Enhancing the Communication of Suddenly Speechless Critical Care Patients

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Background Sudden speechlessness is common in critically ill patients who are intubated or have had surgery for head and neck cancer. Sudden inability to speak poses challenges for hospitalized patients because strategies to facilitate communication are often limited and unreliable.

Objective To determine the impact of a technology-based communication intervention on patients' perception of communication difficulty, satisfaction with communication methods, and frustration with communication.

Methods A quasi-experimental, 4-cohort (control and intervention) repeated-measures design was used. Data were collected daily for up to 10 days. Patients in adult critical care units were followed up as they were transferred to other units within the institutions selected for the study. The impact of a technology-based communication system (intervention) was compared with usual care (control). Patients' communication outcomes pertinent to communication with nursing staff that were evaluated included perception of communication ease, satisfaction with methods used for communication, and frustration with communication.

Results Compared with participants in the control group, participants in the intervention group reported lower mean frustration levels (-2.68; SE, 0.17; 95% CI, -3.02 to -2.34; $P<.001$) and higher mean satisfaction levels (0.59; SE, 0.16; 95% CI, 0.27 to 0.91; $P<.001$) with use of the communication intervention. Participants in the intervention group reported a consistent increase in perception of communication ease during the hospital stay.

Conclusions The results facilitated evaluation of a bedside technology-based communication intervention tailored to the needs of suddenly speechless critically ill patients. (*American Journal of Critical Care.* 2016; 25:e40-e47)

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Critical care patients who experience sudden speechlessness due to airway intubation or surgery for head and neck cancer face major challenges in trying to communicate their needs. These challenges exist despite recognition of the vulnerability of these patients and the development of guidelines to improve safety and quality of clinical care.[1-4] Suddenly speechless patients continue to face the difficult task of trying to communicate their needs via limited and often unreliable methods.[5,6]

When health events result in a sudden inability to speak, patients can express their needs only by using nonverbal communication techniques (eg, gestures, mouthing of words, writing) and, when accessible, pointing to various styles of alphabet boards.[5-8] Patients also have the option to activate the standard electronic call light system. However, the call light system is of limited assistance; staff responding to the call expect a verbal response from the patient.[9] These strategies are challenging for both patients and nurses, because expeditious communication of patients' needs is compromised, and nurses' abilities to interpret nonverbal communication are restricted by lack of time, training, and effective strategies to facilitate communication.[9-12] Consequently, the inability to communicate leaves patients at risk for unsafe situations and preventable adverse events[13] and causes marked frustration.[9,10,14-17]

Benefits of integrating technology-based communication interventions in critical care include the expeditious communication of patients' needs and decreases in adverse emotional outcomes (eg, frustration) for both patients and health care staff.[6,9,10,18] However, the evolution of communication systems has been limited by difficulties with integrating technology in hospital environments, nurses' lack of familiarity with the systems, and preprogramming requirements for use by patients.[6,19-24] Most recently, efforts have been directed toward tailoring communication systems to the needs of suddenly speechless patients, including decreasing challenges identified in previous studies.[25]

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In one study,[25] the feasibility and usability of a communication intervention prototype to meet the needs of 11 critically ill suddenly speechless patients were determined. Patients demonstrated independent use of icons with prerecorded messages, handwriting, and typing strategies. Using a Likert scale (1, strongly agree to 5, strongly disagree), participants reported a high degree of satisfaction with the intervention (score 1.5; SD, 0.29; range, 1.16-2.0). However, the research also indicated a need to continue tailoring the intervention and improving accessibility in the acute care environment.

Suddenly speechless patients face the difficult task of trying to communicate via limited and often unreliable methods.

In this article, we report on the effect of the revised communication system on patients' outcomes pertinent to communication with nursing staff: perception of communication difficulty, satisfaction with communication methods, and frustration with communication. We hypothesized that participants who used the communication system would report lower levels of frustration and perception of communication difficulty and higher satisfaction with the communication method than would a control group.

Methods

The appropriate institutional review board approved the study before implementation of the intervention.

Design

The study was undertaken in conjunction with development of the communication system with funding from a Small Business Innovation Research award. A design was chosen that allowed sequential sampling of an initial control group and an intervention group (cohorts 1 and 2), followed by a technology-development phase to optimize the communication system, and implementation of a sequential sampling of a second control and intervention group (cohorts 3 and 4). The sequential sampling

was needed to control for exposure of the control group to the intervention condition, because no option was available to influence patients' bed assignments to separate the intervention group from the control group. A repeated-measures design was used, and data were collected daily for up to 10 days after participants entered the study.

Two tertiary care institutions in the southeastern region of the United States were selected for the study. The study was conducted in adult critical care units, but participants were followed up when they were transferred from critical care.

