

Assessment of the Context for eHealth Development in the Philippines: A Work in Progress from 1997 to 2020

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ABSTRACT

Introduction. eHealth is described by the World Health Organization (WHO) as the use of information and communication technologies (ICT) for health. The use of eHealth closes the gaps in terms of geographical barriers, time constraints, lack of healthcare professionals in healthcare and service delivery. This study is important as it provides the current landscape and status of eHealth in the Philippines. Hence, policymakers, program implementors as well as other stakeholders, including the public, will be able to know which eHealth and telemedicine services and products are available in various sectors of society, either private or government, what are the existing gaps in eHealth, and the trajectory in the future based on the guide of the World Health Organization - International Telecommunication Union (WHO-ITU).

Objectives. The objectives of the study are 1) to provide a landscape of eHealth in the Philippines since its start in the country; 2) to identify programs, services, and technology innovations implemented in the country on eHealth and telemedicine; and 3) to identify Philippine systems that correspond to the eHealth components laid out by WHO-ITU for a successful implementation of eHealth at a national level.

Methods. We conducted an extensive review of the literature and key informant interviews with eHealth experts in the Philippines. The literature review covered research and studies, gray literature, peer-reviewed journals, databases, and government statistics. The years covered in this study span a total of 24 years from 1997, which is the beginning of the information management system as an institutional approach in the country, to 2020. The assessment tool was based on the framework provided by the WHO-ITU on the context for eHealth development.

Results. The National Telehealth Center (NTHC) of the Philippines began with projects for 1) eLearning, 2) eMedicine, 3) eRecords, 4) eHealth Policy and Advocacy, and 5) eSurveillance. Telemedicine services are now being offered by hospitals in the country. This shows eHealth services, in general, and telemedicine are being utilized in not only targeting the poor, but also in giving faster, more efficient, and equally effective virtual health services to the general public, even the private-pay patients.

Conclusion. The sustainability of eHealth in the Philippines still depends on the national effort to institutionalize an eHealth structure and eHealth system where the various components are interrelated.

Key Words: telemedicine, policymaking delivery of health care, health services, Philippines

INTRODUCTION

The World Health Organization (WHO) defines eHealth as the use of information and communication technologies (ICT) for health.¹ In its broadest sense, eHealth is concerned with improving the flow of information, through electronic means, to support the delivery of health services and the management of health systems. ICT provides significant benefits not only in achieving health goals but

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also in demonstrating what has been attained and at what cost. eHealth has been described to ensure that “the right health information is provided to the right person at the right place and time in a secure, electronic form to optimize the quality and efficiency of health care delivery, research, education, and knowledge.”¹

The advent of ICTs using electronic platforms has indeed changed the healthcare system to reach the greatest number of patients and the farthest areas. Corollary to this are challenges that might hamper or facilitate the improvement of the health system; hence, it is essential to know and understand the basic landscape of this relatively new emerging field in the country.

eHealth – a global perspective

eHealth, coined in the latter part of the 20th century, refers to the use of ICT, mainly through electronic means, to support the delivery of health services and management of health systems (WHO & International Telecommunication Union [ITU], 2012). e-Health which can cover all digital health-related information including several components: “1) products, such as instruments to ensure the constant monitoring of blood pressure in ambulatory patients; 2) systems, such as computer-assisted surgery systems; and 3) services, such as a) operating surgical and intensive care units, with interconnected instruments and surveillance services ensuring continuous patient monitoring; b) computer-assisted prescription services, where the software checks for incompatible drugs, contraindications, and dosage levels; or c) information services for patients and consumers, including individual electronic health records.”²

eHealth Benefits for Public Health

There are various benefits brought about by eHealth in the field of public health. It promotes evidence-based decision-making and patient safety by opening doors for changes in work processes, and improvements in communications, interaction, and risk management. It also helps overcome geographical and time barriers, lessening waiting times and increasing access to health professionals, thereby improving the quality of life of the patients and the general population. In addition to this, eHealth also ensures a heightened efficiency in time and resource use and provides timely data which aids decision-makers in identifying areas to focus on as well as actions that need to be taken to address challenges in the public health arena.³

eHealth Key Players

According to the ITU (2008), the new players in eHealth are grouped accordingly: 1) United Nations agencies and other international bodies dealing with health, telecommunications, and trade; 2) government authorities, health and telecommunication decision-makers at the national and regional levels, as well as the regional bodies to which they belong; 3) academic and research institutions;

4) local health professionals and their associations; 5) consumers, patients and their associations; 6) donors; 7) non-governmental organizations; 8) the private sector, including foundations and industries related to health and ICTs; and 9) the media.

eHealth Challenges in Southeast Asia

In the Southeast Asia region, the most important challenge in healthcare is to “reach the unreached” population, given the considerable inequalities currently happening around access to healthcare services. Key challenges in eHealth in the region include the lack of policy and strategy; uncoordinated investment in ICTs in health; low degree of cooperating, collaboration, and sharing across all sectors; limited public sector capacity to implement eHealth programs; widely differing levels of eHealth maturity across and within countries; little or no interoperability and communication of health information systems; poor communication infrastructure; and lack of cooperation between potential stakeholders.³

The objectives of the study include 1) to provide a landscape of eHealth in the Philippines since its start in the country; 2) to identify programs, services, and technology innovations implemented in the country on eHealth and telemedicine; and 3) to identify Philippine systems that correspond to the eHealth components laid out by WHO-ITU for a successful implementation of eHealth at a national level.^{4,5} This study is important as it provides the current landscape and status of eHealth in the Philippines. Hence, policymakers, program implementors as well as other stakeholders including the public will be able to know which eHealth and telemedicine services and products are available in various sectors of society, either private or government, what are the existing gaps in eHealth, and the trajectory in the future based on the guide of the WHO-ITU.

