

The Effects of Postdischarge Telephone Counseling and Short Message Service on the Knee Function, Activities of Daily Living, and Life Satisfaction of Patients Undergoing Total Knee Replacement

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BACKGROUND: No study comparing short message service (SMS) texts and telephone counseling for patients undergoing total knee replacement (TKR) has been reported.

PURPOSE: The purpose of the study was to provide postdischarge telephone counseling and SMS texts to TKR patients and to analyze the effects of these services on their knee function (KF), activities of daily living (ADL), and life satisfaction (LS).

METHODS: This study used a randomized clinical trial design. This study was conducted with 40 patients (counseling group: 21; SMS group: 19). In the telephone counseling group and the SMS group, KF, ADL, and LS were assessed before surgery and 1 and 3 months after TKR.

RESULTS: Telephone counseling and SMS texts have the same effects on KF, ADL, and LS of TKR patients.

CONCLUSION: Future research is needed to determine optimal frequency and duration of post-TKR SMS to support patients who have undergone TKR.

Necessity of Study

In Korea, the number of patients who underwent total knee replacement (TKR) in 2014 was 57,738 (National Health Insurance Service, 2016), and it is increasing steadily with the aging of the population. In the United States, 4.0 million adults are living with TKR, and as more adults in the United States undergo TKR, the population at risk for complications increases and the cost of reoperation or continuous management continues to rise (Weinstein et al., 2013). Knee joint disorder significantly affects activity competence and restricts daily living, markedly impairing quality of life (Takemasa et al., 2014).

Self-care is required for the first full year after TKR. Self-care refers to individual responsibility for improving health and supporting recovery. (Omisakin & Ncama, 2011). Self-care behavior at home after TKR

includes medication, wound care, monitoring for complications exercise, coping with stress, etc. (National Association of Orthopedic Nurses, 2014). Adequate postdischarge self-care is important for maintaining knee function (KF), activities of daily living (ADL), and life satisfaction (LS) (Oatis et al., 2014; Sasaki et al., 2014).

Patients undergoing TKR can tire of the self-care regimen in the months after discharge; as a result, they often become inattentive to self-care over time, which may result in adverse effects such as the loosening of prosthesis, breakdown and abrasion of the polyethylene insert, and joint stiffness (American Academy of Orthopaedic Surgeons, 2014; National Association of Orthopedic Nurses, 2014). Self-care is life-long, but monitored and supported at the 1, 3, 6 and 12 month follow-up visits.

Previous studies reported that telephone counseling for discharged patients was an effective method for management of postdischarge chronic health problems, reducing recurrence and resultant rehospitalization (Harrison, Hara, Pope, Yong, & Rula, 2011), and that short message service (SMS) texts supported high-quality health self-management at a low cost (Mukund Bahadur & Murray, 2010). Because TKR patients have

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This work was supported by the Gachon University research fund of 2015 (GCU-2015-0050).

The authors have disclosed no conflicts of interest.

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DOI: 10.1097/NOR.0000000000000332

temporal restriction on their movements after surgery, telephone counseling or SMS is particularly helpful because the patient does not have to visit the hospital; in addition, the timing is more flexible for both the provider and the recipient. In many hospitals, ward nurses carry out "postdischarge telephone follow-up" to check the patient's medication, wound and drainage management, range of motion, discomfort, satisfaction with nursing and education, etc., but this work can be burdensome to busy nurses. Although telephone counseling provides information needed by the patient; it can be time-consuming for the nurse. SMS texts have the advantage of being convenient and are not time-sensitive; however, they are not responsive to patient need.

Currently, most hospitals provide postdischarge telephone counseling services, but in response to recent reports that SMS alone produces good results (Hughes, Done, & Young, 2011; Mukund Bahadur & Murray, 2010), there is an increasing interest in the use of SMS. However, no study comparing SMS and telephone counseling, as it applies to TKR patients, has been reported.

Thus, this study compares KF, ADL and LS of patients who received telephone counseling with that of patients who received SMS texts after TKR.

Objectives

The purpose of this study was to provide postdischarge telephone counseling or SMS to TKR patients and to analyze the effects of these services on their KF, ADL, and LS. Specific goals were as follows:

1. To examine differences in KF, ADL, and LS at different time points within the telephone counseling group and the SMS group;
2. To examine differences in the pattern of change in KF, ADL, and LS between the telephone counseling group and the SMS group.

Methods

DESIGN

This study used a randomized clinical trial design that assigned participants to either of the two groups at random.

