The Use of Robotics in Dementia Care: An Ethical Perspective

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Abstract. Dementia and other related diseases are becoming increasingly diagnosed and are placing a serious strain on the healthcare system. Robotic technology research is currently underway to provide the much needed support to patients, caregivers, and health providers. This includes examining the ethical implications of robots use in healthcare. This scoping review explores the current state of the literature regarding robotics and dementia with a special lens on ethics. More specifically, this paper strives to gain an understanding of the current ethical considerations, and propose an intervention for evaluating ethical considerations prior to implementation. This research was conducted using PRISMA guidelines, extracting data from articles. Our findings revealed that further attention to policies and guidelines that are currently in place for general use of the technology should be utilized, and applied specifically to the context where the technology will be used.

Keywords. Robotics, dementia, ethics

1. Introduction

Dementia and other related diseases are becoming increasingly diagnosed in Canada, placing a serious burden on patients, families, caregivers and health practitioners [1]. 402,000 Canadian seniors aged 65 and over are living with dementia, and the number of individuals diagnosed with the disease increases by 76,000 people each year. The incidence rate is 14.3 cases per 1,000 senior individuals and over two thirds of those diagnosed with the disease are women [2]. There is a growing need for support and assistance for patients and families, who have been affected by dementia and other related diseases, due to the severe economic challenges that the disease poses to families and the healthcare system. Currently, the annual healthcare costs for dementia patients in Canada are $8.3 billion, and by 2031 these costs are expected to double to over $16.5 billion [2]. The use of technological solutions in healthcare in general can significantly reduce federal and provincial spending. The use of technology in any way should be done in an ethical and thoughtful manner. Therefore, there is a need to consider the technology in the context of the patient's best interests [3]. The objective of this research is to examine the current state of the literature regarding the use of robotic technology in dementia care with a special emphasis on ethical considerations. Specifically, the aim is to explore ethical awareness surround the technology among designers, developers and implementers.

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2. Background

Robotic technology has the potential to assist many individuals who are experiencing limitation and their caregivers. Limitations can include physical, cognitive, and/or emotional impairments that affect the patient as a result of their disease or condition [4]. By definition, a robotic device is a "physically embodied system capable of enacting physical change in the world". It should be added that robots can assist patients with cognitive tasks such as problem-solving and financial management, as well as basic activities of daily living (ADL) tasks such as grooming, feeding and moving [4]. Robotic devices can help with ADLs such as hygiene and instrumental activities of daily living (IADLs) such as going grocery shopping. Robotic devices can support an individual with dementia throughout the progression of their disease by helping them to adapt to the cognitive challenges associated with navigating differing contexts or settings [5].

The use of robotics and other medical technologies can provide life changing support to patients, families, caregivers and healthcare providers. However, ethical discussions must be understood in order to ensure that the rights of patients and involved parties are respected. The IMIA Code of Ethics includes the Fundamental Ethical Principles and the General Principles of Informatics Ethics, which provide for the planning and consideration of ethics in the delivery of modern healthcare solutions [3]. It should be noted that the IMIA Code of Ethics encompasses several, if not all medical (or health) technologies. It is argued that the guidelines can be interpreted differently for varying types of diseases and technologies that are used to treat or support those diseases.

3. Methods

A scoping review was undertaken to assess the current state of the literature. The review employed Arksey and O'Malley's [6] and Levac's [7] guidelines, and adhered to the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines.

3.1. Literature Search

A comprehensive search of four electronic databases: MEDLINE®, PubMed®, IEEEXplore® and Web of Science® was conducted. The search terms used were "dementia", "ethics" and "robotics", and were entered into each of the databases. Articles were extracted between the years of 2005 and 2021 in order to obtain relevant results. Following the database searches, all articles were extracted using Zotero® software. After extraction, the cumulative search results were imported into Covidence® for title screening and abstract screening, full text review and data extraction. Prior to importing the articles, the search results were visually checked for accuracy and unrestricted ability to view and download documents.

3.2. Inclusion Criteria and Exclusion Criteria

For an article to be included in the scoping review, it must be an empirical study focused on the ethical implications of robotics use in home care, and specifically in dementia care. Articles were included between the years 2005 and 2021. Additionally, if the article mentioned mild cognitive impairment and home care it was were considered for

inclusion and review. Articles were excluded if: (1) they did not mention ethics in either the objectives or discussion, (2) did not include robotics in the study (3) studied the use of a robot outside of a home care context (e.g. a hospital) and (4) not in English or French. Posters, abstracts, pamphlets and infographics were excluded. Studies that did not mention dementia or mild cognitive impairments were excluded, as well as studies which were primarily concerned with the function of the device rather than the ethical implications of its use.

