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Medical System and Artificial Intelligence: How AI assists hospital-dependent patients

Keerada Keeratihuttayakorn[1], Nattanan Chavanotai[2], Yanisa Namwat[3]

Satriwithaya School, Bangkok, Thailand

Email: bellekeeradaza@gmail.com[1], 49276@satriwit.ac.th[2], yanisa.mook1@gmail.com[3]

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Abstract

The main objective of this study is to examine how artificial intelligence assists hospital-dependent patients and explore the role of artificial intelligence in the medical system. Hospital-dependent patients have become common in current society due to the elderly with multiple chronic conditions and the COVID-19 infection patient. Thus, it is undeniable that the medical field is lacking healthcare workers. However, in a globalized world, artificial intelligence, the field of science and engineering technology that makes intelligent machines perform given tasks, is chosen to be used as a tool for assisting hospital-dependent patients and collecting databases from the patients. Nevertheless, the paper will cover the use of artificial intelligence in the medical system, hospital-dependent patients as well as provide both positive and negative aspects and the comparison of using artificial intelligence instead of human intelligence. To conclude, we detail how artificial intelligence can take part in the medical system, assist hospital-dependent patients and study further the future of artificial intelligence in the medical system.

Keywords*— *Artificial Intelligence (AI), bedside patients, hospital-dependent patients, medical systems.

I. INTRODUCTION

The number of hospitalized patients has surged, especially due to Covid-19. According to a study, 7% of the elderly above 60 years in Thailand have been hospitalized in the previous year, which is the majority of hospitalized patients. Most of the patients over 60 years old still need help for performing daily activities after hospital discharge (Kunakorn, 2017). This shows that most hospitalized patients need assistance not only in the hospital but also after being discharged.

The interests of health professionals towards the usage of artificial intelligence in healthcare have increased significantly. The application of AI can provide major developments in the health system and medication. AI will be able to assist and enhance human work, but not replace the work of professionals. Communication between patients and medical professionals is crucial since it can lead to more successful and efficient treatments. AI can help deal with the lack of medical staff, and can also save time in processes of medication and treatment. By collecting data and organizing information such as patient history, communication among patients and professionals will be easier and more efficient. Rather than just assisting individuals in treatments, AI can also be used in the medical system as it is one of the biggest databases. The development of Artificial Intelligence in medication will, therefore, make a substantial impact on healthcare around the world.

II. LITERATURE REVIEW

2.1 Hospital Dependent

Patient Hospital-dependent patients have acute medical needs which can't be met elsewhere, therefore; they are repeatedly readmitted to the hospital. These patients, unlike the chronically critically ill, aren't continuously dependent on life-sustaining equipment. However, some might spend up to years in the hospital to receive resource-

intensive care since they aren't able to be safely discharged. (Calvin, 2017)

According to a qualitative study in the United States, the elderly accounted for a substantial proportion of hospitalizations, and a subset is hospital-dependent. Criteria for selection of this study included age 65 and above, at least 3 hospitals for over 6 months. The interviews were audiotaped and the major themes derived were the necessity and inevitability of hospitalizations, feeling safe in the hospital, hospitalization with outside medical and social support, and inadequate health care discussions. (Tao, 2017)

2.2 Needs of hospitalized patients

2.21 Communication

Trust is essential for the harmonious relationship between health professionals and patients and is also vital for their good cooperation. Effective communication, from taking the medical history of the patient to processing of medical or nursing practices, helps reduce patients' anxiety levels and also ensures their cooperation. Meanwhile, effective communication can help the patients understand the medical instructions in detail, accept their conditions and comply with the treatment.

However, there are times when the interactive relationship between patients and medical professionals is violated. For example, patients sometimes demand more time or attention from the health professionals than actually required. In the case of hospital-dependent patients which requires a long-term relationship between the patient and the health professionals, and sometimes become a dependent relationship. Therefore, health professionals have the responsibility to keep the relationship within safe limits by trying to understand the psychology of the patients and also act professionally.

