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The Impact of Post-Discharge Call Interview to Improve the Screening of Post-Intubation Tracheal Stenosis: An Experimental Study

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Abstract

Background: Tracheal stenosis is one of the worst complications of endotracheal intubation, but timely diagnosis can change its natural history. Management of these patients places a great burden on the health care system and the well-being of the patients and their families. Therefore, discharged intensive-care-unit (ICU) patients who underwent more than 24 hours of intubation should be actively followed-up 3 months after extubation and screened for post-intubation tracheal stenosis. The present study was aimed at assessing the impact of post-discharge follow-up call interviews on increasing successful screening for post-intubation tracheal stenosis.

Objectives: To determine the effect of post-discharge call interviews on improving screening of post-intubation tracheal stenosis.

Methods: This experimental study was conducted in Iran in September 2014. Using the simple randomization method, 140 patients who had undergone than 24 hours of endotracheal intubation and had received oral and written educational materials upon discharge from the ICU were equally assigned to an intervention and a control groups (received a call interview before or after the follow-up due date, respectively). The needed sample size was calculated to be 70 participants in each group (considering $\alpha = 5\%$, the statistical power of 90%, and effect size = 0.4).

Results: There was a significant difference in follow-up rates at the due date between the intervention group (50.7%, 34of 67 participants) and the control group (17.5%, 11 of 63 participants) (OR = 4.871, 95% CI = 2.172 to 10.924, $P < 0.0001$). In the control group, the call interviews significantly increased the follow-up rate from 17.5% to 66.7 % (42 of 63 participants) ($P < 0.0001$), although follow-up occurred after the due date. The results of the logistic regression model showed that the patients who had attempted suicide completed follow-up more than those who had not ($P = 0.017$), that interviews with patients and their parents were more effect than interviews with others ($P < 0.05$), and that phone call interviews after the follow-up due date were more effective than those before the follow-up due date (OR = 2.653, 95%CI = 1.079 to 6.526, $P = 0.034$).

Conclusions: We highly recommend making call interviews, along with distributing the oral and written educational materials, to increase the follow-up rate among discharged ICU patients.

Keywords: Patient Education, Interview, Phone, Follow-Up, Intensive Care Units, Tracheal Stenosis

1. Background

Endotracheal intubation in intensive care units (ICU) is a procedure frequently performed in cases of a variety of diseases and conditions to secure the airway (1-3). This procedure can cause early and late complications (4, 5). Post-intubation tracheal stenosis (PITS), one of the worst complications, is the most common cause of reconstructive airway surgery after tracheal intubation (6, 7). Due to respiratory manifestations, most patients improperly treated for asthma for a long time, and unfortunately, some undergo tracheostomy before a correct diagnosis (8, 9), which complicates later definitive airway surgery. The wide variation in incidence rates (6% - 22%) (10, 11) could be affected by the many different local risk factors in each country, such as the prevalence of certain etiologies, the expertise of medical staff, the number and equipment of ICUs, and, most importantly, the nursing care of intubated patients.

In Iran, one of the most common causes of fatal in-

juries is traffic accidents, especially among younger populations (12). As expected, our 2-decade database of more than 2,300 patients with PITS (Alborz database) (13-16) shows that traffic accidents were the main causes of hospitalization and intubation.

Given then considerable burden of PITS, we decided to conduct a cohort study to first estimate the incidence rate of PITS in Iran, then to assess its related risk factors, and finally to propose and evaluate preventive interventions. Most of the patients in the Alborz database were admitted about 3 months after their extubation, so our national cohort study, which is still ongoing, was planned to actively follow up with patients at 3 months after ICU discharge.

Previous studies have indicated that patients missing follow-up appointments is a major challenge for the health care system (17, 18). This problem could be related to such restrictions as the economic and cultural situations of hard-to-engage individuals, levels of health literacy, and even the healthcare system's infrastructure and facilities (19). The adherence rate to long-term therapies is around 50% in developed countries and is much lower in developing countries (20, 21). In addition, among various methods to improve patient communication and consequently the response rate, about 50% of the interventions were ineffective (18, 22).