PARTICIPANTS

This study was conducted with patients who had received a diagnosis of degenerative arthritis and were about to undergo TKR at the Joint Center of a university hospital, who were given an explanation of the purpose of this study, and who gave their consent to participate. The minimum required sample size was estimated using the G*Power program (Faul, Erdfelder, Buchner, & Lang, 2009). On the basis of repeated-measures analysis of variance (ANOVA) with a significance level of .05, power of test of 0.90, effect size (f) of 0.25, the number of measurements three, and the number of groups two, a total of 36 subjects were required. Considering the expected dropout rate, 43 participants were recruited,

numbered at random, and assigned to either the telephone counseling group or the SMS group. As one dropped out of the counseling group and two dropped out of the SMS group, 21 patients in the telephone counseling group and 19 patients in the SMS group participated, and the power of test with 40 participants was 93.5% (0.935). For confidentiality, a separate list was prepared so that the researcher could not identify the numbers, and data were collected by research assistants. The inclusion and exclusion criteria were as follows:

Inclusion criteria:

- Those who underwent TKR for degenerative arthritis;
- Those able to understand and answer the questionnaire by themselves;
- Those with a personal mobile phone and able to check SMS;
- Those able to respond to the questionnaire survey and telephone counseling; and
- Those who understood the purposes of this study and gave written consent to participate.

Exclusion criteria:

- Those who had received a diagnosis of a disease that might affect KF and pain;
- Those who were going to undergo revision surgery; and
- Those with dementia or mental disorders.

DATA COLLECTION PROCEDURE

Data were collected from outpatients at the Joint Center of the university hospital. The researcher first explained the purpose of the research, guaranteed participants' anonymity, and promised ethical protection and then obtained written consent from those who agreed to participate voluntarily.

In both groups (telephone counseling and SMS), KF, ADL, and LS of participants were assessed three times: before surgery and 1 month and 3 months after TKR. Both SMS and telephone counseling were conducted every other week, a total of six times. Telephone counseling was provided for 5 minutes, whereas the SMS texts included structured messages. Both groups were provided with an exercise video on discharge (see Table 1).

INTERVENTIONS

Telephone counseling and SMS texts were provided by the researcher, and the contents of the services were as follows:

- For the telephone counseling sessions, the researcher made phone calls at: 1, 3, 5, 7, 9, and 11 weeks after discharge. During each call, the researcher asked about the patient's general condition, ADL, and dysfunction or inflammatory symptoms in the affected joint; encouraged exercise; and confirmed the time of the next session.
- For SMS texts, the researcher sent SMS texts six times: at 1, 3, 5, 7, 9, and 11 weeks after discharge. Texts enquired about the patient's general condition, ADL, and dysfunction or inflammatory symptoms in the affected joint; encouraged exercise;

TABLE 1. DATA COLLECTION PROCEDURE

Group	Before Surgery	Discharge	1 Week After Surgery	3 Weeks After	1 Month After	5 Weeks After	7 Weeks After	9 Weeks After	11 Weeks After	3 months After
Telephone counseling group	First DC	Discharge education ^a	Phone call 1	Phone call 2	Second DC	Phone call 3	Phone call 4	Phone call 5	Phone call 6	Third DC
SMS group	First DC	Discharge education ^a	SMS 1	SMS 2	Second DC	SMS 3	SMS 4	SMS 5	SMS 6	Third DC

Note. ADL = activities of daily living; DC = data collection; KF = knee function; LS = life satisfaction.
^aDischarge education = Postoperative education including an exercise video.

and confirmed the time of the next session. The scripts were adapted based on timing (see Table 2).

INSTRUMENTS

Knee Function

Knee function was measured using WOMAC (Western Ontario and McMaster University Osteoarthritis) developed by Bellamy (1989), which is currently used by the Joint Center of the university hospital. This scale consists of 24 items including five items on pain, two on stiffness, and 17 on ADL disability. Each item is answered on a 5-point Likert scale (not at all: 0; absolutely yes: 4), with a high score indicating a high level of knee dysfunction. The reliability (Cronbach's α) of the scale was .94 on its development and .94 in this study.

Activities of Daily Living

Activities of daily living was measured using the Korean-style ADL scale developed by Won, Rho, Sun, and Lee (2002). This scale consists of seven items including grooming, face washing, bathing, eating, moving, toileting, and bowel and bladder control, and each item is answered on a 3-point scale (perform independently: 1; perform with help: 2; fully dependent: 3). A high score indicates a high level of ADL disability. The reliability (Cronbach's α) of the scale was .94 on its development and .77 in this study.

Life Satisfaction

Life satisfaction was measured using a scale developed by Kang (1996) through revising and supplementing LSI-Z (Life Satisfaction Index-Z) developed by Wood, Wylie, and Sheafor (1969). This scale consists of 13 items asking about subjective feelings related to general life satisfaction. Each item is answered on a 3-point scale (Yes: 3; So-so: 2; No: 1), and a high score indicates high life satisfaction. The reliability (Cronbach's α) of LSI-Z was .79 on its development and .68 in this study.

ANALYSIS METHODS

SPSS 23.0 was used for statistical processing of data. The characteristics and variables of the telephone counseling group and the SMS group were analyzed using frequencies, percentages, and means. The chi-square and independent *t* tests were used for testing the pretest homogeneity of the two groups for KF, ADL, and LS. The paired *t* test was used for analysis of differences in KF, ADL, and LS between the two groups at different time points. Repeated-measures analysis of covariance was performed for KF that showed a pretest difference to determine differences in the pattern of change between the two groups, and repeated-measures ANOVA was performed for ADL and LS. Statistical significance was accepted if *p* < .05.

ETHICAL CONSIDERATIONS

This study was approved by the institutional review board (IRB) of the university hospital with which the author was affiliated (CNUH-2015-072). Participants received an explanation of the purpose and process of the research and their right to refuse, data protection

TABLE 2. CONTENTS OF INTERVENTION

Time	Group	
	Telephone Counseling Group	SMS Group
1, 3 weeks	Daily living management	How are you? Do you have any discomfort or pain in daily living? Avoid hot tub bath or sauna and just have a short shower at home.
	Inflammation management	What are most important after surgery are knee exercise and the observation of inflammatory symptoms at the surgical site. Check if the surgical site suddenly turns reddish or has severe flush.
	Exercise	For maintaining joint function after surgery, keep doing quadriceps femoris muscle strengthening exercise and knee exercise continuously.
	Reminding	The next outpatient visit is on MM/DD at HH o'clock. The next counseling will be on MM/DD at HH o'clock.
5, 7, 9 weeks	Daily living management	How are you? I am nurse B at A hospital. How is your knee pain?
	Inflammation management	Avoid hot tub bath or sauna and just have a short shower at home. What are most important after surgery are knee exercise and the observation of inflammatory symptoms at the surgical site. Check if the surgical site suddenly turns reddish or has severe flush.
	Exercise	Keep doing knee bending, stretching exercise, and light walking exercise continuously.
	Reminding	The next counseling will be on MM/DD at HH o'clock.
11 weeks	Daily living management	How are you? I am nurse B at A hospital.
	Inflammation management	Do you have any discomfort or pain in daily living? What are important for maintaining knee function are knee exercise and the observation of inflammatory symptoms at the surgical site.
	Exercise	Indoor cycling or swimming is good for the knee joints. Keep doing exercise continuously.
	Reminding	You must observe the dates of postoperative outpatient visit, and visit the hospital at least once for x-ray studies to check the stability of the knees and the condition of the artificial joint. The next outpatient visit is on MM/DD at HH o'clock.

methods, gifts for participation, etc. A collection box was provided so that participants could return their questionnaires in confidence. Participant questionnaires were encoded for electronic processing, and their personal information (telephone number, mobile phone number) was used only for the purposes of this research. The researcher explained the contents presented in the invitation letter to those who wanted to participate in the research and requested signing the consent form by those who agreed to participate. The participants were informed that they could withdraw from the research at any time and that they could request additional information or contact the IRB for any questions on research subjects' rights at any time during the period of research, and contact information was provided in the invitation letter.

Results

PARTICIPANT HOMOGENEITY IN CHARACTERISTICS AND VARIABLES

There was no difference in gender, age, cohabitation, body mass index (BMI), and the number of comorbidities between the telephone counseling and SMS groups. The mean KF was 2.33 in the telephone counseling group and 2.75 in the SMS group, which was significantly different ($\chi^2 = -3.84, p = .000$). There was no significant difference between the groups in ADL ($\chi^2 = 0.21, p = .837$) and LS ($\chi^2 = 1.40, p = .169$) (see Table 3).

DIFFERENCES IN KF, ADL, AND LS ACCORDING TO TIME WITHIN THE TELEPHONE COUNSELING GROUP AND THE SMS GROUP

In comparing the telephone counseling group responses from the first (presurgery) and second (at 1 month after surgery) data collection points, KF ($t = 11.05, p = .000$) and ADL ($t = -17.18, p = .000$) were different but LS ($t = -0.44, p = .666$) was not different. All of KF ($t = 15.03, p = .000$), ADL ($t = 18.86, p = .000$), and LS ($t = -3.61, p = .002$) were different between the second and third data collection points.

