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| RESEARCH ARTICLE

Early Detection of Health Problems through *Artificial Intelligence* (Ai) Technology in Hospital Information Management: A Literature Review Study

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| ABSTRACT
Early detection of health problems needs to be supported by optimal hospital service quality subsystems through an integrated Hospital Management Information System. Artificial intelligence (AI) as a modern technology has entered the mainstream of clinical medicine. Diagnostics has traditionally been one of the main areas of AI in medicine. AI will broadly transform diagnostic and predictive analysis of medical images in the coming years. Studies in the fields of pathology and dermatology have demonstrated the ability of AI to outperform human diagnostics in accurately detecting and classifying various types of cancer. Artificial intelligence technology in the health aspect is useful in disease diagnosis and can analyze medical images to identify certain diseases so that they are able to distinguish between benign and malignant diseases. AI can also help identify the risk of mental illness and identify the risk of suicide among patients with psychiatric disorders or among certain populations, such as prisoners and soldiers. This helps doctors quickly get disease information and provide a more accurate disease diagnosis, thereby saving time for disease treatment.

| KEYWORDS

Diagnosis, health, hospital management, artificial intelligence (AI).

| ARTICLE INFORMATION

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1. Introduction

Early detection of health problems needs to be supported by an optimal hospital service quality subsystem through an integrated Hospital Management Information System. The existence and function of SIM RS will provide great benefits for every hospital user, including patients, doctors, nurses, management, hospital partners, and other stakeholders because, through SIM RS, every transaction will be recorded, processed, and then utilized into the right service area (Yulianti and Mahardi, 2019). The collected data is further processed according to scientific principles so that it can help decision-makers to make decisions that are best for patients and hospital management. According to Nekoel-Moghadam and Amiresmaili (2018), information systems are one of the biggest needs of hospitals to overcome common problems in hospitals such as irregular patient data, errors in the queuing system, incomplete identity information, unclear medical prescriptions and so on. The use of information systems can minimize these problems and will subsequently have a positive impact on the overall quality of hospital services.

Management communication technology is experiencing rapid development; this is marked by the emergence of the Interwar system. This system provides data connections between computers and networks that can be utilized in the health field by providing various standard or non-standard data communication links, which are very important for clinical health systems (Ayanlade *et al.,* 2019). The world of health services is increasingly dynamic with demands for high quality and quantity of information systems. However, with the situation at hand, the slow improvement of hospital information technology, the inability of human resources to utilize information technology, software crises, and user complaints are increasing. Questioning the latest

technology used by hospital administration, customer service, engineers, and medical employees can really provide satisfaction for every user. Based on the situation, to improve the quality of information systems in the health sector, hospitals build better and more capable information systems that will help hospitals to produce faster and more accurate medical service decisions (Schmidt *et al*., 2015).

Information management systems were initially introduced to support administrative functions, information and communication technology, then adopted to support clinical activities in health organizations. Hospital management information systems are implemented for electronic medical record purposes that integrate information from pharmacies, radiology, and laboratories, thus providing access to information that presents a comprehensive picture of the patient's health, treatment, and background (Arvanitis and Loukis, 2016). SIM RS has capabilities that are increasingly integral to many work processes in health organizations and are proven to improve health services, reduce antibiotic use and make work easier (Ayaad *et al.,* 2019; Park *et al.,* 2020). Nevertheless, apart from the beneficial results regarding hospital driver's licenses and healthcare services for patients, the extensive integration of information systems in healthcare has also damaged the working conditions of healthcare professionals, especially doctors and nurses. Petrakaki and Kornelakis, for example, found that the introduction of the ESDM system increased the standardization of work tasks performed by doctors and nurses, thus limiting the flexibility of health professionals' work. Existing research on the influence of information systems on the working conditions of registered physicians and nurses shows that the presence of information technology in daily work often limits the autonomy of health professionals (Bansler, 2021), increasing workload,9,10 facilitating surveillance and negatively impacting relationships with other professional and patient groups (Dupret, 2017).