However, multi-strategic interventions are more effective than single-strategy interventions at increasing the patient compliance rate, especially with long-term treatments (17, 23, 24). Patient education can improve patients' knowledge as and participation in disease management (25, 26). Different educational interventions, such as pamphlets, brochures, telephone counseling, telephone reminders, payment vouchers, and video clips, have increased response rates from 5% to 31% (5, 27, 28). As well, verbal and written health information for discharged hospital patients significantly increased patients' knowledge and satisfaction scores (26, 29).

Education of ICU patients could have a crucial role in follow-up process to prevent the late complications of intubation. Some studies support that post-discharge telephone follow-up could be helpful to disseminate information, promote health education, diagnose the early complications, and increase follow-up rate (29, 30). However, the effectiveness of this method has not been determined (29, 31). As a loss during follow-up is a limitation of cohort studies, we conducted an individual study (the current study) alongside our national study to determine an effective method for improving the follow-up rate.

To best of our knowledge, there is a current trend to conduct long-term follow-up after hospital discharge via critical care outpatient clinics (32). Hence, in this study, we aimed to examine the effect of post-discharge call interviews accompanied with other educational materials on improving successful office follow-ups to screen and prevent this complication, especially in developing countries. We also assessed verbal, written, and audio-visual educational methods to increase knowledge of tracheal stenosis and the follow-up process and to improve the response rate of post-intubation discharged patients by the scheduled time. Finally, a follow-up plan was developed based on the features of cases that have never been performed or received attention in ICUs or follow-up clinics in Iran.

2. Objectives

To determine the effectiveness of post-discharge call interviews at improving the screening of post-intubation tracheal stenosis.

3. Methods

3.1. Research Design

In September 2014, this experimental study was conducted at 14 ICUs in 10 cities in Iran. Twelve ICUs were in university teaching hospitals (10 general, 2 specialized), and 2 were general private ICUs. The number of beds was less than 15 in 4 ICUs, 15–25 in 6 ICUs, and more than 25 in 4 ICUS. Figure 1 presents the flow chart of the study.

3.2. Sampling

The participants were recruited from the samples of the ongoing national study (started in February 2013 at 24 ICUs in 14 cities). Using the simple randomization method, cases were randomly divided into the intervention group (call interview before the due date) and the control group (call interview after the due date).

The needed sample size was calculated to be 70 participants considering $\alpha = 5\%$, statistical power of 90%.

$$d = \frac{P_1 - P_2}{\sqrt{P_1(1-P_1) + P_2(1-P_2)}} = 0.4 \quad (1)$$

(moderate effect size), and following formula

$$n = \frac{\left(z_{\frac{\alpha}{2}} + z_{\beta}\right)^2}{d^2} = \frac{10.49}{0.16} = 65.56 \approx 66 \quad (2)$$

Considering the 20% drop-out rate, we added 14 participants to optimal sample size, yielding a total of 70 samples. From all the registered patients in PITS national study who had not passed their follow-up due date, 150 patients were randomly selected. Of these, 140 could be reached through their contact numbers. They were then randomly and equally allocated to two groups. The doctors and nurses,

