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Global Health Through EHealth/Telehealth

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1. Introduction

EHealth is an umbrella term that covers Health Informatics, Telehealth and other ICT (information and communications technology) solutions in health care and medicine. It has been broadly defined as “the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology” [1].

EHealth also incorporates virtual reality, robotics, multi-media, digital imaging, computer assisted surgery, wearable monitoring systems, health portals.

While the primary focus of Health Informatics is the use of information systems and digital repositories in healthcare (electronic health record or EHR, medical terminologies, clinical guidelines), Telehealth refers to the use of ICT for the purpose of providing services across distance, time, social and cultural barriers. These services include both clinical services (such as telemedicine, telenursing, telerehabilitation, telepharmacy, teledentistry, or telemonitoring) and non-clinical applications (health education, research, or administrative). Telemedicine focuses primarily on the delivery of clinical care and includes a number of speciality terms such as teleradiology, telepathology, telepsychiatry, teledermatology and telesurgery. [2]

In this chapter we discuss the challenges, strategies and trends in healthcare. We also discuss the opportunities and benefits associated with the adoption of eHealth/Telehealth solutions as well as their impacts on the health system and the population. Although these topics are discussed in Canadian context, they may also apply in other countries.

One of the fundamental goals of health systems in most countries is to provide equitable access to healthcare. However, there are multiple and varying barriers to achieving this goal.

In some countries these barriers include limited access to portable clean water, a trained healthcare worker or critical lifesaving drugs. Other countries face challenges with providing medical intervention or an inoculation to prevent infectious diseases from spreading in an equitable and timely manner. There are also significant disparities between urban and rural healthcare. The barriers in the rural regions include “limited local expertise, resources, economic infrastructure, reimbursement for health services, as well as difficulties in retention and recruitment of health professionals, smaller population bases, isolation, and significant distances from needed expertise and service.” [3].

With advancement of ICT and financial support, we may be able to reduce the disparities between regions regardless of availabilities of local resources. For example, Canada’s First Nations people are not only affected by geographical isolation, but also by chronic poverty, under- or unemployment, substance abuse, limited opportunities for education and social advancement. Most reserves are located outside of major cities where all the social amenities are available, including sophisticated health care services. Over the past two decades the federal government has initiated a process of “transferring of control” to native communities and regional organizations. As a part, health care has become an integral aspect of aboriginal self-determination. In general, chronic care patients such as diabetics fare better at their home environment [4]

While we implement eHealth/ Telehealth services, we have to be cognisant of the needs for business continuity and disaster recovery plans and solutions. The current set up for eHealth/ Telehealth services is quite fragile as the disaster recovery plans do not exist or their implementation is not adequate.

Consequently, the scope of eHealth has been expanded. The World Health Organization (WHO) defines eHealth/ Telehealth/e-commerce as follows: “Tele-health includes surveillance health promotion and public health functions. It is broader in definition than tele-medicine as it includes computer-assisted telecommunications to support management, surveillance, literature and access to medical knowledge. Tele-medicine is the use of telecommunications to diagnose and treat disease and ill-health. Telematics for health is a WHO composite term for both tele-medicine and tele-health, or any health-related activities carried out over distance by means of ICT [5].

2. Definition of eHealth/Telehealth through scoping studies

The primary focus of eHealth/Telehealth is not technology. Rather, it is the adoption of the discoveries in medical sciences and advances in ICT to improve access to health services, and expand the range of these services from care to disease prevention to health maintenance to health education. The technology is just an enabler.

EHealth systems and services combined with organizational changes and the development of new skills create new opportunities to improve the healthcare system locally, nationally and globally through the collaboration and contribution of many stakeholders, including patients, health professionals, institutions, governments, researchers, academia and industry.

The healthcare system faces increasing pressure to improve health service delivery, health outcomes, and to contain healthcare costs regardless of economic status of the country. These challenges are directly linked to the changes in population demographic (e.g., ageing population, increased prevalence of chronic diseases), and increased expectations and needs for more equitable access to care, improved quality of care, improved health outcomes, and improved safety of care. Recently, these challenges have become more acute because of the shortages of healthcare professionals, complexity and accelerated communicability of diseases in many countries.

