Health Informatics: A Primer

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Abstract Health informatics uses information technology (IT) to organize and analyze health records to improve healthcare delivery. It is an interdisciplinary discipline that marries information technology with the medical field. It applies information science methods to analyze and understand health care information. It is one of the fastest-growing segments of the healthcare profession today. This paper provides a brief introduction to health informatics.

Introduction

Informatics is an emerging discipline that uses algorithms to improve interpretation and management of information in order to help solve application-specific problems. In our case, the application is healthcare. Informatics is crucial in addressing the challenge of healthcare quality and reducing cost. Health Informatics is the science that uses data, information, and knowledge to improve the delivery of health care services. In 1957, the German computer scientist Karl Steinbuch coined the word Informatik in his a paper called Informatik. The technology boom at the turn of the century has helped informatics to evolve rapidly.

Health informatics (also known as medical informatics or healthcare informatics) is the interdisciplinary field that uses medical data, information, and knowledge to improve human health. Health informatics sits at the junction of two thriving industries: healthcare and information technology. It may be regarded as the science that addresses how best to use information to improve health care. It aims to help health practitioners perform their job better.

Health informatics is perhaps the area where informatics finds the greatest application. This is why medical informatics is often used to encompass all informatics applications. Health informatics is the integration of information technology into all aspects of healthcare information science, from fundamental research to clinical applications. It concerns itself with the cognitive, information processing, and communication tasks of medical practice. It is an interdisciplinary field that applies principles of information science to the advancement of life sciences research, public health, and patient care.

Applications

The subfield or areas of specialization of health informatics include nursing informatics, pharmacy informatics, clinical informatic, bioinformatics, dental informatics, pathology informatics, cancer informatics, radiology informatics, clinical research informatics, computational health informatics, consumer health informatics, public health informatics, cardiovascular health informatics, laboratory informatics, and primary care informatics. How some of these subfields are related is shown in Figure 1 [1].
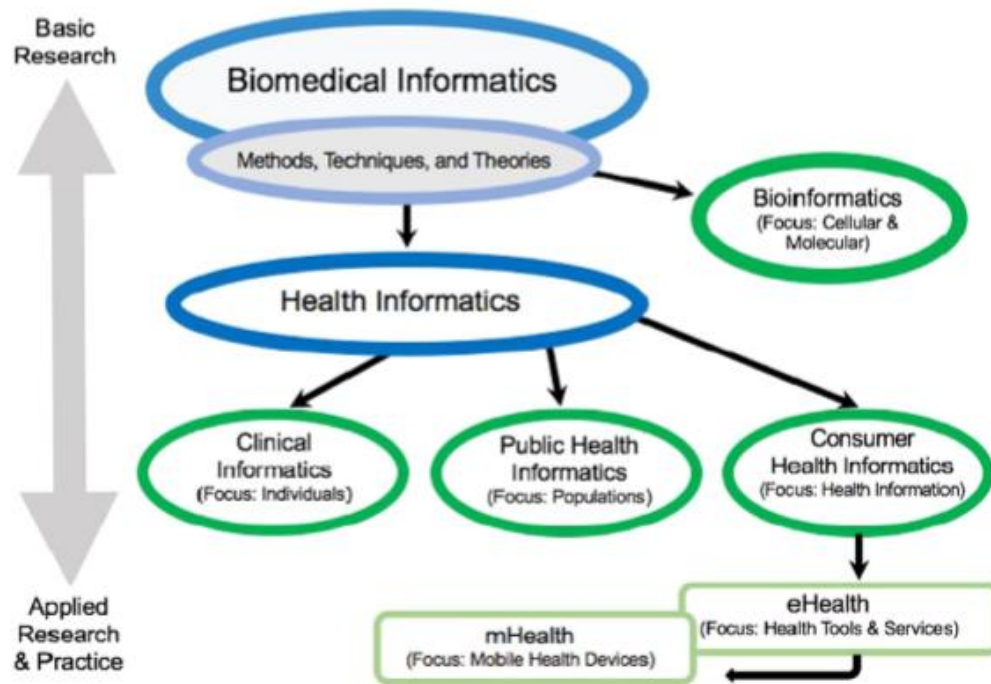
Figure 1: Subcategories of the biomedical and health informatics field [1].