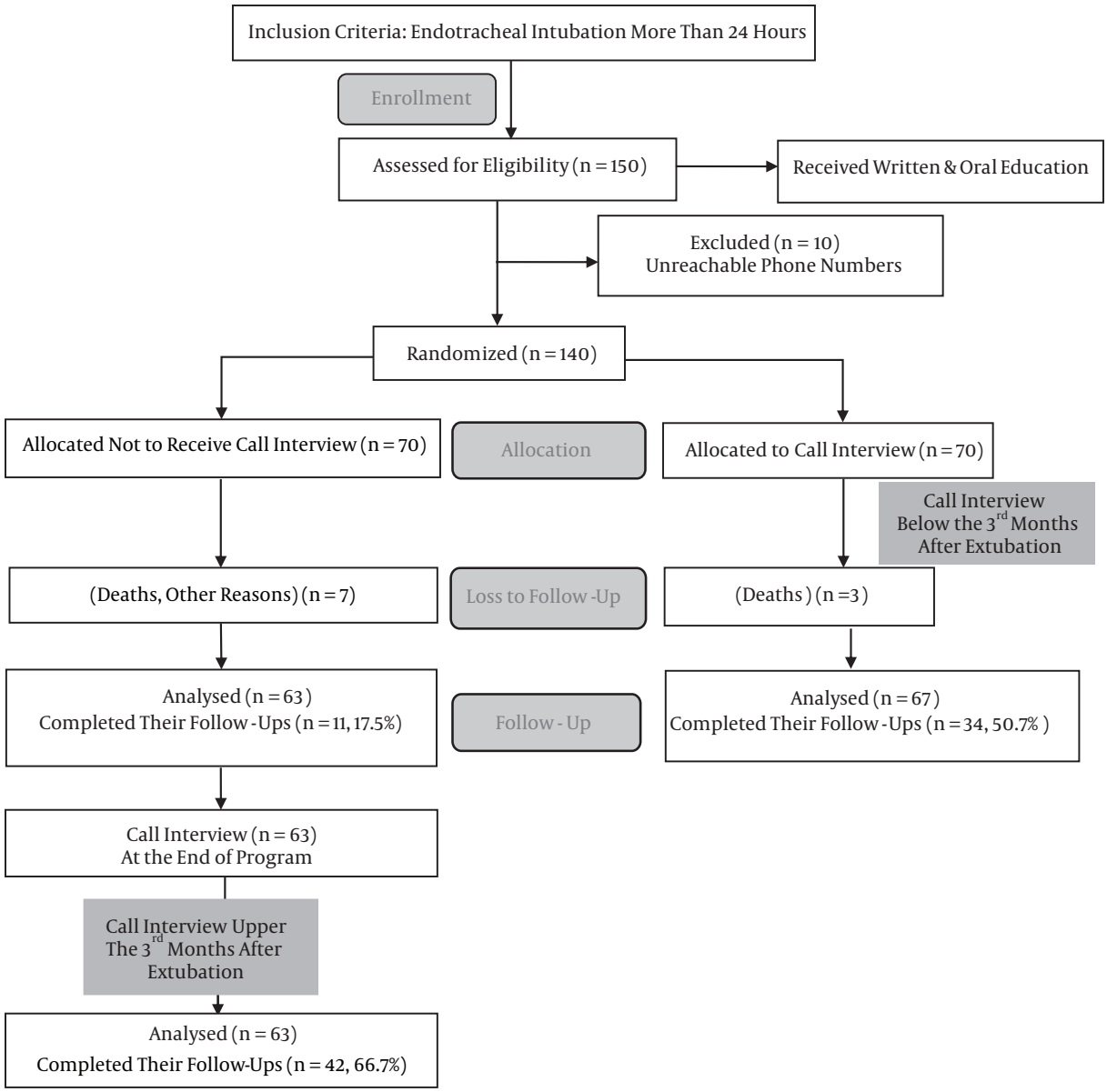

Figure 1. CONSORT Flow Diagram of the Call-Interview Randomized Controlled Trial

as well as the study authors, were blinded to the intervention. The inclusion and exclusion criteria were as follows. All patients who had undergone more than 24 hours of endotracheal intubation and been discharged from the ICU were included. The exclusion criteria were any history of major airway tumors, direct airway trauma, previous intubation for more than 24 hours, tracheal surgery, and tracheostomy or T-tube insertion. Patients who died or did not consent were also excluded (3 patients in the intervention group and 7 patients in the control group). The data of 67 patients in the intervention group and 63 patients in the control group were analyzed.

The included patients were scheduled for follow-up 3 months after their extubation for PITS. Upon discharge from the ICUs, all patients received oral and face-to-face education from the intensivists, as well as written and audiovisual educational materials to consider at home. This education was intended to familiarize patients familiar with

PITS and its warning symptoms and inform them about the physicians in charge and the date and location of the recommended follow-up visit. The patients were also given the name and telephone numbers of two researchers, a nurse, and a physician in the main research center who would be available to answer their questions. The printed educational materials also included four landlines and cellular phone numbers patients could always call to have their questions answered and to deal with emergency situations.