To address these challenges and meet the healthcare needs of population, many countries implement strategies that include establishing national health programs, improving health service delivery systems, fostering health maintenance and disease prevention, adopting proactive approach to management of healthcare resources, fostering research and innovation and adopting standardization and integration across the health systems.

Oh and colleagues [6] reported the results of scoping study by using the search query string “eHealth” OR “e-Health” OR “electronic health”. They used the Medline and Premedline (1966-June 2004); EMBASE (1980-May 2004); International Pharmaceutical Abstracts (1970-May 2004); Web of Science (all years), Information Sciences Abstracts (1966-May 2004); Library Information Sciences Abstracts (1969-May 2004); and Wilson Business Abstracts (1982-March 2004); dictionaries and an Internet search engine. They concluded that the term eHealth encompasses a set of disparate concepts, including health, technology, and commerce. In the definitions of eHealth, technology was viewed both as a tool to enable a process, function, service and as the embodiment of eHealth itself (e.g., a health website on the Internet). They discovered that technology was portrayed as a means to expand, to assist, or to enhance human activities, rather than as a substitute for them [6].

Paré and his colleagues [7] had reviewed more than 65 telemonitoring studies in the United States and Europe. The study, entitled “Systematic Review of Home Telemonitoring for Chronic Diseases”, concluded that home telemonitoring produces accurate and reliable data empowers patients and influences their attitudes and behaviours, and may improve their medical conditions. They concluded that home telemonitoring produces accurate and reliable data, empowers patients and influences their attitudes and behaviours, and may improve their medical conditions.

According to their study, the key clinical impact of implementing telemonitoring was a decrease in emergency room visits, hospital admissions, and average length of hospital stays. The effects of telemonitoring tended to be more consistent in pulmonary and cardiac studies than in studies on diabetes and hypertension.

3. Role of local, provincial, national governments and international organization in promoting e-health/ Telehealth

In order to implement comprehensive and over reaching e-health/ Telehealth service, it is vital to have all levels of governments and international organizations’ cooperation and

support. Governments as policy-making organizations, play a key role in formulating regulations, governing, financing, and regulating the health and business sectors.

EHealth was discussed at the United Nations World Summit on the Information Society in December 2003 and at the World Health Assembly in May 2005. The World Health Organisation (WHO) has established various eHealth initiatives, such as the WHO Global Observatory for eHealth (GOe) in 2005, which aims "to provide Member States with strategic information and guidance on effective practices, policies and standards in eHealth". The World Summit on the Information Society (WSIS), held with the participation of 175 countries (second phase, 16-18 November 2005, Tunis), affirmed its commitment to "improving access to the world's health knowledge and telemedicine services, in particular in areas such as global cooperation in emergency response, access to and networking among health professionals to help improve quality of life and environmental conditions".

The second global survey on eHealth was conducted by the GOe in late 2009 and was designed to build on the knowledge base generated by the first survey in 2005. While the first survey was general and primarily asked questions about the national level, the 2009 survey was designed to be thematic with far more detailed questions used to explore areas particular to eHealth. The survey has provided the GOe with a rich source of data that is being used to create a series of eight publications, the Global Observatory for eHealth series. GOe has release three reports to date: Telemedicine - Opportunities and developments in Member States; Atlas of e-Health country profiles; and m-Health. They are the most updated collection of survey data on eHealth from around the world. Over 800 eHealth experts and 114 counties have contributed to the data collection process. The mobile-Health (mHealth) survey was focused to identify the diverse ways mobile devices are being used for health around the world and their effectiveness. It is also to highlight the most important obstacles to implementing mHealth solutions and to examine if mHealth can overcome the 'digital divide'. Their report was released in June 2011. For the purpose of their study, GOe defined mHealth as a component of eHealth and support medical and public health practice by using mobile phone by capitalizing on a mobile phone's core utility of voice and short messaging service (SMS) as well as more complex functionalities and applications including general packet radio service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system (GPS), and Bluetooth technology [5].

It is valuable to have global data on eHealth adaption stages. The following Canadian example illustrates how adaption of eHealth/Telehealth intertwines the governments, health care providers, patients, public sectors and industries.

3.1. Canadian example

Every Canadian citizen has access to publicly funded healthcare, however, the manner in which the healthcare system is structured, funded and governed varies from province to province. While each province sets its own policies, strategies and priorities, some of the challenges are common across the country.

