

The Southwestern Surgical Congress

Robotic telepresence: a helpful adjunct that is viewed favorably by critically ill surgical patients

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KEYWORDS:

Robotic telepresence;
Intensive care unit;
Telemedicine;
Tele-ICU;
Telerounding

Abstract

BACKGROUND: The purpose of this study was to assess how surgical intensive care unit (SICU) patients and their families would perceive robotic telepresence. We hypothesized that they would view such technology positively.

METHODS: This research was an Institutional Review Board–approved prospective observational study. Our robotic telepresence program augmented the SICU multidisciplinary team rounding process. We anonymously surveyed patients and their families on their perceptions. Those who interacted at least once with the robot served as our participant base.

RESULTS: Twenty-four patients and 26 family members completed the survey. Ninety-two percent of respondents were comfortable with the robot, and 84% believed communication was “easy.” Ninety percent did not perceive the robot as “annoying” and 92% did not believe that “the doctor cared less about them” because of the robot. Ninety-two percent of respondents supported the continued use of the robot.

CONCLUSIONS: Robotic telepresence was viewed positively by patients and their families in the SICU. Furthermore, they believed the robot was beneficial to their care and indicated their support for its continued use.

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Telemedicine provides clinicians with the ability to monitor and provide care to patients as well as to communicate with other care providers and/or patients and their families from geographically distant locations.^{1–11} Robotic telepresence takes this one step further in which the caregiver’s

physical presence is virtually extended via a mobile robotic platform with real-time audiovisual communication.^{12–19} Such technology is foreign to many medical staff and anecdotally is associated with negative perceptions. In addition, there is concern pertaining to the potential negative perception from patients and their family members.²⁰

We previously queried our surgical intensive care unit (SICU) staff about the use of such technology. The results of the staff survey were presented at the Southwestern Surgical Congress in 2009. A total of 77 of 101 (77%) staff surveys were completed. The staff had an overall positive attitude toward the concept of introducing robotic telepres-

Presented at the 63rd Annual Meeting of the Southwestern Surgical Congress, April 3–8, 2011, Ko Olina, HI.

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Manuscript received April 12, 2011; revised manuscript August 2, 2011



Figure 1 Multidisciplinary SICU team meeting.

ence into the SICU. Importantly, 57 respondents (74%) believed that it would be inappropriate for the intensivist to perform routine daily rounds using robotic telepresence. This observation prompted discussions about the intended use of the robot with our SICU staff. We identified that our staff was most concerned by the noise and traffic in the SICU created by multidisciplinary morning rounds. Based on this evaluation, we designed our robotic telepresence program to augment the multidisciplinary rounding process in our SICU. The purpose of this study was to assess how

SICU patients and their families would perceive robotic telepresence. We hypothesized that they would view such technology positively.

Methods

This was a prospective observational study performed in the SICU at The Methodist Hospital in Houston, Texas. The




Figure 2 Robotic mobile unit participating in the morning rounding process.

Methodist Hospital is a 904-bed tertiary care referral center, serving southeast Texas and western Louisiana. Our SICU is a 27-bed unit serving a diverse group of patients including critically ill general, vascular, oncologic, transplant, thoracic, orthopedic, plastic, urologic, and head and neck surgical patients. In 2008, we instituted a robotic telepresence program to aid our morning rounding process.

The robotic telepresence system consists of a robotic mobile unit, now in its seventh revision and therefore termed "RP7" (InTouch Health, Santa Barbara, CA). It stands approximately 6 feet tall and is equipped with 2 high-resolution cameras, a 15-inch flat screen liquid crystal display monitor, and an omnidirectional microphone. The RP7 is controlled over a standard Internet connection using proprietary video conferencing and robotic control software, enabling real-time two-way audiovideo communica-

tion along with multidirectional robot movement.¹⁶ The RP7 is completely untethered and communicates via a wireless 802.11g secure hospital intranet connection. Access to the RP7 from a remote workstation is achieved either within the hospital's secure intranet, or outside the hospital via a secure end-to-end encrypted virtual private network.

As previously mentioned, before introducing robotic telepresence in our SICU, we surveyed our staff. The results of the staff survey were shared with the respondents, prompting further dialogue among all stakeholders. We identified that although the robot would potentially allow an off-site intensivist to have improved communication, this was not our most important issue. We did, however, have a perceived problem with noise and traffic within the SICU owing in part to the large multidisciplinary SICU team (sometimes ballooning up to 20 persons in size). From these



Opinions Regarding the ICU Robotic Telepresence System

The Methodist Hospital Department of Surgery, Division of Surgical Critical Care is interested in enhancing the ability for an intensive care doctor to always be available at the bedside. In addition, we are continually working to improve support for the resident physicians and nurses at night. We believe that using advanced robotic technology will help us continue to provide improved patient care.

