Final Report

ITU-D
Study Group 2

Question 2/2

Information and telecommunications/ ICTs for e-health

6th Study Period
2014-2017

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Question 2/2: Information and telecommunications/ ICTs for e-health

Final Report

Preface

ITU Telecommunication Development Sector (ITU-D) study groups provide a neutral contribution-driven platform where experts from governments, industry and academia gather to produce practical tools, useful guidelines and resources to address development issues. Through the work of the ITU-D study groups, ITU-D members study and analyse specific task-oriented telecommunication/ICT questions with an aim to accelerate progress on national development priorities.

Study groups provide an opportunity for all ITU-D members to share experiences, present ideas, exchange views and achieve consensus on appropriate strategies to address telecommunication/ICT priorities. ITU-D study groups are responsible for developing reports, guidelines and recommendations based on inputs or contributions received from the membership. Information, which is gathered through surveys, contributions and case studies, is made available for easy access by the membership using content-management and web-publication tools. Their work is linked to the various ITU-D programmes and initiatives to create synergies that benefit the membership in terms of resources and expertise. Collaboration with other groups and organizations conducting work on related topics is essential.

The topics for study by the ITU-D study groups are decided every four years at the World Telecommunication Development Conferences (WTDCs), which establish work programmes and guidelines for defining telecommunication/ICT development questions and priorities for the next four years.

The scope of work for **ITU-D Study Group 1** is to study "**Enabling environment for the development of telecommunications/ICTs**", and of **ITU-D Study Group 2** to study **"ICT applications, cybersecurity, emergency telecommunications and climate-change adaptation"**.

During the 2014-2017 study period **ITU-D Study Group 2** was led by the Chairman, Ahmad Reza Sharafat (Islamic Republic of Iran), and Vice-Chairmen representing the six regions: Aminata Kaba-Camara (Republic of Guinea), Christopher Kemei (Republic of Kenya), Celina Delgado (Nicaragua), Nasser Al Marzouqi (United Arab Emirates), Nadir Ahmed Gaylani (Republic of the Sudan), Ke Wang (People's Republic of China), Ananda Raj Khanal (Republic of Nepal), Evgeny Bondarenko (Russian Federation), Henadz Asipovich (Republic of Belarus), and Petko Kantchev (Republic of Bulgaria).

Final report

This final report in response to **Question 2/2: "Information and telecommunications/ICTs for e-health"** has been developed under the leadership of its two Co-Rapporteurs: Isao Nakajima (Japan) and Done-Sik Yoo (Republic of Korea); and three appointed Vice-Rapporteurs: Leonid Androuchko (Dominic Foundation, Switzerland), Grégory Domond (Haiti) and Malina Jordanova (Bulgaria). They have also been assisted by ITU-D focal points and the ITU-D Study Groups Secretariat.

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Executive summary

This report defines eHealth and its applications for developing countries and brings forward significant information on eHealth services and systems from more than 40 countries, and eHealth ecosystem and standards – both technical and for service quality. Special attention is dedicated to mobile applications as ~7 billion people, or 95 per cent of the global population live in areas covered by mobile-cellular networks.

This report is divided into four (4) main sections, generally increasing in level of details and specificity:

- **Chapter 1:** Introduction;
- **Chapter 2:** Guidelines for eHealth implementation in developing countries;
- **Chapter 3:** Lessons learned; and
- **Chapter 4:** Recommendations.

Due to the limited size of the main body of the report valuable contributions are listed as annexes to the report.

This report does not duplicate other ITU documents and reports as it offers information focused on potential solutions form and for developing countries. This is essential as the basis (technical, financial, human resources, etc.) in developed and developing countries is different and a copy-cat approach is not the best solution.

The results and guidelines presented apply to all – national and local administration, individual practitioners, group practices, healthcare systems, as well as to providers of health-related services where there are eHealth interactions either directly to the patient or from provider to provider for the purposes of healthcare delivery. They are developed over the past years by a group of experts from ITU-D Study Group 2 Question 2/2.

Future of the Question

The future Question shall:

- Aim for the realization of Sustainable Development Goals (SDGs) while focusing on SDGs 3: Ensure healthy lives and promote well-being for all at all ages;
- Take further steps to assist in raising the awareness of decision makers, regulators, telecommunication operators, donors and customers about the role of ICTs in improving healthcare delivery in developing countries;
- Support the ITU Telecommunication Development Bureau (BDT)'s eHealth activities in cooperation with other United Nations agencies, such as the World Health Organization (WHO).
- Collect information about the condition and social reception include legal and financial issue to manage public service in a developing countries; and,
- Provide suitable guidelines on eHealth standardization and show new technologies include medical big data and Artificial Intelligence in conjunction with ITU Telecommunication Standardization Sector (ITU-T).

1 CHAPTER 1 – Introduction

1.1 Purpose of the report

This report provides details on the policy messages derived from the findings and lessons learned within the work of Question 2/2: Information and Telecommunications/ICTs for eHealth. The key messages of Question 2/2 are developed to be presented to all ITU members as well as to the attendees of the World Telecommunication Development Conference (WTDC) in 2017. The goal is to share the learnings from Question 2/2 with all ITU members, international, national and regional institutions and policy makers as well as with all groups or individuals related to eHealth.

1.2 Definitions

To avoid misunderstanding, the starting point of the report is the clarification of terminology as members of the Study Group, representing various countries and continents, often use different terminology.

What is telemedicine and what is eHealth, as they are often used in the text below?

[1]Telemedicine encompasses diagnostic, treatment and prevention processes within the frame of modern healthcare services, which are carried out primarily by means of telecommunication and computer technologies. Its history goes back to over 150 years.[2,3]

For decades there was no internationally accepted definition of telemedicine. A study published in 2007 found 104 peer-reviewed definitions of the term telemedicine.[4] Recognizing this, the World Health Organization (WHO) adopted the following broad description of telemedicine[5] according which telemedicine is:

"*The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities*".

In sum, WHO has underlined that telemedicine includes four interrelated elements:

- Its purpose is to provide clinical support;
- It intends to overcome geographical barriers, connecting users who are not in the same physical location;
- It involves the use of various types of information technology;
- Its goal is to improve health outcomes.

With more involvement of the electronic communication systems, the major International Organizations, European Union (EU), International Telecommunication Union (ITU) and European Space Agency (ESA) have officially adopted the denomination "eHealth". "eHealth refers to the use

1 Contribution Dr Malina Jordanova, Space Research and Technology Institute, BAS, Bulgaria, Vice-Rapporteur for Q2/2.
2 Bashshur R., Shannon G., History of Telemedicine: Evolution, Context, and Transformation, Mary Ann Liebert; 2009.
3 Vladzymyrskyy A., Jordanova M., Lievens F., A Century of Telemedicine: Curatio Sine Distantia et Tempora, Sofia, Bulgaria, 2016.
4 Sood S. P., Negash S., Mbarika V. W., Kifle M., Prakash N. Differences in public and private sector adoption of telemedicine: Indian case study for sectoral adoption. Studies in Health Technology and Informatics, 2007, 130, pp. 257–268.
5 WHO Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth 2009 (Global Observatory for eHealth Series, 2), WHO, Geneva, Switzerland, 2010.

of modern information and communication technologies to meet the needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers".[6]

WHO described eHealth[7] as "the transfer of health resources and health care by electronic means. It encompasses three main areas:

– The delivery of health information, for health professionals and health consumers, through the Internet and telecommunications;
– Using the power of IT and e-commerce to improve public health services, e.g. through the education and training of health workers;
– The use of e-Commerce and e-Business practices in health systems management.

E-health provides a new method for using health resources – such as information, money, and medicines – and in time should help to improve efficient use of these resources. The Internet also provides a new medium for information dissemination, and for interaction and collaboration among institutions, health professionals, health providers and the public".

One more term is often used "telehealth". Telehealth includes surveillance, health promotion and public health functions. It is broader in definition than telemedicine as it includes computer-assisted telecommunications to support management, surveillance, literature and access to medical knowledge.

What is the correct terminology? Which one of both terms – telemedicine or eHealth – is the right one? To this very moment, the terminology has neither been agreed in Europe nor at worldwide level. Paradoxically even between and within the countries from EU different terms are used to describe one and the same service. Positions differ and the preferences are usually influenced by individual experience, personal and professional viewpoints. Thus, for some authors telemedicine and eHealth are synonyms. Others accept that eHealth is a broader term and includes telemedicine. A third group separate the terms, accepting that telemedicine incorporates telecardiology, teleradiology, telepathology, tele-ophthalmology, teledermatology, telesurgery, tele-nursing, etc., while eHealth comprises of e-Santé, Information and Communication Technologies in health (ICT-Health), all types of health communication services, PACS, patient information systems, e-education, e-prescription, etc.

In 2005, the World Health Assembly recognized eHealth as the way to achieve cost-effective and secure use of ICTs for health and related fields, and urged its Member States to consider drawing up long-term strategic plans for developing and implementing eHealth services and infrastructure in their health sectors.

The relation between telemedicine and eHealth are presented in **Figure 1**. In this report both telemedicine and eHealth are used as synonyms.

1.3 Statement of the situation

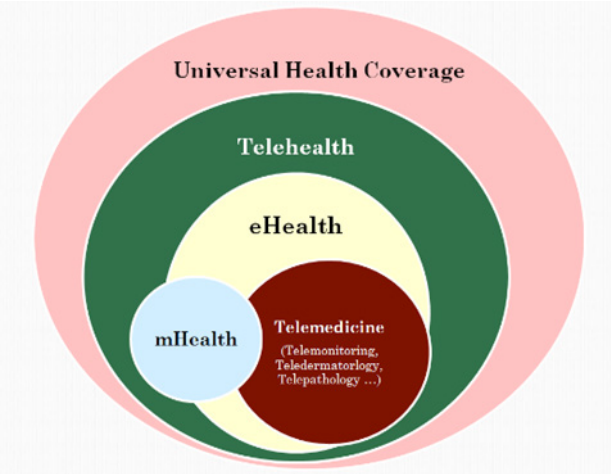
eHealth is an integrated system of healthcare delivery that employs telecommunications/ICTs as a substitute of face-to-face contact between medical staff and patient or between medical professionals. It includes many applications, such as telemedicine, electronic medical records, medical consultation at a distance, etc. eHealth provides transmission, storage and retrieval of medical information in digital form between doctors, nurses, other medical staff and patients for clinical, educational and administrative purposes, both at the local site and at a distance.

eHealth is playing a very important role in healthcare delivery in developing countries, where the acute shortage of doctors, nurses and paramedics is directly proportional to the enormous unsatisfied

[6] EU Ministerial Declaration, eHealth 2003, High Level Conference, Brussels 22 May 2003. Retrieved May 21, 2011 from http://europa.eu.int/information_society/eeurope/ehealth/conference/2003/index_en.htm; http://ec.europa.eu/information_society/activities/ict_psp/documents/com_2004_0356.pdf.

[7] WHO Trade, foreign policy, diplomacy and health: eHealth, 2016, available at http://www.who.int/trade/en/.

Figure 1: Relation between telemedicine and eHealth



demand for health services. Some developing countries have already successfully implemented pilot eHealth projects. They are also looking forward to proceeding further by considering the development of eHealth master plans, as recommended by the WHO in its Resolution WHA58.28 in May 2005. The latter aims at reducing disparities with regard to medical services between urban and rural areas and pays special attention to the least developed countries (LDCs). Yet, the implementations of eHealth in the developing world has not reached the necessary level in order significantly influence the healthcare systems.

In some developing countries, the number of mobile phones has overtaken the number of fixed phones, and the mobile telecommunication network could be considered a more attractive platform for the introduction of eHealth services.

Lots have to be written on the topic but in sum: According to recent research, we could face a serious medical professional shortage across the world in the next ten to fifteen years. What does this mean for us – and our healthcare system?

- Not enough doctors to go around;
- The crisis is and will be international;
- Affecting both developed and developing countries.

The shortage that many developing countries are facing and will face is and will be much serious as compared to the shortage in developed countries. The chronic shortages of trained medical professionals are due to lack of training, limited finances (bad working conditions) and brain drain.

The question is: What can we do? The answer is: Foster worldwide eHealth implementation as fast as possible. Definitely, eHealth implementation will not be the miracle solving all problems, yet, it will provide a chance to offer citizens worldwide affordable and high-quality healthcare.

1.4 eHealth implementation worldwide: needs, expectations, global approach

No doubt, eHealth is now a global topic. However, what is the current situation regarding eHealth implementation worldwide?

The results from one of the most extensive surveys performed recently are revealed in the WHO Global eHealth Observatory.[8,9] Its various parts outline the eHealth development among WHO Member States. The results from 114 countries covering 81 per cent of the world's population discovered that 4 areas of eHealth are implemented with a priority – teleradiology, telepathology, teledermatology and telepsychiatry. The provision of these four (4) services is far less advanced in upper-middle, lower-middle and low-income countries than in high-income countries. The African and Eastern Mediterranean Regions generally had the lowest proportion of countries with established telemedicine services. As far as applications of mobile health technologies (mHealth) are concerned, the four most frequently applied services are: health call centers (59%), emergency toll-free telephone services (55%), managing emergencies and disasters (54%), and mobile telemedicine (49%). Consistent with Telemedicine/eHealth general trends, higher-income countries are more active in implementation of mHealth than lower-income countries. Countries in the European Region are the most active and those in the African Region the least active.

In sum, despite of the significant funds and efforts dedicated to the development of eHealth services they are not as widely implemented as it must be expected. And this is not because these services are not needed. Time proved that eHealth can help solving the healthcare dilemmas or at least is offering the means to do so. The increasing acceptance of eHealth applications in various areas of healthcare such as chronic heart failure, wound care, psychiatry, psychology, surgery, chronic disease and care for elderly and house bound patients, mobile eHealth solutions, etc. is a reality. Experts admit that eHealth has a vast and still unrealized potential.

eHealth has to be integrated into the system of public health but with the ultimate goal to achieve a personal well-being. It promises a lot:

- Quick, timely high quality affordable healthcare for all, everywhere, at any time;
- Overcoming shortage of healthcare staff and funding;
- Optimization of patient care;
- Optimization of the work of medical staff;
- Enhancing preventive care;
- Protecting human rights;
- Educating and thus empowering citizens and much more.

The fulfilment of these promises requires an approach far beyond the local (regional or single country) level. The reason is simple – with >14,000 known diseases,[10] most of them spread worldwide; there is no single national healthcare system that is able to dedicate human or financial resources to deal with all of them. Learning from others is one of the best ways to go and grow as there is always something new to learn and someone there to learn from!

The experience from previous study cycles of SG2 revealed that eHealth implementation is successful and highly beneficial for citizens if it:

- Is based on knowledge, confidence and credibility;
- Meets the needs of the community;
- Respects local traditions, culture, business development, avoids copy-cat-approach, etc.;

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8 WHO: mHealth: New horizons for health through mobile technologies, based on the findings of the second global survey on eHealth, Global Observatory for eHealth series, 2011, Vol. 3, [accessed on August 30, 2011]; Available at: http://www.who.int/goe/publications/goe_mhealth_web.pdf.

9 WHO: Telemedicine: Opportunities and development in the Member States, Report on the Second Global Survey on eHealth, Global Observatory for eHealth series, 2011, Vol. 2, [accessed on August 30, 2011]; Available at: http://www.who.int/goe/publications/ehealth_series_vol2/en/index.html.

10 WHO, Classifications- ICD-10, http://www.who.int/classifications/help/icdfaq/en/.

– Is based on and uses the already developed healthcare system.

Or, if local and/or national eHealth implementation occurs in a global context and vice versa, i.e. from a "glocal" perspective.

What does "glocal" mean? Affordable and widely available ICTs and Internet support the shift from local to global healthcare. The Internet permits the formation of worldwide networks of facilities with common features. Through these networks, local care facilities have access to global expertise that improves their access, quality and safety. This is glocal healthcare.

The goal of glocal healthcare is a system that is open, high quality and not wasting either the global or the local resources. Yet, we are witness of global cooperation deficiencies. The lack of sufficient global cooperation ensures that governments continue to negotiate, renegotiate, revisit and experiment with healthcare policies and philosophies. The way forward is collaboration and cooperation in order to make the benefits of science, information and technology, available to all – and this is what Question 2/2 is trying to facilitate.

1.5 Question 2/2

Question 2/2 is a continuation of the previous study cycle, i.e. of the Question 14-3/2, and is based on the achievements revealed in its final report (Question 14-3/2: Information and telecommunications/ICTs for eHealth, 2014, http://www.itu.int/pub/D-STG-SG02.14.3-2014), as well as on other initiatives which resulted from the last study period, namely mobile telecommunications for mobile ehealth.

Question 2/2 continues to build on previous studies and to provide more focus on the telecommunication infrastructure and platform that would be required to enable all ehealth applications and services.

Its goals are to:

– Raise the awareness of decision-makers, regulators, telecommunication operators, donors and customers about the role of information and telecommunications in improving health-care delivery in developing countries by using eHealth;
– Promote development of telecommunication standards for eHealth application in conjunction with ITU-T and ITU-R in particular;
– Disseminate experiences and best practices with the use of information and telecommunications in eHealth in developing countries;
– Encourage collaboration between telecommunication and healthcare sectors in developing countries;
– Facilitate the further work on the eHealth Master Plan for developing countries;
– Report on how hospitals and other healthcare institutions in developing countries can benefit from the broadband telecommunication access infrastructure to be used for an e-health solution;
– Prepare a report and recommendations with regard to use of mobile telecommunications for eHealth solutions in developing countries;
– Encourage cooperation among developing countries in the field of telecommunications for eHealth.

The goals are achived by:

– Collecting case Studies from Members, Sector Members and Associates regarding best practices on e-health technologies, services and applications, and country experiences in implementing successful ICTs for health, particularly in developing countries, addressing high health priority areas, such as Maternal and Child Health, communicable and non-communicable diseases, etc.;

- Promoting telecommunications for e-health applications, when and where there are relevant conferences and exhibitions;
- Participation of the members of Rapporteur's Group in international, regional and national workshop and making presentation in order to disseminate the lessons learned;
- Facilitating networking and brainstorming of ITU members and representatives of developing countries.

Results

The contributions received till now revealed already a good progress in building the final Question 2/2 deliverables. The results acheved are presented in this report (**Table 1**) and its annexes.

In sum: Due to extensive networking >100 contributions were received and discussed at Question 2/2 meetings. Some of the documents dealt with organizational issues and are not included in this report. The rest presented experiences of countries from all continents to implement eHealth services. Successful stories, problems and plans were presented. In one or another form these contributions found their place in the report. In general, the inputs are focusing on:

- Basic problems and considerations that have to be taken into account while planning or introducing eHealth services such as eHealth ecosystems and standards. These contributions are the basis of **Chapter 2**.
- Best practice examples from developing countries as well as well advanced and tested in practice eHealth services, ready to be implemented. These contributions are included in Chapter 3 or as annexes, due to the limited space of the report;
- Examples of start-up projects and/or eHealth initiatives. Although they are extremely important and interesting, they are included as annexes and/or tables due to their rather preliminary stage of development.

Table 1: Question 2/2 deliverables for the 2014-2017 study period

Outputs	Results
Guidelines on how to draft the telecommunication/ICT part of an e health master plan	√
Guidelines with regard to the use of mobile telecommunications for ehealth solutions in developing countries	√
Collection and summary of the requirements and effectiveness of telecommunication infrastructure for the successful implementation of eHealth applications, taking into account the environment of developing countries	√
Dissemination of the technical standard related to the introduction of ehealth services in developing countries	√
Collaboration with ITU-T Study Group 16 in order to accelerate the elaboration of technical standards for ehealth applications	√
Collaboration with the relevant BDT programme, if so requested, to support implementation of the telecommunication/ICT component of ehealth projects in developing countries, including advice on best practices on how to train developing countries in the use of the telecommunication/ICT component of ehealth projects	√
Sharing and dissemination of best practices on ehealth applications in developing countries using the ITU/BDT website, in close collaboration with the relevant BDT programme	√

Collaboration

– With other ITU-D Study Group Questions: Question 2/2 collaborates with:
  - Question 1/1 (Policy, regulatory and technical aspects of the migration from existing networks to broadband networks in developing countries);
  - Question 7/1 (Access to telecommunication/ICT services by persons with disabilities and with specific needs), and
  - Question 1/2 (Creating the smart society: Social and economic development through ICT applications).

– Collaboration in progress:
  - With ITU-T Study Group 20 (IoT and its applications including smart cities and communities (SC&C)) to advance the work on eHealth requirements and applications in ITU-T SG20, especially identification of the requirements for the eHealth ecosystem to be standardized based on mature and stable existing eHealth technologies in developing countries;
  - With ITU-T Study Group 16 (Multimedia coding, systems and applications);
  - With ITU-T Study Group 5 (Environment and climate change).

Annex 1 provides the liaison statements related to these interactions and collaboration.

– With other Organizations: Question 2/2 collaborates, if and when needed, with the relevant UN agencies and other regional and international organizations that are specialized in health, e.g. WHO and other Standards Development Organizations (SDOs), particularly IEEE.

Question 2/2 will continue to collaborate and share information with other ITU-D Study Group Questions and with other groups in the Sectors and with other Organizations, as appropriate.

With all its activities Question 2/2 supports developing countries to avoid re-inventing the wheel and copycat approach in the inmplementation of eHealth. Question 2/2 is focused at developing countries as they differ from other countries and need all possible support in their attempts to settle the differences with developed countries. Certain aspects of the developing countries, as indicated bellow, have always to be beared in mind and especially, when healthcare systems expansion is concerned.

1.6 Developing countries: problems and challenges

Why has Question 2/2 developed a specific approach when eHealth implementation in developing countries is concerned? The answer is in the definition of what a developing country is as well as in the differences between developed and developing countries.

Definition: A developing country, also called a less-developed country, is a nation with a low living standard, undeveloped industrial base, and low Human Development Index (HDI) relative to other countries. Nevertheless, there is no established convention for the designation of “developed” and “developing” countries or areas in the United Nations system. The common practice of United Nations (UN) is to consider Japan in Asia, Canada and the United States in northern America, Australia and New Zealand in Oceania, and Europe as “developed” countries or regions. In international trade statistics, the Southern African Customs Union is also treated as a developed region and Israel as a developed country. Countries emerging from the former Yugoslavia are treated as developing countries; and countries of Eastern Europe and of the Commonwealth of Independent States in Europe are not included under either developed or developing regions.

The International Monetary Fund (IMF) uses a flexible classification system that considers (1) per capita income level, (2) export diversification – so oil exporters that have high per capita GDP would not make the advanced classification because around 70 per cent of its exports are oil, and (3) degree of integration into the global financial system.

The World Bank classifies countries into four income groups. These are set each year on July 1. As per 1.07.2015 economies were divided according to their Gross National Income (GNI) as (http://data.worldbank.org/news/new-country-classifications-2015):

- Low income countries that had GNI per capita of US$1,045 or less in 2014;
- Lower-middle-income and upper-middle-income economies are separated at a GNI per capita of US$4,125;
- Middle-income economies are those with a GNI per capita of > US$1,045 but less than US$12,736;
- High-income economies are those with a GNI per capita of US$12,736 or more.

The World Bank classifies all low- and middle-income countries as developing but notes that "The use of the term is convenient; it is not intended to imply that all economies in the group are experiencing similar development or that other economies have reached a preferred or final stage of development. Classification by income does not necessarily reflect development status".

The above information is important and should be considered as the concept of supporting the developing countries is the core of the Question 2/2.

Some significant aspects

These aspects have always to be considered when discussions about eHealth implementation are held as they may both hinder and shape the eHealth development and wide application.

Major financial and healthcare problems of developing countries – outline:

- The disease burden is different from that in the developed regions;
- The population is younger and is increasing faster as compared to developed regions;
- The medical services are un-efficient due to lack of sufficient number of both medical schools and specialists;[11]
- The healthcare spending is times lower as compared to the developed economies.

Madagascar reports risks on implementing eHealth strategy[12] as follows:

- Lack of financing;
- Weakness of technical human resources to carry out the process;
- Low level of commitment to implementation on the part of professionals;
- Legal and regulatory aspects not behind schedule;
- Lack of ICT infrastructure, particularly in certain rural areas;
- Durability of services rendered by eHealth: the associated operating and utilization costs must be identified and covered by clearly identified institutions;
- Lack of interest on the part of citizens in the use of eHealth services.

[11] Eastwood J. B. et al. Loss of health professionals from sub-Saharan Africa: the pivotal role of the UK. The Lancet, Volume 365, Issue 9474, 28 May–3 June 2005, pp. 1893–1900.

[12] Document 2/407, "Start-up of cyberhealth in Madagascar. Refocusing of programmes", Republic of Madagascar.

The digital divide

This is one of the major problems for those that are planning or trying to implement eHealth services and Question 2/2 always has this in mind.

What is the digital divide? The term was introduced in 1990's[13] and refers to the gap between those who have access to and the ability to use information and communication technologies and those who do not.

The reasons for this divide are many – poverty at first place as well as education, literacy, age, gender, culture, exposure to ICTs, geographic location, infrastructure, connectivity, bandwidth and telecommunication costs. The digital divide occurs not only between developed and developing countries but also within countries, mainly between urban and rural areas.

The digital divide has been seen as an obstacle to the implementation of eHealth in the developing world and in rural areas of the developed countries too. The expectations were that as infrastructure and connectivity improved, additional bandwidth became available, technology and communication costs came down, and mobile phone use increased, the divide would narrow. These have all occurred to varying degrees in much of the developing world, yet the digital divide remains.

In an article M. Mars[14] revealed that the digital divide between developed and developing countries has not narrowed over the past 10 years and raises the question as to whether the divide will ever be narrowed. Theoretically it should, but in practice this is unlikely as technology continues to evolve. The conclusions of experts as to when the digital gap between developed and developing countries will disappear are not encouraging. That is why all eHealth related activities in the developing countries should be guided by a realistic understanding of the digital divide, its implications and the factors that drive it.

The copycat approach, local culture and traditions, infrastructure

While there are successful eHealth deployment models such as a case study of Spain,[15] within the last two decades the healthcare has witnessed the failure of thousands of projects in eHealth. Even well developed and working in developed countries solutions, when implemented in the developing areas did not work well and failed. It is more than evident that a copy-cat approach is not the best way for wide development of eHealth. Solutions broadly used in developed countries are not always what developing countries are really looking for or what they desperately need!

Lack of respect or even worse – ignorant neglect of local traditions and cultural characters also may blow up even the most carefully prepared eHealth business project. The cultural acceptance of every single eHealth initiative in developing areas is a condition sine qua non.

Infrastructure and lack of ICT skills also remain as frustrating obstacles that may eliminate eHealth as a viable option in many areas. Developing countries in Africa, the Americas, and South-East Asia cited infrastructure as one of the greatest barriers to telemedicine implementation.[16]

Instead of a conclusion, in addition to the above, it is worth citing a 2015 survey focused on challenges and hurdles of eHealth Implementation in developing countries.[17] The latter was performed among

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13 Eubanks V. E. Trapped in the digital divide: the distributive paradigm in community informatics, The Journal of Community Informatics, 2007, vol. 3, pp. 1-12.

14 Mars M. The Digital Divide: Still a Reality? In M. Jordanova and F. Lievens (Eds.) Global telemedicine and eHealth Updates: Knowledge Resources, Vol. 6, Publ. ISfTeH, Luxembourg, 2013, pp. 277-280.

15 Document 2/404, "Incorporation and use of ICTs in the Spanish National Health System", Spain.

16 Telemedicine Opportunities and Developments in Member States, WHO, Global Observatory for eHealth series- Volume 2, 2010, Switzerland.

17 Mandirola Brieux H. F. et al. Challenges and Hurdles of eHealth Implementation in Developing Countries, Stud Health Technol Inform. 2015; 216, pp. 434-437.

experts and the results clearly indicated that according to them the important problems that need to be addressed in order to implement successfully eHealth in developing countries are dealing with:

1) Cultural and educational problems (95% of the answers);
2) Economic support policies of the eHealth status (58%); and
3) Development of policies for long periods of eHealth usage (50%).

2 CHAPTER 2 – eHealth implementation in developing countries: some guidelines

This chapter outlines three basic issues that have to be taken into account while planning or introducing eHealth services:

- eHealth ecosystems;
- Technical and service standards; and
- The potential benefits from m-Powering Development Initiative.

Their identification was a result of the extensive research of the Question 2/2 during this study period. Due to the limited space, some additional information is provided in **Annex 3**.

2.1 eHealth ecosystem

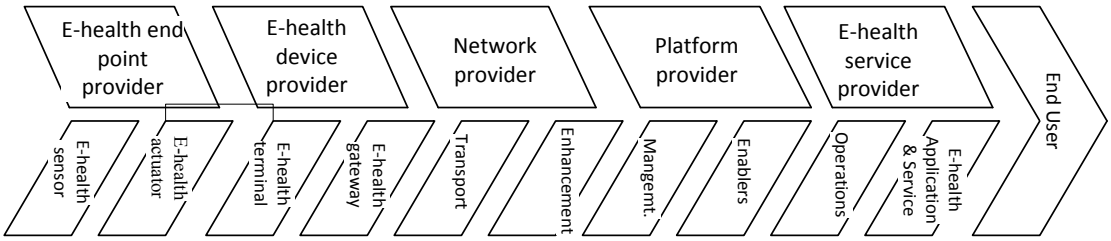
Too often, eHealth projects and applications are launched without a thorough approach that takes into account all the essential elements for a viable program. It is important to envision eHealth initiatives as the outcome of a multifaceted eHealth ecosystem that considers five key elements, i.e. (1) Governance policies and regulations; (2) Financing model; (3) Technology infrastructure; (4) Services; (5) Stakeholders. Creating eHealth programs in the context of their larger eHealth ecosystem will ensure lasting viability for these initiatives.

2.1.1 eHealth ecosystem, typical use cases and challenges in People's Republic of China

2.1.1.1 Ecosystem description

eHealth ecosystem is shown in **Figure 2**. This figure points out some key roles and demonstrates their typical contributions for eHealth system.

Figure 2: Ecosystem of eHealth



eHealth end point provider manufactures and provides eHealth sensors and eHealth actuators. eHealth sensors and actuators have to cope with severe limitations on e.g. form factor and battery consumption because of their impact on human body.[18]

eHealth device provider manufactures and provides eHealth devices which can be categorized into terminals and gateways. Their functions are quite similar. The main difference between eHealth terminals and eHealth gateways is that a gateway usually acts as an anchor between short range networks and wide area networks, while a terminal directly connects with a wide area network. Some eHealth devices belong to medical devices which must be compliance with medical device rules.

Network provider provides commercial networks that provide connectivity for transporting eHealth data. Furthermore, eHealth special enhancements upon networks are become more attractive to

[18] Contribution Ms Jia XueQin, China Unicom for the Ministry of Industry and Information Technology (MIIT), People's Republic of China.

cater new requirements, such as alarm messages always need to be delivered securely and quickly, location-tracking needs to be supported, etc.

Platform provider delivers platform which is based on a set of capabilities in the form of software modules that are offered to the eHealth applications (eHealth applications can be deployed in eHealth devices and eHealth application servers) in order to accelerate their development, test, and deployment. Some examples of these modules are eHealth device management, conversion and storage of monitoring data so on.

eHealth service providers offer eHealth services to end users. Based on eHealth application server, eHealth service providers mainly responsible for the daily operations of the eHealth service and are responsible for user assistance and billing, if applicable.

End users are recipients of eHealth services, often labelled by their insurance status: e.g., insured or uninsured, privately or publicly insured etc. for the purposes of financial case management and clinical case management.

To be noted, some special roles may also belong to eHealth ecosystem, such as Regulators, Insurance providers, etc.

2.1.1.2 Representative use cases for the eHealth

According to different regulation requirements, eHealth can be classified into two types: healthcare service and medical care service.

2.1.1.2.1 Use case 1: healthcare service

Figure 3: eHealth monitoring service of eHealth

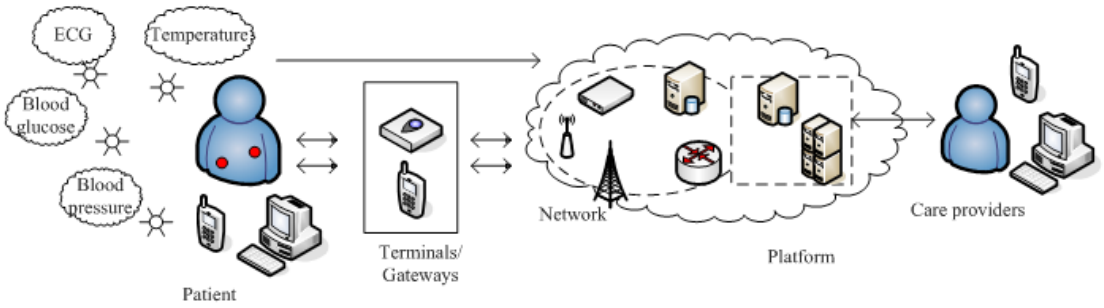


Figure 3 illustrates an eHealth monitoring service as a kind of typical healthcare service of eHealth.

1) As shown in **Figure 3**, a patient (i.e., the end user) can obtain his biological signs (e.g., electrocardiogram, temperature, blood glucose, blood pressure) through body-embedded sensor devices, wearable sensor devices, or sensor devices around him. Besides, motion information (e.g., walking, running, fallen down) of the user and other context information (e.g., monitoring time, position) may also be gathered by related devices.

2) Gathered information will be uploaded to an eHealth platform, via hand set which direct connects with the public network or via wireless eHealth gateways which are between the public network and the patient environment. EHealth end points (e.g., Electro Cardio Gram, temperature, blood glucose, blood pressure) connect with eHealth gateway through short-range wireless network (Bluetooth, Zigbee, etc.).

3) An eHealth platform is responsible for data processing, addressing fragmentation of various Health Information systems, providing effective devices management and other service support functions (e.g., authentication, traffic control, and B2B administration). This platform can be provided by a network operator or a 3rd platform provider.

4) EHealth service providers, e.g., care providers (e.g., clinicians, healthcare assistants, family members and fitness coaches) can have access to personal data of monitored patient via web/PC/hand set and provide feedback about the patient's health situation.

5) The patient himself can also access his personal data and review his feedbacks via web/PC/hand set.

2.1.1.2.2 Use case 2: medical care service of eHealth

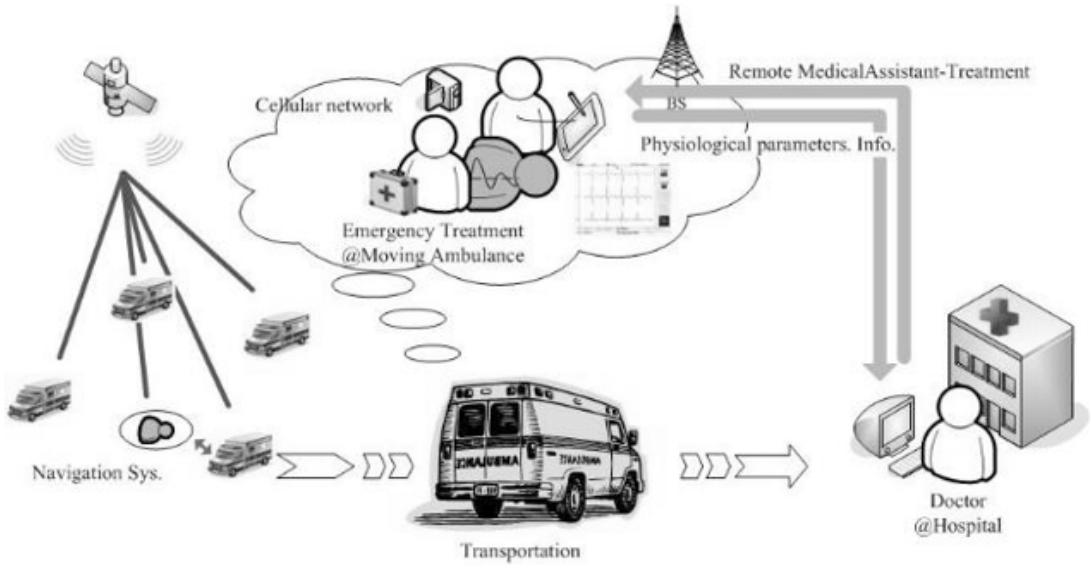
Figure 4 illustrates a pre-hospital emergency medical service as a kind of typical medical care service of eHealth. Pre-hospital Emergency Medical Service (PEMS) can be understood as an emergency medical treatment for patients injured by accidents or life-threatening disease from the onsite location to hospital; it can reduce the time and allay the costs of patient transportation significantly.

1) In **Figure 4**, ambulances install navigation system with positioning system, e.g., GPS, and wireless communication network, e.g., GPRS are presented. By GPS satellite positioning system, emergency medical service center can know the locations of available ambulances and quickly send an ambulance which is the most nearby. At the same time, the navigation system can also show to the ambulance team the most effective path to the hospital.

2) After the patient is moved to the ambulance, the emergency medical doctor on board can give an instant treatment according to the patients' physiological signals, such as ECG, heart rate, oxygen saturation, blood pressure, respiratory rate etc. Despite unstable environment of the moving ambulance, the physiological signal can be transmitted to hospital in a guaranteed manner so that the doctor in the hospital can obtain the high quality vital signals then based on these signal give significant direction to doctors on board or prepare necessary facilities in advance before the ambulance arrive.

3) Instant-treatment on board makes possible for patients in ambulance needing special medical care to have face-to-face consultations with specialists who stay in hospital or another far away medical institution.

Figure 4: Pre-hospital emergency medical service



2.1.1.3 Challenges

Challenge 1: To support confidentiality protection. Whenever patient information is exchanged, stored, or processed, the confidentiality of the data must be enforced and safeguarded by the roles of eHealth ecosystem. Exchanges of data between the roles of eHealth ecosystem must be performed in a way that prohibits any unwanted disclosure of data, e.g. to any third party.

Challenge 2: Interoperability of heterogeneous systems. Unless eHealth applications become fully-standardized, interoperability will be a big concern for roles of eHealth ecosystem, which may use different data models, APIs and confidentiality protection mechanisms etc.

Challenge 3: Regulation impacts the growth of the eHealth market, especially medical care related market. Due to light regulation and urgent market needs (e.g. smart living for the elders and so on), healthcare related market is bloom in these years. While due to strong regulation and autonomy of hospitals, medical care related market is hard for standardization to reach interoperability.

2.2 eHealth standardization

2.2.1 Towards eHealth standardization

[19]eHealth standardization is another extremely complex question and is one of the main obstacle hindering the implamantations of eHealth. It concerns both developed and developing countries.

In spite of huge amount of money and manpower spent in this field, the result is rather poor particularly for the interest of developing countries. They require special attention to meet their needs taking into account the condition of their fixed and mobile networks. ICT solutions for health and eHealth services, including mHealth as well, have been developed a lot, particularly in the last decade. However, the solutions are still much too often isolated islands of small-scale applications that are unable to communicate with other health systems and/or share information across geographies and technologies.

Barriers to scaling-up small systems in developing countries prevent supporting a larger patients and care providers base. Decision makers are not necessarily able to assess the actual health situation, which in turn inhibits comprehensive planning, response and policy formulation.

ITU's Standardization Sector coordinates the technical standardization of multimedia systems and capabilities for eHealth applications. The Sector has released a Technology Watch Report (www.itu.int/en/ITU-T/techwatch/Pages/ehealth-standards.aspx) that looks to the future of eHealth. The report observes that eHealth development will require more universal eHealth interoperability standards, and strategies to overcome technical infrastructure barriers and address privacy, security, and other legal requirements. There are many generic standards used in eHealth applications for video coding, security, multimedia transmission, and languages for instance. And many of those have been developed by ITU-T. These and other issues are being addressed by experts within ITU-T Study Groups 15, 16 and 17 (Security), the Focus Group on M2M Service Layer (http://www.itu.int/en/ITU-T/focusgroups/m2m/Pages/default.aspx) as well as within other external standardization bodies. International Standards for eHealth need to be based on already existing "mature and stable technologies" rather than only on future advanced technologies.

The ITU Plenipotentiary Conference 2010 in Guadalajara, Mexico adopted a new Resolution 183 on "Telecommunication/ICT applications for e-Health" calling ITU to give priority consideration to the expansion of Telecommunication/ICT initiatives for eHealth and to coordinate eHealth-related activities between the Standardization, Development and Radiocommunications sectors and, in particular, to promote awareness, mainstreaming and capacity building in the creation of telecommunication/ICT eHealth standards, reporting findings to the Council as appropriate". In addition to the Resolution 183, approved "Strategic Plan for the Union for 2012-2015" where one of the strategic objectives for ITU-T is "Bridging the standardization gap: to provide support and assistance to developing countries in bridging the standardization gap in relation to standardization matters, information and communication network infrastructure and applications, and relevant training materials for capacity building,

[19] Contribution: L. Androuchko[1], M. Jordanova[2,], I. Nakajima[3], [1]International University in Geneva, Dominic Foundation, Switzerland, Vice-Rapporteur for Question 2/2; [3]Space Research Institute, Bulgarian Academy of Sciences, Bulgaria, Vice-Rapporteur for Question 2/2, [3]Tokai University, School of Medicine, Japan, Rapporteur for Q2/2.

taking into account the characteristics of the telecommunication environment of the developing countries". It is exactly concern eHealth technical standards to be appropriate for existing network in developing countries.

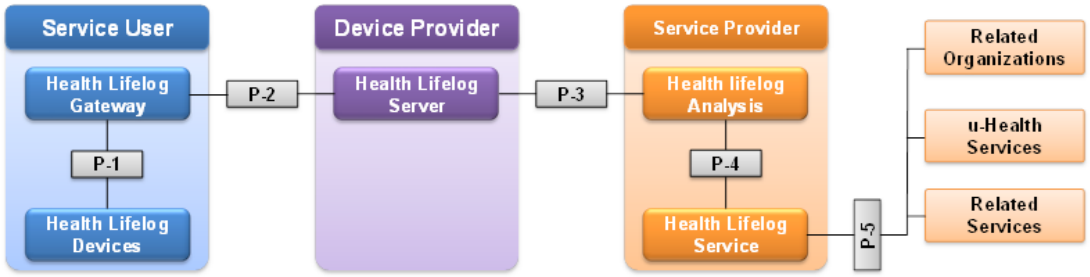
The World Telecommunication Development Conference in Hyderabad, 2010 also approved Resolution 65 on "Improving access to healthcare services by using information and communication technologies", where it was stated "…to continue to promote the development of telecommunication standards for eHealth network solutions and interconnection with medical devices in the environment of developing countries, in conjunction with ITU-T and ITU-R in particular".

The resolutions, as those cited above, are just outlines. The work on eHealth standards never stopss. The following case study demonstrate the Korean experience in eHealth Standards. Four standards are summarized below: (1) Health Lifelog Service Reference Model for Personal Health Management; (2) Information Security Reference Model for Health Lifelog Service; (3) CCR Based Personal Health Record Exchanging Model – Part 1: Definition and Structure; (4) Korean Medicine Personal Health Record Exchanging Model – Part 1: Definition and Structure.

2.2.2 Health Lifelog Service Reference Model for Personal Health Management

[20]The purpose of this standard[21] is to define the "Health Lifelog Service Reference Model for the Personal Health Management". Using this reference model, consistent applications and interoperability in the development of a health lifelog service becomes possible. This standard describes a health lifelog service reference model. This model consists of a health lifelog user, a device supplier, and a service provider. Each of the components has a data processing unit and a communication protocol. This document also describes functional requirements and constraints of the lifelog service. Creating a health lifelog service reference model can help to minimize the confusion which may occur in developing a health lifelog service. This standard can help the development of an interoperable system with a common service infrastructure and a standard architecture for each component.

Figure 5: Health Lifelog Service reference model for personal health management



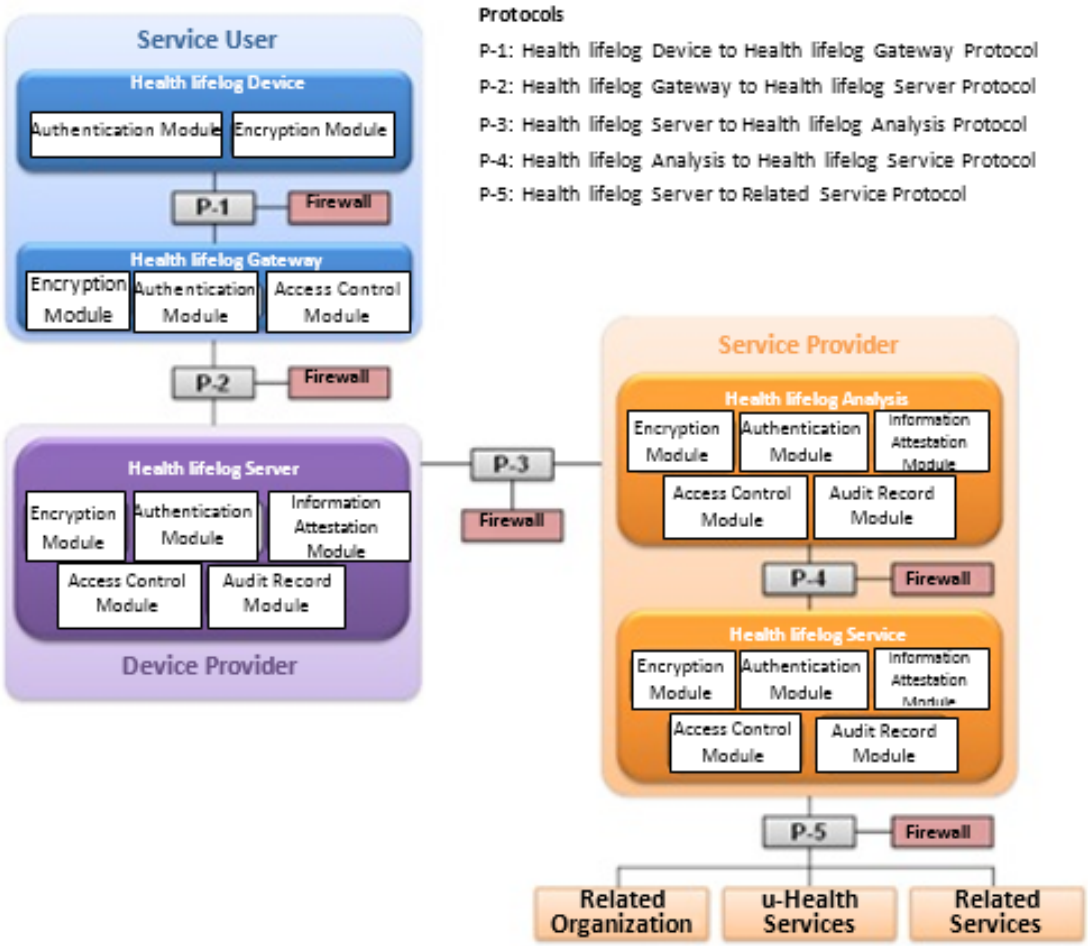
Protocole:
P-1 : Health lifelog Device to Health lifelog Gateway Protocol
P-2 : Health lifelog Gateway to Health lifelog Server Protocol
P-3 : Health lifelog Server to Health lifelog Analysis Protocol
P-4 : Health lifelog Analysis to Health lifelog Service Protocol
P-5 : Health lifelog Server to Related Service Protocol

[20] Document 2/233, "Development of e-health standards in Korea: Year 2014", Republic of Korea.
[21] TTAK.KO-10.0749, "Health Lifelog Service Reference Model for Personal Health Management", Telecommunications Technology Association (TTA), Korea, December 2014.