METHODOLOGY

This study used a narrative qualitative methodology based on secondary data as well as mining of online journals to come up with a comprehensive historical development and evolution of eHealth in the Philippines.

For the assessment of the eHealth in the Philippines, a comprehensive study of the eHealth landscape in the Philippines was conducted through an extensive review of the literature covering research studies, gray literature, peer-reviewed journals, databases, and government statistics. The years covered in this study span a total of 24 years from 1997 which marks the beginning of information management systems as an institutional approach in the country to 2020.

The historical development of eHealth in this study covers the following areas: 1) institutions in the country that have initiated and housed the information technology (IT) systems related to health information, and their

corollary programs; 2) electronic medical record innovations in the country; 3) devices and technologies connected to EMRs and ICTs for health information and patient data management; 4) the landscape of telemedicine in the Philippines including adoption in hospitals and network institutions; 5) pertinent laws and policies in the Philippines on eHealth and related domains, and 6) appraisal of the state of eHealth in the Philippines using the WHO-ITU framework.

The corresponding protocol for the conduct of this study was cleared and approved by the Research Grant Administration Office of the University of the Philippines Manila.

RESULTS AND DISCUSSION

Using the context for eHealth development of the WHO-ITU,⁴ the framework used has various components. Leadership and governance consist of activities to direct, implement, and monitor the eHealth goals and outcomes at the national level. Strategy and investment engage stakeholders and sectors through comprehensive strategies and plans. Moreover, legislation, policy, and compliance include the environment for regulating eHealth. The workforce makes the delivery of eHealth attainable through ensuring that knowledge and skills needed are “available through internal expertise, technical cooperation or the private sector.” Standards and operability ensure accurate data through interoperability of various systems and to allow data exchange between these channels, and this data exchange is supported by an infrastructure that includes physical infrastructures (network), core services, and applications. These building blocks will strengthen the eHealth strategy. The graphical summary of these components is shown in Appendix 1.

This paper discusses the eHealth landscape in the Philippines using the various components above.

Institutions that have initiated eHealth and their Corresponding Programs

Specifically, the drivers of the national context for eHealth in the Philippines are four major institutions which are the 1) National Telehealth Center (NTHC) of the National Institutes of Health (NIH), University of the Philippines Manila, 2) Department of Health (DOH) particularly the National Telehealth Service Program (NTSP), a joint project with NTHC, 3) Department of Science and Technology (DOST), and 4) Philippine Research, Education and Government Information Network (PREGINET). The eHealth landscape of these institutions is shown below.

The National Telehealth Center

The NTHC was established in the University of the Philippines Manila through the University Board of Regents on July 30, 1998. It is now under the NIH of UP Manila,

and at the forefront in the conduct of health research and extension services including developing cost-effective tools and innovations in ICT. This is the offshoot of initiatives for telemedicine and eHealth in the NIH in 1997. It also has the telemedicine research-cum-service in remote and underserved areas from Batanes to Zamboanga through partners with the then Commission on Information and Communications Technology’s (CICT, 2004-2008) and DOST - Philippine Council for Health Research and Development (DOST-PCHRD, 2008-2011).

The NTHC now has five projects —“1) eLearning – a pre-service and in-service training program to build people’s capacities on eHealth; 2) eMedicine – through telemedicine research-cum-service, a patient’s condition can be referred directly to clinical specialists in their region or the Philippine General Hospital (PGH) through ICTs; 3) eRecords – advocating electronic medical record systems (EMR) that could easily work with other information systems, an example of this is the Community Health Information Tracking System (CHITS) – the first EMR for government-based health facilities now implemented to over 200 health facilities in the country; 4) eHealth Policy and Advocacy; and 5) eSurveillance – innovating mHealth, or the use of mobile technology for health, and web-based systems to monitor performance in reaching goals of DOH priority programs.”

Specific projects and endeavors that have been pursued by NTHC from 2011–2012 are: “1) *eLearning* and Capacity Building for /via eHealth includes eLearning Videos on tuberculosis, child poisoning, avian flu and stroke – implemented in sites of GiveCare Couples for Christ Medical Mission Foundation, and the 1st Philippine Undergraduate eHealth Research Awards; 2) *eMedicine* covers Telemedicine for DTTB with the DOH, Development of the NTSP in the DOH (Telemedicine component); 3) *eRecords* includes CHITS such as a) Citywide implementation of CHITS in Quezon City (75 Health Facilities), with the Local Government and collaborative development of additional local and national health program modules; b) Citywide implementation of CHITS in Navotas City (10 Health Facilities) with the WHO – Country Office: collaborative development of additional maternal and child health (MCH) program modules with Navotas Health Office staff; c) Citywide implementation of mCHITS (mobile CHITS) in Navotas City (10 Health Facilities), with the Local Government; d) CHITS Wireless Access for Health Project; e) CHITS implementation in Pasay City, UP Manila MOA with Pasay City - technical support; and f) CHITS implementation in San Juan, Batangas with Health Action Information Network, and training of regional health units (RHU) staff and technical support; 4) *eSurveillance* covers the NTSP collaborative development of policy, program design and eHealth applications; and 5) **eHealth and eHealth policy Advocacy** includes medical privacy and patient information confidentiality, in context for eHealth and/or ICTs for Development.⁶

Department of Health (DOH) - National Telehealth Service Program (NTSP)

The NTSP is a joint project of the DOH and the NTHC of UP Manila-NIH. It is a 5-year program aimed at expanding telemedicine in 4th to 6th class municipalities nationwide targeting the geographically isolated and disadvantaged areas (GIDAs). NTSP enables consultations between primary care physicians in GIDAs and clinical specialists of the PGH using a mobile and internet-based interface and triaging system.