Intervention Group. The software associated with the communication system was incorporated in a 9.7-inch (24.6-cm), touch-screen, tablet personal computer. Functions accessible for use included touch selection of pictorial hot buttons with premade spoken messages representing symptoms or needs, handwriting with a finger or stylus, and typewriting with an on-screen keyboard. A freestanding urgent button, which announced, "I need help," was provided to patients as a backup method for use during an emergency or failure of the technology.[25]

A total of 78 participants were screened in the 2 intervention cohorts. The initial plan was to assess the usability of the device after use by the first 20 participants in the intervention group and then make any necessary refinements in the technology. However, after the first 7 participants (cohort 2, study site 1) were enrolled, technical difficulties involving the stand holding the device made assessment of the technology by the participants difficult. At this point, the refinements in technology were made, and data from these 7 participants were not included in the analysis. Once technology revisions were completed, recruitment efforts were initiated to enroll a larger number of participants in the second intervention group (cohort 4, study site 2). Of 67 patients screened, 52 met the criteria for enrollment.

Participants' ability to use technology associated with the intervention was evaluated daily.

Usual Care Control Group. Usual care consisted of giving participants access to a call light and providing pen and paper on which to write messages. Because a content analysis of communication events was a topic of interest, the usual care group received a pad of bound paper that facilitated saving used sheets for analysis. In order to account for the impact of the urgent button used in the intervention group, an urgent button was provided to participants in the usual care control group. Of 126 patients who were screened, 64 enrolled in the study. A total of 58% of the participants (n = 37) met criteria for enrollment in cohort 1 at study site 1, and 42% (n = 27) met the requirement for enrollment in cohort 3 at study site 2.

Study Participants

A consent form was obtained from all study participants. Inclusion criteria included sudden speechlessness for at least 8 hours; age 21 years or older; ability to read English or Spanish; ability to see and the use of at least one arm; no permanent speech disability or use of adaptive speech devices; score on the Richmond Agitation-Sedation Scale (RASS)[26] +1 to -1; and score on the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU)[27] indicating no delirium. Exclusion criteria included participation in a previous study or an admitting diagnosis of a major mental illness according to the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*).[28]

Procedures

Participants were recruited during preoperative visits or in the critical care units. Individuals were prescreened by using the CAM-ICU and the RASS before consent was requested and daily to determine whether or not criteria for data collection were still met. Patients who did not meet the criteria were reevaluated for potential inclusion at a later date.

After they completed the consent form, participants in the intervention group received a demonstration of use of the communication system and how to activate the urgent button. Participants in the usual care control group were instructed about how to activate the urgent button and use a notepad to communicate their needs.

Data Collection

Study measures associated with the study are given in Table 1. Data collection was conducted for a maximum of 10 days. Enlarged Likert scales were provided so participants could point at the participants' selection when data were collected. Research staff monitored participants and delayed data collection if a participant reported fatigue.

Daily evaluations of the participants' abilities to activate messages and to use the handwriting and typing strategies were obtained starting on day 2 of the study. Additionally, participants' reports about communication methods most commonly used and accessibility and functionality data on technology used were collected daily.

Data Management and Statistical Analysis

The data were managed by using Research Electronic Data Capture[35] software. The final database was exported to SAS, version 9.3 (SAS Institute Inc), software for data analysis.

Table 1
Study measures

Measures	Description
Confusion Assessment Method for the Intensive Care Unit	Delirium as an acute onset or fluctuating course in mental status and disorganized thinking or altered level of consciousness. Interrater reliability: $\kappa = 0.79$-0.96; sensitivity, 93%-100%; specificity, 89%-100%.[26]
Richmond Agitation-Sedation Scale	Ten-point scale with 0 as the neutral position. Positive numbers 1 to 4 indicate increasing agitation; negative numbers -1 to -4 indicate increasing sedation. Reliability and validity: $\kappa = 0.64$-0.82; $r = 0.93$.[26]
Perception of Communication Difficulty Questionnaire	Ten-item instrument; Likert scale 0 = not hard at all and 5 = extremely hard; used to measure perceived difficulty to communicate about physical needs and thoughts and with staff. Internal consistency: 0.81-0.96.[29,30]
Frustration With Communication	One-item instrument; Likert scale 1 = not frustrating and 5 = extremely frustrating. Adapted from Patak's Frustration Survey.[16]
Satisfaction With Communication Method	Nine-item Likert scale 1 = strongly disagree to 5 = strongly agree, used to rate satisfaction with method of communication. Adapted from the Quebec User Evaluation of Satisfaction with Assistive Technology (test-retest 0.82-0.91; Cronbach α 0.76-0.82).[31,32]
Acute Physiology and Chronic Health Evaluation II	Used to measure the severity of illness to predict individual survival. Score ranges from 0 to 71 (maximum) based on 12 physiological variables, age, and underlying health. Increasing score is equivalent to increasing risk of hospital death.[33,34]