2.2.3 Information Security Reference Model for Health Lifelog Service

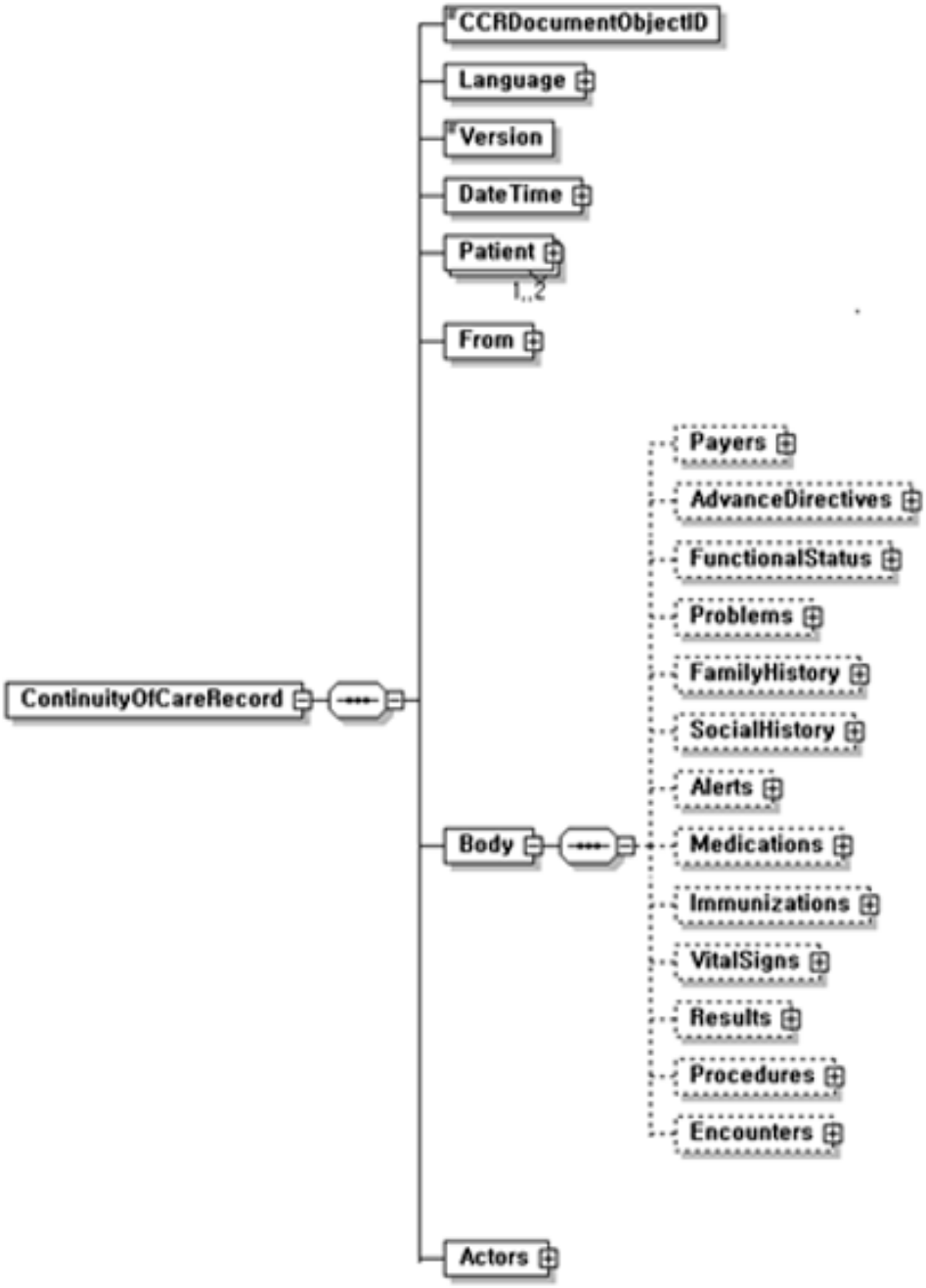
In this standard,[22] "Information Security Reference Model for Health Lifelog Service" is proposed for the healthcare services using lifelog. To provide personalized medical and healthcare service, this standard defines the security requirements and a reference model which reflects actual considerations of the security requirements. For introduction of the information security reference model for healthcare service using lifelog, this standard defines terminologies, describes security requirements in a health lifelog service and the reference model which provides the actual considerations of the security requirements. With the advent of smartphone cameras and popular cloud services in recent years, the paradigm of life logging has been extended to mobile and wearable devices. Studies on lifelog are vigorously progressing to utilize big data, which help record and store all the precious details of daily life through its companion lifelog application. Healthcare services using lifelog are expected to contribute to the emergence of a new medical service market and to help lead the health ICT market. Lifelogs might benefit health or improve medical practice. For example, the ability to measure the patient's behaviours could lead to better diagnoses, improved therapies and beneficial lifestyle changes. The vast amount of information collected from subjects could be used to improve medical studies. Scientists and companies all over the world are focused on the unlimited possibilities and potentialities of lifelog technology and thereby working hard to develop user-specific healthcare services using personal lifelog data. This standard can contribute to the growth of the related industries and creation of new markets by suggesting the publication of clear guidelines applying a privacy protection reference model for user-specific healthcare services, which uses personal lifelog data.

Figure 6: Information security reference model for Health Lifelog Service



[22] TTAK.KO-10.0750, "Information Security Reference Model for Health Lifelog Service", TTA, Korea, December 2014.

Figure 7: Structure for the CCR



2.2.4 CCR based Personal Health Record Exchanging Model

The purpose of this standard[23] is to define CCR[24] based Personal Health Record Exchanging Model so that the consistent application of standard and interoperability become possible in exchanging personal health records. In this standard, the basic principles and structure of the CCR based "Personal Health Record Exchanging Model" are defined and the related components, rules for data description, and requirements to complete a standard based model are described. In addition, detailed examples of each component are described. This standard will contribute to minimizing the confusion which

[23] TTAK.OT-10.0366, "CCR Based Personal Health Record Exchanging Model – Part 1: Definition and Structure", TTA, Korea, December 2014.

[24] ASTM E2369-05, "Standard Specification for Continuity of Care Record (CCR)", 2006.

may occur in exchanging personal health records (PHR) generated from healthcare institutions with diverse structures, and to speed up the development of related technologies such as metadata and high usability of PHR. In addition, through compatibility with the established PHR exchanging model, it is expected to contribute significantly to expanding related industries.

2.2.5 Korean Medicine Personal Health Record Exchanging Model

The purpose of this standard[25], "Korean Medicine Personal Health Record Exchanging Model" is to present an exchange model for the various types of Korean medicine (K-medicine) personal health records (PHR), collaborated treatments, and integrated medicine in eHealth services, and to develop safe and meaningful eHealth services including K-medicine personal healthcare service, which could be widely served in Korea. For the introduction of the Korean Medicine Personal Health Record Exchanging Model for e-Health service, this standard defines terminologies, describes interoperability in eHealth services and reflects the actual considerations. The scale of eHealth services is very huge and complicated, including a wide range of stakeholders such as the government, hospitals, telcos, service providers and manufactures. To create synergies and to facilitate communication among these stakeholders, standards are essential. Furthermore, when K-medicine hospitals, K-medicine clinics, and K-medicine healthcare devices are included, more various services can be provided. However, this requires different services and information processing in accordance with the source of information to share data and to communicate. In this regard, standards can be helpful in communicating and increasing efficiency of healthcare services. More specifically, this would bring about several advantages including: (1) cheaper, better and consistent services for patients, and (2) opportunities to provide more efficient, cheaper, and customized services for suppliers.

2.3 Quality standards of eHealth services

While discussing standards, it is essential to distinguish between technical standards and standards for healthcare service delivery, i.e. quality standards.[26] The successful development of eHealth services necessitate as high level of trust among healthcare staff, service providers, service users and careers. The need for such trust has repeatedly been called for at both national and international levels.

One of the solutions is the development of a comprehensive Code of Practice for eHealth Services, which is a long running task as such Code has to provide a benchmark standard for services that will assist both service providers and users and, in so doing, will support national and cross-border initiatives to overcome the barriers to effective development of eHealth services.

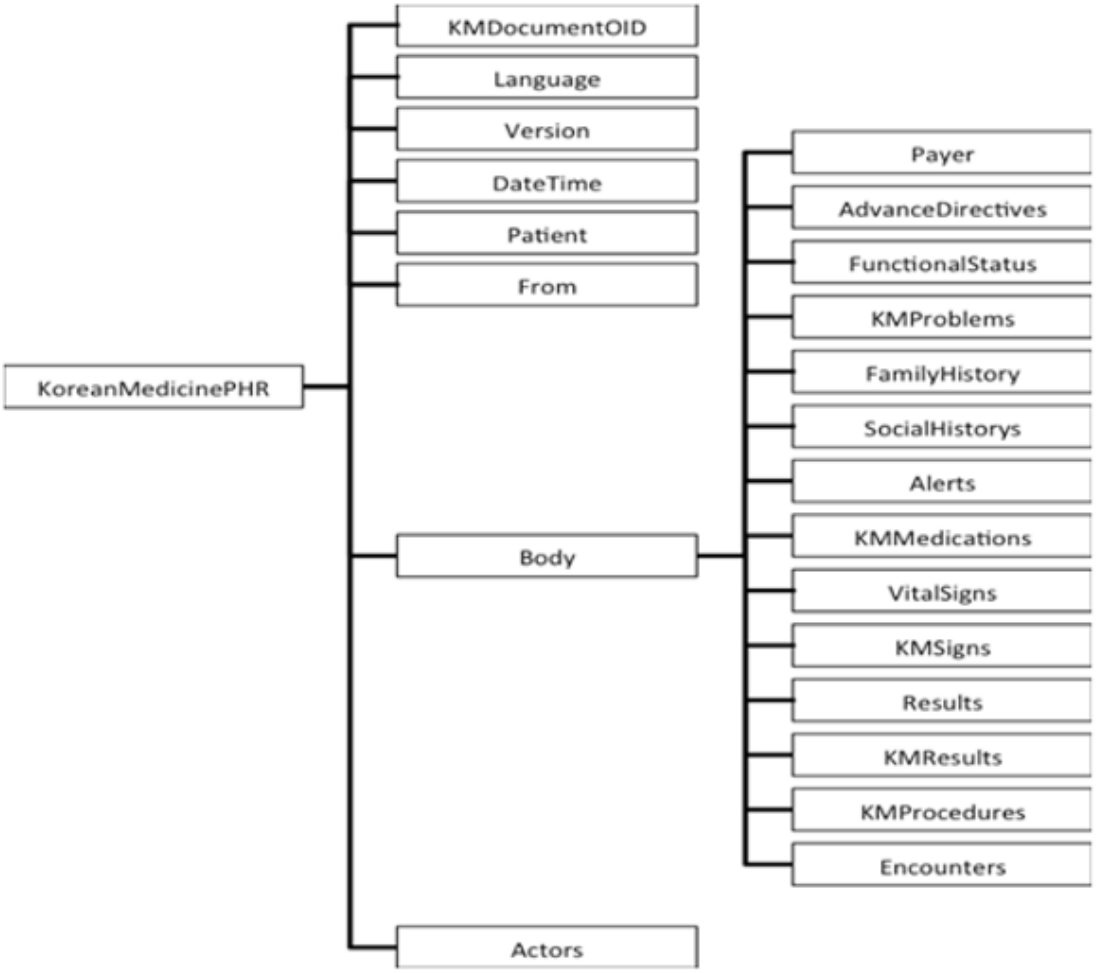
One of the first attempts to create and introduce such Code was executed by Telecare Services Association (TSA). TSA is the largest industry specific network in Europe. TSA is a not-for-profit organization. Its members are over 340 organizations predominantly from the United Kingdom and from Europe. TSA members are local authorities, registered social landlords, health & private sector care service providers, private sector technology suppliers, telecoms and infrastructure providers supporting ~1.7 million telecare and telehealth service users mainly in the UK.TSA has developed two Codes:

Telecare Code of Practice (COP) is the first and is inspired by the wide development of the telecare industry in UK. This industry interacts and impacts directly with individuals who may be vulnerable, elderly or suffering from a long term condition. As the need for stringent standards becomes imperative in order to provide reassurance not only for the individual in receipt of the service, as well as their families and careers, but also to those who commission these services, TSA dedicated time and efforts to develop COP. The latter is a result of the widest stakeholder consultation exercise including government departments in England and the administrations of Scotland, Wales and Northern

[25] TTAK.OT-10.0365, "Korean Medicine Personal Health Record Exchanging Model- Part 1: Definition and Structure", TTA, Korea, December 2014.

[26] Contribution: Dr Malina Jordanova, Space Research Institute, Bulgarian Academy of Sciences, Bulgaria, Vice-Rapporteur for Question 2/2.

Figure 8: Structure for the Korean Medicine Personal Health Record Exchanging Model



Ireland. COP is structured in a modular framework with each Process Module relating to the different components of a telecare service.

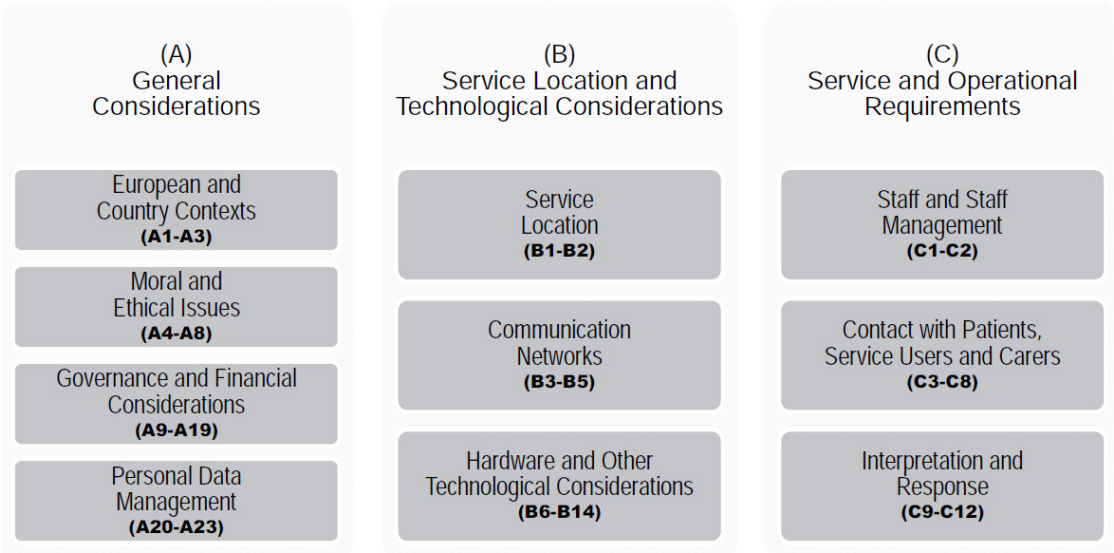
Telehealth Code of Practice is the second Code developed by TSA and its development was made a business priority for 2011. TSA brought together members of its Telehealth Forum – made up of leading policy and opinion makers, technology and service providers, and other interested parties – to help determine the scope of a tender specification. The group recognized that while there were distinct service standards applicable only to telecare or telehealth, there was also a considerable amount of commonality across both. The conclusion was the need for a fully integrated Telecare and Telehealth Code of Practice (COP), but with elements that recognized the specific requirements of either telecare or telehealth.

More information about TSA Codes is available at http://www.telecare.org.uk/standards/telecare-code-of-practice.

The European Union also has its Telehealth Services Code of Practice. It was developed by a consortium of 13 partners from seven (7) European Member States and the work was funded under the European Commission (EC) Programme of Community Action in the Field of Health (EAHC Contract No: 2009 11 11). The *Telehealth Services Code of Practice for Europe* provides a benchmark standard for services that assists both service providers and users and, in so doing, supports EU initiatives that endeavor to build trust in and overcome the barriers to effective development of telehealth services in all EU member states.

A draft of the European Code of Practice for Telehealth Services is available for free at http://telehealthcode.eu/project/documents.html. The approach taken within the Code can be clearly seen to reflect a view that telehealth services can and should help to meet the needs of people of all ages – both with regard to aspects of their clinical health and broader well-being. The critical areas set out in the draft Code are shown in **Figure 9**. The Code provides a welcome framework to guide telehealth service providers in all 27 member states of the European Union and a potential basis by which telehealth services to be able to be certified and/or regulated.

Figure 9: Areas that the European Code of Practice for Telehealth Services addressed



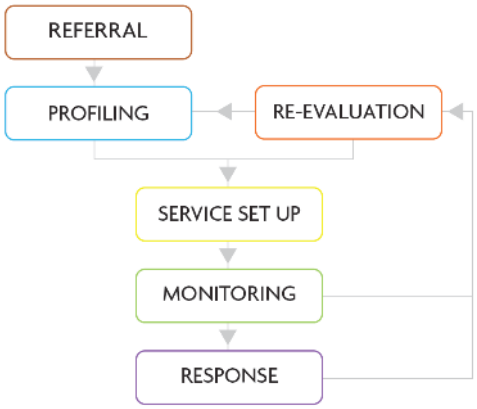
2.3.1 eHealth codes of practice for developing countries

Development of eHealth code, applicable to developing countries, will not be an easy task as it has not only to ensure trust and confidence in the wide implementation and use of eHealth services but it must also reflect the local traditions, cultural and religious aspects. Having this in mind, a possible solution may be the outline of the main principles that such Code has to be based on. As an example the referral-to-response model adopted by TSA in the preparation of the COP may be applied (**Figure 10**[27]). Of course, the areas covered by the European Telehealth Code of Practice[28] must also be included. Once such principles are outline, each country may easily adapt the Code having in mind national eHealth infrastructure, services and needs.

[27] TSA Telecare Code of Practice, http://www.telecare.org.uk/sites/default/files/file-directory/Secure_COP_Documents/Telecare%20Code%20of%20Practice%20Executive%20Summary.pdf.

[28] Rudel D., Jenko T., Fisk M., Rose R. Telescope – Telehealth Services Code of Practice for Europe, Infor Med Slov: 2012; 17(1): 38-44).

Figure 10: Referral response model of TSA



2.3.2 m-Powering Development Initiative

The worldwide spread of the mobile phones and networks is the backbone of the digital world. Over 7 billion mobile subscriptions as per 2016 are active worldwide and are helping people communicate every day. The growth and richness of mobile technology is a fantastic tool that can empower citizens as it improves the access to high quality, affordable healthcare at anytime and anywhere.

m-Powering Development Initiative was developed in 2012 by the ITU Telecommunication Development Bureau (BDT). It is designed to encourage and facilitate the large expansion in mobile communications use to address inequalities and stimulate economic and social development, especially in those communities around the world who lack access to services of all kinds. ITU is calling on partners and stakeholders everywhere to come together and work together to create new services for the benefit of everyone, particularly the most disadvantaged. The support of healthcare is only one aspect of this initiative, yet all countries may benefit from it. The Telecommunication Development Bureau is coordinating the Initiative with an Advisory Board of senior experts drawn from the public and private sectors.The m-Powering Development Initiative is designed to create a resource and an action plan to deploy ICT services, from m-Health, m-Learning, m-Governance to m-Commerce and m-Sport. In doing so, it can cut costs and reshape, for the better, public service delivery for many millions of individuals, particularly those living in in remote or rural areas of the world. The m-Powering Development Initiative has already identified many particular approaches and real-life examples from around the world that could prospectively be adopted elsewhere.

The Initiative is now well underway, having produced its first resources, such as the m-Powering Development Initiative Reports 2015 and 2016, and the high-level Policy Dialogue on Digital Health that was held in Geneva, Switzerland, in May 2016 (http://www.itu.int/en/ITU-D/Initiatives/m-Powering/Pages/DigitalHealth.aspx). The latter brought together Ministers of Telecommunication/ICT and Ministers of Health to exchange views on how policies and cross-sectoral collaboration between the two sectors can foster innovation to improve the quality, equity and accessibility of health services in support of the timely attainment of the Sustainable Development Goal (SDG) for "Healthy Lives and Wellbeing for All (SDG3)". Stakeholders from the private sector and Non-Governmental Organizations in both health and telecommunication/ICT fields also took part. The m-Powering Development Initiative has already identified number of mHealth / eHealth initiatives in the prevention, diagnosis and treatment of illness.

Question 2/2 is also actively contributing to the field of mHealth. Examples of ready to be implemented services as well as evidence based studies are included in **Annex 7**, demonstrating that even 2G services with basic two-way text (SMS) messaging can provide valuable patient information and

advice services in the infant care, maternity control, etc. Other widely developed initiatives, also listed in the table, include:

- Affordable teleconsultation systems and diagnosis support;
- E-Learning programs;
- Specific initiatives such as smoking cessation programs (see **Annex 4**);
- Disease outbreak notification systems using mobile networks, etc., just to list some.

Road ahead: The m-Powering Development Initiative suggests that several strategies such as encouraging wide advertisement of evidence-based practices; employing a systems approach for the bigger picture, active involvement of governments, ministries, and regulatory agencies, etc., could help. The Initiative pays special attention to the potential of the mobile devices to contribute significantly to medical education and e-learning globally as well as on the facilitating of healthy lifestyle and wellness.

2.3.3 Conclusions

This chapter outlined some basic problems that have to be taken into account while planning or introducing eHealth services such as eHealth ecosystems and technical and service standards. In the limited space of this report it is not possible to discuss all problems but at least one more has to be mentioned, i.e. the approach to eHealth implementation. This issue is not missed by the research of Question 2/2 and will be outlined in **Chapter 3**.

3 CHAPTER 3 – Lessons learned from developing countries

This chapter summarizes the lessons learned from Question 2/2 activities. It also provides some examples of successful, highly beneficial for developing countries initiatives. Due to the limited space, readers are highly recommended to pay attention to the annexes that provide additional information and list some countries' experiences.

The following lessons were formulated to assist healthcare policy and decision makers from developing countries:[29]

General lessons

Lesson 1: Terminology – the need for adoption of standardized terminology is evident

Even in the Question 2/2 contributions different terms for one and the same service are used. The application of standard terminology will support coherent and consistent communication and documentation across all parties involved in eHealth services.

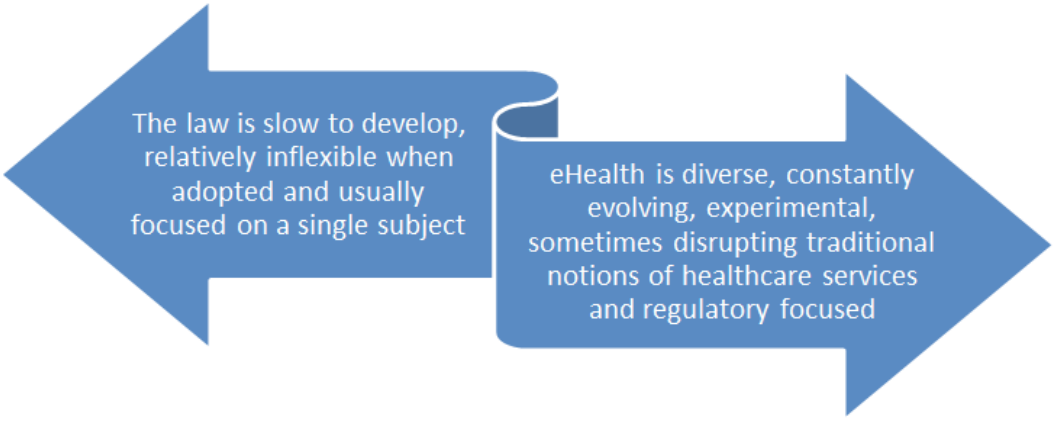
Lesson 2: Networking and exchange of information at all possible levels – local, national, global, is a basement for successful eHealth adoption

Do not reinvent the wheel! There is a lot of expertise and information, successful stories and failures available and there are people to learn from. Exchange of knowledge is important for effective implementation of eHealth.

Lesson 3: Development of sustainable eHealth policy

Adaption of national laws to the modern way of working is a long lasting task. The reasons why such adaption is needed is illustrated in **Figure 11**.

Figure 11: Necessary adaption of national laws to the modern way of working



Local and national decision and policy makers have to pay more attention to long-lasting policy solutions and avoid solving issues just for the moment. Special attention has to be paid on:

– Inadequate funding and lack of ICT skills at all levels of healthcare system. A basic start is to adapt the medical students' curricula to the new realities, including more courses about ICT,

[29] Contribution: L. Androuchko[1], M. Jordanova[2], I. Nakajima[3], [1]International University in Geneva, Dominic Foundation, Switzerland, Vice-Rapporteur, Question 2/2; [2]Space Research Institute, Bulgarian Academy of Sciences, Bulgaria, Vice-Rapporteur for Question 2/2, [3]Tokai University, School of Medicine, Japan, Rapporteur for Question 2/2.

eHealth and telehealth. Special interest may be the open source solutions as a cost effective software applications;

- Finding satisfactory local billing and reimbursement solutions as without such stimuli the wide and sustainable eHealth services cannot exist;
- Licensure and Scope of Practice (Standard of Care) must also be widely discussed and taken care of;
- One of the main roles of the authorities is to define the policy frame of eHealth implementation and development ahead in time.

Lesson 4: Strong governmental involvement through national eHealth master plan and/or application of ITU-WHO National eHealth Strategy Toolkit is another prerequisite for success

In addition, never forget that healthcare is a local issue, i.e. the delivery will always take place in a local or regional setting, and i.e. the local authorities have the crucial role for eHealth promotion. In addition: smaller (local) administrative units can respond quicker and with greater flexibility to the healthcare demands of their citizens. This will ensure that the eHealth services, that are implemented, are responding directly to citizens' needs. Regional authorities may also, with ease (as compared to national administration), facilitate the early involvement of healthcare stakeholders as well as all interested parties, in the planning and development stages of eHealth implementation.

Organizational lessons

Lesson 5: Selecting the right approach, involving local policy makers and coordination are vital for success of eHealth adoption

Lesson 5.1: Selecting the correct approach in eHealth implementation is essential.

Two different approaches are implemented: the first is a 'top-down' approach which focuses on developing policy, procedures, regulations and guidelines to aid decision-makers. The second is a 'bottom-up' approach, which begins with those who are most affected by the issues and attempts to inductively develop consensus, recommendations and policy. Choosing the one and neglecting the other is not the best strategy.

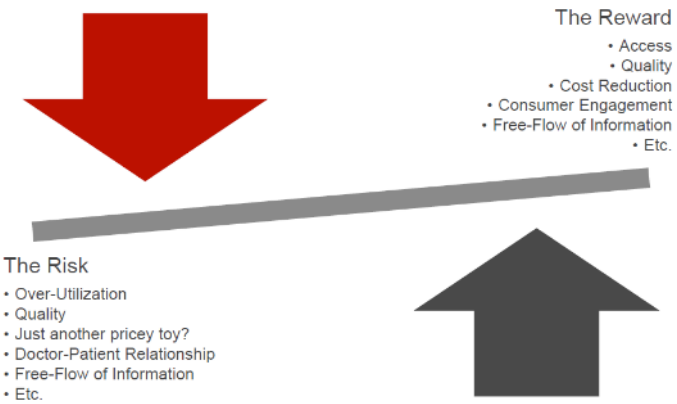
Let's not forget: It's not all government's work! The top down approach has its benefits, but the same refers to the bottom up approach. Finding the balance is the beneficial strategy. The balanced policy is a responsibility of local authorities. The practice revealed that policy makers at developing countries at any level, incl. regional and local levels, can act to enable, promote and support eHealth deployment but always have to balance this support.

The need for policy balancing act is illustrated at **Figure 12**.[30] The balanced top-down policy support will contribute to making healthcare more sustainable by wide application of eHealth that in turn will:

- Provide alternative ways of delivering healthcare;
- Ensure better and more equitable access;
- Use existing resources more efficiently and effectively.

[30] Struck K. et al. Telehealth: Implementation Challenges in an Evolving Dynamic, http://www.mwe.com/files/Uploads/Documents/Events/Digital-Health-Webinar-Series-Telehealth-041415.pdf.

Figure 12: The policy balance after



Lesson 5.2: The selection of the technology – hard and software; the available network bandwidth; choosing mobile and and/or wireless techniques – these are significant challenges and the right decisions may pre-define the success or the failure of the eHealth implementation.

Lesson 5.3: Paying special attention to the early impact – services that have an immediate impact on users are vital.

Lesson 5.4: Management and support are essential to move from the pilot stage to wide implementation of eHealth services. Both may come from local or national authorities.

Lesson 5.5: Public-private partnerships may also be extremely successful (Example. India Himalayas see table "Compendium of ready to implement eHealth services" in this report).

Privacy, security, standards

Lesson 6: Development of eHealth policy and application of standards is a must

Access to a secure communication infrastructure, standards and privacy and security of data and services are important but standards and legal documents take a long time to be developed. Yet, the usage of standards is mandatory as this will ensure interoperability in a later stage of eHealth implementation. The role of the government in developing policies and application of standards is inevitable.

Concerning standards – technical or for the high quality of the services – no need to re-invent the wheel. Learning from the others will save time, efforts, money.

The rest of this chapter presents brief information about working models of eHealth services already developed and implemented (or in process of implementation) in some developing countries.

3.1 Development and installation of telemedicine mobile station in areas hit by catastrophes in Argentina

Access to healthcare is a major human right, and it is an undeniable responsibility of the states and societies to ensure it to the community, in order to achieve and preserve its wellbeing[31,32,33]. However, inequality in access to health standards is still a hallmark feature of the Latin America and Caribbean

[31] Natacha Dinsmann, Universidad Nacional de Rosario, Facultad de Ciencias Médicas, Argentine Republic.

[32] United Nations General Assembly: Universal Declaration of Human Rights, Resolution 217 A (III). Paris, December 10, 1948.

[33] Organization of American States, Inter-American Telecommunications Commission (CITEL): La Telesalud en las Américas: Unión Internacional de Telecomunicaciones, (2003).

countries, as well as many other developing countries around the world[34]. There is an urgent need for developing tools that will allow the implementation of health policies which enable efficient high-quality medical care for geographically and socioeconomically isolated populations[35].

The development of the enterprise, here presented, was triggered by the natural disasters which devastated America during the first half of 2010,[36,37] such as earthquakes in Haiti and Chile, landslips in regions of Bolivia and Rio de Janeiro in Brazil, overflowing rivers in Machu Picchu in Peru and northern Argentina, floods and landslides in Guatemala, El Salvador and Honduras, and hurricanes which hit the Caribbean repetitively. All these catastrophes unraveled the fragility of medical assistance schemes not only when communication is impeded or denied but also when healthcare needs to reach isolated regions.

Another inspiration was the work and thinking exposed by Prof. Marcelo Petrich (first chairman of Era Digital Foundation)[38] in the book Telehealth in the Americas: "It is the aspiration of all those who participated in this project that this publication will make a positive contribution to the development of telehealth in the Americas, consolidating the commitment to a reform of the health sector based on solidarity".[37] This allows us to analyze the level of evolution reached by these technologies in our regions, as well as understanding the strength the ITU gave to these solutions.

But beyond these unpredictable, although expected circumstances, the ultimate goal in the development of new technologies should be reducing inequities in access to certified healthcare, which are made evident by the reality these countries live daily. Telehealth contributes to reduce the digital divide.

3.1.1 Objectives

In order to develop a transportable telemedicine base to be employed both in situations of natural disasters and to facilitate specialized medical care in distant geographical areas this device should meet the following requirements:

- Connectivity anywhere and under any circumstances;
- Portability for any land, air or river environment;
- Autonomous energy supply;
- Versatility in the composition of medical peripherals appropriate to each situation;
- Sustainability in scientific-academic medical specialties consulting staff;
- Adaptability to local health policies and regional economic reality;
- Cost-saving implementation.

3.1.2 Project design

The planning agenda included the creation of a collaborative consortium between national universities, NGOs and private companies, under the auspices of international organizations, which addressed the different aspects of construction, operation and connectivity of the telemedicine mobile station

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[34] Pan American Health Organization; Buenos Aires Declaration: Towards a health strategy for equity, based on primary health care. Buenos Aires, August 17, 2007.

[35] Economic Commission for Latin America and the Caribbean: Proposed regional agenda on population and development for Latin America and the Caribbean beyond 2014. International Conference on Population and Development Beyond 2014. Montevideo, August 13, 2013.

[36] Fernandez A, Oviedo E.: United Nations publication LC/L.3252: eHealth in Latin America and the Caribbean: progress and challenges. United Nations, Santiago, Chile, July 2011.

[37] Guha-Sapir D, Vos F, Below R, Ponserre S: Annual Disaster Statistical Review 2010: The Numbers and Trends. Brussels: CRED; 2011. Available online at http://www.cred.be/sites/default/files/ADSR_2010.pdf.

[38] Collaborative agreement between Faculty of Medical Sciences and Digital Era Foundation.

and provided academic solutions as well. This work included in a successive way: (a) construction of agile, practical and transportable container box; (b) selection and adaptation of medical peripherals to be included; (c) development of information unit, software, and supporting systems; (d) selection of media and satellite connectivity protocols; (e) designation of academic professionals to provide remote specialized assistance; (f) testing the operability of equipment in extreme conditions; (g) presentation and demonstrations at scientific-technological national and international events and to the general public through dissemination media; (h) installation of the first prototype in an area of catastrophes where socio-health was in need.

3.1.3 Results

3.1.3.1 Collaborative consortium

The consortium consisted in agreements signed between the National University of Rosario, Faculty of Medical Sciences (FCM-UNR), the Digital Era Foundation and EXO S.A. The project had the support and sponsorship of the Telehealth Network of the Americas[39,40]of the Inter-American Telecommunication Commission of the Organization of American States (CITEL-OAS), and the Government of Argentina – Communication Secretariat and Ministry of Defense.

3.1.3.2 Development of the Mobile Telemedicine Station (ETMo)

In its latest version (Version 2.0 – WiP / December 2013) the mobile telemedicine station is composed of several modules which may be selected by the user for their actual incorporation to the container:

- Basic Telemedicine module: composed of a workstation with 14" monitor, Bluetooth keyboard and mouse, a communications router, a specific telemedicine software, wiring and integration;
- Cardio-Respiratory module: composed of vital signs monitor, blood pressure device, 12-lead electrocardiograph, digital spirometer and digital stethoscope;
- Imaging module: composed of a camera for visual surface exploration, portable ultrasound transducers, light table, and direct light microscope (optional);
- Medical Digital Peripherals: white light source, dermatoscope, ophthalmoscope, otoscope and laryngoscope;
- Power supply: deployable solar panels, batteries, electric generator;
- Satellite connection optional;
- Transportation Container: storage box for telemedicine equipment provided with wheels and convertible into desktop for working place.

All instruments, notebook and monitors that the box should carry as well as connection needs were considered for the container construction. Medical equipment selection took into consideration features of versatility, connectivity, compatibility, origin and cost. Efficiency, accessibility and affordability were prioritized, considering that the intention is that this telemedicine station can be used in remote locations and low-income regions (**Figure 12**).

3.1.3.3 Consulting staff

A group of encompassing experts from most disciplines and medical specialties, with recognized expertise in the diagnosis, management and treatment of different situations that could arise in

[39] Inter-American Telecommunication Commission. OAS: Resolution CCP1 Creation of the Telehealth Network of the Americas. Resolution PCC.I/RES.152 (XIV- 09).

[40] Inter-American Telecommunication Commission. OAS: Resolution CCP1 Denomination of the Telehealth Network of the Americas. Resolution PCC.I/DEC.133 (XIX-11).

the very different circumstances which may require these of ETMo, was selected from the list of Professors of the FCM-UNR and the Heads of the specialized services of hospitals that have regular contact with the University.[41]

3.1.3.4 System operability

To test the operation of the ETMo in extreme conditions, a group of physicians and technicians moved to the southernmost region of the world, transporting the container box with the telemedicine equipment by means of a regular flight to the city of Ushuaia, in Tierra del Fuego Province, Argentina with the support of the Communication Secretariat of Argentina. Upon arrival, the group and the equipment continued overland in multiple traction vehicles to Lapataia Bay, in wintertime conditions of several degrees below zero, where either no routes or nearby towns, neither power or Internet connectivity, were available (**Figure 13** and **Figure 14**).

Satellite multipoint connection was established with a base held in the city of Ushuaia, where representatives of CITEL and delegates from the Permanent Consultative Committee: Telecommunications/ICT (PCC.I) of different countries of the OAS[42] were gathered, as well as with the Situation Room of the Telehealth Network of the Americas, located at the FCM-UNR in the city of Rosario. During the test, images and audio could be transmitted using various medical peripherals on a simulated patient, receiving real time responses from the expert group and comments from the audience.

Figure 13: The first ETMo prototype set in Rosario, Argentina, in 2010

Figure 14: Test run of the ETMo in Lapataia Bay, Ushuaia, Tierra del Fuego, Argentina

[41] Designation of the staff of specialists and experts for second medical opinion program. Rosario, FCM, 2010.
[42] Inter-American Telecommunication Commission. OAS: Sixteenth CCP.I Meeting. Ushuaia, Argentina, 11-14 May 2010.

3.1.3.5 Presentation of equipment and dissemination of the initiative

The acknowledgment of this mobile telemedicine station was nationally and internationally widespread by graphic and audio-visual material issued by CITEL and its Telehealth Network of the Americas[43,44,45]. Due to the recent incorporation of the National University of Rosario to the ITU as an Academia Associate member, the presentation of this project to ITU-D, Study Group 2, has been planned with purposes of gaining recognition as the most suitable option available for use in developing countries.

3.1.3.6 Installation and commissioning of the first prototype

In early 2014, Argentine Defence Minister[46] witnessed the launch of a transportable telemedicine station in Port au Prince, Haiti (**Figure 15**). This equipment was specially designed to meet medical assistance necessities during natural disasters and extreme situations, enabling the request for second medical opinion to any centre in the world. The ETMo was donated to the Argentinian Re-locatable Hospital (HMR) by the Faculty of Medical Sciences of the National University of Rosario and the Digital Era Foundation. The HMR is the only second level medical facility in Haiti and it is fully operated by members of the Argentine armed forces integrating peacekeeping mission set by the United Nations since 2004 in the Caribbean country. Teleconferences between the Director of the HMR in Haiti and the second medical opinion staff from the FCM-UNR in Rosario formally started on March 2014[46].

In **Figure 15** the Argentinian Defence Minister, Agustí Rossi can be seen during the installation of ETMo in Port au Prince, Haiti, in 2014.

Figure 15: Installation of ETMo in Port au Prince, Haiti, in 2014

Figure 16: Cover of the "Telehealth in the Americas" publication developed by CITEL, with the support of ITU and the Panamerican Health Organization

43 Telam: Telemedicine transportable station. Telam Audiovisual 2010. Available online at: http://www.youtube.com/watch?v=lxsHzjdRGYg.

44 TN Ciencia: ETMo and Telemedicine. Available online at: http://www.youtube.com/watch?v=vrwn0W2qr0Q.

45 Aen: Mobile Telemedicine. Available online at: https://www.youtube.com/watch?v=06gB4zpt0w4.

46 Rossi A.: Debemos trabajar para que América Latina disminuya la desigualdad social. InfoNews, February 26th, 2014.

Figure 17: Interdisciplinary team of the National University of Rosario (Argentina)

3.1.3.7 Impact

The development, construction, transportation and installation of a mobile telemedicine station crafted in Latin America, stresses the relevance of joining efforts in the public and private sectors in order to achieve community transcendence objectives.

Figure 18 shows the interdisciplinary team of the National University of Rosario that developed the project. Professor Marcelo Petrich, showing the device to the former dean of FCM, Dr. Carlos Crisci, Current Dean of FCM, Dr. Miguel Farroni and Prof. Natacha Dinsmann, Director of the Informatics and Telehealth Area, with Haitian students who reside in Rosario when the ETMo was launched in Puerto Príncipe.

Figure 18: Interdisciplinary team of the National University of Rosario during ETMo launch in Puerto Príncipe

The initiative for the development of the device here presented rose as a response to the fragility shown by the healthcare system when confronting situations of the measure of natural disasters and catastrophes. Thus, the first ETMo, while ensuring portability, connectivity and energy supply, incorporated medical devices suitable solely for emergency situations.

However, the reality of Latin America and the Caribbean regarding geographic and socioeconomic conditions, which are common to many other developing countries worldwide, generates options for a wider usage of the mobile telemedicine station. This will undoubtedly lead to equitable access to high quality healthcare under any circumstances. This is the reason why the second ETMo prototype also incorporates a modular system that allows the adaptation of the equipment composition according to specific needs, both socio-economical and positional. In this way, the active incorporation of tele-medicine workstations to Primary Healthcare strategies will increase the chance of secondary level referrals, plus an actual reduction in costs due to the elimination of commutes to the hospital, both for physicians and patients, which also contribute in preventing central hospitals from overcrowding. Furthermore, the participation of local professionals and workers of the national industry enabled the development of this invaluable device at an affordable cost for developing countries, essential for the deployment of universal health policies.

3.1.3.8 Perspectives

The speed of progress in various areas of medical technology, informatics and telecommunications creates the necessity to continue this collaborative project incorporating those advances in order to improve the performance and adaptability of the ETMo to future scenarios.

Finally, this equipment is not an isolated commercial product but a fully integrated system which works linked to an academic medical staff. There is an urgent need to organize Schools of Medicine and University Hospitals in Latin America, and in many other developing countries, to provide a comprehensive educational and research network in order to assist doctors who are not near urban centers. The ETMo might be a suitable tool for achieving this goal.

3.2 Ambulatory telemedicine and Article 44 of the Emergency life-saving technician's Act and Article 20 of the Medical Practitioner's Act in Japan

3.2.1 Purpose

A case study from Japan takes various legal approaches in analysing the current risk of providing medical counsel to emergency vehicles and in discussing an implicit issue: how to implement such medical counsel under Article 21 of the Basic Act on Establishing a Networked Society Based on Advanced Information and Telecommunications.[47]

3.2.2 Background

If an AED incorporating artificial intelligence determines that an electrocardiogram has gone from flat to ventricular fibrillation for a successfully resuscitated patient, an electric shock is administered to the patient's chest. However, in certain cases, patients defibrillated in an ambulance will complain of pain thereafter. This may occur because the electric shock is applied automatically, even in cases in which the patient maintains certain levels of cardiac output and brain blood flow. Guided by artificial intelligence, a defibrillator provided on board an ambulance converts electric potential by FFT for frequency spectrum analysis, then administers treatment in cases of frequencies above a specified level (which the defibrillator interprets as vf). Other readings are interpreted to indicate ventricular tachycardia. Note that no universally accepted diagnostic criteria exist for this demarcation. A patient's complaint of pain indicates either that the artificial intelligence has misinterpreted vt as vf, despite cardiac output, or that vf has returned to vt on its own. Since patients with vf rarely return to normal so quickly, the latter explanation is unlikely. Such issues highlight the limitations on artificial intelligence when no medical practitioner is present to examine the patient in person.

3.2.3 Discussion

The scope of activity of emergency technicians is specified by Article 21 of the Enforcement Regulations for the Emergency Life-Saving Technician's Act and by notices issued hereunder by the Ministry of Health, Labour and Welfare. Medical practitioners are not always (or rarely, in fact) present on the spot; in most cases, emergency technicians must obtain instructions over the phone. These conditions require medical practitioners to issue specific instructions concerning patients they have never examined before, based solely on an oral account. In the author's opinion, this does not comply with Article 20 of the Medical Practitioner's Act, which bars medical practitioners from treating a patient without in person evaluation. It is reasonable to doubt whether an emergency technician, whose medical education includes a mere 250 hours of classroom lectures and a tour of an emergency medical center, can really act in place of a medical practitioner. The author believes broadband telecommunications

[47] Nakajima, I. & Tomioka Y. (2009). Aspects of Information Communications Technology for Better Medical Control. International J. of eHealth & Medical Communications. 1(1), 18-27 and Isao Nakajima, Tokai University, School of Medicine, Japan, Rapporteur for Q2/2, Jh1rnz@aol.com; js2hb@ets8.jp.

can help resolve this issue. Article 21 of the Basic Act on Establishing a Networked Society Based on Advanced Information and Telecommunications appears to point to the establishment of a broadband mobile telecommunication environment that enables the monitoring of patients in ambulances. The current mobile telecommunications system, which cannot transmit large volumes of data from inside the ambulance to the medical practitioner, fails to satisfy Article 21 of the Act. The Japanese government leaves mobile infrastructure development to private-sector enterprises, which follow the principle of free competition or cream-skimming (i.e., developing infrastructures only in profitable urban areas, not in rural areas). Private-sector mobile public line networks are limited in coverage. The rate of dropped calls has risen since the earthquake, due to congestion. Accessibility has been limited. Dependence on market-based private sector companies to provide mobile telecommunications for emergency medical care and disaster purposes suggests the national government is not fully aware of the importance of risk management.

3.2.4 Conclusion

In light of Article 21 of the Basic Act on Establishing a Networked Society Based on Advanced Information and Telecommunications and Article 44 of the Emergency Life-Saving Technician's Act, the Japanese government is obligated to mobilize the public and private sectors to work together in providing citizens with a broadband mobile telecommunication environment that enables remote medical consultations.

3.3 Pan-African e-Network for tele-education and telemedicine in India

Providing adequate educational facilities and affordable healthcare to citizens are two prominent concerns of many developing countries.[48] Technological improvements in terms of communication infrastructure for delivering quality education and healthcare uniformly, across length and breadth of the country are a key factor in the progress of any country. Efforts in delivering education and healthcare from resourceful urban areas/developed countries to inaccessible remote/rural areas have yielded fruitful results in terms of success to the quality services in time and a cost effective manner.

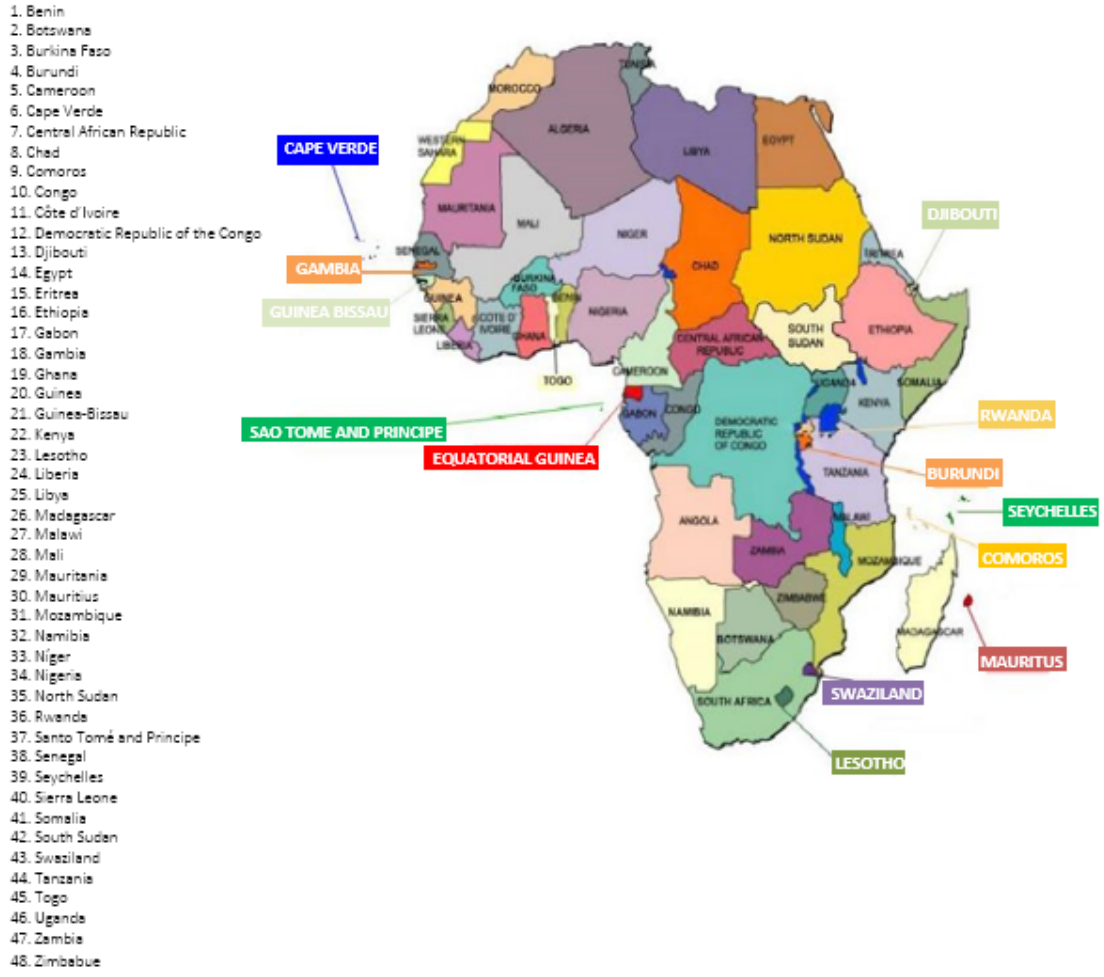
Inspired by advances in the provision of healthcare and medical education through the use of Information and Communication Technology, the former President of India Dr. A. P. J. Abdul Kalam, during the inaugural session of the Pan-African Parliament held in Johannesburg on 16th September 2004 had proposed in his address to connect all the nations of the African Union by a satellite and fiber optic network that would provide effective communication for Tele-education, Telemedicine, Internet, Videoconferencing and VoIP services and also support e-Governance, e-Commerce, info-tainment, resource mapping, meteorological services etc.

As a follow up of the initiative, the Ministry of External Affairs, the Government of India proceeded to set up an e-Network now called Pan-African e-Network. The Pan-African e-Network project is funded by the Government of India with an approved budgeted cost of INR 5.429 Billion, i.e. about US$ 117 Million. Telecommunications Consultants India Limited (TCIL) has been designated as the turnkey implementing agency with the role to design the network, procure and install the equipment, provide operations and maintenance and support for 5 years after commissioning the network in respective countries. With an extension of 2 years, in mid-2016, support was still being provided.

Regular telemedicine and tele-education services have already been started on this network. At present, the Telemedicine consultations are regularly being conducted from Super-Specialty Hospitals from India to the African countries on need basis. Moreover, regular Continued Medical Education (CME) sessions have been started with effect from 22 April, 2009 from 12 Indian Super-Specialty Hospitals.

[48] Anil Prakash, ITU-APT Foundation of India, India; Rakesh Kuman Bhatnagar, TEPC &- Chairman, ITU-T SG, ITU-APT Foundation of India, Vice- Rapporteur for Question 2/2.