Patients were supposed to return for follow-up in case that they experienced dyspnea or stridor. These symptomatic patients underwent rigid bronchoscopy for evaluation of any tracheal stenosis. Asymptomatic patients were expected to perform a spirometry 3 months after their extubation (due date). If the flow-volume loop showed an upper airway obstruction, bronchoscopy was carried out to rule out any tracheal stenosis. Follow-up was considered complete when patients returned for a visit on their due date or later and underwent spirometry and/or bronchoscopy.

In April 2015, we first determined and compared the rate of completed follow-ups in the two groups. Next, all the patients in the control group who had passed their follow-up due date were also interviewed, and their outcomes were compared with their results before the interview. To evaluate the educational approaches to improving the follow-up rate and to identify the predictors of follow-up, all patients in the 2 groups were statistically assessed.

3.3. Study Intervention

3.3.1. Post-discharge Follow-up Call Interview

In this study, the patients in the intervention group received a call interview before their follow-up due date, and the control group patients did not receive a call interview before their follow-up due date.

Telephone interviews were performed with the patients or a relative who lived with them. The main aim of the call interviews was to increase patients' compliance with follow-up to screen for PITS cases. We also evaluated patients' knowledge of PITS and the follow-up process explained in the educational materials they received upon discharge. As well, we sought to re-educate the patients and appraise the implementation of the study plan by the intensivists or their coordinators in the hospitals. The patients or their relatives were interviewed only once.

We prepared a follow-up evaluation form (FEF) (Appendix 1 in the Supplementary file) for the interviews which included questions regarding patients' conditions and baseline characteristics and whether they received oral education, read the follow-up card and pamphlet, and watched the video clip. The structured questionnaire included both open- and close-ended questions. The content validity index (CVI) of the FEF was acceptable (CVI = 1), while the value of CVI for each question was also 1. The content validity ratio (CVR) was 0.89 (0.67-1), and all but 4 questions had a value of CVR = 1. The value of the CVR for the remaining 4 questions was 067. Two of these 4 questions asked about tracheal stenosis and oral education, 1 about participation in follow-up program, and 1 about patients' attitude. The experts decided to retain all 4 questions. Regarding reliability, Cronbach's alpha was 0.73.

A trained interviewer asked interviewees whether they knew about PITS, its complications and warning symptoms, their recommended date and site of follow-up, and the physician in charge of their visit. Finally, they were requested to give feedback about the interview process and their patient's tendency to return for follow-up. We used the FEF for data collection. Most interviews were performed at the research center during working hours.

Asymptomatic patients who came in for follow-up earlier than their due date were requested to return at their scheduled time for another visit. If the patients did not want to participate in follow-up visits, they were asked about the reasons, and their responses recorded. We also motivated participants to not miss their follow-up appointments by offering them vouchers and fast-track treatment upon arrival for their follow-up. The interview was completed when the interviewer determined that the interviewee had acquired the desired knowledge and reconfirmed the appointment.

3.4. Educational Materials

All the educational materials were designed by experts in education and experts who had many years' experiences in tracheal stenosis management. The materials were evaluated and revised to achieve the best results.

3.5. Pamphlet

A colorful pamphlet was prepared and shared basic information about respiratory tract and tracheal stenosis, urgent tasks in case of the appearance of symptoms, a brief follow-up process, the name and contact numbers of the investigators, and the address and a map of the research center.

3.6. Video Clip

The main objective of the video clip was to give a step-by-step presentation of the follow-up process from discharge from the ICU to the follow-up office visit. Through this 4-minute clip, the patients were educated about tracheal stenosis and how it is diagnosed and approached by

ICU nurses, intensivists, and thoracic surgeons. Previously admitted patients with tracheal stenosis also shared their history and experiences with this complication. The patients who watched the video were also familiarized with the spirometry procedure and how to perform it. The website, email address, zip code, postal address, and fax and telephone numbers of the research center were printed on the package of the video clip.

