Advanced Biomedical Research and Innovation

Extended Abstract

Novelties in Artificial Intelligence Recognition and Diagnosis Technology in Pressure injury

Wei Luan and Zhu Z

Renji Hospital Affiliated to Medical School of Shanghai Jiaotong University, China

Abstract

Artificial intelligence recognition and diagnosis technology of pressure injury is mainly used in clinical auxiliary diagnosis system. By using the image recognition technology of artificial intelligence, the algorithm with higher parallel performance is designed and the special language for parallel image processing is developed to scientifically and rapidly identified and diagnosed pressure injury.

Accordingly, the clinical assistant diagnosis system can provide nurses with the most possible diagnosis of pressure sore nursing and recommend nursing measures. The application of artificial intelligence technology has achieved great success in the field of image diagnosis. Therefore, it is also very reliable and safe to be used in the field of pressure injury.

Such artificial intelligence recognition and diagnosis technology can greatly improve the correct diagnosis rate of pressure ulcer and the work efficiency of nurses. Especially in remote areas, there is a lack of wound stomatologists or licensed nurses, and family members of patients can also take photos and upload them to the system. Nurses can make remote diagnosis and guidance.

Background

Artificial Intelligence (AI) is designed to mimic cognitive functions of humans. It introduces a paradigm change to healthcare, driven by expanded availability of healthcare data and rapid development in analytical techniques. We survey the current status of AI healthcare applications and discuss their future. AI can be applied to various (structured and unstructured) health-care data types. Machine learning methods for structured data, such as the classical support vector machine and neural network, and modern deep learning, as well as natural language processing for unstructured data are common AI techniques.

Large fields of illness using AI technologies include cancer, neurology, and cardiology. We will then study the AI applications in stroke in more depth, in the three main areas of early detection and diagnosis, treatment, as well as prediction of outcome and assessment of prognosis.

Recently, AI techniques have sent vast waves throughout healthcare, even fueling an active discussion about whether AI physicians will eventually replace human physicians. We agree that in the near future, human physicians won't be replaced by computers, but AI will certainly help physicians make better clinical decisions or even substitute human judgment in some practical areas of healthcare.

Recent successful AI applications in healthcare have been made possible by the increasing availability of healthcare data and the rapid development of big data analytics methods. Guided by relevant clinical questions, powerful AI techniques can unlock clinically relevant information concealed in the massive amount of data, which can in turn assist clinical decision making.

Four AI aspects relevant to this:

1. Motivations for AI use in healthcare
2. Data types which AI systems have analyzed
3. Mechanisms which allow AI systems to produce meaningful clinical outcomes
4. Types of diseases which are currently being addressed by AI communities.

Hospital-acquired pressure injuries (HAPIs) occur in 3 to 24 percent of critical care patients in the U.S. and patients with such injuries have longer stays, higher costs and more human suffering than patients without these injuries. Although pressure injuries are common, some can be prevented by using measures such as specialty beds, which are not feasible because of the costs for every patient. Therefore, it is crucial to consider patients at the highest risk for a HAPI, as clinicians can then perform detailed skin assessments to detect pressure injuries at the earliest reversible point.

Pressure injuries sustained from hospitals are one field where researchers apply these advanced technologies. Pressure injuries are common among patients in intensive care units (ICUs), occurring in 8 to 10 per cent of patients with critical care. Such accidents are also associated with longer stays in the hospital, more patient pain and increased cost of health care.

The data that clinicians produce will be key in that work, as well as machine learning technology. Prediction of risk of injury to pressure is one example of where clinicians can use big data analytics tools to improve care.

Machine learning may use vast quantities of data from the electronic health record to predict the occurrence of pressure injuries, efficiently and effectively.

Extended Abstract

Machine learning is a form of artificial intelligence that can be used to create predictive models but it is rarely used in pressure injury research. Machine-learning approach provides a valuable model for predicting pressure injuries as machine-learning approaches can use vast volumes of clinical data regularly collected in electronic health records (EHRs) effectively and efficiently.

For EHR data, we queried an enterprise data warehouse in accordance with our sampling criteria and interest variables. We used an iterative approach to refine our question through validation procedures and analysis by domain experts, data managers and the team of biomedical computer scientists.

The study consisted of data on patients admitted to the University of Utah Hospital's adult surgical or surgical cardiovascular ICU, an academic medical center with a level I trauma centre, either directly or after an acute care stay between September 1, 2008 and May 1, 2013, which met the inclusion criteria. We included patients under the age of 18 who were admitted to adult ICU in an attempt to accommodate all patients admitted to adult cardiovascular surgical or adult ICU.

Treatment plans for all patients included tailored treatments focused on Braden Scale criteria (e.g., use of moisture-wicking pads and moisture-skin barrier creams). Additionally, ICU's quality of treatment was turning and repositioning at least every 2 hours for patients who couldn't turn on themselves.

Perfusion is theoretically a crucial concept in the development of pressure injuries because skin cannot survive without the supply of oxygen-rich blood.5 In our study, variables related to perfusion, including infusions of vasopressors, oxygenation and hypotension, were not defined as relevant depending on the mean decrease in precision, although these variables were important risk factors in other stubs.

However, we used a single-measure approach: Perhaps by using a longitudinal approach, variables related to perfusion are better delineated, which would indicate the dynamic effects of unstable hemodynamic status. Future researchers could suggest a random forest approach to survival, which would take repeated perfusion-related steps into account.

Calibration may be required to optimize specificity so that the model can used to identify patients who would benefit most from interventions such as specialty beds or continuous bedside pressure mapping that are not financially feasible for every patient. Finally, our finding that time required for surgery was an important variable in the analysis warrants further investigation.