Knowledge from health professionals can moderate the negative impact of information systems on the working conditions of health professionals. Based on the knowledge of health experts, professionals acquire legal status from a society that grants jurisdiction and privilege to exercise occupational discretion and self-regulation in their field of expertise. Self-governance then provides the ability for professionals to not only organize their own work but also develop training programs, which are subject to collegial control and the opportunity to control groups of work when entering areas of expertise (Currie and Croft, 2015). The difference exists in expert knowledge and discretionary power, therefore, placing physicians at the top of the professional hierarchy when compared to other medical-based health occupations (Molleman and Rink, 2015). Medical expertise allows physicians to reject standards in information systems, whereas registered nurses find themselves controlled by standards based on medical algorithms integrated into information technology (Rusell *et al.,* 2016). Information systems are essentially different in the working conditions of doctors and nurses, but with the progress and development of the era, the performance of doctors and nurses must be able to collaborate with information technology.

2. Research Methods

The research design used is the *Literature review* method. A literature study is a research conducted by researchers by collecting a number of articles or journals related to the problem and research objectives. This technique is carried out with the aim of revealing various theories that are relevant to the problem being faced/researched as reference material in the discussion of research results. The data analysis used is by using thematic analysis. Thematic analysis is one way to get results by conducting data analysis that aims to identify patterns or determine themes through data that has been collected by researchers (Braun &; Clarke, 2006 in Heriyanto, 2018), while the stages of data analysis include (1) *Compare*, finding similarities among several literatures; (2) *Contrast*, finding differences among several literatures and drawing conclusions and (3) *Criticize*, giving your own opinion based on the sources read.

3. Results and Discussion

*Artificial intelligence (*AI) as a modern technology has entered the mainstream of clinical medicine (Hamet and Tremblay, 2017). The use of tools in medical imaging is not new; AI has been used since the early 1970s, such as simple neural network imaging that has been used to interpret electrocardiograms (ECGs), diagnose myocardial infarction, and predict the prognosis period after heart surgery. The use of this technology has drawn various criticisms due to its lack of consistency and low specificity (Kohli and Jha, 2018). Today, recent breakthroughs in second-generation AI methods called *Deep Learning* to make it much more powerful and effective than previous applications (van Ginneken, 2017); even in recent years, AI has evolved into image analysis, drug discovery, gene mutation prediction, chronic disease management and so on (Angermueller *et al.,* 2016).

Diagnostics has traditionally been one of the key areas of AI in medicine (Miller and Brown, 2018). It is widely known that AI is likely to fundamentally change the diagnostic and predictive analysis of medical images in the coming years (Zhou *et al.,* 2017). Research in the field of pathology and dermatology has shown AI's ability to equal or outperform human diagnoses in accurately detecting and classifying various types of cancer (Esteva *et al*., 2017). In radiology, computer-aided diagnosis (CAD) has been used in breast cancer detection on mammograms, differential diagnosis of lung nodules, and interstitial lung disease on CT. Although speculation of fully automated diagnostics is looming, at present, it can only be said that AI algorithms can establish themselves as virtual second diagnoses in various subspecialties of medicine (Venkatesh *et al.,* 2017). In the last 4 years, there has been a surge in AI-based medical applications from all over the world. Several offers are awaiting regulatory approval to market the product, including AI for CT stroke diagnosis, AI iniCAD for digital breast tomosynthesis, Algorithm for CT brain hemorrhage diagnosis by AiDOC and Maxq, AI Transpara breast cancer detection software by Medical Screenpoint, and diagnosis of liver and lung cancer using MRI or CT by Arteries are some of the AI solutions approved by the Food and Drug Administration (FDA) commercially available in the US market (Topol, 2019). In China, major hospitals have started using ICDDSS developed by Tencent Miying to assist doctors in early lung and esophageal cancer screening, as well as several other ICDDSSs from Europe, China, and Japan are commercially available (Pan *et al.,* 2019).