2.2.2 Need for information

A moral shift towards the health sector was suggested according to paternalism. The doctor was the person deciding the patient's therapy and the degree of information given to the patient by considering what's best for the patient. The rationale behind this is to promote autonomy and to respect the patient's right to be clearly informed about their health conditions. Patients require information not only regarding the treatments but also for other practical problems associated with daily activities.

2.2.3 Need for education

Recently, health sciences have focused their interest on individual educational programs which can change the patients' behavior towards more efficient management of their health and quality of life.

2.2.4 Need for support

It has been widely accepted that hospitalization is stressful and that the patients need support from their families and health professionals to cope with diseases. Most patients have experienced various problems mainly after being discharged, the magnitude of these problems is associated with the adaptability to the physical, emotional, and psychological impact of the disease. A rising number of studies confirms the importance of preventing social isolation by maintaining communication and support, this has a beneficial impact on the outcome of the treatment process. (Maria,2011)

2.3 AI

Artificial intelligence is the simulation of human intelligence operated by machines, especially computer systems, and created by humans. Normally, AI systems work by absorbing large amounts of data, analyzing the data for correlations and patterns, and using the patterns to make predictions. Creating an AI system is a heedful process of reversing human traits and capabilities into a machine. AI can be classified into 3 different types based on functionalities. Firstly, Artificial Narrow Intelligence (ANI) is the most common form of AI. Artificial Narrow Intelligence systems are designed to perform a single task extremely well. By definition, they have narrow capabilities. Secondly, Artificial General Intelligence (AGI) has a human-level of cognitive function. It would be a machine capable of understanding the world as well as any human. For example, robots. Lastly, Artificial Super Intelligence (ASI), a software-based system that would be able to surpass all human capabilities.

2.4 AI in the medical system (management)

In a globalized world, it is undeniable that artificial intelligence is one of the biggest databases that everyone uses to collect and secure data. Due to the high speed of artificial intelligence, AI algorithms come into the picture or flowcharts, which are easy for people to read and understand. Essentially, an AI algorithm is an extended subset of machine learning that tells the computer how to learn to operate on its own. Artificial intelligence is playing a highly main role in hospitality management, firstly because of its ability to carry out traditionally human functions at any time of the day and never need to rest. This potentially means that it can save notable money, eliminate human error, and provide superior service. Secondly, AI is being utilized, in hospitality management, in data analysis. In this capacity, artificial intelligence can be used to sort large amounts of data and draw important conclusions about the patient.

Nowadays, During the COVID-19 pandemic. The problem with hospitality management is lacking frontline

healthcare workers. When it comes to limiting disease spread, the aim is to use AI tools to allocate human resources better while still protecting patients and staff. Bringing artificial intelligence to become the frontline workers may reduce the time because fighting a pandemic is a task that requires speed. Furthermore, there is no need to be concerned about frontline healthcare workers getting the infection. Now artificial intelligence will be able to accurately and quickly identify infected patients and put them in the hospitality databases and be able to trace them. AI can help doctors identify patients at risk based on a number of factors. Then, other caregivers can arrange follow-up appointments, to the digital, like sending secure text messages reminding patients to take their medication via AI databases of the patient from Machine learning. (ML)

2.5 AI in assisting bedside patients

As hospitals face the strain of the COVID-19 pandemic, it has shown how hospitals become an overwhelmed place with patients. Consequently, lacking healthcare workers. The use of AI bedside technologies could be able to solve the issue of unsustainable demand within healthcare, allowing doctors to treat more patients. The technology behind artificial intelligence health providers is the same as that of any virtual assistant, reliant upon input and intelligent algorithms. With patients giving information to the artificial intelligence health providers which in turn will respond with the right info and at the right time.

Telemedicine, the exchange of medical information from one location to another, has shown the rise of possible artificial intelligence applications and has become essential to healthcare delivery in the COVID-19 era. Artificial Intelligence can assist in caring for patients casually by monitoring their information through sensors. With the significant evolution of electronic devices and the internet, telemedicine became an acceptable way for providing health care to bedside patients.

2.6 AI in assisting patients at home

In medical care at home, artificial intelligence is highly possible to be an effective assistant of the patient. There was a study in 2011 about the companion robots for the care of the elderly that discussed how to make the machine-learned from the human gestures in order to develop the decision and response. This is one of the most advanced ideas to use AI to help the patient at home.