The NTSP also supports the Doctor-to-the-Barrios program of the DOH, where doctors are assigned to rural and hard-to-reach municipalities. Telehealth services have been offered to more than 350 doctors to the barrios (DTTBs) and municipal health.⁷

The accredited TeleHealth Centers in the Philippines are Baguio General Hospital and Medical Center, PGH, and Eastern Visayas Regional Medical Center. Cordillera Autonomous Region (CAR), Romblon, Masbate, Eastern Visayas, and Tawi-Tawi are the priority NTSP sites.⁸ At present 412 municipal health centers benefiting from this telemedicine service (Table 1).

Department of Science and Technology (DOST)

The DOST has been at the forefront of paving the way for smarter healthcare through the use of ICTs. To date, the projects supported by DOST for smarter healthcare include the RxBox, eHealth Technology-Assisted Boards for LGU Efficiency and Transparency (e-TABLET), and the Philippine Health Information Exchange (PHIE). The projects include 1) **RxBox: Connecting medics** which was developed by the University of the Philippines Manila-NTHC and DOST. The RxBox is a medical device with built-in medical sensors for monitoring blood pressure and blood oxygen levels, assessing the strength of contraction of the mother’s uterus, electrocardiogram, and fetal heart monitor. The data acquired by the sensors can easily be stored and transmitted to a specialist in urban areas for further consultation and management; 2) **e-TABLET: Managing medical records** – the e-TABLET is a tablet-based electronic medical record system developed by Ateneo de Manila’s Institute of Philippine Culture and Ateneo Java Wireless and Competency Center. It is a system that enables health

workers to encode and manage patient information; 3) **PHIE: Centralized medical records** - The PHIE is a centralized database of health and medical records nationwide that enables a patient to retrieve personal medical records. This allows sharing of patient records among hospitals for accurate and timely health information; 4.) **Internet connectivity** is essential in providing eHealth. In line with this, the DOST through its Information and Communication Technology Office is tapping into the potential of TV White Spaces, or unused frequencies between broadcast TV channels, to service cost-effective internet connectivity and data delivery in areas underserved by private providers.⁹

Philippine Research, Education and Government Information Network (PREGINET)

PREGINET is a research and education network (REN) in the Philippines. It is under the Advanced Science and Technology Institute, a research and development agency attached to the DOST. It also has a network with international RENs such as the TEIN and Asia-Pacific Advanced Network, Trans-Eurasia Information Network 3 (TEIN3), School-on-the-Internet Asia, and Collaboration for Network-enabled education Culture, Technology and Science (CONNECT) Asia. PREGINET conducted the First Philippine Telemedicine Network Symposium in 2016 participated by St. Luke’s Medical Center, PGH, National Kidney and Transplant Institute, Baguio General Hospital, University of Cebu Medical Center, Davao Doctors Hospital, Aborlan Medical Care, and the Veterans Memorial Medical Center. PREGINET provides services such as voice over IP (VoIP), videoconferencing, and technical consultancy, among others. It also supports e-learning activities and telemedicine in the Philippines thru its veritable collaboration with the NTHC, UP-PGH, Manila Doctors Hospital (MDH), and Veterans Memorial Medical Center (VMMC). Its regular technical support to said hospitals during live surgical demonstrations has been an important strategy in e-learning in the medical field.¹⁰

The comparison of the abovementioned eHealth drivers in the Philippines is summarized in Table 2.

Electronic Medical Records in the Country

Paper-based medical record systems pose problems with errors, destruction, or alterations in records. There is also the problem of consolidating paper-based data into a cohesive and consolidated report.¹¹ Thus, the need for electronic medical record systems that provide real-time access and monitoring of patients’ conditions. This also improves workflow as it decreases the time to pull out charts by allowing remote access, and provides access to convenient appointment scheduling, prescription, and management.¹¹ Likewise, EMRs serves as a major communication tool for physicians and other allied healthcare workers, thus health providers become better informed.¹² The consolidated electronic data can also be used for decision-making

Table 1. Summary of telemedicine sites per region (N=416)

Region	Number of sites	Region	Number of sites
CAR	54	Region VII	14
Region I	16	Region VIII	136
Region II	14	Region IX	15
Region III	7	Region X	19
Region IV-A	110	Region XI	5
Region IV-B	32	Region XII	3
Region V	29	Region XIII	19
Region VI	20	ARMM	23

Adapted from National Telehealth Service Program Infographics, 2015⁸

Table 2. Comparison of eHealth drivers in the Philippines

Components	National Telehealth Center	National TeleHealth Service Program	Department of Science and Technology	Philippine Research, Education and Government Information Network
TeleMedicine	Yes	No	No	Supporting Platform
Managing medical records	Yes	Yes	Yes	No
Tracking	Yes	Yes (during pandemic)	Yes	No
Policy and Advocacy	Yes	No	Ongoing	Supporting Platform
Surveillance	Yes	Yes (during pandemic)	Yes	No
eHealth Technology	No	No	Yes	No

regarding medical interventions.¹³ In the Philippines, several EMRs have been developed by different concerned agencies, hospitals, and the academe. The more prominent are: CHITS of the University of the Philippines Manila; Integrated Clinic Information System (iClinicSys) of the DOH; and SHINE OS+ of Ateneo University.

