

编号: YY006-20230109001

**标题: Ethical Issues of Digital Twins for Personalized Health Care Service: Preliminary Mapping Study**

**简介:** Background: The concept of digital twins has great potential for transforming the existing health care system by making it more personalized. As a convergence of health care, artificial intelligence, and information and communication technologies, personalized health care services that are developed under the concept of digital twins raise a myriad of ethical issues. Although some of the ethical issues are known to researchers working on digital health and personalized medicine, currently, there is no comprehensive review that maps the major ethical risks of digital twins for personalized health care services. Objective: This study aims to fill the research gap by identifying the major ethical risks of digital twins for personalized health care services. We first propose a working definition for digital twins for personalized health care services to facilitate future discussions on the ethical issues related to these emerging digital health services. We then develop a process-oriented ethical map to identify the major ethical risks in each of the different data processing phases. Methods: We resorted to the literature on eHealth, personalized medicine, precision medicine, and information engineering to identify potential issues and developed a process-oriented ethical map to structure the inquiry in a more systematic way. The ethical map allows us to see how each of the major ethical concerns emerges during the process of transforming raw data into valuable information. Developers of a digital twin for personalized health care service may use this map to identify ethical risks during the development stage in a more systematic way and can proactively address them. Results: This paper provides a working definition of digital twins for personalized health care services by identifying 3 features that distinguish the new application from other eHealth services. On the basis of the working definition, this paper further layouts 10 major operational problems and the corresponding ethical risks. Conclusions: It is challenging to address all the major ethical risks that a digital twin for a personalized health care service might encounter proactively without a conceptual map at hand. The process-oriented ethical map we propose here can assist the developers of digital twins for personalized health care services in analyzing ethical risks in a more systematic manner.

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**标题: The Impact of Artificial Intelligence on Waiting Time for Medical Care in an Urgent Care Service for COVID-19: Single-Center Prospective Study**

**简介:** Background: To demonstrate the value of implementation of an artificial intelligence solution in health care service, a winning project of the Massachusetts Institute of Technology Hacking Medicine Brazil competition was implemented in an urgent care service for health care professionals at Hospital das Clínicas of the Faculdade de Medicina da Universidade de São Paulo during the COVID-19 pandemic. Objective: The aim of this study was to determine the impact of implementation of the digital solution in the urgent care service, assessing the reduction of nonvalue-added activities and its effect on the nurses' time required for screening and the waiting time for patients to receive medical care. Methods: This was a single-center, comparative, prospective study designed according to the Public Health England guide "Evaluating Digital Products for Health." A total of 38,042 visits were analyzed over 18 months to determine the impact of implementing the digital solution. Medical care registration, health screening, and

waiting time for medical care were compared before and after implementation of the digital solution. Results: The digital solution automated 92% of medical care registrations. The time for health screening increased by approximately 16% during the implementation and in the first 3 months after the implementation. The waiting time for medical care after automation with the digital solution was reduced by approximately 12 minutes compared with that required for visits without automation. The total time savings in the 12 months after implementation was estimated to be 2508 hours. Conclusions: The digital solution was able to reduce nonvalue-added activities, without a substantial impact on health screening, and further saved waiting time for medical care in an urgent care service in Brazil during the COVID-19 pandemic.

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**标题: Intelligent virtual case learning system based on real medical records and natural language processing**

**简介:** Background: Modernizing medical education by using artificial intelligence and other new technologies to improve the clinical thinking ability of medical students is an important research topic in recent years. Prominent medical universities are actively conducting research and exploration in this area. In particular, given the shortage of human resources, the need to maintain social distancing to prevent the spread of the epidemics, and the increase in the cost of medical education, it is critical to harness online learning to promote medical education. A virtual case learning system that uses natural language processing technology to process and present a hospital's real medical records and evaluate student responses can effectively improve medical students' clinical thinking abilities. Objective: The purpose of this study is to develop a virtual case system, Alteach, based on actual complete hospital medical records and natural language processing technology, and achieve clinical thinking ability improvement through a contactless, self-service, trial-and-error system application. Methods: Case extraction is performed on a hospital's case data center and the best-matching cases are produced through natural language processing, word segmentation, synonym conversion, and sorting. A standard clinical questioning data module, virtual case data module, and student learning difficulty module are established to achieve simulation. Students can view the objective examination and inspection data of actual cases, including details of the consultation and physical examination, and automatically provide their learning response via a multi-dimensional evaluation system. In order to assess the changes in students' clinical thinking after using Alteach, 15 medical graduate students were subjected to two simulation tests before and after learning through the virtual case system. The tests, which included the full-process case examination of cases having the same difficulty level, examined core clinical thinking test points such as consultation, physical examination, and disposal, and generated multi-dimensional evaluation indicators (rigor, logic, system, agility, and knowledge expansion). Thus, a complete and credible evaluation system is developed. Results: The Alteach system used an internal and external double-cycle learning model. Students collect case information through online inquiries, physical examinations, and other means, analyze the information for feedback verification, and generate their detailed multi-dimensional clinical thinking after learning. The feedback report can be evaluated and its knowledge gaps analyzed. Such learning based on real cases is in line with traditional methods of disease diagnosis and treatment, and addresses the practical difficulties in reflecting actual disease progression while

