

Mobile Telepresence Robots in Health Care Settings

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Mobile robotic telepresence (MRP) systems allow communication and mobility to interact from a distant location. In health care settings, these robots are used to enhance interactions between physicians, patients, and family members. MRP systems can thus be effective in improving quality and efficiency in health care; however, the interactions that MRP systems afford need to be studied to address issues related to their design, development, and implementation in line with the physical affordance space by looking not only at the features but also at the relationships they create. Therefore, this study aims to identify the types of interactions offered by two different types of MRP systems in health care settings, and the perceived differences between the two MRP systems. Empirical data were collected in Spain, in two hospitals, a nursing home and with professionals from private clinics. With a qualitative approach, the main data source were 25 semi-structured interviews with informants that used CLARC and GoBe tests in situ and video recorded as stimulus. Findings show perceived differences related to the appearance of the two MRP systems result in different evoked feelings that are either appropriate or inappropriate depending on the type of patient. This study improves the understanding of how to design, develop, and implement MRP systems in health care settings.

Keywords: Mobile Telepresence Robots · Human-Robot Interaction · Health Care

1 INTRODUCTION

As a result of their use in health care settings, robots may impact patients' health positively by facilitating access and speed of caregiving tasks [1]. Mobile robotic telepresence (MRP) systems [2] can be controlled remotely by users to interact with local informants [3]. Therefore, MRP systems that are implemented and used in health care settings may enable remote interactions between health care workers, patients, and family members while supporting physical presence [4]. MRP systems may thus provide emotional and physical support [5] in health care settings by allowing social interaction and by enabling in situ mobility for remote users. For example, telepresence can promote well-being, increase self-esteem and reduce loneliness in the elderly [6]. In situations such as infectious disease outbreaks, telepresence can help alleviate the negative effects of social distancing on the elderly and patients [7]. Furthermore, healthcare processes can be improved in terms of efficiency because robots can facilitate access and speed of care tasks, for example, with telemedicine practices. Even when the health sector measures performance mainly with the well-being of patients and not with the maximization of profits [8], the use of robots such as MRP systems is relevant due to the benefits for effective performance.

2 METHODOLOGY

Data was collected from different sources of information and analyzed with the help of qualitative case study methodology, which is particularly appropriate for fields that are not mature [9], [10]. As part of a larger exploratory research that investigated the safety and effectiveness of MRP systems in health care settings, test environments were created in which one or two different MRP systems, CLARC and GoBe were tested. CLARC (see Fig. 1) has a humanoid form that includes a touch screen at the torso, a shotgun microphone, speakers, and a webcam developed by the University of Malaga and was, at the time, being tested in a nursing home located in Malaga, Spain. GoBe (see Fig. 2) is an MRP system with a touch display, multiple cameras, speakers, and microphone developed by the Danish company Blue Ocean Robotics and was being tested in the nursing home and in two hospitals located in Seville, Spain. Moreover, the study included independent professionals working in private clinics in the south of Spain that were selected using snowball sampling.



Fig. 1 CLARC at the nursing home.



Fig. 2 GoBe at the nursing home.

2.2 Data Collection and Analysis

The first author visited the health care settings three to four times 7a week between April and May 2022 to collect primary and secondary data. While onsite, the researcher (i) observed daily health care practices, (ii) participated in the MRP system tests, and (iii) conducted the interviews with staff. The main primary data source were 25 semi-structured interviews with health care staff working in the selected health care settings. Only interviews with private clinic informants were conducted via Zoom, where MRP systems were presented via a video recording. The informants had various occupations, e.g., nurses, physiotherapists, psychologists, social workers, and psychiatrists. Each interview lasted between 20 to 30 minutes. The first part of the interview was related to the MRP system being tested at the time to elucidate the health care staff's perspectives and then about the second MRP system, which created the basis for comparison. Reflective notes were taken based on the onsite observations and the informal conversations. As we transcribed the interviews and collected the reflective field notes and secondary data transcripts, we followed a coding process that involved first-order concepts, second-order themes leading to aggregated dimensions. This process was done in NVivo to identify patterns, determine categories, analyze them, and interpret them in-depth [11].

3 FINDINGS

The main perceived difference between GoBe and CLARC is related to their appearance, which in turn created a difference in the evoked feelings. To illustrate, while CLARC is perceived as “informal” and “toy-like”, GoBe is perceived as “sophisticated”, and “more functional”. The appearance of each MRP system makes it more appropriate for some patients and less appropriate for others. As put by an informant, “For mental health patients, CLARC can trigger fear or hallucinations, that is why I think the other [GoBe] is more neutral” (P12). Observations revealed that the nursing home residents called CLARC by the name “Felipe” and had conversations with the MRP system when turned off, while no conversations were observed with GoBe. Thus, CLARC may evoke a feeling of presence of an ascribed identity, while GoBe may be better at evoking a feeling of closeness, as if the person operating the MRP system is present in the room, “It gives the feeling of company, being tall, because it is the height of a person, it seems to me that it can be of great help for some people, especially in isolation” (P22). “It seems that it is the family member who approaches [the resident], then I think it is easier for them to recognize them” (P5). In the nursing home, GoBe’s screen size resulted in an advantage compared to CLARC’s, given that elderly people might be visually impaired. However, some informants believed that

CLARC may be more beneficial for elderly people because it has a familiar form, “For older patients perhaps a robot in human form would be more friendly [...], for young patients who are more used to technology, I think the screen would be good” (P13).

3.1 Considerations for the Design, Development, and Implementation of MRP systems in Health Care Settings

Design and Development Implications. Some participants proposed new features or ways in which both MRP systems could be improved to contribute more effectively to the quality and effectiveness of health care. The proposals did not distinguish between the MRP systems but, rather, addressed them in general. Related to the hardware, some participants mentioned the relevance of having a button to call staff when assistance is needed, as well as an emergency button to turn off the MRP system immediately. Also, hospital nurses preferred the MRP systems to have a space to carry objects that patients may need, e.g., tissues. As for the software, input from interviewees and observations revealed that MRP systems should be able to detect objects while navigating to avoid accidents or an autonomous navigation mode, mainly in the nursing home, because residents are usually walking around with no supervision. Also, some clinicians would like to share relevant information through the screen with the patients during remote consultations, similar to sharing their screens with other tools such as Zoom.

Effective Implementation of MRP systems in Health Care Settings. For an effective implementation of MRP systems in health care settings, the fit between type of interaction and setting should be considered. The types of interactions identified in this study are two: family members communicating through the robot with the patient and the clinicians communicating through the robot with the patient. In both cases, the patient is facing the MRP system and the remote interactant is controlling it remotely. Therefore, the relevance of each interaction depends on the type of health care setting, which implies analyzing what a certain group of users and stakeholders may require. For instance, a nursing home may highly benefit from family members using MRP systems to talk because patients are dependent on health care workers to communicate, while hospitals may benefit more from a clinician interacting via MRP systems because health care staff’s workload may be decreased if remote clinicians join with the MRP systems to assist onsite patients. Private clinics might not be the most appropriate setting for MRP systems interactions, given that the patients do not stay overnight. Moreover, they typically expect an in-person consultation if attending the private clinic premises. Moreover, choosing GoBe or CLARC for a given health care setting may depend on whether patients should be attached to the MRP system or not. Findings showed that patients may build an affective relationship with CLARC due to the humanoid form, whereas GoBe has a neutral form that is less likely to trigger such social reactions.

4 CONCLUSION

This study covers implications for the design, development, and implementation of MRP systems in health care settings by looking not only at the features but also at the relationships created with patients, nursing home residents, health workers and family members. Future research may examine the effects of using MRP systems in health care settings with particular medical specialties and types of patients to understand differences and best practices.

Acknowledgements. This project has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 956745. The content of this publication does not reflect the official opinion of the European Union. Responsibility for the information and views expressed in the publication lies entirely with the author(s).

MOTIVATION STATEMENT FOR THE WORKSHOP

After collecting data for this research project, I felt intrigued by the effects of remote communication on the perceptions of healthcare employees about their work and social relations. I would like to explore different systems in the workshop to

understand the differences in terms of immersion, interaction capabilities, and overall experience to have more insights on what type of systems could be interesting in a health care context. Furthermore, I would like to connect with other researchers and industry members who are interested in remote communication and emerging technologies to find synergies and future collaborations.

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