iClinicSys was developed by the DOH which provides public health information systems targeting local health units (e.g., health centers, rural health units, and barangay health stations). In general, the data collected from iClinicSys such as demographics, consultations, health services availed (e.g., immunization, maternal care, family planning, laboratory examinations, diagnosis, and other clinical health data are processed and uploaded to the DOH electronic Field Health Services Information System system.¹⁴

Similar to the target demographics of iClinicSys, SHINE OS+ (Secured Health Information Network and Exchange) was developed by Smart Communications and the Ateneo Java Wireless Competency Center for information recoding, appointment and medicine reminders through text messages to patients, faster referral, and summarizing health

information reports to DOH and PhilHealth “for faster processing of e-claims and real-time health statistics.”¹⁵ A recent development for SHINE OS+ is its offline version which allows monitoring and tracking even with limited internet connection access.¹⁶

CHITS was developed by the NTHC of the University of the Philippines Manila to aid in the management of health data in the RHU level.¹⁷ CHITS aids in the efficient patient record encoding and retrieval which can be generated upon patient admission. Requests for pertinent clinical data such as laboratory results and reports can also be uploaded through CHITS. Moreover, CHITS is connected to the RxBox, a mobile health device and developed by the University of the Philippines Manila as well, to can measure the patient’s vital statistics. As of 2020, CHITS is currently being utilized in 35 RHUs all over the Philippines, 33 public health centers in Taguig City, 12 in Pasay City, and 91 in Quezon City.¹¹

Aside from these, the DOH validates EMRs by third-party providers that can be used for patient information recording (Table 3).

Table 3. List of validated EMRs for hospital statistics

System Name	Company Name	Date Validated
Third Party Providers		
iHomis	DOH	2019
Comlogik	New Comlogik Business System	September 16, 2019
Medix	E-Med Health Care Solutions Inc.	October 1, 2019
Bizbox Hospital Systems	Bizbox Incorporated	October 21, 2019
Cerebro HIS	Cerebro Diagnostic System	November 22, 2019
Drainwiz	Drainwiz Computer System	December 5, 2019
MakMed EMR	Makilala Medical Hospital Inc.	December 20, 2019
Simple HIS	Simple Softech Solutions Co.	January 3, 2020
Medsys	KCCI - Medsys	January 16, 2020
Magis Hospital Information System	MMG Federation	January 16, 2020
Hospital One	Hospital One	January 16, 2020
MeRx	Medcurial	February 28, 2020
Diana HIS	Geodata	March 9, 2020
Appoluz	CNR Software Systems	March 12, 2020
Seg HIS	Segworks Technology Corporation	November 3, 2020
In-House Developed		
St. James Hospital Inc		March 9, 2020
Divine Mercy Hospital		March 9, 2020
Family Care Hospital		March 9, 2020

Adapted from Department of Health – National eHealth Electronic Health Records System Validation, n.d.¹⁸

mHealth Devices and Technologies for Health Information and Patient Data Management in the Philippines

To improve access to care and quality of healthcare, there are two main technological projects of the NTHC, in collaboration with the DOH, DOST, the RxBox and the Real-time Monitoring of Vital Maternal and Child Health Indicators (rCHITS).

The RxBox

The RxBox is a machine capable of measuring vital signs (heart rate, ECG, blood pressure, pulse rate and oxygenation) and transmit this data through both the Internet and GSM network to a medical specialist in a different location.

The RxBox is a multi-component program (biomedical device, electronic medical record system, and telemedicine training) designed to provide better access to life-saving health care services in isolated and disadvantaged communities nationwide. It is also an ICT innovation designed to support the DOH's call for "*Kalusugang Pangkalahatan*" or Universal Health Care (UHC).

The RxBox is a telemedicine device capable of capturing medical signals through built-in medical sensors, storing data in an electronic medical record (Community Health Information Tracking System – CHITS), and transmitting health information via the internet to a clinical specialist in the PGH for expert advice. It also catalyzes improvement in the local referral system by facilitating teleconsultations (audio-video conferences) within the NTSP. The RxBox can reduce the overall cost of healthcare by enabling health workers to diagnose, monitor, and treat patients within the rural health facility, thanks to medical sensors inside the box.¹⁹

In 2017, there are 169 RxBox units deployed in different municipalities and cities (Appendix 2).

The height of the COVID-19 pandemic prompted the deployment of additional 369 units of RxBox in different regions of the country in 2020 (Appendix 3).²⁰

The rCHITS

On the other hand, rCHITS through CHITS was developed to strengthen the health information systems of health facilities across the country through the use of ICTs. rCHITS has the following components – the use of 1) EMR CHITS; 2) mReports, an android-based application reporting system for rural health midwives to document and transmit clinical data through smartphones; and 3) an LGU dashboard, a visualization tool that facilitates analysis of health data and decision-making. mReports, one of the main components of rCHITS, focuses on equipping field health workers with the capacity to report maternal and child health services rendered, create appointments for, and send reminders to patients on maternal and child-care services in real-time using mobile phone and SMS Technology.