AI can monitor the patients through medical devices that digitally reported the results such as blood pressure, body temperature, oxygen saturation (fingertip device), and photographs of the patients. The information will be used in either the AI algorithm or human doctor consultation.

AI can be a virtual nurse. From interacting with patients to directing patients to the most effective care setting, virtual nursing assistants could save the healthcare industry $20 billion annually. Since virtual nurses are available 24/7, they can answer questions, monitor patients, and provide quick answers. Most applications of virtual nursing assistants today allow for more regular communication between patients and care providers between office visits to prevent hospital readmission or unnecessary hospital visits. Care Angel's virtual nurse assistant can even provide wellness checks through voice and AI. (Yorita,2011).

When the internet of things are well developed and widely used, medicine preparation at specific times of day will be done easily by AI. It will remind the patient and serve the medication. Furthermore, the reporting of receiving medication will submit to the doctor or the health care team.

2.7 AI in socializing with patients

Nowadays people are no longer need to adapt to technology because AI technology will adapt to our needs. The revolution we are experiencing every day isn't about the awful future of machines controlling humans. It is about technology designed for the people, not the other way around. We are no longer waiting for things to happen; we create what fits our needs. By empowering people with this technology, businesses are transforming their relationships with society. Today, companies have already implemented new artificial intelligence technologies that are socializing like humans to improve the user experience.

The idea of smart machines with social knowledge isn't totally new. Game-playing AI agents also require an understanding of the relationship landscape to know whom to cooperate and compete with. But they're given these relationship structures explicitly within the rules of the game, while humans can quickly pick them up in ambiguous situations.

Inspired by this ability, the researchers developed a new machine-learning algorithm to figure out the relationships among multiple agents through a limited number of observations. They then ran two experiments to test the algorithm's performance. In the first one, it had to infer the alliances of players in a video game by watching several sequences of gameplay. In the second, it had to predict the players' actions in the same video game to see whether it truly understood each player's motivations. It wasn't trained for either task.

In both experiments, the algorithm's inferences and predictions closely corresponded to the judgments of

humans, demonstrating its ability to rapidly grasp social structures from very little data.

In medicine, the way that the machine learns the health care personnel's or patients' behavior will lead to a better response. (Karen,2021).

2.8 AI in collecting data

Patient care in the future with AI data collection is a useful way to ensure the completeness of the medical records. Either in a hospital or at home, the monitoring gadgets that report the status of the patient to the health care team will be available. If the patient gets worse, there will be an alarming signal to the care team. All information will be analyzed and help the doctor judge the treatment plan.

Data collection can be noisy and costly, which is why it's essential to design data collection workflows to capture high-quality data. With data being critical to health care success, especially when it comes to AI, there is added urgency for efforts that include data collection, data management, data storage, data access, data security, and more. Without a priority and dedicated thought to these, data may accidentally be mismanaged, making it useless to the health care team. Without proper data collection methods from the beginning, the rest of your data pipeline concerns will be a moot point.

To avoid losing one of the most valuable assets, it is needed to understand rules, regulations, and implications of data collection while leveraging technology to enable the health care team to develop machine learning at scale.

The data collected by the AI must include the delivery of large volumes of high-quality data across multiple data types, including image, video, speech, audio, and text for your specific AI program needs. (Data collection).

2.9 Benefits and risks

Medical professionals spend a tremendous amount of time dealing with electronic medical records, reading screens. AI systems can record appointments and conversations into structured data, and can also queue up the most relevant information in the patient records which will save significant time for providers. This would benefit both the patients and medical professionals since it may increase the quality of the medical encounter for both. Moreover, AI can help prevent the isolation of patients after being discharged from the hospital by communicating with the patients and supporting them.

On the other hand, there are also some risks from using AI, the most obvious risk is that some error might occur. If an AI system fails to support the patients in the correct way or gives the wrong information to the patients, the patient could be injured. Another risk is training AI systems requires a tremendous amount of data from sources such as electronic health records, as data are typically fragmented across many different systems. This increases the risk of error yet decreases the comprehensiveness of datasets.