- *Nursing Informatics*: This has emerged as an integral part of health care delivery and a subset of health informatics that deals with the role of the nurse in the healthcare setting. It encompasses nurses' interactions with health IT systems. The combination of informatics and nursing is rich in job opportunities. Nursing informatics is evolving as an educational field in which students can receive academic certificates and degrees [2].

- *Dental informatics:* This is the application of informatics to improve dental practice. Dental informatics shares some research questions and methods with its parent discipline, health informatics. While there is a growing number of trained dental informaticians, dental faculty and administrators are generally not very familiar with dental informatics. In spite of this, dental informatics is contributing to progress in dental practice, research, and education [3]

- *Clinical Informatics*: This involves the use of informatics in a multitude of processes within the clinical setting. Clinicians and patients utilize online portal systems, electronic medical records, and data collection devices [4]. Clinical informatics can be applied in a range of healthcare settings such as hospital, physician's practice, military, and others. A clinical informaticist typically evaluates the existing information systems and recommends improvements to functionality.

- *Pharmacy Informatics:* This uses data to monitor dosing and ensure more accurate and detailed prescriptions from physicians to improve patients' care. It deals with streamlining patient care, while enhancing efficiency and accuracy in the administration of medications. Pharmacy informaticists use their knowledge of medication management to design and develop discipline-specific system.

- *Consumer Health Informatics:* This is the branch of medical informatics that analyses consumers' needs for information. It deals with technologies focused on patients as the primary users to health information. It has as first priority to analyze the interaction between IT and health consumers. It is part of a growing trend toward empowering consumers to be proactive in their health care [5]. It will increasingly be used to facilitate better and faster communication among patients, payers, and health care providers.

- *Public health informatics:* This is the application of informatics in areas of public health, including surveillance, prevention, preparedness, and health promotion. It was introduced in 1995 as a profession

within public health. Its main application is promoting the health of the whole population, not just individuals. It is capable of fundamentally changing public health practice, research, and learning [6]

The diversity of medical informatics creates a wide range of informatics careers. Many health informaticists work in hospitals, clinics, group practices or nursing facilities

Benefits and Challenges

The strengths of health informatics lie in its ability to service the diverse needs of healthcare. Its purpose is to solve practical healthcare problems for researchers, practitioners, and educators.

The three grand challenges for health informatics are improving the recording and organization of patient data, using data in research, and ensuring that the knowledge so gained is used to best effect [7]. Another challenge is the financial investment required to develop, implement, and maintain e-health initiatives.

A basic problem of using the Internet for healthcare is that those who are at highest risk of preventable health problems have the greatest need for information and are the least likely to have access to it.

Medical devices and healthcare systems rely on software that has the tendency to fail.

Because these devices and systems are safety-critical to patients, ethics becomes important. Health informatics ethics deals with ethical behavior required of anyone handling data and information [8]. Creating rigorous, fair requirements for individuals who come from diverse professional backgrounds and desire to specialize in the field of health informatics is difficult.

Conclusion

Health informatics combines information technology, communications, and healthcare to improve the quality of healthcare. Health informatics professionals have argued that all who work in the field of healthcare need some exposure to the discipline since they increasingly use information technology. Professional bodies are also demanding that some elements of health informatics should be integrated into the core curriculum [9].

The future of health informatics careers is bright and the demand is very high.

Health informatics professional who enter this field with a master's or other advanced degree can anticipate salaries that go well beyond the average. Additional information about health informatics can be found in the books [7,10-13] and the journals exclusively to it: *International Journal of Medical Informatics* and *International Journal of Medical Informatics.*

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