From November 2011 to August 2016, rCHITS was implemented in 13 selected GIDAs with high rates of

maternal mortality and poverty incidence. A total of 365 health workers nationwide were also trained in using rCHITS during the duration of the project. Its implementation was made possible through the support of the UNICEF Joint Programme on Maternal and Neonatal Health (JPMNH).

MInTS (Mag-Ina Telereferral System) and BiRTS (Birth Registration Tracking System) are part of rCHITS Quezon City component or rCHITS supported by the JPMNH. MInTS aims to strengthen the service delivery network of maternal and neonatal referral and feedback process between health facilities. Meanwhile, the BiRTS facilitates birth registration through the digital form from rCHITS to the Local Civil Registry (LCR). As of February 2016, 277 health workers from District 2 Health Center and Lying-In clinics, along with partner hospitals implementing MInTS (QMMC & QCGH) were trained on MInTS.²¹

Telemedicine Services in Philippine Hospitals

Telemedicine generally refers to the use of communications and information technologies for the delivery of clinical care over the cellular phone/telephone or use of satellite technology and videoconferencing to conduct real-time consultation and medical care across distance in the interface between patient and doctor, among doctors with specialists, and between and among various hospitals locally and internationally. This may include diagnostic testing or monitoring a patient's posttreatment progress in any specialty such as cardiology, dermatology, and even emergency medicine.²² It is also defined as the practice of health care delivery, diagnosis, consultation, treatment, transfer of medical data, and education using interactive audio, visual, and data communications.²³

Telehealth is an expansion of telemedicine, and unlike telemedicine (which more narrowly focuses on the curative aspect), it encompasses preventive, promotive, and curative aspects. Telehealth involves a broader variety of clinical and nonclinical remote healthcare services such as patient education, assistance with medication adherence, and troubleshooting of health issues.²⁴ Telehealth is defined as the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health, and health administration.²⁵ Telehealth can be applied to different settings including primary and long-term care, mental health, and even school health.²⁶

With telemedicine, remote communities have access to the services of clinical specialists in their region and the PGH. Health data reported through R4Health in real-time assists decision makers manage resources, allocate funds, plan and budget investments on health which can translate to better health for Filipinos. To date, telehealth services have been offered to more than 350 DTTBs and municipal health officers through various government initiatives of the DOH and the NTSP.⁸ There are 412 municipal health centers benefiting from this telemedicine service.²⁵⁻²⁷

Telemedicine services have also been offered by major hospitals in the Philippines as they foresee its importance to their clientele. This shows the wide penetration of eHealth services and telemedicine not only to target the poor, but also in giving faster, more efficient, and equally effective virtual health services to the public, even the private-pay patients.²⁸

Telemedicine services in the Philippines include tele dermatology, teleparasitology, telesurgery, teleaudiology, teleradiology, teleophthalmology, telepsychiatry, telepharmacy, and telecardiology. All these revolve around the use of technologies in delivering efficient and convenient healthcare services to patients.

Tele dermatology started as part of the design for Community teleservice, together with geotelemedicine and teleradiology, in the program of the National Academy of Science and Technology in 2002. Tele dermatology using mobile phones was shown to reach underserved communities that have a scarcity of dermatologists.²⁶ This is being implemented in PGH. Tele dermatology is seen as an accurate diagnostic tool of dermatologic conditions relative to the face-to-face medical consultation, and that health care providers are open to such a new form of consultation.²⁷ There are two additional providers of teleradiology in the Philippines: Lifetrack Medical Systems (LMS) and Mediaarchives Philippines Inc. (MAPI). LMS features a radiology software platform that is paired with experienced radiologists in hospitals who help evaluate medical images. MAPI has a virtual clinic where radiologic images such as X-rays, CT scans, and MRIs are transmitted from one location to another to share studies with other radiologists and physicians.²⁹

On the other hand, telesurgery and telecardiology of The Medical City (TMC) use robotic systems to aid in procedures related surgeries. TMC has pioneered in robotic-assisted surgery telecardiology as well as stem cell therapy and regenerative medicine, leukemia and lymphoma management, customized wellness, and liver transplantation. The Ortigas hospital serves as a hub for 17 satellite outpatient clinics and 4 other hospitals in the provinces and Guam.³⁰

JR Borja General Hospital, a hospital in Cagayan de Oro City, is the first to launch the Telepsychiatry Project in 2016 which was aimed at giving medical/clinical diagnoses and prescriptions to mentally ill patients in Cagayan de Oro City and neighboring provinces through video conferencing. This was in partnership with the Southern Philippines Medical Center in Davao City.^{31,32}

Telepharmacy is generally used to prescribe medications online. Telepharmacy Services is also covered by Republic Act No. 10918 otherwise known as the Philippine Pharmacy Act which ensures the availability of prescription drugs via telephony among the 1,069 GIDAs in the country.³³ Telepharmacy is envisioned to provide solutions to the pharmacy staffing woes in the Philippines as it provides instantly available relief pharmacists on a short- or long-term basis as well as remote supervision of rural pharmacies.