Figure 19: Pan-African e-Network



3.3.1 Elements being connected through the network

1) India

a) A Data Centre at TCIL Bhawan, New Delhi (It acts as a Hub for all the Indian sites & Super Specialty Hospitals);

b) Tele-education set-up in 5 Universities/ Educational Institutions;

c) Telemedicine set-up in 12 Super Specialty Hospitals.

2) Africa

a) Satellite Hub earth Station at Dakar, Senegal;

b) Regional Leading Universities;

c) Regional Super Specialty Hospitals;

d) Learning Centers (LC) for tele-education, one in each country with MoU;

e) Patient-End Hospitals (PEH) for telemedicine, one in each country with MoU.

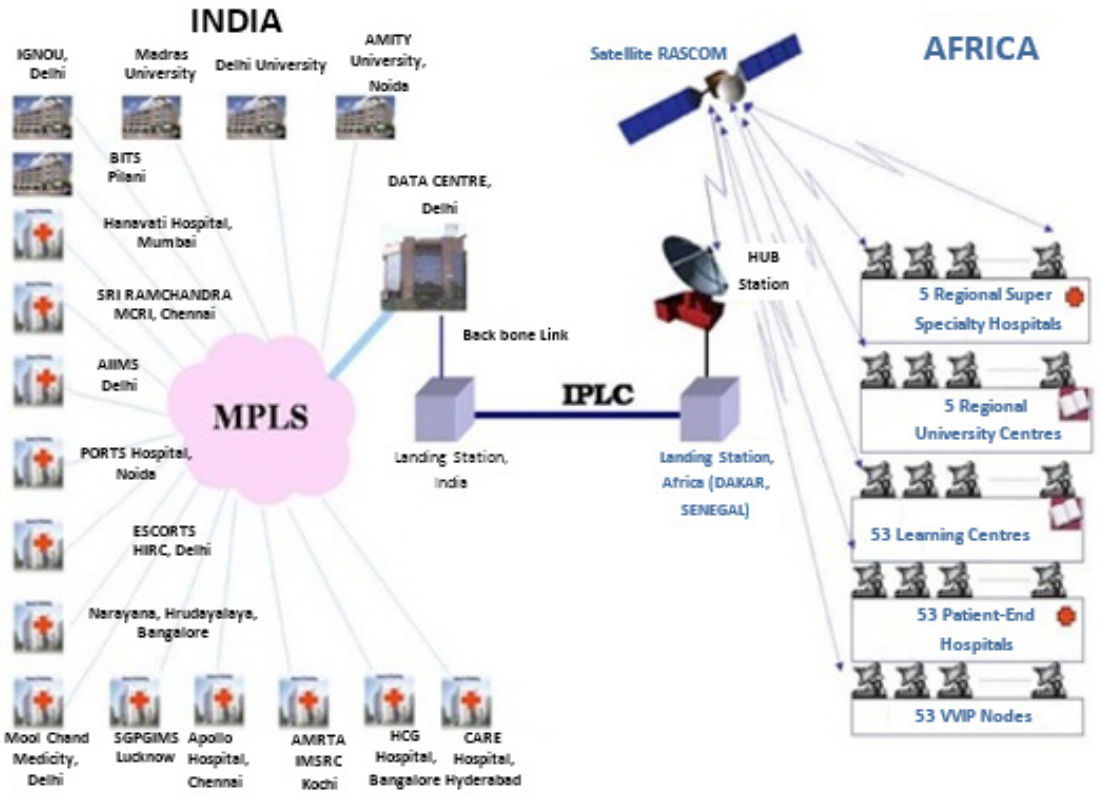
All the five (5) selected Indian Universities and 12 Super Specialty Hospitals are connected (through Multiprotocol Label Switching (MPLS) based IP Network) to the Data Center at TCIL Bhawan, which is further connected to the Submarine Landing Stations of the IPLC service provider.

3.3.2 Objective and benefits of the project

The basic objective of the Pan-African e-Network project is to help Africa in capacity building by way of imparting quality education to students, through the best Indian universities and educational institutions and to provide telemedicine services by way of online medical consultations to the medical practitioners in the patient-end locations from Indian medical specialists in various disciplines/specialties/sub-specialties, such as general/internal medicine, cardiology, neurology, pathology, dermatology, urology, endocrinology, gastroenterology, oncology, gynecology, infectious diseases, ophthalmology etc. Telemedicine services are provided by the Indian Super Specialty Hospitals to the participating countries. The project also covered Continuing Medical Education (CME) to practicing doctors and the paramedical staff with a view to updating and enhancing their knowledge and skills.

During the implementation of the project, training programmes were organized at the regional centers in Africa to familiarize their telecom, IT and paramedical staff who are required to operate the equipment and network on day-to-day basis. The training covered the concepts, system/architecture and operating procedures in respect of the network elements installed in the African countries.

Figure 20: Architecture of PAN-African e-network



Telemedicine is the use of electronic Information and Communication Technology (ICT) to provide and support healthcare irrespective of the distance between the doctor and the patient. The advances in medical science, bio-medical engineering together with ICT have led to the development of telemedicine solutions. This has contributed to providing affordable healthcare facilities to the rural population. Adoption of telemedicine technology is one of the best options to deliver healthcare to rural population. Use of ICT between specialist doctors and patients ensures improved healthcare facilities. The Continuing Medical Education (CME) System offers a suitable platform to the practicing doctors to seek guidance and to be abreast of the latest developments from experts in their respective fields.

Telemedicine connectivity has enabled 12 Super Specialty Hospitals to provide expert services to 53 Remote Hospitals that are equipped with the medical equipment such as Electrocardiogram

(ECG), Ultra Sound, and pathology and X-Ray at each location. Each remote location is equipped with Telemedicine hardware, camera and software. Software is an integrated package capable of managing the patients, storing and forwarding medical records and analyzing digitally signed prescription for advice to remote patients. Any doctor from any of remote locations can refer patient's medical records to any of the Super Specialty Hospital and have a Telemedicine video session for live diagnosis and advice by doctors on a scheduled time in association with provider, Super Specialty Hospital, and receiver and Remote Telemedicine center.

The 12 Super Specialty Hospitals provide seamless healthcare services to Member States of the African Union (AU) with 8 hours of consultation (online and offline) scheduled for various disciplines and schedules for various countries in mutually agreed timings. The telemedicine network also provides Continuing Medical Education (CME) services based on selected Super Specialty disciplines in medical courses offered by Indian and AU Regional Super Specialty Hospitals as a certificate/diploma course as per the AU requirement. Regular CME sessions started from April 22, 2009 from SSHs. 4637 CME Sessions in English and 584 CME Sessions in French have been held from Indian Super Specialty Hospitals till 30th June, 2015. 72 CME sessions take place every month including 24 in French. The project continues until July 2016.

An example how the Pan-African network is used in one specific country, Guinea, is provided in **Annex 3**.

3.4 SAARC Telemedicine project in India

3.4.1 eHealth case study from India

1) SAARC telemedicine project

[49]The basic objective of the SAARC e-Network project is to help SAARC countries to provide telemedicine services by way of online medical consultations to the medical practitioners in the patient-end locations from Indian medical specialists in various disciplines/specialties/sub-specialties, such as general/internal medicine, cardiology, neurology, pathology, dermatology, urology, endocrinology, gastroenterology, oncology, gynecology, infectious diseases, ophthalmology etc. Telemedicine services are provided by the Indian Hospitals to the participating SAARC countries. The project also covers Continuing Medical Education (CME) to practicing doctors and the paramedical staff with a view to updating and enhancing their knowledge and skills.

Indian Government intended to share India's expertise in the field of Healthcare/Medicine with SAARC nations. The Network offers Telemedicine and Continuing Medical Education (CME) services to SAARC Member Countries by establishing a communication network connecting India with SAARC Nations. In India, two Super Specialty Hospitals (SSH) offer these services SGPGI, Lucknow and PGIMER, Chandigarh. Telecommunications Consultants India Limited (TCIL) has implemented the project on turnkey basis covering the design, supply, installation, testing and commissioning and offering Operation and Management services. Network is designed utilizing a VSAT Network initially between Super Speciality Hospital (SSH) and Remote Patient end at each SAARC member country. Continuing Medical Education (CME) and Telemedicine setup is made at identified Super Specialty Hospitals (SSH) in India. The telemedicine server is installed at SGPGI, Lucknow. Telemedicine and CME setup is also made at each remote terminal in SAARC member country.

[49] Anil Prakash, ITU-APT Foundation of India (India); Rakesh Kuman Bhatnagar, ITU-APT Foundation of India (India), Vice-Rapporteur for Question 2/2.

Figure 21: Initial network connectivity

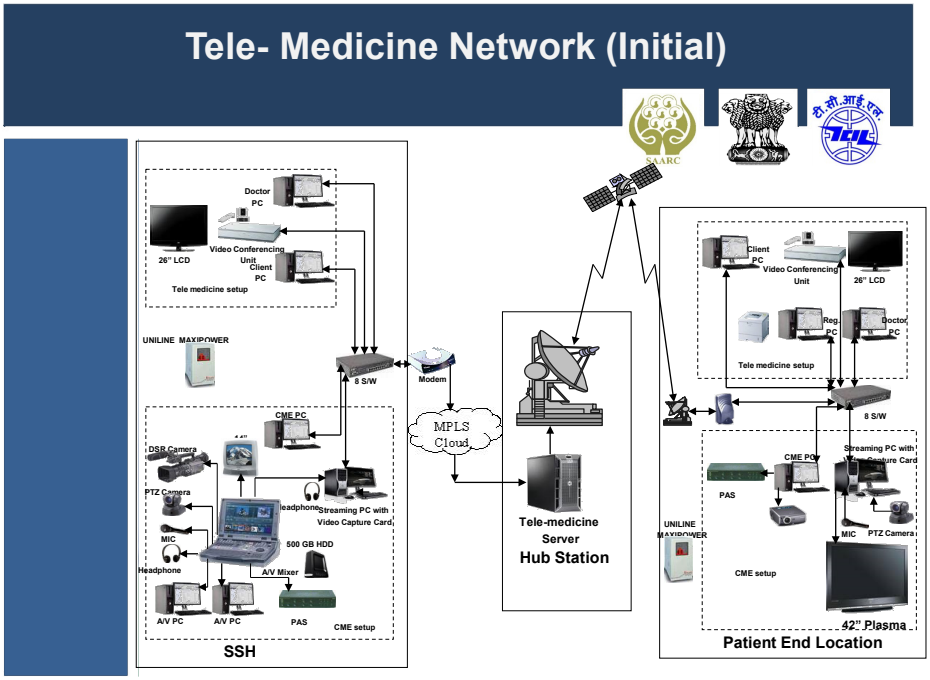
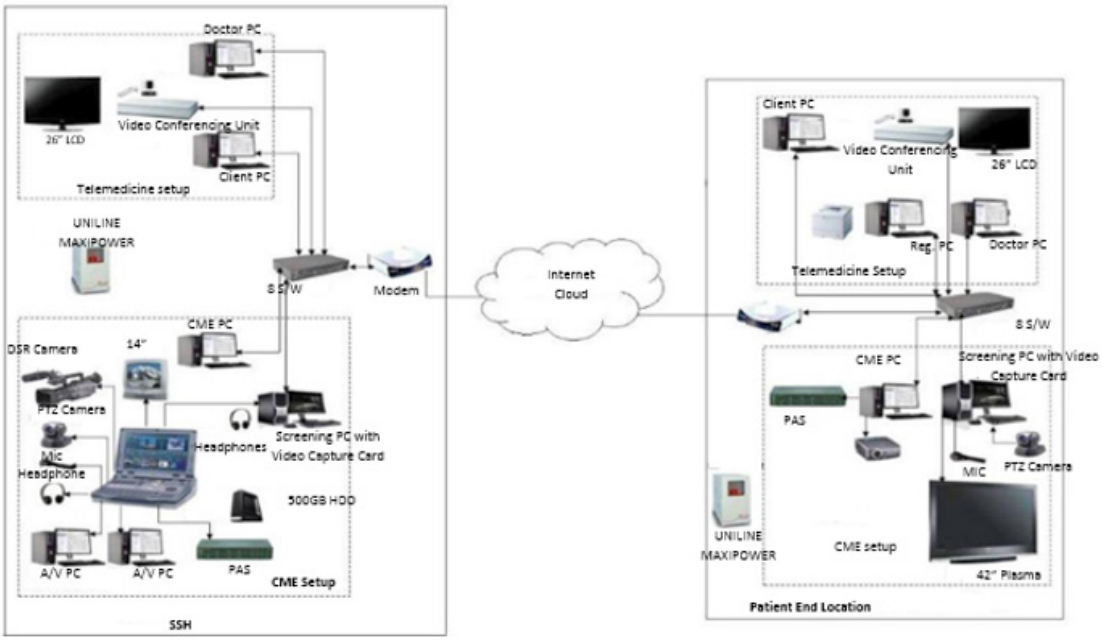


Figure 22: Present network connectivity



Infrastructure deployed consists of Telemedicine Server, Telemedicine server software, Router with LAN switch. Connectivity can be any of the following options – VSAT based Network Broadband.

2) Telemedicine setup

Super Specialty Hospital in India has installed: Telemedicine Application S/W for Super Specialty Hospital, Video Conferencing Equipment; PCs (Doctor, Registration); UPS; LAN Switch and 26" LCD

monitor. SAARC Country Hospital has Telemedicine client Application S/W for two client PC; Video Conferencing Equipment; PCs for Doctors & Equipment; UPS; Router with LAN switch; LCD monitor; Medical Equipment – As per requirement.

3) CME setup

Super Specialty Hospital in India is equipped with Audio Video Mixer; Camera and essential accessories; Streaming workstation with video capture card & accessories; Public address system; 14" TV set with A/V input & output; PC with 17" TFT Monitor – 3 Nos; Managed LAN switch and VGA splitter. SAARC Country Hospital is equipped with Web cam; Microphone (Dynamic) with table type microphone stand and adaptor; PCs; Public address system; LCD projector and VGA splitter. Software applications shall be entirely based on Open source platform and can interoperate with all existing systems. TeleVital application software is being also used.

Implementation in Bhutan:

- Telemedicine Patient end – Jigme Dorji Wangchuck National Referral Hospital, Thimphu, Bhutan.
- MoU signed between MEA and TCIL on 8 February 2008 – Bhutan was the first country identified.
- The network was inaugurated in December 2008 and completed two years of operation in December 2010. MoU signed between Government of Bhutan and TCIL further extended project by 1 year up to December 2011.
- Medical Equipment installed: Digital Radiography System.
- There are more than 140 successful Consultations/CME sessions during the period.

Implementation in Afghanistan:

- Telemedicine Patient end – Indira Gandhi Institute of Child Health, Kabul, Afghanistan
- MoU signed between MEA and TCIL on 17 December2008 for implementation of project in Afghanistan.
- The network was inaugurated in September 2009 and completed four years of operations in August 2013 through new MoUs extending project based on the benefits derived from this network.
- There are more than 180 successful Tele-Consultations/CME sessions during the period.
- Medical equipment installed: Digital Microscope, X-ray Film Scanner/Digitizer, 12 Lead ECG Machine, Tele-Pathology Microscope with Camera, Blood pressure instrument, Glucometer, Urine Analyzer, Defibrillator).

Implementation in Nepal:

- Telemedicine Patient end – Patan Hospital, Kathmandu;
- MoU signed between MEA and TCIL on 28 July, 2009 for implementation of the project in Nepal.
- The network was inaugurated in January 2011 and has completed 3 years as in Jan-2014 through project extension MoU.
- Regular Telemedicine/CME sessions are being delivered from Indian SSH to Patan Hospital, Kathmandu Nepal. Both the super specialty hospitals circulate the CME sessions in advance to enable the recipient countries to join the sessions.
- Medical Equipments installed: X-ray Film Scanner/Digitizer, Tele-Pathology Microscope including Camera) Echo Cardiography
- About 120 CME & Tele-consultation sessions have taken place till date. The sessions are interactive.

4) Other SAARC countries take up

- The site survey has been completed in the sites identified at the other SAARC member nations:
  - Bangladesh – Bangabandhu Sheikh Mujib Medical University Hospital in Dhaka.
  - Maldives – Kulhudhuffushi Regional Hospital, H Dh. Kulhudhuffushi.
  - Pakistan – Jinnah Post Graduate Medical Centre, Karachi.

5) Beneficiaries

- Doctors, nurses, technicians, students of the beneficiary hospitals in Bhutan, Nepal and Afghanistan.
- Medical specialties in which CME / Tele-consultation sessions were conducted: pediatrics, radiology, dermatology, dentistry; dermatology; endocrinology; cardiology; neurology; genetics; transfusion medicine; surgery; pediatric gastro surgery; E.N.T, rheumatology and ophthalmology.

6) Current status of SAARC Telemedicine e-network project:

Afghanistan – The operations and maintenance services rendered under the project had expired in August 2013 but presently services are being continued.

Nepal – the operations and maintenance services rendered under the project had expired in January 2014. Proposal for providing operations and maintenance services for longer is under consideration, though currently services are on hold.

3.5 Perinatal telemedicine in remote areas: ready to implement Japanese solution

3.5.1 Background and issues

In Japan, there is trend to reuse data which is gathered in hospitals and clinics to make use of patient diagnoses by using accumulation case data.[50] The history of medical ICT has begun from electronic health records in hospitals, and then it has expanded to various types of regional medical alliances since 2000. The hospital is able to manage and obtain patients' test results, diagnoses, images and prescriptions by using electronic medical record system.

The regional medical alliances, and the networked hospitals make it possible to share patients' data and able to reduce medicine duplication or duplicate examination of patient who has visited from different hospitals. According to the common data, high-risk patient can be transferred to a higher-level hospital immediately. The higher-level hospital is able to prepare to accept the high-risk patient, examining the data of previous hospital.

The important role of telemedicine is sharing the medical information between doctor and patient, and utilizing health data of patients effectively. If patients want to improve their own condition, they recognize what is required for them to get better themselves by selecting telemedicine system. MITLA (Medical Information Technology Laboratory), which is specialized in Medical IT, is providing services in this domain and this contribution describes the experiences for introducing telemedicine technology in the field of perinatal medicine in rural and remote areas.

3.5.2 Perinatal telemedicine system

The perinatal electronic record is the key technology of this telemedicine system. It is quite different from the general Electronic Medical Record (EMR) or other departments EMR, because the perinatal

[50] Isao Nakajima, Tokai University, School of Medicine, Japan, Rapporteur Q2/2.

EMR has to accumulate the data of two lives, mother and fetus. The related laws and regulations of obstetrics and gynecology department are also different from others. Considering those differences, the perinatal EMR is worthwhile and perinatal care technologies would have valuable implications to medical ICT as a whole.

There are three types of specialized perinatal EMR; for hospitals, clinics and perinatal telemedicine. For hospitals, it has an excellent high-risk management function for the Perinatal Maternal and Child Medical Center, the tertiary hospital. Secondly for clinics, it can manage every system of the hospital as an EMR. It is also easy to find any risks of pregnancy. All of the specialized perinatal EMR has a list of prenatal checkup screen. Maternal basic information and the prenatal checkup data for each pregnancy can be observed. It comes with screens exclusively for obstetrics and gynecology which can register medical information of prenatal checkups and health guidance. Clinical information which cannot be found on general EMRs can easily be recorded. It also has computerized formats, which is specific to obstetrics and gynecology including the pregnogram and partogram. The specialized perinatal EMR is possessed with authenticity, visual readability, and storability.

Figure 23: Total number of obstetricians

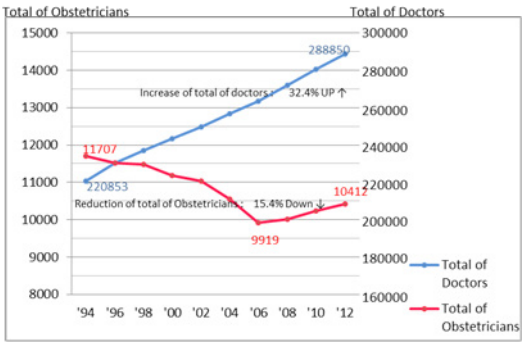
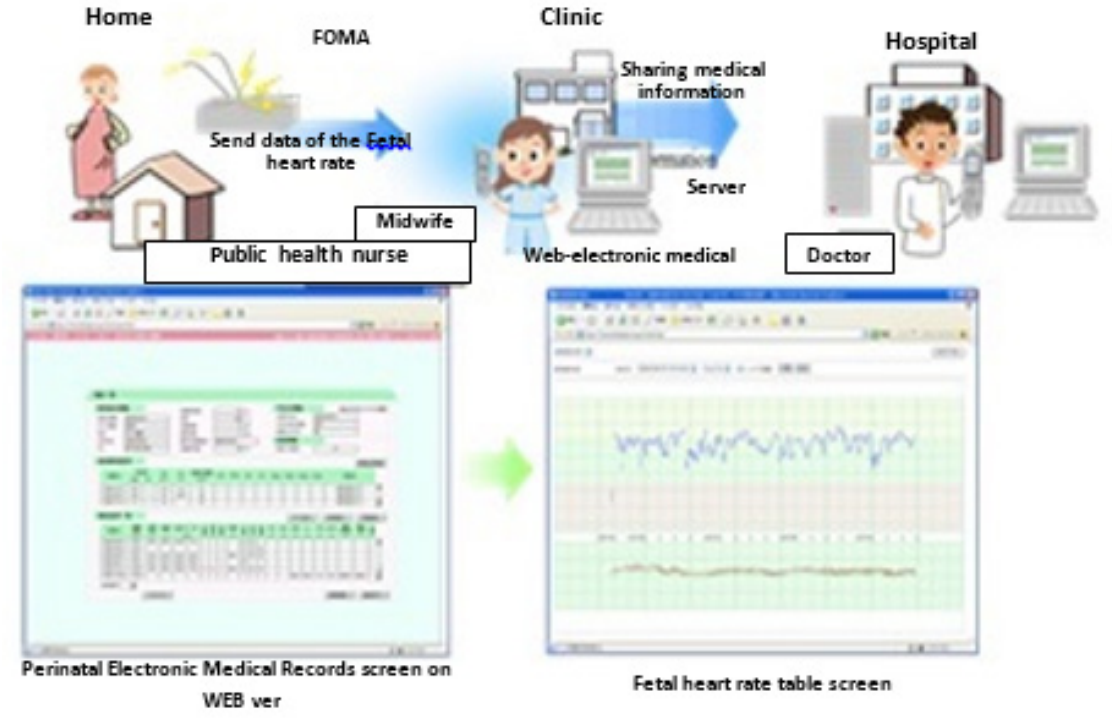


Figure 24: Perinatal Telemedicine System



The number of obstetricians and gynecologists has decreased dramatically from 1984 to 2006 compared to other departments of doctors (**Figure 23**). This caused due to the large number of obstetric litigations sued by patients and the increasing number of women doctors who discontinue work after marriage.

In remote areas such as islands and mountainous areas, social issues are arising as no obstetricians work in hospitals. Such social phenomenon is noticeable from 2004 to 2006 and this is continuing. The perinatal telemedicine system (**Figure 24**) was developed in 2006 and connected the core hospital to the maternity center where there are no medical specialists. The distant medical doctor is able to examine the information entered by the midwife at the maternity branch. The perinatal telemedicine system is composed from the data center server system, ASP perinatal electronic medical record and mobile CTG, the medical equipment that measures the mother's contraction and the baby's heart rate. It can also connect diagnostic imaging system as needed. ASP perinatal electronic medical record and mobile CTG are placed together in the core hospital, clinics and the maternity center respectively, and all data can be shared mutually. Medical specialists, general physicians and midwives share the real-time medical information, depending on the risk of the patients and able to examine their condition together. The patient can receive the appropriate advice from a medical specialist utilizing telemedicine.

Initially this perinatal telemedicine system was introduced to Tono city, Iwate prefecture, where there were no obstetricians. Pregnant women were in need of a perinatal checkup once a month or more frequently, however, for women living in Tono, this meant a long 50 km drive to the main hospital on mountainous roads. Facing this problem, a medical center called Net Yurikago (cradle) was built in Tono city in 2007. At this maternity center, pregnant women in Tono city are able to have regular checkups provided by midwives. If the pregnant woman has any worries or concerns, she can speak to a doctor via the Internet.

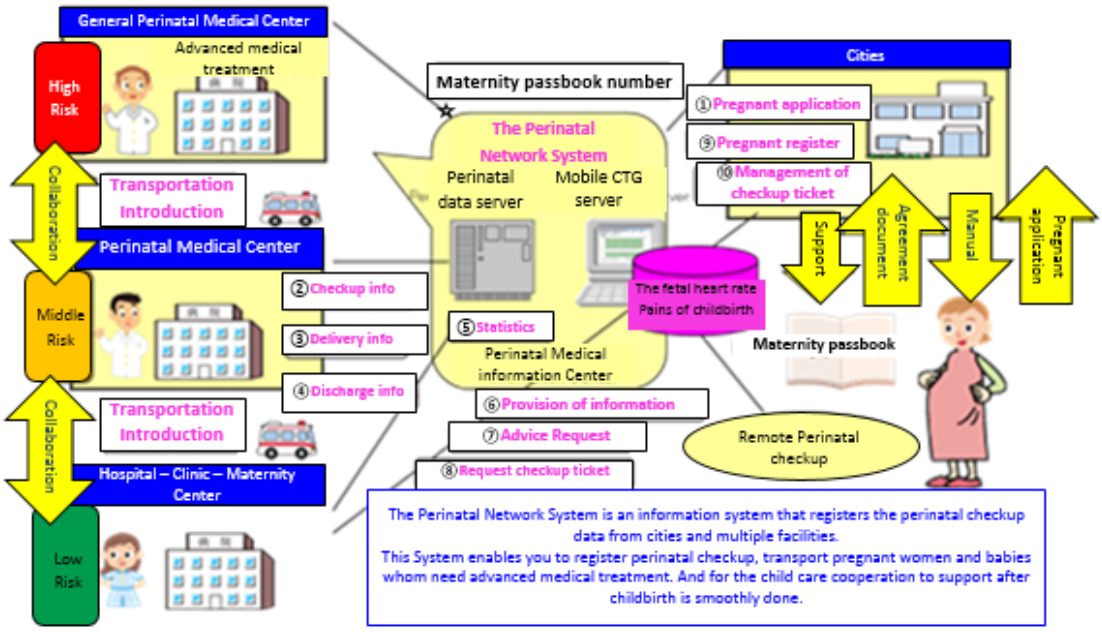
After introducing the perinatal telemedicine system in Tono city, it has also been implemented in Hokkaido, Okinawa, and on Amami-Oshima Island. After the International Conference held in 2011, it was introduced in Phitsanulok region in Thailand. At this time, it used a server which was located in Japan, however, medical specialists in Phitsanulok wanted to locate the servers in their own country, in order to store the medical information collected. Following the case of Phitsanulok, the server was introduced in Chiang Mai, Thailand for JICA grassroots project of Kagawa Prefecture. In the same year, this system was introduced in Lao People's Democratic Republic, including the server. In that same period, an advisory committee was set up in Iwate Prefecture in Japan. They discussed a regional alliances system that covered not only telemedicine, but also perinatal emergency and personal healthcare. This meeting comprised of eminent panelists from industry, government and academia.

3.5.3 Application to the perinatal regional alliances "Ihatov (Utopia)"

"Ihatov[51]" is a perinatal medicine information network system for pregnant women, which allows hospitals and municipalities to build a good relationship during the pregnancy period. Pregnant women can maintain the relationship even after delivery and if the pregnant woman decides to return to her hometown to give birth at the parents' home, her nearest clinic can check her medical information in advance (**Figure 25**).

[51] Toshihiro Ogasawara. Kazuhiro Hara. A challenge for producing Data cooperation system of medicine information network construction "Ihatov" and electronic medical recording system for perinatal medicine. Japanese Journal of Telemedicine and Telecare. 9(2):2013.10. 203-206 ISSN 1880-800X.

Figure 25: "Ihatov" network



The Great East Japan Earthquake caused devastating damage on the coastal area of the northeastern region of Honshu of Japan, and much medical information flowed out from tsunami. Since the information of the perinatal care of the Iwate Prefecture, where the tsunami hits, was recorded by the data center server of "Ihatov". Therefore, "Ihatov" has been recognized as a very effective system.

The Japanese Government has decided to introduce a social security ID number in the near future; however Iwate prefecture has already introduced ID number for newborn baby in advance. This number is one of the keys for sharing information between medical institutions and municipalities utilizing "Ihatov". The pregnant woman can decide whether she will agree to share her information or not when she receives the maternity passbook with the number. If she agrees, the information can be shared with all hospitals and municipalities, and the data is carefully kept for the future. Medical institutions can find all patients' data from various places easier utilizing "Ihatov".

In Japan, hospitals are classified under three categories according to the risk of the patient; primary, secondary and specialized hospital. The specialized hospital is able to accept patients with higher risks. If the patient's condition takes a sudden turn, the patient might be transferred to a specialized hospital at a higher stage. If the accepted hospital already has the patient's data, using "Ihatov" they can prepare and manage the patient transfer faster and more efficiently, and are also able to manage transfer of the high risk pregnant woman to the hospitals selected from primary to specialized hospital in its region. The core hospitals joined the network and the clinics may also follow. This perinatal regional liaison has been bringing satisfactory results. Other prefectures will follow this model in the near future.

"Ihatov" regional alliances represent a significant effect in the following three points. "Ihatov" is a system to take advantage of a medical health information database. By registering using "Ihatov", the pregnant women and babies' emergency transfer to the hospital is implemented smoothly, and prenatal care is carried out under fully prepared circumstances. Furthermore, registration is carried out based on a personal agreement, and the individual's privacy is strictly managed.

3.5.4 Accelerate overseas operations and domestic operation

Accelerate overseas operations

In Japan, due to the decrease of obstetricians and gynecologists, some areas have to rely on a telemedicine system. In overseas, especially some developing countries, the situation is similar to Japan. There are not enough medical specialists for the increasing number of pregnant women. There are three risk categories; high, medium and low. Most hospitals overseas, especially those located in rural areas, treat medium and low risk patients due to the lack of medical specialists and medical surgery equipment.

Introducing a perinatal telemedicine system is meaningful to developing countries and rural areas. The perinatal telemedicine system is relatively simple and easy to operate. Hospitals are only to prepare PC and mobile CTG. The benefit of using mobile CTG and PC telemedicine system will efficiently improve perinatal care even with the decreasing number of healthcare specialist. For example: the possibility to diagnose pregnant woman in remote location from the hospital with only a few specialist.

Accelerate domestic operation

Declining birthrate and the increasing of aged population in Japan are progressing more rapidly compared to countries in Europe. The population of 65 and above years of age is 25 per cent of the total current population. It has been estimated that the rate of aging will be 30 per cent in 10 years, and a nearly 40 per cent in 30 years. It means that the number of young people who takes care of the elderly will reduce. There are not enough young people to adequately take care of the elderly. To ensure better health for the elderly, there is necessity to manage their own health by using smartphone and check the health data for themselves.

The maternity passbook is the starting point of the Personal Healthcare, PHR. Relatively young women began to use the maternity passbook at first, which is written in the paper; however, they have already gotten used to using mobile technology such as: tablets and smartphones as necessary in their daily life. We emphasize Electronic Maternity Passbook. The Electronic Maternity Passbook is connected and it can share information to hospitals and municipalities. The concept of the Electronic Maternity Passbook enables the user to be able to confirm the information, which is automatically inputted by municipalities and her primary care hospitals. For example: to take the necessary measures immediately from the system. The Electronic Maternity Passbook has the advantage not only childcare generation and pregnant woman, but also it bring benefits to the local hospitals, municipalities where she lives, and shops or companies that she is interested in.

It is desirable to generate PHR data from the system like “Ihatov”, which is a data interface with municipalities and the hospital. The PHR mechanism should be developed for many companies or shops that provide detailed information to the people as needed. In the future, we need a more realistic data integration technology and data mining technology. Data mining technology differentiates into environmental statistical processing and personal health history management. These technologies are also related to each other. It is convenient for individuals to find out their information instantly, based on their own health data. Currently, various institutions are carrying out R&D for creating mechanism to deliver more useful information to individuals.

The contribution below is an illustration of the application of the above perinatal telemedicine system.

3.6 Introducing perinatal telemedicine in Laos

3.6.1 Introduction

The Lao People’s Democratic Republic (hereinafter Laos) is a landlocked country, and its population is 6,510,000[52] inhabitants. Laos is bordered by China, Vietnam, Cambodia, Thailand and Myanmar. Its area is same as Honshu, Japan. Laos is located important positions geopolitically in Mekong area and Indochina. Laos is a developing country in the ASEAN area, so there is big economic difference

[52] Yhuko Ogata, Japan, yhuko@melody.international.

between Laos and other ASEAN countries. However, Laos is doing steady economic development by growth in the field of mineral resources and hydraulic power generation. Population growth is necessary for economic development, and Lao government's targets are achievement of Millennium Development Goals (MDGs) and breakaway from the developing country by 2020.

For perinatal care, target 4 of MDGs is reducing infant and toddler mortality, and target 5 is improvement of pregnant women health. The under 5 year-old child death decreased to 79 in 2011 from 131 people in 2003 per 1,000. Even though it achieved 80 people aimed for until 2015, it is still a low level. Therefore, the Lao government modified their target to 70 people per 1,000 until 2015. In addition, Laos has the second highest rate for the under 5 year-old child death next to Myanmar among Mekong area. The infant mortality was improved to 68 in 2011 from 104 in 2003 per 1,000 people, but it is far from new target value of 45.

3.6.2 Background and issues

On average a woman from Laos gives birth to 3.108108 children, and approximately 100,000 children are born every year in the whole country. This number is however not completely accurate as there is no family registry system in Laos. There is a health checklist for pregnant women decided by the Lao government. Based on WHO guidelines, examination items and contents are decided on depending on the week of pregnancy. Even though WHO recommends four check-ups during a pregnancy, some mothers never have a medical examination. The average medical examination rate in whole country is less than 80 per cent.

The medical facilities compose of the central hospital, prefectural hospital, county hospital and health center. There is no doctor present at the health center, which is the primary medical facility, and usually there are only one to three nurses. The second medical facility is a county hospital where only 27 of 130 facilities can perform an operation. For referral system from health center to county hospital is judged appropriately by patient diagnosis.

The number of the cell-phone subscribers is approximately 6,700,000 in Laos, and the population diffusion rate is around 104 per cent. Not all people have an own cell phone, and one has several prepaid SIM cards because of overflow SIM card. As a result, cell phone diffusion rate is very high.

Most of the subscribers of the cell-phone is 2G, and they use mainly telephone (voice call) and SMS (text). New smartphones are getting available, but there are still few people using it by 3G networks. LTC started providing 4G (LTE) at Vientiane on January in 2013, and will provide 4G (LTE) for major cities. So communications infrastructure is developing rapidly.

In addition, comparing to the landline is 150,000 (14 per cent of household diffusion rate) and broadband is 110,000 (10 per cent of household diffusion rate); we can see how cell phone subscriber rate is high.

3.6.3 System integration

Two proposals are presented: 1) Web type of Perinatal Medical Record System and 2) Mobile fetal heart rates monitor "Mobile CTG".

Doctors and hospitals can use them by Internet and through server. Core hospital can see the data which rural hospital input, and also rural hospital can see the core hospital data in same way. Mobile CTG equipment set up at rural hospital and measure. They send data to core hospital doctors or specialist doctors, so doctors can diagnose from remote areas. It enables to share medical information of pregnant women with remote medical facilities in a real time. The primary hospital with no specialist can perform an appropriate and safe medical care by the instruction of the specialist in remote area hospitals by using this telemedicine system. It brings good result for primary hospitals to improve their skills and to care patient properly.

Using communication line (2G, 3G, 4G), Mobile CTG can measure fetal heart rate, fetal movement and contraction. It enables to share those data to the medical specialists in rural areas. Medical specialist can confirm the data of high-risk pregnant women, and they can refer immediate and appropriate examination by using perinatal telemedicine system. The perinatal telemedicine system has been introduced in Laos in 2013. Two to three clinics that match the following characteristics were selected: (1) Rural area; (2) Only has midwives or nurses; (3) Does not have a specialized doctor.

The timeliness of the mobile CTG Monitor

During pregnancy, most likely, the condition of the patient will not take a sudden turn. Doctors can examine the results from a 20-40 minutes measurement, and see the fetus' heart rate to check the wellbeing of the fetus. This is the most seen case for telemedicine.

During delivery, there is a possibility that the condition of the patient changes all of a sudden. The monitor has an automatic diagnosis function which prompts you to send the measurement results immediately. You can change the length of time of measurement deepening on the situation.

Two Mobile CTG Monitors were let to each two clinics to examine. The perinatal medical record system was ready for trial use, and the aim was to improve the system to suit the needs in Laos. For tele-consulting, TV meeting system by a Japanese company was used. The PCs were also supplied by the same company. The government-affiliated local network was used. During this trial at Mittaphab Hospital in Vientiane, a pregnant woman who measured the graph mentioned above in the morning (labor pains are strong, short interval). It was decided to keep her in the hospital. She gave a birth in the afternoon safely.

3.6.4 Discussion and conclusion

One of the most important matters for perinatal care is data management. Data management has evolved beyond paper medical records, into the paperless digital world. Therefore, we have to establish the check-up for mother and baby with further improvement of medical technologies. The following recording format is required for perinatal electronic medical records:

- The data of perinatal information is recorded in time series.
- Easy to detect the slight changes in pregnant woman.
- Enables doctors to know good conditions for pregnant woman and if there any complications.
- Viewing the data provides critical information for the doctors to make confident decisions.
- Sharing perinatal information makes hospital to be patient ready before the ambulance arrives. Also, doctors and specialist enable checking for high risk patients remotely.

In Japan, clinics, primary hospitals, and core hospitals accept patients depend on patient risks and condition. This system has been advanced especially in the fields of obstetrician due to the decrease in obstetricians and gynecologists. Regional alliances, open and semi-open systems, have proceedings with the primary, secondary and core hospitals. Overseas, especially in developing countries as is the case in Japan, there is a shortage of doctors. However, what is different between developing countries and Japan, is that in Japan medical education level, and mother and child medical examination system, are available. Solution to these problems: specialist in developed countries takes the second opinion in remotely. In addition, the usage of a maternity record book in developing countries is encouraged.

In order to introduce Japanese perinatal care model in developing countries, especially in Southeast Asia, and in particular in Laos, this takes time and needs some efforts. Once the systems are introduced and being used, the value and usefulness of them will surely be noticed. Currently, doctors in core hospitals have the technical ability to read mobile CTG monitor graphs. The mobile CTG system is a medical measuring instrument which transmits medical data of fetal heart rate, fetal movement and contraction through internet connection. High risk patients in primary hospitals or secondary

hospitals can be helped through the specialist's early diagnosis. When the Japanese perinatal care model was introduced in Laos, doctors and midwives were also dispatched to educate local staff and to introduce the system efficiency.

The "Research project for introduction of ICT system for basic health and medical care (remote consultation for perinatal healthcare in rural areas) in Laos" was funded by the Ministry of Internal Affairs and Communications, Japan. Working models of eHealth services already developed and implemented in developing countries or in process of implementation, i.e. the so called start-ups are summarized as tables in **Annex 7**. Information about the benefits of IMT2020 for eHealth implementation in developing countries and examples of women's health wearable for the developing world are also included as annexes (**Annex 8** and **Annex 9**).

4 CHAPTER 4 – Recommendations

Based on the experience gathered during the lifetime of Question 2/2, the following recommendations were found essential for the healthcare policy and decision makers from developing countries:

- More efforts to be dedicated to raise the awareness and educating of local authorities, decision-makers, stakeholders, telecommunication operators, medical staff and especially citizens about the role of ICT in wide implementation of eHealth as well as about the benefits that eHealth adoption will bring to the national healthcare systems. Special attention has to be paid on medical staff in order to facilitate their acceptance of eHealth services, if and where needed;
- More efforts to be dedicated to the wider implementation of:
  - mHealth solutions Example of benefits of mHealth adoption is **Annex 2.1** (ITU-WHO Mobile Health initiative for non-communicable diseases (Be He@lthy Be Mobile initiative), an applications which is focused on mobile's role in individuals' daily routines to foster behavioral change via health promotion and continuous self-management;
  - Assistive technologies – these underestimate solutions are able significantly to change healthcare services;
  - EHealth economics as it is a must to evaluate eHealth cost effectiveness before starting an eHealth implementation;
  - Social media – wide implementation of social media is extremely suitable for educational tool for both citizens and medical staff as well as for disease preventions;
- More attention has be paid to:
  - Inadequate funding and lack of ICT skills at all levels of healthcare system. A basic start is to adapt the medical students' curricula to the new realities, including more courses about ICT, eHealth and telehealth. Special interest may be the open source solutions as a cost effective software applications;
  - Finding adequate local billing and reimbursement solutions as without such stimuli the wide and sustainable eHealth services cannot exist;
  - Licensure and Scope of Practice (Standard of Care) must also be widely discussed and taken care of.
- Facilitating exchange of lessons learned and networking at local and global level.
- Encourage the collaboration between the telecommunication and health sectors in order to maximize the utilization of limited resources on both side for implementing eHealth services and solutions into medical practice;
- The application of the ITU-WHO National eHealth Strategy Toolkit is highly recommended (**Annex 4**).

Abbreviations and acronyms

Various abbreviations and acronyms are used through the document, they are provided here for simplicity.

Abbreviation/acronym	Description
AAL	Ambient Assisted Living
ACCP	Advanced Care Coordination Platform
AED	Automated External Defibrillator
AICD	Automated Implantable Cardioverter-Defibrillator
API	Application Program Interface
APT	Asia-Pacific Telecommunity
ASEAN	Association of Southeast Asian Nations
ASHA	American Speech-Language-Hearing Association
ASP	Application Service Provider
ATM	Automatic Teller Machine
B2B	Business to Business
BAN	Body Domain Network
BDT	Telecommunication Development Bureau
CCR	Continuity of Care Record
CCSA	China Communications Standards Association
CDMA	Code-Division Multiple Access
CDR	Call Detail Record
CEN	European Committee for Standardization
CHUK	University Teaching Hospital of Kigali
CHW	Community Health Workers
CIDEP	Interdisciplinary Centre for Ongoing Education
CITEL-OAS	Inter-American Telecommunication Commission of the Organization of American States
ClaML	Classification Markup Language
CME	Continued Medical Education
CMS	Clinical Management System
CO	Carbon monoxide
COEL	Carbon Monoxide Exposure Limiter
CONATEL	Comisión Nacional de Telecomunicaciones

Abbreviation/acronym	Description
COP	Telecare Code of Practice / Telehealth Code of Practice
CTG	Cardiotocography
CVD	Cardiovascular Disease
DOH	Department of Health
DICOM	Digital imaging and communication in medicine
DRC	Democratic Republic of the Congo
e-LMIS	electronic Logistic Management Information System
EC	European Commission
ECG	Electrocardiogram
EDI	Electronic Data Interchange
EDPRS	Economic Development and Poverty Reductiion Strategy (Rwanda)
EDS	Demographic and Health Survey (Enquête Démographique et de Santé de la République Démocratique du Congo)
EHR	Electronic Health Record
EMR	Electronic Medical Record
ENT	Ears, nose and throat (otolaryngology)
epSOS	Smart Open Services for European Patients
ESA	European Space Agency
ETMo	Telemedicine Mobile Station (Estación de Telemedicina Móvil)
ETRI	Electronics and Telecommunications Research Institute (Korea (Rep. of))
ETSI	European Telecommunications Standards Institute
EU	European Union
EV-DO	Evolution-Data Optimized
FCM-UNR	National University of Rosario, Faculty of Medical Sciences
FDD-LTE	Frequency Division Duplex – Long-Term Evolution (4G)
FG	Focus Group
FFT	fast-Fourier transform
FHIR	Fast Healthcare Interoperability Resources
FOSS	Free and Open Source Software
GCC	Global Communication Center
GDP	Gross Domestic Product

Abbreviation/acronym	Description
GDSN	Global Data Synchronization Network
GLN	Global Location Number
GMPC	Gateway Mobile Positioning Center
GNI	Gross National Income
GP	General Practioner
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GSVML	Genomic Sequence Variation Markup Language
GTIN	Global Trade Item Number
HDI	Human Development Index
HDO	Healthcare Delivery Organization
HIV/AIDS	Human Immunodeficiency Virus infection and Acquired Immune Deficiency Syndrome
IHE	Integrating the Healthcare Enterprise
HIF	Healthcare Information Framework
HIS	Hospital Information Systems
HL7	Health Level Seven International
HMR	Argentinian Re-locatable Hospital (Hospital Militar Reubicable)
HRA	Health Reimbursement Agreements
HRTT	Health Resource Tracking Tool
HSSP	Health Sector Strategic Plan (Rwanda)
ICD	International Classification of Disease
ICSRs	Individual Case Safety Reports
ICT	Information and Communication Technology
ID	Identity Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IHE	Integrating the Healthcare Enterprise
IHTSDO	International Health Terminology Standards Development Organisation
ILTC	Intermediate and Long-term Care

Abbreviation/acronym	Description
IMF	International Monetary Fund
INR	International Normalized Ratio
IoT	Internet of Things
IP	Internet Protocol
IPLC	International Private Leased Circuit
ISDN	Integrated Services Digital Network
ISMS	Information Security Management System
ISO	International Organization for Standardization
IT	Information Technology
ITU	International Telecommunication Union
ITU-D	ITU Telecommunication Development Sector
ITU-R	ITU Telecommunication Radiocommunication Sector
ITU-T	ITU Telecommunication Standardization Sector
K-medicine	Korean medicine
LAN	Local Area Networks
LC	Learning Center
LCD	Liquid-Crystal Display
LDCs	Least Developed Countries
LED	Light-Emitting Diode
LHR	Lifetime Health Record
LTC	Lao Telecommunications Company
LTE	Long-Term Evolution (4G)
M2M	Machine to Machine
MDGs	Millennium Development Goals
MEA	Ministry of External Affairs (India)
mHealth	Mobile Health Technologies
MHz	Megahertz
MITLA	Medical Information Technology Laboratory
MoH	Ministry of Health (Rwanda)
MOHH	Ministry of Health Holdings (Singapore)
MoU	Memorandum of Understanding

Abbreviation/acronym	Description
MPLS	Multiprotocol Label Switching
NCDs	Non-Communicable Diseases
NEHR	National Electronic Health Record
NGN	Next-Generation Network
NGO	Non-governmental Organization
NICT	New Information and Communication Technology
OEM	Original Equipment Manufacturer
OID	Office of Intellectual Disability
PACS	Picture Archiving and Communication System
PC	Personal Computer
PEH	Patient-End Hospital
PEMS	Pre-hospital Emergency Medical Service
PGIMER	Postgraduate Institute of Medical Education and Research (Chandigarh, India)
PHC	Portable Health Clinic
PHD	Personal Health Devices
PHR	Personal Health Record
PKI	Public Key Infrastructure
PMNCH	Partnership for Maternal and Newborn Health
PSTN	Public Switched Telephone Network
R&D	Research and Development
R-HMIS	Rwanda Health Management Information System
RBC	Rwanda Biomedical Center
RCT	Randomized Controlled Trials
RECOTED	Congolese Telemedicine and Distance Learning Network
RHU	Regional Health Unit
ROI	Return of Investment
RURA	Rwanda Utilities Regulatory Authority, Rwanda (Rep. of))
SAARC	South Asian Association for Regional Cooperation
SAMU	Number of emergency calls for ambulance
SDGs	Sustainable Development Goals
SDO	Standards Development Organisation

Abbreviation/acronym	Description
SGPGI	Sanjay Gandhi Post Graduate Institute of Medical Sciences (Lucknow, India)
SMS	Short Message Service
SNOMED	Systematized Nomenclature Of Medicine Clinical Terms
SSH	Super Specialty Hospitals
TCIL	Telecommunications Consultants India Limited
TD	Teledentistry
TDD-LTE	Time Division Duplex – Long Term Evolution (4G)
TEPC	Telecom Equipment & Services Export Promotion Council
TFT	Thin-Film Transistor
TMDU	Telemedicine Data Transmission Unit
TRAC	Treatment and Research AIDS Centre
TSA	Telecare Services Association
TTA	Telecommunications Technology Association (Korea (Rep.of))
UFMG	Universidade Federal de Minas Gerais (Brazil)
UN	United Nations
UNDP	United Nations Development Programme
UNIKIN	University of Kinshasa (Democratic Republic of the Congo)
UPS	Uninterruptible Power Supply
USF	University of Florida (United States of America)
UWB	Ultra-wide Band
V2V	Vehicle to Vehicle
VoIP	Voice over Internet Protocol
vf	Ventricular fibrillation
VGA	Video Graphics Array
VSAT	Very Small Aperture Terminal
vt	Ventricular tachycardia
WADO	Web Access to DICOM Persistent Objects
WGs	Working Groups
WHO	World Health Organization
WiMAX	Worldwide Interoperability for Microwave Access
WTDC	World Telecommunication Development Conference

Annexes

Annex 1: Liaison statements

Liaison statement to ITU-T Study Group 20 on collaboration

LIAISON STATEMENT FROM ITu-D Study Group 2 Question 2/2 TO ITU-T STUDY GROUP 20 on COLLABORATION

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

29 April 2016

To:	ITU-T Study Group 20 (IoT and its applications including smart cities and communities (SC&C))
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	Q2/2 Rapporteur Group meeting on 29 April 2016
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Point:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int

The **Rapporteur Group on Question 2/2 (Information and telecommunications/ICTs for eHealth)** thanks ITU-T SG20 for its liaison statement to Q2/2 (document SG2RGQ/96) concerning the work on eHealth requirements and applications in ITU-T SG20, especially identification of the requirements for the eHealth ecosystem to be standardized based on mature and stable existing eHealth technologies in developing countries. We will reflect the content of the liaison statement in the Question 2/2 Final Report.

