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REVIEW ARTICLE

ARE INDONESIAN NURSES READY FOR HEALTHCARE ROBOTS DURING THE COVID-19 PANDEMIC?

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Abstract
Healthcare robots are used in Indonesia and other countries to combat COVID-19 pandemic. This article was aimed to describe a perspective about healthcare robots, and to recommend ways for Indonesian nurses to engage with healthcare robots during the COVID-19 pandemic. One view hindering healthcare robot appreciation as partners of nurses is its threat to their practice. However, with the current environment of COVID-19 'frontline' situations, increasing infections of patients with SARS COV2, limited personal protective equipment, and the fastidious nature of maintaining social distancing and mask-wearing, it may be best to view healthcare robots as significant partners to facilitate safety, and ease the demands of nursing care activities in order to safeguard human lives while enhancing human well-being. Educating healthcare practitioners about healthcare robot programming and assurance of its safe and secure use can advance robot appreciation as partners in healthcare. These goals, challenges, and recommendations can provide Indonesian nurses some pathways-to-readiness towards a partnership involving healthcare robots, particularly during this COVID-19 pandemic, and in the future.

KEYWORDS
robotics; nurses; pandemics; COVID-19; Indonesia

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BACKGROUND

After the presentation on the topic, "Increasing aging population, humanoid nurse robot, and the Transactive Relationship Theory of Nursing (TRETON) in Japan" during the 2nd Andalas International Nursing Conference in Indonesia on September 2019, one participant asked about the possibility of using healthcare robots in Indonesia, saying, *"Wouldn't this be a threat for nurses if healthcare robots will be implemented in Indonesia"? "Healthcare robots may replace nurses if they will be used in Indonesia!"*

A news item was reported by *Kompas TV* on April 6, 2020, entitled, "A medical robot is prepared to treat patients with corona virus in Pertamina Jaya Hospital", publicizing that this may be the first time that a hospital in Indonesia will be using healthcare robots for patient care. Furthermore, it explained that the purpose of using these robots is to prevent infection through direct contacts between healthcare providers and patients (Reza, 2020). Similarly, this article featured healthcare robots because of the heightened awareness in the increasing numbers of patients with SARS COV 2, the virus responsible for the COVID-19 pandemic.

While using robots in healthcare may be relatively new in Indonesia, healthcare robots have been used in other countries. Several hospitals in China have used healthcare robots because of the COVID-19 pandemic. Functions of these robots were to deliver meals to healthcare personnel and patients, medicines to nursing departments, and information to patients. Healthcare robots also performed disinfection procedures, and cleaned floors (Arthur & Shuhui, 2020). Moreover, Yang et al. (2020) also found specific functions of healthcare robots during COVID-19 pandemic such as measuring patient temperatures and assisting human nurses in taking specimens by swabbing patients' throats with precision to determine accurate medical diagnosis of patients. This article aims to describe a perspective about healthcare robots, and to recommend ways for Indonesian nurses to engage with healthcare robots during the COVID 19 pandemic.

RESEARCH INVOLVING HEALTHCARE ROBOTS

Long before COVID-19 became a pandemic, in Japan, healthcare robots were widely used as subjects of healthcare research. This was due to the demographics of Japan as a super-aging society with a low birth rate and high turnover rate among nurses. Thus, Japan is facing

an increased demand for healthcare providers (Takase et al., 2009). Using healthcare robots in healthcare settings has been touted to be a welcome solution (Masui, 2016).

Research on healthcare robots have been increasing, particularly as a tool or as an instrument for interventions especially for patients with mental health conditions. Similarly, subjects of studies with robots included its utilization during exercise programs (Tanioka et al., 2019a), and as conversation companions (Miyagawa et al., 2019) particularly among older persons. Currently, a team of Japanese nurse researchers headed by Tanioka and colleagues have been conducting clinical research on transactive relationships between Pepper, a humanoid robot, with specific functionalities and interactive capabilities involving human nurses and their patients (Tanioka et al., 2017). Tanioka (2017) developed the *Transactive Relationship Theory of Nursing (TRETON),* a nursing engagement model for persons and human beings. Understanding the theoretical framework of healthcare robot development imbued with caring science perspectives to assist nurses with health care tasks such as performing care-related activities (Tanioka et al., 2019b).

It is important for nurses to consider healthcare robots as competent colleagues (Pepito & Locsin, 2019). Particularly in dangerous situations such as the current circumstance of infections with COVID-19 dominating and rendering human health care personnel exhausted yet unyielding in pursuing health care despite higher incidences of infections. Nonetheless, with healthcare robots functioning with competent capabilities for communication and infection prevention, these robots can also undertake the role of a *conversation partner* for patients. If these healthcare robots are equipped with capabilities for expressing caring in nursing and engage in interactive communication, these robots can become expressive "*caring robots"* that is able to connect with patients' families who cannot have limited human to human physical contacts. This can be expressed as a simple touch with those who are isolated because of the COVID-19 pandemic. Tanioka et al. (2017) has described a caring robot to be more of a humanoid nurse robot, an entity that is expected to express caring behaviors much like human nurses do, i.e., with capabilities to respond to emotion, feeling, mood, and expressions of suffering through eye contact, facial expression, personal touch, and knowing persons through verbal and nonverbal communication. Locsin et al. (2018) indicated that "a person's humanness certainly includes an emotional content regardless of well-intentioned activity. For humanoid nurse robots, however, to be more human-like and manifest caring in health care situations, they will need to show facial expressions and gestures as functionally imbued by their humanness as much as possible" (p. 152). In essence, healthcare robots will not be a threat to nurses, but instead will become "competent colleagues" that can play important roles in providing quality nursing care.