Privacy is another concern; the system requires a large number of datasets which might be a concern for some patients that this collection may violate their privacy.

2.10 Possible Solutions

The possible solution for possible errors is to oversee the AI-system quality, this will help address the risk of patient injury. The Food and Drug Administration (FDA) oversees some healthcare AI products, however; many AI systems won't fall under FDA's preview. As a result, increased oversight efforts by health systems may be vital to ensure the quality of systems.

In terms of protecting patients' privacy, one solution is to set standards for electronic health records or even directly provide technical support for high-quality data-gathering efforts in the health system. Another option is to directly invest in the creation of high-quality datasets. This might ensure effective privacy safeguards for large-scale datasets which can ensure patients' trust and participation. (W. Nicholson,2019)

2.11 Future of AI in healthcare

AI has transformed the field of healthcare including diagnosis and recommendations, patient communication, and care coordination. According to Dr. Paul Weber, associate dean for continuing medical education at Rutgers's Robert Wood Johnson and New Jersey medical schools, he implied that it is possible to train machines to exhibit human-like intelligence and apply it in a clinical setting, however; human intelligence hasn't been achieved yet.

There are currently several applications of AI that involve pattern recognition, robotics, and natural language processing, which include speech recognition and translation. Some of the latest tools are robotic-assisted therapy, which is the use of robotics and AI to assist patients in their stroke recovery. A robotic arm and hand detect motions that patients can't perform during therapy, using a digital algorithm, and help guide them through it. This helps patients perform more recorded movements per hour than working with a physical therapist alone. Another example is a virtual assistant which is an AI-driven technology that can help people with Alzheimer's disease with their daily activities. For instance, reminding the patient to eat, bathe and take medication. (Micah,2020)

Two AI luminaries, Fei-Fei Li and Andrew Ng discussed the state of AI in healthcare, they said that Covid-19 has made healthcare a top priority around the

world and accelerated efforts to apply AI to develop the healthcare system, from drug discovery to more efficient hospital operations. They are figuring out the path to a human win and taking a human-centered approach, which they believe is a key to advancing the state of the art of AI in healthcare. Moreover, Ng supports shifting AI development from being model-centric to being data-centric, this includes improving the quality of data for AI programs training and for putting data at the center of developer's work. Ng implied that the standards of data quality are still ambiguous, so AI developers need to brainstorm all the possible mishaps and analyze the data accordingly. (Gil,2021)

In the next 5-10 years, it is likely that there will be substantial progress in the development of powerful algorithms that require fewer data to train and are more efficient, able to use unlabeled data and can combine fractured and unstructured data including imaging, electronic health data, behavioral and pharmacological data. In the long term, AI systems might enable AI healthcare systems to achieve a state of precision medicine through AI-augmented healthcare. Healthcare will no longer be the traditional one-size-fits-all form of medicine yet a preventative, personalized, data-driven disease management model that can improve patient outcomes.

With regards to hospital management, AI could significantly reduce inefficiency, improve patient flow and safety. It might be applicable to the remote monitoring of patients such as intelligent telehealth through sensors, and provide timely care of patients with a risk of deterioration. In the long term, healthcare clinics, hospitals, social care services, patients, and caregivers are expected to be all connected to a single, interoperable infrastructure. (Junaid, 2021).

III. CONCLUSION

In conclusion, artificial intelligence has been supported by a number of studies that AI can allocate human resources better while still protecting hospital-dependent patients and staff. In addition, it can foretell the development of hospital-dependent patients by their medical records. Moreover, AI grants in various aspects of the medical system, for example, the way that AI can assist patients at their homes by giving an opportunity for doctors to take care of patients at their homes and facilitate them. In our opinion, AI has transformed the field of healthcare, it paved the way for new developments and discoveries which lead to the possibilities for successful treatments. Therefore, despite lacking healthcare workers in the medical system, artificial intelligence will become the greatest factor that advances the medical system.

