goals established by the NHS (National Health Strategy).

Similarly, in addition to these seven E-Health principles, five additional principles provide the direction to be followed in all data management activities and plans.
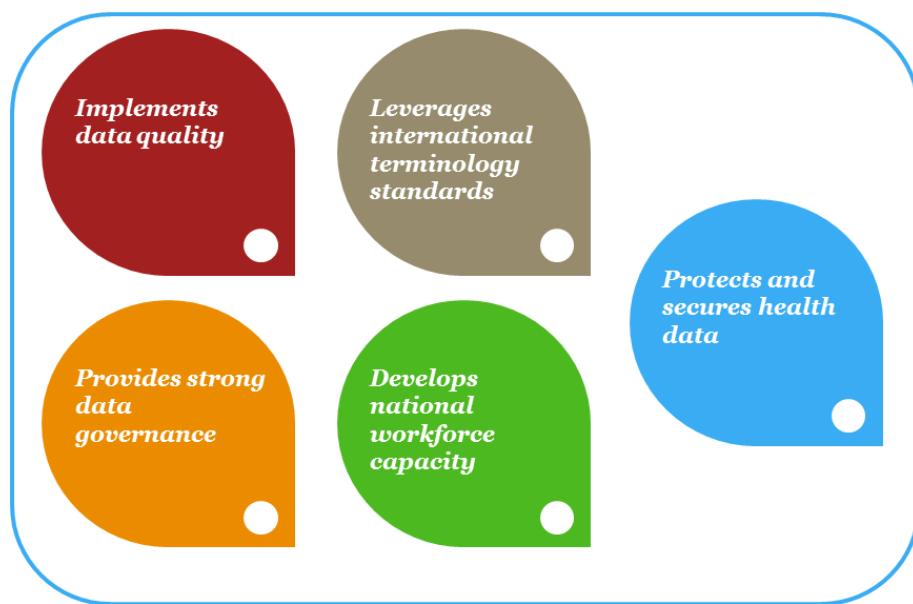

1. A focus on data quality is paramount to the success of an E-Health ecosystem. Making informed decisions on patient safety through confidence in the underlying data from multiple organizations will help ensure maximum benefit to the health system while at the same time minimizing errors made with incomplete or unreliable data. Good data is a fundamental pre-requisite for supporting new advanced data analytics services that will be providing reporting and insights about the health system.

2. Data governance ensures that there is accountability and focus on data usage across the full health ecosystem. It includes oversight on data sharing policies as they relate to sensitive patient date.

3. A system of policies, regulations and legislation will cover the protection of sensitive patient data for multiple purposes including primary, secondary and tertiary care and health analytics. In addition, the securing of this information from external parties will help build confidence in the E-Health system in order to maximize health system benefits.

4. Terminologies provide the basis to derive meaning and knowledge from health data, especially to transform textual data into codified terms. Active management of terms and the establishment of a terminology authority (or National Product Center) will help ensure that terminologies are maintained appropriately.

5. As with the E-Health Guiding Principles, a sustainable E-Health ecosystem needs to define, attract and build the necessary data management skills and capabilities in a local workforce.

E-HEALTH CONCEPTUAL MODEL

To achieve the E-Health vision that has been agreed, it is necessary that all components of the E-Health ecosystem be designed and implemented to work collaboratively towards a common goal: ***better health for all people in Qatar.***

The figure below shows the major components of the E-Health ecosystem that will be involved in the execution of this Strategy.
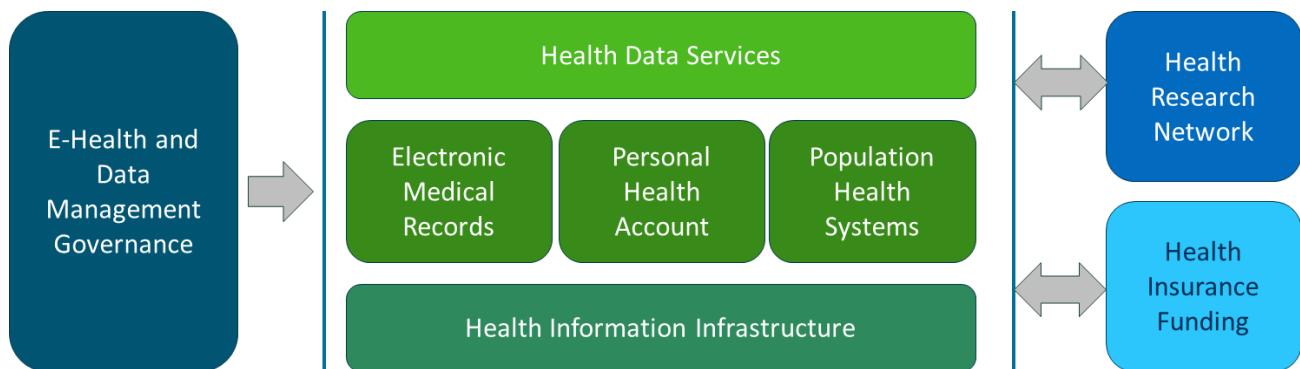
Each conceptual component represents the various resources, processes and technologies that will be impacted, at some form or another, by this Strategy.

Component	Description	Strategy Implication
E-Health and Data Management Governance	Defines the organizations, roles and responsibilities, policies and processes of the E-Health Program.	Implementation of E-Health policies and organizations is imperative for the launch and success of the National Program.
Health Information Infrastructure	Collection of E-Health resources, including people, technologies and national services, required to support the collection and sharing of health information.	Establishment of the national E-Health services needs to be prioritized in order. Foundational services, repositories and systems need to be procured and implemented early in the program timeline.
Electronic Medical Record (EMR)	All application systems that digitize health data at the care delivery points of services (e.g. hospital systems, pharmacy systems, lab systems, etc.).	The Strategy needs to promote the use and adoption of EMR systems in all healthcare delivery locations, both private and public services.
Personal Health Account (PHA)	Collection of consumer health applications that include a unified personal health record and support health self-management services for individuals in Qatar.	The PHA is the centerpiece of the Strategy, as it is the primary door to the E-Health services for all individuals. Many of the envisioned benefits require active participation of patients and caretakers.

Component	Description	Strategy Implication
Population Health Systems	Collection of systems that monitor population-level health matters such as, but not limited to, non-contagious and contagious disease management, outbreak detection, immunization management, etc.).	Public Health systems focus on healthy lifestyle promotion and patient empowerment, disease prevention and population health protection. In order to do this effectively, these systems will depend on reliable information from healthcare facilities as well as a secure channel for direct communication with all providers and other emergency response agencies.
Health Data Services	Consists of the collection, quality review, aggregation and reporting of health-related data for clinical and system-wide use.	With the increasing availability of coded clinical data, supported by standardized terminologies, it will be possible to create advanced data analytics services, for both clinical and operational health data.
Health Research Network	Collection of organizations that perform health-specific research (e.g. evidence-based protocols, population health management, genetics, disease prevention, health system performance, etc.).	The health research community will be a key beneficiary of the E-Health Strategy once initial services are operational and more high-quality clinical data becomes available. However, new policies for the use of this data will require patient consent.
Health Insurance Funding	Collection of organizations, policies and processes associated with the payment for healthcare services in Qatar.	Significant transformation is under way on how healthcare services are funded. NHIC is the first organization to collect detailed system-wide data, and will benefit from the extended capabilities to be provided by the national health data services.

PART II: REALIZING THE VISION

TECHNOLOGY ADOPTION

The availability of quality health information in digital form is an essential pre-requisite for achieving the E-Health Vision and benefits. Most health data is still processed using paper today and significant effort and investments need to occur in order to change this scenario. The adoption of modern, standards based IT solutions must take place across everywhere, including government, semi-government and public sector organizations.

The E-Health Program will need to collaborate with the various stakeholders to find pragmatic and creative solutions to resolve this issue and accelerate the use of digital solutions while implementing the national E-Health services.

Personal Health Account (PHA)

The PHA is the patient's digital door to their health data and services

The National Health Strategy has as one of its main goals enhancing the wellness of the people of Qatar so that a vibrant, healthy, and productive society can be established for today, and for the future. To achieve this goal, individuals need to be engaged and empowered to manage their own health status and that of other people they may be responsible for.

This is the principal purpose of the Personal Health Account (PHA), which forms the primary focus of this strategy. The PHA will not only provide the desired single point of interaction between individuals and their health data and services, it will also act as the primary guide to decisions and priorities to be made by the national E-Health Program.
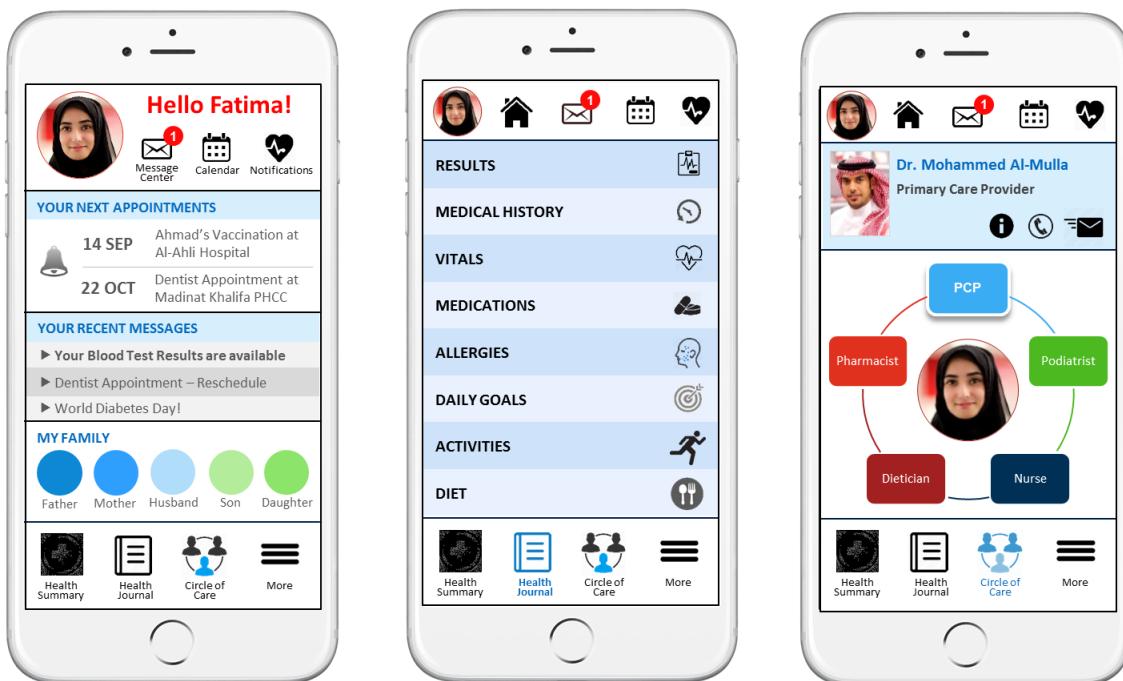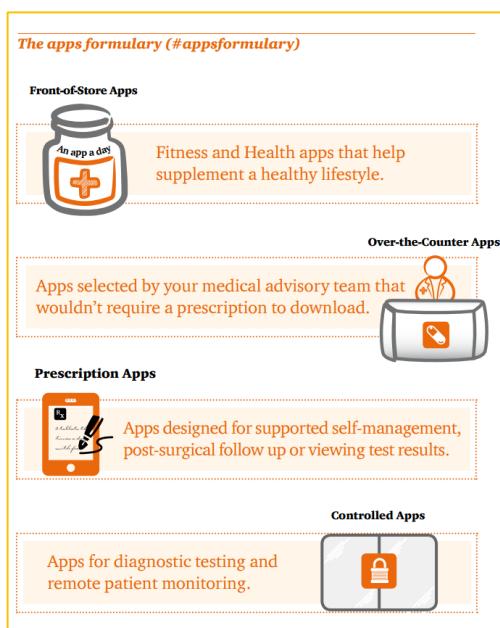
In essence, E-Health services, systems, standards and infrastructure will be designed and implemented to support one or more of the needs of patients, families and individuals, whether to provide better health information and education, access to the various healthcare services, or improve the quality of care with better communication with service providers. What the population expects is a much better experience when receiving the care they need.

