



Research on Patient Satisfaction of Robotic Telerounding: A Pilot Study in a Korean Population

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OBJECTIVES	To evaluate the efficacy and functionality of robotic telerounding among Korean patients using the RP-7 robot system and a questionnaire survey comparing the results of robotic telerounding and standard rounding in Korean patients.
METHODS	A total of 40 patients who underwent urologic minimally invasive video-assisted minilaparotomy surgery, laparoscopic and robotic surgery, and endoscopic surgery were recruited. The patients were divided into 2 groups – telerounding (20) and standard rounding (20) – and underwent robotic telerounding and standard rounding. We assessed the patients using a 24-item questionnaire to evaluate the efficacy and functionality of their hospital care.
RESULTS	The hospital factors such as self-rated health, assistance, and pain control scores showed no statistically significant differences between groups. Patient satisfaction showed a statistically significant difference in MD confidence, medical communication, explanation understanding, explanation satisfaction, mutual communication, and mutual response. In the telerounding group, participants were satisfied with the audio and video qualities and believed that the robotic telerounding provided better care, and 85% of patients preferred telerounding in the absence of the attending physician.
CONCLUSION	Robotic telerounding can provide efficient and cost-effective medical rounding by reducing inconvenience and labor cost with greater patient satisfaction with postoperative care. However, there is no statistically significant difference in the hospital factors and postoperative morbidity. In addition, the patients doubted that the robotic telerounding could replace standard rounding due to the Eastern culture. UROLOGY 130: 205–208, 2019. © 2019 Elsevier Inc.

Traditionally, the doctor–patient relationship has mainly been determined by face-to-face contact. With this bedside interaction, patients could be satisfied with their medical care. Advances in communication technology have accelerated the development and spread of telerounding. Telerounding is applied to outpatient care mainly by telephone, e-mail, and so on. Recently, postoperative robotic telerounding, introduced as service robotic technology, has evolved for human–robot interaction with vision and sound information.^{1–3} Robotic telerounding increases accessibility, reduces inconvenience, and improves cost-effectiveness by reducing labor cost. In fact, many

reports have indicated that patients in Western countries are satisfied with robotic telerounding.^{4–15} Robotic telerounding appears to acceptably facilitate physician communication with hospitalized patients. Robotic telerounding has not resulted in missed or increased postoperative complications. The use of robotic telerounding with patients in intensive care units (ICU) has enabled rapid face-to-face response of attending physicians to ICU patients and resulted in decreased ICU cost and length of stay.

Several researchers have reported that robotic telerounding is useful in increasing patient satisfaction.^{4–15} However, no such study has yet been conducted in Korean patients, which have conservative views on medical care.

Therefore, in this study, we evaluated the effectiveness and functionality of robotic telerounding among Korean patients using the RemotePresence-7 (RP-7) robot system (InTouch Health, Santa Barbara, CA) and a modified version of the survey questionnaire of Ellison et al.^{6,7}

METHODS

The RP-7 robot system, which is a telerounding robot, was developed to enable a clinician to evaluate and participate in

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inpatient management process even when he/she is not physically present in the hospital setting (ie, telerounding).⁴⁻¹³ The robot consists of a wheel-driven base, a speaker, a screen monitor, a camera, and a controller embedded into the body of the robot. It stands at 165 cm and has a base of 63 cm × 76 cm, making it similar to the size of a human being. It can be remotely controlled using a portable laptop. In this way, a physician can communicate with patients using the robot.

Between June and July 2009, 40 patients who underwent urologic minimally invasive video-assisted minilaparotomy surgery, laparoscopic and robotic surgery, and endoscopic surgery were recruited. The patients were divided into 2 groups, that is, telerounding (20) and standard rounding (20). Robotic telerounding was performed once a day using the RP-7 robot (Intuch Health, Santa Barbara) and without medical staff members, from postoperative day 1 to the day before discharge. Vital signs, hydration status, blood tests, physical examination conducted by the patients themselves (palpation of abdomen), diet, and status after removal of drain and Foley catheter were included in the routine assessment. The robotic telerounding was terminated when patients were discharged, or a major complication occurred requiring intervention. Some minor complications (eg, paralytic ileus, blood test indicator deterioration, continuation and increase of drainage, fever, etc.) delayed patients' discharge for more than 24 hours. Even if it was telerounding, rounds by residents continued (dual-rounding design). We used a validated 24-item questionnaire to evaluate patient ratings of their hospital care, including standard rounding and telerounding. We modified the survey questionnaire used by Ellison et al⁵⁻⁶ to suit the purpose of this study. The survey comprised 3 questions on the patients' assessment of their own condition during hospitalization, 7 questions regarding the management after surgery, and 7 questions on the introduction and possibility of using telerounding robots. The independent *t* test was used to assess the differences between the survey results on the robotic telerounding and standard rounding. SPSS version 12.0 (SPSS) was used to perform statistical analyses.