The Rapporteur Group is pleased to accept the invitation to collaborate with ITU-T Study Group 20 and exchange information on topics of mutual interest.

Question 2/2 would like to invite ITU-T Study Group 20 to share the information and provide input for consideration during the preparation of the Final Report on Question 2/2 for the 2014-2017 study period. A preliminary report will be submitted to the ITU-D Study Group 2 meeting in September 2016. The studies will be concluded in April 2017 when the Final Report will be submitted to Study Group 2 for approval.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and ongoing work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

ITU-D Study Group 2 (SG2), Question 2/2 looks forward to cooperating with you.

Attachments:

Mandate of Question 2/2

Report of the Rapporteur Group April 2016 meeting on Question 2/2

Liaison statement to ITU-T Study Group 16 on collaboration

LIAISON STATEMENT FROM ITu-D Study Group 2 Question 2/2 TO ITU-T STUDY GROUP 16 on COLLABORATION

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

29 April 2016

To:	ITU-T Study Group 16 (Multimedia coding, systems and applications)
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	Q2/2 Rapporteur Group meeting on 29 April 2016
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Point:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int

The **Rapporteur Group on Question 2/2 (Information and telecommunications/ICTs for eHealth)** thanks ITU-T SG16 for its liaison statement to Question 2/2 (document SG2RGQ/95) concerning the work on a large number of Recommendations related to eHealth, namely in the ITU-T H.810-H.850 series of Recommendations. We will reflect the content of the liaison statement in the Question 2/2 Final Report.

The Rapporteur Group is pleased to accept the invitation to collaborate with ITU-T Study Group 16 and exchange information on topics of mutual interest.

Question 2/2 would like to invite ITU-T Study Group 16 to share the information and provide input for consideration during the preparation of the Final Report on Question 2/2 for the 2014-2017 study period. A preliminary report will be submitted to the ITU-D Study Group 2 meeting in September 2016. The studies will be concluded in April 2017 when the Final Report will be submitted to Study Group 2 for approval.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and ongoing work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

ITU-D Study Group 2 (SG2), Question 2/2 looks forward to cooperating with you.

Attachments:

Mandate of Question 2/2

Report of the Rapporteur Group April 2016 meeting on Question 2/2

Liaison statement to ITU-T Study Group 5 on collaboration

LIAISON STATEMENT FROM ITu-D Study Group 2 Question 2/2 TO ITU-T STUDY GROUP 5 on COLLABORATION

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

29 April 2016

To:	ITU-T Study Group 5 (Environment and climate change)
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	Q2/2 Rapporteur Group meeting on 29 April 2016
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Point:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int

Rapporteur Group on Question 2/2 (Information and telecommunications/ICTs for eHealth) thanks ITU-T SG5 for its liaison statement to Question 2/2 (document SG2RGQ/90) concerning the WHO Monograph on Radio Frequency fields: Environmental Health Criteria, Chapter 2 on Sources, measurements and exposures and Chapter 3 on Radiofrequency Electromagnetic Fields Inside The Body. We will reflect the content of the liaison statement in the Question 2/2 Final Report.

The Rapporteur Group is pleased to accept the invitation to collaborate with ITU-T Study Group 5 and exchange information on topics of mutual interest.

Question 2/2 would like to invite ITU-T Study Group 5 to share the information and provide input for consideration during the preparation of the Final Report on Question 2/2 for the 2014-2017 study period. A preliminary report will be submitted to the ITU-D Study Group 2 meeting in September 2016. The studies will be concluded in April 2017 when the Final Report will be submitted to Study Group 2 for approval.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and ongoing work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

ITU-D Study Group 2 (SG2), Question 2/2 looks forward to cooperating with you.

Attachments:

Mandate of Question 2/2

Report of the Rapporteur Group April 2016 meeting on Question 2/2

Liaison Statement from ITU-D Study Group 2 Question 2/2 to Asia-Pacific Telecommunity (APT) on collaboration

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

7 April 2017

To:	Asia-Pacific Telecommunity (APT)
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	ITU-D Study Group 2 meeting on 7 April 2017
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Points:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int Mr Takashi Masumitsu, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 5369 E-mail: takashi.masumitsu@itu.int

ITU-D Study Group 2 Question 2/2 (Information and telecommunications/ICTs for eHealth) would like to express its sincere appreciation and gratitude for your liaison statement to ITU-D SG2 Q2/2 (document 2/455) concerning the APT Report on eHealth in APT region.

The Rapporteur Group is pleased to accept the invitation to collaborate with Asia-Pacific Telecommunity and exchange information on topics of mutual interest.

We are pleased to inform you that ITU-D Study Group 2 Question 2/2 (Information and telecommunications/ICTs for e health) approved the **Final Report on Information and telecommunications/ICTs for eHealth** at the fourth and final meeting of ITU-D Study Group 2 for the 2014-17 study period which was held in Geneva in April 2017. The Report defines eHealth and its applications for developing countries and brings forward significant information on eHealth services and systems from more than 40 countries, and eHealth ecosystem and standards – both technical and for service quality.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

We look forward to continuing cooperating with you.

Attachments:

Final Report on Question 2/2 for the 2014-17 study period

Liaison Statement from ITU-D Study Group 2 Question 2/2 to ITU-T Study Group 16 AND Study Group 20 on final report for ITU-D SG2 Q2/2 (eHealth)

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

7 April 2017

To:	ITU-T Study Group 16 (SG16), Study Group 20 (SG20)
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	ITU-D Study Group 2 meeting on 7 April 2017
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Point:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int Mr Takashi Masumitsu, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 5369 E-mail: takashi.masumitsu@itu.int

ITU-D Study Group 2 Question 2/2 (Information and telecommunications/ICTs for eHealth) is pleased to inform you that it has approved the **Final Report on Information and telecommunications/ICTs for eHealth** at the fourth and final meeting of ITU-D Study Group 2 for the 2014-17 study period which was held in Geneva in April 2017. The Report defines eHealth and its applications for developing countries and brings forward significant information on eHealth services and systems from more than 40 countries, and eHealth ecosystem and standards – both technical and for service quality.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

We look forward to continuing cooperating with you.

Attachments:

Final Report on Question 2/2 for the 2014-2017 study period

Liaison Statement from ITU-D Study Group 2 Question 2/2 to World Health Organization on final report for ITU-D SG2 Q2/2 (eHealth)

ITU-D Study Group 2 Question 2/2: Information and telecommunications/ICTs for eHealth

7 April 2017

To:	World Health Organization (WHO)
From:	ITU-D Study Group 2 (SG2), Question 2/2
For:	Action
Approval:	ITU-D Study Group 2 meeting on 7 April 2017
Contacts:	Mr Isao Nakajima, Japan, Rapporteur for Question 2/2 Phone number: +81 90 8850 8380 E-mail: js2hb@ets8.jp Mr Done-Sik Yoo, Korea (Rep. of), Co-Rapporteur for Question 2/2 Phone number: +82 42 860 1163 E-mail: dsyoo@etri.re.kr
BDT Focal Point:	Mr Hani Eskandar, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 6026 E-mail: hani.eskandar@itu.int Mr Takashi Masumitsu, BDT/IEE/CYB, BDT Focal Point for Question 1/2 Tel.: +41 22 730 5369 E-mail: takashi.masumitsu@itu.int

ITU-D Study Group 2 Question 2/2 (Information and telecommunications/ICTs for eHealth) is pleased to inform you that it has approved the **Final Report on Information and telecommunications/ICTs for eHealth** at the fourth and final meeting of ITU-D Study Group 2 for the 2014-17 study period which was held in Geneva in April 2017. The Report defines eHealth and its applications for developing countries and brings forward significant information on eHealth services and systems from more than 40 countries, and eHealth ecosystem and standards – both technical and for service quality.

Additional information about the ITU-D SG2 Question 2/2 structure, management team and work, can be found in the Attachment and following website: http://www.itu.int/net4/ITU-D/CDS/sg/rgqlist.asp?lg=1&sp=2014&rgq=D14-SG02-RGQ02.2&stg=2.

We look forward to continuing cooperating with you.

Attachments:

Final Report on Question 2/2 for the 2014-2017 study period

Annex 2.1: IEEE standards activities in eHealth

Overview

The eHealth environment emerging around the globe is predicated on standards-based interoperability of multi-vendor technology, and helps to enable multi-vendor systems and applications to speak the same language.[53]

Figure 1A: Improving personal health device communication through consensus building

Healthcare providers are then able to cost-effectively source the disparate array of standards-based technologies that their patients need without limitations on how information is shared across the end-to-end infrastructure.

IEEE has many standards in the eHealth technology area designed to help healthcare products, vendors and integrators create devices and systems for disease management; fitness tracking; health monitoring; independent living. Many of these IEEE standards cover eHealth technology area, from body area networks to 3D modeling of medical data and personal health device communications. The IEEE 11073™ family of standards is a group of standards under Health Informatics/Personal Health Device Communication for data interoperability and architecture.

IEEE is part of a larger ecosystem and has active collaborative relationships with other global organizations such as:

- Health Level Seven International (HL7), with a focus on data exchange/delivery);
- Integrating the Healthcare Enterprise (IHE), with a focus on development domain integration and content profiles; and
- International Health Terminology Standards Development Organisation (IHTSDO) with a focus on Systematized Nomenclature Of Medicine Clinical Terms (SNOMED) Clinical Terminology;
- ISO and CEN, both of which adopt many of the IEEE 11073 standards.

[53] Bill Ash, Institute of Electrical and Electronics Engineers, Inc., (IEEE), United States of America, w.ash@ieee.org.

This allows IEEE standards to be developed and used within a framework for interoperable medical device communications worldwide.

The growing IEEE 11073 family of standards is intended to support interoperable communications for personal health devices and convey far-ranging potential benefits, such as reducing clinical decision-making from days to minutes, reducing gaps and errors across the spectrum of healthcare delivery and helping to expand the potential market for the medical devices themselves.

IEEE standards

1) Approved Standards

- IEEE Std 802.3-2012, IEEE Standard for Ethernet
- IEEE Std 802.11-2011, IEEE Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
- IEEE Std 802.15.1-2005, IEEE Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 15.1a: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications for Wireless Personal Area Networks (WPAN)
- IEEE Std 802.15.4-2011, IEEE Standard for Local and Metropolitan Area Networks – Part 15.4: Low Rate Wireless Personal Area Networks (LR-WPANs)
- IEEE Std 802.15.6-2012, IEEE Standard for Wireless Body Area Networks
- IEEE Std 2010-2012, IEEE Recommended Practice for Neurofeedback Systems
- IEEE Std 11073-10101:2004, Health informatics – Point-of-care medical device communication -- Part 10101: Nomenclature
- IEEE Std 11073-00103:2012, Health informatics – Personal health device communication Part 00103: Overview
- IEEE Std 11073-10101:2004, Health informatics – Point-of-care medical device communication – Part 10101: Nomenclature
- IEEE Std 11073-10102:2012, Health informatics – Point-of-care medical device communication Part 10102: Nomenclature – Annotated ECG
- IEEE Std 11073-10103:2012, Health informatics – Point-of-care medical device communication Part 10103: Nomenclature--Implantable device, cardiac
- IEEE Std 11073-10201:2004, Health informatics – Point-of-care medical device communication - Domain information model
- IEEE Std 11073-10404:2008, Health Informatics – Personal Health Device Communication - Device Specialization- Pulse Oximeter
- IEEE Std 11073-10406:2011, Health informatics – Personal health device communication Part 10406: Device specialization – Basic electrocardiograph (ECG) (1-to 3-lead ECG)
- IEEE Std 11073-10407:2008, Health Informatics – Personal Health Device Communication - Device Specialization- Blood Pressure Monitor
- IEEE Std 11073-10408:2008, Health informatics – Personal health device communication Part 10408: Device specialization – Thermometer
- IEEE Std 11073-10415:2008, Health Informatics – Personal Health Device Communication - Device Specialization- Weighing Scale

- IEEE Std 11073-10417:2011, Health informatics – Personal health device communication Part 10417: Device specialization – Glucosemeter
- IEEE Std 11073-10418:2011, Health informatics – Personal health device communication Part 10418: Device specialization – International Normalized Ratio (INR) monitor
- IEEE Std 11073-10420:2010, Health informatics – Personal health device communication Part 10420: Device specialization – Body composition analyzer
- IEEE Std 11073-10421:2010, Health informatics – Personal health device communication Part 10421: Device specialization – Peak expiratory flow monitor (peak flow)
- IEEE Std 11073-10424:2014, Health informatics – Personal health device communication- Device specialization- Sleep apnea breathing therapy equipment
- IEEE Std 11073-10425:2014, Health informatics – Personal health device communication- Device specialization – Continuous Glucose Monitor (CGM)
- IEEE Std 11073-10441:2013, Health Informatic – Personal health device communication Part 10441: Device specialization – Cardiovascular fitness and activity monitor
- IEEE Std 11073-10442:2008, Health informatics – Personal health device communication Part 10442: Device specialization – Strength fitness equipment
- IEEE Std 11073-10471:2008, Health informatics – Personal health device communication Part 10471: Device specialization – Independent living activity hub
- IEEE Std 11073-10472:2010, Health informatics – Personal health device communication-- Part 10472: Device specialization – Medication monitor
- IEEE Std 11073-20101:2004, Health informatics – Point-of-care medical device communication - Application profile – Base standard
- IEEE Std 11073-20601:2008, Health informatics – Personal health device communication- Part 20601: Application profile – Optimized exchange protocol
- IEEE Std 11073-20601:2014, Standard for Health Informatics – Personal Health Device Communication- Application Profile – Optimized Exchange Protocol
- IEEE Std 11073-30200:2000, Health informatics – Point-of-care medical device communication - Transport profile – Cable connected
- IEEE Std 11073-30200a:2011, Health informatics – Point-of-care medical device communication Part 30200: Transport profile – Cable connected Amendment 1
- IEEE Std 11073-30300:2004, Health informatics – Point-of-care medical device communication - Transport profile – Infrared
- IEEE Std 11073-30400:2010, IEEE Health informatics – Point-of-care medical device communication Part 30400: Interface profile – Cabled Ethernet

2) Current new or revision projects

- IEEE P3333.1.2, Draft Standard for the perceptual Quality Assessment of Three Dimensional (3D) Contents based on Physiological mechanisms
- IEEE P3333.2.2, Draft Standard for Three-Dimensional (3D) Medical Visualization
- IEEE P3333.2.3, Draft Standard for Three-Dimensional (3D) Medical Data Management
- IEEE P1333.2.4, Draft Standard for Three-Dimensional (Medical Simulation)
- IEEE P1708, Draft Standard for Wearable Cuffless Blood Pressure Measuring Devices
- IEEE P1822, Draft Standard for Digital Microscope Analyzer, Whole Slide Image Scanner and Digital Microscope

- IEEE P3333.1, Draft Standard for the Quality Assessment of Three Dimensional (3D) Contents based on Psychophysical Studies
- IEEE P3333.2, Draft Standard for Three-Dimensional Model Creation Using Unprocessed 3D Medical Data
- IEEE P11073-10101, Draft Standard for Health informatics – Point-of-care medical device communication – Nomenclature
- IEEE P11073-10101a, Draft Standard for Health informatics – Point-of-care medical device communication- Nomenclature Amendment for additional definitions
- IEEE P11073-10201, Draft Standard for Health informatics – Point-of-care medical device communication- Domain information model
- IEEE P11073-10301-1, Draft Standard for Health informatics – Point-of-care medical device communication- Part 10301-1: Device Specialization – Infusion pump, General
- IEEE P11073-10302-1, Draft Standard for Health informatics – Point-of-care medical device communication- Part 10302-1: Device Specialization – Physiologic monitor, General
- IEEE P11073-10303-1, Draft Standard for Health informatics – Point-of-care medical device communication- Part 10303-1: Device Specialization – Ventilator, General
- IEEE P11073-10404, Draft Standard for Health Informatics – Personal Health Device Communication- Device Specialization – Pulse Oximeter
- IEEE P11073-10406a, Draft Standard for Health informatics – Personal health device communication Part 10406: Device specialization--Basic electrocardiograph (ECG) (1- to 3-lead ECG) Amendment
- IEEE P11073-10407-2008/Cor 1, Health Informatics – Personal Health Device Communication - Device Specialization- Blood Pressure Monitor – Corrigendum 1
- IEEE P11073-10408-2008/Cor 1, Health informatics – Personal health device communication Part 10408: Device specialization – Thermometer – Corrigendum 1
- IEEE P11073-10413, Draft Standard for Health informatics – Personal health device communication- Device specialization – Respiration rate monitor
- IEEE P11073-10415-2008/Cor 1, Health Informatics – Personal Health Device Communication - Device Specialization – Weighing Scale – Corrigendum 1
- IEEE P11073-10417a, Draft Standard for Health informatics – Personal health device communication Part 10417: Device specialization--Glucose meter Amendment 1
- IEEE P11073-10418-2011/Cor 1, Health informatics – Personal health device communication Part 10418: Device specialization – International Normalized Ratio (INR) monitor - Corrigendum 1
- IEEE P11073-10419, Draft Standard for Health informatics – Personal health device communication- Device specialization- Insulin pump
- IEEE P11073-10420-2010/Cor 1, Health informatics – Personal health device communication Part 10420: Device specialization – Body composition analyzer- Corrigendum 1
- IEEE P11073-10422, Draft Standard for Health informatics – Personal health device communication – Device specialization – Urine analyzer
- IEEE P11073-10423, Draft Standard for Health informatics – Personal health device communication – Device specialization – Sleep Monitor IEEE P11073-10424
- IEEE P11073-10471a, Draft Standard for Health informatics-Personal health device communication Part 10471: Device specialization-Independent living activity hub Amendment

- IEEE P11073-20101, Draft Standard for Health informatics – Point-of-care medical device communication – Application profile – Base standard
- IEEE P11073-20201, Draft Standard for Health informatics – Point-of-care medical device communication – Part 20201: Application profile – Polling mode
- IEEE P11073-20202, Draft Standard for Health informatics – Point-of-care medical device communication – Part 20202: Application profile – Baseline asynchronous mode
- IEEE P11073-20301, Draft Standard for Health informatics – Point-of-care medical device communication – Part 20301: Application profile – Optional package, remote control
- IEEE P11073-20401, Draft Standard for Health informatics – Point-of-care medical device communication – Part 20401: Application profile – Common networking services

Annex 2.2: Standards for eHealth

Standards for eHealth especially telemedicine has been developed since 1990's in ISO (ISO/TC215).[54] In early 2000's, standardization for Personal Health Devices (PHD) has been started in IEEE (IEEE-11073 PHD Work Group). The standards for eHealth has been established in the field of medical information and medical data exchange systems. The published standards are in **Table 1A**.

Table 1A: Standards for medical information and medical data exchange systems

No	Title of Standard
ISO 10159:2011	Health informatics- Messages and communication- Web access reference manifest
ISO/IEEE 11073-00103:2015	Health informatics- Personal health device communication- Part 00103: Overview
ISO/IEEE 11073-10101:2004	Health informatics - Point-of-care medical device communication - Part 10101: Nomenclature
ISO/IEEE 11073-10102:2014	Health informatics - Point-of-care medical device communication - Part 10102: Nomenclature- Annotated ECG
ISO/IEEE 11073-10103:2014	Health informatics - Point-of-care medical device communication - Part 10103: Nomenclature- Implantable device, cardiac
ISO/IEEE 11073-10201:2004	Health informatics- Point-of-care medical device communication- Part 10201: Domain information model
ISO/IEEE 11073-10404:2010	Health informatics- Personal health device communication- Part 10404: Device specialization- Pulse oximeter
ISO/IEEE 11073-10406:2012	Health informatics- Personal health device communication- Part 10406: Device specialization- Basic electrocardiograph (ECG) (1- to 3-lead ECG)
ISO/IEEE 11073-10407:2010	Health informatics- Personal health device communication- Part 10407: Device specialization- Blood pressure monitor
ISO/IEEE 11073-10408:2010	Health informatics- Personal health device communication- Part 10408: Device specialization- Thermometer
ISO/IEEE 11073-10415:2010	Health informatics- Personal health device communication- Part 10415: Device specialization- Weighing scale
ISO/IEEE 11073-10417:2014	Health informatics- Personal health device communication- Part 10417: Device specialization- Glucose meter
ISO/IEEE 11073-10418:2014	Health informatics- Personal health device communication- Part 10418: Device specialization- International Normalized Ratio (INR) monitor
ISO/IEEE 11073-10420:2012	Health informatics- Personal health device communication- Part 10420: Device specialization- Body composition analyzer
ISO/IEEE 11073-10421:2012	Health informatics- Personal health device communication- Part 10421: Device specialization- Peak expiratory flow monitor (peak flow)
ISO/IEEE 11073-10441:2015	Health informatics- Personal health device communication- Part 10441: Device specialization- Cardiovascular fitness and activity monitor

[54] Dr Done-Sik Yoo, Electronics and Telecommunications Research Institute (ETRI), Republic of Korea, +82 42 860 1163, dsyoo@etri.re.kr.

No	Title of Standard
ISO/IEEE 11073-10442:2015	Health informatics- Personal health device communication- Part 10442: Device specialization- Strength fitness equipment
ISO/IEEE 11073-10471:2010	Health informatics- Personal health device communication- Part 10471: Device specialization- Independant living activity hub
ISO/IEEE 11073-10472:2012	Health Informatics- Personal health device communication- Part 10472: Device specialization- Medication monitor
ISO/IEEE 11073-20101:2004	Health informatics - Point-of-care medical device communication - Part 20101: Application profiles- Base standard
ISO/IEEE 11073-20601:2010	Health informatics- Personal health device communication- Part 20601: Application profile- Optimized exchange protocol
ISO/IEEE 11073-30200:2004	Health informatics - Point-of-care medical device communication - Part 30200: Transport profile- Cable connected
ISO/IEEE 11073-30300:2004	Health informatics - Point-of-care medical device communication - Part 30300: Transport profile- Infrared wireless
ISO/IEEE 11073-30400:2012	Health informatics - Point-of-care medical device communication - Part 30400: Interface profile- Cabled Ethernet
ISO 11073-90101:2008	Health informatics - Point-of-care medical device communication - Part 90101: Analytical instruments- Point-of-care test
ISO 11073-91064:2009	Health informatics- Standard communication protocol- Part 91064: Computer-assisted electrocardiography
ISO/TS 11073-92001:2007	Health informatics- Medical waveform format- Part 92001: Encoding rules
ISO/TR 11487:2008	Health informatics- Clinical stakeholder participation in the work of ISO TC 215
ISO 11615:2012	Health informatics- Identification of medicinal products- Data elements and structures for the unique identification and exchange of regulated medicinal product information
ISO 11616:2012	Health informatics - Identification of medicinal products - Data elements and structures for the unique identification and exchange of regulated pharmaceutical product information
ISO/TR 11633-1:2009	Health informatics - Information security management for remote maintenance of medical devices and medical information systems - Part 1: Requirements and risk analysis
ISO/TR 11633-2:2009	Health informatics - Information security management for remote maintenance of medical devices and medical information systems- Part 2: Implementation of an information security management system (ISMS)
ISO/TR 11636:2009	Health Informatics- Dynamic on-demand virtual private network for health information infrastructure
ISO 12052:2006	Health informatics- Digital imaging and communication in medicine (DICOM) including workflow and data management
ISO/TR 12300:2014	Health informatics- Principles of mapping between terminological systems
ISO/TR 12309:2009	Health informatics- Guidelines for terminology development organizations

No	Title of Standard
ISO/TR 12773-1:2009	Business requirements for health summary records- Part 1: Requirements
ISO/TR 12773-2:2009	Business requirements for health summary records- Part 2: Environmental scan
ISO 12967-1:2009	Health informatics- Service architecture- Part 1: Enterprise viewpoint
ISO 12967-2:2009	Health informatics- Service architecture- Part 2: Information viewpoint
ISO 12967-3:2009	Health informatics- Service architecture- Part 3: Computational viewpoint
ISO/TR 13054:2012	Knowledge management of health information standards
ISO 13119:2012	Health informatics- Clinical knowledge resources- Metadata
ISO 13120:2013	Health informatics- Syntax to represent the content of healthcare classification systems- Classification Markup Language (ClaML)
ISO/TR 13128:2012	Health Informatics- Clinical document registry federation
ISO/TS 13131:2014	Health informatics- Telehealth services- Quality planning guidelines
ISO/TS 13582:2013	Health informatics- Sharing of OID registry information
ISO/TS 14265:2011	Health Informatics - Classification of purposes for processing personal health information
ISO/TR 14292:2012	Health informatics- Personal health records- Definition, scope and context
ISO/TR 14639-1:2012	Health informatics- Capacity-based eHealth architecture roadmap- Part 1: Overview of national eHealth initiatives
ISO/TR 14639-2:2014	Health informatics- Capacity-based eHealth architecture roadmap- Part 2: Architectural components and maturity model
ISO/TR 16056-1:2004	Health informatics - Interoperability of telehealth systems and networks - Part 1: Introduction and definitions
ISO/TR 16056-2:2004	Health informatics- Interoperability of telehealth systems and networks- Part 2: Real-time systems
ISO/TS 16058:2004	Health informatics- Interoperability of telelearning systems
ISO/TS 16791:2014	Health informatics - Requirements for international machine-readable coding of medicinal product package identifiers
ISO 17090-1:2013	Health informatics- Public key infrastructure- Part 1: Overview of digital certificate services
ISO 17090-2:2008	Health informatics- Public key infrastructure- Part 2: Certificate profile
ISO 17090-3:2008	Health informatics- Public key infrastructure- Part 3: Policy management of certification authority
ISO 17090-4:2014	Health informatics- Public key infrastructure- Part 4: Digital Signatures for healthcare documents
ISO 17115:2007	Health informatics- Vocabulary for terminological systems
ISO/TS 17117:2002	Health informatics- Controlled health terminology- Structure and high-level indicators

No	Title of Standard
ISO/TR 17119:2005	Health informatics- Health informatics profiling framework
ISO 17432:2004	Health informatics- Messages and communication- Web access to DICOM persistent objects
ISO/TS 17439:2014	Health informatics - Development of terms and definitions for health informatics glossaries
ISO/TR 17791:2013	Health informatics- Guidance on standards for enabling safety in health software
ISO 18104:2014	Health informatics- Categorial structures for representation of nursing diagnoses and nursing actions in terminological systems
ISO 18232:2006	Health Informatics- Messages and communication- Format of length limited globally unique string identifiers
ISO/TR 18307:2001	Health informatics- Interoperability and compatibility in messaging and communication standards- Key characteristics
ISO/TS 18530:2014	Health Informatics- Automatic identification and data capture marking and labelling- Subject of care and individual provider identification
ISO 18812:2003	Health informatics- Clinical analyser interfaces to laboratory information systems- Use profiles
ISO/TR 19231:2014	Health informatics- Survey of mHealth projects in low and middle income countries (LMIC)
ISO 20301:2014	Health informatics- Health cards- General characteristics
ISO 20302:2014	Health informatics- Health cards- Numbering system and registration procedure for issuer identifiers
ISO/TR 21089:2004	Health informatics- Trusted end-to-end information flows
ISO 21090:2011	Health informatics- Harmonized data types for information interchange
ISO 21091:2013	Health informatics- Directory services for healthcare providers, subjects of care and other entities
ISO/TS 21298:2008	Health informatics- Functional and structural roles
ISO 21549-1:2013	Health informatics- Patient healthcard data- Part 1: General structure
ISO 21549-2:2014	Health informatics- Patient healthcard data- Part 2: Common objects
ISO 21549-3:2014	Health informatics- Patient healthcard data- Part 3: Limited clinical data
ISO 21549-4:2014	Health informatics- Patient healthcard data- Part 4: Extended clinical data
ISO 21549-5:2008	Health informatics- Patient healthcard data- Part 5: Identification data
ISO 21549-6:2008	Health informatics- Patient healthcard data- Part 6: Administrative data
ISO 21549-7:2007	Health informatics- Patient healthcard data- Part 7: Medication data
ISO 21549-8:2010	Health informatics- Patient healthcard data- Part 8: Links
ISO 21667:2010	Health informatics- Health indicators conceptual framework

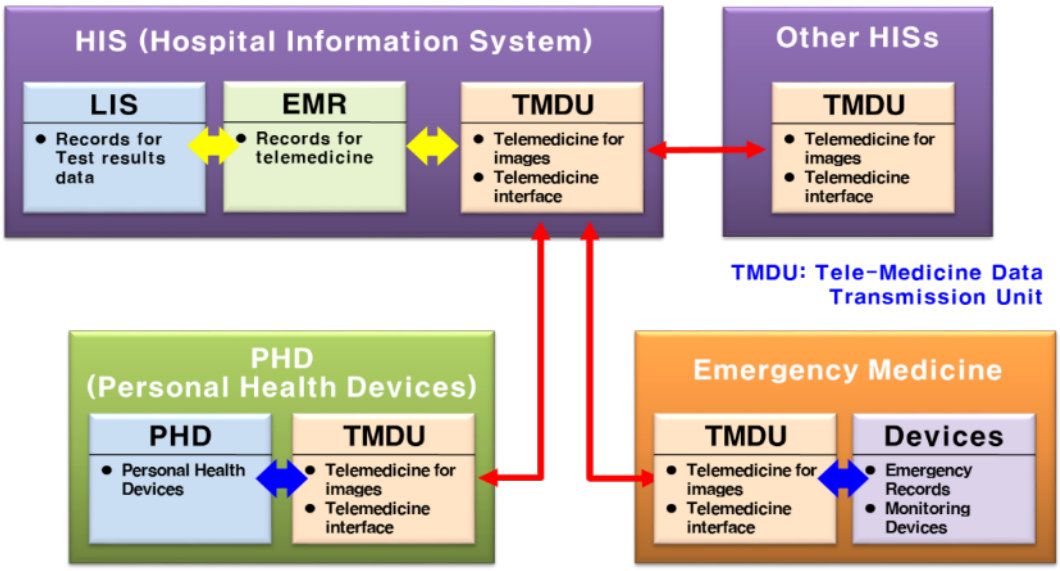
No	Title of Standard
ISO/TR 21730:2007	Health informatics- Use of mobile wireless communication and computing technology in healthcare facilities- Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices
ISO/HL7 21731:2014	Health informatics- HL7 version 3- Reference information model- Release 4
ISO/TS 22220:2011	Health informatics- Identification of subjects of healthcare
ISO/TR 22221:2006	Health informatics- Good principles and practices for a clinical data warehouse
ISO/TS 22224:2009	Health informatics- Electronic reporting of adverse drug reactions
ISO 22600-1:2014	Health informatics- Privilege management and access control- Part 1: Overview and policy management
ISO 22600-2:2014	Health informatics- Privilege management and access control- Part 2: Formal models
ISO 22600-3:2014	Health informatics- Privilege management and access control- Part 3: Implementations
ISO/TS 22789:2010	Health informatics - Conceptual framework for patient findings and problems in terminologies
ISO/TR 22790:2007	Health informatics- Functional characteristics of prescriber support systems
ISO 22857:2013	Health informatics - Guidelines on data protection to facilitate trans-border flows of personal health data
ISO/TS 25237:2008	Health informatics- Pseudonymization
ISO/TS 25238:2007	Health informatics- Classification of safety risks from health software
ISO/TR 25257:2009	Health informatics - Business requirements for an international coding system for medicinal products
ISO 25720:2009	Health informatics- Genomic Sequence Variation Markup Language (GSVML)
ISO/TS 27527:2010	Health informatics- Provider identification
ISO 27789:2013	Health informatics- Audit trails for electronic health records
ISO/TS 27790:2009	Health informatics- Document registry framework
ISO 27799:2008	Health informatics- Information security management in health using ISO/IEC 27002
ISO/TR 27809:2007	Health informatics- Measures for ensuring patient safety of health software
ISO/HL7 27931:2009	Data Exchange Standards- Health Level Seven Version 2.5- An application protocol for electronic data exchange in healthcare environments
ISO/HL7 27932:2009	Data Exchange Standards- HL7 Clinical Document Architecture, Release 2
ISO/HL7 27951:2009	Health informatics- Common terminology services, release 1
ISO/HL7 27953-1:2011	Health informatics- Individual case safety reports (ICSRs) in pharmacovigilance- Part 1: Framework for adverse event reporting
ISO/HL7 27953-2:2011	Health informatics- Individual case safety reports (ICSRs) in pharmacovigilance- Part 2: Human pharmaceutical reporting requirements for ICSR

No	Title of Standard
ISO/TR 28380-1:2014	Health informatics- IHE global standards adoption- Part 1: Process
ISO/TR 28380-2:2014	Health informatics - IHE global standards adoption - Part 2: Integration and content profiles
ISO/TR 28380-3:2014	Health informatics- IHE global standards adoption- Part 3: Deployment
ISO/TS 29585:2010	Health informatics- Deployment of a clinical data warehouse
IEC 80001-1:2010	Application of risk management for IT-networks incorporating medical devices- Part 1: Roles, responsibilities and activities
IEC/TR 80001-2-1:2012	Application of risk management for IT-networks incorporating medical devices - Part 2-1: Step by Step Risk Management of Medical IT-Networks; Practical Applications and Examples
IEC/TR 80001-2-2:2012	Application of risk management for IT-networks incorporating medical devices - Part 2-2: Guidance for the communication of medical device security needs, risks and controls
IEC/TR 80001-2-3:2012	Application of risk management for IT-networks incorporating medical devices Part 2-3: Guidance for wireless networks
IEC/TR 80001-2-4:2012	Application of risk management for IT-networks incorporating medical devices - Part 2-4: General implementation guidance for Healthcare Delivery Organizations
IEC/TR 80001-2-5:2014	Application of risk management for IT-networks incorporating medical devices - Part 2-5: Application guidance- Guidance for distributed alarm systems
ISO/TR 80001-2-6:2014	Application of risk management for IT-networks incorporating medical devices - Part 2-6: Application guidance- Guidance for responsibility agreements
ISO/TR 80001-2-7:2015	Application of risk management for IT-networks incorporating medical devices - Application guidance - Part 2-7: Guidance for Healthcare Delivery Organizations (HDOs) on how to self-assess their conformance with IEC 80001-1

A schematic diagram for telemedicine is shown in **Figure 2A**[55]. The Telemedicine Data Transmission Unit (TMDU) should be positioned in every telemedicine system including Hospital Information Systems (HIS), Personal Health Devices (PHD) and ambulances for emergency medicine. If the standard based TMDU is installed, it would be very easy to establish and expand the telemedicine system in the country.

[55] Yoo, Done-Sik, Standard Development of Data Exchange Technology for Telemedicine Services, Presentation at u-Health Project Group Meeting, Telecommunications Technology Association (TTA), Seoul, Republic of Korea, March 2015.

Figure 2A: Schematic diagram for telemedicine



It is necessary to review and investigate published standards for eHealth and to prioritize them in order to introduce developing countries. To do this, it is needed to meet and collaborate with standard experts. In the Question 2/2 for the 2014-2018 Study Period, it would be very helpful to appoint the Liaison officer to the T sector as well as other related SDOs such as ISO/TC215.

Development of eHealth Standards in Korea during 2015

1) Wellness Human Care Service Platform – A Reference Model for Wellness Condition Reasoning and Content Recommendation

[56]The purpose of this standard is to define a Reference Model for Wellness Condition Reasoning and Content Recommendation (**Figure 3A**[57],[58]) on the Wellness Human Care Service Platform that provides services for the pursuit of optimal health and high quality of life through an individual's active health promotion and prevention activities. This standard describes the requirements and standard items on the wellness human care platform to provide services that enable the reasoning of personalized wellness conditions and recommendations of appropriate content and programs. In addition, detailed requirements and recommendations for each component are also described.

Considering individuals' increasingly active pursuit of healthy lifestyles beyond the limited markets of Korean eHealth industries mainly based on medical institutions, this standard is applicable to various fields as follows: self-care, living care, wellness entertainment, etc. This standard provides the interoperability between products and services in these fields and the wellness human care service platform and is expected to have a great impact on related industries in the future.

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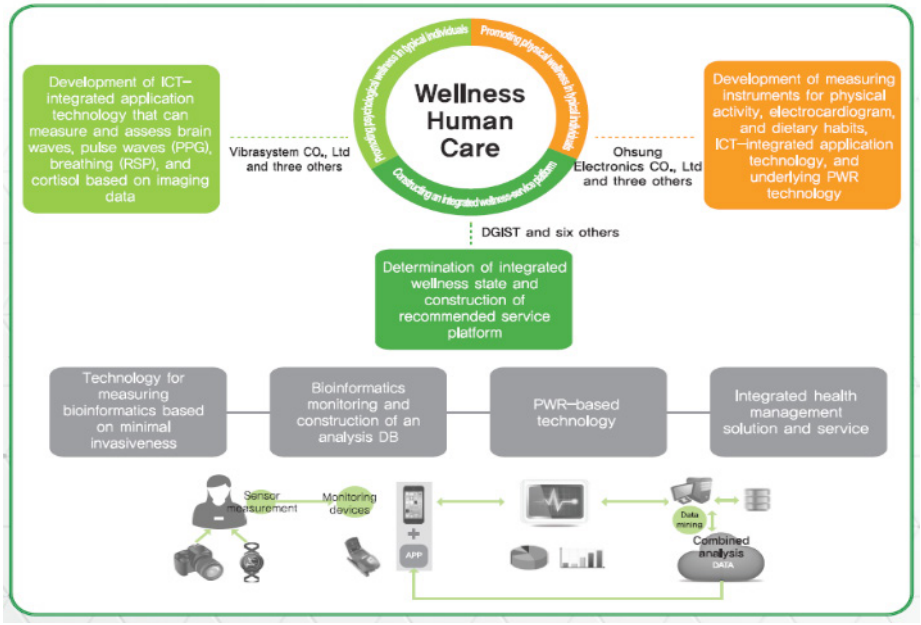
56 Dr Done-Sik Yoo, Electronics and Telecommunications Research Institute (ETRI), Korea (Rep. of), dsyoo@etri.re.kr.

57 2/233, "Development of e-health standards in Korea: Year 2014", The Second Meeting of ITU-D Study Group 2, ITU-D, Geneva, Switzerland, September 2015.

58 TTAK.KO-10.0831, "Wellness Human Care Service Platform - Reference Model for Wellness Condition Reasoning and Contents Recommendation", Telecommunications Technology Association (TTA), Republic of Korea, Dec 2015.

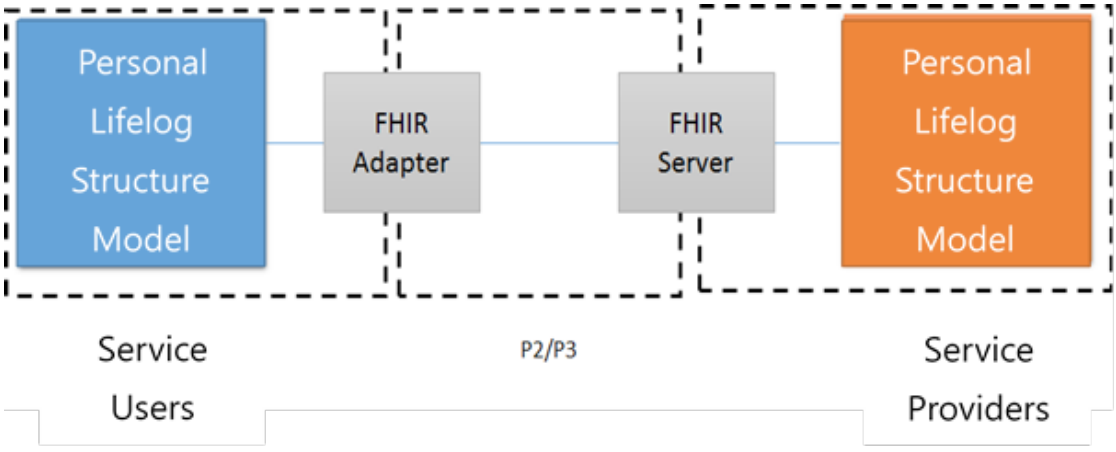
Figure 3A: Reference model for wellness condition reasoning and content recommendation



2) Protocols based on HL7 FHIR for Health Lifelog Services

The purpose of this standard is to help implement standardized services by defining the components and protocols for health lifelog services. With the development of smart devices, the healthcare service sector has been rapidly changing. However, the standardization of related products and services does not catch up with market demands. This standard defines the communication components and RESTful APIs based on HL7 FHIR for health lifelog services. The provision of health lifelog service protocols with a health lifelog data model will contribute to minimizing confusion, which may occur in the development of a health lifelog service. As a result, this standard is expected to help build a system that provides service infrastructure and the basic architecture of each component.

Figure 4A: Service based on the Data Model



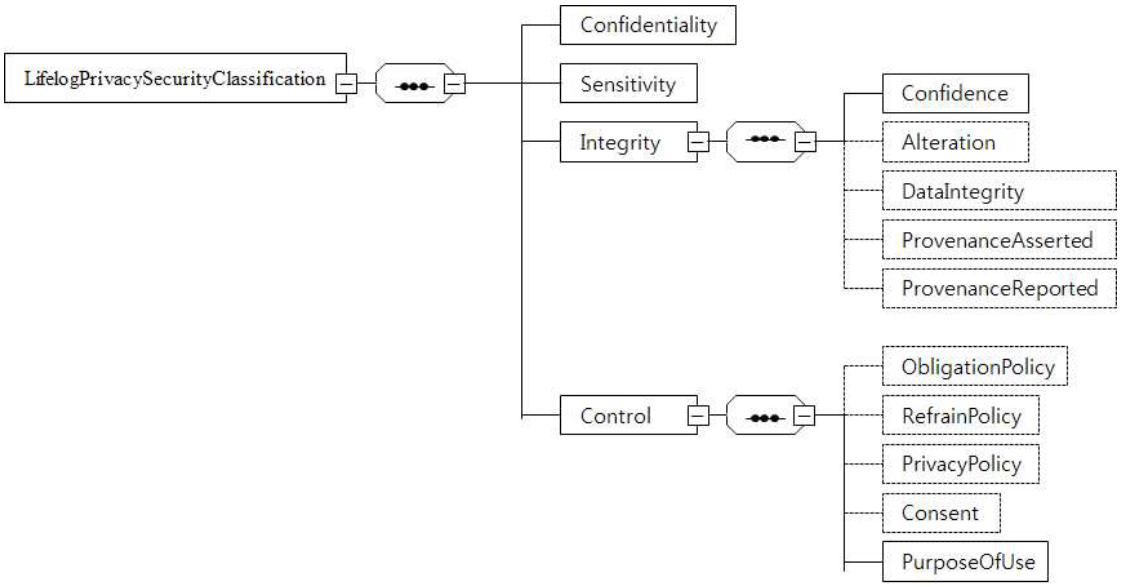
Source: TTAK.KO-10.0832, "Protocols based on HL7 FHIR for Health Lifelog Services", TTA, Republic of Korea, December 2015.

3) Privacy and security classification guideline for Health Lifelog Services

This standard defines the privacy and security classification guideline for health lifelog services to prevent privacy invasion. In providing personalized medical and healthcare services, the privacy and security classification guideline can be used to control access, specify protective measures, and determine additional handling restrictions required by communications security policy. In presenting

the privacy and security classification guideline for health lifelog services, this standard defines terminologies and describes the details of the privacy and security classification guideline, which applies based on the risk assessment of harm resulting from unauthorized disclosure. The advent of lifelog technologies has changed the user patterns as well as the paradigm of internet services, and emphasized the importance of personalized services. However, the issue of privacy infringement and leakage of users' sensitive medical information is aggravating with the application of lifelog technologies to healthcare. This standard helps address the problem of privacy infringement in healthcare services using lifelog technologies and ensures the interoperability among healthcare services. Moreover, this standard is expected to help reduce medical expenses by improving the health of individuals. Finally, this standard is expected to contribute to the emergence of a new medical service market that will include remote treatment services as well as to the revitalization of various business areas, including healthcare, marketing, and public health policy-making.

Figure 5A: Structure for the privacy and security classification guideline



Source: TTAK.OT-10. 0834 "Privacy and Security Classification Guideline for Health Lifelog Services", TTA, Korea, Dec 2015.

4) Requirements for description of Korean medicine treatment in personal health record exchange – Part 1: Medication

The purpose of this standard is to present the requirements for description of Korean Medicine treatment in personal health record exchange for the various types of personal health records of Korean medicine, and to help Korean medical services collaborate with and be integrated into eHealth services. It also describes requirements to consider in exchanging Korean Medicine treatment records. To enable the exchange of personal health records for Korean Medicine personal healthcare services, this standard defines terminologies and describes the interoperability with eHealth services and necessary considerations. The scale of eHealth services is very huge and complicated due to the involvement of various stakeholders including the government, hospitals, telcos, medical service providers and medical device manufactures. To create synergy and facilitate communication among stakeholders, standardization is a must. Furthermore, if Korean medicine hospitals, Korean medicine clinics, and Korean medicine healthcare devices are included in eHealth services, a more variety of services can be provided. To that end, it is necessary to differentiate services and information processing procedures in accordance with the source of key data for data sharing and communication. In this context, this standard can facilitate communication and increase the efficiency of healthcare. The benefits this standard is expected to deliver include: 1) more affordable and sustainable better-quality services for patients, and 2) more efficient, cheaper and customized provision of patient services for suppliers.

Annex 3: eHealth Initiatives of Member States

Telemedicine initiative in Cameroon

1) Introduction

Cameroon has an estimated population of 22 million, and a ratio of one doctor per 10,000 inhabitants in 2009.[59] That ratio will certainly not have evolved much since that date, given the speed with which the population is increasing and the low training rates in the field of healthcare in Cameroon.

This situation is made worse by the fact that barely 15 per cent of the population has social security health coverage, making healthcare a luxury for many Cameroonians. Thus, numerous patients have died because they have not received care in time. This led young doctors, in 2015, to create an initiative to resolve, if only partially, the difficulties relating to access to healthcare in Cameroon. This not-for-profit organization – SOS MEDECINS – uses information and communication technologies to provide proximity services.

This contribution presents this approach, which is in fact midway between traditional medicine and telemedicine.

2) The "SOS MEDECINS" services

SOS MEDECINS offers two types of service: a service at home, and advice online. The medical service at home is provided to those who have subscribed to it in advance. When required, the subscriber or person acting on his/her behalf calls the SOS MEDECINS switchboard and indicates where the patient is, providing any further information necessary to foresee the resources required (general practitioners, specialists, nurses, equipment, etc.). The resources are mobilized and taken to wherever the patient is.

Where advice is concerned, use is made of current means of communication – WhatsApp, Facebook, Viber, and even the traditional telephone. In general, people can ask basic questions even if they are not subscribers, but if they want to take it any further they have to subscribe.

After barely a year's existence, SOS MEDECINS in Cameroon has had 497 patients receiving home visits, with appointments generally made by telephone, and 11 834 people receiving advice online (WhatsApp, Viber, Facebook, etc.).

3) Difficulties and future outlook

The difficulties encountered by SOS MEDECINS relate to the address system, which is very imprecise in Cameroon. It often takes patients a long time to explain where they are.

With the development of mobile broadband in Cameroon, SOS MEDECINS intends to get their subscribers to use geolocation applications to make it easier to find them. SOS MEDECINS now provides its services in three towns, and intends to expand to most localities in Cameroon, allowing subscribers anywhere in those localities to receive care when required. Partnerships are also being envisaged with SOS MEDECINS France and SOS MEDECINS Sénégal.

4) Gifted Mom – services

According to the 2013 Human Development Report published by the United Nations Development Programme (UNDP), 690 out of every 100,000 women die from pregnancy-related causes. The report also observes that 61 out of every 1,000 children die before the age of five years, particularly as a result of non-vaccination.

The statistics relating to such mother and child mortality issues are far more alarming, although they are not available on WHO's, or even Cameroon's, web pages showing current statistics. In 2016, cases

[59] Mr Albert Kamga, Ministry of Posts and Telecommunications, Cameroon, kamga@minpostel.gov.cm.

of tragic and dramatic deaths of pregnant women have been recorded in Cameroon's main cities. A case in point was the death on 13 March 2016 of a mother with her four babies.[60] Only a few days later, another case involving the death of twin-pregnancy babies was recorded in Yaoundé, the political capital. With such dramatic events occurring in the main cities, in which the key hospital facilities are located, one can imagine how bad the situation is in remote areas.