Conceptually, the Personal Health Account contains a set of innovative solutions and services that allow individuals to digitally access the health system and that provide a collection of useful health management tools. It also provides access to their health data, clinical diagnostics, prescribed treatment plans and trusted information about their conditions. Examples of the services and apps that will form the PHA include:

- Track and assess their health status and its evolution, as well as that of other individuals under their care (e.g. family members, relatives, and others);

- Establish healthy lifestyle goals together with their physician, such as lowering cholesterol levels, and track progress towards those goals;

- Create and manage their own personal diary with information about their vitals (e.g. weight, blood pressure, blood glucose and more), their diet, exercise regime, stress factors and other lifestyle and environment factors that can impact their health.

- Make the best use of doctor visits (either at a facility or virtually). Individuals can prepare questions for their doctors and share personal health information collected by them, (e.g. blood pressure, weight, and glucose measurements, etc.);

- Address lack of patient literacy through access to key health information sources and thereby enabling greater participation in managing their wellness;

- Promote wellness and understanding of their care by targeting specific audiences such as children / youth with materials specific to their situation;

- Communicate electronically and securely with their healthcare team, receiving reminders, instructions, advices, recalls and other much needed information;

- Organize and plan upcoming visits with the health system by managing appointments, tests, procedures, vaccinations, and preventive or screening activities; and

- Become educated on their health conditions and treatments via access to trusted knowledge bases and other sources of information, in some cases anonymously.

Today, most if not all of these functions can be best provided by mobile applications, which have profoundly changed how people use and depend on technology. This is particularly true in Qatar, given the very high use of smartphones among all segments of the population.

However, selecting the right mobile application can be quite a challenge. There are thousands of health apps available for all mobile platforms, but the vast majority is not necessarily beneficial to patients. The large availability of apps and the incredible pace at which new solutions are created also make it very difficult to keep people informed of the best products. The result is that the use of good health applications is still very small if we consider the overall number of people in Qatar that could be benefiting from them.

The apps formulary (#appsformulary)

Front-of-Store Apps

An app a day — Fitness and Health apps that help supplement a healthy lifestyle.

Over-the-Counter Apps

Apps selected by your medical advisory team that wouldn't require a prescription to download.

Prescription Apps

Apps designed for supported self-management, post-surgical follow up or viewing test results.

Controlled Apps

Apps for diagnostic testing and remote patient monitoring.

To help individuals chose choose correctly which mobile applications are suited to their needs, the PHA will also include a service, called ***Apps Formulary***, which will guide providers and patients to the "best of class" apps. This is not the same as the drugs formulary that exists in the country, but a new catalogue of mobile health solutions that have been previously selected.

The Apps Formulary Service includes not only the mobile apps to be used by individuals and selection and regulation of the apps that have been tested and accepted for use healthcare practitioners, but it also provides the processes and standards for in Qatar. Using a process similar to prescribing drugs, clinicians will be able to recommend one or more apps to be used by their patients. The Apps Formulary ensures that these programs work properly, provide proven benefits to the patient, are easy and safe to use and can be easily downloaded for different mobile platforms.

The PHA will also be aligned with Qatar's broader E-Government Strategy and leverage some of the National Services that will be put in place, such as:

- Single Sign On / Authentication: Utilizing the same set of credentials and authentication services used by E-Government; and

- Digital Mail and Personal Vault: supporting secure e-mail communications between individuals and the participating organizations.

The Personal Health Account will continue to evolve as new and better applications become available. The availability of quality, standardized data will also provide the fertile ground for the development of "made in Qatar" solutions and innovation.

It is noteworthy that the Apps Formulary can be used not only for clinical treatment situations, but in prevention, education and general patient wellness. In fact, these apps can also be used to broadcast warnings and other messages that are in the public interest.

Electronic Medical Record Systems

Use of Electronic Medical Records Systems is essential

Several governmental and semi-governmental healthcare providers have embarked or are planning to embark on various programs to implement EMR systems with a defined roadmap. The current implementation of a single, EMR system across all HMC hospitals and PHCC sites is the best example of the financial and organizational commitment of these entities to automate their clinical processes and digitize their health data.

However, many other providers, mainly within the private sector, do not have such systems in place and some don't even have immediate plans to implement them. This situation cannot be allowed to continue, both for the quality and safety of healthcare services, but also if the E-Health Vision is to be achieved.

One of the key priorities of the E-Health Program will be to find ways, through a combination of incentives and penalties, to accelerate the adoption of electronic systems in all organizations that deliver health care in the country. A robust understanding of program benefits is required for designing incentives and penalties that promote value generation by stakeholders. It will also need to establish the minimum requirements, standards and capabilities that these new systems will need to meet in order to become participants of the national E-Health services.

Population Health Systems

Population Health Systems is a category of applications that perform continuous, systematic collection, analysis and interpretation of health-related data at a population level. This data can be used for the planning, implementation, and evaluation of communicable disease outbreaks. If an outbreak is detected, contact tracing, outbreak management and case management functions are used to monitor the outbreak and help ensure the outbreak is contained. As recent outbreaks as MERS, Ebola and SARS have demonstrated, disease outbreak can move swiftly and across borders. Therefore, it is critical to have systems in place to help detect, monitor and contain communicable disease in Qatar, and indeed, the GCC region.

Population Health Systems also include preventive measures such as managing immunizations provided to a patient group (cohort) as part of a vaccination program. Many diseases can be prevented and / or mitigated through a demonstrated program of vaccination; knowing which patients have received specific vaccines can assist in their treatment.
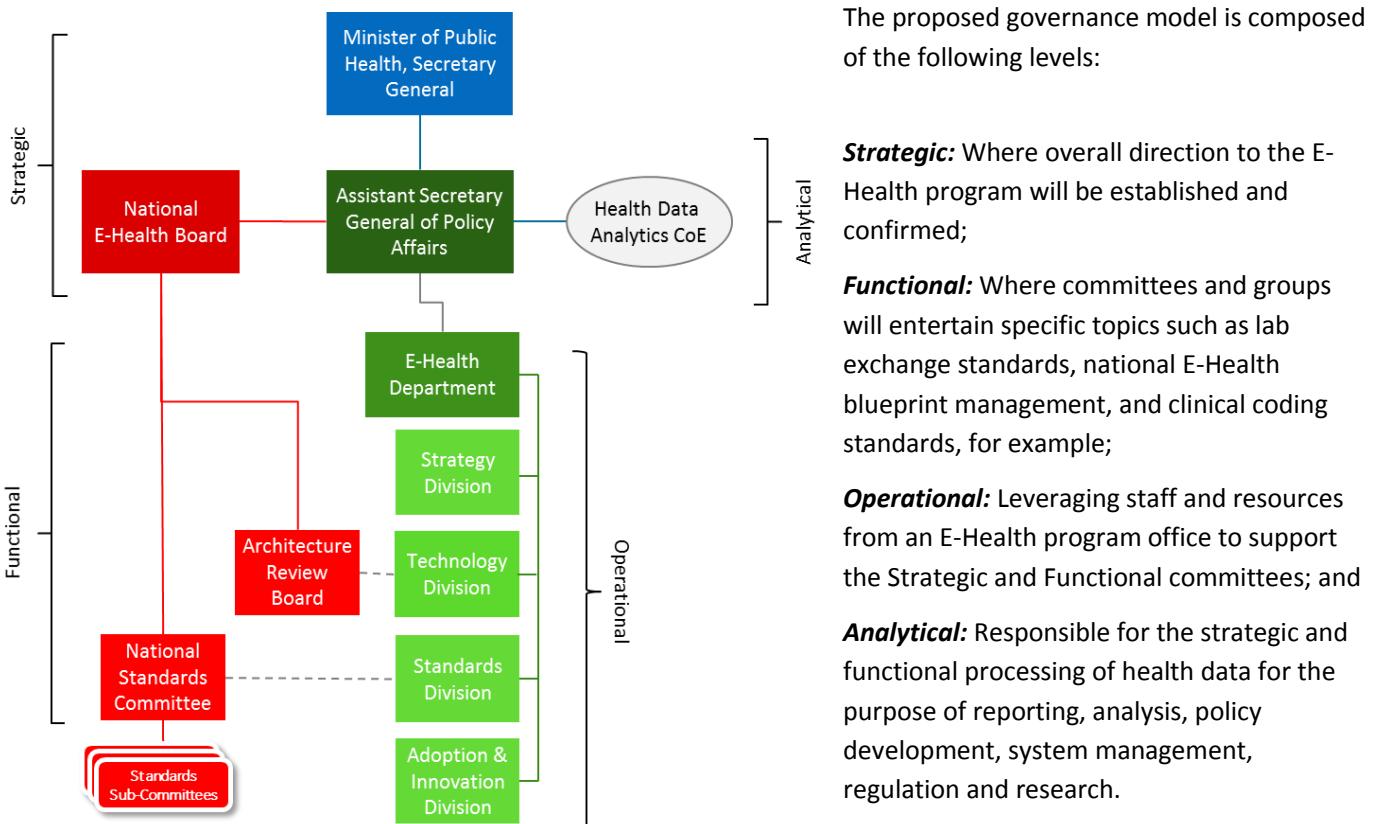
Population health systems will leverage Health Data Services (see E-Health Conceptual Model), aggregating and summarizing data at a population level. This can be used for identifying outbreaks, cohorts for immunization campaigns and for identifying population groups for education and preventative planning measures. Population health systems could also leverage social media in some situations to better predict trends in the population.

E-HEALTH AND DATA MANAGEMENT GOVERNANCE

Strong leadership and commitment by government are key factors for the realization of the E-Health vision and Strategy. This necessarily includes the establishment of an empowered governance model with supporting operational business functions.

The E-Health and Data Management Steering Committee has provided the leadership and guidance needed during the development of the E-Health and Data Management Strategy. Within its existing structure, the Steering Committee has been supported by two working groups: E-Health and Data Management. In collaboration and in consultation with the Working Groups, the QNeDP Project Team designed and validated the various components of this Strategy.

To ensure the successful implementation of this Strategy over the coming years, a permanent governance structure and respective operational business functions needs to be formally established.