3.7. Follow-up Card

Upon discharge, each patient received a green card listing the warning symptoms and primary management of tracheal stenosis and the telephone numbers and address of the research center. The intensivists or their coordinators were also requested to record on the cards their contact numbers and patients' discharge date, follow-up date and site, and the name of hospital, patient, intensivist, physician and coordinator in charge of follow-up.

3.8. Statistical Analysis

Data were analyzed using SPSS software (version 16.0). The effect of call interviews on improving the follow-up rate was the primary outcome. Chi-square (χ^2), Fisher's exact test, Mann-Whitney U, crude risk, McNemar test, and multiple logistic regressions were performed to analyze the data. Shapiro-Wilk and Kolmogorov-Smirnov tests were conducted to measure the normality of data. Mann-Whitney U test was used to analyze continuous data (age, height, weight and BMI) which had a non-normal distribution. In bivariate analysis, chi-square test was used for the variables of education, interviewee, and causes of admission. Fisher's exact test was utilized for other categorical variables. P values of < 0.05 were considered to be significant. The ROC curve was used to test the sensitivity and specificity of the model.

3.9. Ethics

All the included patients signed consent forms at discharge allowing them to be enrolled in the research project. In addition, all of patients' information was kept confidential. The Medical Ethics Committee at the International Respiratory Institute of Tuberculosis and Lung Diseases approved the study (No: F89125).

4. Results

The 2 groups had a total of 130 patients (74.6% female, 25.4% male) ages 13 - 88 years (median: 34.5, IQR: 27.75) in 2 groups. The most common causes of intubation were suicide (33.1%) and head injuries due to car accidents (23.1%). The symptoms experienced since discharge were coughing (40.6%), dyspnea (39.5%), hoarseness (34.9%), and stridor (22.5%).

No significant differences were seen between the intervention and control groups in demographic characteristics, previous diseases, development of symptoms before the follow-up due date, consideration of educational materials, and knowledge about PITS and the follow-up process (Table 1).

In the control group, only 11 of 63 patients (17.5%) completed their follow-up at their due date, and all the individual educational items had a significant effect on the successful follow-up ($P < 0.05$). After the call interviews with patients in the control group (after their follow-up due dates), 31 more patients completed their follow-up, increasing the follow-up rate in that group from 17.5% to 66.7% ($P < 0.0001$).

In the intervention group, 34 of 67 patients (50.7%) completed their follow-up. The intervention group showed a significant difference in the follow-up rate at the due date compared to the control group (OR = 4.871, 95% CI = 2.172 to 10.924, $P < 0.0001$).

Those who were called after the due date (control group) displayed a greater rate of successful follow-up than those who were called before the due date (intervention group) (66.7% versus 50.7%), although the difference was statistically insignificant ($P = 0.07$).

For the 130 patients who received call interviews either before or after their follow-up due date, all potential contributing factors (Table 2) for promoting a successful follow-up were entered in a logistic regression model to ensure the reliability of the findings of the bivariate analysis. The causes of intubation, the relation of the interviewee with the patient, the follow-up groups by interview time, and knowledge about tracheal stenosis and the date, center and physician in charge of follow-up were entered in a logistic regression model (Table 3). The results of the Hosmer and Lemshow test was not significant, so the whole model was statistically approved ($P = 0.83$). The model had an overall accuracy of 77.5%, sensitivity of 66.7%, and specificity of 85.3%. The area under the Roc curve was 0.77 (Figure 2).

Overall, the rate of successful follow-up among the 130 patients was 58.5%, and the mean time of follow-up was 112.32 ± 43.66 days. Those patients who considered any educational item (except the video clip) had more successful follow-up ($P < 0.05$).

Although considering any kind of educational item increased interviewees' knowledge about PITS and the follow-up process, those who were informed of only the date, site and physician in charge of the follow-up better completed their follow-ups ($P < 0.05$).

Table 1. Demographics and Baseline Characteristics of the Participants in the Two Groups

	Variables	Control Group, n = 63	Intervention Group, n = 67	P Value
Demographics	**Age (Median and IQR)**	29, 21.75	37.5, 31	0.483
	Sex (male) n (%)	47 (74.6)	50 (74.6)	1.000
	Weight (kg) (Median and IQR)	70, 21	73.50, 13	0.442
	Height (cm) (Median and IQR)	170.5, 14.25	172, 15	0.959
	BMI (kg/m2) (Median and IQR)	23.60, 5.56	25.37, 4.94	0.147
	Education			
	More than a high school diploma	13 (54.2)	11 (45.8)	0.770
	Diploma	9 (39.1)	14 (60.9)	
	Less than a high school diploma	15 (44.1)	19 (55.9)	
	Illiterate	6 (46.2)	7 (53.8)	
	Marital status married	31 (59.6)	38 (64.4)	0.696
	Occupation			0.296
	Employed	26 (48.1)	33 (50.8)	
	Unemployed	14 (25.9)	23 (35.4)	
	Retired	4 (7.4)	4 (6.2)	
	Student	10 (18.5)	5 (7.7)	
	Cause of admission			0.350
	Car accident	18 (28.6)	12 (17.9)	
	Suicide	19 (30.2)	24 (35.8)	
	Other	26 (41.3)	31 (46.3)	
	Interviewee			0.284
	Patient	18 (29)	16 (23.9)	
	Parents	12 (19.4)	15 (22.4)	
	Spouse	6 (9.7)	14 (20.9)	
	Other	26 (41.9)	22 (32.8)	
	Having symptoms	40 (63.5)	47 (70.1)	0.459
Educational materials	**Watching DVDs**	15 (22.4)	15 (24.2)	0.837
	Reading pamphlet	27 (43.5)	30 (44.8)	1.000
	Reading follow-up card	32 (51.6)	33 (49.3)	0.861
	Receiving oral education	35 (56.5)	45 (67.2)	0.276
Knowledge	**PITS**	18 (29)	24 (35.8)	0.455
	Warning symptoms	16 (26.7)	14 (21.5)	0.535
	Symptoms management	10 (16.4)	6 (9)	0.285
	Follow-up date	32 (51.6)	40 (59.7)	0.380
	Follow-up site	28 (45.2)	40 (59.7)	0.114
	Physician's Name	19 (30.6)	17 (25.4)	0.559

The 54 patients in the 2 groups who did not take part in follow-ups gave the following reasons: disability (13), inappropriate attitude toward health services (7), no symptoms (6), far from the site of the follow-up (4), and other (24).

Table 2. Unadjusted Odds Ratio for Successful Follow-up and Independent Variables

Independent Variables	Successful Follow-up, No. (%)		Crude OR	95% CI	
	Yes	No		Lower	Upper
Male	56 (58.3)	40 (41.7)	1.020	0.461	2.258
Female	20 (58.8)	14 (41.2)	0.980	0.443	2.169
Age					
< 25	31 (81.6)	7 (18.4)	4.625	1.850	11.562
25 - 55	36 (54.5)	30 (45.5)	0.720	0.357	1.451
> 55	9 (34.6	17 (65.4)	0.292	0.119	0.721
Education					
High school diploma or higher	32 (68.1)	15 (31.9)	1.877	0.811	4.346
No diploma	25 (53.2)	22 (46.8)	0.533	0.230	1.233
Single	33 (78.6)	9 (21.4)	4.240	1.766	10.179
Married	32 (46.4)	37 (53.6)	0.236	0.098	0.566
Occupation					
Employed	45 (60.8)	29 (39.2)	1.358	0.642	2.871
Unemployed	24 (53.3)	21 (46.7)	0.737	0.348	1.557
Cause of admission					
Car accident	19 (63.3)	11 (36.7)	1.303	0.562	3.023
Suicide	33 (76.7)	10 (23.3)	3.377	1.483	7.689
Post-surgical	5 (41.7)	7 (58.3)	0.473	0.142	1.578
Interviewee					
Patient	25 (73.5)	9 (26.5)	2.500	1.056	5.918
Parents	22 (81.5)	5 (18.5)	4.048	1.429	11.576
Spouse	7 (35)	13 (65)	0.325	0.120	0.880
Receiving oral education	53 (66.3)	27 (33.8)	2.409	1.162	4.995
Watching DVDs	21 (70)	9 (30)	1.944	0.810	4.666
Reading pamphlet	41 (71.9)	16 (28.1)	2.864	1.366	6.004
Reading follow-up card	44 (67.7)	21 (32.3)	2.230	1.092	4.557
Symptoms	49 (56.3)	38 (43.7)	0.764	0.361	1.617
Knowledge of tracheal stenosis	29 (69)	13 (31)	1.988	0.913	4.328
Knowledge of warning symptoms	20 (66.7)	10 (33.3)	1.725	0.730	4.076
Informed of the date of follow-up	49 (68.1)	23 (31.9)	2.540	1.238	5.214
Informed of the site of follow-up	48 (70.6)	20 (29.4)	3.022	1.462	6.248
Informed of the physician's name	72.2 (26)	10 (27.8)	2.335	1.013	5.382

5. Discussion

The presented study found that a combination of face-to-face patient education, educational materials, and call interviews can improve the PITS follow-up rate in discharged ICU patients with more than 24 hours of intubation. Some studies have found effects favoring call interview groups (29). Accordingly, our study showed that the call interview in addition to the other educational initiatives increased the follow-up rate in the intervention group. In control group, the follow-up rate also improved after the call interviews. Although we could not precisely measure the effect of interviewees' knowledge after the interview, it seems that the call interviews were effective

Table 3. Logistic Regression Model for Predictors of Type of Successful Follow-up/Non-successful Follow-up

Variable	Odds Ratio	95% CI		P Value
		Lower	Upper	
Interviewee				
Patient	4.024	1.337	12.113	0.013
Parent	7.146	1.772	28.810	0.006
Other	0.593	0.168	2.095	0.417
Cause of intubation				
Car accident	0.974	0.306	3.102	0.964
Suicide	3.614	1.262	10.347	0.017
Knowledge of PITS	1.359	0.456	4.049	0.581
Knowledge of the follow-up date	0.798	0.161	3.964	0.783
Knowledge of the follow-up site	0.408	0.082	2.020	0.272
Knowledge of the physician	0.457	0.133	1.577	0.215
Call interview after due date	2.653	1.079	6.526	0.034

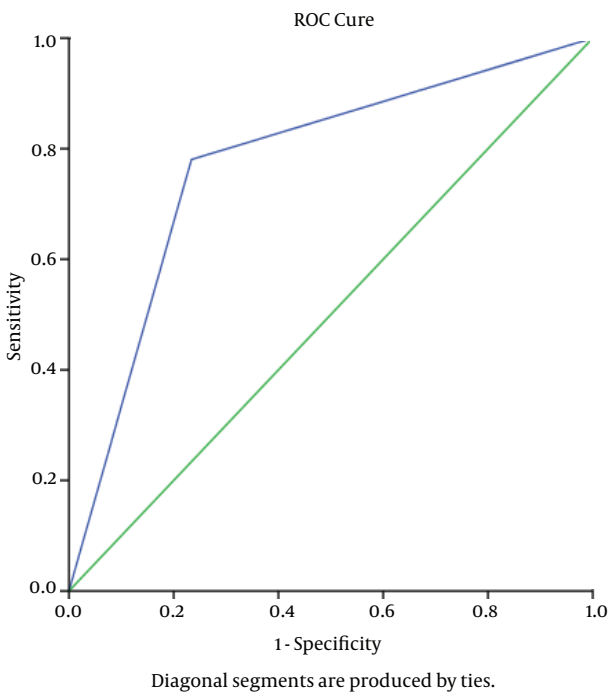

Figure 2. ROC Curve for Successful Follow-Up and Logistic Regression

based on the meaningful difference in follow-up rates between the 2 groups and in the control group (call interviews after the due date). This intervention either helped patients recall information they had acquired from verbal and written education or educated patients who had missed the educational materials. Additionally, the call interviews might have encouraged the patients to review the educational materials again. Moreover, the investigators took advantage of this opportunity to re-educate the patients at an appropriate time without the stress or anxiety the patients might feel upon discharge. The patients could also ask questions during the interviews. Therefore, it seems that the call interviews better influenced the patients and their caregivers compared to oral education at the time of discharge.

