Riding the Medical Technology Wave to Empower Your Career in Medicine

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Medical technology has changed greatly in the last 90 years or so since the inception of this journal. At that time the term medical technology was largely used to describe equipment used in medical practice and, to a much lesser extent, manually-transcribed medical records. Just over 50 years ago, intensive care units came into being that would ultimately generate the need for new medical technology that would enable higher frequency monitoring of many organs and systems within the body. However, around 30 to 40 years ago, medicine and healthcare together with many other industries were beginning to undergo a new form of medical technology transformation through the use of mainframe computers to automate many previously-manual paper based tasks and to provide an electronic form of data persistence. The landscape of the use of computers and related equipment for innovation in healthcare has changed dramatically since then, and the only thing that is certain in the years to come is that medical professionals must be armed with the tools to understand how to integrate new information technologies and other computing technologies to improve healthcare outcomes, improve the working environments for medical professionals, and reduce healthcare costs.

Innovation can take two forms, namely progressive or disruptive. While progressive innovation has the ability to make improvements to existing processes, disruptive innovation completely replaces those processes with new ones. A well-known disruptive innovation was the Amazon.com which forever more has changed the paradigm of the shopping experience for the purchaser, the sale process and customer engagement experience for the seller.

Clinical decision support systems, 3D printing, Serious Games with Immersive Reality and Big Data are four technologies that are set to cause the latest disruptive innovations in the broad domain that is now referred to as health and wellness. Clinical decision support systems refer to systems that 'provide clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care'.[1] While these have been in existence in rudimentary form for over a decade, their functionality, purpose, accuracy, and acceptance is set to accelerate. Additive manufacturing, now commonly referred to as "3D printing" enables the generation of solid objects through the addition rather than removal of the material used in manufacture through use of data representing the required shape of the structure within a digital file. This form of manufacture is set to disrupt healthcare significantly through inexpensive approaches to personalized bone segment replacements and other applications.

Serious games refers to computer games that are used in an educational context rather than for recreational gaming and this form of training is gaining use within the domain of healthcare as it enables inexpensive creation of multiple scenarios and easily supports repetition. The aim of immersive reality games is to immerse any, some or all of the five senses within the game to improve the realism of the game. While games that attempt to immerse players' visual and auditory sensing have been around for some time, new approaches for tactile, olfactory immersion and even taste are set to bring new dimensions to the realism of immersive reality experiences.

The growing volume of sensor-based data and other streams of data such as from social media have given rise to a new domain known as "Big Data". Unlike other forms of data, Big Data arrives in high volume as streams at high velocity or frequency and can be from a range or variety of sources thus enabling it to be usually defined by the attributes of the three foundational V's of Big Data: volume, velocity, and variety. A second by second stream of heart rate data, twitter feeds, weather sensors, data streams and mobile phone location data streams are just a few examples of Big Data. All this data at a personal, community, societal, and/or organizational level has enormous potential to be translated to information, knowledge, and wisdom to improve healthcare outcomes and reduce healthcare costs.

Never before has there been such pressure to ensure the progression of research and discovery along with its translation to practice together with ongoing, independent quality improvement initiatives for improved healthcare outcomes and reduced healthcare costs.

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For newly trained medical professionals set to enter the healthcare sector, together with those already practicing, new skills are required to understand how to practice within such a constantly changing landscape. In addition, the ability to critically assess the function, purpose and value proposition of any new technology to be introduced in the future will be a critical skill for any healthcare professional in a leadership role. One thing that has remained consistent since the establishment of the medical profession is that medical technologies themselves are not a magic pill. Their appropriate integration within a healthcare practice is what drives healthcare innovation.

In the United States, the American Medical Association and the American Medical Informatics Association (AMIA) have worked together to establish a medical subspecialty in clinical informatics, enabling it to span many disciplines. They recognized the fundamental need to have the training for these required skills for successful research, innovation, translation, and implementation of health technologies formalised within a subspecialty. Many countries are now looking to follow suit.

While many futurists are working to predict the next directions for disruptive innovations and their impact on various industries and societies as a whole, we know that medical technology innovation will continue into the future, making impact on healthcare practices and professionals. As always, medical professionals will be required to remain current in the relevant medical technologies of their respective disciplines in the same way they will be required to remain current in innovations generated by other areas such as basic science and genomics.

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References

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