RESULTS

A total of 40 patients were enrolled: 20 for standard rounding and 20 for robotic telerounding. Table 1 outlines the baseline

patient factors, surgical distribution, hospitalization factors, and minor complications. For the hospitalization factors, the self-rated health scores of telerounding and standard rounding were 2.9 and 2.75, respectively; assistance scores, 2.95 and 3.15; and pain control scores, 2.6 and 2.95. There were no statistically significant differences in baseline characteristics between the 2 groups. In addition, regarding complication rates, all cases involved minor complications and were similar (telerounding vs standard rounding: 25% vs 25%; *P* = 1.00), as shown in Table 1.

There was a statistically significant difference in patient-reported satisfaction. Table 2 and Figure 1 show the results on MD confidence, medical communication, understanding of the explanations, satisfaction with the explanations, mutual communication, and mutual response. The results show statistically significant differences.

In the telerounding group, high ratings were given for audio and video quality. More than half of these patients agreed or strongly agreed that robotic telerounding makes for better care and should be a part of regular hospital care. Especially, 17 patients (85%) preferred telerounding in the absence of the attending physician. However, they doubted that telerounding could replace standard rounding (55%), as shown in Table 3.

DISCUSSION

With remarkable progress in communication technology, telerounding using robots will be inevitable in the near future in modern society. Robotic telerounding increases accessibility, reduces inconvenience, and improves cost-effectiveness by reducing labor cost.

The doctor–patient relationship is developed during their physical contact and could be affected greatly by such contact. In an Eastern culture, especially, people usually consider affection and spiritual energy as important, and that is why the level of satisfaction with robot telerounding is lower in this study than in studies conducted in Western populations.

Previous studies^{4,15} have found telerounding as being associated with greater patient satisfaction with postoperative care. An example is Kau et al¹⁶ that evaluated the

Table 1. Baseline characteristics of the 40 study participants

	Telerounds (n = 20)	Standard Rounds (n = 20)	<i>P</i> Value
Patient factors			
Age (year)	65.3	63.6	.515
Male (%)	17 (85)	18 (90)	1.0
Surgical distribution (n)			
Transurethral resection	5	4	-
Laparoscopic radical nephrectomy	1	1	-
Robotic surgery			-
Simple nephrectomy	1	-	-
Partial nephrectomy	2	1	-
Prostatectomy	10	12	-
VAMS donor nephrectomy	1	2	-
Hospital factors* (scale, 1-5)			
Self-rated health score	2.9	2.75	.675
Assistance score	2.95	3.15	.591
Pain control score	2.6	2.95	.333
Minor complications [#] (%)	5 (25%)	5 (25%)	1.000

VAMS, Video-assisted Minilaparotomy Surgery.

* The response scales ranged from 1, poor, to 5, excellent.

[#] There were no major complications.

Table 2. The patient-reported satisfaction scores about postoperative care

	Telerounds*	Standard Rounds*	P Value
MD confidence	3.45	4.3	.008
Medical communication	3.5	4.25	.014
Explanation understanding	3.5	4.3	.006
Explanation satisfaction	3.4	4.05	.042
Mutual communication	3.45	4.25	.016
Mutual response	3.25	4.25	.002

*: The response scales ranged from 1, poor, to 5, excellent.

feasibility of telerounding system. Vespa et al reported that compared with conventional, the use of robotic telerounding in ICU patients increased by 11% and led to a savings of about USD 1.1 million in ICU costs for the period of 2005 to 2006 in the UCLA Medical Center.^{4,5} Ellison et al showed that standard rounding and telerounding had similar morbidity rates (16% vs 13%; $P = .64$) and length of stay (2.8 vs 2.8 days; $P = .94$). In addition, they found that patient satisfaction was equivalently high between the two.^{6,7} Gandsas et al showed that robotic telerounding could reduce the length of stay of patients undergoing non-complicated laparoscopic gastric bypass operation, which resulted in a substantial cost savings for the hospital and patients.⁸ Sucher et al reported that surgical intensive care unit (SICU) patients and their families would believe the robotic telerounding, which can provide benefits for their care.⁹ Garingo et al introduced the feasibility of telerounding in neonatal intensive care with data analyses on patient rounding data, clinical outcomes, length of stay, and hospital costs.¹⁰ Marini et al and Agarqal et al reported that robotic telerounding is useful for patient satisfaction and care, but medical staff members (eg, medical students, physician assistants [PAs], and surgical residents) would prefer standard rounding.^{11,12}