Global Tech Giants are playing a key role in driving AI applications into healthcare practices in India. IBM introduced the idea of AI in healthcare in India with the launch of its cognitive platform, Watson for Oncology [57]. Another example is Microsoft's partnership with Apollo Hospitals to develop an AI-powered risk score app designed to predict cardiovascular disease risk [58]. Microsoft has also jointly developed an AI-based ophthalmology screening tool in partnership with Forus Health and L V Prasad Eye Institute. Google has also joined the race by developing AI-based solutions to detect preventable causes of blindness in collaboration with Aravind Eyecare Hospitals (Widner and Virmani, 2019). In the field of clinical imaging, Indo-US startup Qure, AI has developed FDA-approved automated screening algorithms for head CT, chest X-ray, and tuberculosis detection (Chilamkurthy *et al*., 2018). The algorithm is offered via the cloud at a cost of $1–$5 per scan. It has spread products in more than 50 locations in more than 12 countries around the world. Apollo Hospitals and Zebra Medical Vision, a popular Medical AI company, have announced a collaboration focused on applying deep learning algorithms to detect 40 key conditions, including brain hemorrhage on head CT, cancer on mammograms, and critical conditions on X-chest rays (Solomon, 2019). GE Healthcare has begun offering search engine algorithms as a smart subscription service through Edison's newly launched AI platform as an improvement on its existing engine. It is rapidly incorporating AI analytics capabilities in its new suite of devices. There are promising home startups, such as SigTuple, Artelus, ChironX, and Niramai, offering a range of AI-powered diagnostic solutions. Teleradiology companies have also started providing AI analytics capabilities as an additional service. Indian public thinks tank NITI Ayog recently released a white paper outlining the government's official strategy for AI development with a significant increase in research funding for healthcare AI (NITI Ayog, 2018).

Clinical Decision Support System (CDSS) is a health information technology developed to assist clinical decision-making tasks for doctors and other health professionals. CDSS technology makes it easy for physicians, staff, patients, and other individuals with people-specific knowledge and information, screened or presented at the right time, to improve health and health care. CDSS classification uses several dimensions, such as based on the time at which the support is provided, how active/passive the support is and so on. An important typology categorizes CDSS into knowledge and non-knowledge-based systems (those that have a knowledge base and those that don't. Knowledge-based CDSS typically uses a knowledge base and reasoning engine (a formula for combining associations in the knowledge base with actual patient data), whereas non-knowledge-based CDSS uses search engines and other advanced AI techniques that allow computers to learn from past experiences and/or identify patterns in clinical data.

The use of AI technology is a debate in the world of medicine because it has direct implications for human life. User resistance and AI technology are one of the most significant factors associated with the failure of information technology projects in medicine. Research on information systems has offered rich insights into the importance of using technology, but individual resistance to technology has so far been considerable (Sahmhan, 2018). User Ressence cannot be thought of simply as the opposite of acceptance. Early thoughts on the idea of user resistance are credited to Lewin's study of opposing forces. Social systems, such as biological systems, tend to maintain the status quo by resisting change and returning to the original state, a phenomenon known as *homeostasis*. Irregularity about information systems, few studies have tried to open the black box of user resistance and provide a theoretical explanation for why it happens. The importance of new technologies arises from changes in the intra-organizational distribution of power with the introduction of new information systems. Thus, loss of power can lead to resistance by the user. The equity theory perspective is also used to analyze resistance to changes related to the implementation of information systems, this

theory suggests that users evaluate each change in relation to its impact on equity status, and rejection can occur if there is no profit. The concept of dispositional resistance is used to change and argues that individuals have resistance traits linked to personality, which make individuals resistant to change in certain settings. The perception of threats arising from the interaction of resistance objects (features of the system) and initial conditions generates resistance behavior.