Teleophthalmology assists in eye examinations. The Philippine Eye Research Institute of the NIH has established the Teleophthalmology Retina Reading Center in the Philippines. This is in collaboration with the Harvard Medical School and the Joslin Diabetes Center to establish. The program provides diagnostic services through fluorescent angiography and optical coherence tomography of the retina.³⁴ TMC operates the first and only teleophthalmology clinic in the Philippines, where digitized eye examination images captured from across the TMC health network both locally and internationally are transmitted online to the Eye Center and interpreted by experts of each eye sub-specialty.^{31,35} Another endeavor was a study on the implementation and pilot data on diabetic retinopathy in a teleophthalmology program at a multispecialty primary care clinic. This program has facilitated early detection of potentially sight-threatening disease thus preventing visual loss and other complications.³⁵

Teleparasitology connects experts via online microscope/mobile phone interface for early and accurate diagnosis of various parasitic diseases which is in response to the challenge of the WHO to strengthen expertise and information systems to overcome the global impact of neglected tropical diseases which affect about 42 million at-risk individuals globally. In the Philippines, millions of Filipinos are suffering from four major neglected parasitic infections, namely, schistosomiasis, lymphatic filariasis, and food-borne trematode infections in 44 endemic provinces.³⁶ Most peripheral laboratories lack the expertise and technology for accurate and early diagnosis of emerging and re-emerging parasitic infections. Hence, the Philippine Health Research Registry implemented a project called “Medical Teleparasitology for Laboratory Diagnosis of Parasitic Infections in the Philippines,” to connect peripheral laboratories to selected regional diagnostic referral centers.³⁷ In 2014, the Philippine project on controlling parasitic diseases, called the ctrl.para.site – was implemented to link peripheral laboratories to experts via an online microscope/mobile phone interface for early and accurate diagnosis of various parasitic diseases. The ctrl.para.site project targeted laboratory staff in two regions in the country – Western Visayas and CARAGA.

Teleaudiology, on the other hand, was set to realize the Universal Newborn Hearing Screening and Intervention Act for mandatory hearing screening of newborns in the Philippines.³⁸ Teleaudiology is seen as vital a means for GIDAs to comply with the requirement of the Universal Newborn Hearing Screening and Intervention Act, that all newborns must be screened for hearing loss within 3 months after birth. The newborn hearing screening device with telehealth capabilities will enable all newborns to be screened by accredited screening centers without traveling great distances. The telehealth capability involves the deployment of automated data collection for local (CHITS/EMR) and cloud storage (NHS Registry), and through the tele-

audiology protocol, facilitate prompt referral for confirmatory testing and intervention. The project also incorporates capacity building among primary care health facilities (telelearning) for newborn hearing screening to screen and appropriately refer patients with potential congenital hearing problems.³⁸

Telemedicine in Local Government Units

The height of the COVID-19 pandemic has opened opportunities for telemedicine to flourish in the Philippines. Hospitals and LGUs sought alternatives or supplements to the traditional face-to-face consultations to adapt to the new normal. In the National Capital Region, telemedicine services are being offered to COVID-19 and non-COVID-19 patients for free through telemedicine hotlines launched by the DOH in partnership with private companies: Telimed Management Inc. and Medgate.³⁹ In the CALABARZON region, “O-HI DOC” (Oral Health Initiative for Dental Online Consultation) project by DOH-CALABARZON allowed consultations and referral systems via mobile phones or telephones to address dental issues of patients especially those in the GIDAs in response to COVID-19 pandemic.⁴⁰

LGU initiatives also adapted to telemedicine. In Davao City, in the southern part of the Philippines, Davao Central 911 set up consultations remotely using telemedicine to minimize personal contacts between healthcare workers and patients. This expanded through Executive Order (EO) 20 authorizing doctors to prescribe medicines remotely through a text message from 911.⁴¹ Telepsychology is also being offered free in Davao through their HOPE line.⁴¹ Taguig in Metro Manila also set up telemedicine hotlines to serve as a communication platform for healthcare professionals and patients remotely.⁴² This may be done through traditional text messages or online through an application that allows video calls via cellphones. Moreover, health workers also deliver prescriptions and/or health services such as immunizations done house-to-house.⁴³

Telemedicine in the city of Quezon City in Metro Manila is COVID-19 patient-focused. The LGU set up an online system called Quezon City COVID Telemed Program wherein patients who are COVID-19 positive isolating in their homes or quarantine facilities can consult with their doctors online⁴⁴ via video calls. Online prescriptions are also e-mailed to the patients.⁴⁵ This initiative is in partnership with the DOH and is “connected directly to the national COVID-19 surveillance system” in the Philippines.⁴⁶

Telemedicine in Other Countries

Telemedicine was established primarily to meet the healthcare demands of an aging population and accommodating the increasing burden of non-communicable diseases.⁴⁷ This bridges the gap in healthcare professionals, specialists, and caregivers’ shortages, and most importantly in providing access to where there was previously none or there was an increasing demand in the overall level of care.

Telemedicine in various countries involves delivering healthcare services in different departments. In the United States (US), telehealthcare services have become popular.⁴⁸ It is widely used in radiology, psychiatry, and cardiology.⁴⁹ In 2016, 50% of the 110 million recorded patient visits were conducted online based on Kaiser Permanente, which is the integrated largest health network in the US. A study showed that patients were more satisfied with the services offered by telemedicine with lesser misdiagnoses and lower malpractice complaints.⁵⁰

In Canada, technologies to deliver health care virtually such as telemedicine/telehealth, have been around for decades^{51,52} and the main driver for advancing telehealth is to meet healthcare demands conveniently and on time. Advances on Canadian physician’s offices and healthcare facilities now use some form of a digital record, but there is still a long way to go in terms of the use of digital technology to provide in-depth virtual care.⁵¹