Similarly, in comparing the SMS group responses from the first (presurgery) and second (1 month after surgery) data collection points, KF ($t = 17.05, p = .000$) and ADL ($t = -10.52, p = .000$) were different but LS ($t = -1.68, p = .110$) was not different. All of KF ($t = 15.86, p = .000$), ADL ($t = 11.34, p = .000$), and LS ($t = -4.15, p = .001$) were different between the second and third data collection points 1 and 3 months after surgery (see Table 4).

THE PATTERN OF CHANGE IN KF, ADL, AND LS IN THE TELEPHONE COUNSELING GROUP AND THE SMS GROUP

There were statistically significant differences in KF ($F = 0.03, p = .860$), ADL ($F = 203.55, p = .000$), and LS ($F = 27.40, p = .000$) from one time point to another, but the pattern of change was not different between the groups. Changes over time for both groups were not significantly different, indicating that the pattern of change

TABLE 3. TESTING HOMOGENEITY BETWEEN THE TELEPHONE COUNSELING GROUP AND THE SMS GROUP

Variable	Category	Telephone, <i>n</i> (%) / Mean (<i>SD</i>)	Text Message, <i>n</i> (%) / Mean (<i>SD</i>)	χ^2, t or <i>F</i> (<i>p</i>)
Gender	Male	1 (4.8)	2 (10.5)	(.596)
	Female	20 (95.2)	17 (89.5)	
Age	50–60	10 (47.6)	8 (42.1)	0.123 (.761)
	70–80	11 (52.4)	11 (57.9)	
Cohabitation	Alone	3 (14.3)	4 (21.1)	0.454 (.903)
	Spouse	14 (66.7)	12 (63.2)	
	Children	4 (19.0)	3 (15.8)	
BMI	Normal (18.5–22.9)	7 (33.3)	3 (15.8)	2.554 (.311)
	Overweight (23.0–24.9)	3 (14.3)	8 (31.6)	
	Obesity (25+)	11 (52.4)	10 (52.6)	
Number of comorbidities	One or fewer	11 (52.4)	14 (73.7)	1.931 (.204)
	Two or more	10 (47.6)	5 (26.3)	
KF	Pain	2.16 (0.45)	2.64 (0.45)	-3.41 (.002)
	Stiffness	2.33 (0.29)	2.55 (0.39)	-2.11 (.042)
	ADL disability	2.37 (0.37)	2.81 (0.37)	-3.74 (.001)
	Total	2.33 (0.34)	2.75 (0.36)	-3.84 (.000)
ADL		1.12 (0.15)	1.11 (0.16)	0.21 (.837)
LS		2.03 (0.31)	1.90 (0.28)	1.40 (.169)

Note. ADL = activities of daily living; BMI = body mass index; KF = knee function; LS = life satisfaction.

TABLE 4. DIFFERENCES IN KF, ADL, AND LS BETWEEN THE TELEPHONE COUNSELING GROUP AND THE SMS GROUP, AND THE PATTERN OF CHANGE

Variable	Group	Baseline, Mean (SD)	1 Month After Mean (SD)	3 Months After Mean (SD)	p for Time Differences		Source	F	p
					Baseline-1 Month After t (p)	1 Month After-3 Months After (p)			
KF	Telephone	2.33 (0.34)	1.35 (0.37)	0.58 (0.30)	11.05 (.000)	15.03 (.000)	Group	0.03	.860
	Text	2.75 (0.36)	1.56 (0.15)	0.63 (0.32)	17.05 (.000)	15.86 (.000)	Time	5.24	.028
ADL	Telephone	1.12 (0.15)	1.52 (0.12)	1.16 (0.13)	-17.18 (.000)	18.86 (.000)	Group × Time	1.74	.196
	Text	1.11 (0.16)	1.55 (0.07)	1.10 (0.14)	-10.52 (.000)	11.34 (.000)	Group	0.20	.656
LS	Telephone	2.03 (0.31)	2.05 (0.26)	2.24 (0.21)	-.44 (.666)	-3.61 (.002)	Time	203.55	.000
	Text	1.90 (0.28)	2.01 (0.21)	2.26 (0.24)	-1.68 (.110)	-4.15 (.001)	Group × Time	2.14	.125
							Group	0.56	.459
							Time	27.40	.000
							Group × Time	1.89	.157

Note. ADL = activities of daily living; KF = knee function; LS = life satisfaction.

was the same between the telephone counseling group and the SMS group (see Table 4).