REFERENCES

[1] คุณากร เอี้ยวสุวรรณ, et al. (2017). สถานการณ์การเข้าพักรักษาตัวในโรงพยาบาลและการมีผู้ดูแลในขณะพักฟื้นของผู้สูงอายุในประเทศไทย. Available at:http://ihppthaigov.net/DB/publication/attachdomestic/270/Full-text.pdf

[2] Calvin Sung, Jennifer L. Herbst. (2017). The ethics of caring for hospital-dependent patients. Available at: https://bmcmedethics.biomedcentral.com/articles/10.1186/s12910-017-0238-1#Sec2

[3] Tao Liu, Eliza Kiwak, Mary E Tinetti. (2017). Perceptions of Hospital-Dependent Patients on Their Needs for Hospitalization. Available at: https://pubmed.ncbi.nlm.nih.gov/28574536/

[4] Maria P, Mariana N. (2011). Needs of hospitalized patients. Available at: https://www.hsj.gr/medicine/needs-of-hospitalized-patients.php?aid=3492

[5] W. Nicholson Price. (2019). Risks and remedies for artificial intelligence in healthcare. Available at: https://www.brookings.edu/research/risks-and-remedies-for-artificial-intelligence-in-health-care/

[6] Micah Castelo. (2020). The Future of Artificial Intelligence in Healthcare. Available at: https://healthtechmagazine.net/article/2020/02/future-artificial-intelligence-healthcare

[7] Gil Press. (2021). The Future of AI in Healthcare. Available at: https://www.forbes.com/sites/gilpress/2021/04/29/the-future-of-ai-in-healthcare/?sh=5a1f90f7163b

[8] Junaid B., Usman M., Aditya N., Bryan W. (2021). Artificial intelligence in healthcare: transforming the practice of medicine. Available at: https://www.rcpjournals.org/content/futurehosp/8/2/e188

[9] Vaishali Advani. (2021). What is Artificial Intelligence, How does AI work, Types and Future of it. Available at:https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/

[10] Harrer, Stefan et al. (2017). Artificial Intelligence for Clinical Trial Design. Available at: https://www.cell.com/trends/pharmacological-sciences/fulltext/%20S01656147(19)301300?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%20%2Fpii%2FS0165614719301300%3Fshowall%3Dtrue

[11] AHA Committee on Clinical Leadership. (2020) AI and Care Delivery. Available at: https://www.aha.org/system/files/media/file/2019/11/Market_Insights_AI_Care_Delivery.pdf

[12] Zweig, Megan, and Tran, Denise. (2018). The AI/ML use cases investors are betting on in healthcare. Available at: https://rockhealth.com/insights/the-ai-ml-use-cases-investors-are-betting-on-in-healthcare/

[13] Trends for Scaling Innovation in Health Care. (2019). Center for Connected Medicine and the Health Management Academy. Available at:https://www.connectedmed.com/documents/reports/ccm-research-trends.pdf

[14] Liu, Xiaoxuan et al. (2019). A comparison of deep learning performance against health-care professionals in detecting diseases from medical imaging: a systematic review and meta-analysis. Available at: https://www.sciencedirect.com/science/article/pii/S2589750019301232?via%3Dihub

[15] Daley, Sam. (2019). Surgical Robots, New Medicines and Better Care: 32 Examples of AI in Health- care. Available at: https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare

[16] J Family Med Prim Care. (2019). Overview of artificial intelligence in medicine. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6691444/

[17] Yorita, Akihiro; Kubota, Naoyuki (2011). Cognitive Development in Partner Robots for Information Support to Elderly People. Available at: https://ieeexplore.ieee.org/document/5688294

[18] Bernard Marr. How Is AI Used In Healthcare - 5 Powerful Real-World Examples That Show The Latest Advances. Available at: https://www.forbes.com/sites/bernardmarr/2018/07/27/how-is-ai-used-in-healthcare-5-powerful-real-world-examples-that-show-the-latest-advances/

[19] Data collection. Available at: https://www.datarobot.com/wiki/data-collection/

[20] Karen Hao. (2021). An algorithm that mimics our tribal instincts could help AI learn to socialize. Available at:https://www.technologyreview.com/2019/01/22/103542/an-algorithm-that-mimics-our-tribal-instincts-could-help-ai-learn-to-socialize/