You have seen "the robot" which allowed the intensive care doctor to be immediately available from a location outside the ICU. This allowed the intensive care doctor to support the nurses and resident physicians, just like he/she was actually present in the ICU.

We are very interested in your opinions regarding your experience with the ICU doctor using the robot. Please complete this questionnaire and return it by placing it in the secure drop-box in the ICU marked "ROBOT SURVEY".

We will not ask for any personally identifying information. Any information that you provide us cannot be linked to you. The ICU doctor will not have any knowledge of your responses.

We appreciate your help and will use your responses to improve how we continue to provide the highest standard of patient care.

I am a patient in the Dunn Surgical ICU

I am a family member of a patient cared for in the Dunn Surgical ICU

CIRCLE THE NUMBER THAT BEST MATCHES YOUR OPINION

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|--|-------------------|----------|---------|-------|----------------|
| 1. Care is better because the ICU doctor uses the robot to see me. | 1 | 2 | 3 | 4 | 5 |
| 2. I feel comfortable with my ICU doctor visiting me using the robot. | 1 | 2 | 3 | 4 | 5 |
| 3. I feel that my ICU doctor cared less about me by visiting me with the robot instead of in person. | 1 | 2 | 3 | 4 | 5 |
| 4. Communication with the ICU doctor using the robot is easy. | 1 | 2 | 3 | 4 | 5 |
| 5. I support The Methodist Hospital's use of "the robot" in the ICU. | 1 | 2 | 3 | 4 | 5 |
| 6. I feel like the robot makes it more difficult for me to communicate the way I would like to. | 1 | 2 | 3 | 4 | 5 |
| 7. When my doctor is not present, I prefer to communicate using the phone instead of the robot. | 1 | 2 | 3 | 4 | 5 |
| 8. I feel that the robot is annoying. | 1 | 2 | 3 | 4 | 5 |
| 9. I feel that use of the robot to see patients in the ICU should become a regular practice. | 1 | 2 | 3 | 4 | 5 |
| 10. I am concerned that the doctor can't fully examine me using the robot. | 1 | 2 | 3 | 4 | 5 |

Figure 3 Patient and family survey form.

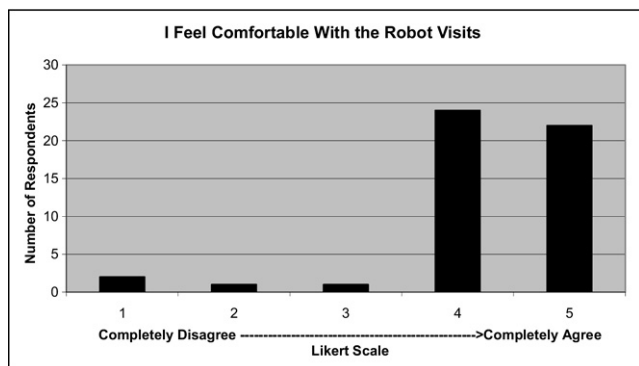


Figure 4 Patient and family comfort level with the robot.

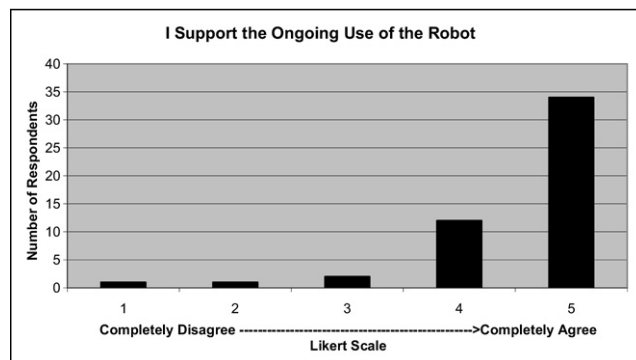


Figure 6 Patient and family support for continued use of the robot.

SICU staff meetings, we developed the concept of using the robot as a surrogate on the unit to replace having the entire multidisciplinary team standing at each patient’s bedside. We agreed that the robot would not be appropriate for replacing the surgical intensivist’s daily rounds, but that the robot would allow the multidisciplinary team to convene in a conference room for a “robot morning report.”