Discussion

In both the telephone counseling group and the SMS group, KF and ADL increased 1 month after surgery compared with presurgery measurements, but LS was not different. In both groups, LS showed a significant difference at 3 months after surgery, suggesting that LS changes slowly. Papakostidou et al. (2012) reported that the change in quality of life was significant 6 weeks after TKR. These findings suggest that quality of life increases during the period between 6 weeks and 3 months from TKR. The outcome of TKR is influenced by personality trait such as life satisfaction (Giurea et al., 2016) and postoperative support systems (Stevens et al., 2004); it is also influenced by cultural characteristics (Zacharia, Paul, & Sherule, 2016). Long-term intervention and ongoing self-care are required to support TKR patients to achieve LS. The results of this study showed that the effects of telephone counseling and SMS on KF, ADL, and LS of TKR participants were not different. This is contrary to the expectation that direct contact interventions, such as telephone counseling, would be more effective in supporting participants' self-care. In the research with diabetic patients by Zolfaghari, Mousavifar, and Haghani (2012), the effects of telephone counseling and SMS were the same. In this study, the time for telephone counseling was limited to 5 minutes per session, making it difficult to give detailed answers to participants' questions, but simple questions and answers could be exchanged (telephone counseling was mainly for encouraging, reminding, providing information, and answering basic questions). As SMS is not as inviting to discussion as is telephone counseling, it was more for encouraging exercise, emphasizing self-care, and providing appointment reminders. The results of this study show that SMS was more effective for encouraging and reminding than for the provision of information. This could be because of patients' access to information through the Internet.

Because SMS is not limited by time and place, it is accessible and convenient. With these merits, information can be provided to recipients regardless of their circumstance and the provider can send the same contents to multiple recipients at the same time, improving economic efficiency (Ferrer-Roca, Cardenas, Diaz-Cardama, & Pulido, 2004).

In the past, before patients had access to the Internet, it was reported that counseling played a significant educational role (Roussi et al., 2010). Given the accessibility of health-related information today, patients need support implementing this information (not in accessing it). For this reason, giving encouragement and issuing reminders are believed to play an important role in supporting self-care. However, as excessive SMS texts can annoy patients, further research is necessary to identify the optimal frequency and duration of SMS texts.

In both groups, ADL worsened 1 month after surgery, probably because postoperative physical recovery was not yet complete. In this study, ADL regained the preoperative level 3 months after surgery. Therefore,

postoperative change in ADL should be monitored through a longer follow-up period.

No difference in pattern of change in KF, ADL, and LS was observed between telephone counseling and SMS transmission, implying that SMS is as effective as telephone counseling in supporting postoperative self-care for TKR patients. As such, SMS can substitute for telephone counseling. If SMS is included in the postoperative management protocol, it is important to decide timing and duration. Further studies are needed to determine the most effective content, interval and duration of SMS for promoting self-care.

Many participants said that telephone counseling and SMS messages helped them trust the hospital and the medical staff, suggesting that these services enhanced participant satisfaction with hospital services. Further study is needed to explore patient satisfaction with medical services, medical expenses, and nursing efficiency when SMS is provided after TKR.

Conclusions and Clinical Suggestions

This study provided postdischarge telephone counseling or SMS to patients with artificial TKR and analyzed the effects of services on their KF, ADL, and LS. A randomized clinical trial design was used for this study, and the participants assigned to either of two groups. The number of participants evaluated was 21 in the telephone counseling group and 19 in the SMS group, with a total of 40. For each group, postdischarge SMS transmission or telephone counseling was conducted six times, and assessment of the participants' KF, ADL, and LS was performed three times: before artificial TKR and 1 month and 3 months after.

Within each group, KF, ADL, and LS showed a statistically significant difference before artificial TKR in comparison to 1 month and 3 months after, but they were not different between the telephone counseling group and the SMS group. The pattern of change in KF, ADL, and LS was similar between the two groups. These results show that telephone counseling and SMS texts have the same effects on KF, ADL, and LS in TKR participants.

This research was conducted solely in one university hospital and sample size was small; despite these limitations, this study suggests that SMS is a highly effective intervention to promote patient self-care after TKR. Future research is needed to determine optimal frequency and duration for post-TKR SMS.

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Orthopaedic Snafus—When Adverse Events Happen in Orthopaedics: Erratum

In the March/April 2017 issue of *Orthopaedic Nursing*, an author's name was misspelled in the article by Smith et al., "Orthopaedic Snafus: When Adverse Events Happen in Orthopaedics."

The fourth author's name should have been spelled Kathryn L. Eten, BSN, RN, ONC, CCM.

The article has been corrected online.

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