

Health Informatics: Improving Patient Care

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Abstract

Health Informatics is the practice of acquiring, studying and managing health data, and applying medical concepts in conjunction with information technology systems to assist clinicians in providing better healthcare. Health informatics, on the other hand, isn't just about making healthcare more efficient. Health technologies are also being employed in life-saving research endeavours. Patient care is one of the most important methods to measure success in the healthcare industry. This statistic is critical for verifying that present methods and procedures are effective and identifying those that are not and should be changed accordingly. It is often defined as the achievement of care goals — from both a provider and a patient perspective. Measuring patient outcomes yields vast data sets that can be utilized to enhance outcomes in a variety of ways. In this process, health informatics can play a crucial role. Professionals may use data to improve processes, identify at-risk patients, increase efficiency, and promote research, all in the pursuit of better patient outcomes, by correctly collecting, evaluating, and utilizing these numbers.

Keywords: Health Informatics, efficiency, patient care

1. Introduction

Technology is a rapidly changing field. The technology of the early 1980s compared to now is vastly different. People in those days would never have predicted that technology would advance to the point where it is now. Today, people can buy even at home through online shopping, at home internet transaction, working even at home, searching all information using the internet etc. Having said that, nowadays, evolving in the technologies influence most of the industries, including healthcare industries. Changes or updates to procedures and methods are constant in the healthcare industry. One of the criteria for determining whether or not a medical professional is competent is whether or not he or she is up to date on current technologies. In medicine, data analysis and monitoring are critical for research, monitoring, and evaluating the performance of medical people or departments. Data can also be used as an indicator to identify any flaws in the existing technique for the goal of improvement and, most significantly, to improve the patient's quality of care. As a result, one of the main areas in which every medical professional must be knowledgeable is information technology.

Health informatics is “a discipline at the intersection of information science, health care and computer science. It deals with the devices, resources, and methods required to optimize the collection, storage, retrieval, and communication of health-related data” (Health Informatics, 2013). It is a collaborative and complex system that involves records systems,

clinical teams, medical technologies, health information exchange standards, as well as portable medical devices for health data collection (Zhuo Xu, 2019). In other words, healthcare informatics is where healthcare and technology meet. It is the combination of art and science of using technology to collect and utilize data to improve the patient's care and to support research and developments in the field of healthcare. (History of Health Care Informatics from 1949 to the Present, 2018)

Technically, health information systems (HIS) is a broad and diversified system. It was classified into a specific database system that provides optimum services for the benefits of healthcare personnel and the patients entirely. Consequently, HIS has several components that assist the healthcare personnel. The components are Clinical Information System (CIS), Financial Information System (FIS), the Nursing Information System (NIS), Laboratory Information SYSTEM (LIS), the Pharmacy Information System (PIS), the Radiology Information System (RIS) and Picture Archiving Communication System (PACS). These systems can be intertwined with each other to produce desired data on fulfilling the various user demands (Ismail, Abdullah, & Shamsuddin, 2015)

In truth, the development of health informatics started in the 1950s with the rise of computers (Health Informatics, 2013). In the United States of America, Robert Ledley invented the first full-body CT Scan, credited as one of the founders of U.S informatics. Apart from the CT Scan, he also involved in the first use of medical computerization in his dental projects at the United States of America (The history of health informatics, 2011). In the United Kingdom (UK), by mid-2000s, UK Council of Health Informatics Professions created eight critical constituencies within the domain of health informatics: communication and information technologies; information management; health records; knowledge management; health informatics service and project management; clinical informatics; education, training, and development; and research (Health Informatics, 2013).

Historically, for the data management system in Malaysia healthcare system, during pre-independence, health information was recorded and documented by the medical department and then submitted to Medical Department Headquarters to prepare an annual report. Between 1948 to 1962, the Ministry of Social Welfare was the responsible body to manage such data (Ministry of Health, 2013). Post-independence, in 1963, after the formation of Malaysia, Ministry of Social Welfare were merged to become Ministry of Health (MOH), and now after several evolutions, in 2007, Health Informatics Centre (HIS) was established, responsible for Malaysia health data management, publication and dissemination (Ministry of Health, 2013). Now, MOH has started working on the Malaysia Health Data Warehouse (MyHDW) project since 2010. It is a concept of the standardization and integration of health data from a variety of sources (Ministry of Health, 2017). It provides ad-hoc query analysis, dashboarding for visualization of data, statistics and predictive analysis, geographic information system and Myharmony, that manage unstructured textual data to generate analytics reports (Ministry of Health, 2017)