Issues Associated with Healthcare Delivery

- **Geography:** Canada is a country of over 34.6 million people spread across almost 10 million square kilometres. While the majority is concentrated in a several urban areas, a significant proportion is scattered across the land in hundreds of geographically isolated communities, many in areas of extreme climatic conditions. These factors pose serious challenges to the provision of health services.
- **Ageing population:** Seniors constitute one of the fastest growing groups in Canadian society. By 2041, about 23% of the population will be over 65, up from 12% in 1995. This growing portion of the population will inevitably require the devotion of a larger proportion of expensive health resources.
- **Shortage of health professionals:** There is a general shortage of healthcare professionals. That threatens the supply of and extends wait lists for some healthcare services.
- **Inequitable distribution of health professionals:** Most health service providers live and work in large urban centres. This contributes to acute shortage of health professionals in many smaller communities and rural areas where the provision of equitable access to health services is increasingly challenging.
- **Patient safety:** Several studies conducted by the Canadian Patient Safety Institute revealed that a significant number of patients experienced adverse events. One of the studies [8] revealed that an estimated 7.5% of patients admitted to acute care hospitals in Canada in the fiscal year 2000 experienced 1 or more adverse events. Also, 36.9% of these patients were considered to have highly preventable adverse events. Most of the patients who experienced adverse events recovered without permanent disability; their adverse events contributed to longer stays in hospital or temporary disability. However, a small but significant proportion of patients died or experienced a permanent disability as a result of their adverse events.
- **Increasing prevalence of public health threats:** The number of incidents of chronic diseases is increasing. Furthermore, emerging threats to public health such as SARS and avian flu require a pan-Canadian health surveillance system to provide critical information to support a rapid and effective response. These factors contribute to a high utilization of the scarce healthcare resources.
- **Limited integration:** Silos of care fail to provide patients and providers with timely and seamless access to the information they require and cause delays and needless duplication of services.
- **Fragmented funding:** Funding of health services is a complicating factor and a matter currently of intense scrutiny and considerable controversy. The division of political, managerial and fiscal accountability across provincial and federal lines has created tensions particularly around the question of the current level, and most appropriate future level of funding.
- **Budget constraints:** New treatments and technologies cost more and put additional demands on the strained healthcare budgets.
- **Language barriers:** Canada is a culturally diverse country, which has created some health care challenges. From the last national census, of 30 million people, 18 million

speaking English, 7 million French and 5 million a mother-tongue other than English or French (official languages). Not being able to speak either official language is an obstacle for newcomers when seeking or obtaining healthcare.

Recent Trends in Delivery of Healthcare Services

Notwithstanding the provincial variations, several major trends have emerged that have a direct impact on adoption of eHealth. These trends include:

- Consolidation of services: Entails consolidation of healthcare services delivery, either through hospital amalgamation or regionalization.
- Integration of services: Integration of vertical health service delivery across the continuum of care primarily through regionalization.
- Co-operation among service providers: Entails organizing workflows in such a way that they support the individual patient care process and facilitate co-operation among service providers.
- Partnering: Third-party provisioning of health services through various mechanisms including outsourcing, shared service organizations and partnering between several healthcare organizations.
- Alignment of federal and provincial strategies: Alignment of provincial eHealth agendas and strategies with the strong involvement of Canada Health Infoway - a federal organization created to foster and accelerate the development of pan-Canadian electronic health information systems.
- Investment in eHealth: Strong senior-level support for eHealth solutions within healthcare organizations, regional health authorities and provincial ministries of health.

National Health Strategies for Health Information

In 2001, Canada Health Infoway was launched to develop Health Information Strategy and deploy information management and information technology solutions across the country. Infoway is an independent, not-for-profit organization whose members are 14 federal, provincial and territorial Deputy Ministers of Health.

Canada Health Infoway invests in partnership with provincial and territorial governments and regional health authorities across Canada to implement and reuse compatible health information systems that support a safer, more efficient healthcare system.

Infoway and its public sector partners have hundreds of projects, either completed or underway, delivering electronic health record (EHR) and point-of-service solutions to Canadians – solutions that bring tangible value to patients, providers and the healthcare system.