It was in the interests of helping to resolve this prenatal and neonatal problem that a group of young Information and Communication Technology (ICT) engineers set up, in 2013, a platform known as "Gifted Mom", to provide better support for pregnant women and monitoring for children aged below five years.

The Gifted Mom platform offers the following services and solutions:

- Green telephone line for ad hoc assistance to pregnant women: A woman requiring telephone assistance can send a text message to the short code 8006. She will then be put in contact with a call-centre operator for assistance and advice, in English or French – the official languages – or in one of the local languages.
- Monitoring of pregnant women: Pre-registered pregnant women receive telephone calls, for those who are unable to read, or SMS texts for those who can, reminding them of important dates and deadlines for prenatal consultations.
- Monitoring of child vaccinations: Mothers of children under five years of age are informed by telephone or SMS of the vaccination dates foreseen in the national immunization programme (measles, poliomyelitis, tetanus, etc.).
- Education: Gifted Mom advises young girls and communities, particularly on sex-related matters (sex education) and family planning. Information on scheduled training sessions is for the most part disseminated by mobile, but the training sessions themselves are face to face.

Awareness-building among women and the general public regarding the services provided by Gifted Mom is achieved through the distribution of flyers, radio and television spots, representation at forums, partnerships with hospital training exercises, a presence on social networks, websites, and so on.

In June 2016, the platform had over 10,000 users. The services provided by Gifted Mom are free of charge. Financing comes from awards received and from partners, including the following:

- The Partnership for Maternal and Newborn Health (PMNCH)
- Mobile Alliance for Maternal Action
- The MasterCard Foundation
- Women Deliver
- ALN Ventures
- etc.

Gifted Mom has already received numerous awards, including:

- African Young Enterprise Award
- The Queen's Young Leaders
- D-Prize
- Ashoka Changemakers
- Anzisha Prize

[60] https://www.youtube.com/watch?v=UlF4j-8ipNY.

5) References

– http://www.giftedmom.org

– http://www.lemonde.fr/afrique/article/2015/02/06/gifted-mom-un-projet-innovant-pour-combattre-la-mortalite-infantile_4571727_3212.html

– http://www.lemonde.fr/afrique/article/2016/05/10/au-cameroun-une-application-pour-que-les-femmes-enceintes-ne-meurent-plus-en-silence_4916830_3212.htm

– https://www.facebook.com/thegiftedmom/

Wireless heart health: case study from People's Republic of China

To support the prevention and management of CVDs in China's rural communities, Qualcomm® Wireless ReachTM launched the Wireless Heart Health program in collaboration with Life Care Networks in 2011.[61] Wireless Heart Health targets rural doctors and patients. This program was deployed in resource-scarce, community health clinics located in 21 provinces and direct-controlled municipalities across China.

The Wireless Heart Health program features a mobile broadband-enabled system developed by Life Care Networks. This system includes a smartphone with three built-in ECG sensors and an Electronic Health Record (EHR) platform that offers instant access to patient records, including ECG data.

Table 2A: Wireless heart health

1. Entity submitting the case study		
1.1 Country of entity:		USA
1.2 Name of entity:		Qualcomm Incorporated
1.3 Type (one reply only):		
□	Member State	
X	**Sector Member**	
□	Associate	
□	Academia	
□	Regional Organisation	
□	International Organisation	
□	UN Organisation	
□	Other	
1.4 Website:		www.wirelessreach.com
1.5 Contact name:		Michelle Martin
1.6 Contact title:		Government Affairs Analyst, Staff
1.7 Contact phone:		858-845-8621
1.8 Contact e-mail:		
1.9 Contact e-mail:		
X	Case study only	

[61] Contribution Ms Laboni Patnaik, Qualcomm Inc., United States of America.

□	Case study and discussion at the next relevant meeting
	Information on who will present the case study at the meeting(s) can be entered using the contribution submission form here (http://www.itu.int/ITU-D/CDS/contributions/sg/index.asp)

2. Case study details	
2.1 Title:	Wireless Heart Health
2.2 Country:	China
2.3 Study period:	2011 (continuing)

2.4 Relevant ITU-D Study Group Question:	
X	**Q10-3/2: Telecommunications/ICT for rural and remote areas (2010-2014)**
X	**Q14-3/2: Information and telecommunications/ICTs for eHealth (2010-2014)**
X	**Q25/2: Access technology for broadband telecommunications including IMT, for developing countries (2010-2014)**

2.5 Status (one reply only):	
□	Planned
X	**Ongoing**
□	Completed
□	Other. Please specify

2.6 Type of initiative (one reply only):	
□	Not applicable to this initiative
X	Pilot/trial
□	Initiative funded by USF
□	Other. Please specify

2.7 Start year:	2011

2.8 Length (years) (one reply only):	
□	< 1
□	1
□	2
□	3
□	4
□	5
X	**6-10**
□	> 10

2.9 Seat location of the initiative/project:	Twenty-one provinces and direct-controlled municipalities: Beijing, Shanghai, Tianjin, Anhui, Shandong, Hunan, Jiangsu, Fujian, Zhejiang, Jilin, Shanxi, Shaanxi, Xizang, Guangdong, Liaoning, Heilongjiang, Yunnan, Guizhou, Guangxi, Xinjiang and Hebei.
2.10 Please indicate closest main city and GPS coordinates, if possible:	

2.11 Size of the population concerned by the initiative/ project:	Population of China: 1.4 billion (as of 2015). Rural population of China: 603 million (as of 2015). Rural population concerned by the initiative: 390 million (as of 2015).
2.12 Website of the initiative:	https://www.qualcomm.com/company/wireless-reach, http://www.qualcomm.cn/company/wireless-reach, http://www.lifecarenetworks.com/

2.13 Beneficiary region:	
□	Global
□	Africa
□	Arab States
X	**Asia & Pacific**
□	CIS
□	Europe
□	The Americas
□	Not in any region

2.14 Beneficiary countries (please list):	China
3. Detailed description	
3.1 Detailed description:	

Description of the country's geography, terrain, climate, demographics, and socio-economic situation:	China is developing fast. However, the income gap between urban and rural residents is widening. According to government statistics, the average disposable income of rural residents is less than RMB 12,000 (about USD $1,800) per year – approximately one-third that of urban residents. Recently, Peking University's Institute of Social Science Survey found that China's Gini coefficient for income was 0.49 in 2012, compared to 0.47 in 2010. The imbalanced allocation of health resources between rural and urban areas has been a subject of public concern. In most remote and underdeveloped areas in China, the private clinic is an important supplement to public hospitals, which have a severe shortage of health professionals and medical resources. Experts agree that the global health burden of cardiovascular disease (CVD) is on the rise and disproportionately affects rural residents. CVDs are currently the leading cause of death in China, responsible for about 2.6 million deaths annually. By 2020, this figure is projected to increase to 4 million deaths per year. China will lose USD $27.8 trillion in national income between 2012 and 2030 due to the five main non-communicable diseases (NCDs), including CVD, cancer, chronic respiratory disease, diabetes and mental health. CVD is one of the two most costly NCDs. Cardiovascular diseases are some of the hardest diseases to diagnose, especially when patients are not showing common symptoms. The main challenges facing CVD care in rural areas are the difficulties in reaching patients, inadequate medical facilities and sometimes the limited capacity and capabilities of doctors. Experts worldwide agree that early detection and consistent monitoring through electrocardiogram (ECG) screening, paired with necessary treatment, have the potential to decrease health risks associated with CVD.
3.2 Objectives and implementation details:	

Objectives and implementation details of the initiative/project applications (basic telephony, e-business, e-administration, e-education, eHealth, ICT training, etc.):	Luo Zhengxiang, head of the Guangdong Cardiovascular Disease Research Institute, notes, "CVDs have spread to many rural areas in most parts of China, where medical care is less adequate than what can be found in the cities." To support the prevention and management of CVDs in China's rural communities, Qualcomm® Wireless Reach™ launched the Wireless Heart Health program in collaboration with Life Care Networks in 2011. Wireless Heart Health targets rural doctors and patients. This program was deployed in resource-scarce, community health clinics located in 21 provinces and direct-controlled municipalities across China. The Wireless Heart Health program features a mobile broadband-enabled system developed by Life Care Networks. This system includes a smartphone with three built-in ECG sensors and an electronic health record (EHR) platform that offers instant access to patient records, including ECG data. Doctors hold the device to patients' chests for approximately 30 seconds while the sensor collects their ECG data. The data is automatically stored in the patient's EHR and sent immediately over the 3G or 4G LTE wireless network for analysis by a cardiac specialist at the Life Care Networks Call Center, which is staffed around the clock in Beijing. The on-call cardiac specialists provide feedback within minutes to clinic staff and patients via SMS or a phone call. Currently, the call center has 72 physicians and 10 nurses. For simple cases, the physicians at the call center can provide diagnosis, consultation and treatment remotely. For more complex cases, patients are screened by the system and then referred to specialized hospitals for further testing or treatment.
3.3 Considerations:	
Consideration of indigenous communities, isolated and poorly served areas, small islands and their particular needs and situations:	As the largest information and communications platform in history, mobile broadband technology has become a force for change. It drives economic growth and provides unprecedented opportunities to empower individuals across all socio-economic levels and in every corner of the globe – places where landlines and paved roads may not reach. Mobile technology is the principal tool for digital inclusion, giving everyone the chance to access the Internet and broadband services. Low cost devices and free applications bring isolated communities access to information and people worldwide. CVDs are currently the leading cause of death in China and are on the rise, especially in rural areas. Mobile technology is now empowering rural communities with tools and resources to better manage their health.
3.4 Financing:	
Financing and partnership aspects of the initiative, including the estimated total cost of the initiative and the types of funders (e.g. sponsors' contribution, charitable donations and subsidies from USF):	It is the Company's policy to not disclose the amount of funding for each program. It is important to recognize that the success of this program is made possible by the shared responsibility of all the partners who have contributed their expertise, resources and technology. Because of the program's reach and the variety of contributions from the different partners, the investment is much more than a US dollar amount. The program partners have worked together, each providing technical advice, support, training, funding and in-kind contributions.
3.5 Financial scale of the initiative (one reply only):	

□	Not applicable
□	Less than USD 100 000
X	Between USD 100 000 and USD 499 999
□	Between USD 500 000 and USD 999 999
□	USD 1 000 000 or more
3.6 Type of initiative (in relation to financing) (one reply only):	
□	Not applicable for this initiative
□	Governmentally subsidized (sponsored)
□	Privately subsidized
X	**Partnership between government and private sectors**
□	Funded by USF
□	Other
***3.7 Type of application/services provided:**	
□	Not applicable for this initiative
□	Public voice and data services
□	Radio or TV broadcasting
□	E-governance, e-administration
□	Support for small business, e-business
X	EHealth
□	Tele-education, e-learning
X	ICT training
□	Disaster preparedness / emergency support / disaster mitigation
□	Environmental monitoring / protection
□	Other
3.8 Type of technology used:	
□	Not applicable for this initiative
□	Wired local loop: Copper, optical fibre, etc. (customer's loop)
□	Wireless local loop (customer's loop)
□	Fixed wireless access (long distance)
X	**Mobile wireless access**
□	Satellite two-way communications: VSAT, etc.
□	Wireless LANS and IP-based related networks
□	Terrestrial voice, data, sound or television broadcasting
□	Satellite voice, data, sound or television broadcasting
□	Hybrid or combined technologies
□	Other

3.9 Decision-making process to determine the initiative/project:	Qualcomm Wireless Reach holds an open call for proposals annually. Applicants are encouraged to submit a proposal focused on education, healthcare, public safety, entrepreneurship or the environment. Proposals are vetted based on the strength of their ability to demonstrate the use of wireless technology to strengthen economic and social development.
4. Infrastructure and regulatory environment	
4.1 Infrastructure components (Pre-existing telecommunication facilities, transport access, electricity supply, distance to the nearest local exchange and/or IP network, human resources, security, etc.):	The project leverages existing advanced wireless telecommunications networks, in this case China Telecom's CDMA2000 1x, EV-DO, TDD-LTE and FDD-LTE networks, which are serviced with power and backhaul capabilities. The networks cover most populated areas, although additional spectrum may serve to increase coverage and quality of service issues. The project operatives and beneficiaries require only the most basic infrastructure/power services.
4.2 Regulatory components (Universal service obligations, licensing conditions, frequency availability (for radio-based projects), other regulatory issues, etc.):	China has licensed radio spectrum for 3G and 4G LTE mobile services and had allocated spectrum to the three Chinese mobile carriers for long-term use (without specific withdraw date) respectively. China Telecom, as the project partner, has been allocated 30 MHz (2x15) within the 1900 MHz band (reserved), 20 MHz(2x10) within the 800 MHz band for CDMA2000 (1x&EVDO) use, 40 MHz (2x20) within band40 and band41 for TDD-LTE use, and 60 MHz (4x15) within band1 and band3 for FDD-LTE use.
4.3 Other factors which influenced the operating environment (Manufacturers, standards, etc.):	The project utilizes standard 3G and 4G LTE equipment and operations – there are no special factors required for the successful execution of the project.
5. Technical description and services provided	
5.1 Architecture, type of systems, main technical characteristics, frequencies (for radio-based projects), **power** consumption, **performances** (capacity, reliability, quality of service), **network management**, etc.:	The purpose-built smartphone includes three sensors which drive the one-lead ECG module inside the mobile device to record and receive the data. The smartphone then displays the ECG waveform on the screen and sends the data to the backend server via CDMA air interface. The device is powered by the Qualcomm Snapdragon S1 processor and installed with Android 4.2 operating system. Patient data in the EHR and in the ECG-sensing smartphone is protected by SSL encryption Life Care Networks partners closely with government health systems, so data adheres to the government's protection and privacy standards in order to integrate with government hospital-grade EHRs.
5.2 Installation and deployment (Network planning, subscriber management, etc.):	Life Care Networks operates a platform, connected to all user devices for data collection and analysis. The platform can also allow system managers to push out application updates, provide remote debugging services and conduct remote user communications.
5.3 Interconnection to national networks/backbones:	All devices can be connected to the national/local 3G or 4G LTE wireless network. The Life Care Network data platform is also connected to the national public health network. The program assists local health bureaus to collect and monitor patient data.
5.4 For each service delivered (POTS, "IP telephony", etc.)**: mode** (data type and bit rate) **and quality** (voice quality and bit error rate):	SMS – Data (GMS, 9.6kbps) Telephony – Voice (GMS, 9.6kbps) ECG Data – Packet Data (3G, 2.8Mbps; 4G, 50Mbps)
6. Cost aspects	

6.1 Cost of the equipment, cost per line and cost of the operation of the system:	Device Cost – USD $95 Operation Cost – USD 2,500 per month
6.2 Cost of each terminal and cost of the service for the user:	The rural healthcare providers participating in the Wireless Heart Health program received ECG-sensing smartphones at no cost, contingent upon a three-year commitment to pay a monthly service fee of USD $24 to China Telecom.
6.3 New technologies deployed for providing reduced cost capital and operating cost solutions:	Smartphones with built-in ECG sensors, pre-loaded with an EHR platform developed specifically for this program and with connectivity to an advanced wireless 3G or 4G LTE telecommunications network provide healthcare workers with instant access to electronic patient records and can provide cost-effective user experiences.
7. Effectiveness and sustainability of the initiative/project	
7.1 Effectiveness and benefits of the initiative/project for the targeted user groups:	By utilizing 3G and 4G LTE wireless technology to collect heart data from underserved patients and send it to specialists for immediate consultation, this project successfully overcomes some of the barriers to screening for and treating cardiovascular diseases in rural areas of China. Since the project's implementation in 2011, more than 600 doctors have used the Wireless Heart Health system and more than 160,000 patients have benefitted from it. For example, Dr. Ren Nianbao runs a community clinic in Langmaoshan, a rural region outside Jinan city, Shangdong province. Although it is a tiny clinic, Dr. Ren receives hundreds of patients each day. He said that about 20 percent of these patients are suffering from CVDs and that CVDs are on the rise in many of the areas he serves mainly "because of bad habits, such as eating a lot of high-calorie foods." However, a large portion of these patients do not realize they have CVDs. Prior to participating in the Wireless Heart Health program, Dr. Ren and his staff were using a conventional 12-lead ECG machine to screen for CVDs. Because this huge, complex machine is too difficult to transport and use in patients' homes, it was difficult to screen patients with a potential risk of acute CVD and who may need immediate help but aren't able to travel to a clinic. Now, Dr. Ren's clinic relies on the smartphone to quickly, easily and affordably collect accurate ECG data and receive expert consultation from cardiac specialists in the Life Care Networks Call Center in Beijing 310 miles away. Dr. Ren said he uses the mobile device 30 to 50 times per day, as more and more people are coming to him for health consultations. "Patients now have access to quick and accurate screenings," says Dr. Ren. "It's also convenient that we can check a patient's medical history on the mobile-centric digital tracking system and get examination results from the monitoring center in one to two minutes." Dr. Ren was also very excited to report that some of his patients were now correcting their own bad habits, based on greater understanding of their health, gained through the Wireless Heart Health program. Taking corrective measures will help patients prevent their diseases from worsening. Speaking about the ECG-sensing smartphones' impact on patients, Dr. Ren says, "With these efficient and trustworthy devices, many patients are now willing to get regular health examinations – increasing their knowledge and understanding of how to develop healthy lifestyles."

7.2 Profitability of the initiative/ project and/or its contribution to local entrepreneurial activities:	Given that the need for CVD diagnosis and management will be ongoing, the Wireless Heart Health program was designed to be financially sustainable and is not reliant on future funding from Qualcomm Wireless Reach. The more than 600 rural healthcare providers participating in the Wireless Heart Health program received ECG-sensing smartphones at no cost. Moving forward, providers will continue to receive ECG-sensing smartphones for free, contingent upon a three-year commitment to pay a monthly service fee of RMB 150 (USD $24) to China Telecom. Market research by Life Care Networks shows that, by charging a nominal fee for their ECG screening services, each rural doctor would earn about RMB 300 (USD $48) per month from the delivery of ECG screenings, which means they will capture roughly RMB 150 (USD $24) in revenue. Patients pay an average price of RMB 10 (USD $1.60) for a screening that uses the ECG-sensing smartphone. The Chinese government provides a subsidy of RMB 50 (USD $8) toward heath care costs, which patients can use to pay for ECG screenings.
7.3 Specific strategies to respond to the needs of women, youth, handicapped, indigenous people and other marginalized or socially disadvantaged groups:	Quick, accurate, affordable heart screenings are provided via mobile broadband devices in order to efficiently and effectively reach resource-scarce populations and provide them with access to much-needed health services.
7.4 Aspects of the initiative/project, which could be strengthened to enhance its effectiveness or sustainability maximizing the benefits of telecommunication infrastructure in rural and remote areas:	Providers report that most patients are happy with the new method of conducting ECG screenings, though many lack full knowledge about the device and remain more ambivalent than providers toward the new technology. This is not unusual when new technology is introduced. Often, user education is the first step to a successful and sustainable technology deployment. Providers suggested some potential technology advances for the next iteration of the devices, including adding more sensors for more leads and improving wireless connectivity. While most users reported overall satisfaction with the device, the few who reported being dissatisfied noted connectivity issues as a reason. Wireless connectivity in rural areas has greatly improved in the past decade and is expected to continue to improve steadily in the coming years. With better connectivity, even more patients in rural areas with limited access to advanced medical care can have access to CVD screening, diagnosis and treatment.
8. Social and human development impact	
8.1 Overview of key social and human development needs of the population in the initiative/project area:	As discussed in "3.1 Detailed description", CVDs are currently the leading cause of death in China, responsible for about 2.6 million deaths annually. By 2020, this figure is projected to increase to 4 million deaths per year. The main challenges facing CVD care in rural areas are the difficulties in reaching patients, inadequate medical facilities and sometimes the limited capacity and capabilities of doctors. The Wireless Heart Health program provides unprecedented access to affordable, quality CVD screening and treatment for rural patients. By charging a nominal fee for their ECG screening services, the more than 600 rural doctors participating in this program are incentivized to conduct home visits and reach as many patients as possible.

8.2 Role and commitment of the initiative/project to addressing these needs:	The Wireless Heart Health program was developed by Qualcomm Wireless Reach in collaboration with Life Care Networks and Community Health Association of China. Qualcomm Wireless Reach is the main funder of the Wireless Heart Health program and provides project management support. Life Care Networks provides ECG-sensing smartphones, developed the mobile application and EHR, provides technical training to participating clinicians and provides remote services for consultation, diagnosis and treatment through its call center in Beijing. From 2011 to 2013, Community Health Association of China aided in site selection, program implementation and impact analysis; from 2014 to present, China Telecom and Momentum have assumed this role.

8.3 Socio-economic benefits for, and impacts on the community(ies) and/or at a wider level, including support for gender equity, promotion of community participation and the needs of marginalized and disadvantaged populations:	More than 600 doctors and staff in approximately 600 hospitals, community health centers and primary clinics are utilizing the ECG-sensing smartphones and EHR platform provided by the Wireless Heart Health program. Since the program's rollout, CVD specialists in Life Care Networks Call Center have given expert feedback to local doctors for more than 160,000 rural patient ECG screenings, of which 20 percent pointed to potential CVD conditions requiring further medical attention. In fall 2015, Qualcomm Wireless Reach, Life Care Networks and a team of experts from Vital Wave, Inc. designed and implemented a use and satisfaction survey for the Wireless Heart Health program. The goal of the survey was to understand experiences among healthcare providers using the ECG-sensing smartphones to care for their patients. The survey showed that healthcare providers in rural China are very satisfied with the mobile devices and believe they are providing improved care and services to patients with CVD. Key points from the research findings include: – Two-thirds (66%) of providers were able to examine more patients than before by using the ECG-sensing smartphone; 61% report more CVD diagnoses using the device. – Almost one-quarter (23%) of providers offered in-home ECG screenings to patients using the ECG-sensing smartphone. – A majority (75%) of respondents reported that the biggest benefit of the ECG-sensing smartphones is the long-run decrease in cost of CVD screening and diagnosis. – More than half (62%) of providers reported that the Life Care Networks Call Center increased the accuracy of their diagnoses and that call center feedback improved their confidence in providing diagnoses. – ECG-sensing smartphones with the Life Care Networks platform are six times less expensive for patients than conventional 12-lead ECG machines: RMB 4.47 (USD $0.67) versus RMB 26.48 (USD $3.96). In conclusion, research findings demonstrate that the Wireless Heart Health program has been very successful in supporting rural residents, providers and government agencies addressing the rising health burden of CVD. With the ECG-sensing smartphones, costs are decreasing significantly, quality and reach of care is increasing, and satisfaction is high among patients and practitioners. China views technological innovation as the key for sustainable progress now and in the future. The Wireless Heart Health program contributes to China's sustainable development. This program also addresses UN Sustainable Development Goal (SDG) 3: Ensure healthy lives and promote well-being for all at all ages.

8.4 Means foreseen to enhance the initiative's/project's future contributions to human and social development:	Wireless Heart Health is an excellent example of how Wireless Reach takes programs to scale. We developed, tested and refined this program's technology and business model to ensure that Wireless Heart Health could succeed at-scale. Sustainability of the business model in order to deliver critical CVD screenings to at-risk and underserved populations was the top priority when we scaled the program across China in 2013. The business model proved successful as the uptick of users sky-rocketed beyond the original targeted provinces. Simply put, with ECG-sensing smartphones, CVD screening in China is now a possibility for the many instead of the few.
9. Other observations	
9.1 Unexpected results and lessons learned:	The ECG-sensing smartphone from Life Care Networks is increasing the volume of ECGs being conducted in rural China. Since 2012, more than 525,000 ECG images have been sent over the wireless network using ECG-sensing smartphones. Approximately 160,000 of these images were covered by the Wireless Heart Health program. Additionally, just half of the providers surveyed had used traditional 12-lead machines to administer ECGs prior to obtaining the ECG-sensing smartphone. Therefore, we can conclude that the ECG-sensing smartphones are increasing patient access to CVD testing. However, the mechanism for feedback loops from end beneficiaries (patients) is underdeveloped, which results in lack of knowledge on end beneficiary satisfaction. Also, there is lack of knowledge on use and satisfaction to inform decision-making on UI, functionality and services. Based on the program findings, we recommended that Life Care Networks create a sustainability and scale-up strategy that includes: 1) providing enhanced training for providers and education for patients, 2) furthering research and development on the sensors, 3) conducting periodic surveys to create feedback loops with providers, and 4) deepening collaboration with operators on improving connectivity.
9.2 Anticipated near/long-term initiative/project challenges and reorientation:	Findings suggest that from the providers' perspective, increased patient education about the device could improve acceptance and satisfaction among patients, and further system enhancements would increase their own satisfaction with the devices. For example, more than one-quarter (26%) of survey respondents reported that they may use the traditional ECG machines if a patient does not trust the ECG-sensing smartphone. This is a common occurrence when new technology is introduced and presents an opportunity for Life Care Networks to support healthcare providers in educating patients about the accuracy of the ECG-sensing smartphone. Providers suggested some potential technology advances for the next iteration of the devices, including: adding more sensors for more leads (77%) and, as discussed above in 7.4, improving wireless connectivity (67%). Life Care Networks is currently developing the next generation device – a 12-lead ECG-enabled smartphone – as directed by the program findings and user feedback.
9.3 Additional information considered useful:	The mobile industry changes at a rapid pace and solutions need to continually be reinvented and/or enhanced to meet current needs.

eHealth in Congo

The situation of the Democratic Republic of the Congo, a country with a land area of 2,345,405 km^2 and the second largest country in terms of population (69 million) in sub-Saharan Africa, continues to be characterized by levels of disease and mortality aggravated by the poverty and food insecurity experienced by most of the population.[62] Poor access to healthcare – generally of low quality – comes on top of the precarious economic situation and the limited ability of the population, in the absence of any collective funding system, to pay the cost of care. This, together with poor hygiene, access to drinking water and nutrition, allows infectious diseases to flourish, including diarrhea, malaria, respiratory infections, parasite infestations, tuberculosis and AIDS. This was confirmed by the statement made by the Minister of Public Health at the 65th World Health Assembly. It was acknowledged that DRC is facing enormous difficulties in organizing healthcare, difficulties that are due not only to the quasi-continental scale of the country but also to the privatization of the healthcare sector in 1987, which led to the breakdown of the health system and restricted the population's access to care.

The results of the first demographics and health survey (EDS) in 2007, covering the period 2002-2007, show that infant mortality (for children aged up to 1 year) has stagnated at around 90 per 1 000 live births over the past ten years. Child mortality for the 1 to 5 year age group appears to have fallen, from 84 per 1 000 live births (1992-1997) to 62 (2002-2007), giving an overall infant/child mortality rate (for the 0-5 years group) of around 148 per 1,000 live births, which is still one of the highest rates in Africa. Maternal mortality of 549 deaths per 100,000 live births, some 50 per cent of which are the result of hemorrhages or infections, remains above regional levels despite an apparent fall during recent years.

In addition, depending on the particular region and environment, sleeping sickness, onchocerciasis (river blindness), bilharzia, leprosy, plague, rabies and Ebola-type fevers are specific health problems of potentially high morbidity and mortality. In addition to problems of transmissible diseases, there are the "non-transmissible" ones, once associated more with the developed and industrialized countries which, looking beyond 2020, will become a major public health problem in Sub-Saharan Africa too.

In the Democratic Republic of the Congo, the emergence of non-transmissible diseases (diabetes, high blood pressure, strokes) is beyond doubt. Studies carried out in Kinshasa have shown that 7 per cent of the 15 to 49 years age group suffers from diabetes. An estimated 228,000 people in Kinshasa alone (a city of 12 million) are diabetic. The same source suggests that hospital prevalence of diabetes is 5.4 per cent, while high blood pressure is a major concern owing to its prevalence, severity and early onset. According to hospital data, cardiovascular disease represents 20.7 per cent of all illness and 21 per cent of deaths; high blood pressure accounts for more than 12.5 per cent of illness and 14.7 per cent of deaths.

Human resource problems are also especially severe. Health services which once suffered shortages of healthcare staff, especially in rural areas (accounting for two-thirds of the population), have experienced a total reversal over the past 15 years.

In the absence of any state monitoring and regulating mechanism, the country has seen an uncontrolled proliferation of private training institutions for medical staff (nurses and doctors) and administrative staff (healthcare managers). As a result, most health services today have a glut of staff, while the number of private health services grows constantly, artificially inflating the range of private care services on offer and competing with public and community services. This also has repercussions as regards quality of services, viability of the healthcare system, and precarious employment and living conditions of healthcare staff.

The health system of DRC is in the middle of a reconstruction process. Achievements of the sector between 2001 and 2010 should not be minimized, notably the increase in routine vaccinations and

[62] Masika Sikuli Kivu, Ministry of Posts, Telecommunications and New Information and Telecommunication Technologies, Democratic Republic of the Congo.

the reduction in child and maternal mortality rates. The second demographics and health survey (EDS 2014-2015) showed that the health status of the Congolese population has improved. The most significant improvements have been seen in the child mortality rate, the use of impregnated mosquito nets, vaccinations of children against measles, and childbirths attended by qualified medical staff.

However, primary healthcare relies on around 20,000 doctors and on infrastructure comprising 8,266 health centres, 250 general hospitals of reference, and 516 health areas. Those figures are not sufficient for the country's total population given that, according to WHO standards, a doctor should be seeing 20 patients a day in a hospital, whereas a health centre doctor in DRC has to deal with 14,000 inhabitants per health region.

Many other challenges have to be faced. Low birth weight remains a matter of concern, the fertility rate is still high, the quality of some services still needs to be improved, and particular attention needs to be paid to the treatment of diseases among children below the age of five years. High-risk behavior likely to spread HIV infection among the general adult population persists, despite a slight fall in the incidence of the disease as recorded by the EDS 2013-2014 compared to 2007. Achieving improvements will require more robust intervention by all those concerned, improved basic training for medical staff, better working conditions, harmonization of financial resources of partners, infrastructures and hospital equipment, funding to launch the health development programme, an increased health budget, and so on. But it will also require above all raising of awareness and a greater sense of responsibility on the part of the general public.

Against this background, it is possible to use Information and Communication Technologies (ICTs) as part of a strategy in such a way as to improve processes in the health system and interconnect those involved – patients, doctors, laboratories, pharmacies, hospitals, care staff, and so on. Healthcare can be made accessible by something as simple as a mobile phone.

In Africa, use of ICTs is still small in scale and fragmented, and coverage is limited. Some countries use mobile telephony to support health service provision, awareness raising and education, remote data collection, remote monitoring and care in the home, communicating treatments and notifications to patients, and in response to epidemic outbreaks and emergencies. Others use the satellite system to promote health by communicating with patients and healthcare professionals in hospitals and healthcare establishments. Major problems in the region include the "digital divide", that is, not all of the population, especially in Africa, has access to telecommunication/ICT services as a result of inadequate telecommunication/ICT infrastructure and services and the lack of expertise in their use.

The Millennium Development Goal (MDG) advocated by ITU aims to "connect the world" by broadband by 2015. The DRC currently has more than five GSM operators and several ISPs installed across the country, offering users mobile telephony and Internet services. As for the Internet service, the available speeds are such that certain applications cannot be used as intended.

Although it is a developing country in which the telephone is no longer a luxury for the few, being now within reach of all, overall national coverage is still equivalent to a penetration rate of no more than around 17 per cent, according to the Posts and Telecommunications regulatory authority (ARPTC) in a recent study published in Kinshasa. The market research company Target is attempting to analyze ways of reversing this trend in DRC. Like other countries, DRC is obliged to adapt to trends in the new information and communication technologies which are now a key factor in social and economic development in all areas of human life throughout the world. This is why the Government, through the Deputy Prime Minister responsible for posts, telecommunications and new information and communication technologies, is making considerable efforts to develop the country's fiber-optic networks (cables for data packet transport). The President of the Republic on 8 July 2013 officially inaugurated the fiber-optic cable landing station at Moanda in the Province of Congo-Central.

The implementation of the Congo SAT I project, will, according to the Deputy Prime Minister, speaking at a press conference on 23 June 2015, lead to many benefits for the country and for Africa in the field of telecommunications. Areas where optical fiber is inaccessible owing to natural obstacles will

be covered by the satellite, according to Minister Thomas Luhaka Losendjola, who has emphasized his commitment to strengthening the country's fibre-optic communication capacity. The project costs for this first satellite are of the order of USD 320 million. A feasibility agreement was concluded in 2012 between DRC and a Chinese company. The satellite will be launched following agreement on the funding arrangements, three years from the date of the original commitment. DRC will be the third country in Africa to benefit from a satellite communication system, after Egypt and Nigeria. As regards the legal and regulatory aspects of telecommunications and ICTs, the President of DRC on 16 October 2002 approved the framework Law No. 13/2002 on telecommunications, complemented by Law No. 014-2002, for which there are a number of implementing texts, namely:

- The Ministerial Order regarding measures to combat telecom fraud in DRC;
- Inter-ministerial Order setting conditions for telephone subscriptions in DRC;
- Decision regarding the establishment of the Interconnection Advisory Board;
- Decision on the Directive regarding certification of telecommunication terminal equipment and facilities;
- Decision defining the principles of interconnection;
- Ministerial Order concerning the appointment of a delegate responsible for management of the C/D point.

Thus, SAT I project will build an infrastructure and lay the foundation for further implementation of eHealth.

There are as yet, however, no specific provisions on the use of telecommunications/ICTs in the health sector. EHealth is a young discipline which brings health into the digital age. There is no other solution for storing and filing the billions of items of data currently filed on paper or, in some cases, in electronic form. Electronic processes assist all those involved in accomplishing their respective tasks. The aim is to enhance security and quality in the area of healthcare, and in the longer term to help stabilize costs. All citizens should be confident of having their health data available at the right time and place.

DRC, other than endeavoring to set up telemedicine in the university clinics of Kinshasa and the Kinshasa Medical Centre, and actually using it already at the Ngaliema clinic, lags behind certain other African countries in the area of eHealth. Thanks to the telemedicine project, part of the Pan-African Online Services Network to be implemented over five years from 2009 to 2014, a number of African doctors and 10,000 students have benefited from the transfer of Indian expertise via an e-network. The project is based in the English-speaking countries of Africa and in Senegal. DRC joined the programme one year after the launch.

The Ministries for Higher and University Education and Public Health of DRC have collaborated with the NGO PSDA and its international partners in developing an autonomous structure called the Congolese Telemedicine and Distance Learning Network (RECOTED) with a view to setting up an independent mechanism for following up the implementation of joint projects supported by foreign contributions and implemented through public-private partnerships.

To that end, with the encouragement of the Minister for Higher and University Education at that time, PSDA has established infrastructure intended to facilitate the operation of the RECOTED/UNIKIN and RECOTED/ISTA sites. RECOTED is made up of international and national experts in the fields of medicine and higher education. Its mandate is to:

- Establish a national network for the promotion and appropriation of NICTs especially in the field of health (telehealth, telemedicine) and education (e-learning);
- Combat the "brain drain";
- Act as a catalyst for foreign contributions and provide a meeting place for North-South and South-South partnerships;

- Promote the economic sustainability of projects;
- Promote exchanges of experience in the framework of an "International Voluntary Health Initiative";
- Advise the Government on health policy and respond to the Government's requests on anything that concerns public health;
- Advise members of the national network on issues of health at the global level;
- Organize international forums in order to contribute to progress in the various areas of the healing arts.

In order to facilitate the use of eHealth throughout our country, in accordance with the circular note BDT/IP/CSTG of 27 May 2015 regarding Question 2 of BDT Study Group 2, it will be essential to address the following initiatives.

1) *Take further steps to assist in raising the awareness of decision-makers, regulators, telecommunication operators, donors and customers about the role of ICTs in improving healthcare delivery in developing countries.*

a) Decision makers must:

- Adopt, through governments, a telecommunication development policy to encourage the application of telecommunications/ICTs to healthcare and implementation of eHealth;
- Develop a framework of standards, legislation and regulations better adapted to the telecommunication/ICT environment in the service of eHealth;
- Educate the wider public on the above framework;
- Deploy and progressively exploit optical fibre over the entire country in order to make urban and rural health areas accessible;
- Launch the satellite to improve accessibility to communications in areas where optical fibre is inaccessible owing to obstacles;
- Draw up the national Informatization master scheme for the public services;
- Ensure that the health information system is computerized;
- Improve regulation of the postal, telecommunication and new information and communication technology (NICT) markets;
- Take steps to implement the current legal framework for reforming the postal and telecommunications/NICT sector;
- Strengthen leadership, governance and inter-sector collaboration by building capacity and improving equipment in the health and telecommunication/ICT sectors;
- Establish material telecommunication/ICT infrastructure in urban and rural health areas in order to make primary care accessible;
- Provide higher educational establishments with medical IT curricula;
- Mobilize partners, within and outside the sector, to implement eHealth;
- Reinforce cooperation between national and foreign training institutions;
- Progressively integrate eHealth in local community facilities;
- Equip urban and rural health areas with suitable electrical facilities;
- Up a body to harmonize, integrate and coordinate telecommunication/ICT projects in the service of eHealth.

b) The regulator must:

- Encourage widespread introduction of broadband access in order to reduce the digital divide;
- Facilitate licensing for telecommunication/ICT operators;
- Exempt telecommunication/ICT equipment from taxes and duties;
- Use universal service funds to reduce telecommunication/ICT investors' costs in rural health areas.

c) Donors must:

- Conclude public-private partnership agreements in order to improve basic telecommunication/ICT infrastructure in provinces where they are currently inadequate;
- Promote and contribute actively to funding eHealth development activities.

d) At the level of telecommunication/ICT operators, it is important to:

- Invest in telecommunications/ICTs in urban and rural health areas in order to facilitate implementation and use of eHealth;
- Ensure that access to telecommunication services is affordable and of good quality.

e) At the customer level, it is important to raise awareness of national communities to encourage use of eHealth.

2) *Encourage collaboration and commitment between the telecommunication sector and the health sector in developing countries, in order to maximize the utilization of limited resources on both sides for implementing eHealth services.*

This means significantly strengthening the use of health-related NICTs by the health ministry, which will allow:

- Improvements in primary healthcare systems and health information systems, ensuring reliability, creativity, high quality and affordability;
- Promotion of research in the medical field to reinforce public disease prevention programmes in the areas of sexual health, genetics and sexually transmitted and chronic diseases while respecting the citizen's right to privacy;
- Development of international standards for the exchange of health data, taking due account of privacy concerns;
- Reporting, monitoring and dealing effectively with persistent behaviour involving high risk of HIV infection and propagation in the adult population, despite the reduction in the incidence recorded by the EDS – 2013-2014 by comparison with 2007;
- Extend telecommunication/ICT coverage in the most remote or poorly served health areas and for vulnerable populations;
- Medical and humanitarian assistance in disasters and emergencies.

3) *Continue to disseminate experiences and best practices with the use of ICTs in eHealth.*

Training of doctors comes under the remit of the Ministry of Higher and University Education, which every year sends an average of 2,500 doctors onto the employment market, according to the 2010-2011 statistical directory. In order to disseminate experiences and best practices in using information and telecommunication technology for eHealth in developing countries, it is important

to integrate medical information, an area which concerns clinical practice, IT management and management for better health:

a) As an option in universities, higher medical and IT training institutions, to ensure that the qualified professionals sent by the Ministry onto the employment market are skilled in information and communication technologies, in order to improve quality, security and efficacy of health and care systems. These medical IT professionals will have skills including:
   - Basic notions of medical IT;
   - Familiarity with the prospects and limitations regarding the informatization of healthcare processes and the implementation of IT systems to improve security, quality and efficacy;
   - Analyzing and evaluating the particular challenges of managing medical information at the level of the user, institutions, and healthcare institutions;
   - Using modelling and analysis applied to information systems in the medical field;
   - Understanding IT tools including databases, files, decision-making aids and so on;
   - Learning to implement and follow-up Informatization projects, including strategic dimensions and change management;
   - Understanding the means of building intelligent systems and understanding data warehouses, data mining, and knowledge management;
   - Dealing effectively with the current challenges of eHealth, care networks, e-medicine and the medical Internet.

b) As a training module at the Interdisciplinary Centre for Ongoing Education (CIDEP), in order to strengthen capacity of health professional at work:
   - Putting in place communications infrastructure to promote distance learning;
   - Informing the beneficiary population of new information and telecommunication technologies in the field of eHealth;
   - Improving governance of the existing telemedicine and distance learning network (RECOTED), and at the level of the country's pilot universities, to enable it to carry out these missions.

In conclusion, we would note that the emergence of eHealth is a major challenge for improving primary healthcare in DRC, a country of continental dimensions. The recent deployment of optical fibre along the African coast and the bringing into service of the first satellite communication project (Congo Sat I) will enable DRC to have a national backbone and better prospects in priority areas such as health and education.

Experts:

1) Mr. Alanga Famba Vicky, Member of the Cabinet of the Deputy Prime Minister Responsible for Posts, Telecommunications and New Information and Communication Technologies (PT-NICT);
2) Mr. Mahamba Kyambale, ATB2, Single Division of the PT-NICT Directorate;
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4) Mr. Ngbango Kale Apollinaire, ATB1, Responsible for Databases, Directorate of IT, Ministry of Higher and University Education;
5) Madame Kimosi Ditu Edwige, ATB1, Single Division, Ministry of Higher and University Education;
6) Mr. Kanyinda Kazadi Rémy, Head of Works, Higher Institute of Medical Technologies, (ISTM/KINSHASA);

7) Mr. Ngika Mbulu Richard, CB, Coordinator, Communications Cell, General Secretariat for Public Health;

8) Mr. Ebwa Abongomane Dieudonné, ATB2, Technical Assistant, General Secretariat for Public Health.

The importance of adequate infrastructure is well underlined in the case of Congo. Yet, it is necessary to note that even in developed economies, the infrastructure may not be sufficient for a wide implementation of some eHealth services as for examples in emergency care. The following contribution from Japan reveals such a case.

Assistance in implementing cyberhealth programmes: the case of Guinea

1) Overview of the pilot project

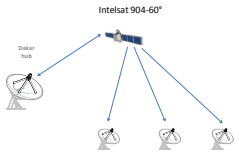
[63]The project is being implemented by Telecommunications Consultants India Limited (TCIL) with funding from the Indian Government. The network created by the project is called the "Pan African E-Network Project". At the level of the African continent, the network comprises a central earth station (hub) in Dakar (Senegal), which is already linked by satellite to:

- 53 VSAT stations in 53 national hospitals (one in each Member State) for telemedicine, 53 VSAT stations set up in 53 universities (in each Member State) for e-learning, and 53 VSAT stations set up in 53 diplomatic or presidential missions (one for each Member State) to provide VIP services.
- 53 VSAT stations in five African "regional leader" universities and five African "super-regional specialist hospitals" providing telemedicine and e-learning services, respectively, via the network.

The central earth station in Africa is linked to the data centre in India via fibre-optic submarine cable. For each signatory country, there is an agreement for the management and operation of the network related to the resources donated by the Indian Government.

In Guinea, the Gamal Abdel Nasser University has been chosen to host the e-learning centre, the University Hospital of Donka has been chosen for eHealth, and the Ministry of Foreign Affairs for e-diplomacy.

Figure 6A: Pilot project: Completion and extension of the Pan African E-Network Project (eHealth)



2) Project description

In Guinea, a number of important project elements have been implemented in the fields of eHealth (site of the Donka University Hospital Centre), e-learning (University of Conakry) and e-diplomacy (Ministry of Foreign Affairs).

The eHealth site is equipped with high-tech facilities including digital radio. This enables professionals to exchange information with their colleagues in India on cases which, in the past, would have required medevac of patients abroad.

63 Mr Ibrahima Sylla, Ministry of Posts, Telecommunications and New Information Technologies (MPTNTI), Guinea.

In the light of the above, the extension of the Pan African E-Network Project (eHealth) for the period 2015-2017 focuses on the following elements:

- The Ignace Deen University Hospital Centre (Conakry), for 2015;
- The Kindia and Kankan regional hospitals, for 2016;
- The Nzérékoré and Labé regional hospitals, for 2017.

3) Project objectives

The aims of the project are to:

- Reduce the digital divide in the field of health;
- Improve the capacities of medical professionals (doctors and nurses) using information and communication technology;
- Promote the widespread use of ICTs and facilitate access to these technologies for the entire population in both urban and rural areas;
- Ensure access to high-quality healthcare in rural areas.

4) Actions still required:

- Complete and improve the eHealth site (Donka University Hospital Centre) that is currently in use;
- Undertake a feasibility study for the various health centres identified;
- Ensure project implementation and follow-up;
- Develop management structures for planned new services.

Implementation of telemedicine in Haiti

1) Introduction

[64]The healthcare system in Haiti is in a very precarious condition owing to a combination of factors arising from a shortage of human resources and medical infrastructure. In the face of this alarming situation, considerable resources need to be deployed in order to meet the crucial need for access to medical services. eHealth can serve as a shortcut to the improvement of Haiti's healthcare service.

2) Healthcare situation in Haiti

Haiti, a country of 10.4 million inhabitants, is contending with numerous crises, including an alarming medical situation. Things became even more precarious in the wake of the 2010 earthquake, which left many people without limbs and with all manner of other after-effects. A cholera epidemic only made matters even worse for this already very weakened country in the western hemisphere.

A number of challenges stand in the way of access to healthcare in Haiti:

- Lack of medical specialists;
- The cost of medical services;
- The price of medicines;
- A highly deficient medical and health infrastructure.

These shortcomings have a negative impact on normal access to healthcare services in Haiti, most of whose population is therefore unable to obtain adequate care. The situation is all the more difficult for those on low incomes, who are unable to seek medical treatment abroad. As new diseases prepare

[64] Mr Gregory Domond, National Telecommunications Council (CONATEL), Haiti.

to strike the country, the means available for combating them are dwindling further and further. The capacity of the existing hospitals to accommodate new cases is very limited by comparison with the high level of demand. In Haiti, there is only one hospital on three levels, and one doctor for every 10,000 inhabitants. A study has shown that 35.7 per cent of medical facilities are public, 31.8 per cent are parastatal, and 32.5 per cent are in the private sector.

Over 40 per cent of Haitians are without access to healthcare, while 80 per cent of the population uses traditional medicine to meet its needs. Implementation of a telemedicine project in Haiti is justified for the following reasons:

- Scarcity of doctors specializing in certain fields;
- Absence of medical and healthcare infrastructure, particularly in remote areas;
- Meagre economic resources of those concerned;
- Emergence of new diseases.

3) Potential applications of telemedicine in Haiti

Bearing in mind the various constraints and the urgent needs of Haiti's population, it is altogether reasonable to opt for telemedicine applications that are easy to apply and capable of offering some degree of solution to patients' expectations. In this highly precarious context, the following applications could be implemented within the country.

- Establishment of a telemedicine network: case-file transmission;
- All medical case files requiring specialist examination will be sent to Port-au-Prince via the transmission system;
- Tele-expertise: remote consultation of doctors or other experts;
- Doctors in regional hospitals will submit case files requiring expert examination to specialists based in Port-au-Prince, via the transmission system;
- Tele-information: consultation of medical information (databases, medical imagery, training courses);
- Doctors can consult patients' medical data, as necessary, for training purposes, thanks to the databases and file transmission system.

In the future, other telemedicine applications will become possible as further telecommunication/ICT facilities are deployed throughout the country.

4) Public hospitals selected

Haiti has a referral hospital in each of its ten major cities. Private hospitals are not accessible to most of the population on account of the financial constraints. In the majority of cases, patients are referred to the public hospitals for the treatment they require. It is therefore reasonable to select public hospitals so that the greatest possible number of patients can be treated. The hospitals covered by this project are the busiest ones and belong to the Haitian State.

The Hospital of the State University of Haiti, based in Port-au-Prince (West), is the country's largest hospital in terms of patient capacity. Under this project, it will exchange medical data with the nine other hospitals located in the country's nine other major cities: Hôpital Saint Michel (Jacmel, Sud-Est), Hôpital Immaculée Conception (Cayes, Sud), Hôpital Saint Antoine (Grande Anse), Hôpital Sainte Thérèse de Miragoâne (Nippes), Hôpital Justinien (Cap Haïtien, Nord), Hôpital de Fort-Liberté (Nord-Est), Hôpital Immaculée (Port-de-Paix, Nord-Ouest), Hôpital Sainte Thérèse (Hinche, Centre) and Hôpital La Providence (Gonaïves, Artibonite).

5) Networking of the public hospitals

Given that most of the specialists live in Port-au-Prince, Haiti's capital city, and that the state of the roads makes it impossible to save someone's life in a critical emergency, the solution has to lie in the networking of the main hospitals, making it the medical data which travel rather than patients.

Various solutions are possible for such a transmission system. An Internet connection provided by a telecommunication operator or Internet access provider would not appear appropriate since medical activities must not be subject to outages, i.e. loss of the signal during the course of an emergency.

Considering the requirements in terms of deployment time, costs and service reliability, it is logical to opt for radio-relay links, by means of which the Hospital of the State University of Haiti will be interconnected with the nine other referral hospitals located in the country's other major cities. This private network will be used solely for the transmission of patient data.

It will, moreover, be supplemented by a backup link to ensure service continuity at all times.