Other studies have described the role of telephone counseling and follow-up calls in the follow-up process (33-35). Eckman et al. showed that the continued reinforcement provided could better improve the healthy behavior in patients with coronary artery disease than only taking educational material home (25). However, Costanza (36) found that education through call counseling was not effective at increasing colorectal cancer screening because the intervention focused on educating patients without considering their motivation. However, in our study, we both educated and motivated patients by offering vouchers and scheduling appropriate appointments for visits with the thoracic surgeons in charge upon arrival without any the need to wait.

Murphy et al. (25) did not find any difference the in knowledge of patients with sleep disorders regardless of

whether they received educational materials. Our findings are in accordance with those of other studies (37-40) which demonstrated the educational pamphlet and follow-up card effectively improved knowledge. In our study, verbal and written education without any call interviews (control group) resulted in a follow-up rate of only 17.7%. Therefore, call interviews accompanied by verbal and written education are highly recommended to achieve better results (38, 39). These cost-effective, easily deliverable educational materials might be very helpful because the patients can read written educational materials in any setting without the need for any specific equipment such as computers. We found that the educational items should include at least the date, site, and physician's name for follow-up because participants who knew this information returned for follow-up more frequently than others.

As have other researchers (25, 37, 41), we also provided an educational video clip to enhance patients' knowledge about PITS and the follow-up process. However, the video clip did not meaningfully promote adherence to follow-up in patients. Most participants and their relatives living in their home did not watch the video because they were busy, involved in care of the patients did not have a DVD player at home, misplaced the DVD, or encountered cultural barriers to the use of audio-visual educational materials. The regression model found that the time of the interview, the type of the interviewee, and the cause of intubation were the essential predictive factors of whether patients participated in their office follow-up.

In the present study, calls interview after the due date for discharged ICUs patients seems to have been more effective than proactive interviews before the due date. Call interviews offer economic and social benefits (42), and we could take the advantage of the lower costs (e.g., time, money) of this approach because it is not necessary to interview with all patients, some of whom already participated in the follow-up before the interview. However, a potential disadvantage of this method is the prolongation of the follow-up and the increased chance of missing a serious stenosis and the resultant increased risk for patients' wellbeing.

The caregivers of the patients who attempted suicide might be more concerned than the others. Consequently, they might have been more interested in becoming familiar with the concept of tracheal stenosis and its outcomes and participated more seriously in the follow-up visits.

Based on the best of our knowledge, no study in the literature that addresses the question of who is the best person to be interviewed in this context. The current study found that, if the patients or their parents were interviewed, participants were more likely to complete their follow-up visit than if other relatives were interviewed.

This experimental, multicenter study enabled identifying the causal relationship between call interviews and the follow-up rate among patients discharged from the ICU. It also showed change over time, and the random sample selection could eliminate bias. As well, all of the patients were educated about a serious complication (PITS) which could aid in making timely diagnoses. Finally, the output of the developed model related to significant factors could be used to design and develop an intelligent mathematical model with an artificial neural network. The model could be the core of an intelligent predictive system to identify high-risk cases in the follow-up of intubated patients discharged from the ICU.

Our study has some limitations. Some factors might have been caused the observed changes in the dependent variable. First, the educators had different levels of communication skills, although they had all undergone training. Second, the length of the interviews varied greatly among the patients because they were from different parts of the country with different cultures. Third, we recorded the call interview time as only before or after the due date and did not note the exact time of the interviews for either group of patients. The 3-months interval before the due date and the indefinite interval after the due date could have affected the results.

5.1. Conclusions

To increase follow-up among as discharged ICU patients with prolonged intubation, we suggest conducting post-discharge follow-up call interviews in addition to verbal or written education. The ideal persons to interview are the patients or their parents, and the ideal time for interviews is after patients' follow-up due date.

Supplementary Material

Supplementary material(s) is available here.

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Footnotes

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