To accomplish its mission, vision and goal, Canada Health Infoway invests in health information technology solutions in priority areas, including the Registries, Interoperable Electronic Health Records, Diagnostic Imaging Systems, Drug Information Systems, Laboratory Information Systems, Public Health Surveillance, Telehealth, Innovation and Adoption, and Info structure.

Canada's total healthcare expenditure was approximated at \$121.4 billion in 2003/2004 fiscal year and \$140 billion in 2005/2006 fiscal year. Although the Canadian health system is described as publicly funded, nearly 30% of funding comes from non-public sources, such as insurance companies and individuals.

As indicated in the 2003 Report on Canadian Hospital IT: Top Issues, Applications and Vendors, less than 2% of healthcare funding in hospitals is spent on information technology majority of which (over 80%) is spent on maintaining existing infrastructure and only 17% is devoted to development of new information technology solutions.

Public spending on eHealth is heavily influenced by Canada Health Infoway. Canada Health Infoway is an independent not-for-profit organization whose members are Canada's 14 federal, provincial and territorial Deputy Ministers of Health.

For more detailed information see [9]

EHealth-Related Considerations:

While the initiatives led by Infoway and its public sector partners are an integral part of the pan-Canadian strategy to improve the health system, there are numerous challenges involved in the implementation of these initiatives. Examples include:

- **Privacy and security:** Concerns about personal privacy and information confidentiality and the recent proclamation of Privacy and Confidentiality legislation across the provinces and territories is a considerable challenge to the development of inter-jurisdictional data sharing arrangements and to storage and manipulation of data holdings (especially patient records).
- **Standardization and interoperability:** There is a growing recognition that compliance with health informatics and technology standards is critical to achieving interoperability among eHealth solutions. However, given the number of health informatics and technology standards, their state of maturity and adoption, and lack of universal interoperability standards for eHealth, the challenge of building plug-and-play interoperable systems requires significant expertise and continuing effort.
- **Integration with service delivery:** the integration of technology with the service delivery system is a key critical success factor for a wide adoption of eHealth solutions.
- **Technology suitability:** Deployment of eHealth solutions that are suitable and well-aligned with the healthcare workflows is critical. Some challenges still remain to be addressed. For example, some of the technologies remain unproven in extremes of climate and in far-north locations. There are also limitations imposed by the fragility and newness of certain technologies and products in situations where ongoing technical maintenance and operational services are limited or do not exist.
- **Technology acceptance:** Public and professional acceptance of the new technology solutions and new ways of service delivery remains a significant risk factor and a challenge to be addressed.

- **Safety:** while there is growing recognition that eHealth solutions assist in ensuring patient and health professional safety, there is also recognition that the safety of eHealth products must be addressed in a similar way as for medical devices.
- **Sustainability:** There is a growing recognition that the deployment of eHealth solutions goes beyond technology and involves change management and further investment. Financial and human resources must be invested in the management and operations of the eHealth solutions to realize their full potential and be sustainable.
- **Education and training:** Education of sufficient numbers of information technology, information management and health informatics specialists to implement, operate, manage and continue the development and improvement of the technologies and the systems remains a challenge that needs to be addressed.

The healthcare market is changing and expanding at a rapid rate and the focus is on automation, increased efficiency and effectiveness of decision making, improved outcomes and patient care provider safety through the increasing use of information technology and eHealth applications.

The following table presents some examples of trends in care delivery and eHealth/Telehealth solutions.

Future Global Healthcare Strategies is quite clear from the Canadian example that there are many challenges associated with an adoption of eHealth/Telehealth at the national level. There have been many pilot projects and initiatives using varied equipment and strategies. Some of the initiatives have been sustained and others were abandoned. The key factors for abandonment are costs and benefits, complexity of technologies, low level of acceptance among healthcare service providers, and lack of technical assistance.

Over a decade, Wootton had held annual conference on “Success and Failure of Telehealth” He found that despite the large number of published articles on the concept of telemedicine in the developing world, there are remarkably few examples of successful implementations. Wootton and others [10] have published a book on “Telehealth in developing world” which summarized the experience of starting and sustaining Telehealth projects in the developing world. This book has assembled large contribution of Telehealth experience from developing countries.