The establishment of the hospital information system (HIS), which aims to provide good healthcare to the public, is one of MOH's initiatives to merge this medical innovation with better use of technology. (Ahmadi H. et al. 2017). It is a systematic hospital Information System (IS) that helps to ensure faster, manageable and efficient hospital services to overcome several problems faced by the public hospitals in Malaysia (Ismail N. I. et al., 2015)

2. How health informatics transforming healthcare?

2.1. Financially Savings

Every year, the expense of healthcare rises. Healthcare in the United States (US) cost roughly \$27.2 billion in 1960, but it has ballooned to \$3.3 trillion in 2016 after 56 years. Healthcare is not only expensive; it is also inefficient. It's because, unlike other economic sectors where competition and other economic incentives drive people to decrease waste and expenses, none of the stakeholders in the healthcare system have strong incentives to do so. Repeat operations, lags in care, failure in care or delivery, and other factors are estimated to account for about half of all medical expenses. Health informatics can minimize waste by improving communication, delivering care faster, reducing errors, and driving efficiency where there was previously a lot of inefficiency and hindrance. Health informatics can help to reduce medical errors by taking out many labour-intensive tasks by health care workers. When this practice is automated, the healthcare business and patients will save a lot of money. The frequency of repeat tests or blood tests will be reduced as a result of the use of Electronic Medical Records (EMR) in health informatics, as EMR allows the clinician to access the tests and records that have been performed on the patient. However, it should be noted that the high cost of EMRs can be a significant deterrent to their adoption.

2.2. Shared Knowledge

During their illnesses or hospitalizations, almost all patients see many health care providers. Previous paper-based records made maintaining a patient's prescriptions difficult because all of these medical records from physicians, specialists, laboratories, pharmacists, radiologists, and hospitals were not unified.

EMR systems, on the other hand, make managing patient records easier and more secure. They do not need to describe their past medical history during the stress of medical treatment, and parents do not have to worry about forgetting paediatrician names or losing immunization records when they relocate. Health care providers can also see all of the patient's previous treatment and investigations from other health care providers. Rather, when the health care professional arrives at the facility, he or she already has all of the patient's medical information from the EMR system. This will also benefit patients because they would not have to carry their medical documents with them everywhere they go. Health care providers always need to update their knowledge and sharpening their skills thus there's a reason why medicine is referred to as a "practice". Health informatics gives an access on knowledge about patients, diseases, treatments, medications, and the like to be more effectively shared. As the information is communicated between health care providers and patients, the practice of medicine gets better and give benefit to everybody within the chain of medical care, from hospital administrators and doctors to nurses, pharmacists and patients.

2.3. Patient Participation

In health informatics, when patients were given access to their own health history and recommendations, it give them power to take their role in their own health care more seriously. Patients with access to their care portals can better educate themselves about their diagnosis and prognoses while also keeping track of their meds and symptoms. They can also communicate more easily with doctors and nurses, which can lead to better outcomes. Patients can feel like they are an important part of their own health care team because to health informatics.

2.4. The Impersonalization of Care

Patient-centered care is specifically defined as "care that is respectful of and responsive to individual patient preferences, needs, and values. The area of health informatics has grown in recent years to focus on how information is gathered, stored, and used in health care, with a special emphasis on technology.

Health care providers have a difficulty in engaging their patient in their health when the patient is away from the hospital/clinic setting. With the introduction of portable health devices such as smartphones and wearables, we can discover new ways to monitor serious illnesses at home, remind patients what they can do to improve their care, and motivate people in fun ways to prevent illness through good health habits or to manage chronic illness before its effects become out of hand. The end result is highly personalised consideration. Apple Watch and Fitbit, for example, can now monitor heart rate, blood pressure, and even read an electrocardiogram. It's excellent for keeping track of a patient's health. Nonetheless, there is a complaint that when health practitioners use information and technology to approach patient care, human interaction between healthcare practitioners suffers. Rather than a doctor getting to know a patient in real time and space in order to provide the best care, the focus of "knowing" is on data and algorithms.