After a comparative analysis of clinical and demographic factors, the usual care control group cohorts were combined because no significant differences between the groups were identified. The intervention group was compared with the usual care control group by using 2-sided *t* tests (sensitivity to a difference of 0.63 SD with 80% power at $P = .05$) for sample sizes of 20 evaluable participants per cohort. A 1-way analysis of variance was used for age, education, total scores on the Acute Physiology and Chronic Health Evaluation (APACHE) II, and baseline RASS score. The Fisher exact test was used to compare sex, ethnicity, and diagnosis. A mixed-model approach (repeated measures) with a compound symmetric covariance matrix was used to analyze the primary outcomes. The APACHE II score was used as a baseline covariate in the analysis.

Results

Sample Characteristics

A total of 123 participants were enrolled in the study. One participant from cohort 1 withdrew from the study, and data on 7 participants in cohort 2 were removed from the analytic sample because of technology development requirements. In the remaining group of participants, 45% (n = 52) were in the intervention group and 55% (n = 63) were in the usual care control group. Data on participants without APACHE II data (n = 2), participants from cohorts at study site 2 who were enroled in the study and did not meet inclusion criteria at study start (n = 3), and participants without at least 1 completed measure for the primary outcomes were not included in the final analytical sample. The final analytical sample associated with the primary outcomes consisted of data on 97 to 101 participants.

Participants' ages ranged from 22 to 85 (mean, 57; SD, 15.80) years. Most participants were men (61%), were white (77%), and had completed at least the 8th grade. The most common diagnoses included surgery for head and neck cancer and respiratory failure (Table 2). The 2 groups did not differ significantly in age, education, primary diagnosis ($P = .16$), ethnicity ($P = .49$), or sex ($P = .71$). Compared with the usual care control group, the intervention group had a higher mean APACHE II total score, indicating a greater severity of illness in the latter group.

Primary Outcomes

Participants reported their perceptions about communication difficulty, frustration, and satisfaction with communication method. Information on the unit clerk's understanding of messages generated by patients who used the intervention was also collected.

The Perception of Communication Difficulty Questionnaire[29,30] was used to measure the level of participants' perceived difficulty in communication on study day 2, and twice before completion of the study (n = 101). The estimated difference between the intervention group and the usual care control group was not significant (-0.06; SE, 0.039; 95% CI, -0.136 to 0.020; $P = .14$). However, participants in the intervention group reported a consistent increase in the ease of communication, represented by progressively lower rating scores (0, not hard at all, to 4, extremely hard) during the hospital stay (Table 3).

> Patients using the technology-based intervention reported increased ease of communication.

Table 2
Demographic statistics[a]

Variable	Intervention group (n = 52)	Control group (n = 63)	Statistics
Age, mean (SD), y	57.28 (15.94)	57.14 (15.82)	F=0.17; P=.84
Years of education, mean (SD)	12.96 (2.038)	13.14 (2.56)	F=0.08, P=.92
Total APACHE II score, mean (SD)	14.32 (6.40)	11.15 (4.83)	F=5.27, P=.006
Education,[b] years			
8-12	31 (60)	34 (60)	
13-17	20 (38)	21 (37)	
18-21	1 (2)	2 (4)	
Sex			
Male	32 (62)	38 (60)	
Female	20 (38)	25 (40)	
Racial group[c]			
White (non-Hispanic)	36 (71)	52 (83)	
Black	8 (16)	5 (8)	
Hispanic	7 (14)	6 (10)	
Condition associated with sudden speechlessness			
Surgery for head and neck cancer	11 (21)	25 (40)	
Respiratory failure	14 (27)	20 (32)	
Cardiac surgery	9 (17)	4 (6)	
Abdominal surgery	2 (4)	5 (8)	
Transplant surgery	6 (12)	3 (5)	
Trauma	3 (6)	4 (6)	
Sepsis	4 (8)	2 (3)	
Tracheal stenosis	1 (2)	0 (0)	
Myasthenia gravis	1 (2)	0 (0)	
Stroke	1 (2)	0 (0)	
Reason for sudden speechlessness			
Tracheostomy	45 (87)	58 (92)	
Endotracheal tube	7 (13)	3 (5)	
Glossectomy	0 (0)	1 (2)	
Stoma	0 (0)	1 (2)	

Abbreviation: APACHE, Acute Physiology and Chronic Health Evaluation.
[a] Values are number (percentage) of persons in group unless otherwise noted in first column. Because of rounding, not all percentages total 100.
[b] