Deploying Social Robots in Pediatric Hospitals: What Needs To Be Considered?

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ABSTRACT
There is a big gap between supply and demand for socio-emotional support for patients and their family members in pediatric care field. In order to close this gap, researchers are exploring how socially assistive robots could complement the service and support provided by human specialists. We envision social robots to become part of pediatric care team in the hospital, and take various roles that could improve the overall inpatient care for patients. The robots will entertain young patients with playful activities; distract them from pain, stress and anxiety; and facilitate communication between patients and medical staffs. However, there are a number of ethical issues that may arise when the robots are deployed without proper thoughts and preparation due to the sensitive nature of pediatric care context; children and medical information. In this paper, we pose questions on (1) how the recording features of the robot should be designed and handled, and (2) how collected data from the robot should be manipulated in order to minimize the privacy breach while utilizing the benefits of using robots for pediatric care, and invite roboticists, medical staffs, legal experts, psychologist and more for further discussions in the future.

Categories and Subject Descriptors
H.1.2 **[User/Machine Systems]**

General Terms
Human Factors.

Keywords
Pediatric care, Child-Robot Interaction, Healthcare, HIPPA.

1. INTRODUCTION
Many children admitted for inpatient care at pediatric hospitals often go through tough times. To provide socio-emotional support young patients and their family members, most large hospitals specialized in pediatric care have child life programs. Certified child life specialists (CLS) engage patients with developmentally appropriate play and interventions to mitigate stress and anxiety caused due to upcoming clinical care and hospital stay [4]. However, there is still gap between human resource supply and demand for the support service.

In order to close this gap, Jeong et al. are exploring how the Huggable robot could to complement the service provided by CLS in pediatric care [2]. In another study done by Beran et al., a humanoid robot distracts children from pain caused by vaccination [1]. Based on latest developments and interest in robots for young patients in hospital context, we envision social robots partnering with human specialists will become part of standard pediatric care in many hospitals in the future.

In this paper, we propose some ethical questions that need to be pondered upon before social robots get deployed at pediatric hospitals. The authors of this paper are currently involved in running a child-robot interaction study at Boston Children's Hospital [2], and most of our questions came from our own experience of bringing a social robot into patients' bed space, and interacting with study participants, family members and hospital staffs.

2. ROBOT'S ROLES IN PEDIATRIC CARE
Before posing ethical questions, we present our views of what social robots' potential roles in pediatric hospitals. We imagine robots to be used for various applications in pediatric care context. Either autonomous or remotely controlled, a social robot can gather valuable information about patients' emotional and mental states during hospital stays and medical procedures. In autonomous mode, the robot will entertain patients with simple play activities and distract them from pain and anxiety during medical operations. Using various sensors, the robot will measure patients' emotional and mental states based on their facial expressions, gestures, prosodies, etc. and share the gathered information to medical staffs for better assessment on patients' condition. When Wizard-of-Oz operated, the robot could become a platform for facilitating and moderating communication between patients and medical staffs.

3. QUESTIONS
As mentioned in the earlier section, the robots are assumed to be equipped with cameras and microphones for sensory input. However, any kind of video recording in hospitals needs to be handled very carefully and should be regulated under the guidelines of the Health Insurance Portability and Accountability Act (HIPPA) [3]. The following subsections present questions that may need to be answered when deploying robots in pediatric hospitals.

3.1 What can be recorded and stored?

3.1.1 Protecting Patients' and Family's Privacy
One of the proposed applications for social robots in pediatric care context is assessing child patients' affective states during playful activities. This would require some types of recorded data of the interaction for the medical care providers to review. The simplest data format to store is raw video and audio footage from the interaction. However, depending on the patient's medical

The Emerging Policy and Ethics of Human Robot Interaction, Mar 2, 2015, Portland, OR, USA.

conditions, camera footage can violate the privacy of the child and his/her family.

For instance, certain populations in pediatric hospitals are physically not able to use the bathroom due to their medical conditions. How would such situation be handled when the robot is present in the patient bed space? Would children and the family have a choice to request the removal of that footage? Should the patient and family members be instructed on how to able/disable recording features of the robot to protect themselves from any privacy breach?