2.5. Increased Coordination

Management of a patient sometimes will involve multiple health professional such as specialist from different discipline, nurses, pharmacist, physiotherapist etc. In order to give the best treatment to the patient, all the team members need to communicate not just within the hospital, but across multiple facilities.

Nowadays, health care is getting increasingly specialized, which implies most patients get treatment from many different people in one hospital stay. This multi-disciplinary approach in medical treatment will requires more coordination, and thanks to health informatics that provides the way forward. During the hospital stays, patient will undergo a lot on treatment/ intervention/ investigation and therapies such as pharmaceutical concerns, blood levels, nutrition, physical therapy, x-rays, discharge instructions etc. It is really amazing to think that how many different discussions a single patient may have with a team of people regarding his/her illness, and unless those discussion and efforts are made together with one another, issues will emerge and care will suffer if there is no coordination. Health informatics makes the essential coordination possible in order to get the best treatment for the patient.

2.6. Improved Outcomes

The most important manner by which informatics is changing health care is in improved outcomes. Because integrated teams provide better diagnosis and reduce the likelihood of medical errors, EMR results in higher quality and safer care. Doctors and nurses can improve their efficiency, allowing them to spend more time with patients. Hospitals, clinics, health care professionals, consumers, insurance companies, and governments will all profit from the computerization of previously manual occupations and processes, which saves time and money.

Health care is undergoing a huge transformation as a result of technological adoption, and health informatics is assisting in ensuring that this transformation results in increased efficiency, coordination, and improved care. It's crucial to remember that computers alone do not increase the quality of health care provided in a clinic or hospital; instead, doctors, nurses, pharmacists, and other health care workers work together to do so. However, strong information systems and the analysis based on them can help health-care practitioners improve the quality of their services. Chronic disease represents for 90 percent of health-care costs and also cause of individual suffering and morbidity. Clinical informatics systems allow the health care providers and health systems to discover patients who have significant medical problems but have had difficulty maintaining their care for a variety of reasons. This capacity gives health care providers the information that they need to reconnect with their patient and provide the necessary education and support systems to get patient's serious health problems under control.

For examples, the EMR can be programmed to create a list of hypertensive patients with poor blood pressure who have not attended appointments in the last four months. By generating this list, the health care practitioner can then reconnect to their patients and intensify their care to prevent downstream complications. Additionally, the data that is accumulated as part of routine care can be used to identify patients who may require screening tests or other preventive procedures, sending them and their doctor's reminders that it's time for their mammogram or a needed immunization. EMRs can also ensure that patients receive the correct medication the first time around, reducing the risk of allergic responses to antibiotics or other medications. If the technology detects harmful interactions with a prescription that the patient is currently taking, it can alert doctors before prescribing a certain drug. These systems have the potential to eliminate human oversight from the situation. One systematic review of 28 trials discovered evidence of improvement in physician performance. The authors also concluded that there is strong evidence that computerized decision support can improve physician performance but that additional well-designed studies are needed to evaluate their effects and cost-effectiveness, especially on patient outcomes.

2.7. Make clinical research more accessible to more patients

In Malaysia, clinical research is frequently conducted with a moderately modest number of patients affected by a given disease at that particular hospital/clinic. Health care providers need to find out whether the treatment works before offering it to all patients. Despite the fact that many patients want to participate in clinical research, getting information to patients and their doctors with respect to a chance to participate in a study has been troublesome. EMRs, through digital diagnostic codes, can recognize patients affected by specific medical issues who may respond to a new treatment or service. By allowing a bigger, more diverse group of patients to participate in a study, if they wish, we will quickly and efficiently know what helps people in real-world settings and what helps those who are historically less represented in research studies.

2.8. Computers don't lose data

This is an issue that we today overlook, but prior to the broad adoption of EMRs, clinicians in almost every setting were often unaware of the patient's previous treatment when they met with them for the first time. Up to 10% of visits were directed in this direction. The patient's case note could be on its way to the hospital, another doctor's office, or a storage facility. The floods in Kelantan and Pahang in December 2014 resulted in the loss of all medical records.

Practicing medicine with restricted data is wasteful and may harm the patient since tests may be unnecessarily repeated, and can be dangerous if the doctor doesn't have access to information such as past surgeries or prior side effects from medications. Utilizing an EMR creates a history that cannot be lost.

