REVIEW ARTICLE

Development of Information Technology in the Field of Dermatology

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Abstract

In many ways, medicine, and specifically dermatology, is practiced in much the same manner today as in centuries ago, but more recently, dermatologists have been facing enormous changes in the way they perform their profession and much of this is a result of a fundamental change in the manner in which information is exchanged through information technology. With the advent of more advanced telecommunications, imaging capabilities, information transfer, and management options, dermatology, as with many medical fields, is facing new opportunities and challenges. Therefore, the need for integration of new events throughout information technology seems to be necessary. This article determines the effects of health information technology (HIT) on mainly two important aspects: quality and efficiency, and indicates that HIT system substantially improves health care quality and efficiency. This article also identifies advanced types of these information systems in dermatology field. There are challenges to HIT's adoption and unfortunately, in opposite to the developed countries, investing in technologic affairs mostly has been neglected in the developing countries. Therefore, we have suggested some recommendations for the improvement of these information systems. *(Iran J Dermatol 2008;11: 118-122)*

Keywords: health information technology, dermatology, information systems

Introduction

We are currently in the information age. In part, this means that information is recognized as a commodity with value. As part of the information age, an explosion of information technology (IT) is transforming the workplace[1].

In many ways, medicine, and specifically dermatology, is practiced in much the same manner today as in centuries past: a patient presents to a physician, a history is obtained, a physical exam is performed, an assessment is made, and treatment is recommended. Of course, the level of complexity of each of these steps has changed dramatically. More recently, however, dermatologists have been facing enormous changes in the way they perform their profession: procedures by which patients are examined, diagnoses are developed, and treatments are planned. Much of this is a result of a fundamental change in the manner in which information is exchanged through information technology. With the advent of more advanced telecommunications, imaging capabilities, information transfer, and management options, dermatology, as with many medical fields, is facing new opportunities and challenges[2]. In fact, due to intricacy in modern medicine, information technology has gained more importance in health organization management[3]. Therefore, the need for integration of new events through information technology seems to be necessary. This article aims to determine the effects of health information technology (HIT) on mainly two important aspects: quality and efficiency, also to identify advanced types of these technologies to dermatologists. This article will review many of the ways information technology is changing dermatology, both those that have already arrived and those rapidly approaching.

Effects of health information technology

Several studies that were performed (in November 2003 and January 2004) by Agency for Healthcare Research and Quality (AHRQ) demonstrated that the major effect of health information technology on quality of care was its role in increasing adherence to guideline-or protocol-based care and on decreasing medication errors by improving medication dosing. Decision

support systems, usually in the form of computerized reminders, were a component of all adherence studies. Improvements in processes of care delivery ranged from absolute increases of 5 to 66 percentage points through using these systems[4].

These systems assist the physician in selecting the correct medication and other testing (i.e., therapies) based on real-time clinical information, as well as ordering the correct medication, dose, route, and time for each patient[5]. According to experts' opinions, using the IT is a suitable approach to having access to timely information and to improving the relationships and patients safety through decreasing medication errors[6].

Studies relating effects to efficiency are performed in two ways: utilization of care and provider time. Regarding the effect of HIT on utilization of care, one large study from Tierney and colleagues examined direct total costs per admission as its main end point and found a 12.7% absolute decrease (from $6964 to $6077) in costs associated with a 0.9-day decrease in the length of stay[7]. The effect of health information technology on provider time showed slight decreases in documentation-related nursing time[8,9] that were due to the streamlining of workflow. One study examined overall time to delivery of care and found an 11% decrease in time to delivery of care treatment through the use of computerized order entry with alerts to physician pagers[10].

Challenges to Adoption of HIT

Each of these technologies requires a significant initial financial investment by the provider or the health system in order to purchase and maintain the systems and to train users[11]. But the Department of Health and Human Services (HHS) estimates that as much as $140 billion per year could be saved through adoption of HIT by reducing duplicative care, lowering healthcare administration costs, and avoiding medical errors[12].

On the other hand, in the absence of internal IT capabilities, health-care organizations have relied heavily on the fragmented IT vendor market in which vendors do not offer an open architecture, and are unwilling to offer electronic interfaces that would make their 'closed' systems compatible with those of other vendors. They are hamstrung as a result because they have implemented so many different technologies and databases that information stays in silos[3].

Advanced Information Technology in Dermatology Area

Digital Imaging Systems

Photography has proven itself to be a valuable aid in many aspects of medicine including dermatology. Dermatologic care, research and publishing have enhanced through the use of images. Dermatology pictures are also the basis for teledermatology (telemedicine), are sometimes requested by insurance reimbursement plans and are used throughout medical education[13]. Also accurate diagnosis is possible using clinical information supplemented with photography[14].

Digital technology has modified the concept of photographic recording[15]. A digital photo is a row of color matrixes electronically stored in a screen unit as a computer monitor. Most important features of a digital photo are sharpness and resolution, also success of a digital photography more depends on the color and light of environment[16].