The proposed governance model is composed of the following levels:

Strategic: Where overall direction to the E-Health program will be established and confirmed;

Functional: Where committees and groups will entertain specific topics such as lab exchange standards, national E-Health blueprint management, and clinical coding standards, for example;

Operational: Leveraging staff and resources from an E-Health program office to support the Strategic and Functional committees; and

Analytical: Responsible for the strategic and functional processing of health data for the purpose of reporting, analysis, policy development, system management, regulation and research.

Strategic Governance

There are 2 components to strategic governance:

- Supreme Council of Health (SCH); and

- National E-Health Board.

SCH will own the E-Health Strategy

The **Supreme Council of Health,** through the Assistant Secretary General of Policy Affairs will act as the regulator and custodian of the National E-Health Strategy. This responsibility includes ensuring that the Strategy is acted upon, adjusted to meet changing priorities defined by the Minister of Public Health and other key stakeholders, and refreshed on a periodic basis. The SCH will receive recommendations on these matters from the National E-Health Board and from the E-Health Department.

National E-Health Board will be the strategic advisor for the E-Health Program

A **National E-Health Board** consisting of representatives from various governmental and private sector providers, health insurance organizations and academia will be established. The National E-Health Board will develop and confirm overall E-Health priorities and act as the review body for key E-Health program deliverables. This includes making recommendations to the SCH to approve national standards. The current E-Health and Data Management Steering Committee will transition to the National E-Health Board.

Functional Governance

At a functional level, a number of committees will be established to provide external oversight to the execution of the E-Health Strategy. These committees will consist of a broad range of stakeholders that are drawn together for a specific functional purpose. This can include a detailed committee reviewing privacy & security standards, laboratory coding and exchange standards, or even oversight on the National E-Health Architecture.

The following stakeholder committees have been identified:

Qatar National Clinical Coding Committee (QNCC) will transition to a new National Standards Committee

National Standards Committee (NSC) with responsibility for the selection, development and maintenance of E-Health and Data Management Standards that are required to realize the E-Health vision and implement the National E-Health Blueprint. The NSC will provide coordination and oversight functions across a number of domain specific sub-committees. Membership in the NSC will initially be drawn from the Qatar National Clinical Coding Committee (QNCCC). It will serve as a neutral arbitrator for all standards matters in Qatar.

Reporting to the NSC, several **Standards Sub-Committees** will be established with stakeholders drawn from across the health sector, covering specific standardization matters, including:

- Data Standards to manage Data Standards selection and changes to these standards;

- Clinical Coding Standards to manage Clinical Coding Standards selection and changes to these standards;

- Privacy & Security to provide oversight to the management of privacy & security standards;

- Technical, to ensure common and shared technical standards such as message transport, data types and use of XML (as an example) are properly used across all E-Health Standards; and

- Domain sub-committees, struck to cover a broad range of clinical and administrative domains such as Pharmacy, Laboratory, Claims, Diagnostic Imaging, and others.
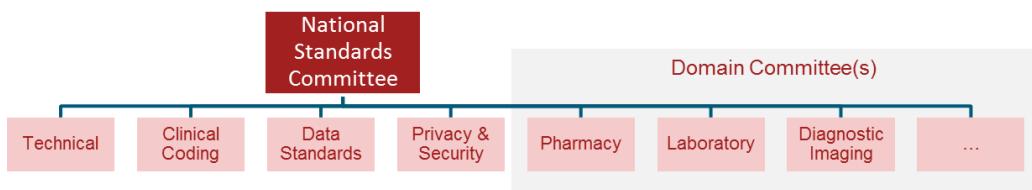
These sub-committees will be created on an as-needed basis and will start and/or end at opportune times, including the rollout of Generation 1 and 2 systems (see Roadmap).

The ARB will be responsible for the National E-Health Blueprint

An *Architectural Review Board* (ARB) will help refine and provide oversight to the execution of the National E-Health Blueprint. The Architecture Review Board (ARB) is responsible for validating, recommending and approving solutions that support the National E-Health Architecture.

This includes alignment of the architecture to the strategic goals of the E-Health program, including adherence to enterprise principles, policies, standards, and defined industry proven practices are followed. From a support perspective, new and existing solutions and changes to existing systems are reviewed to ensure they are consistent with the E-Health Strategy.

Operational Governance

An E-Health Department within the SCH will be established

A new E-Health Department headed by the E-Health Director will be established within the SCH. This E-Health Department will lead the E-Health Program and will be accountable for the execution of the E-Health Strategy. Operational support for the Functional and Strategic committees will be provided by the E-Health Department through four different divisions:

- Strategy Division;

- Technology Division;

- Standards Division; and

- Adoption and Innovation Division.

National E-Health and Data Management Strategy

The *Strategy Division* will oversee the execution of the E-Health Strategy and monitor the progress against the Implementation roadmap. A number of monitoring and reporting mechanisms will be established by the PMO section within the Strategy Division.

Initially, the Strategy Division will focus on the development and refinement of national E-Health and Data Management policies that will guide the program as a whole.

A clear gating process with decision making points will be put in place to ensure that only projects are executed that are aligned with the Vision and Strategy.

Benefits Evaluation and Realization

Besides monitoring progress, the Strategy Division will also measure the realization of the intended benefits of each project across the following five dimensions of E-Health Benefits:

- Better Health Outcomes;

- Increased Patient Safety;

- More Effective and Integrated System(s);

- Access to Better Quality Data; and

- Development of a Knowledge Industry.

The framework that establishes the mechanisms to evaluate the benefits of the E-Health Program will be defined by the Adoption and Innovation Division and executed by the Strategy Division.

National E-Health Blueprint

The *Technology Division* will plan, direct and maintain the National E-Health Blueprint activities in support of the national E-Health Strategy. The Architecture Review Board will be established and be responsible for approving changes to the National E-Health Blueprint.

National E-Health Services and Solutions

In addition, the Technology Division will procure, implement and manage National E-Health services and solutions included in the National E-Health Blueprint. These E-Health services and solutions will need to comply with established E-Health standards and policies as defined by the Standards Division.

National E-Health Standards and Policies

The *Standards Division* will support the establishment and maintenance of National E-Health Standards. This includes the selection of E-Health Standards, setting up processes to publish and maintain these standards, and helping to ensure proper compliance. Alignment with international standards is also a key function within the Standards Division.

The Standards Division will help establish National Standards for data sets, data types, coded data elements (terminology) and data exchange. The Standards Division, in consultation with the Standards Sub-Committees and National Standards Committee, will develop drafts for consideration. Approvals for E-Health Standards will be through recommendations from the National Standards Committee to the E-Health Board and through to the NHS Ministerial Board and SCH.

In addition to defining E-Health Standards, the Standards Division will also help establish supporting policies to cover the data management life cycle (creating, using, sharing, archiving and destroying data) and the standards management lifecycle (standards selection, release management, deprecation).

Support Adoption and Engage Stakeholders

The *Adoption and Innovation Division* will support adoption and uptake of key outputs from the E-Health department such as E-Health Standards and national E-Health services and solutions. Communication material, tools and methodologies will be developed and provided by the Adoption and Innovation Division to support this function.

The Adoption and Innovation Division will also be responsible for all external communications for the E-Health program and will disseminate new services and solutions across the country. In addition, it will promote activities in support of best practices in respect to change management and training, to healthcare stakeholders. This could also take the form of annual symposiums to highlight new e-health developments/ innovations.

Certification of Solutions and Organizations

Another key function within the Adoption and Innovation Division is to establish clear minimum requirements that must be met to safeguard the eco-system and to enhance the ability for organizations to safely and securely exchange information. A certification process will be set up certify E-Health solutions and organizations against these requirements. Ultimately, organizations will only be allowed to participate if the E-Health Solution and the organization using the solution are certified. Direction for the certification program will be drawn from various E-Health Standards, policies (Standards Division) and underlying technical requirements (Technology Division).

Testing and Evaluation of New Technologies

Finally, this Division will also be responsible to monitor and promote the use of new, innovative technologies that support the goals of the E-Health Program. Using pilot implementations, innovation competitions and other similar campaigns, new solutions will be tested and evaluated to determine their clinical value, extensibility and integration with the national E-Health services.

Analytical Governance

One of the five primary benefits of this Strategy will be the substantial availability of quality health data collected for the purpose of recording events, medical records, clinical datasets, outcomes and health system performance. In order to make best use of the large amount of data that will become available through the national E-Health services, it is paramount that the SCH acquire and develop specialized teams that can perform the sophisticated analytics required to produce meaningful information and insights about the health system.

Supporting Health Data Analytics Services

The *Health Data Analytics Center of Excellence (COE)* will be responsible for supporting the teams providing this activity across the various departments at the SCH and to other external stakeholders. This function will also be the custodian for the various data warehouse systems that form the *Health Data Services*.

LEGISLATIVE AND REGULATORY CHANGES
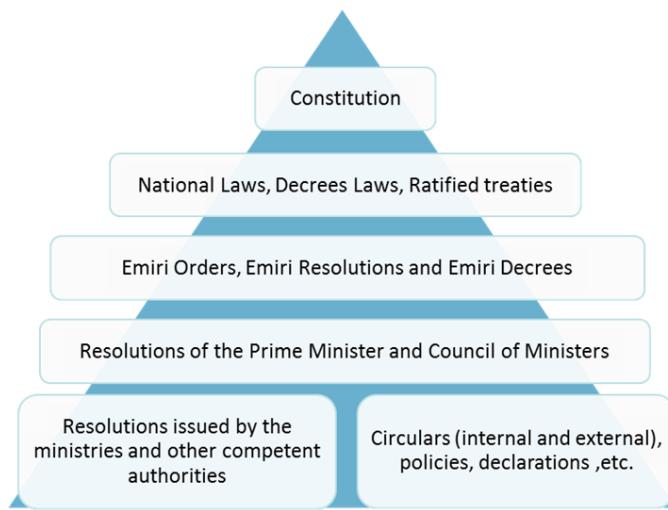
Qatar has a comprehensive and fine grained State Legal System. The SCH is the highest authority for the supervision of medical care in the State of Qatar. The SCH has wide authorities to achieve its role and purpose. Alongside the SCH, in matters of importance to the E-Health Program, is the Ministry of Information and Communication Technology (MICT), which is the legal regulatory authority in the Information and Tele-Communication sector in the country.

Another unique component of the State Legal System is the Qatar Financial Centre (QFC) legislation and regulation. The QFC may be classified as "stand alone jurisdiction". It applies its own laws and regulations to the entities established in or working through the QFC. Many Thirds Party Administrators and Health Insurance Companies are QFC registered and regulated entities. QFC regulations prevail over State laws for those entities registered with the QFC, unless there is an express statement to the contrary.

The national E-Health Program will have to be created and governed within this complex legal framework. New laws, policies and regulations will likely need to be created to provide the support to establish the organizations, rules and requirements, incentives and remedies required to fully execute the E-Health Strategy.

Data Privacy Laws

Qatar does not currently have a specific data protection law. While various Qatari laws set out certain rights of privacy relevant to the protection of personal data, there are no specific laws or regulations pertaining to data protection, protection and management of health data, or data processing requirements.