Our process incorporated the use of the robot within the workflow of providing daily care for critically ill patients in the SICU. The surgical residents and nurse practitioners would see patients and family members in the early part of the morning to perform physical examinations and gather clinical data. Each patient and/or family member was informed that the SICU team would convene in a conference room later in the morning to discuss the care plan, during which time the team would visit the patient via the robot. Therefore, immediately after the initial clinical encounter, the SICU multidisciplinary team (a surgical intensivist, the surgical residents, the nurse practitioners, a pharmacist, a nutritionist, along with members of other services) would meet in a remote conference room. This room provided a round-table conference environment, with the ability to project clinical laboratory results and diagnostic radiology images on a large screen for the entire team to see (Fig. 1). The video from the robot was projected alongside the clinical data. The robot was driven to each patient bedside, in just the same way as walking into the patient room (Fig. 2).

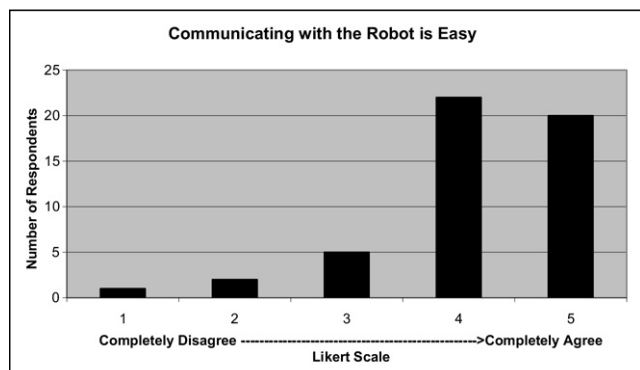


Figure 5 Communication of patients and family with the robot.

The robot operator engaged the patient and/or family member by stating “Good morning, this is Dr._____. The ICU team is in conference discussing your care. We are making sure that everything that needs to be done for you today is being done. Do you have any questions?” The patient and/or family had an opportunity to converse with the SICU team members via this process. As well, the SICU team was able to effectively see the patient, the real-time monitors, and all the clinical laboratory and radiologic data at the same time. Bedside nursing and respiratory care personnel were able to interact with the team as well. Physician orders and care plans were made during this meeting. After the morning report, a focused SICU team complement would return to visit each patient individually and implement the care plan.

We spent 2 months refining the workflow. Once we were confident that our process of seeing patients via the robot was optimized we began the formal implementation of the program.

In June 2009, we developed a patient/family survey to assess their attitudes toward the use of robotic telepresence in the SICU. The survey instrument was developed by expert consensus, consisting of 10 questions using a 5-point Likert scale. Five questions were worded for a positive response and 5 for a negative response (Fig. 3). The patient and family surveys were given to any patient and/or family member who had at least one interaction with the robot. Family members (one for each patient) were allowed to complete surveys if they wished to do so whether or not the patient participated. Respondents anonymously placed completed surveys into a secure drop box located within the SICU. The collection and review of data was approved by The Methodist Hospital Research Institute Institutional Review Board.

Results

Of the 53 patient/family surveys distributed, 50 (94%) were completed. Twenty-four of 25 (96%) patients responded and 26 of 28 (93%) family members responded. Figs. 4, 5, and 6 show the overall positive attitude toward

the robot from the respondents. In addition, 45 (90%) patients did not perceive the robot as “annoying,” 46 (92%) did not believe that “the doctor cared less about them,” and if asked if care was better because the robot was used, 42 (84%) agreed.

Discussion

By engaging our entire SICU staff in the evaluation of robotic telepresence through a structured and quantitative process, we were able to optimize our plans for how and when we would use the technology. Specifically, this process allowed us to address SICU staff concerns regarding the use of robotic telepresence during morning rounds. During this process we identified that nurse and patient satisfaction were impacted negatively by the noise and traffic in the SICU created by multiple physicians and their teams rounding in the morning. After discussing the pros and cons of the technology, all stakeholders were able to agree that robotic telepresence could be used to help decrease the noise and traffic caused by our multidisciplinary team rounds. However, we were not able to implement a suitable model and instrument for quantifying noise and traffic for this study period. Therefore, we concentrated first on patient and family perception of our implementation of robotic telepresence.

Patients and families have a positive attitude toward the use of robotic telepresence in the SICU. Robotic telepresence was perceived by the patients and their families as beneficial to their care and they indicated their support for its continued use. Our previous survey of SICU staff opinions was positive and provided important feedback for optimal implementation of a robotic telepresence program. Our use of robotic telepresence with a multidisciplinary team in an SICU represents a unique implementation not previously described. Although we believe that robotic telepresence use by a multidisciplinary team helps to ensure that all aspects of clinical care are optimally reviewed and delivered, further outcome studies need to be performed.

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