3. How health informatics can improve patient's care

Health informatics can give a positive effect on a patient's care, such as:

3.1 As a tool to improve care towards a patient in the rural area

Malaysia is unique because of the high demographic diversity gap between urban and rural area. Access to healthcare in Klang valley is might not be as same as in Gua Musang in Kelantan or Tawau in Sabah. Adverse consequences with difficulty accessibility to healthcare are regarding loss of patient for follow up. With the combination of information system (health informatics), telecommunication and multimedia technologies, healthcare service can be delivered to the patient (Mat Som M. H. 2010), rather than old school pattern, which is patient to the healthcare facility. This term is known as a Telehealth. Telehealth defined as the use of telecommunications and virtual technology to deliver health care outside of traditional health-care facilities. (World Health Organization, 2019)

MOH of Malaysia is actively supported this telehealth concept in Malaysia to become a reality. Malaysia's Telemedicine Blueprint was launch at 1997 with the objectives to strengthen the healthcare delivery via the use of telecommunications, information and multimedia technologies (Mat Som M. H. 2010). Of course, there will be opponents and supporters for each move or endeavour. Opponents may argue that this notion is impossible to implement in Malaysia due to inadequate internet access in rural areas. Another issue is that patient safety may be jeopardised since healthcare professionals provide services without having the patient physically present to do a thorough physical examination. Overall, this telehealth concept (with health informatics as one of the components) is useful in reducing costs for patients and healthcare providers, reducing time spent treating patients, and improving patient accessibility. However, internet coverage in rural areas must be improved, patient and healthcare provider education must continue, and most importantly, the Ministry of Health must issue clear guidelines regarding procedure, patient selection, and more.

3.2 Improve healthcare efficiency in government hospitals

Malaysia healthcare system is divided into public and private hospital. Other than MOH, Ministry of Education and Ministry of Defense also provide healthcare services, such as University teaching hospitals and army hospitals (Selim Ahmad, 2017). Compared to a private hospital, number of patient in a public hospital is higher compared to private hospital. Health Minister did comment, the current number of civil servants is inadequate and public health facility in a needful stage to increase the number of staff (Nur Aqidah Azizi, 2019). This condition becomes worse with less of other resources, such as equipment, space etc. in the public hospital compared to the private hospitals. Previous statement can be proved with often we heard complaints from the public that service in public hospital is slow and ineffective (Mohd Khairie Khalid, 2019). Thus, I opined, one of the solutions is by utilizing the use of technology, which is health informatics.

According to Ismail N. I. et al. (2015), systematic hospital Information System (IS) helps to ensure faster, manageable and efficient hospital services. Yes, agreed, even service in the HIS public hospital also facing the same problem even though it is already HIS hospital, but at least it contributes to the improvement in the efficacy in delivering service to the patient. Factors contributing to the delay in the service did not only lie on the technology used by that hospital itself, but factors that contribute more is about the unbalanced ratio of the total number of patients compared to the number of healthcare professional. Imagine, this issue will become more worse without the technology used.

3.3 Helps researcher, policymakers to obtain more useful data to use in medical research and drafting a policy

As mention earlier, medicine is an area that evolved rapidly. The aim of changing is to improve the care towards the patient with the new invention. Because of that reason, medical research is one of the essential areas of medicine. Data used in research can be classified as primary, which is data is collected by the researcher or by secondary data, a previously gathered data and can be accessed by researchers (Margaret Rouse, 2017). With health informatics, it will encourage more researcher to conduct a study by using secondary data. Health information technology is a tool to standardize data and enhance accessibility (Katherine Bell, 2018). In other words, it will help the researcher to conduct a study with a large sample, broadened the scope of the study and conducted a research project in less time-consuming. In the end, the result of the study will benefit the patient directly.

Apart from research, standardize data will be useful for other parties. This data is an excellent resource for policymakers, researchers, insurance company and innovators (Katherine Bell, 2018). Many guidelines, policies, and regulations can be established by MOH policymakers using the data generated from this health informatics system. Not only that, but senior management may be informed about specific information in a specific area/healthcare facility at a certain time; this is the beauty of technology when properly applied.

3.4 Health informatics influence specialty in the medical area in delivering a service to a patient

Health informatics influence most of the specialist in medicine. According to Simon A. F. et al. (2019), for radiologist specialist, informatics solution has proven effective at improving issues undermining radiologist engagement levels and reduce the burnout symptoms. It helps the radiologist to generate reports, reduce interruption and delays by automating the protocol process for routine cross-sectional imaging studies, such as contrast or non-contrast CT Scan (Simon A. F. et al. (2019).

