



## Clinical Informatics in Physiatry

# Informatics and Technology in Resident Education

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### Abstract

Biomedical or clinical informatics is the transdisciplinary field that studies and develops effective uses of biomedical data, information technology innovations, and medical knowledge for scientific inquiry, problem solving, and decision making, with an emphasis on improving human health. Given the ongoing advances in information technology, the field of informatics is becoming important to clinical practice and to residency education. This article will discuss how informatics is specifically relevant to residency education and the different ways to incorporate informatics into residency education, and will highlight applications of current technology in the context of residency education. How informatics can optimize communication for residents, promote information technology use, refine documentation techniques, reduce medical errors, and improve clinical decision making will be reviewed. It is hoped that this article will increase faculty and trainees' knowledge of the field of informatics, awareness of available technology, and will assist practitioners to maximize their ability to provide quality care to their patients. This article will also introduce the idea of incorporating informatics specialists into residency programs to help practitioners deliver more evidenced-based care and to further improve their efficiency.

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### Introduction

Over the course of the 2014-2015 academic year, there were 9768 residency programs in the United States that provided training to 118,366 postgraduate trainees [1]. Each of these programs was entrusted to not only educate trainees in the arts and sciences of their given discipline but also to impart knowledge on how to practice in an ever-changing world of medicine. Part of the change includes the increasing use of technology and the emergence of biomedical or clinical informatics in the practice of medicine. Every year there are more and more hospitals that transition over to electronic health records (EHRs) and away from paper records. Residents are also exposed to an ever-changing world of technological devices that are becoming even more portable and applicable in day-to-day clinical and scholarly activities. As each wave of portable technology and the associated user interfaces are released, the potential application of these devices in residency training evolves. Residency program directors are now faced with an overwhelming task of providing an education on how to best use available technology in their own system of care.

Biomedical or clinical informatics is the transdisciplinary field that studies and develops effective

uses of biomedical data, information technology innovations, and medical knowledge for scientific inquiry, problem solving, and decision making, with an emphasis on improving human health [2]. The American Medical Informatics Association website reviews how biomedical or clinical informatics incorporates the 4 concepts or corollaries summarized below:

- Develops, studies, and applies theories, methods, and processes for the generation, storage, retrieval, use, and sharing of biomedical data, information, and knowledge
- Builds on computing, communication, and information sciences and technologies and their application in biomedicine
- Investigates and supports reasoning, modeling, simulation, experimentation, and translation across the spectrum from molecules to populations, dealing with a variety of biological systems and bridging basic and clinical research and practice and the healthcare enterprise.
- Recognizing that people are the ultimate users of biomedical information, draws upon the social and behavioral sciences to inform the design and evaluation of technical solutions and the evolution of

complex economic, ethical, social, educational, and organizational systems [2,3].

As the field continues to develop, program directors should incorporate informatics concepts and information technologies into their residency programs. The application of these corollaries in the context of residency education will be discussed in the subsequent sections.

### Relevance of Informatics to Residency Education

As technology continues to advance, there is an increasing role for informatics within residency training. Today, in the digital age, there are more and more technology-based systems in place that physicians and residents are forced to interact with in order to achieve desired patient care goals. Providers are confronted with numerous electronic resources and various methods to interact with digitally stored medical records. Across the nation, multiple systems of care are adopting EHRs. Some scholarly works have documented this transition to EHRs for residency programs [4]. These EHRs tend to be structured in a manner to optimize documentation for billing purposes and not always research-based analysis of medical data.

In addition, residents benefit from using EHRs to improve handing off information in the new world of work hour restrictions. Using electronic handoff tools, components of medical information can be compiled to standardize and simplify handoff communication [5]. This type of communication likely leads to a more efficient and focused verbal communication between teams. This form of electronic handoff also allows residents to update handoff information throughout their day, ideally leading to fewer missed items during handoff communication [6].

Developing along with the increasing amount of digital medical data are a growing number of ways to access electronic clinical practice knowledge. Journals are now widely available on the Internet, and there are an ever-growing number of Web-based reference materials. There are also several national databases for specific disease processes. Model systems in traumatic brain injury, spinal cord injury, cerebral palsy, and stroke collect and store information in nationwide databases to promote medical research, resident education, and evidence-based practice.

How to best integrate the generation, storage, retrieval, use, and sharing of medical patient data and clinical knowledge are likely topics that most residency programs are already tackling. Incorporating informatics and technology based skills into residency training enables program directors to provide residents an education on how to best use available technology in their system of care. "By not doing so, we risk producing a generation of clinicians underprepared for the

changing realities of medical practice brought on by mobile health technologies" [7].

### Incorporating Informatics in Residency Education

Hopefully it has become clear that biomedical or clinical informatics is so much more than information technologies. "Clinical informatics is not simply 'computers in medicine' but rather is a body of knowledge, methods, and theories that focus on the effective use of information and knowledge to improve the quality, safety, and cost-effectiveness of patient care as well as the health of both individuals and populations" [8]. Clinical informatics has become its own subspecialty with board certification. The informatics topics reviewed above were published in 2012, and there are now several different clinical informatics fellowships across the country. In 2013, the first board certification examination was held [8]. As this field continues to develop, program directors are tasked with introducing residents to informatics concepts. In doing so, programs hope to produce graduates who can practice in a changing medical technology landscape.

### Improving Communication

One of the major ways in which informatics can be applied in residency training is through various methods of communication between different health care providers and their patients. Resident-to-resident and resident-to-faculty information sharing has been studied most in the realm of handoffs. In the world of work hour restrictions and shift-based work, handoffs are becoming more and more important to patient safety and safe care delivery. Pennsylvania State University evaluated an electronic form of handing off medical information from the emergency department to the medicine floor. They found that, compared with the former process requiring mandatory verbal communication, 93% of respondents believed the electronic handoff was more efficient, and 61% preferred the electronic handoff. Although authors from Pennsylvania State University did not directly poll the participants as to why they preferred the electronic handoff, they did comment that it was because it seemed to help standardize information contained in the handoff, help to minimize information omission, and helped to prevent the need for an inefficient chart "biopsy" to obtain necessary clinical information [5]. Another group at Columbia University tabulated the frequency with which an electronic handoff tool was updated and noted that teams updated this information throughout treatment days [6].

Some other examples of communication technology in clinical practice settings involve common methods used to communicate by the general public. Outside of clinical settings, texting is a primary way in which our

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