In these studies, a high proportion of patients involved in telerounding believed that this technology should be introduced into usual postsurgical care, and most patients thought their care was equivalent to or better than the care they would have received with standard rounding. The value of telerounding has already been proven in

Table 3. Patients' evaluation of the telerounding system (%)

	Poor	Fair	Good	Very Good	Excellent
Audio quality	0	0	8 (40)	9 (45)	3 (15)
Video quality	0	0	5 (25)	7 (35)	8 (40)
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
My care was better because of robotic telerounding.	0	5 (25)	3 (15)	7 (35)	5 (25)
I feel that robotic telerounding should be a regular part of patient care in the hospital.	1 (5)	4 (20)	4 (20)	9 (45)	2 (10)
If I were hospitalized again, I would feel comfortable with robotic telerounding on an everyday basis.	1 (5)	8 (40)	3 (15)	5 (25)	3 (15)
If my MD was out of town, I would rather teleround with my MD than be seen by a partner.	1 (5)	1 (5)	1 (5)	11 (55)	6 (30)
Telerounding can replace standard rounding.	1 (5)	5 (25)	5 (25)	7 (35)	2 (10)

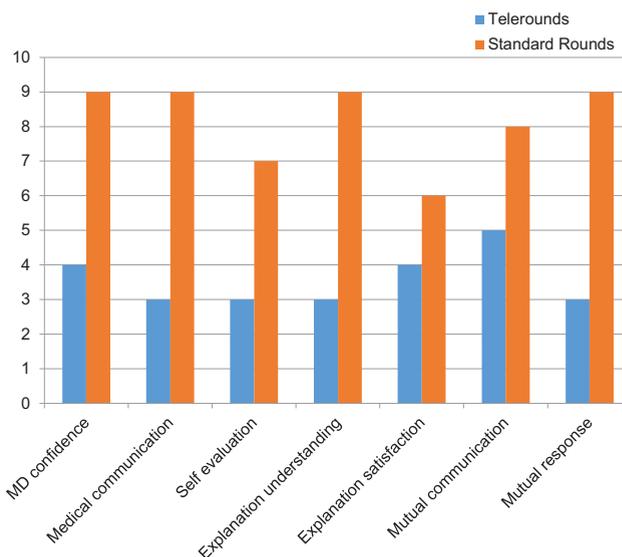


Figure 1. Numbers of patients reporting "excellent" ranking for each postoperative satisfaction measure. (Color version available online.)

Western countries, and more studies have been conducted to increase the effect of telerounding. Aydogdu et al investigated the potential effect of telerounding system and evaluated it as a feasible and inexpensive procedure to improve physician-patient communication.¹⁴ Corrado et al showed the effect of robotic telerounding on medical education of medical staff members, such as medical students, physician assistants, surgical residents, and nurses.¹⁵ Kaczmarek et al used a tablet PC to perform remote rounding, and evaluated its feasibility by assessing patient satisfaction.¹⁷ The results showed that 91% of the patients reported satisfaction with telerounding when compared with standard rounding. Matthews et al developed a mannequin-based robotic system to use telepresence to reduce mortality in African countries.¹⁸

Although the number of cases is considerably small (20 for standard rounding and 20 for robotic telerounding), most patients still thought that standard rounding was an important part of a doctor-patient relationship, even

though they received robotic telerounding well and there was no increase in postoperative complication. There was a significant difference in the level of patients' satisfaction, and they doubted that telerounding could replace standard rounding, which is not consistent with the previous studies. These results show that Korean patients tend to be more conservative about medical care than their Western counterparts. This conservative view of medical care should be changed along with this technically advanced world, which could be achieved through a general introduction of this technology in hospitals, improvements in robotic equipment to be more delicate and warm-hearted, and persistent advertisements to the public. Moreover, a prospective multicenter research of a number of patients based on an established clinical protocol should be conducted. To increase the statistical power of this research, we have planned a large volume study.

CONCLUSION

Robotic telerounding can provide efficient and cost-effective medical rounding, by reducing inconvenience and labor cost, and result in greater patient satisfaction with postoperative care, according to previous studies. This study found that robotic telerounding was generally acceptable only because there was no change in the hospitalization factors and postoperative complication rates. However, Korean patients seemed to prefer the typical standard rounding more than robotic telerounding and doubted that the latter could replace the former; such perception is attributable to their Eastern culture orientation.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.urology.2019.04.030>.

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