6) Infrastructure and equipment in the public hospitals

Each of the selected public hospitals must be equipped with a local area network (LAN) connected to the radio-relay transmission system. A database must be developed for each hospital in order to store patient data and have them readily available upon request.

Other items of equipment such as printers, scanners and sensors will be necessary for the work of each hospital.

7) Modus operandi of Haiti's telemedicine system

Given that most of the country's specialists are located in Port-au-Prince, it is logical for the operational centre of the telemedicine system to be accommodated there as well. All the other nine regional hospitals use the transmission system to transmit to it all the medical data of patients living in their respective geographic *départements* (results of medical examinations, medical imagery, photos of injured and fractured limbs, etc.), whereupon the on-duty specialists examine the data and send back their medical opinions and advice for the treatment to be given. In the case of patients requiring special attention, the specialists can ask that they be sent to Port-au-Prince.

8) Training of medical staff

The project's success will depend on the levels of awareness and training of Haiti's medical staff. To begin with, the entire medical community must be made familiar with the use of ICTs in the field of healthcare, so that they can feel comfortable and ready to work together in this way.

Doctors and nurses assigned to the hospitals concerned by the project must receive training in the workings of the system and in processing of the medical data transmitted and received by means of the transmission system.

9) Project objectives

The project objectives are as follows:

- Foster the use of ICTs in the healthcare sphere to meet the corresponding challenges
- Enhance the capacities of healthcare professionals (doctors and nurses) through the use of ICTs.

10) Actions required

- Undertake a feasibility study for the selected hospitals
- Guarantee the project's implementation and bringing into operation.

Use of ICT for eHealth promotion in Rwanda

1) Background

[65]Since 2009 after the inception of Rwanda National eHealth Strategic Plan, the Government of Rwanda has engaged in the deployment of various information technologies in a bid to improve its health sector development. On this basis, Information management and technology have helped the Rwanda's health sector achieve a sustainable improvement in healthcare system. The Ministry of Health (MoH) and the Rwanda Biomedical Center (RBC) have marged all Government institutions that contribute to healthcare service delivery to facilitate integration of eHealth systems under one leadership. This aimed to have an effective infrastructure, applications and information systems supporting effective and efficient delivery of healthcare services in Rwanda.

2) Rwanda ICTs Initiatives to Promote eHealth and the Welfare of its Citizens

eHealth is now an effective tool of sharing information needed to deliver healthcare services and controlling different diseases.

To strengthen community-level and facility based maternal and child health interventions, the Government of Rwanda through Ministry of Health has launched a mobile application (mHealth) called RapidSMS system, this system dedicated to advancing the use of mobile technologies to improve health services.

The objective of this mHealth is to save lives by tracking pregnant women and newborn (children under two years of age), promote early detection of life-threatening emergencies, and facilitate Community Health Workers (CHW) reporting by using this innovative technology tool RapidSMS.

Table 3A: RapidSMS Rwanda Continuum Care Model

RapidSMS RWANDA CONTINUUM CARE: 1000 DAYS OF TRACKING PREGNANT WOMEN & NEWBORNS				
Pregnancy (9 Months)	**Newborn Care (28 Days)**	**Postnatal Care (42 Days)**	**Child Health (12 Months)**	**Child Nutrition (2 Years)**
Pregnancy Confirmation	**Newborn Home Care Visits**	**Postnatal Home Care Visits**	**Child Health & Immunizations**	**Child Killer Diseases & Nutrition**
Early registration of women begins immediate reminder alerts for completion of prenatal visits, tracking of risky pregnancies and increased deliveries at health facilities.	Continued follow-up of newborns during the first 28 days after birth.	Continued follow-up of women during the first 42 days after delivery.	Monthly child health checkups including nutrition and immunization progress.	Tracking of leading killers of children and severe malnutrition leading to stunting.

Rwanda has ambitious plans to strengthen its healthcare system by improving patient data management. On this basis, in creating a stronger and more efficient eHealth sector, the Rwandan Ministry of Health is now expanding a digital medical records system called OpenMRS, a platform that carries patients' data reliably and can be customized for different uses.

Initially, OpenMRS was rolled out in Rwanda to support HIV services. But with this new OpenMRS, the hospital staff will be able to use the system for antenatal and maternity services, neonatology,

[65] Jean de Dieu Imanishimwe, Rwanda Utilities Regulatory Authority (RURA), Republic of Rwanda; Mathieu Ntegano, Rwanda Utilities Regulatory Authority (RURA), Republic of Rwanda.

pediatric consultation, family planning and gynecology, internal medicine, emergency clinical services, and billing services.

The OpenMRS allows healthcare providers to track, follow-up, manage, and better support patients. It also produces comprehensive reports, helping healthcare facility leadership make evidence-based decisions, and reducing mistakes made because of insufficient information, such as incorrect diagnoses.

In 2012, The Rwandan Ministry of Health has initiated a project called Rwanda Health Management Information System (R-HMIS) a tool for collection, validation, analysis, and presentation of aggregate statistical data, tailored to integrated health information management activities. With this tool all data from health facilities are timely and accurately reported.

In 2013, an initiative called electronic Logistic Management Information System (e-LMIS) was launched by Rwandan Ministry of Health to provide effective and sustainable supply chain system for medicines and other health commodities. This e-LMIS initiative has the ability to:

- Monitor drug expire dates and stock situation alerts for better inventory management at national, district and facility levels.
- Improve supply planning and ordering cycle time.
- Provide management information at real time to enable correct and impactful decision making.

The e-LMIS is currently deployed and fully functioning in all district pharmacies, district/referral hospitals and all health centers of Rwanda.

In 2010, the Rwandan Ministry of Health has initiated a tracking tool called Health Resource Tracking Tool (HRTT) to map all financial resources used and allocated to the health sector by both Ministry of Health and development partners, and harmonization of reporting of health spending. This improves accountability at national and districts levels.

In this year 2016, the digital healthcare scheme is expected to be deployed in Rwanda by a British company in partnership with the Rwandan government. With support from the Ministry of Health and that of Youth and ICT, the state-of-the-art system is expected to allow mobile phone subscribers to access consultations, reducing the impact of the shortage of doctors and other health professionals in the country. The company has already its team in Kigali, particularly software developers who are working on the product to localize it both in terms of having a feature phone version and also being able to use Kinyarwanda, the national language of Rwanda.

In June 2016, the Ministry of Health in Rwanda has signed a memorandum of understanding with the Republic of South Korea as part of efforts to improve technology within the health sector. The collaboration is expected to improve telemedicine, Hospital Information System (HIS) and provision of ICT-based medical services in Rwanda. This agreement will enable Korea Telecom, Yonsei University Health System and University Teaching Hospital of Kigali (CHUK) to cooperate on digital healthcare.

Another eHealth programme in Rwanda is the Treatment and Research AIDS Centre (TRAC), which was established in 2005. TRAC is a digital system that collects, stores, retrieves, displays and disseminates critical information about drug distribution and HIV/AIDS patient information. The system enables anti-retroviral treatment programme practitioners to submit reports electronically and have access to information.

By improving interventions, monitoring and reporting, these eHealth solutions have increased citizens' access to healthcare.

3) Major outcomes of eHealth Initiatives in Rwanda

Rwanda's health sector kept its leadership in the use of ICT for the delivery of health service across the country. In Rwanda, telemedicine and e-diagnosis have improved the way medical professionals

share medical expertise. These include creation of a network of specialists; improving access by healthcare practitioners to specialists and improving the quality of diagnostics and treatment as well.

In Rwanda, the great strides are being made to improve healthcare services through the use of ICT in different eHealth initiatives. Among other benefits, the efforts made by the Government of Rwanda for eHealth promotion in Rwanda have caused a drop of maternal mortality rate from 750 to 210 for the period of 2005 – 2015 and the infant mortality decrease from 62 to 32 deaths per 1000 live births for the period of 2008 – 2015 (source: Rwanda DHS survey).

The percentage of health facilities connected to internet has reached 96.2 per cent countrywide, and this has marked an increase in number of clinical emergencies supported through RapidSMS, while the number of patients at community level tracked using RapidSMS reached 186,719 by December 2015.

The initiated eHealth programs in Rwanda have improved patient health outcomes and patient safety by equipping primary healthcare providers with better equipment, tools and information for clinical decision support and by allowing a gradual transition to technology assisted practice.

Table 4A: ICT in Health Sector of Rwanda

Key Indicators	2015
Infrastructure	
Hospitals	
Total number of Public and Private non-profit Hospitals	48
% of Public and Private non-profit Hospitals with Telemedicine Infrastructure	21%
% of Hospitals connected to Internet	100%
Health Centers	
Total number of Health Centers	494
Total number of Health Centers connected to Internet	475
% of Health Facilities connected to Internet	96.2%
Applications and systems	
Electronic Medical Records (EMR) Migrated to OpenMRS	
Number of Hospitals using less paper in medical records	10
% of Hospitals using less paper in medical records	21%
Health Management Information System (HMIS)	
Number of Health facilities reporting into HMIS	1,161
HMIS data managers assisted through HMIS e-support messaging	463
Rapid SMS	
Number of Patients at community level tracked using RapidSMS	186,719
Number of clinical emergencies supported through RapidSMS	4,185
Telemedicine	

Key Indicators	2015
Number of hospitals using Telemedicine	13
% of Hospitals using Telemedicine	27%
Calls for Medical Assistance (Call Center)	
Number of emergency calls for ambulance (SAMU)	38,423
Number of call received for clarification on health issues	720
EDPRS 2/HSSP Indicators	
Number of registered private clinics and dispensaries reporting routinely using HMIS	301

4) Challenges

In Rwanda, the promotion of ICT in Health sector is still facing a number of challenges; some of them are: a) Low electricity access rate. As of July 2016, the electricity access rate was 24 per cent of population in Rwanda, b) Low level of computer literacy among healthcare providers

5) Conclusion

Rwanda is investing considerable resources to realize its eHealth vision. As the country is divided into four provinces which are structured in four tiers: 30 districts, 416 sectors, 2,148 cells and 14,837 villages, the government of Rwanda through its Ministry of Health continues to engage with a visionary approach in deploying various technologies required to achieve a sustainable health system from national to districts, sectors, cells and villages.

The ITU eHealth expert training course hosted at Tokai University

1) Purpose

This input document reports on the activities over the past 12 years (2001-2012) of the eHealth expert training course hosted at Tokai University, Japan.[66]

2) Background

In accordance to the Buenos Aires Action Plan in 1994, the Telecommunication Development Bureau (BDT) of ITU has undertaken 10 activities to improve telecommunication infrastructures in developing countries. Among these activities telemedicine projects were one of the most favourite activities that many developing countries were interested and eager to participate.

Though only few countries had any experience related to telemedicine in 1994, the ITU/BDT SG2 Question 14/2 implemented and studied a number of telemedicine pilot projects in developing countries. As a result, the awareness and interest in telemedicine has been growing tremendously among ITU members. There are now over 100 developing countries that have undertaken different kinds of telemedicine projects.

However, despite the recent improvement in hardware and the removal of regulatory barriers, telemedicine is facing major difficulties in developing countries. Lack of expertise and training opportunities on telemedicine has become one of the major obstacles for the deployment of telemedicine in developing countries. Professor Leonid Androuchko, the Vice-Rapporteur of ITU/BDT SG2 Q2/2, has requested developed countries to offer training courses on telemedicine, but to date no ITU member has responded due to issues related to cost. On the end, at the meeting of ITU/BDT SG2 in Caracas,

[66] Isao Nakajima, Rapporteur for Question 2/2, Japan.

Venezuela in September 2001, the Co-Rapporteur of Telemedicine, Dr Isao Nakajima (Professor of Tokai University) proposed an eHealth Expert Training Course hosted by Tokai University Institute of Medical Sciences. This proposal was adopted unanimously. It was the first attempt to offer the specialized training courses on telemedicine and eHealth for healthcare workers from developing countries. The course has already attracted attention not only in Japan but also from a number of other countries.

3) Program outline

The ITU Telemedicine Expert Training Course was hosted at Tokai University. Tokai University invited selected participants from developing countries like Indonesia, Bhutan, Haiti, Pakistan, and Nauru, and Cook Islands to study and provided all facilities including accommodation.

On the completion of this program, participants got the knowledge in current trends of telemedicine as well as research and application methodology in telemedicine

Activities in the course can be summarized as follows:

1) Dissemination of telemedicine research and implementation, especially involvement of Nakajima Laboratory in the telemedicine project.
2) To get insight about the advances in telemedicine equipment.
3) To enrich and explore research possibilities related to telemedicine.

Research items:

- Telemedicine via PSTN in rural areas;
- Wifi and IP-based satellite communications;
- Wavelet analysis for biomedical data;
- Independent component analysis;
- UWB radar to detect victims;
- Super high definition TV;
- Web radio for disaster application;
- Ambulance communications;
- Tele-Surgery;
- Teleradiology;
- Telecardiology;
- Tele-Presence and virtual reality.

4) To enhance the administrative and management capability in telemedicine services.

4) Conclusion

The Course has benefitted participants from developing countries. The participants have gained an understanding of telemedicine system from knowledge-wise up to its current and future trends.

During 2001-2012, 16 researchers from Indonesia, Pakistan, Bhutan, China, Haiti, Nauru, and Cook Islands graduated from the ITU eHealth expert training course hosted at Tokai University. After the training, they returned to their countries and have continued to contribute substantially to eHealth and telemedicine and on rural communications in developing nations.

Remote Interactive Training for Doctors Based On Video Conference Solutions

Medical education as no other area requires an access to best practices and knowledge of leading practitioners: diagnosticians and surgeons, as even best in class course books.[67] 3D films and modern simulators cannot replace clinical discussions with experienced doctors and communication with peers while mastering new methods of diagnostics and surgeries. One would like to gain knowledge from best professionals, leaders in their areas. However in real life it is not always possible as renowned medical professionals don't work in the same clinic, let alone a city or country. In this regard the advent of modern videoconference tools are very helpful. They provide remote interactive communication based on high quality audio and video signal, simultaneous broadcasting of two video streams and in the near future – transmittance of a 3D image.

Our experience of remote interactive trainings for doctors in video conference format started with using inexpensive Intel and V-Con videoconference systems, PictureTel office systems and ISDN digital telephony. Notably, to provide transmission at speed of 24-30 frames per second (for broadcasting surgeries for instance) we had to use 6 to 8 digital phone channels. That increased the costs of telemedical lectures. However, the costs were still 10 times lower as compared to overall costs of a lecturer's trip to any remote region. Even larger cost saving effect was demonstrated during first remote video conferences that helped us promptly solve issues of diagnostics and treatment.

If we compare costs of a teleconference organized to diagnose and choose treatment for newborns with heart defects, they are 100 times lower than an actual trip of a patient and his family to Moscow Cardio-Vascular Center. It is also important to note that the telemedical project "Moscow to the Russian Regions", launched in late 1990s, and aimed at organizing remote trainings for doctors and telemedical consulting revealed a high level of interest among the regions. The only constraints for our activities were the limited digital capacities and low budgets of clinics during the economic crisis.

With the development of digital telecommunications and a possibility to use HD video format we moved to a new level of teletraining for doctors. Our aims were:

- To hold remote lecture courses as part of continuous postgraduate training for doctors;
- To involve the best Russian and foreign clinics for holding interactive master classes with on-line broadcasting of surgeries and diagnostic procedures;
- To offer remote telementoring for young doctors (primarily surgeons) by experienced medical professionals.

The idea of remote telelectures is to use multiple point video conference format based on high quality audio and video signal for full-pledged interactive communication between the lecturer and a remote audience of doctors. During the lecture it is possible to organize clinical and medical case discussions or demonstrate any (presentations, videos, medical research data, ECG, X-Ray images, etc. It is also possible to examine a patient by using diagnostic equipment. Maintaining contact between an audience and a lecturer might be problematic, however this challenge is set off by a possibility to attend lectures of renowned professionals from various cities and countries.

The idea of interactive master classes in videoconference format is to provide full-pledged interactive communication between the audience located remotely and an operating surgeon. Observing a surgery is possible by means of video cameras installed in the operating theatre and a camera on the surgeon's helmet. This approach allows to learn from the experience of a great professional as students can watch the surgery "through the eyes of a surgeon" (It is well known that often a surgeon has to keep his head low over the operating field and even his assistants can't see all the surgical procedures. It is important to note that video cameras in the operating theatre are controlled remotely (zooming, pointing a camera to an object, switching from one camera to the other). This is done from a remote class room (except for a camera on the surgeon's helmet) and this allows observing work

[67] V. Stolyar, M. Amcheslavskaya, A. Selkov, Russian Association of Telemedicine, Moscow, Russian Federation.

of an entire surgical team or some of its members. During many surgeries (endoscopic, X-ray and others) and diagnostic procedures it is important to provide a remote audience with two or more simultaneous video streams.

As an example, that enables at the same time to watch hands of an endovascular surgeon and an X-ray image of placing a stent or positioning an ultrasound sensor. On top of that there is a possibility of interactive communication. During on-line broadcasting it is important to get a 3-D image of a surgery. That will provide for a good understanding of everything the surgeon does. But this effect is impossible to achieve by means of a standard camera, therefore, we have developed a stereoscopic set consisting of a surgical helmet equipped with two miniature digital HD cameras with the same optical characteristics, means of control, etc. This development is protected by several patents. Within two years it was tested in such areas as neurosurgery, oncology, maxilla-facial surgery, laser surgery and others. It has proved to be very helpful during interactive master classes for practicing surgeons.

The idea of telementoring is rather simple. It is aimed at organizing interactive communication between a young doctor working at an operating theatre or a diagnosticroom and his experienced mentor located remotely. In challenging circumstances this format helps a young doctor immediately apply his mentor's advice and demonstrate acquired skills.

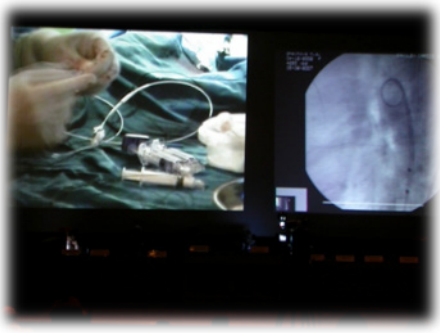
Table 5A: The interactive training school during last two decades

1999 Teleconsultation Moscow- Yakutia

1999 Moscow, Lecture on pediatric neurosurgery

2004 Lecture for Russian doctors given in the University of Regensburg (Germany)

2004 Lecture for doctors from 12 Russian regions given in Moscow



2014 Demonstration of an endovascular procedure

2014 Demonstration of an open heart surgery

2015 Utilization of a stereoscopic set

2015 Stereoscopic set in neurosurgical operating theatre

2016 Broadcasting of an endoscopic procedure

2016 Broadcasting of an eye surgery

In conclusion: Modern videoconference technologies are effective for remote medical trainings. However, we see a need in modernizing existing technologies with the account of specific goals of medical trainings, first and foremost, trainings of top-level doctors. Firstly, it is organizing simultaneous broadcasting of two videostreams, one of which provides for stereoscopic images. Secondly, image quality has to improve up to 4K. Thirdly, these solutions have to be integrated with virtual reality technologies and that is very relevant for telementoring. At the moment we are exploring these areas together with Russian and foreign developers, R&D and educational facilities.

Annex 4: Fighting NCD

ITU-WHO Mobile Health initiative for non-communicable diseases

With non-communicable diseases (NCDs) killing more people each year than all other causes combined, it is no longer a question of when these diseases will be addressed in public health, but how.[68] A new initiative, run jointly by the World Health Organization and the International Telecommunications Union, may provide the answer. It seeks to use the mobile phone as a new public health tool for the prevention and management of NCDs, leveraging the fact that with a global penetration rate of 96 per cent the technology has a greater reach into the lives of most populations than the majority of public health infrastructure in the developing world.

Not only do mobiles represent a unique opportunity in terms of availability, they are also affordable, accessible, and acceptable to users. On the provider side, the role of telecommunication infrastructure as an intermediate good – meaning it can be used in a variety of other sectors beyond health – makes it a good public investment. Economies of scale also offer a way to reduce the increasing burden on health systems to meet the healthcare needs of expanding populations. Finally the mobile's existing role in individuals' daily routines puts it in a unique position to foster behavioural change via health promotion and continuous self-management. Preventing the onset of NCDs requires early and broad-based community health interventions, whilst treatment requires a complex set of long-terms disease management and behavioural components (Ezzati & Riboli, 2012[69]). Add this to the infrastructure and resource constraints affecting the majority of health systems in the developing world, and the need for health systems to equip patients with tools for self-care becomes obvious (Alwan et al. 2010[70]).

The potential to integrate mobile phones into health management (mHealth) has existed for some time, but previous mHealth interventions have suffered from being limited to small trials in high-income settings, with a lack of assessment on long-term health impact or cost-effectiveness (Free et al., 2013[71]; Labrique, Vasudevan, Chang, & Mehl, 2013[72]). It is this gap which the new UN initiative, Be He@lthy Be Mobile, is aiming to bridge. Through the UN organizations for health and ICTs it works with the health ministries of low-, middle- and high-income countries to scale up successful mobile-based methods of NCD prevention and management to create population-level programmes. Over a four-year period, the initiative will work with the ministries of health and telecommunications in eight countries – Costa Rica, India, Philippines, Norway, United Kingdom, Zambia, Senegal and Tunisia – to launch mHealth programs addressing national NCD burdens. In collaboration with international experts the initiative is creating a series of "Planning and Implementation Documents" (PIDs) to assist country efforts to scale up mHealth solutions for NCDs within national health systems. Once complete, this series of PIDs will form a 'toolkit' for mHealth programmes, currently including tobacco cessation, diabetes prevention and management, cervical cancer control, hypertension prevention and management, and wellness promotion. The solutions will initially be SMS- or app-based, and will provide interventions targeting the full disease spectrum from prevention to management and treatment. It will also strengthen national health systems by training health workers and facilitating data collection.

The PIDs will represent a blueprint for large-scale mHealth implementation, with countries choosing the programmes and interventions that are the most feasible, affordable and suited to their needs. Experiences are fed back into the initiative to create a set of best practices and standard operating procedures for large-scale mHealth programs, which will eventually be published and made freely available for any country wishing to use mobiles to reduce NCD rates in their population. A longer-term

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68 Hani Eskandar, ITU/BDT/IEE/CYB, BDT Focal Point for Question 2/2.

69 Ezzati, M., & Riboli, E. (2012). Can noncommunicable diseases be prevented? Lessons from studies of populations and individuals. Science (New York, N.Y.), 337(6101), 1482–1487. doi:10.1126/science.1227001//

70 Alwan, A. (2011). Global status report on noncommunicable diseases 2010.

71 Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., et al. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: a systematic review and meta-analysis. PLoS Medicine, 10(1), e1001363. doi:10.1371/journal.pmed.1001363//

72 Labrique, A., Vasudevan, L., Chang, L. W., & Mehl, G. (2013). H_pe for mHealth: more "y" or "o" on the horizon? International Journal of Medical Informatics, 82(5), 467–469. doi:10.1016/j.ijmedinf.2012.11.016/

aim of establishing regional research hubs to foster innovation and knowledge around mHealth is designed to set the technology's use as a permanent focus area in public health management. There are two elements to this approach which maximize its chances of successfully incorporating mHealth tools into national NCD strategies. The first is the range of interventions made available by the technology. The flexibility of the mobile as a platform allows countries to select the approach, content and delivery form which is best suited to the local context and sociocultural preferences of the community or area where the intervention will be offered. This kind of targeting increases the likelihood of the program having a positive impact on population health.

The second is the initiative's approach to partnerships. By requiring that there be government financial and technical buy-in from the very beginning of a program, the initiative guarantees its long-term sustainability as an element of national health services. Governments will gain the technical knowledge needed to run the programs without the support of the WHO-ITU secretariat, based in Geneva. This is then reinforced by the inclusion of partners from across all sectors: academia, private sector, philanthropy, non-governmental organizations and civil society. The diversity of stakeholders ensures that both the technology and the medical input are consistently of the highest quality available, whilst also encouraging a more holistic approach to health which encapsulates the spirit of the program and the behavioural shift it is trying to catalyze.

The disease burdens and health system challenges of the twenty-first century demand a shift in public health response mechanisms (WHO, 2013).[73] The evidence showing mHealth can be an effective tool in population health management exists and is growing rapidly; the remaining challenge facing the technology is how to firmly embed its role as a public health tool by demonstrating its medical and financial effectiveness at scale. The Be He@lthy Be Mobile initiative places existing evidence on a global platform which is enabling a range of partners to work together in providing a holistic solution to a common problem, using an even more common device.

Some key policy recommendations:

- mHealth is a good aid for smoking cessation, diabetes management and (systolic) blood pressure control. It should be made available nationally for these services in order to gather additional evidence on areas outside the remit of small-scale trials, such as longer-term health impact and cost-effectiveness at scale.
- Further research is required to improve our understanding of which other applications have a positive effect on NCD management and prevention for specific diseases, such as cancer. However this should not limit work directed at scaling up successful mHealth interventions in a post-trial phase to offer mHealth services at a wider level.
- There remains an urgent need for trials conducted in low- and middle-income settings. Of the trials reviewed in this study, 95 per cent were conducted in high-income countries. This creates barriers to understanding important elements such as cost and message content adaption which could influence mHealth impact in these settings.
- In areas where mHealth has shown minimal impact in trials, the intervention design should be improved before running additional trials. This could include adopting elements from successful mHealth trials and incorporating these into the design of weaker interventions to see if the success can be transferred.

[73] World Health Organization (2013) "Global Action Plan for the Prevention and Control of Noncommunicable Diseases: 2013-2020".

mTobaccoCessation

1) Background

[74]The World Health Organization (WHO) and the International Telecommunication Union (ITU) have formed a partnership called the 'Be He@lthy, Be Mobile' Initiative to use mobile technology – in particular text messaging and apps – to help combat noncommunicable diseases (NCDs) such as diabetes, cancer, cardiovascular diseases and chronic respiratory diseases. As part of this initiative they wish to assemble evidence-based and operational guidance to help countries and governments to implement these programmes. This document provides an extract of such a guide in relation to mTobaccoCessation – mobile phone-based support for people to quit smoking.

There is now sufficient evidence that mobile phone-based support for smoking cessation can be effective. A recent Cochrane Systematic Review *(1)* included five high-quality randomized controlled trials (RCT) with 6-month cessation measures and concluded that the intervention increased quitting rates by approximately 71 per cent. Three of the studies included purely text messaging interventions: STOMP was developed by the University of Auckland and trialled across New Zealand *(2)*; txt2stop was further developed from STOMP for a United Kingdom (UK) population and tested in the largest and highest quality trial to date *(3)*; researchers in Australia added text messages as an option to their online quitting coach and as a separate intervention *(4)*. The review identified several studies underway on further text message cessation programmes in the United States of America (USA), Norway and the UK.

Other reviews have indicated that text messaging may also be effective in other areas of healthy behaviour change and disease management. There are currently no randomized controlled trials of the effectiveness of any smartphone apps to support smoking cessation. One review of the available smartphone apps (via iTunes) found that few apps adhered to key cessation guidelines, or recommended or linked to proven effective techniques such as pharmacotherapy, counselling or quit lines *(5)*.

2) Steps for developing a new text messaging behaviour change programme: Overview

In broad terms, developing a text messaging programme should include the same phases of development that are typical for the development of all health communication materials.

1. **Designing the text messaging programme**
    - **Step 1:** Choose the behaviour change goal.
    - **Step 2:** Choose the communication objectives and behavioural techniques.
    - **Step 3.** Design the framework for the programme.
    - **Step 4:** Write the message library.
2. **Pretesting the text messaging programme concept and messages**

Once a text messaging programme has been developed it needs to be pretested, pilot tested and revised. Additional evaluation is recommended to determine its efficacy and, if disseminated, to evaluate the programme implementation.

3. **Designing the text messaging programme**

Step 1: Choose the behaviour change goal

The target of a behaviour change programme should be carefully selected based on a balance of health priorities and characteristics of the target audience, such as readiness to change.

[74] Hani Eskandar, ITU/BDT/IEE/CYB, BDT Focal Point for Question 2/2.

Step 2: Choose the communication objectives and behavioural techniques

Carefully consider the communication objectives and behavioural techniques that will be used to promote change in the targeted group. Communication objectives and behavioural techniques should be based on insights from the formative research and informed by theory and available evidence-based guidelines. Communication objectives are what people should know at the end of the programme and behavioural techniques are the actions people should take to make the targeted behaviour change.

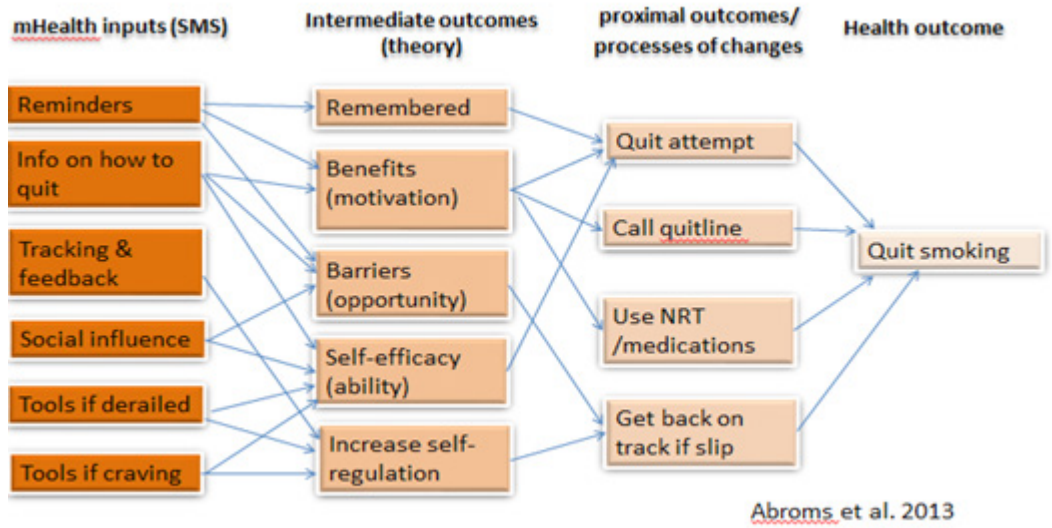
Example: For a smoking cessation programme, communication objectives might be aimed at increasing knowledge about the short-term health benefits associated with quitting. Behavioural techniques might include getting participants to call a quitline, set a Quit Date, track smoking patterns in the pre-quit period, manage cravings in the post-quit period, and reach out for help when experiencing an intense craving or when slipping up and smoking.

Once the communication objectives and behavioural techniques are identified, consider how the attributes of text messaging as a modality can support the communication objectives and behavioural techniques targeted.

Mobile communication allows for interactive help anywhere and anytime. This includes: real-time help in crisis situations; messaging that can interrupt and remind participant of goals; help that is personalized and tailored to the individual; goal setting; in-the-moment tracking of goals and feedback on goals. Additionally, mobile communication can be thought of as a modality that can supplement other programming modalities (e.g. face to face counselling) and provide additional opportunities to reinforce messaging from counselling sessions.

To help organize the logic of a health behaviour text messaging programme, it is beneficial to create a diagram outlining how particular programme components (inputs) fit with theoretical constructs, which can then be used to achieve proximal outcomes and longer term behavioural and health outcomes. **Figure 7A** presents a logic model describing how a hypothetical smoking cessation text messaging programme might work.

Figure 7A: Logic model for mHealth & smoking cessation



Step 3: Design the framework for the programme

The framework for the programme provides an overarching plan of how messages are sent to users. The framework should include a description about the timing and frequency of messages as well as indicate the kinds of messages that 'check-in' on users (surveys) and the keywords users will be able

to use to ask for additional help in times of need. For an example of a framework and message library, see QuitNowTxt message library.[75]

In designing the framework, decisions may need to be made about the following key issues:

- **Frequency of messages:** The frequency of messages will be determined by the need for the programme's messages to stand out to the user. Most proven text messaging programmes proactively send out at least one message per day in the key behaviour change periods of the programme, and fewer text messages (e.g. three messages per week) in a less acute phase of the programme. Example: Text2Quit sends five messages on the quit date, daily messages in the first week after quit date and three messages per week in the weeks after that. For users who are frequent texters, message frequency may need to be higher so that messages stand out from the many texts they already send and receive daily. It should be noted that some programmes do not send regular texts, and only send texts when a user requests information (e.g. SexInfo, a sexual health information service, is a reactive service that replies when the user initiates a question to the system).
- **Timing of messages:** The timing of messages may be related to both their content (e.g. what they are asking the user to do), the daily routine of the user (e.g. when the user is free to consider the text message), and the nature of the behaviour change (e.g. meal tracking texts should be sent at lunchtime). Consideration also needs to be made as to what event will trigger the messages. These could be messages timed around the event of enrolment, around a date of behaviour change (e.g. quit date), or around a weekly cycle (e.g. day of the week such as a Monday pledge text).
- **Nature of interaction with the programme:** While some text messaging programmes (e.g. text4baby) are primarily one-way, with little opportunity for replies and other forms of interaction, most proven programmes have some element of interaction. It is recommended that interaction occurs around surveys (e.g. "Are you ready to quit? Reply 1 if you are ready or 2 if you are not ready"), tracking (e.g. "How many cigarettes did you smoke yesterday? Reply and see if you met your goal") and with keywords. Keywords are words that the user can send into the system at any time for additional help (e.g. a user sends in the keyword 'crave' if they are having a craving and need help). Keywords should be limited in number so that users can easily remember them and use them as needed.
- **Source of messages:** The source of the text messages is generally the programme name (e.g. text4baby). However, automated messages may be supplemented with messages from a real person, counsellor or clinician. In some programmes, automated messages are supplemented by messages written by a person when a user indicates to a computer-generated survey that they need additional help (e.g. they just smoked a cigarette). Even within automated programme messages, message source can vary, with some messages coming from the programme and others from a specific person who is part of the programme. For example, in Text2Quit, some messages come from a fictitious quit pal who offers social support. In other programmes, the programme may pair a user with an actual quit buddy to interact with via text.
- **The degree to which the programme will be tailored:** A decision has to be made as to whether the programme will run as a single generic programme, with all users receiving the same programme, whether there will be different versions (or protocols) for different types of user, or even whether personalized versions of the programme may be offered. In general, creating extra protocols or tailoring to individual characteristics can be expensive and therefore must be carefully thought through. A reason to consider including tailored protocols is because the evidence suggests that tailored programmes result in higher readership, higher message recall, perceptions of higher personal relevance and in some cases greater behaviour change.

[75] http://smokefree.gov/health-care-professionals.

Example: In a texting programme designed to help pregnant women quit smoking, there could be different message protocols for women who are: ready to set a quit date in the next 2 weeks; women who want to cut down on their smoking; and women who are not willing to quit or cut down. Across programmes, message protocols could be tailored around factors such as: demographic variables (e.g. if the user is male or female), readiness to change (e.g. if the user is willing to set a quit date), planned method for behaviour change (e.g. whether they will quit with medications), source of social support, and benefits they will personally reap by changing behaviour. For programmes with multiple protocols, consideration needs to be made as to whether a user will be able to switch protocols once in one particular programme protocol (e.g. move from having a quit date protocol to the cutting down protocol).

– **Consider other ways the programme will be 'smart'**: Because text messages are sent by a computer system, they can be 'smart'. They can track progress over time and give feedback on progress towards goals. They can track user interaction with the system and offer points or other 'gamified' rewards systems to promote engagement. For users with low engagement, the system can offer reminders to take steps and make progress.

Step 4: Write the message library

The message library is a database of the actual messages that will be sent to the user. Messages need to be written for each case supported by the programme. Messages need to be 160 characters (including spaces) or fewer. For an example of a framework and message library, see QuitNowTxt message library.[76]

Here are some tips when writing the message library:

– **Messages can take many forms.** They can be aimed at providing information or advice, asking users to track behaviours, providing feedback on goals, offering reminders or providing social support (see **Table 6A** for examples). Remember: try to keep it to one actionable message per text. People are processing information in a distracted state and it is possible to say too much in 160 characters (even likely).

– **Message language.** Text messages generally should start with the programme name. Do not use abbreviations or text speak (e.g. 'how r u doin?'). Users find this type of language to be unprofessional coming from a credible health source.

– **Provide a way for users to get more information.** Give them the option to either reply to a text to request more information or provide a link to a web page with more information.

– **Consider smartphone or social media integration.** Remember, users may be reading text messages on smartphones. This means that text messages can seamlessly link to email, web and Facebook, and the content can include multimedia (audio, video), games and visualization of data. Consider how you might build in multimedia links from the text messages.

– **Repurpose already-existing content.** Where possible, use existing materials and adapt for use in the text messaging programme. Most government publications are in the public domain and can be used without permission for such purposes.

– **Focus on message quality.** As with all good health communications materials, messages should be evidence-based and derived from theory. Messages should stem from your communication objectives and the behavioural techniques you plan to promote.

– **Consider the literacy demands on your audience.** Once the message library is written, check the literacy demands associated with the messages. This can be done by importing the messages into Microsoft Word and using the tool to determine reading level. In general, shorter words and sentences have lower literacy demands. Also, messages should cover one main point rather than multiple points to avoid confusion.

[76] http://smokefree.gov/health-care-professionals.

Table 6A: Message examples based on approach

Approach	Example message
Provide health information, advice and tips, often tailored around user characteristics	Try using Nicotine Replacement Therapy (NRT). Smokers who use NRT double their quit rates.
Ask users to set goals	By how many cigarettes do you hope to cut down?
Provide opportunities for tracking progress	Track how many cigarettes you smoked yesterday.
Provide reinforcement for goals which are met	Congrats! You met your goal.
Offer reminders (e.g. to take vitamins; to follow-through with goals)	Your Quit Day is tomorrow.
Offer social support	Hi! I'm your quitpal. I've been through this and quitting is tough. Stick with it and you'll make it through.

Annex 5: eHealth in APT Region

[77]This annex collects several use cases of eHealth system with M2M/IoT system in Asia – Pacific regions, and describes concept and importance for eHealth, related international standardization. Hopefully this informative report will help readers to learn about how the eHealth services are introduced in the APT region and will be a facilitator of new ideas and collaborations.

1) Scope

The scope of the report is followings:

- Introduction of concept and importance of ICT countering eHealth
- Introduction of related international standards activities
- Introduction of case studies
- Analysis of further study items for APT member countries

2) Terms and Definitions

It includes all terms and definitions of this report. This clause will be the good collection of well-known terminologies for the study of ICT and eHealth.

Editor's note: Because this document has several terms related to eHealth, EHealth and eHealth, we have to define the term of eHealth.

mHealth: Mobile computing, medical sensor and communications technologies for healthcare

3) Concept and importance for eHealth

The period 1998-1999 was the era of a significant rise in e-commerce and "eHealth" was introduced at that time as a new term to describe the combined use of Information and Communication Technologies (ICT) in the health sector and a subset of e-commerce [8]. Along with the progress of ICT, eHealth has been characterized not only by health-related technical developments, but also by the development of solutions to improve healthcare locally, regionally, and worldwide by the usage of ICT [2].

eHealth provides substantial benefits to both personal health and public health. It empowers individuals in self-monitoring, chronic disease management and access to trusted health knowledge sources. It also improves the abilities to support surveillance and management of public health interventions and to analyse and report on population health outcomes [3].

An eHealth ecosystem involves different roles impacting the ecosystem stakeholders, such as citizens, research professionals, hospitals, health-related business actors and governments.

3.1 Concept of eHealth

eHealth is an emerging field in the intersection of medical informatics, health and business, referring to health services and information delivered through, or enhanced by, ICT.

eHealth is concerned with improving the flow of information to support the delivery of various health services and the management of systems for health.

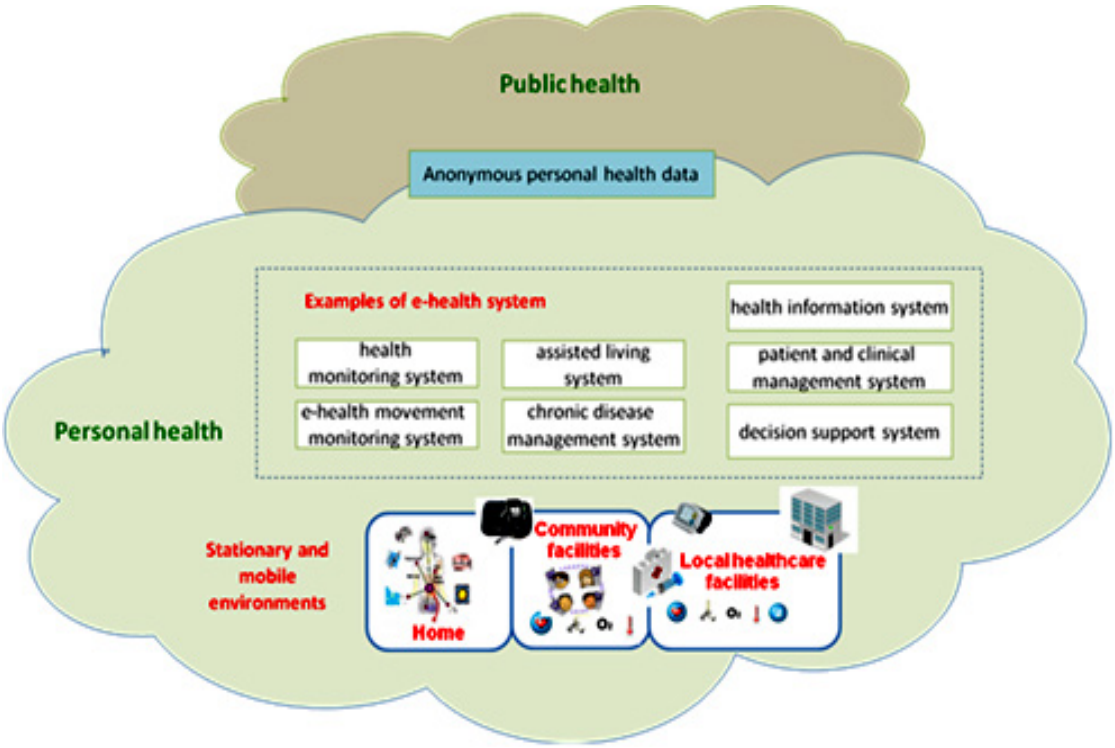
eHealth deals with both personal health and public health: personal health focuses on personalized healthcare, while public health manages diseases and risk factor trends in populations.

[77] Hideo Himeno, NEC Corporation, Japan.

3.2 Overview of eHealth system

An eHealth system contains the infrastructure for providing eHealth services to users. **Figure 8A** provides an overview of eHealth system, including examples of eHealth system and their deployment environments.

Figure 8A: eHealth system overview



Examples of eHealth system include health monitoring system, eHealth movement monitoring system, chronic disease management system, assisted living system, decision support system, health information system, patient and clinical management system, as well as other systems assisting disease prevention, diagnosis, treatment and lifestyle management. These systems may be deployed in stationary and mobile environments, such as home, local healthcare facilities and community facilities.

NOTE 1 – The local healthcare facilities are patient-care points of first intervention and may include clinics, hospitals, ambulances, regional health sites and primary healthcare centers [4].

NOTE 2 – The community facilities provide social welfare and community services, typically in, but not limited to, rural and remote areas. It is expected that basic and enhanced health services for communities be not limited to those provided at home and in local healthcare facilities.

In the personal health domain, an eHealth system is used by professionals to provide medical services, and also used to provide healthcare service such as movement and health monitoring for individuals.

In the public health domain, an eHealth system is used by public health organizations to provide public health services, utilizing anonymous personal health data retrieved from personal health domain in order to make analysis and take decisions.

3.3 eHealth ecosystem

According to concept of eHealth mentioned-before, an eHealth ecosystem contains three consideration points for the practical deployment. The eHealth ecosystem needs to be developed to sustain

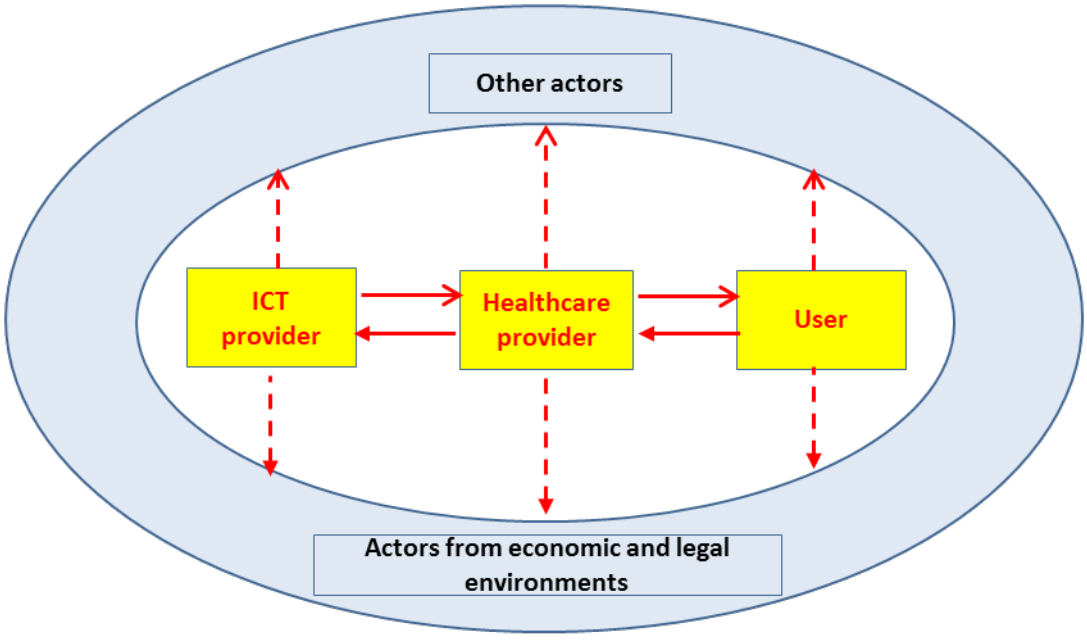
the expected eHealth services and this implies the implementation of the required functional features using ICT, the so-built infrastructure constituting an eHealth system. The ecosystem also needs to be flexible enough to evolve in line with the development of new information and communication technologies or services.

Secondly, the eHealth ecosystem involves different roles impacting the ecosystem stakeholders, such as citizens, research professionals, hospitals, health-related business actors and governments. The exact roles and benefits of actors in the ecosystem should be taken into account in order to adapt the system to variety of actors and using scenes.

Thirdly, eHealth is aimed at supporting both personal health and public health. Each of these two health domains has its own ecosystem. The personal health domain benefits from an ecosystem mainly from a business model flexibility viewpoint, whereas the public health domain benefits from it also from a governmental viewpoint, as well as from the perspective of not only individual nations but also of global health.

The ecosystem for personal health is characterized by integrated services provided by the actors of the ecosystem. **Figure 9A** shows a high level view of the ecosystem for personal health with the involvement of «User», «Healthcare provider» and «ICT provider» as the key actors. In the ecosystem, these key actors interact with other actors, including those from the economic and legal environments, such as insurance companies, regulation entities and legal entities.

Figure 9A: High level view of the eHealth ecosystem for personal health with its actors



The three key actors of the eHealth ecosystem for personal health are characterized as follows:

- ICT provider: Offers ICT facilities that store, retrieve, process, transmit or receive information electronically.
- Healthcare provider: Implements and offers eHealth services to be used by the User.
- User: Consume eHealth services.

The ecosystem for public health is more complex than the ecosystem for personal health, and encompasses all aspects of the society: it is characterized by a multiplicity of interactions among the numerous actors of the ecosystem, including healthcare institutions, social services, educational institutions, urban planning agencies, public health agencies and so on. The large diffusion of the

ecosystem for personal health and the large aggregation of data operated by the eHealth services may benefit the ecosystem for public health, e.g. for a global health surveillance service, through the use of anonymous personal health data.

4) Use cases in APT region

4.1 eHealth overview in China

There are urgent requirements for eHealth in China. China's total healthcare costs in 2011 is 2.43 trillion RMB, accounting for 5.15 per cent of the Gross Domestic Product (GDP), and China's population health state is serious, such as the number of chronic disease and sub-health patients, according to the definition of health by the WHO, the health population in China is just 15 per cent of the total population, 15 per cent in a disease status and the rest 70 per cent in a state of sub-health. Chinese government is making efforts to prevent of chronic disease, On May 8, 2012, Ministry of Health and other 14 departments jointly issued the Work Plan on Prevention and Treatment of Chronic Disease (2012-2015), which put forward that, it shall take strengthening the prevention and control of chronic diseases as the important content of improving the people's livelihood and forging the medical reform, and take effective measures.

The Rise of Mobile Health

Mobile technology has an important contribution to the medical field, and can bring benefits for the livelihood of people, government, industry, and technology development. Chinese mobile medical applications market is growing rapidly. Some research firms estimate the size of the Chinese mHealth market is about 1.86 billion RMB, which is up to 17.7 percent over the last year. They also predict the mobile medical market in China will exceed 10 billion RMB by the end of 2017.

They also predict rapid growth in the Chinese wearable medical devices market. The wearable medical equipment market in China reached 420 million RMB, and will exceed 5 billion RMB by 2017 according to data published by some consulting company.