A Data Privacy Law is currently being developed by the MICT and will provide for the first time a comprehensive set of safeguards that defines the rights of individuals to decide what can be done with and who may access their personal information that has been collected by other parties.

Alongside this Law, the SCH has also initiated the drafting of a Health Data Privacy Law to specifically govern and regulate the rights of Individuals in respect to their health data. Such complementary regulation is necessary due to the particularly sensitive and personal nature of health data.

A key cornerstone in both draft laws is the individual's right to grant or deny consent for data sharing and uses beyond the original purpose for which the data was collected. Under the principle of express, informed consent, the

individual must be first educated on the required use of their health data for the purpose of healthcare services, and also be advised if that information may be used for different purposes in the future (e.g. research, etc.) in the future. An explicit consent must be obtained or confirmed before personal health information can be collected and processed.

In addition, consideration should be provided to creating a conformance environment where organizations can be certified as to their ability to meet privacy legislation, E-Health and data management policies and information reporting requirements.

E-Health and Data Management Regulations

The Supreme Council of Health is the preferred vehicle to regulate E-Health in the State of Qatar and house a new entity which will oversee the governance of the national E-Health Program. Based on its enabling legislation, the SCH has the powers to issue policies, adopt new organizational structures, supervise technical systems for health data, and set out policies for systems of control within the health care industry.

These policies will need to address the following areas:

- *Patient Consent Policies:* Defining when and how consent to process health data should obtained from an individual;

- *E-Health Governance:* Defining the new organization that will be responsible for executing the E-Health Strategy;

- *Data Security Policies:* Defining security requirements for protecting health data (e.g. Business Continuity Management, Risk Management, Identification, Authentication and Authorization, etc.);

- *Data Management Policies:* Defining data lifecycle responsibilities and requirements (e.g. Data Ownership / Stewardship, Audit, Creation and Collection, Retention and Disposal, Data Quality, etc.);

- *Right to Use Policies:* Defining the purposes for which health data can be used by providers in the direct delivery of care to the patient (e.g. "Need to Know" rules); and

- *Data Sharing Agreements:* Defining the purposes for which health data may be shared between organizations and terms of responsibilities that must be observed by all custodians of that data.
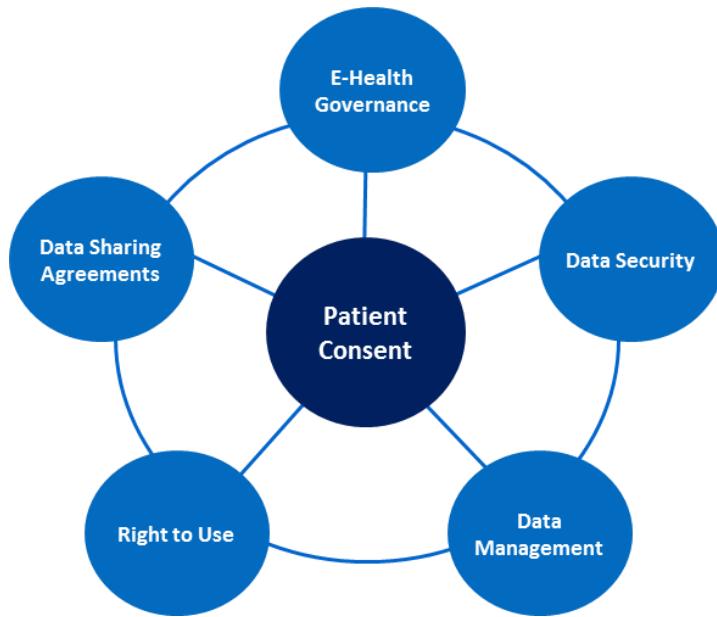
Whenever appropriate, these policies should leverage and build upon similar regulations that may already exist, either within the health sector or possibly from other industries as well.

The development of E-Health policies should also review and align, as much as possible, with international best practices and standards.

Implementation of this framework will also require a number of agreements, including, but not limited to:

- Between healthcare providers and the SCH who will be managing the national E-Health services; and

- Between the SCH and the operators of Electronic Medical Record Systems and Population Health Systems.

E-HEALTH BLUEPRINT

What is the National E-Health Blueprint?

Any large construction project requires detailed plans and blueprints. The same is true for complex IT integration project such as those that will result from the execution of the E-Health and Data Management Strategy. The Qatar National E-Health Blueprint is a comprehensive, high-level plan of how to build the network of systems, databases and technical services that will constitute the integrated Information exchanges. These national services will provide a secure and standards-based access to personal health information shared by all participating organizations in the Qatar health system.

The E-Health Blueprint establishes the national enterprise architecture, identifying the components, processes, capabilities, and services that will guide the planning, design and implementation of national E-Health services.

Why an E-Health Blueprint?

The healthcare system in the State of Qatar is a complex system with the presence of a great number of healthcare providers ranging from large governmental healthcare organizations to very small private practices. It is not surprising that these providers experience very different levels of E-Health maturity and readiness, and very often do not have the capability to communicate and share patient information with other organizations. Increasing the maturity levels of all these entities and creating the IT services to connect them together is a necessary pre-requisite to ultimately improve the delivery of healthcare services.

The E-Health vision clearly recognizes that its goals cannot be achieved through a single system or technology solution; it establishes a national ecosystem through governed, secure and standardized integration of the many information systems that collect and process health data.

Ultimate Goal: "better health for all people in Qatar"

The proposed architecture will allow participants in Qatar's E-Health ecosystem to work collaboratively towards a single goal:

"***better health for all people in Qatar".***

These components, capabilities and services were prioritized and influenced the development of the Implementation Roadmap.

Conceptual View

The E-Health Architecture conceptual view consists of several components grouped into six key building blocks that form the national E-Health services, as depicted below. It is important to note that this architecture does not suggest a single solution instance, but rather a set of healthcare IT systems that are integrated in a secure and standardized manner.
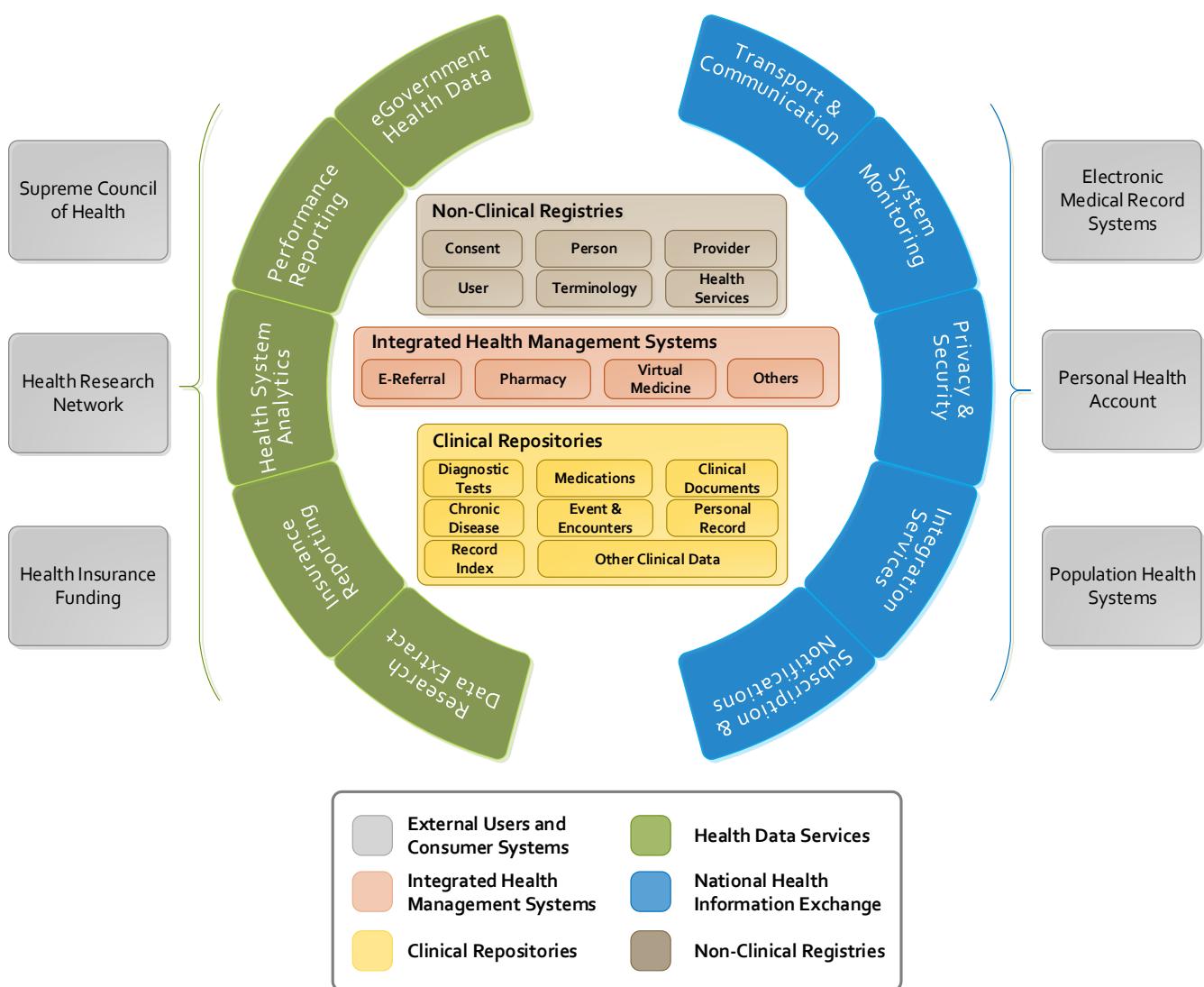
The Health Information Exchange will support primary and secondary use of PHI

A main driver of E-Health benefits is improved clinical service delivery with fewer errors and better adherence to best practices. Importantly then, the *External Source and Consumer Systems* represent the many clinical information systems and their respective organizations that will use the national E-Health services to share and use health data:

- *Electronic Medical Record Systems:* Represents all information systems residing with healthcare providers that are used to collect and process PHI (Personal Health Information) at the point of service, including Hospital Information Systems, Radiology Information Systems and Lab Information Systems, as examples;

- *Population Health Systems:* Represents a set of solutions and services that will be used to monitor the health status of the Qatari population and detect disease outbreaks and abnormal health event patterns; and

- *Personal Health Account:* Represents a set of innovative solutions and services that allow individuals to digitally access the health system to manage their own health and that of other individuals they may be responsible for.

Supreme Council of Health, Health Research Network and Health Insurance Funding: Represents the organizations that process health data for non-clinical purposes (e.g. health system performance evaluation, research analysis, claims adjudication, etc.).

National services to support key clinical workflows integrating healthcare delivery

Integrated Health Management Services represent a set of functions that support clinical workflows across multiple delivery organizations. These services use other national E-Health services and repositories to support particular clinical workflows:

- *E-Referral Services:* Supports standardized referral process to ensure that patients are referred to the right practitioner at a healthcare provider that is properly licensed to deliver the requested service;

- **Pharmacy Management:** Supports the prescribing and dispensing of medications by healthcare practitioners including drug interaction checking; and

- *Virtual Medicine Services:* Support various types of delivering health services digital such-as E-consultation.