According to the International Telecommunication Union, there are now close to 5 billion mobile phone subscriptions in the world. In 2010, there were 143 countries which offer third generation mobile telecommunications (3G) services and several countries are even moving toward fourth generation mobile telecommunications (4G). The Internet access is essential for eHealth and two billion people are Internet users of which 1.2 billion are in developing countries [11]. Given the volume of available mobile phones in the world, the prospect of using mobile phone or devices for healthcare seems promising.

Therefore, it is reasonable for the WHO to pay special attention to mHealth, following the extensive survey of eHealth activities among the member countries. Fourteen categories of mHealth services were surveyed: health call centres, emergency, toll-free telephone services,

Trends	Examples of eHealth Solutions	Purpose
Consumer Health Informatics		
Client empowerment	Health information portals eLearning systems Collaborative tools	Provide access for health information and education material Connect to others who have the same / similar health conditions Participate in support groups
Self-Care	Personal electronic health record Monitoring devices and bio-sensors Medical devices eLearning systems	Collect data about health status Monitor health conditions and lifestyle Perform diagnostic procedures Perform non-invasive treatment interventions
Personal health record	Electronic health record / smart card Document management Data integration systems Messaging systems Privacy and security solutions	Collect data about health status Provide a comprehensive and secure clinical view of client health information accessible to authorized persons (e.g., healthcare professionals) from any location at any time
Evidence-based medicine	Electronic health record Good health practices Health information portals	Provide access to evidence-based guidelines, studies, and health practices Promote good health practices
Professional Informatics		
Computer-aided decision tools	Computer-aided clinical discipline / disease-specific practice guidelines Care pathways	Provide access to medical information / knowledge anywhere and anytime
Clinical communications	Electronic clinical communications tools for booking, referrals, clinical documentation	Communicate electronically with clinical systems and other services providers Assist in sharing clinical expertise
Knowledge management	Collaborative tools Multimedia conferencing systems E-learning systems Data mining tools Data fusion tools Rule discovery tools Knowledge capture systems	Organize and disseminate the existing knowledge Create new knowledge taking into account tacit and explicit aspects of knowledge

Trends	Examples of eHealth Solutions	Purpose
Evidence-based medicine	Computer-assisted clinical practice guidelines Electronic health record Good health practices Health information portals Clinical support systems	Combine the new knowledge with the existing practices and clinical standards Provide tools for rigorous scientific evaluation of collected facts Develop and disseminate practice guidelines and health practices Provide access to medical journals and studies
Service Delivery		
Remote sensing and monitoring	Bio-sensors and wearable products Implantable devices Smart medical devices Telemonitoring	Monitor individuals with critical / chronic conditions Monitor individuals who work / live in extreme conditions
Remote service delivery	Telehealth systems Telemedicine applications Telelearning	Improve access to health and education services for people living in areas with limited access to these services Facilitate collaboration among the health stakeholders, including service providers and service recipients Provide a tool for continuing medical / health education
Personalized care	New diagnostic and treatment modalities Genomic and molecular medicine technologies, including sequencing, genotyping, gene expression profiling, and protein engineering Specialized tools to identify and stratify health risks and recommend preventative measures for individuals	Participate in the development of care plans and assessment of the appropriateness of care Facilitate collaboration among the health stakeholders, including service providers and service recipients Predict and prevent diseases
Population-based care	Population identification and screening tools Specialized tools to aid in decision-making	Facilitate population based health planning Predict the evolution of disease in populations

Trends	Examples of eHealth Solutions	Purpose
Medication management	ePharmacy systems Electronic health record Drug interaction systems Drug dispensing devices	Identify and stratify medical risks and recommend preventative measures for population Prescribe and monitor remotely clients' compliance with the care plan Coordinate response to extraordinary population-wide risks (e.g., pandemic, environment contamination)
Virtual health team	Collaborative tools Multimedia conferencing systems Teleconsultation applications eLearning systems Knowledge management systems	Facilitate collaboration among health stakeholders, including: Communities of practice / interest Service providers across different care areas, including acute, community, continuing care, mental health and other areas
Healthcare Business Management		
Proactive business management	Data mining tools Workflow management Forecasting tools Best management practices	Mine and analyze clinical, organizational and economic information across facilities and service areas to monitor and measure efficiency and effectiveness of the health service delivery system Perform forecasting and service delivery planning Develop and disseminate best management practices
Data Management and Protection		
Data and information quality	Search engine tools Data cleansing tools Data mining tools Data fusion and rule discovery tools Pattern-based tools Ontology tools	Ensure quality of data and information (e.g., accuracy, completeness, consistency, clarity, currency, relevancy, timeliness)
Integration	Virtual electronic health record Middleware Integration broker	Provide access to data Facilitate data exchange between heterogeneous systems