Telehealth in Australia, on the other hand, was ideally placed to support major national programs associated with dementia, mental health, diabetes, and regional concerns related to rehabilitation, acute waiting list relief, and outpatient support. Other purposes of telehealth are also for non-clinical use to which the latter is being utilized for education, case study analysis, peer review, and networking, health promotion, mentoring and supervision, research and evaluation, and rural and urban support.⁵³

In Indonesia, the development of telemedicine started during the 1980s to solve shortages in healthcare workers. In the 2000s, the rise of signal speed eligible for audio and video transfer facilitated teleconsultations of radiology and cardiologic cases. In general, the objectives of telehealth/teleradiology in Indonesia were to give expert services to several hospitals/ community health centers that do not have any radiologist/cardiologist to interpret radiological images of ECG with the additional project for tele-ECG. In recent years, with the use of online health service applications such as Halodokter.com, Konsula.com, and Halodok, patients can contact medical professionals online and access their medical conditions online.⁵⁴

In Malaysia, telehealth aims to strengthen the delivery of healthcare through the use of technologies. The Telemedicine Act of 1997 is the regulating and controlling body of the telemedicine industry in Malaysia, and it is the only country with specific laws for telehealth in South East Asia.⁵⁵ India also has telemedicine projects such as Apollo, Otri, and Asia Heart Foundation which focus on the delivery of cardiology, emergency, radiology, ophthalmology, and nephrology healthcare needs.⁵⁶

Laws and Policies on eHealth in the Philippines

The various laws, policies, and programs on and related to eHealth in the Philippines in this study are summarized in Table 4.

Table 4. Summary of eHealth Policy Domains and Relevant Policies and Programs in the Philippines

Policy Domain	Relevant Policies/Programs
Networked Care	<ul style="list-style-type: none"> • DOH Information Systems Strategic Plan (ISSP) 2011-2013 • RA 10173: Data Privacy Act of 2012 • RA 9995: Anti-Photo and Video Voyeurism Act of 2009
Inter-jurisdictional Practice	<ul style="list-style-type: none"> • RA 2382: The Medical Act of 1959 • RA 7392: Philippine Midwifery Act of 1992 • RA 5181: Act prescribing permanent residence and reciprocity as qualifications for any examination or registration for the practice of any profession in the Philippines • RA 7164: Philippine Nursing Act of 1991 • RA 8344: Hospital Doctors to treat emergency cases referred for treatment • AO 114: Revised/updated the roles and functions of the Municipal Health Officers, Public Health Nurses and Rural Midwives • PMA, Medical Society by-laws
Diffusion of eHealth Addressing the Digital Divide	<ul style="list-style-type: none"> • Free and Open Source Software (FOSS) • Community e-Centers (CeCs) • DepEd: Gearing up Internet Literacy and Access for Students (GILAS) • DOH: Universal Health Care (UHC)
Integration into Existing Systems	<ul style="list-style-type: none"> • DOH EA, ISSP • Philippine Government Interoperability Framework (PGIF) Advocacy • ICT4H: Standards and Interoperability
Handling Innovation at Different Levels	<ul style="list-style-type: none"> • RA 8792: E-commerce Act • DOH: UHC • EO 269: Creating the Commission on Information and Communications Technology
Policy Goal Setting	<ul style="list-style-type: none"> • DOH: UHC, EA, ISSP, National eHealth Strategic Framework • ICT4H: Standards and Interoperability • RA 8792: E-commerce Act
Evaluation and Research	<ul style="list-style-type: none"> • Philippine Health Research Act of 2008 (University of the Philippines NIH, NTHC)
Investment	<ul style="list-style-type: none"> • RA 8792: E-Commerce Act • Philippine Health Insurance Corporation (PHIC) – policies on financing health workers working in remote areas, Primary Care Benefit packages
Ethical Issues	<ul style="list-style-type: none"> • Philippine Medical Association Code of ethics • RA 6713 – Code of Conduct and Ethical Standards for Public Officials and Employees

Way Forward and Trajectory of eHealth in the Philippines

Using the WHO-ITU (2012)⁴ eHealth components, the assessment of national government agencies and stakeholders are shown below.

For leadership and governance, the government and academic sectors are the major players. Based on the landscaping of the eHealth environment provided in this paper, these institutions include the NTHC-University of the Philippines Manila, DOH, PCHRD, DOST, among others.

For services and applications, the involved stakeholders are the EMR providers, telehealth and telemedicine providers and practitioners, mHealth technology innovators and developers, and others. This aspect also includes the

local government units that provide primary health care and various hospitals engaged in eHealth services and telemedicine.

For standards and interoperability, the academic community and the government are essential players. The academe can feed evidence-based research for standards and interoperability while the national government agencies can establish and implement standards of eHealth and the interoperability of systems. The EMR providers are to be engaged in this component to ensure the interoperability of systems. There should also be standards for the ethical practice of eHealth practice and eHealth research. In eHealth practice, this includes standards and quality of care, data protection, the duty of care, management plan for treatment, privacy and confidentiality, safeguard against medical malpractice, vulnerability and risks, and accountability to patient care. In eHealth research, standards on the following are needed- medical devices, disclosure of research results, informed consent, beneficence and non-maleficence (non-maleficence), participation of groups that require special consideration, disclosure of research results, among others. Likewise, there is a need to come up with standards and guidelines for the assessment and licensing of eHealth technologies, medical devices, and medical equipment. eHealth regulation in this respect ensures safety and efficacy of device, clinical and cost-effectiveness, prevention of harm among users and beneficiaries, safeguarding technology life cycle, and benefits to the entire community.

Legislation, policy, and compliance come hand in hand with standards-setting. An overall eHealth policy must be legislated. This puts forward the following essentials of eHealth; the implementing rules and regulations; the functions, mandate, accountability, and resources of respective government agencies and officials; and infrastructure to enable the implementation of eHealth.

In the aspect of infrastructure, both the internal and external support infrastructure is targeted. Internal infrastructure includes the eHealth system including interoperability. The external infrastructure that supports the viability of eHealth includes good electrification and wide internet coverage.

The workforce includes both health and non-health practitioners and employees. There are the health professionals, health providers and caregivers, health researchers, academics, and employees of health organizations and institutions. There are also hardware and software providers, health informatics professionals, and outsourced business enterprises.

The National eHealth Strategy in the Philippines has been put forward and is currently being used as a guide for the implementation of eHealth in the country. However, it is still in its incipient stage and being discussed by the National eHealth Steering Committee composed of important national agencies and institutions.

As shown in this study, the Philippines has started to build an enabling environment for eHealth through

telemedicine services and the use of mHealth devices to facilitate access to care and improving the quality of that care. However, a national plan in this context should focus on making the case for eHealth, through setting up of an institutional structure at the governance level with oversight from the national government itself, creating sustainable enabling environment through the passing of eHealth bills, government funding and not merely project-based contracts, and building workforce education both at the tertiary level and continuing specialty education. The adoption of a national eHealth strategy is also mandatory. These are referred to as enabling environments that should complement the growing and expanding ICT environment.⁴

The study merely covered internet sources which can also be considered as a rigorous tool in analyzing data. This presents as a limitation. It is recommended that interviews and data collection be gathered from concerned agencies to validate or complement the results of this study.

CONCLUSION

The incorporation of eHealth in healthcare services is essential in providing UHC and health services to the underserved populations who are usually located in geographically isolated and resource-poor areas. The study has shown the following: 1) the major institutions that initiated eHealth in the country including their programs and initiatives; 2) the various electronic medical record platforms existing in the country; 3) the mHealth devices that have been innovated to facilitate eHealth and telemedicine; 4) the various telemedicine services implemented by both hospitals and local government units as a mechanism for service delivery network, including covid coverage; 6) laws and policies on and related to eHealth and telemedicine that serve as support for policies and programs; and 7) appraisal of eHealth landscape using the WHO-ITU framework on eHealth. The study has shown that the context for eHealth development in the Philippines is still in the initial stages of development. There are already several efforts to make eHealth palpable in healthcare delivery and health information system; however, these are not yet sustained on a long-term basis, and are merely project-based, and donor-driven. A sustainable eHealth program in the Philippines requires a national effort to institutionalize an eHealth system with components that are interrelated and seamless. It is also noteworthy to mention through the review of literature that the Philippines has already gained momentum in various components of eHealth covering leadership and governance, services and applications, standards and interoperability, infrastructure, legislation, policy and compliance, and workforce.

Statement of Authorship

Both authors participated in the data collection and analysis and approved the final version submitted.

Author Disclosure

Both authors declared no conflicts of interest.

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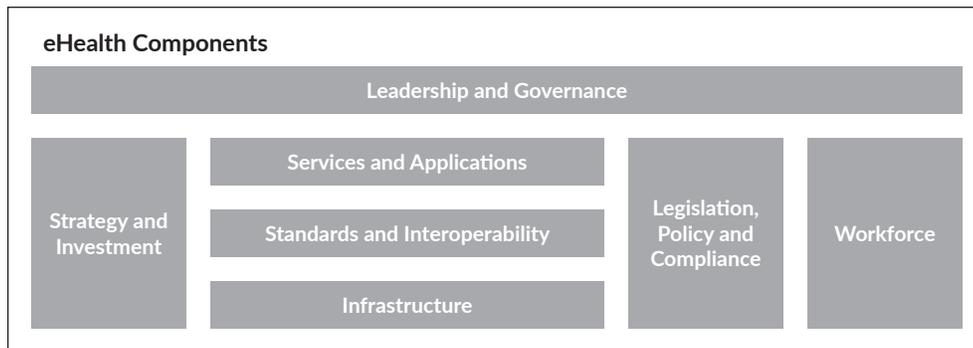
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APPENDICES



Appendix 1. eHealth Components and Building Blocks;⁴ adopted as Telehealth Building Blocks.

Appendix 2. Summary of eHealth Policy Domains and Relevant Policies and Programs in the Philippines

Region	Number of Units Deployed
CAR	15
I	15
II	5
III	9
IV – A	6
IV – B	16
V	7
VI	11
VII	6
VIII	24
IX	3
X	12
XI	6
XII	7
XIII	1
Negros	2
ARMM	15
NCR	3

Special Sites	Number of Units Deployed
BJMP (Bataan District Jail)	1
UP School of Health Sciences - Baler	1
Manila City (M. Icasiano Health Center)	1
Iloilo (Western Visayas State University)	1
Iloilo (UP Visayas)	1
Eastern Visayas (DOST – Region 8)	1

Source: RxBox Research Group¹⁹

Appendix 3. Distribution of additional RxBox Units Deployed as of December 31, 2020 (N=369)

Institution/DOST Regional Offices	No. of Units
Philippine General Hospital	40
DOST National Capital Region	50
DOST Regional Office VII	100
DOST CALABARZON	36
DOST Regional Office III	40
DOST Regional Office XI	31
DOST Regional Office VIII	71
DOST Regional Office XII	1

Adapted from PCHRD Annual Report 2020²⁰