Support for other clinical workflows will very likely be added to future versions of the E-Health Blueprint as needed.

The use of central clinical repositories is decided on a clinical domain basis

The E-Health Architecture also defines several centralized *Clinical Repositories* holding patient health data related to specific clinical domains. Over time the initial list of clinical repositories will be expanded as new data domains become a priority to healthcare delivery and research organizations.

The decision to create a centralized clinical repository (or not) needs to be made for each clinical domain. One of the key E-Health guiding principles is to make use of local solutions and information and, as much as possible, avoid the need for data duplication.

The clinical repositories can include different types of data:

* A standardized summary document containing contextualized PHI (e.g. discharge summary, visit notes, etc.);

* A complete copy of the clinical record, either as the source system for this data or a duplicate copy of the information initially created at one of the EMR systems; and

* A simple index entry to existing PHI that includes a brief description of the data (i.e. metadata) and a pointer to where that data can be found.

The E-Health Blueprint, in its current version, defines the following clinical repositories:

Health data is the most valuable asset of the national E-Health services

* *Event & Encounter Repository:* Holding information about encounters the patient has had with the health system (e.g. visit to a clinician, hospital admission, lab and diagnostic tests, etc.);

* *Medications Repository:* Holding a complete summary of a patient's past and current medications;

* *Diagnostic Tests Repositories:* Holding information about the various diagnostic tests that the patient has had, including:

  o Diagnostic Imaging (e.g. X-rays, CT scans, ultrasounds, nuclear medicine and MRI scans, etc.); and

  o Laboratory Tests (e.g. hematology, immunology, chemistry, microbiology, etc.).

* *Chronic Diseases Specific Repositories:* Storing information related to a specific diagnosis or condition (e.g. cancer, diabetes, COPD, etc.);

* *Personal Health Record Repository:* Holding personal data entered directly by the patient or captured and transmitted by personal medical devices (e.g. glucometer, blood pressure monitor, digital scale, etc.); and

* *Record Index Repository:* Holding information and indices of PHI stored in the EMR's at the various participating organizations.

- *Clinical Document Repository:* Holding clinical documents containing a snapshot of patient data created at a point-in-time in the context of a health care event between an individual and a health service.

Some disease specific projects as part of the National Health Strategy 2011-2016 such as diabetes and cancer project have already designed and implemented disease specific repositories collecting PHI related to specific diseases. The E-Health Blueprint aims at aligning and transitioning existing repositories to the E-Health and Data Management Strategy and the E-Health Blueprint.

Transforming health data into evidence-based knowledge

Health Data Services represent a number of sophisticated systems and tools that are designed to anonymize, de-duplicate, aggregate, and analyze the vast amount of digital health data created in Qatar. Data analytics has been used extensively and successfully in many other industries (e.g. finance, retail, oil and gas, etc.) but is still in its infancy in the health sector. Some of the challenges lie with the very nature of this data, which is can be described by:

- Volume of data collected at any moment (quantity);

- Velocity in which this data is created (speed);

- Variety of the various types of data available (specialization); and

- Veracity of the information from a clinical perspective (quality).

These services will provide a common data analytics platform with access, as permitted by privacy regulations, to clinical data that is available in the clinical repositories and in the local EMRs systems across the country.

The platform will also include a data warehouse system that will contain clinical data, health system data, healthcare performance data and other relevant information, including data from other external data sources, such as government databases, social media and research centers.

Centrally managed non-clinical registries

The *Non-Clinical Registries* represent a set of reference data sources that are needed to properly exchange patient health information. These include:

- *Person Registry:* Holding basic person demographic data associate with a unique person identifier that is used to link health data across systems;

- *Provider Registry:* Holding healthcare provider data associated with a unique provider identifier that is used to authorize access to data;

- *User Registry:* Holding security credentials (both individuals and systems) that are used to authenticate identities and grant access to services;

- *Consent Registry:* Holding patient's consent agreements which must be verified by every system before any PHI can be exchanged;

- *Health Service Registry:* Holding data related to the health services that the participating healthcare providers are licensed to offer their patients; and

- *Terminology Registry:* Holding the various standard terminologies (data standards or codes) that are used to support the publication, validation and processing of coded clinical data.

Communication and Interoperability Services represent the set of systems and services that are required to connect, integrate and secure all data exchanges between participants. They provide trusted access points that will be the main doors into the longitudinal patient history that becomes available once the national E-Health services are in operation.

Protecting Patient Health Information (PHI) is a critical job of the national services. Therefore the E-Health Blueprint defines secure communication services to secure PHI while it is exchanged by the participating organizations and stored within the centralized clinical repositories. In addition, anonymization and pseudonymisation services will support secondary use of PHI by de-identifying it so that it can be used for approved purposes.

Virtual Medicine Applications

Virtual Medicine Applications, also known by the name vHealth, is a new way of delivering care by creating disruptive changes at lightning speed. vHealth can represent many different solutions, from virtual consultations to Do-It-Yourself (DIY) health offerings, and these are just some of the early technologies in use. Many other innovative ideas are being developed today that will continue to transform health services.

The initial introduction of vHealth solutions will be made available to patients and providers, with the focus on:

- Enhancing access to quality services;

- Bringing care closer to home; and

- Supporting new models of care.

The figure below shows how this shift from traditional to virtual care is taking place.
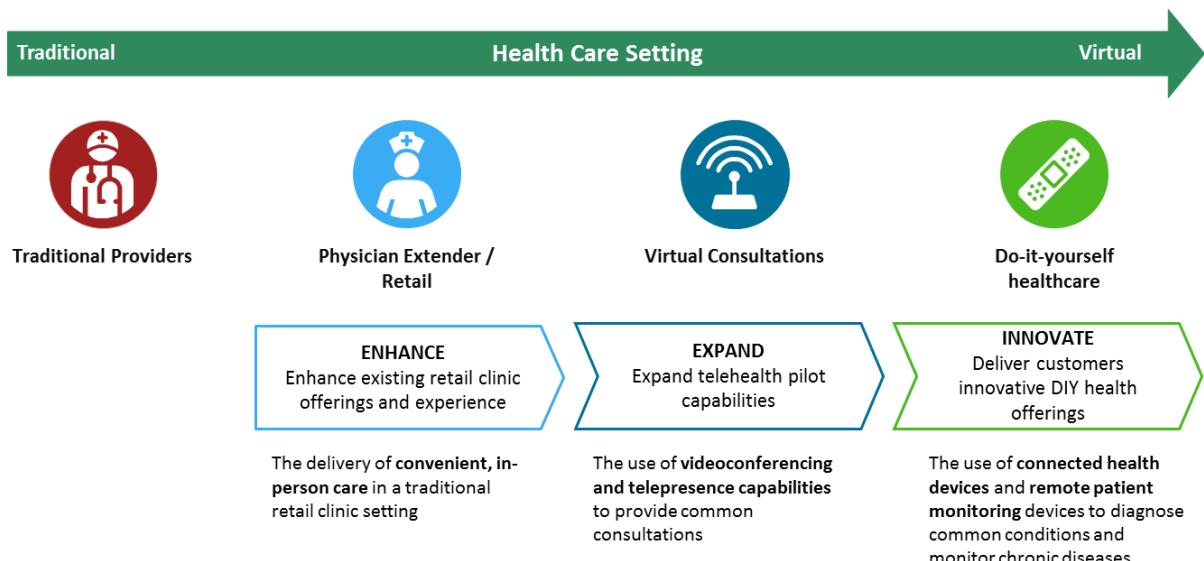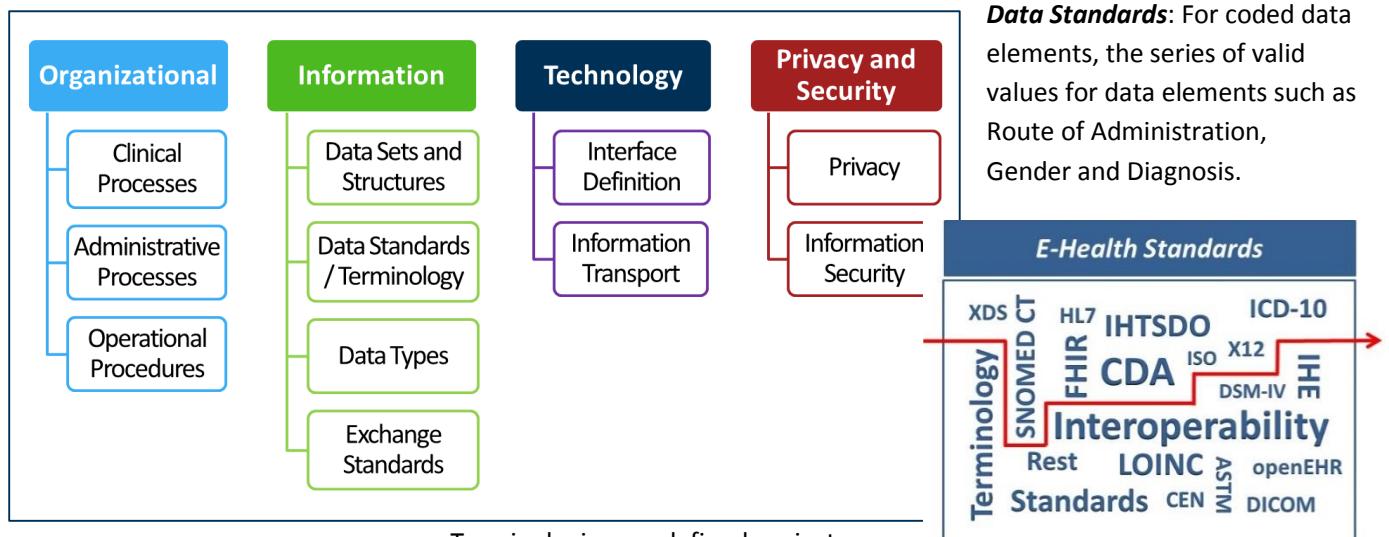

NATIONAL STANDARDS

A strong foundation in E-Health Standards will reap significant benefits to the health system in Qatar. The establishment and management of numerous E-Health Standards will form a strong underpinning of the E-Health Program. Specifically, this element of the Strategy will focus on:

- Core & Fundamental E-Health Standards;

- Standards Selection;

- Standards Change Management;

- Standards Certification;

- Supporting Policies, Procedures and Standards Governance;

- Operational Support; and

- Initial Standards Recommendations.

Core & Fundamental E-Health Standards

There are numerous E-Health Standards available today, implemented in various parts of the world. These range from HL7, X12, ICD-9 & ICD-10, SNOMED CT and ISO, to name a few.

Health Data Set Standards: These describe data elements for a particular clinical or administrative domain such as claims, patient, encounter or E-Dispense. Health Data Sets (HDS) form the necessary building blocks for a comprehensive view of data across the continuum of care.

Data Standards: For coded data elements, the series of valid values for data elements such as Route of Administration, Gender and Diagnosis.

Terminologies are defined against these coded data elements and are drawn from international code sets, such as ICD, SNOMED, LOINC, wherever possible.

Interoperability Profile Standards: An interoperability profile standard describes the data elements that are necessary to support an exchange of information from one organization or system to another. Examples include a prescription, lab result, diagnostic image or discharge summary.

Privacy and Security Standards: Protecting a patient's sensitive data is critical to ensuring there is faith and trust from patients in the E-Health system. This includes managing consent agreements, audit and ensuring appropriate controls are in place to monitor access.

Standards Selection

One of the major challenges facing organizations is selecting the most appropriate E-Health Standard to adopt. There are numerous standards focusing on terminology, exchange, clinical concepts or privacy and security. There is no perfect E-Health Standard that will meet all needs across the spectrum of health use cases. Therefore, a pragmatic and systematic approach to selecting standards is crucial. This includes:

- Selecting international standards where there is an exact fit (Adopt);

- Adjusting international standards to meet Qatari needs (Adapt); or

- Developing Qatari standards where no international standard exists (Develop).

In almost every case, an existing international standard should be adopted or adapted. The good news is there are few situations where new standards are necessary. Regardless of adopting, adapting or developing, a structured peer review with stakeholders across Qatar is necessary to ensure that all affected

groups and organizations have their input into selecting the appropriate E-Health Standards for the country.
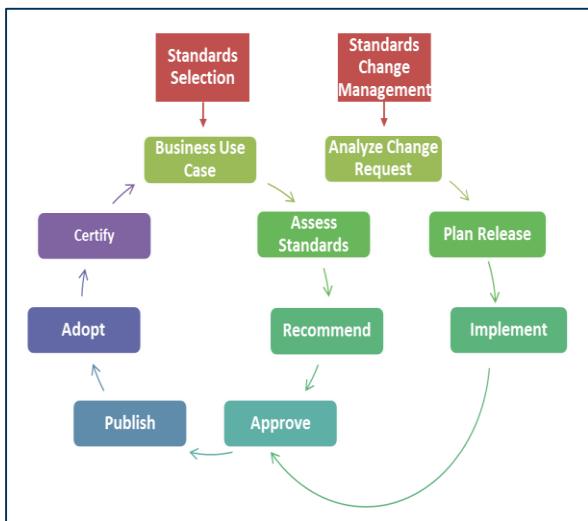
Standards Change Management

E-Health Standards are not static and change to reflect new methods, new clinical procedures and new disease. When SARS struck, new ICD codes were required in order to track the outbreak of the disease. Recognizing change to E-Health Standards requires implementing structured change management processes based on ITIL (Information Technology Infrastructure Library) methods. Along with Standards Selection, this forms a Standards Management approach that not only organizes changes into Releases, but ensures that these Releases are structured and published so that they can be properly implemented into solutions in a timely fashion.

Standards Certification

An important consideration in the deployment of E-Health Standards is certification of solutions to these standards. An information system that cannot properly communicate to a national repository will compromise data quality and integrity and call into question any interpretation of that data, whether for patient care purposes or health analytics. It is therefore critical that a program of conformance testing be put in place to certify solutions against critical E-Health Standards. Going further, tying incentives and purchase decisions to select only those compliant solutions will help motivate software vendors and organizations to pursue certification of their products.

Operation Support

The establishment of a Standards Division with the E-Health Program will help support the Standards Governance committees and the E-Health Standards Selection and Standards Change Management functions. Critical roles that are required include:

- Standards Manager, with oversight and responsibility for the Standards Division;

- Release Manager, to orchestrate new Releases of E-Health Standards;

- Privacy & Security Analyst(s), to manage privacy & security standards;

- Interoperability Analyst(s), to manage Exchange Standards and interoperability profiles;

- Data / Terminology Analyst(s), to manage Data Standards; and

- Help Desk Analyst(s), to respond to standards queries and triage requests for change.

Initial Standards Recommendations

An initial set of E-Health Standards are recommended, subject to further peer review and approval by the Standards Governance committees. These include:

Health Data Sets: Data elements, definitions and data types are drawn from:

- HL7 (Health Level 7) FHIR (Fast Healthcare Interoperability Resource);

- Claim MDS (Minimum Data Set); and

- MHMDS (Mental Health Minimum Data Set).

Data Standards: Coded values for the Patient and E-Dispense Health Data Sets:

- ICD-10 AM;

- SNOMED CT; and

- HL7.

Exchange Standards/Interoperability Profiles: Profiles, message and document standards:

- CDA (Clinical Document Architecture);

- IHE-XDS (Cross Enterprise Document Sharing);

- IHE-XDR (Cross Enterprise Reliable Document Sharing)

- IHE-PIX / PDQ (Patient Identity Cross-reference / Demographic Query)

- HL7 FHIR (Fast Healthcare Interoperability Profile).

PART III: STRATEGIC PLAN (2016 – 2020)

MISSION AND GOALS

While the E-Health Vision provides the overall direction, achieving that vision will require careful planning and a pragmatic implementation strategy. A series of coordinated activities and goals need to be executed concurrently in order to move forward towards the desired end state. These missions are the cornerstone of the pragmatic implementation of each of the components described above. Each mission will be tailored to the opportunities, characteristics and constraints present in Qatar.

The mission statements are grouped according to the 4 pillars of E-Health. The mission objectives listed below describe the key activities and deliverables to be produced by the E-Health program during its initial 5-year period.

Mission

1. POLICY AND GOVERNANCE
- Establish the national governance for E-Health
- Create the framework for standards and compliance
- Define and recommend national policies and regulations
- Achieve alignment on the roadmap and priorities

2. TECHNOLOGY AND SERVICES
- Create the National E-Health Architecture Blueprint
- Establish standards for interoperability and data sharing
- Develop the National Health Information Services with the ability to leverage existing information assets

3. PEOPLE AND TRAINING
- Establish a sustainable E-Health workforce strategy
- Create educational programs for schools and universities
- Develop training, accreditation and certification programs

4. COMMUNICATION AND ADOPTION
- Create and disseminate public awareness programs
- Measure and monitor effective communications
- Promote the use of E-Health solutions by clinicians
- Develop incentive programs to promote adoption

Each of these objectives help provide the inter-related milestones necessary to achieve a set of well-defined program goals for that same initial period. In turn, these goals form the system-wide conditions that will create the mid and long term benefits that were described previously.

In order to evaluate the progress of the E-Health program and adjust as needed, several specific goals or targets will be defined and monitored according to the implementation roadmap. These targets will be established according to a framework structured around three main themes: Digitize, Standardize and Integrate. These themes and the specific dimensions to be measured for each goal are shown below.

DIGITIZE
Comprehensive use of health IT solutions.

REGULATE	= governance in place, policies completed
IMPLEMENT	= systems in place, workforce available
COLLECT	= availability of digital data

STANDARDIZE
Adoption of national E-Health Standards.

ESTABLISH	= standards defined and approved
ADOPT	= entities and systems supporting standards
USE	= availability of standardized data

INTEGRATE
Prepare for exchange clinical and KPI data.

CONNECT	= entities, sites and users connected
SHARE	= accesses made to shared data
ANALYSE	= availability of reports, analysis of data quality

THE NEED FOR ALIGNMENT

The health IT landscape in Qatar is a dynamic and ever evolving sector and many system implementation projects are currently in-flight across both public and private sector health organizations. In the absence of national-level vision and guidance, it is expected that most of these existing initiatives will not necessarily align with the architecture, standards and governance that are been brought forward by this Strategy.

With the launch of the National E-Health Program, alignment of these initiatives, within the SCH or led by external entities, is an important task to be executed in collaboration with all stakeholders involved. In fact, some of these projects will provide the early wins for the National E-Health Program.

These initiatives are at different stages of development and will require a custom approach to maximize alignment, minimize changes and avoid disruptions. It is essential to the success of the National E-Health Program that organizations continue improving the health IT infrastructure and the increase the level of digitization of health data across all their services.

Achieving this alignment will require a continuous collaborative effort, led by the National E-Health Program, and will need to address the use of E-Health Standards, compliance with the E-Health Blueprint and integration with the national E-Health services.

National Health Strategy (NHS)

The NHS is the guiding vision for all transformation work being proposed and implemented in Qatar's health system. It also defines the first level of strategic alignment that will be expected from the E-Health Program.

The following NHS projects are currently addressing information technology solutions and will be aligned with the E-Health Strategy presented in this document:

- *Project 1.7: Diabetes Service Design* (National Diabetes Registry);

- *Project 1.8: National Cancer Program* (National Cancer Registry);

- *Project 2.6: Laboratory Integration and Standardization* (Laboratory Integration and Standardization); and

- *Project 3.1: Preventative Healthcare Governance* (National Public Health Strategy);

- *Project 3.5: Communicable Disease Prevention* (National Communicable Disease Surveillance and Early Warning System);

- *Project 3.7: Occupational Health* (Occupational Health Strategy);

Hamad Medical Corporation (HMC) and Primary Health Care Corporation (PHCC)

The next level of alignment needs to occur across the healthcare providers, in particular HMC and PHCC, who today share the responsibility for a significant share of the healthcare services in operation. The following key strategic initiatives and solutions have been identified as fundamental for rolling out this E-Health Strategy:

- *HMC / PHCC CIS Rollout*: the shared Clinical Information System (CIS) being deployed across all HMC and PHCC facilities will establish the single, largest Electronic Medical Record system in the country. This centralized approach provides immediate benefits by reducing the number of integration points required to establish the national E-Health Blueprint.

- *Diagnostic Imaging Vendor-Neutral Archive (VNA)*: as was the case with the CIS, the existence of a single VNA in operation across HMC and PHCC establishes the foundational service which will be extended as a national service.

National Health Insurance Company (NHIC)

The NHIC is a government-owned entity that manages and operates Seha: the national health insurance scheme in the State of Qatar. The scheme provides mandatory health insurance coverage for Qatari nationals through a network of public and private providers and forms a key component in the realisation of the National Health Strategy and the overall Qatar National Vision 2030. As part of its efforts to support Seha and implement the foundational services for Social Health Insurance in Qatar, the NHIC has several initiatives that will need to be aligned with the E-Health program, including:

- *NHIC Integration Platform:* An integration platform to connect healthcare providers that will create the means for standardizing all claims submissions, including those to private health insurers. It will also provide a collection of services and capabilities that is independent of Third Party Administrator (TPA) processing of health claims.

- *Online e-eligibility:* This service is used by providers to check eligibility when seeing a health-insured patient (Seha Scheme).

- *Prior Authorization: T*his service is used by providers to obtain prior authorization from the respective insurance company before proceeding with specific types of procedures, exams and treatments.

- *Pharmacy Benefit Management (PBM):* This system is comprised of e-prescription, real-time safety check, stocks-management & dispensation, claims & payment for medication.

- *Disease Management Programs:* These are NHIC telephone patient services which require information sharing between NHIC, patients, and providers.

Other Initiatives

In addition to the systems and services listed above, other key stakeholders will be impacted and/or required by the E-Health program, in particular some of the services provided by:

- ***Ministry of Information, Communication and Technology (MICT)*** in respect to their e-Government program, security and identity management systems and technology-specific national policies and guidelines; and

- ***Ministry of Interior*** with respect to their person and immigration registration processes and solutions.

Alignment of services, standards and technologies across these initiatives will require careful coordination of the change management activities. As capacity and capabilities are limited in the health IT sector, attention must be exercised to ensure that expectations on results and timelines are compatible with the availability of resources while at the same time avoiding change fatigue among providers and healthcare practitioners.

Lastly, the National E-Health Program needs to align with international standards and the health IT industry offerings and capabilities to ensure that Qatar can best leverage leading E-Health solutions from around the world.

IMPLEMENTATION ROADMAP

The E-Health Vision represents the long term destination, but reaching it requires a pragmatic and systematic approach that can ensure the success of the journey.

Realizing the E-Health Vision to its fullest extent and across all organizations is a long term journey that will require dedicated planning, commitment and execution. Complicating matters is the fact that new technologies are created in an ever changing, very dynamic market, where innovation and obsolescence cycles are shortening at an incredible rate. In addition, there are a number of concurrent initiatives, as noted in the previous section that need to be monitored and reviewed to ensure alignment with national Standards and the E-Health Blueprint. To keep up with this constant change while at the same time transforming the national healthcare system is a daunting prospect.
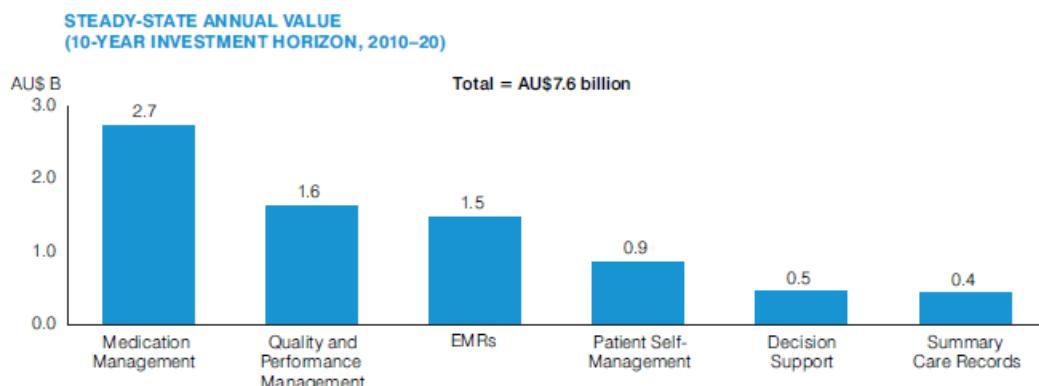
Best Practice Program Execution from Strategy to Change and Implementation
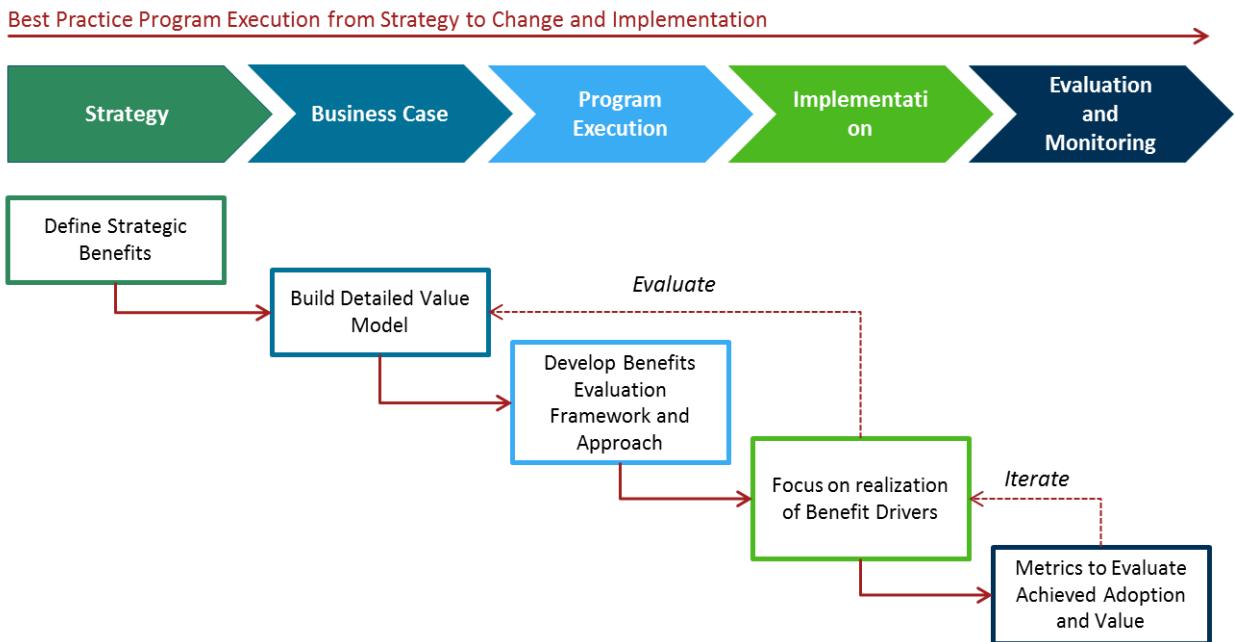
The E-Health Strategy should be implemented via a "benefits-led" methodology, which reflects current best practices of large scale health IT transformation programs. This enables the project to focus on those components of the project that aim to deliver the greatest benefits to all stakeholders, including patients, providers and the government. The main aspects of such an approach are illustrated below. Looking at similar initiatives in other countries, a common lesson is that trying to do too much at once is a recipe for failure. E-Health projects are by their very nature technically complex and require constant attention to change management activities. These challenges are directly impacted by the ambitious expectations that shape the scope of these projects.

The recommended approach in Qatar is to plan for an incremental evolution of the E-Health services that will begin with initial, simpler goals and build on these successes as other, more complex services are introduced in the future. There are 2 Generations contemplated by the Strategy.

The prioritization of clinical E-Health capabilities that need to be realized and put in place is determined on international best practices and lessons learned. Typically, by far the largest value is generated by management of medications and drugs in the primary care/outpatient setting.

Shown in the graphic below is the E-Health benefits assessment conducted in Australia estimating that the value of introducing Medication Management capabilities could provide up to 2.7 Billion Australian Dollars over a 10-year period.

Annual Value of E-Health Applications and Capabilities

**STEADY-STATE ANNUAL VALUE
(10-YEAR INVESTMENT HORIZON, 2010–20)**

Total = AU$7.6 billion

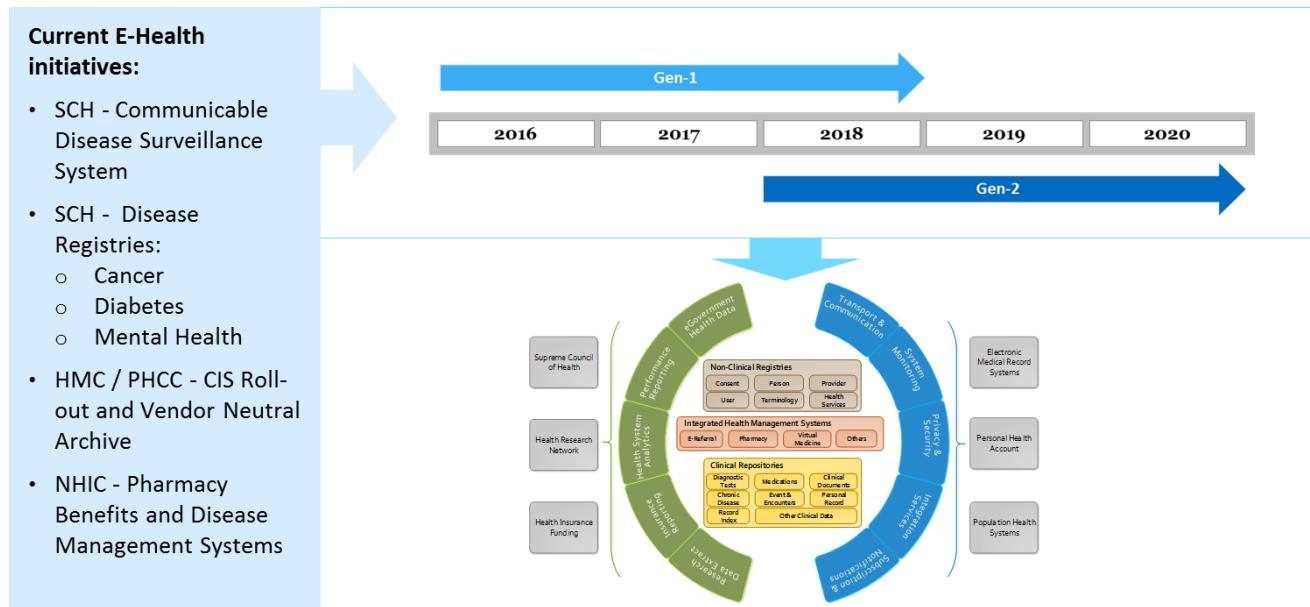| Medication Management	Quality and Performance Management	EMRs	Patient Self-Management	Decision Support	Summary Care Records
2.7	1.6	1.5	0.9	0.5	0.4

Source: Strategy&

Medication management is also the area where most of the lives are saved by avoiding potentially fatal Adverse Drug Events (ADEs). For these reasons, a national Medication Management service to be used by pharmacies is the first clinical service priority for the program in Qatar, The other clinical service elements identified as priority areas include diagnostic imaging and e-referrals. The latter element in particular is important to ensure integrated continuity of care between different care settings – a priority area identified in the National Health Strategy.

Slated for rollout in Generation 2 are the clinical services around Consumer Health and Data Analytics, which will arrive after the other services have already been in operation for some time to allow for the collection of longitudinal data.

Each generation will extend for a 3-year schedule, with an overlap during the mid-year period, as shown in the simplified timeline diagram below.

Current E-Health initiatives:

- SCH - Communicable Disease Surveillance System

- SCH - Disease Registries:
  - Cancer
  - Diabetes
  - Mental Health

- HMC / PHCC - CIS Roll-out and Vendor Neutral Archive

- NHIC - Pharmacy Benefits and Disease Management Systems

First E-Health Generation (Gen-1)

The first E-Health generation will introduce the foundational services that need to be implemented first at a national level as they are pre-requisites for all future capabilities. These include:

- Non-clinical registries;

- Key clinical repositories and integrated health workflow management services; and

- National Health Information Exchange (HIE).