Remote monitoring devices represent a fast-growing part of the mHealth sector. According to a report jointly author by GSMA and the consulting company, the Chinese medical monitoring services market will reach $1.2 billion by 2017, with over 90 percent of the revenues coming from chronic disease management solutions.

eHealth standardization in China

The standardization activities in China has been initiated in China Communications Standards Association (CCSA), the items and directions involve the eHealth, wireless BAN (Body Domain Network), telemedicine, etc.

4.2 eHealth activities in Japan

Japan is leading the aging society of the world and the ICT for eHealth services. The number of aging population has increased and the costs of the social medical insurance system are changing the direction of the health services in Japan. eHealth technologies provide the efficiency of treatment at medical facilities and functions for preventive healthcare, such as health check and monitoring at home.

Three typical practices of eHealth services are described in the following clauses; Mobile Health System from NTT, BAN-enabled Portable Health Clinic (NOTE 3) from NICT and Social Infrastructure Solution from NEC.

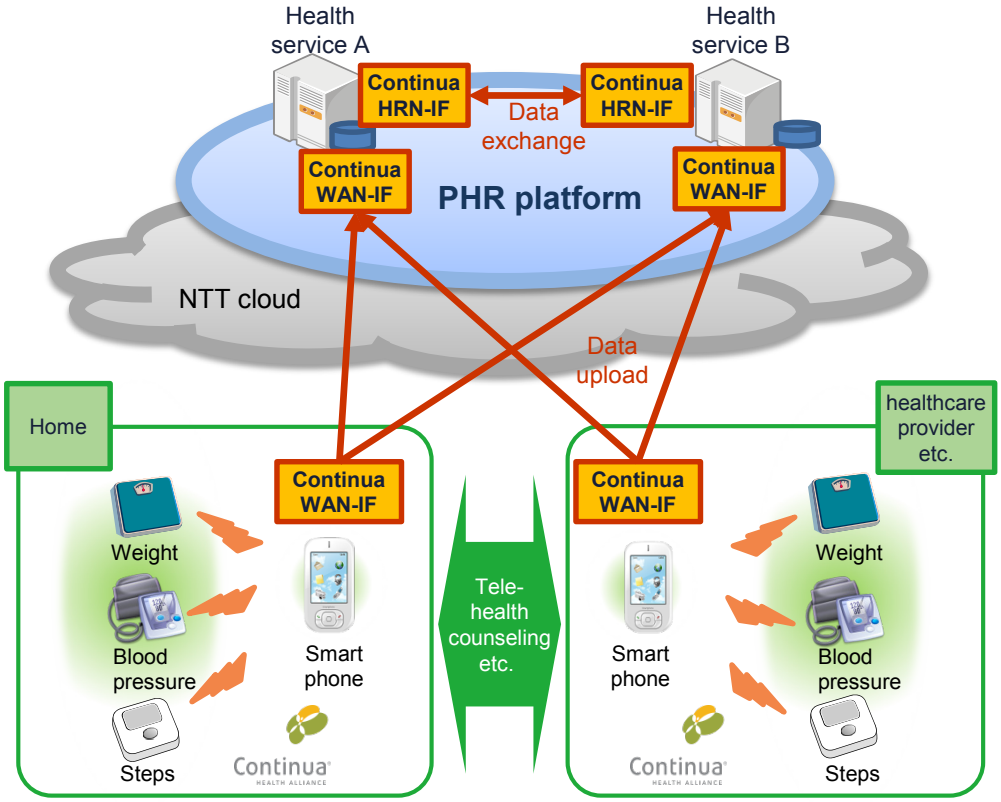
NOTE 3 – The term BAN is described in the FG M2M deliverable “D0.2: M2M enabled ecosystems: eHealth”.

4.1.1. Easy and Convenient Health Checkup with Mobile Health System

Mobile Health System for home care support is used to reduce the amount of commuting by both doctors and patients to and from hospital by uploading health data. A system provided by NTT Corporation is suited to such situations that people share healthcare devices and smart phones (as data upload gateway). The system conforms to Continua Health Alliance Design Guidelines, which is the ITU-T H.810 standard made from a global industry standard for health data.

There are 3 steps application scenarios in Mobile Health System. Step 1 is providing regional clinical pathways between medical providers and home care support providers. Step 2 is ensuring continued medical service and healthcare in disaster areas. Step 3 is providing health check services to developing countries deficient in medical resources. Service flow of Mobile Health System is 1) citizens take health check by using Healthcare devices (weight, blood pressure, steps, etc.) at home or healthcare center, 2) Healthcare devices upload health data to health check services thorough smart phone, 3) Health check services report who has a possible of illness to Medical institutions, 4) Medical institutions recommend taking medical consultation to citizens.

Figure 10A: Overview Mobile Health System



4.1.2. Affordable BAN-enabled Portable Health Clinic toward eHealth M2M service

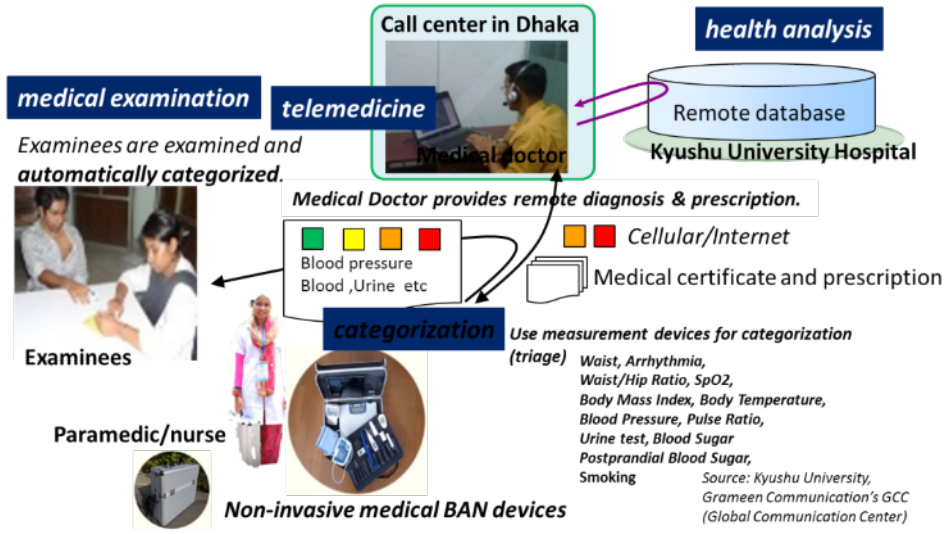
Portable Health Clinic (PHC) was introduced to develop models for social information infrastructure by Kyushu University in Japan and Grameen Communication's Global Communication Center (GCC) in Bangladesh (Note 4), and the associated body area network (BAN) is provided by NICT, Japan. It was prototyped as a portable-clinic box equipped with major diagnostic tools integrating a simple equation to categorize patients into four groups depending on the level of action or attention required.

The BAN-enabled portable health clinic (BAN-PHC) allows a coordinator to wirelessly and securely gather all measured data from medical devices and sensors (**Figure 11A**). The automatic data retrieval

removes human error and reduces time spent on manual data copying. Once data are collected in the coordinator, they are sent to a backend local server for categorization and further remote diagnosis. BAN-PHC consists of **an attaché case equipped with BAN-enabled measurement devices, its coordinator, and a local backend server (a note PC), and connects to a database in network for remote diagnosis (Figure 12A).**

Figure 11A: BAN-enabled portable health clinic

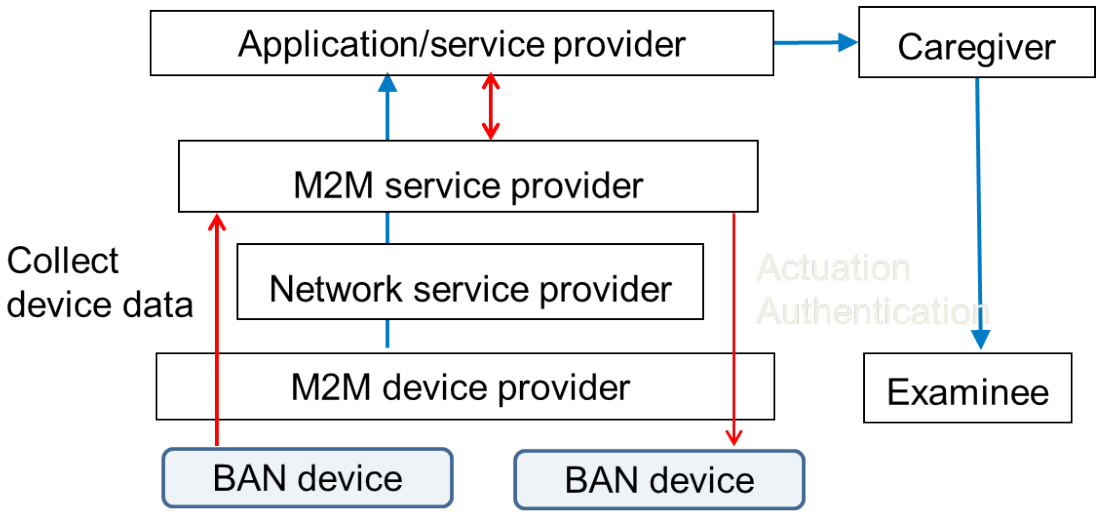
Figure 12A: BAN-enabled portable health clinic



The BAN-PHC health checkup and remote diagnosis was conducted in FY2012 and FY2013 for more than 15,000 subjects. With the assessment of the health checks and diagnoses, actual usefulness was proved (Note 5).

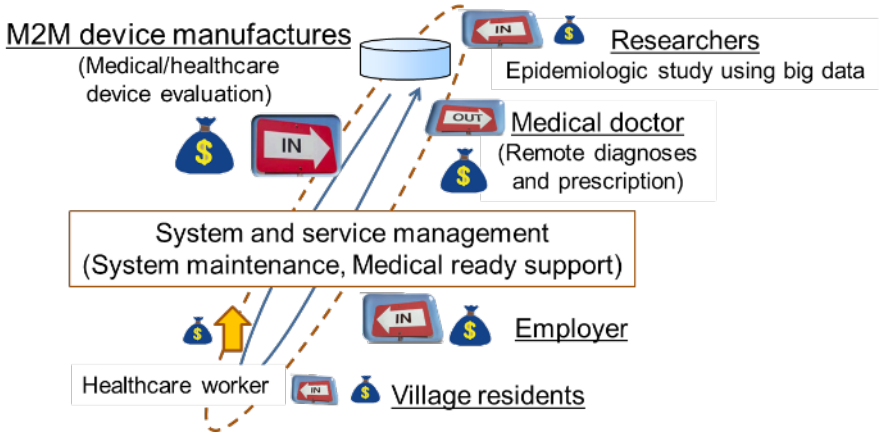
An M2M-enabled eHealth has a potential to improve the scalability of healthcare services and to reduce operation costs by introducing additional roles in the ecosystem. BAN-PHC plays roles in automatically upload not only medical/healthcare data to the backend database, but also operation data, such as the use count of each device to the device manufacturer. It plays an important role in the M2M-enabled ecosystem to increase the use of various data.

Figure 13A: Ecosystem of M2M-enabled BAN-PHC



An M2M-enabled eHealth combined with BAN-PHC increases the number of users and provides equal opportunities to caregivers, such as medical doctors, for medical/healthcare consultation and to users to select one from available caregivers in the M2M service. (**Figure 13A**) In addition to these advantages, it strengthens an affordable business model by involving a group of M2M device manufacturers who receive automatic analysis for durability and ease of use of their own devices (**Figure 14A**).

Figure 14A: M2M-enabled BAN-PHC business model



NOTE 4: the project name is "Development of the fastest database engine for the era of very large database and experiment and evaluation of strategic social services enabled by the database engine" in funding program for world-leading innovative R&D on science and technology (FIRST).

NOTE 5: Yasunobu Nohara, Eiko Kai, Partha Pratim Ghosh, Rafiqul Islam, Ashir Ahmed, Masahiro Kuroda, Sozo Inoue, Tatsuo Hiramatsu, Michio Kimura, Shuji Shimizu, Kunihisa Kobayashi, Yukino Baba, Hisashi Kashima, Koji Tsuda, Masashi Sugiyama, Mathieu Blondel, Naonori Ueda, Masaru Kitsuregawa, and Naoki Nakashima, "Health Checkup and Telemedical Intervention Program for Preventive Medicine in Developing Countries: Verification Study", JOURNAL OF MEDICAL INTERNET RESEARCH, 2015, Jan 28; 17(1).

4.1.3. SmartCare Solutions based on M2M/IoT platform

SmartCare Solutions are provided by NEC Corporation. M2M/IoT platform technology plays key role for SmartCare solutions in order to collect various kind data and analyze the data. M2M service platform solves various problems and provides basic functionality for M2M services. Interfaces are prepared

for many different kinds of devices to be connected with the platform. Interfaces are provided for realizing a wealth of M2M services. Utilizing cloud services enables systems to be built more rapidly and economically. Offers support for building systems from small-start to large-scale configurations, and M2M solution reduces system operation cost and man-hours.

Individual healthcare services can be improved by using a broad range of health information such as weight and blood pressure, consumed calories when eating out, and heart rate while jogging in order to gain a complete and individualized understanding of a person's health.

Figure 15A: SmartCare solution for wellness

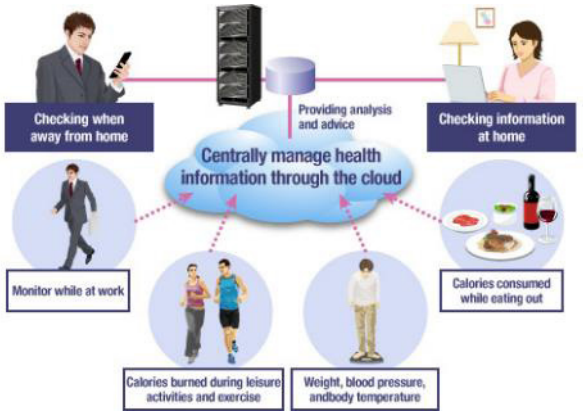
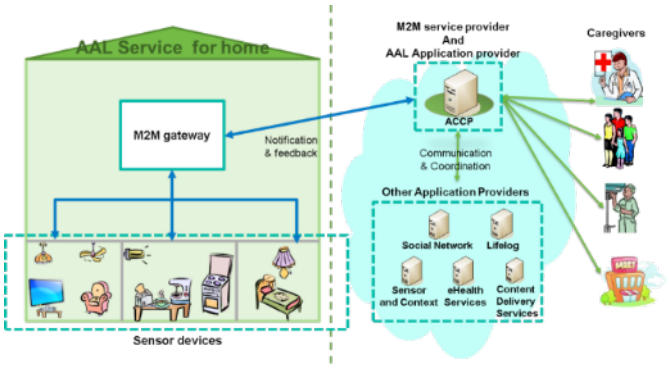


Figure 16A shows SmartCare solution for Ambient Assisted Living (AAL). AAL can provide assist for the elderly people, or people who are handicapped in any way, to live a fully independent life. Technology is seen as one possibility for shaping our future in times of demographic change and living longer. It is seen as a possible means to keep ourselves healthy and active for even longer.

There are several scenarios of AAL service; depending on the user's symptoms and condition, AAL scenarios correspond to each situation.

Figure 16A: SmartCare solution for AAL



The basic Information flow of this solution is following,

1) Monitoring: Some kind of sensors (temperature, moisture, lights/emergency call switch on/off, electronic lock door, smoke etc.) can obtain measurement results or status on equipment embedded sensor devices and also sends these parameters or status to M2M gateway through the wired or short range wireless local network.

2) Interpretation: M2M gateway can interpret what kind of sensor sent information and identify the user and gather the parameters or status information and assemble this information into specified data format. M2M gateway uploads this information to an Advanced Care Coordination

Platform (ACCP) through the wired network (NGN, ISDN, PSTN etc.) or wireless network (GSM, 3G, LTE, WiMAX etc.).

3) Identity Management: ACCP can accept the monitored information by several M2M gateways and can manage the user identification.

4) Distributed Access Control: The information related with one user can be uploaded to an ACCP from several M2M gateways through the most suitable access network (wired/wireless). The ACCP can connect and control the distributed access network.

5) Communication & Coordination: ACCP can obtain and analysis the parameters or status information sent by M2M gateway in order to analysis the result of the monitoring. And ACCP can communicate with other Application provided by other providers (ex. eHealth application, Lifelog application, that is typically to capture their entire lives, or large portions of their lives as digital data with computer devices, Social Network application etc.) and can coordinate with other Application.

6) Feedback: ACCP can get the analyzed result from Caregivers and can obtain the feedback from other Application providers. ACCP can integrate the instructions according to this feedback and can send to M2M gateway. ACCP can also send to Front End Tools for Caregivers or Patients.

7) Analysis: M2M gateway can receive the instructions integrated by ACCP through the network. And M2M gateway can analyze the received instructions for the user. Front End Tools can also receive the instructions and Caregivers or Patients can analyze the received instructions.

4.3 Health Data and Government Multi Purpose Card (GMPC/MyKad) in Malaysia

The GMPC, replaces the current Malaysian National Identity card, which was a laminated plastic ID card with images of the fingerprints on the card [b-GMPC/MyKad]. This identity card is issued to all Malaysians over the age of 12 years that they must carry at all times. At the moment there are 17 million identity card holders in a total population of 21 million. Another function of the card is to replace the current Malaysian driving license. The third application if passport information which allows the card holder to exit and reentry Malaysia using “autogates”, which verify the holders fingerprint biometrics with the cards, check a blacklist and log the exit and reentry date and time details. The fourth application is the critical health information of the cardholder such as blood type and allergies; it also records the latest hospital visit data. Additional non-government applications include electronic purse (MEPS e-cash), automatic teller machine (ATM) and public key infrastructure (PKI) applications. The GMPC contains two-biometrics type of data, a digitized color photo of the cardholder and the minutiae (fingerprint characteristics).

Health Data on GMPC includes several data that are (1)demographic data (next of kin), (2)static health data (blood group, allergies, immunization, implants, chronic disease/disabilities, current medication, insurance/third party payer), (3)dynamic health data (visit episode).

Figure 17A: GMPC/MyKad by using IC chip

Figure 18A shows Malaysia scenario of integrated health services including GMPC.

Step 1: Access health portal & perform Health Reimbursement Agreements (HRA);

Step 2: (Choice 1) Contact call center;

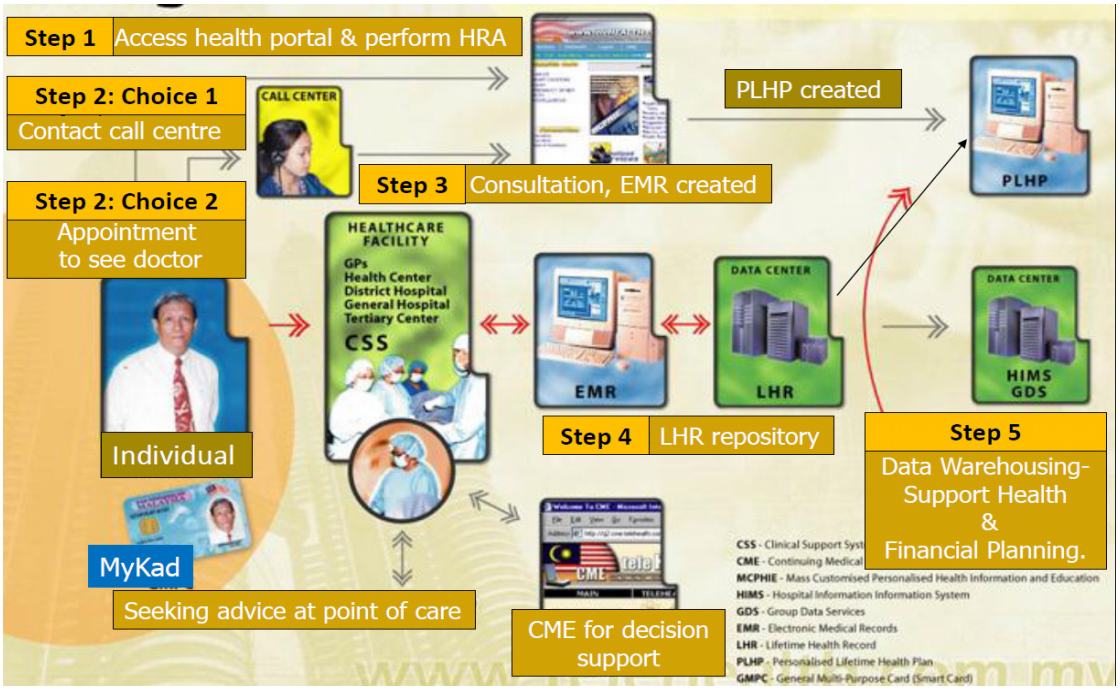
Step 2: (Choice 2) Appointment to see doctor;

Step 3: Consultation, Electric Medical Record (EMR) created;

Step 4: Lifetime Health Record (LHR) repository;

Step 5: Data warehousing support health & financial planning.

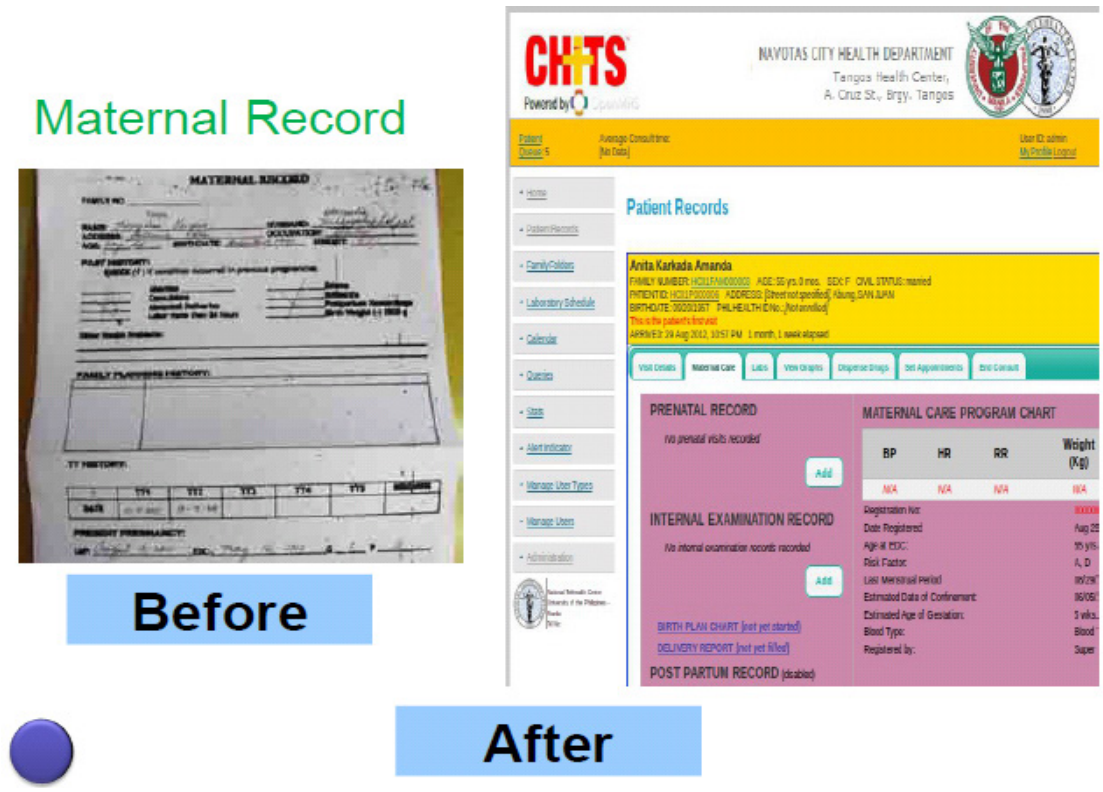
Figure 18A: Malaysia scenario of integrated Health services



4.4 eHealth activities in Philippines – Telehealth and eMedicine by NTHC

These realities mark public health in the Philippines [b-Telehealth]. The country's geography and lack of resources compound the problem of data collection and use on the ground. This poor information management system prevents the development of well-planned and targeted strategies to combat the Philippines' health problems, to reduce inequity in healthcare access and improve the overall health of Filipinos, especially those who live in the poorest and farthest communities. The Community Health Information Tracking System (CHITS) is an electronic medical record system developed by the NTHC to improve health information management at the Regional Health Unit (RHU) level. It was developed alongside health workers and features a workflow much akin to what is employed in local health centers nationwide. It is also built to gather data and generate reports which health workers need and decision makers require. CHITS is made up of several components which are envisioned to lead to the collection and delivery of good quality data. CHITS is primarily a capacity-building program which instils relevant health information systems components among health workers. By using free and open source software, CHITS makes itself flexible and compliant to the needs of RHU's and local health centers as well as the Department of Health (DOH). Once installed, CHITS becomes a platform for the facility to explore other eHealth applications such as telemedicine and eLearning.

Figure 19A: CHITS (The Community Health Information Tracking System)



4.5 National Electronic Health Record (NEHR) in Singapore

The NEHR is an integrated healthcare record centered on each person. It extracts and consolidates in one record, all clinically relevant information from their encounters across the healthcare system throughout his/her life. Secure "real-time" access to patients' NEHR by authorized clinicians and healthcare providers.

NEHR project in Singapore was started by Ministry of Health Holdings (MOHH) from 2008. The initial action is to create roadmap of NEHR architecture.

After approval of NEHR architecture, the concrete development of NEHR was started from April 2009. In this time, the roadmap to develop this system by April 2015 was settled.

Figure 14shows the concept that medical and healthcare information is exchanged among several institutions in Singapore. Private General Practitioners (GPs) have EMR in Clinical Management System (CMS). And also EMR is used in Community Hospitals, other ILTC Intermediate and Long-term Care (ILTC), public healthcare, polyclinics and Ministry of Defense. NEHR will enable strategic vision of patients moving seamlessly across the healthcare system, receiving coordinated patient-centric care at the most appropriate settings.

Figure 20A: eHealth system in Singapore (from MOH Holdings)

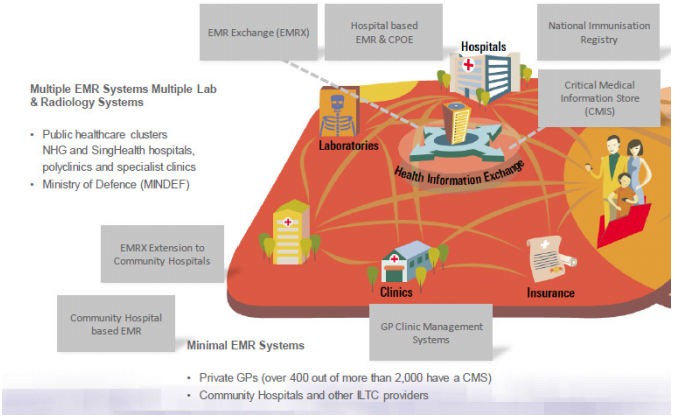
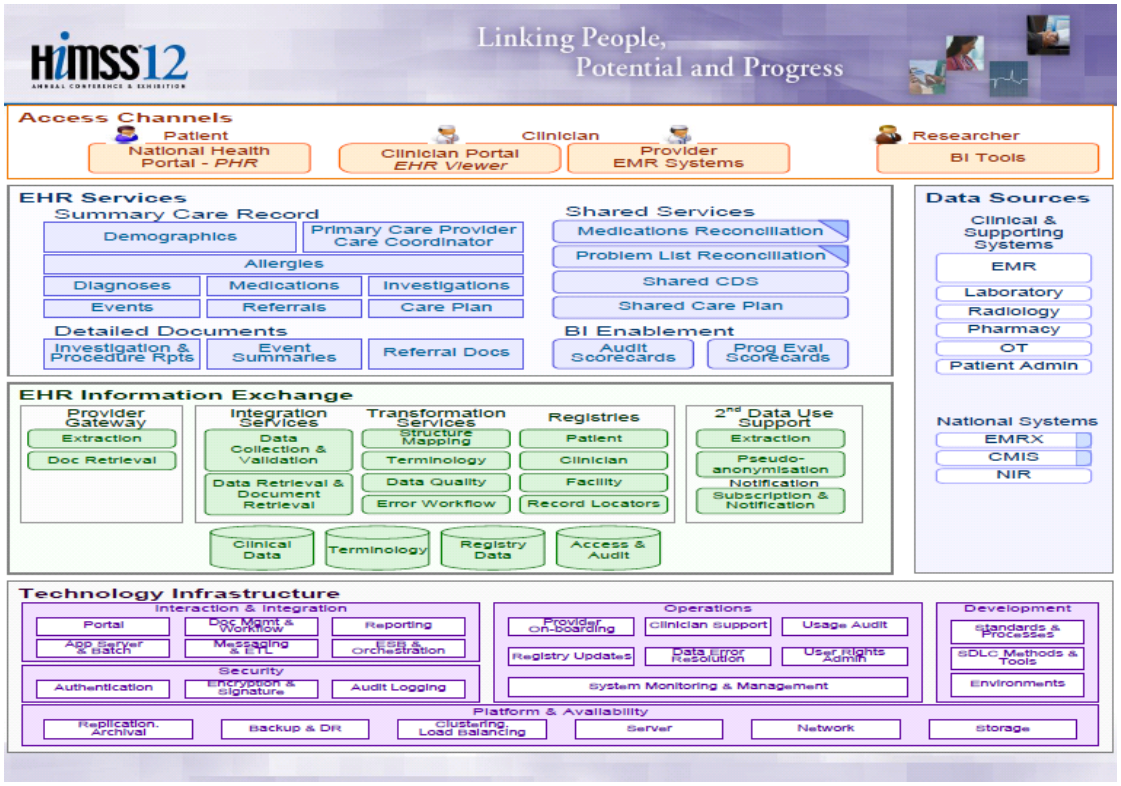


Figure 21A indicates the NEHR architecture based on fundamental scope. The bottom part of this architecture shows technology infrastructure sets functions of Electric Health Record (EHR) information Exchange above technology infrastructure. It enables a lot of EHR services and informs these services to stakeholders via Access Channels indicated on top of this architecture. It is considered that patients can access to EHR services in the future. This architecture includes Data sources on right part of this figure that have not only data from clinical systems but also national systems.

Figure 21A: NHER Architecture (from MOH Holdings)



5) Related international standardization activities

This section provides a brief idea of current activities of international or regional standard bodies. The major SDOs are listed below, but it does not limit to the following organizations.

5.1. ITU-T

Some Study Groups have a direct bearing on eHealth systems to specify standards. Consequently, many ITU Study Groups address issues supporting eHealth, such as quality of service (Study Group 12), mobile telecommunications networks (Study Group 13), multimedia coding and systems (Study Group 16), security issues (Study Group 17), and others.

Table 7A: Related international standardization activities at ITU

Document number	Deliverable title	Ver.	Date
ITU-T / Y.2065	Service and capability requirements for eHealth monitoring services (Y.EHM-reqts)	1.0	2013-11
ITU-T / H.642.1	Multimedia information access triggered by tag-based identification – Identification scheme	1.0	2012-06-29
ITU-T / H.642.2	Multimedia information access triggered by tag-based identification – Registration procedures for identifiers	1.0	2012-06-29
ITU-T / H.642.3	Information technology – Automatic identification and data capture technique – Identifier resolution protocol for multimedia information access triggered by tag-based identification	1.0	2012-06
ITU-T / H.810	Interoperability design guidelines for personal health systems	1.0	2013-12-14
ITU-T / X.1080.1	eHealth and world-wide telemedicines- Generic telecommunication protocol	1.0	2011-10-14
ITU-T / X.1081	The telebiometric multimodal model - A framework for the specification of security and safety aspects of telebiometrics	2.0	2011-10-14

The Focus Group on the M2M service layer (FG M2M) studies activities currently undertaken by various Standards Developing Organizations (SDOs) in the field of M2M service layer specifications to identify key requirements for a common M2M service layer.FG M2M identifies a minimum set of common requirements of vertical markets, focusing initially on the health-care market and application programming interfaces (APIs) and protocols supporting eHealth applications and services, and draft technical reports in these areas.FG M2M identifies a minimum set of common requirements of vertical markets, focusing initially on the health-care market and application programming interfaces (APIs) and protocols supporting eHealth applications and services, and draft technical reports in these areas.

The Focus Group does not intend to duplicate other efforts and benefit from existing work and expertise. Therefore, FG M2M aims at including vertical market stakeholders that are not among the traditional ITU-T membership, such as Continua Health Alliance and the World Health Organization (WHO) for health-care, and will collaborate with M2M communities worldwide (including research and academia), SDOs, forums and consortia.

FG M2M produces five deliverables as output of the activity. Deliverables are as follows.

- D0.1: M2M standardization activities and gap analysis: eHealth;
- D0.2: M2M enabled ecosystems: eHealth;
- D1.1: M2M use cases: eHealth;

– D2.1: M2M service layer: requirements and architectural framework;

– D3.1: M2M service layer: APIs and protocols overview.

Details of FG Smart can be checked in ITU-T website (http://www.itu.int/en/ITU-T/focusgroups/m2m/Pages/default.aspx). FG M2M service layer has concluded in December 2013 and relevant study groups in ITU succeeded that work.

5.2. WHO

The WHO's eHealth unit works with partners at the global, regional and country level to promote and strengthen the use of information and communication technologies in health development, from applications in the field to global governance. The unit is based in the department of Knowledge Management and Sharing in the cluster of Health Systems and Innovation.

http://www.who.int/; http://www.itu.int/pub/ehealth/en/.

Table 8A: Related international standardization activities at WHO

Document number	Deliverable title	Ver.	Date
-	International Classification of Disease (ICD)-10	10	2007
-	National eHealth Strategy Toolkit	-	2012
-	Global Observatory for eHealth series	-	-
-	Connecting for Health: Global Vision, Local insight	-	-

5.3. CEN/TC 251

The Comité Européen de Normalisation or European Committee for Standardization (CEN) is a standards development organization made up of 31 national members developing pan-European standards. CEN has a Health Informatics Technical Committee (TC 251) which coordinates the development of standards for eHealth. According to its business plan and recent activities, the focus of CEN/TC 251 is primarily on technologies at the content level rather than dealing with communication technologies. CEN/TC 251 is further broken down into working groups such as Working Group IV, which focuses on the interoperability of data among devices and information systems.

http://www.cen.eu/cen/Pages/default.aspx

Table 9A: Related international standardization activities at CEN/TC 251

Document number	Deliverable title	Ver.	Date
EN 1068	Health informatics – Registration of coding systems	2005(E)	2005-04-17
EN 12264	Health informatics – Categorial structures for systems of concepts	2005(E)	2005-04-29
EN 12435	Health informatics – Expression of results of measurements in health sciences	2006(E)	2005-12-14
CR 1350	Investigation of syntaxes for existing interchange formats to be used in healthcare	1993	1993-07-01
EN 13940-1	Health informatics – System of concepts to support continuity of care – Part 1 :Basic concepts	2007(E)	2007-05-10

Document number	Deliverable title	Ver.	Date
EN 14463	Health informatics – A syntax to represent the content of medical classification systems – ClaML	2007	2007-10-07
EN 14485	Health informatics – Guidance for handling personal health data in international applications in the context of the EU data protection directive	2003(E)	2003-11-13
EN 1828	Health informatics - Categorial structure for classifications and coding systems of surgical procedures	2012(E)	2012-09-14
CEN/TR 15253	Health informatics – Quality of service requirements for health information interchange	2005	2005-11-13
CEN/TR 15299	Health informatics – Safety procedures for identification of patients and related objects	2006	2006-12-05
CEN/TS 15260	Health informatics – Classification of safety risks from health informatics products	2006-	2005-10-24
EN 12251	Health informatics – Secure User Identification for Healthcare - Management and Security of Authentication by Passwords	2004(E)	2004-06-21
CEN/TS 14822-4	Health informatics – General purpose information components- Part 4: Message headers	2005	2005-03-26
EN 1064	Health informatics - Standard communication protocol - Computer-assisted electrocardiography	2005+A1	2004-12-17
ENV 12612	Medical informatics – Messages for the exchange of healthcare administrative information	1997	1997-03-11
ENV 13607	Health informatics – Messages for the exchange of information on medicine prescriptions	2000	1999-07-29
ENV 13609-2	Health informatics – Messages for maintenance of supporting information in healthcare systems – Part 2: Updating of medical laboratory-specific information	2000	1999-07-29
ENV 13730-2	Healthcare Informatics – Blood transfusion related messages - Part 2: Production related messages (BTR-PROD)	2002(E)	2001-10-18
EN 12381	Health informatics – Time standards for healthcare specific problems	2005(E)	2005-01-20
EN 13609-1	Health informatics – Messages for maintenance of supporting information in healthcare systems – Part 1 :Updating of coding scheme	2005(E)	2005-03-15
EN 14822-1	Health informatics – General purpose information components – Part 1 :Overview	2005(E)	2005-08-16
EN 14822-2	Health informatics – General purpose information components – Part 2: Non-clinical	2005	2005-08-16
EN 14822-3	Health informatics – General purpose information components- Part 3 :Clinical	2005(E)	2005-08-16

Document number	Deliverable title	Ver.	Date
EN 15521	Health informatics – Categorial structure for terminologies of human anatomy	2007(E)	2007-10-07
EN 1614	Health informatics – Representation of dedicated kinds of property in laboratory medicine	2006(E)	2006-08-14
ENV 12443	Medical Informatics – Healthcare Information Framework (HIF)	1999	1999-11-07
ENV 12537-1	Medical informatics – Registration of information objects used for EDI in healthcare – Part 1 :The Register	1997	1997-02-09
ENV 12610	Medical informatics – Medicinal product identification	1997	1997-03-11
ENV 12611	Medical informatics – Categorial structure of systems of concepts – Medical devices	1997	1997-03-11

5.4. ISO/TC 215 – Health informatics

ISO's Technical Committee 215 also addresses health informatics. ISO/TC 215 focuses primarily on electronic health records. Various Working Groups (WGs) within TC 215 address topics such as data structure, messaging and communication, security, pharmacy and medication, devices, and business requirements for electronic health records. For example, ISO/TS 25237:2008 addresses pseudonymization principles and requirements for privacy protection of electronic health records. Many of ISO's standards are collaborations or endorsements of standards developed by other standards organizations such as HL7 or IEEE. For example, ISO/HL7 27931:2009, "Data Exchange Standards – Health Level Seven Version 2.5" establishes an application protocol for electronic data exchange in healthcare environments.

http://www.iso.org/iso/iso_technical_committee?commid=54960.

Table 10A: Related international standardization activities at CEN/TC 251

Document number	Deliverable title	Ver.	Date
ISO 18104	Health Informatics – Integration of a reference terminology model for nursing (ISO 18104:2003)	First edition	2003-12-15
ISO/TR 12309	Guidelines for terminology development organizations	First edition	2009-12-15
ISO/TR 14639-1	Capacity-based eHealth architecture roadmap – Part 1: Overview of national eHealth initiatives	First edition	2012-05-15
ISO 17115	Vocabulary for terminological systems	First edition	2007-07-01
ISO/TS 22789	Conceptual framework for patient findings and problems in terminologies	First edition	2010-06-15
EN ISO 10781	Electronic Health Record-System Functional Model, Release 1.1 (ISO 10781	corrected version	2012-10-15
EN ISO 11073-20601	Health informatics – Personal health device communication - Part 20601: Application profile – Optimized exchange protocol (ISO/IEEE 11073-20601:2010)	First edition	2010-0501

Document number	Deliverable title	Ver.	Date
EN ISO 13606-5	Health informatics – Electronic health record communication – Part 5: Interface specification (ISO 13606-5:2010)	First edition	2010-03-01
ISO 21090	Health Informatics – Harmonized data types for information interchange (ISO 21090:2011)	First edition	2011-02-15
ISO/IEEE 11073-20101	Point-of-care medical device communication – Part 20101: Application profiles – Base standard	First edition	2004-12-15
ISO 13119	Health informatics – Clinical knowledge resources – Metadata	First edition	2012-11-01
ISO 13606-1	Electronic health record communication – Part 1: Reference model	First edition	2008-02-15
ISO 13606-2	Electronic health record communication – Part 2: Archetype interchange specification	First edition	2008-12-01
ISO 13606-3	Electronic health record communication – Part 3: Reference archetypes and term lists	First edition	2009-02-01
ISO/TS 13606-4	Electronic health record communication – Part 4: Security	First edition	2009-10-01
ISO 13606-5	Electronic health record communication – Part 5: Interface specification	First edition	2010-03-01
ISO/TS 14265	Classification of purposes for processing personal health information	First edition	2011-11-01
ISO/TR 14292	Personal health records – Definition, scope and context	First edition	2012-03-15
ISO 17090-1	Public key infrastructure – Part 1: Overview of digital certificate services	Second edition	2013-05-01
ISO 17090-2	Public key infrastructure – Part 2: Certificate profile	First edition	2008-02-15
ISO 17090-3	Public key infrastructure – Part 3: Policy management of certification authority	First edition	2008-02-15
ISO 18308	Requirements for an electronic health record architecture	First edition	2011-04-15
ISO/TR 20514	Electronic health record – Definition, scope and context	First edition	2005-10-15
ISO/TS 21091	Directory services for security, communications and identification of professionals and patients	First edition	2005-12-15
ISO/HL7 21731	HL7 version 3 – Reference information model – Release 1	Corrected edition	2012-10-15
ISO/TR 22221	Good principles and practices for a clinical data warehouse	First edition	2006-11-01
ISO/TS 29585:	Deployment of a clinical data warehouse	First edition	2010-05-17

Document number	Deliverable title	Ver.	Date
ISO/TR 21730	Use of mobile wireless communication and computing technology in healthcare facilities – Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices	Second edition	2007-02-15
ISO/IEEE 11073-10101	Point-of-care medical device communication – Part 10101: Nomenclature	First edition	2004-12-15
ISO/IEEE 11073-10201	Point-of-care medical device communication – Part 10201: Domain information model	First edition	2004-12-15
ISO/TR 11487	Clinical stakeholder participation in the work of ISO TC 215	First edition	2008-12-01
ISO 12967-1	Service architecture – Part 1: Enterprise viewpoint	First edition	2009-08-15
ISO 12967-2	Service architecture – Part 2: Information viewpoint	First edition	2009-08-15
ISO 12967-3	Service architecture – Part 3: Computational viewpoint	First edition	2009-08-15
ISO/TR 25257	Business requirements for an international coding system for medicinal products	First edition	2009-09-01
ISO 10159	Messages and communication – Web access reference manifest	First edition	2011-12-15
ISO/TS 27527	Provider identification	First edition	2010-08-01
ISO 11073-30200	Health informatics – Point-of-care medical device communication – Part 30200: Transport profile – Cable connected (ISO/IEEE 11073-30200:2004)	First edition	2004-12-15
ISO/IEEE 11073-30300	Point-of-care medical device communication – Part 30300: Transport profile – Infrared wireless	First edition	2004-12-15
ISO 11073-90101	Point-of-care medical device communication – Part 90101: Analytical instruments – Point-of-care test	First edition	2008-01-15
ISO/TR 11636	Dynamic on-demand virtual private network for health information infrastructure	First edition	2009-12-01
ISO/TR 16056-1	Interoperability of telehealth systems and networks – Part 1: Introduction and definitions	First edition	2004-07-01
ISO/TR 16056-2	Interoperability of telehealth systems and networks – Part 2: Real-time systems	First edition	2004-07-01
ISO/TS 16058	Interoperability of telelearning systems	First edition	2004-07-01
ISO/TS 21298	Functional and structural roles	First edition	2008-12-01
ISO/TR 22790	Functional characteristics of prescriber support systems	First edition	2007-12-01

Document number	Deliverable title	Ver.	Date
ISO 27799	Health informatics – Information security management in health using ISO/IEC 27002	First edition	2008-07-01
ISO/TR 11633-1	Information security management for remote maintenance of medical devices and medical information systems – Part 1: Requirements and risk analysis	First edition	2009-11-15
ISO/TR 11633-2	Information security management for remote maintenance of medical devices and medical information systems – Part 2: Implementation of an information security management system (ISMS)	First edition	2009-11-15
ISO/TS 22600-1	Privilege management and access control – Part 1: Overview and policy management	First edition	2006-08-01
ISO/TS 22600-2	Privilege management and access control – Part 2: Formal models	First edition	2006-08-01
ISO/TS 22600-3	Privilege management and access control – Part 3: Implementations	First edition	2009-12-01
ISO 22857	Guidelines on data protection to facilitate trans-border flows of personal health information	First edition	2004-04-01
ISO 27799	Information security management in health using ISO/IEC 27002	First edition	2008-07-01
ISO/IEEE 11073-20601	Personal health device communication – Part 20601: Application profile – Optimized exchange protocol	First edition	2010-05-01
ISO 11073-91064	Standard communication protocol – Part 91064: Computer-assisted electrocardiography	First edition	2009-05-01
ISO 18232	Messages and communication -- Format of length limited globally unique string identifiers	First edition	2006-04-01
ISO/TR 21089	Trusted end-to-end information flows	First edition	2004-06-01
ISO/IEEE 11073-10404	Personal health device communication – Part 10404: Device specialization – Pulse oximeter	First edition	2010-05-01
ISO/IEEE 11073-10407	Personal health device communication – Part 10407: Device specialization – Blood pressure monitor	First edition	2010-05-01
ISO/IEEE 11073-10408	Personal health device communication – Part 10408: Device specialization – Thermometer	First edition	2010-05-01
ISO/IEEE 11073-10415	Personal health device communication – Part 10415: Device specialization – Weighing scale	First edition	2010-05-01
ISO/IEEE 11073-10417:	Personal health device communication – Part 10417: Device specialization – Glucose meter	First edition	2010-05-01
ISO/IEEE 11073-10471	Personal health device communication – Part 10471: Device specialization – Independant living activity hub	First edition	2010-05-01
ISO/TS 11073-92001	Medical waveform format – Part 92001: Encoding rules	First edition	2007-09-01

Document number	Deliverable title	Ver.	Date
ISO 12052	Digital imaging and communication in medicine (DICOM) including workflow and data management	First edition	2006-11-01
ISO/TR 13128	Clinical document registry federation	First edition	2012-07-01
ISO/TR 17119	Health informatics profiling framework	First edition	2005-01-15
ISO 17432	Messages and communication – Web access to DICOM persistent objects	First edition	2004-12-15
ISO 18812	Clinical analyser interfaces to laboratory information systems – Use profiles	First edition	2003-03-15
ISO 20301	Health cards – General characteristics	First edition	2006-11-15
ISO 20302	Health cards – Numbering system and registration procedure for issuer identifiers	First edition	2006-12-01
ISO 21090	Harmonized data types for information interchange	First edition	2011-02-15
ISO/TS 21547	Security requirements for archiving of electronic health records – Principles	First edition	2010-02-15
ISO/TR 21548	Security requirements for archiving of electronic health records – Guidelines	First edition	2010-02-01
ISO 21549-1	Patient healthcard data – Part 1: General structure	First edition	2004-05-15
ISO 21549-2	Patient healthcard data – Part 2: Common objects	First edition	2004-05-15
ISO 21549-3	Patient healthcard data – Part 3: Limited clinical data	First edition	2004-05-15
ISO 21549-4	Patient healthcard data – Part 4: Extended clinical data	First edition	2006-11-15
ISO 21549-5	Patient healthcard data – Part 5: Identification data	First edition	2008-04-15
ISO 21549-6	Patient healthcard data – Part 6: Administrative data	First edition	2008-04-15
ISO 21549-7	Patient healthcard data – Part 7: Medication data	First edition	2007-06-15
ISO 21549-8	Patient healthcard data – Part 8: Links	First edition	2010-06-15
ISO 21667	Health indicators conceptual framework	First edition	2010-12-01
ISO/TS 22220	Identification of subjects of healthcare	Second edition	2011-12-15

Document number	Deliverable title	Ver.	Date
ISO/TS 22224	Electronic reporting of adverse drug reactions	First edition	2009-10-15
ISO/TS 25237	Pseudonymization	First edition	2008-12-01
ISO/TS 25238	Classification of safety risks from health software	First edition	2007-06-15
ISO 25720	Genomic Sequence Variation Markup Language (GSVML)	First edition	2009-08-15
ISO/TS 27790	Document registry framework	First edition	2009-12-01
ISO/TR 27809	Measures for ensuring patient safety of health software	First edition	2007-07-15
ISO/HL7 27953-1	Individual case safety reports (ICSRs) in pharmacovigilance – Part 1: Framework for adverse event reporting	First edition	2011-12-01
ISO/HL7 27953-2	Individual case safety reports (ICSRs) in pharmacovigilance – Part 2: Human pharmaceutical reporting requirements for ICSR	First edition	2011-12-01

5.5. Continua Health Alliance

Continua Health Alliance is a non-profit multi-stakeholder group working on standards to develop end-to-end, plug-and-play connectivity for personal connected health. Continua is dedicated to the development of Design Guidelines and test tools to expedite the deployment of interoperable personal connected health devices and systems aiming to improve health management, clinical outcomes and quality of life.

http://www.continuaalliance.org/

Table 11A: Related international standardization activities at Continua Health Alliance

Document number	Deliverable title	Ver.	Date
-	Design Guidelines 2 Terminology	2013	2012-01-23
-	Design Guidelines 3 System Overview	2013	2012-01-23
-	Design Guidelines 4 Common TAN/PAN/LAN Interface Design Guidelines	2013	2012-01-23
-	Design Guidelines 5 TAN Interface Design Guidelines	2013	2012-01-23
-	Design Guidelines 6 PAN Interface Design Guidelines	2013	2012-01-23

Document number	Deliverable title	Ver.	Date
-	Design Guidelines 7 Sensor-LAN Interface Design Guidelines	2013	2012-01-23
-	Design Guidelines 8 WAN Interface Design Guidelines	2013	2012-01-23
-	Design Guidelines 9 HRN Interface Design Guidelines	2013	2012-01-23

5.6. GS1 Healthcare

GS1 is a global non-profit standards association comprised of member institutions from several countries. The focus of GS1's standardization effort is primarily supply and demand chains. GS1 Healthcare develops global standards to "help healthcare companies improve the accuracy, speed, and efficiency of the supply chain and care delivery". GS1 has been involved in supply chain data standardization in a number of industries but more recently expanded into the healthcare area.

http://www.gs1.org/healthcare

Table 12A: Related international standardization activities at GS1 Healthcare

Document number	Deliverable title	Ver.	Date
-	Healthcare GTIN Allocation Rules	7.0.0	2011-04-28
-	GS1 GLN in Healthcare Implementation Guide	1.2	2012-06-01
-	Global Traceability Standard for Healthcare	1.0.0	2009-02
-	AIDC Healthcare Implementation Guide	1.1	2010-12
-	EPC global Pedigree Messaging Standard	1.0	2007-01-05
-	GS1 General Specifications	13.1, Issue 2	2013-06
-	GDSN Trade Item Extension: Healthcare	2.8	2012-02-10

5.7. DICOM Standards Committee

The Digital Imaging and Communications in Medicine (DICOM) standards are standards for exchanging medical images. More specifically, they are about a file format and standards of transmission and other aspects for exchanging medical images and associated information between medical imaging equipment made by different manufacturers. The DICOM standards are widely adopted in equipment and information systems used in hospitals, imaging centers, and in providers' offices to produce, display, store, or exchange medical images.

http://medical.nema.org/.