3.1.2 Protecting Medical Staffs' Privacy

During some of the robot study sessions at Boston Children's Hospital, we encountered a number of medical staffs that showed concerns for the video surveillance in patients' bed spaces. Each time, we assured them that the recording was only for observing study participants' behaviors and not for evaluating clinical staffs' performance. For many medical staffs, the presence of cameras or any type of recording devices can be very distracting during their clinical service. This distraction will hinder them from providing the best medical care, which could cause harm for patients. However, one of the proposed application domains for pediatric robots is supporting patients during medical procedures to mitigate pain and stress. Should the robot be only used when medical staffs consent its presence during medical procedures? If a child patient wants the robot's company and the care provider does not, how should this conflict be resolved? How can we respect privacy of medical staffs and at the same time provide support for patients through the robot?

3.1.3 Protecting Privacy of Others

The risk of breaching privacy from video recordings becomes even more serious when the robot is portable and the child is able to take it to different places in the hospital for play. When placed in public space, such as a playroom or hallways, the robot could accidentally record other patients, their family members and even medical staffs who did not consent to be recorded at all. Furthermore, if audio is being recorded with video footage, there is a higher risk of breaching the HIPPA, depending on who gets access to the footages. If a robot unexpectedly recorded footages of unconsented people, should these video/audio data removed? Or would it be possible to use them if unconsented faces get blurred in the post-processing?

3.2 Should children be informed of recording and Wizard-of-Oz features of the robot?

Any type of video and/or audio recording requires proper parental consents, and sometimes patients' assent as well when running a clinical research study. In this regard, the caregivers of patients using the social robot should be informed of the recording features of the robot and whether a human staff remotely operates it. However, do children need to be informed of this as well?

One of the expected benefits from using robots in pediatric care context is gaining information from children that they would not easily share with adult healthcare providers. The CLS members of the authors occasionally see patients whispering "secrets" to their stuffed animals and sometimes meet a patient would only communicate with them through a hand puppet. We want a social robot to create a mentally and emotionally safe space for children to talk freely, and enable adult care providers to observe how their patients are feeling in a more child-friend way. However, what would happen if children were told that the robot is going to deliver what they said during playtime to their doctors or nurses? Or what if they are told that there is someone remotely controlling the robot and listening to what they say? Would this diminish the nonthreatening and safe nature of playful interaction with the robot? Or would children still remain in the illusion that they are playing with a talking robot that has its own agency? From what age is it appropriate to inform them about the robot's functionalities?

3.3 How should sensitive information or secrets be handled?

Assuming patients openly and willingly share private feelings and thoughts with the robot, how should this information be handled? Many children admitted in pediatric hospitals go through mentally and emotionally challenging experience. Thus, we can imagine some of them would bring up topics that are more serious and delicate during their playtime with the robot. What should the robot do if a child in critical health condition starts asking questions about death? The robot in the autonomous mode might not be able to properly handle such conversations. Should it gently divert the topic to something lighter and simpler? Or should a human specialist be called in for moderation? Also, if patients ask the robot to keep a secret, how should the robot react given that they are in a hospital environment? Are any secrets allowed between the robot and patients?

3.4 Who can access the recorded data?

Once the robot collects data about a patient, to what extent this data could be shared? Would it be only disclosed to the patient's current medical care providers? Could this data be considered as part of medical chart and be viewed by future healthcare providers as well? In some cases, a patient's family might want to review the data collected from the robot to see how the patient was doing when they were not present in the hospital. If family members who would like to "check in" how the patient is doing through the robot, could the data be shared with them?

4. CONCLUSION

This paper describes how social robots could be utilized in pediatric care and presents ethical issues that may arise in the process of deploying the robots in the field. We address issues of how the robot with recording capabilities could breach of privacy and the HIPPA and how information gathered through the robot should be shared among patients, caregivers, healthcare providers and the robot. These questions cannot be answered easily. However, experts in robotics, medicine, laws and developmental psychology should discuss these issues together to create proper guidelines for how social robots can be used for better pediatric care for our children in the future.

5. REFERENCES

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