Nonetheless, several issues exist in using robots in healthcare settings. Despite the benefits of healthcare robots as caring entities, ethico-legal problems may arise such as safety, potential leakage of personal information of patients from stored data, and ethical issues pertaining to healthcare practice (Yasuhara et al., 2019). Nurses and other healthcare providers need to increase their awareness of this ethical concerns and be educated about these situations prior to partnering with healthcare robots.

INDONESIAN NURSES, FOURTH INDUSTRIAL REVOLUTION, AND HEALTHCARE ROBOTS

Indonesian nurses need to be prepared to participate in fostering technological advancements that revolutionize healthcare, particularly in consideration of the tenets of the Fourth Industrial Revolution. In this regard, there were studies using technological advancements involving perceptions of Indonesian nurses: hospital information systems (Setyohadi & Purnawati, 2018); telehealth (Hariyati & Sahar, 2012); and technological competency of nurses (Anggraini & Ismail, 2018). These provide critical information regarding the barriers and challenges of nurses` acceptance of technology use in Indonesia.

Focusing on information technology, infrastructure and systems, training concerns, regulation of technologies, and social systems (Hariyati & Sahar, 2012; Setyohadi & Purnawati, 2018), these studies include referencing Indonesian nurses' perceived technological competency as expressions of caring that is critical to nursing (Anggraini & Ismail, 2018). Due to lack of devices and technological supports (Anggraini & Ismail, 2018), highlighting the needs for training and education related to technology, the influence of the Fourth Industrial Revolution towards increasing nursing practice quality have been clearly identified. The Fourth Industrial Revolution is about more than just technology-driven change; it is an opportunity to help everyone, including leaders, policymakers and people from all income groups and nations, to harness converging technologies in order to create an inclusive, human-centered future. The real opportunity is to look beyond technology and find ways to give the greatest number of people the ability to positively impact their families, organizations and communities (World Economic Forum, n.d.). It is a fusion of advances in artificial intelligence (AI), healthcare robotics, and other technologies. It is the collective force behind many products and services that are fast becoming indispensable to modern life. Nevertheless, little is known about studies on AI and robotic technology, and nursing practice in Indonesia within the purview of the Fourth Industrial Revolution.

Will Indonesian nurses be ready for healthcare robots as partners in their practice? The need to educate nurses on the functionalities of robots pertaining to healthcare demands, and attuning nursing practice to competencies involving future advances in technologies encompassing nursing practice, are becoming critical nursing education topics (Tanioka et al., 2019c). There was a huge change during the pandemic COVID-19 in the way most of learning process in Indonesia, by which changing the conventional way to the online learning process. Moreover, the new policy for "Campus Freedom" that launched by the Ministry of Education and Culture, would open the new perspective of most Indonesian generation that technology is not only a need but become a must in the future.

RECOMMENDATIONS TO ENHANCE APPRECIATING HEALTHCARE USING AI AND ROBOTIC TECHNOLOGIES

Being technologically competent is being caring in nursing (Locsin, 2005). Theory-based practice engages technology, caring and nursing, thereby promoting nursing practice as the recognition of technological competencies as expressions of caring in nursing. To enhance the use of robots in healthcare, healthcare personnel need to have increased awareness of robot capabilities, from elemental functionalities of robot

actions to contributory tasks, and ultimately, the ability to engage in 'troubleshooting' robot performance. So that healthcare personnel have readiness to have these robot-based practice concerns, future contents of nursing education need to include not only concepts and theories of nursing practice, but importantly, content about principles of computer science, engineering, robotics, and software programs such as information data mining, etc. These contents are envisioned for nursing education because of the need for partnership with healthcare robots. Nurses need to learn and be skillful on how these technologies can be used in their practice.

Robots programmed with technologies will be efficient, safe, and will be enabling nurses to be involved in more patient-centered practices, including increased time to interact with patients, and to know more about patient conditions and preferences, while establishing emotional relationships, and responding appropriately to their health care needs (Shishehgar et al., 2018). This patient-centered care viewpoint underscores the important reality of nursing engagements in partnering with healthcare robots. As Locsin (2005) has emphasized, it is critical that nurses are able to understand their patients more fully as participants in their care, rather than simply as objects of care.

Nurses should be aware that technology is critical for understanding disruptive information in nursing education and practice (Aungsuroch & Gunawan, 2019). The theory of Technological Competency as Caring in Nursing (Locsin, 2005) enables nurses to understand that the future is infused with technological dependency and healthcare is not excluded. The challenge of nursing education in facilitating the integration of knowledge about AI, health informatics, and communication strategies with technological proficiency, including multidisciplinary modalities in the teaching-learning nursing situations (Tanioka et al., 2019c) is clearly the future reality for nursing education curriculum.

CONCLUSION

This article aimed to describe a perspective on healthcare robots, and to recommend ways for Indonesian nurses to engage with healthcare robots during the COVID-19 pandemic. Rather than allowing healthcare robots to be perceived as threats to healthcare and nursing, it is recommended that it may be best to envision these robots as significant partners towards facilitating and easing the demands of human health care activities in critical conditions such as during COVID-19 pandemic, while similarly enhancing human well-being. Healthcare providers such as nurses need to be educated as integral healthcare practitioners in their participation in quality practice through the integration of technologies in nursing. Educating healthcare practitioners about healthcare robot programming and assurance of its safe and secure use can advance robot appreciation as partners in healthcare. These goals, challenges, and recommendations can provide Indonesian nurses some pathways-to-readiness towards a partnership involving healthcare robots, particularly during this COVID-19 pandemic, and in the future.

Declaration of Conflicting Interest

Authors declare no conflict of interest associated with this article.

Authorship Contribution

F.B., T.T., R.L., H.M., and D.L. contributed to the conception, analysis, and manuscript writing.

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