3.3. Procedure

The article screening process was conducted using PRISMA guidelines for scoping reviews [8]. One reviewer screened titles and abstracts to fit the inclusion and exclusion criteria using Covidence®. The reviewer downloaded the final set of articles that were accepted into the study that were fully reviewed. All included articles fit the inclusion criteria and relevant data were extracted. Extracted data from the included articles following the full text review included the year of publication, country of origin, study design and number of participants. Additionally, specific details that were related to the inclusion criteria were extracted such as ethical issues and mitigation strategies that were mentioned. Any gaps in the research as well as the findings and impact were extracted.

4. Results

Following an initial search, 49 studies were imported into Covidence® for screening. After 11 duplicates were removed, 38 titles and abstracts were screened. Following title and abstract screening, a total of 31 studies were screened as full text. A further 17 studies were excluded based on the criteria, as outlined above (see Figure 1). Following the full text review, 12 articles were included in the study.

4.1. Article Characteristics

The articles included in the study were published between the years 2010 and 2020. Studies were included from several different journals (n=10). Many studies were published in *Ethics and Information Technology* (25%[3/12]). Half of the studies (50%[6/12]) were published in ethics journals. The studies employed survey, interview and focus group designs. Some researchers published literature reviews focused on this topic. The first authors of these research works represented nine countries, with the most common being England (25%[3/12]) and Switzerland (17%[2/12]). The remaining studies were conducted in Australia, Finland, Sweden, Ireland, United States, Norway and Belgium.
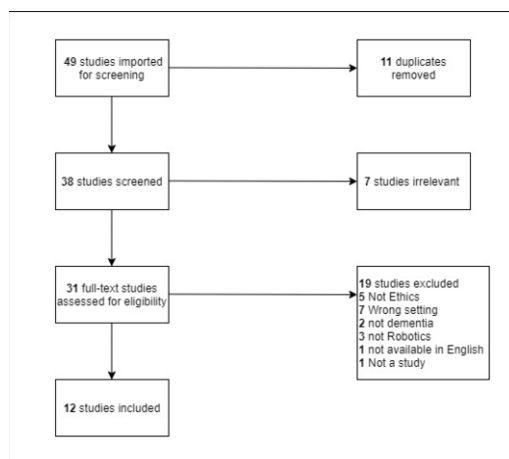
Figure 1. PRISMA Diagram

4.2. Themes

Three themes were identified: ethical considerations, robotic functions and healthcare system impact. The majority of the studies discussed ethical considerations that should be taken into account prior to robot implementation. The most common ethical considerations which were discussed were the potential for reduced human contact, privacy, affordability, infantilization, safety, independence, justice and informed consent [9-13]. The robots that were studied performed a number of functions. Robot functions included providing companionship [9], assistance (with basic movement, preventative measures) [10, 15] or were involved with video surveillance (i.e. surveillance) robots [14]. The remainder of studies did not state the specific functions of the robots. The principle impacts were safety, standardization and providing ethical solutions to health problems. Additionally, there were observed calls for policy change medical professionals in the field of robotics involved with caring for patients with cognitive impairments and dementia.

5. Discussion

The results of the review displayed the current state of the literature involving empirical studies of dementia and robotics used in healthcare with ethical considerations. Early research studies on the topic focus on the specific functions and desired effects of the use of robotic devices in healthcare for different diseases, and have now evolved into trials and studies that examine more than functionality. The role of robotics in the healthcare delivery process has raised questions and concerns about ethics and patient safety [10]. A gap in the research is the lack of standardization between regional codes of ethics and robotic implementations. For example, in Canada, the IMIA Code of Ethics is used; however, there are no guidelines or policies that specifically address the current research findings at the intersection of robotics and dementia care that fully reflect the relevant IMIA ethical principles. The potential implications of ethical breaches and mishaps are discussed in the literature. However, there is limited research regarding ethics in the conception, design and development of robotic devices *prior* to implementation.

6. Conclusion

Robots are considered a treatment and symptom management option for patients with dementia and have been seen to have numerous benefits to patients and caregivers. Further investigation is required to assess the ethical implications of robotic devices, and the potential ramifications that they may have on patients, their families and society. Additionally, a guide should be developed in order to evaluate the suitability of a device before implementation to reduce the chances adverse events from occurring.

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