Revolution has occurred in photography with the development of digital cameras and, even more recently, with the advent of digital epiluminescence microscopy (DELM) or digital dermoscopy[17,18].

Not only may cosmetic and surgical outcomes be documented with high-resolution “before” and “after” pictures, but there are now multiple digital imaging programs that allow surgeons to show prospective cosmetic surgery patients digital preoperative images and then manipulate them to illustrate possible surgical outcomes[19]. The current available software also allows for coordination of text and image files, thus giving the dermatologist the ability to generate letters to referring physicians with pre- and postoperative photodocumentation, as well as maintaining more complete patient records[19,20]. In fact, several reports indicate that appropriate utilization of digital imaging for cosmetic surgery patients may actually reduce medico-legal liability[21].

Electronic Dermatology Record

Due to increasing demands for patients' records, changes have been occurred in health delivery organizations. Physicians and other clinical personnel need medical records for data collecting, problem recording, clinical systematic planning, patients follow up, access to clinical history information, cooperating in care evaluation and planning and decision making. On the other hand, patients' information is used for genetic follow-up, legal supplies and others. However, reliance upon paper_ based records and hand retrieving of

information is very expensive and may cause complexity of data[22].

Therefore, the movement to new patterns of electronic information recording generally named Electronic Health Record (EHR) seems to be very necessary, specially in dermatology that deals with diagnosis of over two thousand conditions affecting the skin, and contributes to other specialties by identifying cutaneous manifestations of systemic diseases[23], and images, data and information transfer play an important role in dermatology diagnosis.

The following lists the expected benefits of the implementation of EHRs:

- supports patient care and improve its quality;
- enhances productivity of health care professionals and reduces the administrative costs associated with health care delivery and financing;
- supports clinical and health service research;
- accommodates future developments in health care technology, policy, management and finance; and
- ensures patient data confidentiality at all times[24].

The advanced systems as clinical decision support system (CDSS) and Order Entry inserted in EHRs guarantee more utilization of these technologies.

Clinical decision support system is software that is designed to be a direct aid to clinical decision-making, in which the characteristics of an individual patient are matched to a computerized clinical knowledge base and patient-specific assessments or recommendations are then presented to the clinician or the patient for a decision. This knowledge base is formed of up-to-date evidence and therefore the use of CDSSs facilitates evidence-based medicine and so promises to substantially improve health care quality[25].

Teledermatology

Telemedicine is defined as the delivery of health care and the exchange of health care information across distances. In general terms, telemedicine is access to specialist knowledge by means of telecommunications and information technology.

Teledermatology is the area of Telemedicine that studies the application of telecommunication and information technology in dermatology practice without the presence of a specialist. It is a potential manner to deliver health planning, research, education, clinical meetings, second medical opinions and dermatological care to populations who cannot easily travel. The evolution, cost reduction and dissemination of telecommunication and information technology have enabled the implementation of low cost and comprehensive teledermatology systems to support clinical practice all over the world[26].

One of the first concepts regarding teledermatology relates to how the system would be used to enable sharing information among remote locations. For this purpose, two types of solutions are developed: 1) store-and-forward 2) real-time[27,28].

1) Store-and-forward: In store and forward systems, also called asynchronous, users do not need to be connected at the same time. A practical and very simple example would be exchange of information about a certain patient between two specialists, which could be made by e-mail or over the web. Such strategic solutions generally give priority to less technological requirements against a larger scope. In the situation of a consultation with a physician and a patient, to give a more specific example, it is possible to provide the necessary and pertinent guidelines for diagnosis, treatment, follow-up and prevention, among other aspects[29].

2) Real-time: In real time systems, also called synchronous, videoconference resources can be used to make a remote consultation, but with one fundamental difference: the consultation occurs in real time, and the interaction between the parts is instantaneous[26]. Several studies have demonstrated that real-time teledermatology using a video link is a feasible alternative to an out-patient appointment but not cost-effective or readily available[30,31].

Conclusion

Health information technology substantially improves health care quality and efficiency, although there are challenges related to it. Among the most important challenges are financial challenges regarding implementation and maintenance, but evidence shows that economic benefits of these technologies are more than their costs[6]. Therefore, the existence of HIT systems in health care organizations is very necessary, especially in dermatology which deals with diagnosis of over two thousand conditions affecting the skin, and images, data and information transfer play an important role in dermatology diagnosis.

In the field of dermatology, we stated three advanced types of information technologies in this article indicating that all of them share one purpose and complete each other.

Generally, it should be said that most parts of health care deliverers and organizations have

moved slowly in HIT's adoption[32], and unfortunately, in opposite to the developed countries, investing in technological affairs mostly have been neglected in the developing countries[33].

Recommendations

- To develop internal IT capabilities that would allow health systems to seamlessly integrate clinical and business IT systems and develop innovative uses of IT
- To educate health information and health care delivery organizations especially on security aspects and information confidentiality and ethical considerations.

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