keeping pace with recent research. Test results regarding short-term learning showed that the average score ( $P < 0.01$ ) increased from 69.87 to 85.6, the five indicators of clinical thinking evaluation improved, and there was obvious logical improvement, reaching 47%. Conclusion: By combining real cases and natural language processing technology, Alteach can provide medical students (including undergraduates and postgraduates) with an online learning tool for clinical thinking training. Virtual case learning helps students to cultivate clinical thinking abilities even in the absence of clinical tutor, such as during pandemics or natural disasters.

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**标题: Improvement of the Public Health Service Platform System Based on the Big Data-Driven System**

简介: At present, complex discrete dynamic systems are widely used in the field of medicine. The control system in the complex discrete dynamic model is gradually transformed into intelligent control. It has become the main research direction of researchers to improve the medical platform system by adding different modeling strategies. The traditional discrete modeling technology can only be used as the knowledge content of students' textbooks because it can no longer meet the needs of the development of human society. In order to improve the application of a discrete system in the public platform, this paper studies the improvement of the public health service platform system based on the complex discrete dynamic system. Firstly, a time-driven control strategy is proposed to study the output feedback control with random sampling in the platform. Then, the stability of random parameters and the addition of dynamic scheduling strategies are further studied. Compared with the traditional system, the optimized system greatly strengthens the data transmission problem of input and output channels. The results show that by improving the performance of the public health service platform system, the probability of problems in the process of data transmission is greatly reduced. After adding controllable and observable performance to the system, the stability of the whole system is further improved. The improved public health service platform system studied in this paper can store and transmit a large number of user data in the network environment, automatically maintaining the stability of the system and has a good social application value.

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**标题: Artificial intelligence healthcare service resources adoption by medical institutions based on TOE framework**

简介: Objectives: This study used the Technology-Organization-Environment (TOE) framework to identify the factors involved in the decisions made by integrated medical and healthcare organizations to adopt artificial intelligence (AI) elderly care service resources. Method: This study identified the Decision-making Trial and Evaluation Laboratory-Interpretive Structural Modeling (DEMATEL-ISM) method was used to construct a multilayer recursive structural model and to analyze the interrelationships between the levels. A MICMAC quadrant diagram was used for a cluster analysis. Results: The ISM recursive structural model was divided into a total of seven layers. The bottom layer contained the four factors of High risk of data leakage (T1), Lack of awareness of the value and benefits of AI healthcare technology (T5), Lack of management

leadership support (O1), and Government policies (E1). Having a low dependency but high driving force, these factors are the root causes of adoption by healthcare organizations. The topmost layer contained the most direct factors, which had a high dependency but the low driving force, influencing adoption: Competitive pressures (E2), Lack of patient trust (E5), and Lack of excellent partnerships (E7). Healthcare organizations are more concerned with technology and their environments when deciding to adopt intelligent healthcare resources. Conclusion: The combination of the three methods of DEMATEL-ISM-MICMAC construction models provides new ideas for smart healthcare services for hospitals. The DEMATEL method favors the construction dimension of the micro-model, while the ISM method favors the construction dimension of the macro-model. Combining these two methods may reduce the loss of information within the system, simplify the matrix calculation workload, and improve the efficiency of operations while decomposing the complex problems into several sub-problems in a more comprehensive and detailed way. Conducting cluster analysis of the adoption determinants utilizing MICMAC quadrant diagrams may provide strong methodological guidance and decision-making recommendations for government departments, senior decision-makers in healthcare organizations, and policy-makers in associations in the senior care industry.

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