Doctors' resistance to information technology in the world of health is done by integrating the literature on acceptance and technological resistance using the *dual-factor theory* of the use of information technology. Ressence is the general opposition to change caused by the anticipated adverse consequences of change, so people reject technology not on the technology itself but on changes brought about by the introduction of information systems in the workplace (Bhattacherjee and Hikmet, 2017). The essence of change is not as a behavior but as a cognitive force that blocks a potential behavior (a precursor to adopted behavior). The model explains resistance through the lens of perceived threats, which are based on previous experience. Although perceived threats were identified as the only predictor of user resistance (resistance to change). It measures user resistance behavior and uses *status quo* bias theory to explain user resistance before the implementation of a new information system. The study of information systems implementation needs to pay attention to user resistance at three different levels behavioral (passive or active, overt or covert), perceptual resistance to change (inhibiting perceptions of change *status quo*), and dispositional resistance to change (personal tendency to resist change in general).

Integrating AI technology in the world of health is a must. Because the world of medicine has become an integral part of health services, based on this, efforts need to be made so that the use of AI technology in the world of health can be designed in such a way that it has profit value. The integration of AI will help the provision of care, with the advantage of increasing efficiency and improving the quality of certain services, leading to higher volumes of care delivery (Hazarika, 2020). Lu (2019) elaborated on the results of his research that artificial intelligence technology in clinical health aspects is useful in disease diagnosis and can analyze medical images to identify certain diseases so as to be able to distinguish benign and malignant diseases. AI can also help identify the risk of mental illness and identify the risk of suicide among patients with psychiatric disorders or among specific populations, such as prisoners and soldiers. This helps doctors quickly get disease information and provides a more accurate diagnosis of diseases, thereby saving time for the treatment of diseases. And can help provide information to nurses in planning nursing care that will be given to patients. The advantage of AI in medicine is that the assessment process helps monitor and analyze Vital Signs (TTV), supports decision-making in diagnosing nursing, helps collect patient data quickly and accurately, and helps in patient care with intelligent robots.

The advantages of AI are felt in every condition in nursing services, this is in the pandemic era, which requires minimizing contact between nurses and patients, especially in the isolation room of Coronavirus Deasease 2019 (Covid-19), and the help of intelligent robots is needed. The emergence of nursing assistant robot innovation is expected to reduce interaction problems because, with the robot, nurses reduce physical contact with patients affected by the Covid-19 virus, so it will reduce the death rate of nurses in Indonesia (Marlon *et al*., 2020).

4. Conclusion

Artificial intelligence (AI) as a modern technology has entered the mainstream of the world of clinical medicine. Diagnostics has traditionally been one of the key areas of AI in medicine. AI is more broadly transforming the diagnostic and predictive analysis of medical images in the coming years. Studies in the fields of pathology and dermatology have shown AI's ability to outperform human diagnostics in accurately detecting and classifying various types of cancer. In radiology, computer-aided diagnosis (CAD) has been used in breast cancer detection on mammograms, differential diagnosis of lung nodules, and interstitial lung disease on CT. Clinical Decision Support System (CDSS) technology makes it easy for physicians, staff, patients, and other individuals with person-specific knowledge and information, screened or presented at the right time, to improve health and health care. The use of AI technology is a debate in the world of medicine because it has direct implications for human life. User resistance and AI technology are one of the most significant factors associated with the failure of information technology projects in medicine. The implementation of AI as an information system needs to pay attention to user resistance at three different levels behavior (passive or active, overt or covert), perceptual resistance to change (inhibiting perceptions of change status quo), and dispositional resistance to change (personal tendency to resist change in general). Artificial intelligence technology in the health aspect is useful in disease diagnosis and can analyze medical images to identify certain diseases to be able to distinguish benign and malignant diseases. AI can also help identify the risk of mental illness and identify the risk of suicide among patients with psychiatric disorders

or among specific populations, such as prisoners and soldiers. This helps doctors quickly get disease information and provides a more accurate diagnosis of diseases, thereby saving time for the treatment of diseases.

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