For nursing, nurses around the world are being asked to use health informatics technologies in long term care, acute care, home care, and community settings (Borycki E. M. et al., 2014). As a result, nurses graduating from university or college undergraduate programs with nursing informatics competencies are in higher demand, according to the same

article. The purpose of this study was to compare the healthcare informatics proficiency of undergraduate nurses in Australia and Canada. Perhaps the nursing standard in Malaysia has not yet reached that level, but in 5 to 10 years, health informatics may become one of the most important aspects of the nursing curriculum.

Laboratory service is an area that health informatics helps a lot in improving the health service to the patient. It achieved optimal test utilization practices and eliminated improper practices (Hassan A. A. et al., 2017). Healthcare facilities that used health informatics in the laboratory service give an advantage to the medical personnel. It helps a lot in term of reducing time-consuming, easy for reviewing during follow up in the clinic, and also easy for monitoring the progress of the patient; especially in infection cases, trend of the blood result is necessary for monitoring the progress of the patient. In contrast, even health informatics is proven to give many benefits, the study by Filipec M et al. (2019), to access attitude of Croatian physiotherapist towards an electronic health record shows differences in the acceptability status. The reason for some physiotherapist not satisfied is because that most physiotherapists in Croatia do not use computers (because they do not have them) in everyday work, and the use of new technologies causes discomfort, dissatisfaction and reduced readiness to accept. The major factor contributes to the medical profession reluctant to use the health informatics is because of the same problem faced by Croatian physiotherapist. In the end, the necessity of education to improve computer skills and raise the motivation for using computers in daily clinical work is suggested to tackle this issue.

3.5 Enhance patient autonomy and patient's right in getting the information

Health informatics not only benefit healthcare provider to delivered healthcare services towards a patient but also benefit from the user side (patient). Nowadays, information about the disease, statistic and prevalence will be put online for the public information. It will enhance the patient's right in getting information and will enhance the patient's autonomy to choose if needed. Information about the quality of care provided by health care organizations is increasingly available to patients online, and it will be enabling transparency (Gann B., 2010). Because of this situation, a patient today already has some information in their mind while seeing a doctor in the healthcare facility. It is a good evolution, task of medical personnel to disclosed information will be easier, and it enhanced two-way communication between the medical personnel and the patient. In England, the NHS Choices website provides a comprehensive portal for patients. There is also evidence of the positive impacts of online health information and tools on behaviour change towards healthier lifestyles (Gann B., 2010). Because of less time consuming to generate data, task MOH to update and put in the website, Facebook or any online media become more efficient. It will also be able to educate the public, and one of the aims by MOH to tackle disease in the prevention stage will become easier.

4. Conclusions

In conclusion, the emergence of technology and knowledge will be improved significantly by the application of Health Informatics, which permits the access to the knowledge at the right time and place via pervasive computer networks and wireless connections to the Internet. The advancement of the systems has opened the entryways for health authorities to look into it, and the utilization of this technology brings benefit of the patients. Health informatics provides instruments for controlling healthcare processes, acquiring medical knowledge, and communicating information among all persons and organizations involved in the industry. Health informatics should assist healthcare professionals in providing better and more cost-effective care, as well as allowing the healthcare system to become more efficient and adapt to the needs of our patients. Health informatics has the potential to transform the way we deliver care in the future to meet future demand. Without a doubt, health informatics benefits both users, such as patients, and healthcare providers, such as medical professionals.

However, when implementing health Informatics, we must evaluate the hurdles to IT acceptance and adoption in order to increase patient safety and treatment quality. This includes the acceptance of new technology by health care professionals and patients, the cost and return on investment, time management and efficiency, and the creation of an efficient plan to overcome these obstacles (P. Aspden and the US Institute of Medicine, 2004). Every system is distinct, with its own set of strengths and flaws. It is critical to ensure that the Health Informatics System functions properly and efficiently after it is established. Researchers, public health practitioners, informaticians, and technologists must collaborate in health informatics and digital health to adapt to the implementation of science and community engagement in our collective mission to eliminate health disparities in the uncertain climate of national health care reform. With improved access to patient data, work becomes more efficient and time-consuming, allowing for faster clinical judgments.

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