Table 13A: Related international standardization activities at DICOM Standards Committee

Document number	Deliverable title	Ver.	Date
Part 1	Introduction and Overview	PS 3.1	2011-08-10

Document number	Deliverable title	Ver.	Date
Part 2	Conformance	PS 3.1	2011-08-10
Part 3	Information Object Definitions	PS 3.1	2011-08-10
Part 4	Service Class Specifications	PS 3.1	2011-08-10
Part 5	Data Structures and Encoding	PS 3.1	2011-08-10
Part 6	Data Dictionary	PS 3.1	2011-08-10
Part 7	Message Exchange	PS 3.1	2011-08-10
Part 8	Network Communication Support for Message Exchange	PS 3.1	2011-08-10
Part 10	Media Storage and File Format for Media Interchange	PS 3.1	2011-08-10
Part 11	Media Storage Application Profiles	PS 3.1	2011-08-10
Part 12	Media Formats and Physical Media for Media Interchange	PS 3.1	2011-08-10
Part 14	Grayscale Standard Display Function	PS 3.1	2011-08-10
Part 15	Security and System Management Profiles	PS 3.1	2011-08-10
Part 16	Content Mapping Resource	PS 3.1	2011-08-10
Part 17	Explanatory Information	PS 3.1	2011-08-10
Part 18	Web Access to DICOM Persistent Objects (WADO)	PS 3.1	2011-08-10
Part 19	Application Hosting	PS 3.1	2011-08-10
Part 20	Transformation of DICOM to and from HL7 Standards	PS 3.1	2011-08-10

5.8. HL7 Inc.

Health Level Seven (HL7) is a standards development organization which issues international application layer healthcare standards for the electronic exchange and management of health information such as clinical data and administrative information. HL7 refers to the standards organization itself but is also commonly used to refer to specific standards the institution develops. HL7 dates back to the mid-1980s, when it was formed to develop a standard for hospital information systems. Like other standards organizations, HL7 is organized into Work Groups chaired by two or more co-chairs and responsible for defining some area of HL7 standards.

HL7 has many Work Groups, including groups addressing electronic health records, infrastructure and messaging, and imaging integration. The HL7 Clinical Document Architecture (CDA) serves as an XML-based markup standard defining the structure, encoding parameters, and semantics of electronic clinical documents.

http://www.hl7.org/.

Table 14A: Related international standardization activities at HL7

Document number	Deliverable title	Ver.	Date
-	CDA (Clinical Document Architecture)	R2	2005-05

5.9. epSOS

epSOS is European Patients Smart Open Services. This relatively young pilot initiative, funded partially by the European Commission Competitiveness and Innovation Programme, involves 23 European countries and seeks to create an interoperable patient summary system across Europe that is accessible to both Health Professionals as well as patients. The objective is a cross-border eHealth system whereby patient summary records, prescriptions could be accessed electronically regardless of where the patient was being treated in Europe. Europeans traveling as tourists, working in another country, or visiting another country as an exchange student etc. would benefit from this interoperability and electronic health data access.

http://www.epsos.eu/.

Table 15A: Related international standardization activities at epSOS

Document number	Deliverable title	Ver.	Date
D1.4.1	EED SERVICES including use cases for all services	1.0	2012-02-22
D1.4.2	Country status outline and template specification	1.0	2012-02-02
D1.4.3	EED SERVICES including specifications for all services	1.0	2012-09-11
D2.1.1	Legal and Regulatory Requirements at EU level	1.0	2012-02-24
D2.1.2	Standard Contract Terms for MS Document for Engagement of Pilot Sites	1.0	2010-01-31
D3.1.2	Final definition of functional service requirements – ePrescription	1.2	2010-03-26
D3.2.2	Final definition of functional service requirements - Patient Summary	0.6	2012-10-29
D3.3.3	epSOS Interoperability Framework	2.3	2010-01-15
D3.4.2	epSOS Common Components Specification	1.00	2010-07-16
D3.5.2	Semantic Services Definition	0.0.3	2010-02-16
D3.6.2	Final Identity Management Specification Definition	1.2	2010-06-25
D3.7.2	Final Security Services Specification Definition (Master Document)	0.4	2010-06-16
D3.8.2	Final National Pilot Set-Up and Deployment Guide	1.1	2010-09-17
D3.9.1	epSOS Pilot System Compontents Specification	1.0	2010-10-01
D3.9.2	Testing Methodology, Test Plan and Tools	1.0	2010-10-15
D3.B.1	epSOS2 Implementation Strategy	0.14	2011-05-20
D3.C.1	Proof of Concept Testing Strategy	1.5	2012-12-21

5.10. IHE

IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical need in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement, and enable care providers to use information more effectively.

Optimal patient care requires that care providers and patients be able to create, manage and access comprehensive Electronic Health Records (EHRs) efficiently and securely. Integrating the Healthcare Enterprise (IHE) accelerates the adoption of EHRs by improving the exchange of information among healthcare systems. Its goal is to improve the quality, efficiency and safety of clinical care by making relevant health information conveniently accessible to patients and authorized care providers.

http://www.ihe.net/.

Table 16A: Related international standardization activities at IHE

Document number	Deliverable title	Ver.	Date
-	IT Infrastructure Technical Framework	10.0	2013-09-27

5.11. mHealth Alliance

The mHealth Alliance champions the use of mobile technologies to improve health throughout the world. Working with diverse partners to integrate mHealth into multiple sectors, the Alliance serves as a convener for the mHealth community to overcome common challenges by sharing tools, knowledge, experience, and lessons learned.

To accomplish this, the mHealth Alliance advocates for more and better quality research and evaluation to advance the evidence base; seeks to build capacity among health and industry decision-makers, managers, and practitioners; promotes sustainable business models; and supports systems integration by advocating for standardization and interoperability of mHealth platforms. The mHealth Alliance also hosts Health Unbound (HUB), an online knowledge resource center and interactive network for the mHealth community.

http://www.mhealthalliance.org/.

Table 17A: Related international standardization activities at mHealth Alliance

Document number	Deliverable title	Ver.	Date
-	Using Mobile Technology for Healthier Aging	-	2012-12
-	Leveraging Mobile Technologies to Promote Maternal & Newborn Health	-	2012-12
-	State of Evidence: mHealth & MNCH (One Page Review)	-	2012-12
-	mHealth Education	-	2012-06
-	The Role of mHealth in the Fight Against Tuberculosis	-	2012-05
-	Advancing the dialogue on Mobile Finance and Mobile Health	-	2012-03
-	mHealth: New Horizons for Health through Mobile Technologies	-	2011-06
-	Health Information as Health Care	-	2011-02

Document number	Deliverable title	Ver.	Date
-	Amplifying the Impact: Examining the Intersection of Mobile Health and Mobile Finance	-	2011-01
-	Economics of eHealth	-	2010
-	Barriers and Gaps Affecting mHealth in Low and Middle Income Countries	-	2010-05
-	Sizing the Business Potential of mHealth in the Global South: A Practical Approach	-	2009
-	New Technologies in Emergencies and Conflicts	-	2009-12
-	mHealth for Development	-	2008-10
-	Wireless Technology for Social Change: Trends in Mobile Use by NGOs	-	2008-03
-	The State of Standards and Interoperabilty for mHealth	-	2013-03
-	Baseline Evaluation of the mHealth Ecosystem and the Performance of the mHealth Alliance	-	2013-02

5.12. GSMA

The GSMA mHealth programme is a market development project designed to support the proliferation of mHealth solutions that increase patient access to quality care whilst reducing costs. The programme includes the following work streams:

- Technology standards and interoperability;
- Policy and regulation;
- mDiabetes Campaign, which focuses on supporting member mobile operators, clinicians and governments to develop and implement mHealth best practices for diabetes, as a model for other non-communicable diseases;
- GSMA Pan-African mHealth Initiative, which focuses on launching services with member mobile operators and partners to support Millennium Development Goals 4, 5 and 6
- Market research, stakeholder outreach and events;
- Technical assistance to mobile operators and partners to launch mHealth services in priority markets.

http://www.gsma.com/connectedliving/mhealth.

Table 18A: Related international standardization activities at GSMA

Document number	Deliverable title	Ver.	Date
-	A High Level Reference Architecture for Mobile Health report	-	2012-03-29
-	The SIM: The Key to Better Healthcare?	-	2012-03-28
-	GSMA Connected Mobile Health Devices: A Reference Architecture	1.0	2012-01

Document number	Deliverable title	Ver.	Date
-	GSMA Understanding Medical Device Regulation: mHealth Policy and Position	-	2012-03-28
-	Evidence for mHealth	-	2012
-	GSMA mHealth Infographic: MDG 6- How mHealth is Supporting the Combat of HIV/AIDS, Malaria and Other Diseases	-	2012
-	Using mHealth to Support Universal Health Access	-	2012
-	Health Hotline Services in Emerging Markets	-	2012-05-30
-	Integrating Healthcare: The Role and Value of Mobile Operators in eHealth	-	2012
-	South Africa Mobile Health Market Opportunity Analysis Full Report	-	2011
-	Key Design Considerations for Service Development	-	2011-09
-	Framework for Technology Assessment for Mobile Health	-	2011-09
-	Mobile Health Services Marketing	-	2011
-	Mobile Health in the Pharmaceutical Industry	-	2011
-	Mobile Health in the Health Insurance Industry	-	2011
-	Policy and Regulation for Innovation in Mobile Health	-	2012-03-29

5.13. ETSI TC M2M

ETSI TC M2M is developing standards for Machine to Machine Communications. The group aims to provide an end-to-end view of Machine to Machine standardization, and will co-operate closely with ETSI's activities on Next Generation Networks, Radio communications, Fiber optics and Powerline as well as close collaboration with 3GPP standards group on mobile communication technologies.

http://www.etsi.org/technologies-clusters/technologies/m2m.

Table 19A: Related international standardization activities at ETSI TC M2M

SDO / No	Deliverable title	Ver.	Date
ETSI TS 102 689:	Machine to Machine Communications (M2M); M2M service requirements	1.2.1	2013-06-21
ETSI TS 102 689:	Machine to Machine Communications (M2M); M2M service requirements	2.1.1	2013-07-01
ETSI TS 102 690 :	Machine to Machine Communications (M2M); M2M functional Architecture	1.2.1	2013-06-24
ETSI TR 102 691	Machine to Machine Communications (M2M); Smart Metering Use Cases	1.1.1	2010-05-18
ETSI TR 102 732	Machine to Machine Communications (M2M); eHealth Use Cases	1.1.1	2013-09-03

SDO / No	Deliverable title	Ver.	Date
ETSI TS 102 921	Machine to Machine Communications (M2M); mIa, dIa and mId interfaces	1.2.1	2013-06-20
ETSI TS 102 921	Machine to Machine Communications (M2M); mIa, dIa and mId interfaces	2.0.11	2013-11-12

Annex 6: ITU-WHO National eHealth Strategy Toolkit

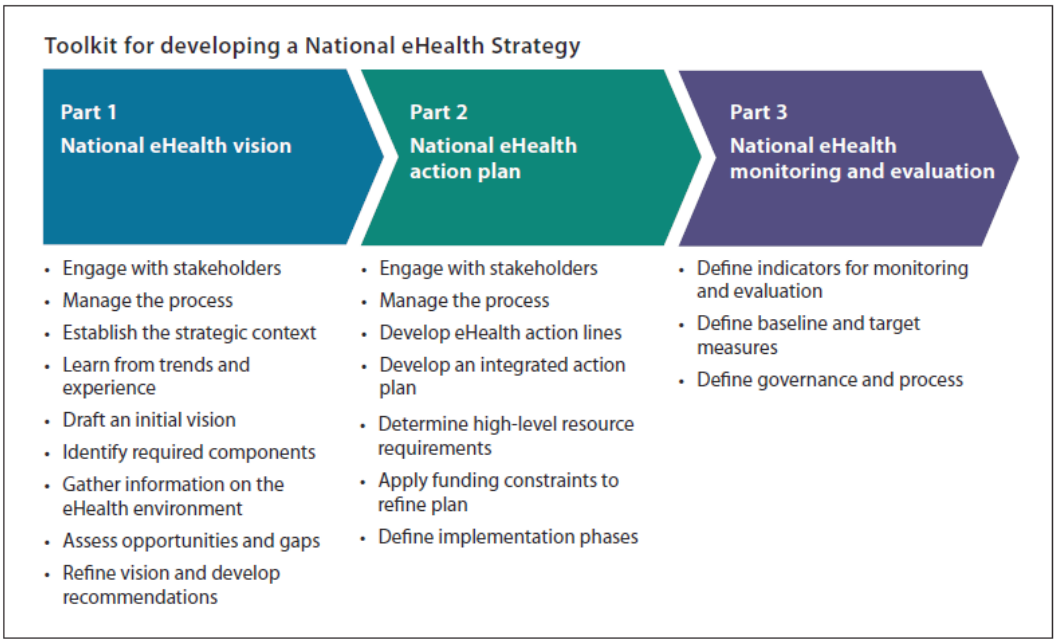
1) The need for national planning

[78]Experience has shown that harnessing ICT for health requires strategic and integrated action at the national level, to make the best use of existing capacity while providing a solid foundation for investment and innovation. Establishing the main directions as well as planning the detailed steps needed are key to achieving longer-term goals such as health sector efficiency, reform or more fundamental transformation. Collaboration between the health and ICT sectors, both public and private, is central to this effort. As the major United Nations agencies for health and telecommunications respectively, the World Health Organization (WHO) and the International Telecommunication Union (ITU) have recognized the importance of collaboration for eHealth in their global resolutions, which encourage countries to develop national eHealth strategies: this Toolkit supports those recommendations.

Ministries of health play a pivotal role, not only in meeting people's needs for care and protecting public health, but in preserving health systems through uncertain times. Ministries of information technology and telecommunications are key to development in all spheres, and can make a vital contribution to the health sector. Common goals and a predictable ICT environment enable coordinated action: building consensus on policy, facilitating better use of shared resources and involvement of the private sector, and investment in skills and infrastructure to improve health outcomes.

2) Purpose and audience

Figure 22A: Toolkit for developing a National eHealth Strategy



The National eHealth Strategy Toolkit is a resource for developing or revitalizing a country's eHealth strategy, from countries just setting out to those that have already invested significantly in eHealth. This includes countries that are seeking to build on promising results from pilot initiatives, establish foundations for scaling up eHealth projects, or update strategies to reflect changing circumstances. The Toolkit can be used by government health sector leaders in ministries, departments and agencies

[78] Hani Eskanar, BDT Focal Point for Question 2/2, ITU/BDT/IEE/CYB.

who will manage the development of an eHealth strategy. Its application requires a team experienced in strategic planning, analysis, communication and stakeholder engagement.

3) Overview of the Toolkit

The Toolkit is designed in three parts, with each part building on the work of the previous one:

Part 1: Develops a national eHealth vision that responds to health and development goals. Explains why a national approach is needed, what the plan will achieve, and how it will be done.

Part 2: Develops an implementation roadmap that reflects country priorities and the eHealth context. Structures activities over the medium-term, while building a foundation for the long term.

Part 3: Establishes a plan to monitor implementation and manage associated risks. Shows the progress and the results of implementation and aids in securing long-term support and investment.

Each section describes the activities required, along with practical advice informed by real-world experience.

Countries can undertake the entire set of activities, or those specific to their context and constraints. How the Toolkit is used, and the end result, will depend on a country's context, priorities and vision.

Toolkit available at: http://www.itu.int/ITU-D/cyb/app/e-health.html and http://www.who.int/ehealth.

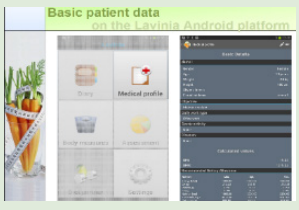
Annex 7: Compendium of ready to implement eHealth services

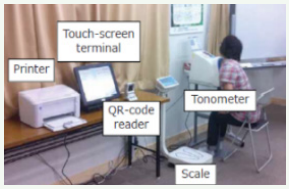
[79]Due to the limited space, **Table 20A** presents brief information about working models of eHealth services already developed and implemented (or in process of implementation). The results are illustrated where possible.

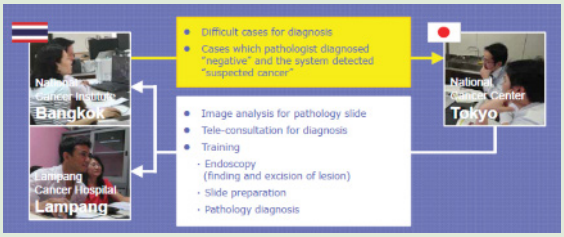
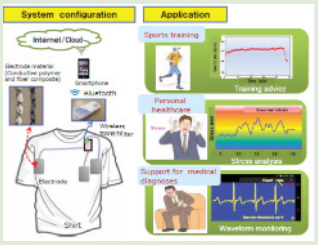
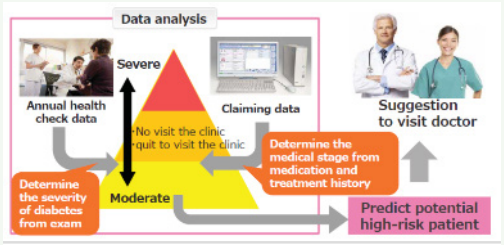
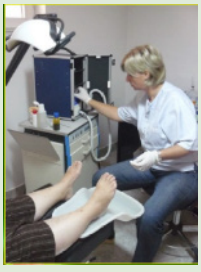
Table 20A: eHealth services ready to be implemented

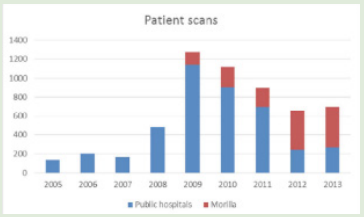
Country	Service	Results
Albania	eHealth in Albania	The integrated Telemedicine and eHealth Program (ITeHP) is a program that is under implementation by the International Virtual eHealth Foundation. It is planned to create 17 centers of telemedicine. Vodafone Albania, the mobile telecommunication operator, in collaboration with the Ministry of Health is planning to use mobile technology for telemedicine services in remote areas of the country. The foundation of the national telemedicine network is developed.
Algeria	SATeS to Support Telemedicine Development in Algeria	A governmental project sets up a national eHealth system with the support of the Algerian Society of Telemedicine and eHealth (Societe Algerienne de Telemedecine et e-Sante SATeS). The initial focus is on providing distance- training as well as a remote medical expertise to facilitate the work of the general practitioners.
Angola	Telehealth Project Brazil-Angola	Brazil and Angola Cooperation Program PROANGOLA. Initially a videoconference system was installed at the Clínica do Exército in Luanda followed by a practical demonstration of telecardiology system during a Screening for Hypertension and Diabetes involving 1,396 citizens in Huambo. Finally a Telehealth System is been designed by UFMG University Hospital to be implemented and operated, initially in seven municipalities, by the Angolan Army Health System.
Australia	the Implementation of Teledentistry for Rural and Remote Paediatric Patients in Victoria, Australia	Assessment and evaluation of Teledentistry (TD) effectiveness. The results indicated that one of the benefits of TD is that it can increase the capacity of the Dental facilities without adding additional dental chairs. The data also showed that >5 hours per week of additional clinic time would be available to see patients, when TD is implemented, that is important especially when demands for services are increasing and government resources are scarce.

[79] Contribution M. Jordanova [1], L. Androuchko[2], I. Nakajima[3], [1]Space Research Institute, Bulgarian Academy of Sciences, Bulgaria, Vice-Rapporteur Question 2/2, [2]International University in Geneva, Dominic Foundation, Switzerland, Vice-Rapporteur, Question 2/2; [3]Tokai University, School of Medicine, Japan, Rapporteur Q2/2.

Country	Service	Results
Brazil	Implementing a Telecardiology Strategy in a Geriatric Institution   Tele ECG room	The objective is to implement telecardiology, through tele-ECG and specialized second opinion, for the monitoring and identification of potential cardiovascular diseases in institutionalized elderly people. Results: Implementing a tele-ECG method was quite an easy process, demanding only two training sessions to the staff in the geriatric facility. The latter take advantage of a 24/7 service, allowing to diagnose cardiac events and to have immediate specialized counselling. Moreover, the availability of onsite ECG facilities brings comfort and fast access to a clinical decision as patients do not need to go out for recording ECGs.
Brazil	Using Online Social Networks as a Support Tool to Reduce Psychoactive Drug Abuse	The objective was to create a page called “Getting Free from Drugs” (FLD) [Ficar Livre das Drogas] on an online social network where users of psychoactive drugs can sign up for treatment. A group was created on Facebook. The results from several months activity (July-September 2015) revealed that online social networks may serve as a support tool in tele-education for combating psychoactive drug abuse and can attract patients, since 64% of FLD Facebook page visitors began treatment for drug dependency. The service is helping to reduce the harm and ensure the well-being of the individual.
Cape Verde	Teleconsultation in VPH: Fighting Zoonoses	This activity is part of the project "Fighting stray dogs on Sao Vicente – A pilot project for the Cape Verdean Islands" co-financed by the European Union as a way to contribute to public health. The project provides for the castration, microchipping, deworming and aftercare of 10.000 dogs with the aim to control the canine population of the island, to make them more adoptable by the local families. The result is a decrease of zoonoses (erlichiosis, piodermitis, mycosis, etc.) that affects humans too, and thus improving public health.
Croatia	Tele-Cardiology Program	Telecardiology enables the remote exchange of data between Saipem doctors (45 sites) and specialist cardiologists (TelBios center, Milan) to facilitate management of cardiovascular conditions. The project brought a net optimization of 345000 Euro in 2013 and a million Euros in 3 years.
Hungary	Android Based Dietary Logging Application	Designed to support the life style change of cardio-metabolic patients. 

Country	Service	Results	
Ghana	PSGH PREVENT Initiative Using M-Health Technologies to Combat Counterfeit Medicines	Once a sub-standard, spurious, falsely-labelled, etc. medicine slips through the supply chain and protective regulatory systems and enters the pharmacy; the harm has already been done. 8 of Ghana's largest pharma companies were the 'launch partners' of PREVENT. Each product participating at the PREVENT bears a unique code that a customer can check with a toll-free SMS hotline.	 Scanners RFID Tags
Guinea	Application of ICTs, eHealth and cyber health to combat epidemic diseases (such as Ebola)	Public information system is introduced as one of the measures measures for the management of the Ebola epidemic. The goal is to supply inofrmation to citizens, receive a feedback, controll the chain of infection and eventually eliminate the disease swiftly. The measure take account of i) post-Ebola management and ii) prevention of any other epidemic or pandemic disease through training of staff and modernization of health infrastructures. Although the program is at its childhood, it has a huge potential. Q2/2 will follow it development and will offer support, if and when needed.	
Haiti	Implementation of telemedicine in Haiti	Preliminary steps in establishing a telemedicine network connecting the university hospital and regional hospitals. Objective – to facilitate access to telecommunication infrastructures and services in rural and remote areas. Applications of a business models to be set up in order to facilitate access to telecommunication infrastructures and services in rural and remote areas.	
India	24/7 Telehealth in the Himalayas 	This innovative Public Private Partnership is providing 24/7, quality, affordable, remote healthcare, to 34,000 citizens of Lahaul and Spiti (14,000 feet) in Himachal Pradesh. Urban teleconsultants were sensitized, for community interaction, while deploying cutting edge technology. An online appointment booking system facilitated patient friendly interaction. The patient CEPHIS was updated in real time. Personal interaction by telemedicine coordinators on both sides ensured that traditional human touch continued. In addition scheduled tele camps (virtual OP's) were organised in 15 different specialities and super specialities. In the first 35 weeks, 1964 teleconsults were provided including 153 emergencies. Tele laboratory services, TeleHealth Education tele cervical cancer screening programmes have been added.	
Japan		Public health promotion program for remote health monitoring of elderly. Easy to use, installed in 10 temporary houses, improved blood pressure.	

Country	Service	Results
Japan	Tele-pathology diagnostic support for Thailand	
Japan	Hitachi lifestyle changing program – Provides weigh loss method with weight and activities recording tools	
Japan	Tele-health counselling – based on measuring blood pressure, weight, pedom-eter – physical activity; electronic health records, wearable sensors	
Japan	Prevention of diabetes deterioration by data anal-yses obtained from health data checks	
Kosovo	Remote diabetic foot care	Started in 2009 in cooperation with The Netherlands 
Mali	Impact of Use of ICT Tools at the Gabriel Touré Hospital of Bamako	The OpenClinic software was implemented to improve quality of service and income. In 10 months has improved significantly the revenues of the hospital with a total of 446 054 837 XOF . This equates to a monthly average of 44,605,483 against 35,090,725 XOF before (1 euro = 655.9 XOF).

Country	Service	Results	
Mali	Telemedicine programme (IKON)	Allowing rural doctors to share images (X-rays and mammograms) and patient information in a secure online environment with radiologists in Bamako for peer consultation.	
Mexico	Midwifery Education with Digital Competences for Mexican and Latin American Indigenous	In 2013 an online training in midwifery started. The course has 7 modules and a total of 100 hour training.	
Mongolia	Inpatients' Medical Records Installed on Mobile Interfaces 	This is a Natural Evolution of the Mongolian Tele-Assistance Medical Network. The purpose of this new step was to adapt the telemedicine system to the hospital environment and to develop appropriate mobile interfaces to provide quality real time information to every level of caretaker, from nurses to hospital management staff, when the patient is hospitalized. Interviews and a workshop were held beforehand to collect the users' requirements and each step of development was proof-tested with them.	
Morocco	Challenges and Opportunities for Telemedicine in Morocco	1. Mobile health ultrasound patrol pilot project for diagnosis of pregnancies with risks in the region of Fes, Funded by Qualcomm Wireless Reach™. 2. Mobile health Tuberculosis in the city of Sala	
New Zealand	TeleDOT: Directly Observed Therapy for Tuberculosis Using Telehealth	TeleDOT demonstrates the potential for technology to improve treatment delivery to Tuberculosis patients and achieves sustainable cost efficiencies	
Nigeria	ICT for Maternal and Child Healthcare	Seven eHealth projects are focusing on maternal and child healthcare in four states in Nigeria.  Example of mobile community based surveillance mCBS.	
Pakistan	Telemedicine application for Treatment of Eczema at Remote Beneficiary in Punjab	Since 2009 Mayo Hospital Lahore, organized a remote examination, diagnosis and treatment of various dermatitis. More than 2000 patients were treated and the treatment was provided free of cost and regular follow-ups were maintained.	
Peru	e-Mobile for Women in Rural Areas	e-PREVENTION's project aims at reducing maternal mortality and maternal health complications through increased access to appropriate healthcare information via mobile voice and text messages in local dialects by pregnant women in rural communities	

Country	Service	Results
Philippines	Implementing an Open Source Health Information System for a City Hospital in a Developing Country	Successful implementation of the whole I.T. infrastructure using Free and Open Source Software (FOSS) for a newly built 50 bed hospital to serve the healthcare needs of the local population of 250 thousand inhabitants –saving money and providing high quality service
Poland	Hearing Screening in Children in East Africa	Hearing screening in children in two African countries and remote diagnosis of hearing problems. Hearing screening was performed in the group of 395 children in Rwanda (195 children, average age 9, 8 yr.) and Tanzania (200 children, average age 7, 9 yr.). All children had videotosopic examination and pure tone audiometry performed on Sensory Examination Platform® with the Sennheiser HDA 200 audiometric headphones.
Switzerland	Mobile application + WoundDesk 	The evolution of the wound surface over the time is good predictive factor for wound healing. The mobile application +WoundDesk allows reliable, repeatable and reproducible measures. The accuracy is especially good for small irregular wounds.
Taiwan (Province of China)	A Mobile Ultrasound E-Learning System	An ultrasound diagnosis e-learning system for medical students and interns to enhance the skills of ultrasound diagnosis was developed. Images and operational procedures of ultrasound, are shown on mobile phones of medical students with less delay. This real time e-learning system provides interns with comprehensive learning scenes, including continuous operational procedures of ultrasound, and corresponding changes of images.
Thailand	Mobile Video Transmission System	IP Network Camera and MiFi are used. Bandwidth requirement ranges from 64-512 kbps; optimum setting (320x240 pixels, 4 fps) ≈ 140 kbps. Applicable in ambulances, dealing with disasters, etc.
Venezuela	SOS Telemedicina Venezuela	Reaching Remote and Disadvantaged Communities at Scale with ICT- equipping and connecting remote centres for primary care with medical specialists from the university to improve their capacity to deal with clinical problems, to provide distance education, to support technology transfer to these regions, to develop skills and to evaluate the benefits of Telemedicine.

More information about most of the listed eHealth services is available at https://www.medetel.eu/?rub=knowledge_resources&page=info. The virtual library is searchable by year, country and topic. Question 2/2 Vice-Rapporteurs M. Jordanova and L. Androuchko are actively contributing to its organization and regular update.

In addition to the above database, the readers are highly recommended to use the ITU-D Study Group Case Study Library http://www.itu.int/en/ITU-D/Study-Groups/Pages/case-study-library.aspx. This new initiative, allows members to submit, store and consult case studies on topics under study by the Questions in the ITU-D Study Groups. Sharing and learning from each other's experiences is at the core of the mandate of the ITU-D Study Groups and through this new tool the remarkable wealth of information that are case studies will be available to all members. Improved features to search and filter have been put in place to make them more easily accessible.

Figure 23A: ITU-D Study Group Case Study Library

Implementation of eHealth services: Start ups

Table 21A outlines innitiatives that are either at the stage of planning or are star-up or are focusing on important issues not firmly related to Question 2/2 task. Yet, Question 2/2 will follow their development and will support the local staff with all its efforts and expertise. Question 2/2 will also inform its members and all interested parties in the development of these innitiatives.

Table 21A: Initiatives that are either at the stage of planning or are star-ups

Service / Title	Summary
Creation of Health Information System (HIS), India	Status – planning. Focused on the necessity to connect/link primary, community and tertiary healthcare centres as well as hospitals into a HIS. Applications of HIS are discussed: a) Health surveillance system (ability to control the spread of diseases and thus to protect inhabitants); b) Health information dissemination through SMS; c) Innovative health monitoring devices to be used by ASHA's; d. Technological interventions in Transport Referral System – pregnant women & children.
Long duration of mobile phone usage and exposure to electromagnetic fields (India)	As on date, there is no conclusive scientific evidence to establish any adverse health effect from exposure to EMF radiation from mobile towers if the radiation is within the prescribed limits. Also, no direct relationship is established as yet between mobile phone use and increased health risks. Further investigations on high users and its possible health implications needs further detailed study/ investigation by WHO and ITU. Mobile Handset Minutes of usage data from all service providers captured over 1 month duration from Billing data CDRs covering one month period of say from 1st October 2015 to 31st October 2015 through an administrative circular by ITU-D SG2.
M2M enablement in remote health management (India)	Machine to Machine Communication: Policy and Regulatory Initiatives taken by India on Machine to Machine Communication and Technical Report titled "M2M enablement in remote health management" from India is included in the paper.
Liaison Statement from ITU-D Study Group 1 Question 22-1/1 to ITU-T JCA-COP on activities related to child online protection	Rising the awareness on cyber security of children, parents. A survey, results from any further development will be distributed to Q2/2 members.

Annex 8: Importance of IMT2020 for developing countries

1) Introduction

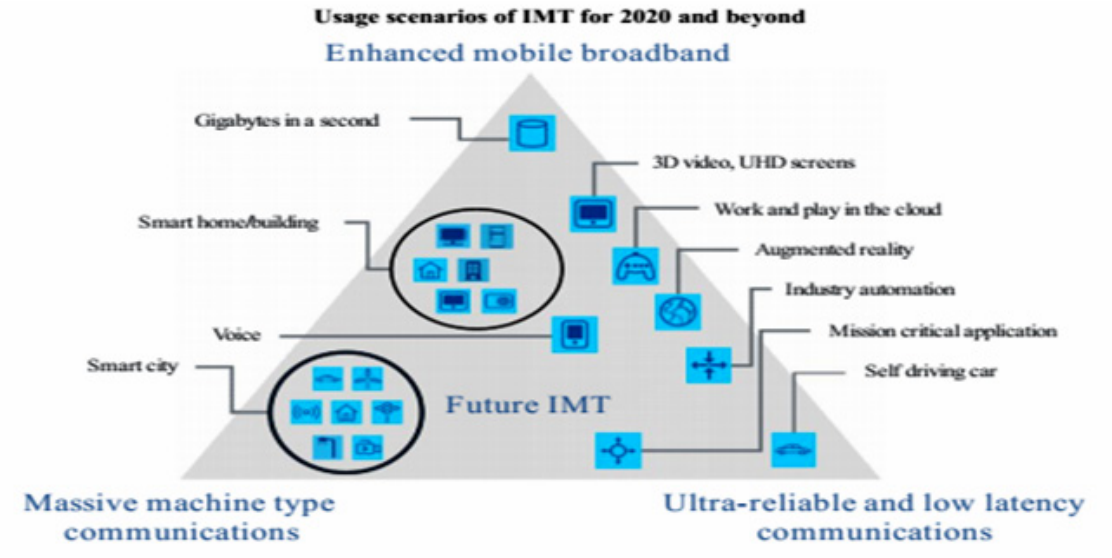
[80]Billions of increasingly smart and connected devices, data-rich personalized services, and cloud applications are driving the need for smarter and more powerful networks. The transition to IMT2020 brings communications and computing together and is a fundamental shift for the industry. The industry is looking to IMT2020 to provide the higher data rates (1-20 Gbps), lower latency and capacity needed to enable the Internet of Things (IoT), new service models and immersive user experiences. This will require immense processing and communications power provided by sophisticated silicon solutions.

What is IMT2020 and how it is different than previous generations of wireless standards? There are myriad answers to these questions, but from a technical perspective, there is one very significant difference. 4G, 3G and 2G were wireless innovations focused largely on improving the speed and efficiency of a connection between point A (a cellular network antenna) and point B (your cellphone or other device). IMT2020 is also about faster and more efficient wireless connectivity, but this time, it is also about computing capability. IMT2020 networks must be smarter, faster and more efficient to support the forthcoming billions of connected devices, data-rich personalized services, and cloud applications that will enable amazing new experiences – from telemedicine to self-driving cars – in our daily lives.

First and second generation wireless networks were focused on voice services, while the focus of 3G and 4G shifted toward data and mobile broadband. While the focus on mobile broadband will continue with IMT2020, support for a much wider set of diverse usage scenarios expected.

The three major usage scenarios include: (1) enhanced mobile broadband; (2) ultra-reliable and low-latency communications; and (3) massive machine-type communications, as shown in **Figure 24A**.

Figure 24A: Usage scenarios of IMT for 2020 and beyond



Source: ITU-R M.2083

2) Computing and communications will converge with IMT2020

IMT2020 will not be about simply increasing speed and capacity, but will also be about intelligence throughout the network to enable devices and the network to communicate more efficiently, transport

[80] Contribution Mr Turhan Muluk, Intel Corporation, United States of America.

data and content more quickly, and share computing resources. Intel plays a very important role to provide this intelligence.

IMT2020 will transform the way we interact with our world—bringing seamless connectivity and computing power to every person and thing across our society and environment.

Intelligent, flexible networks capable of connecting and integrating billions of intelligent devices will bring the IMT2020 future to life. We will witness a fundamental shift from personal communications platforms and their networks to computing platforms that give rise to a rich data economy.

Using fast wireless connections to cloud-based computing and data services, and to other connected devices, IMT2020 will enable a variety of new capabilities such as self-driving automobiles with intelligent traffic routing, smart cities, connected health innovations and more. Meeting this challenge and the capacity and efficiency demands of IMT2020 will require new approaches to network and device design.

3) Industry's role for making IMT2020 a Reality

IMT2020 is more than an evolutionary step forward for the industry. It encompasses many technologies and a much wider ecosystem than has ever been seen in the wireless and telecommunications industries. It's an inflection point, a place in time where we will see and experience everything being smart and connected. But in order for billions of people and machines to be connected, we need smarter, faster and more efficient networks. The ability to connect to each other, to our machines and to the cloud, and to derive actionable insights from the massive amount of data, will bring new experiences to our daily lives and transform businesses. This is why following three key areas are important: industry partnerships, end-to-end IMT2020-related hardware and software development, and supporting 5G standards-setting. We need to create end-to-end solutions from the device to the network to the cloud. We also need prototype solutions through efforts like Intel's IMT2020 mobile trial platform (http://blogs.intel.com/technology/2016/02/paving-the-road-to-5g-mobile-services) and work with standards-setting bodies such as 3GPP and IEEE on defining the IMT2020 standards to ensure a smooth path and entry to a faster and smarter pace of connectivity.

Advanced technology is necessary to power the seamless end-to-end interconnectivity of IMT2020 required to enable a smart and connected world. This includes, unique combination of computing, networking and wireless communications expertise to develop IMT2020 solutions that integrate intelligence across the entire network, from device to data center.

Industry is developing wireless radio access and device processing technologies for PCs, smartphones, tablets, wearables and many future connected devices and sensors. As part of this effort, it is important to provide an open, general purpose platform for network operators and investing in transforming the network in four key areas, including advancing open source and standards, enabling open networking platforms, building out an open ecosystem and accelerating trials and deployments. Intel is working for this objective together with other industry players.

4) Importance of IMT2020 for Developing Countries

IMT2020 will provide new applications and services both for developed and developed countries. Some of the IMT2020 applications will be much more important for the developing countries; such as smart transportation systems, eHealth, education, smart grid, agriculture etc. details can be seen below.

– **Smart Transportation Systems**

According to WHO (http://www.who.int/mediacentre/factsheets/fs358/en), 90 per cent of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have

approximately half of the world's vehicles. IMT2020 will able to provide smart roads and smart vehicles to prevent the accidents. Cars will talk to each other to avoid accidents.

– **Smart Grid**

Access to electricity is a big problem especially in Africa. And IMT2020 will also help to this problem through smart grid.

– **eHealth**

According to Professor Mischa Dohler, Head of the Centre for Telecommunications Research in the Department of Informatics at King's College, London; "IMT2020 has the potential to remove geographic boundaries in the healthcare industry" (http://www.cto.int/media/events/pst-ev/2016/broadband_caribbean_2016/presentations/Chhotalal%20Vinodrai.pdf).

IMT2020 networks open up new avenues for the delivery of healthcare. Instead of bringing patients to a doctor for treatment, IMT2020 networks can connect patients and doctors from across the globe. Connecting more medical devices to IoT will enable doctors to monitor patients without the need for costly in-patient care. Digital imaging can be sent anywhere in the world for analysis, expanding access for patients who live far away from healthcare providers and lowering the cost of getting a second opinion.

There different health applications of IMT2020 (health monitoring, remote surgery, cloud applications etc.). As an example, Remote surgery will reduce the latency to enable remotely assisted surgery. Specialists are not available in many hospitals and could join a local surgeon remotely to perform procedures that require expert skills (https://5g-ppp.eu/wp-content/uploads/2016/02/5G-PPP-White-Paper-on-eHealth-Vertical-Sector.pdf). IMT2020's latency will be around one millisecond-unperceivable to a human and about 50 times faster than 4G. This will be critical, for example, if doctors are to command equipment to carry out surgery on patients located in different cities.

– **Education**

IMT2020 will enter the classroom and bring new ways of learning to students. Augmented Reality, Virtual Reality and Virtual Presence will mean that students will be immersed in a more visual and interactive learning experience where students and teachers may not necessarily be in the same location (http://gsacom.com/paper/5g-verticals-education).

– **Water Management and Agriculture**

IMT2020 will also bring a solution for smart water management and smart agriculture systems in developing countries. Such as sensors with wireless connectivity for crop fields can help optimize growing and minimize use of water and fertilizers through more targeted application.

There are different IMT2020 applications and vertical industries which are also very important for developing countries and details can be seen at "ITU-R WP5D Contribution 163" (healthcare, automotive, public safety, sustainability/environmental, education, smart city, public transportation, wearables, smart homes, smart grid, industrial etc.).

Table 22A: Example use cases and applications of IMT2020

Vertical industry	Example use cases and applications	Partners
Healthcare	Connected Care, Precision Medicine, Imaging and Diagnostics, Genomics/Big Data, Remote Surgery.	Medical Device Manufacturers, Insurers (public or private), Researchers, Ministries of Health.
Automotive	Engine alert and automatic maintenance scheduling, autonomous driving, collision avoidance, V2V.	OEM's, Researchers, Ministries of Transportation.
Public Safety	Enhanced Incident/disaster alert and response, real time traffic management.	Venues (i.e. stadiums, etc.), municipalities and governments, infrastructure vendors, operators, OEMs, etc.
Sustainability/ Environmental	Adaptive air sensors, water management systems, energy.	Researchers, Government Parks services, Agriculture.
Education	wireless real-time interactions, virtual and augmented reality interactions without visual delay.	School Districts, OEM's, Ministries of Education, Regulators, Researchers.
Smart City	Remote monitoring of roads and city infrastructure, smart meters/parking.	Service Providers, Universities, Local Municipalities, Federal Policy Makers, Utilities, etc.
Public Transportation	Flexible/adaptive bus/fleet management, Allowing more efficient routes.	Transit Systems, Operators, Municipal Governments, Researchers, etc.
Wearables	Fully connected devices (no need for a smartphone tether), tagged devices to assist with inventory management.	OEM's.
Smart Homes	Remote security monitoring and controls (i.e. locks, hi res camera surveillance, etc.)	Infrastructure Vendors, Heating and Cooling Systems, Cable Companies, etc.
Smart Grid	Smart 'end to end' power distribution networks with predictive analytics.	See Smart City.
Industrial	Sensors with wireless connectivity for crop fields can help optimize growing and minimize use of water and fertilizers through more targeted application.	Farmers/Agriculture, Ministries of Agriculture, etc.

Annex 9: Women's health wearable for the developing world

1) Attacking a health danger bigger than tuberculosis, malaria and HIV combined

[81]One-third of the humans on earth — more than 2 billion people — need to light a fire in order to cook. That typically means burning wood, charcoal or animal dung indoors. And that means toxic carbon monoxide and particulates inevitably spew into kitchens and inside living spaces.

This little-known but massive global health scourge — officially called household air pollution — contributes to 4.3 million deaths every year, according to estimates by the World Health Organization (http://www.who.int/indoorair/en). That's a staggering number: toxic fumes from cooking fires trigger more deaths than tuberculosis, malaria and HIV combined.

2) Using technology to warn of carbon monoxide (visual and spoken alerts)

GISB (http://www.grameen-intel.com) (Grameen Intel Social Business) a joint collaboration between Intel and the Bangladesh-based nonprofit Grameen Trust develops technologies that address major social issues facing billions of people in the world's developing nations. The vision of GISP is to develop affordable technology solutions to connect and improve people's lives around the world. More information can be seen at http://www.grameen-intel.com.

In small villages across India and Bangladesh, Grameen Intel is piloting a unique health wearable — it's a brightly colored bangle — with a tiny built-in carbon monoxide (CO) sensor (**Figure25A**, **Figure 26A** and **Figure 27A**).

Figure 25A: A woman in India cooking over a fire inside her home

Figure 26A: The carbon monoxide detecting bracelet, field tested in India

[81] Contribution Mr Turhan Muluk, Intel Corporation, United States of America.

Figure 27A: Health wearable bangle developed by Intel

When the sensor detects carbon monoxide at a dangerous level, a red LED flashes. The bangle also produces a voice warning, customized to the wearer's language, to open windows, open doors or get outside.

Women and expectant mothers in the developing world are at an especially high risk from foul indoor air. Women typically spend more time than men indoors or in kitchens. Babies can suffer low birth weight or other serious health complications from the effects of breathing indoor fire cooking fumes.

The bangle is currently called COEL for Carbon Monoxide Exposure Limiter.

Water resistant and made of molded gold, green or red plastic, its internal battery lasts for 10 months. It can be programmed to "speak" about 80 pregnancy wellness messages (in addition to CO alerts), and stores 32 megabytes of data. The device is not connected to the internet in order to maintain a lengthy battery life.

After initial trials in India, the Grameen Intel team in Dhaka will distribute more than 5,000 of the bangles to women in rural Bangladesh.

"It's beautiful… nobody would suspect that you're wearing a piece of high-tech", said Professor Muhammad Yunus. The Bangladeshi Nobel Peace Prize winner pioneered microcredit and microfinance for poor people in the developing world and founded the Grameen Bank.

As part of a commencement address in June at the University of California at San Diego, Yunus told students that he has been "very worried about maternal death in Bangladesh," and that he has been looking to Grameen Intel to find ways for applying technology to tackle the problem.

It's almost certain that in the face of 4 million lives lost annually due to indoor fire fumes, the benefits of the ultra-low-cost COEL wearable will be felt by people all across the developing world.

Annex 10: Composition of the Rapporteur Group for Question 2/2

Table 23A: Composition of the Rapporteur Group for Question 2/2

Name	Organization	Country	Email	Position
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Annex 11: The main activities of Question 2/2 proposed for the next four years

The main activities of Question 2/2 proposed for the next four years (2018-2021) are summarized below.

The Question shall:

- Take further steps to assist in raising the awareness of decision makers, regulators, telecommunication operators, donors and customers about the role of ICTs in improving healthcare delivery in developing countries.
- Encourage collaboration and commitment between the telecommunication sector and the health sector in developing countries, in order to maximize the utilization of limited resources on both sides for implementing eHealth services.
- Continue to disseminate experiences and best practices with the use of ICTs in eHealth in developing countries.
- Collect the information about the condition and social reception include legal and financial issue to manage eHealth in developing countries.
- Encourage cooperation among developing and developed countries in the field of mobile eHealth solutions and services.
- Support BDT's eHealth activities in cooperation with other U.N. agencies, such as WHO, in the field of non-infectious disease, infectious disease include Pandemics, mother and child in particular.
- In conjunction with ITU-T, provide the suitable guidelines on managing medical big data applications and/or AI deep-learning linking with networks, in particular on how to use such new technology.
- Introduce and disseminate ITU technical standards related to eHealth for developing countries.

The expected outputs are:

- Guidelines on how to draft the telecommunication/ICT part of an eHealth master plan.
- Guidelines with regard to the use of mobile telecommunications for eHealth solutions in developing countries.
- Collection and summary of the requirements and effectiveness of telecommunication infrastructure for the successful implementation of eHealth applications, taking into account the environment of developing countries.
- Dissemination of the technical standard related to the introduction of eHealth services in developing countries.
- Collaboration with ITU-T in order to accelerate the elaboration of technical standards for eHealth applications.
- Collaboration with the relevant BDT programme, if so requested, to support implementation of the telecommunication/ICT component of eHealth projects in developing countries, including advice on best practices on how to train developing countries in the use of the telecommunication/ICT component of eHealth projects.
- Sharing and dissemination of best practices on eHealth applications in developing countries using the ITU/BDT website, in close collaboration with the relevant BDT programme.

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