Trends	Examples of eHealth Solutions	Purpose
	Messaging system Enterprise application integration system	Integrate systems at different levels e.g., network, data, application level
Security	Security tools Persistent security	Protect systems and networks through providing security services e.g., authentication, authorization, auditing Protect data, information, knowledge in the environment where security services may not be available

Table 1. Examples of eHealth trends and solutions

managing emergencies and disasters, mobile telemedicine, appointment reminders, community mobilization and health promotion, treatment compliance, mobile patient records, information access, patient monitoring, health surveys and data collection, surveillance, raising health awareness, and decision support systems. According to mHealth document [12], mobile phones are used to call a call center, emergency calls, medical consultations but not for health promotion or decision support or surveillance in developing countries. In case of disaster, they will use mobile phone or toll free call. As they move forward with mHealth, it is a vital importance to establish a policy for protecting privacy and security of health data [13].

According to Paré et al. (2011), implementation of mobile device with customized homecare nursing software helped to structure and organizes the nursing activities in patients' homes. There were 137 homecare nurses and they were asked to complete a structured questionnaire and 101 had completed (74% response rate). The nurses reported significant level of satisfaction with the quality of clinical information collected. A total of 57 semi-structured interviews were conducted and most nurses considered the software to be user friendly. A questionnaire was mailed out to approximately 1240 patients and 223 patients responded. They reported that nurses who used mobile computing device during their home visits seemed to manage their health condition better and provided superior homecare services. The use of mobile computing had positive and significant effects on the quality of care provided by homecare nurses.

4. Disaster recovery plan

As we move forward with the ICT supported healthcare, we must ensure the security, integrity, business continuity and recovery of healthcare data and services after a disaster, either manmade or natural. Advancement of technology and adoption of ICT solutions have contributed to escalating amount of digital data in business and public sectors. It is quite common for health care to be affected by earth quakes, fire, floods and severe storms in resource rich counties.

EHealth/ Telehealth networks can be destroyed or disabled in few seconds by natural disasters like in Japan. Numerous natural disasters such as tsunami, hurricanes, earth quakes, ice storms, tornados, forest fires or floods can significantly affect people's ability to access basic necessities, such as food, shelter, and healthcare regardless of economic status of the country. In addition, there are numerous active wars and battle zones around the world where basic livelihood have been threatened.

Over the past decades there has been a substantial increase in the number of people affected by disasters and the subsequent socio-economic losses. In 2007, 414 disasters resulting from natural hazards were reported. They killed 16,847 people, affected more than 211 million others and caused over 74.9US\$ billion in economic damages. Last year's number of reported disasters confirmed the global upward trend in natural hazard-related disasters, mainly driven by the increase in the number of hydro-meteorological disasters. In recent decades, the number of reported hydrological disasters has increased by 7.4% per year on average. (Annual Disaster Statistical Review: Numbers and Trends 2007, Center for Research on the Epidemiology of Disasters).

Therefore, disaster recovery should be an integral part of planning, development and adoption of ICT solutions in health. It is not a matter of if, but when disaster is going to happen. It is essential to have a policy and a disaster recovery plan for eHealth

An example of such as a policy has been developed by eHealth Ontario (2009) which states;

"Business continuity management processes must be implemented to identify and limit to acceptable levels the business risks and consequences associated with major failures or disasters, considering both the disruption of eHealth Ontario services and the capability and time to resume essential operations.

The potential consequences of disasters, security failures, and service disruptions must be analyzed to determine the criticality of services and supporting IT infrastructure components.

Integrated plans must be developed, implemented, and tested to ensure that all critical business services are maintained or can be restored on a prioritized basis, to an acceptable level and within the required time-scales, in the event of failure. Business continuity commitments for critical services must be incorporated into Service Level Agreements with clients. Disaster Recovery plans should be tested annually.