The figure below shows the proposed collection of systems and services to be implemented as part of the first generation (Gen-1) of E-Health services.
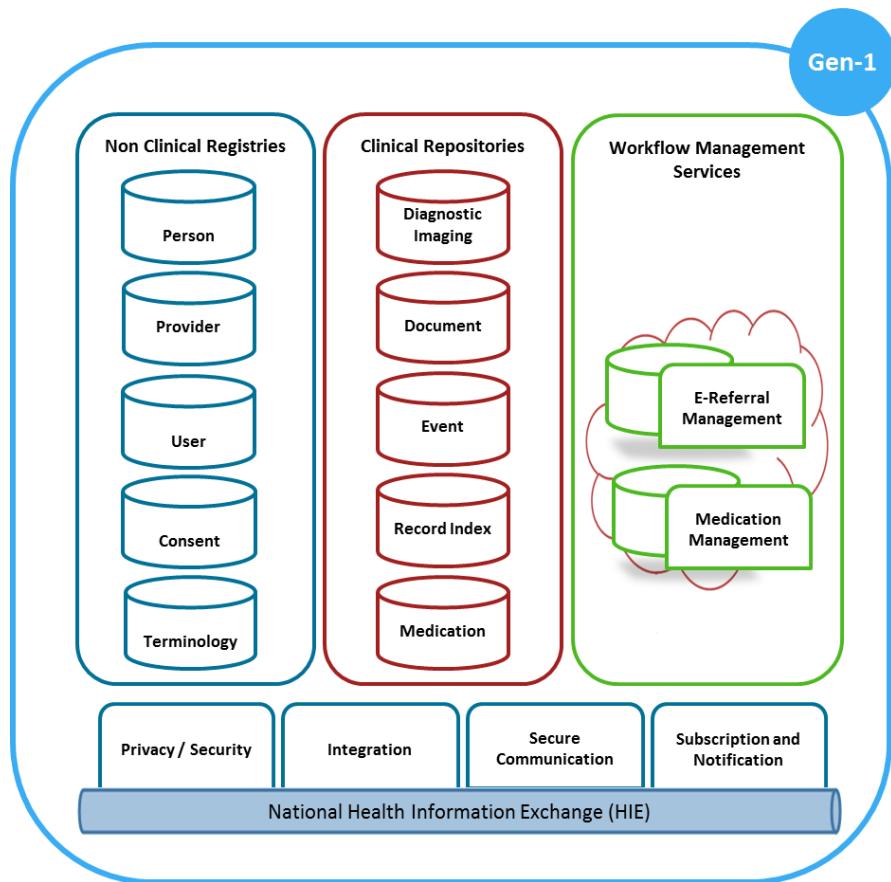
In addition to the HIE and non-clinical registries, a minimum set of clinical repositories and process management systems should be delivered in conjunction, as these are the services that will effectively deliver tangible benefits to the healthcare delivery:

- **_Event Repository and Document Repository:_** These two services, when combined, provide a simple but very effective timeline of each time the patient has been in contact with the health system and a summary document with the key clinical findings, diagnosis and medical advice resulting from these encounters.

- *Record Index:* A general index for any type of clinical data about the patient that has been created and published to the HIE. These may be records or documents that will remain at each EMR system, and may include patient family history, clinical assessments, lab results and many others.

- *Diagnostic Imaging Repository:* A national archive that will contain all diagnostic imaging reports, manifests and images that have been created in hospitals or imaging clinics across the country. This repository may also provide a vendor-neutral image viewer that can be used from any EMR system.

Finally, Gen-1 will also include two very important workflow management systems to be provided as a centralized service to all applicable healthcare sites:

- *E-Referral Management:* A system that will receive and coordinate all requests for referrals between healthcare providers, including those from primary care to specialists, between specialists, from hospitals back to general practitioners, long term care and/or home care services.

- *Medication Management:* A system that will be used across community pharmacies, public and private sectors, to manage the medication profile for patients. It will provide the combined functions of several systems:

  o Drug repository (profiles);

  o E-Prescribing and E-Dispensing processing;

  o Drug interaction checking;

  o Pharmacy practice management; and

  o Drugs benefit management (claims).

This system is proposed as a single national E-Health solution to be provided as a cloud-service and used by all community pharmacies.

As described above, the first generation of the E-Health services will deliver important foundational functions, not the least being the connection and the integration of the many EMRs in use in the country.

As the Gen-1 solutions are implemented, the E-Health Program will proceed to create the E-Health testing and certification services that will ensure that products and organizations meet minimum technical requirements before they are allowed to participate in the national information exchange.

Finally, the E-Health Program team will work with the various stakeholders to promote and measure the adoption of local and national E-Health systems, focusing on the digitization and standardization of clinical data.

The chart below shows the various activities that will be required to complete the implementation of Gen-1, the first E-Health generation.
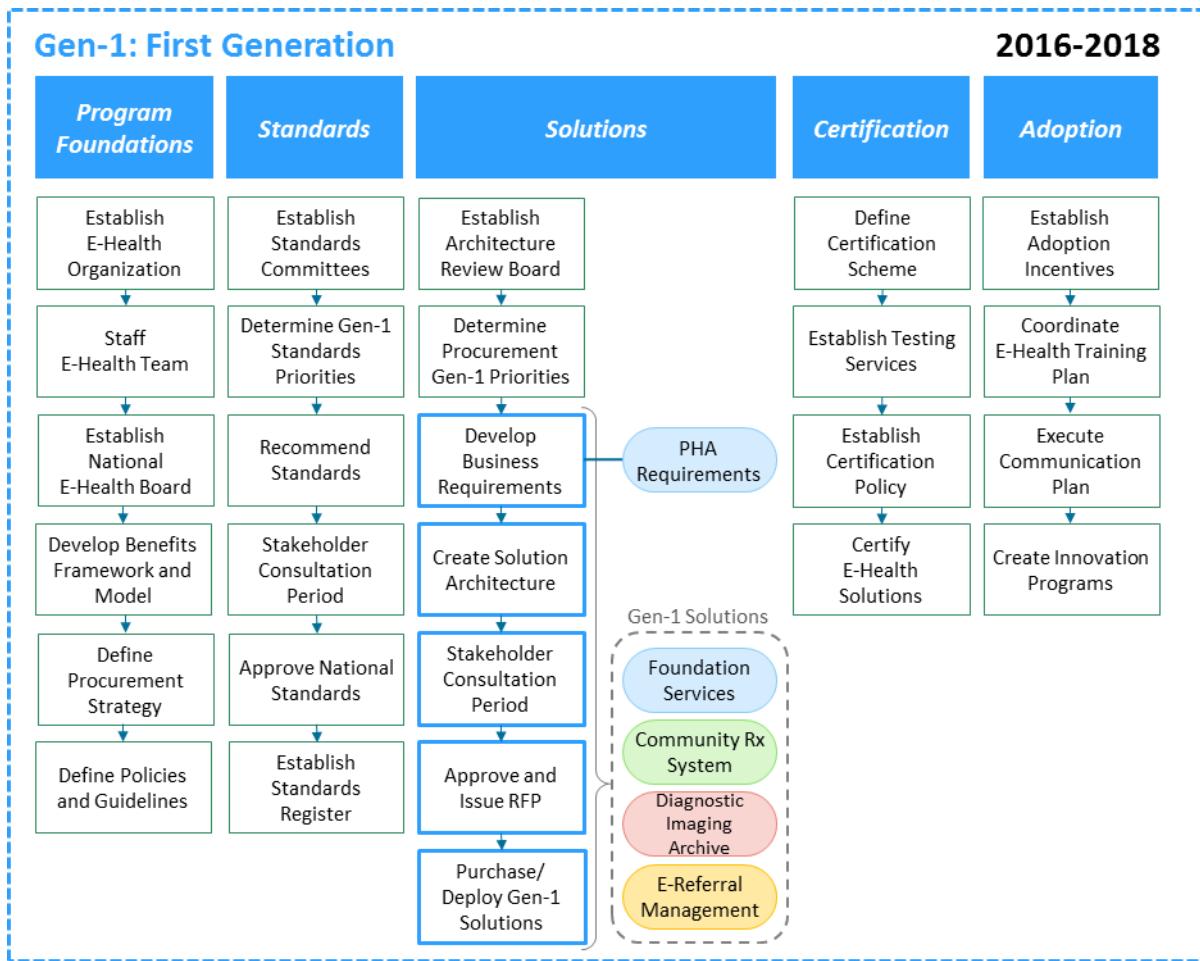
Second E-Health Generation (Gen-2)

The second generation (Gen-2) of E-Health services will significantly enhance the capabilities provided by the national services. Its main focus will be to fully explore and use information already collected and shared through the Gen-1 services.

Additionally, Gen-2 will begin to deliver on the goals linked to consumer involvement and empowerment. It is here that the full extent of the Personal Health Account (PHA) will be provided to everyone in Qatar.

The figure below shows the proposed collection of systems and services to be implemented as part of the second generation (Gen-2) of E-Health services.
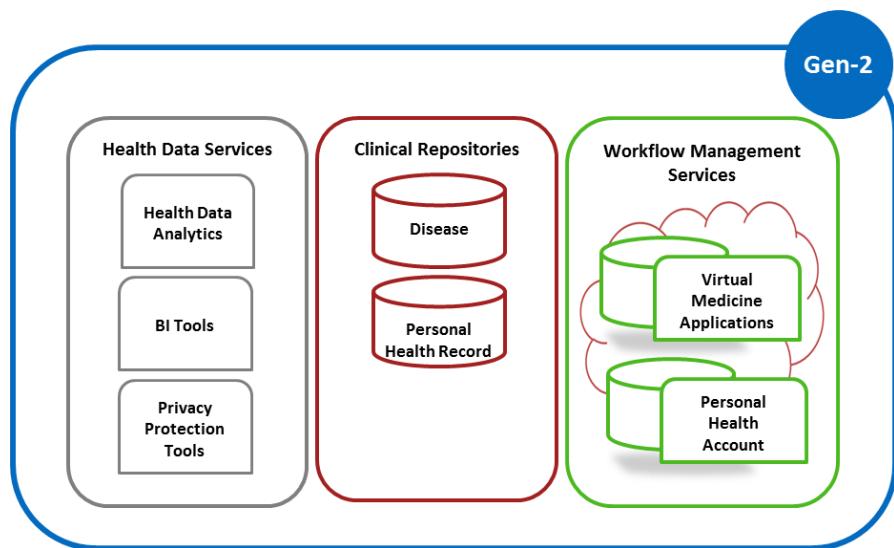
The health data services is a critical part of the E-Health Blueprint, as it is this collection of systems, tools and services that provide the capabilities required to best use the newly acquired clinical data. These capabilities will be made available to health regulators, care delivery organizations and research centers as a national E-Health service.

New clinical repositories are also planned for the Gen-2 scope, and complement those already in delivered during Gen-1. These include:

- **Disease Registries:** The first of possibly many disease-specific repositories, it will hold a record of all diabetic (and possibly pre-diabetic) individuals in Qatar, along with key diabetes management information that has been collected and/or presented to the patient.

- **Personal Health Record:** A national archive that will contain all clinical data provided by the individual and not by providers or healthcare professionals. This repository will be directly associated with one or more of the Personal Health Account applications.

Finally, Gen-2 will add two new workflow management services to the national E-Health services: Personal Health Account and Virtual Medicine Applications.

Gen-2 will overlap with the end of Gen-1, and will extend for the last three years of the implementation plan. First in the activities for Gen-2 is to evaluate the results obtained with the rollout of the first group of E-Health services. Given the foundational nature of Gen-1, the evaluation will center on the digitization of health data and the adoption of the national E-Health standards. Next, the work continues with the definition and establishment of standards and the procurement of the Gen-2 solutions.

These will be the first services available to the general public and consequently, social media will play an important part in the communications approach. The certification services created during the first phase will also be updated to include consumer applications, health data quality metrics and virtual medicine solutions. Finally, as the Gen-2 solutions are being implemented, the Program team will begin the work to refresh the E-Health Strategy for the following period, assessing the results obtained, incorporating new technologies and aligning with the new health system strategy at the time. The chart below shows in more details the Gen-2 activities that will complete the first 5-years of the E-Health Program.