Contingency plans must provide for the following [13]:

- timely restoration of service disrupted by a failure within a system, process, or function
- emergency recovery of service at an alternate location in the event of a disaster or prolonged outage at the primary site
- limited recovery of critical services in the event of major loss of staff."

The mission of the Organisation for Economic Co-operation and Development (OECD) is to promote policies that will improve the economic and social well-being of people around the world. The OECD provides a forum in which governments can work together to share experiences and seek solutions to common problems such as healthcare.

As identified by the OECD, there is "an absence, in general, of independent, robust monitoring and evaluation of programmes and projects" [14]. In this context, there is a very real need to benchmark for the first time in a consistent and comparable manner eHealth deployment, take-up, and impact in hospitals across the EU27.

The OECD [15] has used a case study approach to explore the various handicaps, incentives, enabling of secure exchanges of information, and the use of benchmarking in relation to eHealth with an aim to determine which practices can improve the adoption and use of ICT. It undertook six case studies, three of which were in Europe (the Netherlands, Spain and Sweden). Internationally, it also explored the situation in Australia, Canada and the United States of America (USA). This study therefore plays a vital role in discovering the eHealth deployment, take-up, and impact in hospitals across the EU27.

According to eHealth Benchmarking III [16] was prepared based on the result of survey conducted by Deloitte, in association with Ipsos Belgium and with the support of Diane Whitehouse of The Castlegate Consultancy, on behalf of the Information Society and Media Directorate-General European Commission (EC).

They had surveyed 906 acute hospitals; targeted Chief Information Officers (CIOs) in all the hospitals and Medical Directors in 280 of the hospitals: CIOs were asked about the availability of eHealth infrastructure and applications in their hospitals; whereas Medical Directors were asked about priority areas for investment, impacts and perceived barriers to the further deployment of eHealth. The survey was carried out in 2010 in all 27 Member States of the European Union (EU) and in Croatia, Iceland, and Norway [16].

Their method of data collection and analysis were clearly stated and processes of cross validation were included within and between the questionnaires for the Medical directors and CIOs. Within this study, they have inquired about their disaster recovery plan for the acute hospitals in EU.

Disaster recovery implies the ability to recover those mission-critical computer systems that are required to support the business's continuity – in this case, the business is the hospital. There were more than 80% of the hospitals have an enterprise archive strategy for long-term storage and disaster recovery.

Enterprise archive strategies relate to "a comprehensive information archiving strategy aligned with an organisation's goals and performance needs.

All the hospitals surveyed in eight European countries (Austria, Croatia, Cyprus, Denmark, Estonia, Iceland, Norway, and Sweden) have an enterprise archive strategy for long-term storage and disaster recovery. The similar trend exists in Belgium, Germany, Spain and the UK. However France and Italy are both below the EU+ average. Of the hospitals that have an enterprise archive strategy, for most of them it is driven by the hospital's own strategy. Only in a few hospitals is it driven by national or regional healthcare IT programmes. "IBM - Information Lifecycle Management Services - Enterprise Archive - North America." [17].

Many of the hospitals in EU are operationalizing the disaster recovery plan within the hospital except Denmark, Ireland and Sweden are the only three countries where the strategy is driven by either regional or national health care IT program more than by the hospital's own strategy.

Due to the nature of the service, it is essential to restore hospitals' critical clinical information. In EU, almost half the hospitals' critical clinical information system operations can be restored within 24 hours in the event that a disaster were to cause the complete loss of data at the hospital's primary data centre. However, 10% of hospitals say that this can only be done in less than one week. Shockingly, 1% says that it would take up to a month and, even worse, in another 1% of hospitals it would take more than a month.

Immediate recovery is possible in more than half of the hospitals in Luxembourg and Sweden. More than nine out of ten hospitals in Austria, Bulgaria, and Sweden would restore data immediately or within 24 hours. The response time is longer than 24 hours for more than half of the hospitals surveyed in Finland, Greece and Norway.

5. Conclusion

EHealth/Telehealth will continue to evolve with advances in ICT, information science, medicine and biotechnology. The new generation of healthcare providers and patients will be far more comfortable with new technologies, new applications and services, and innovative service delivery methods. There is also a growing recognition that eHealth provides an opportunity for healthcare providers to improve health systems and transform them from the 'Diagnose and Treat' to 'Predict and Prevent' models.

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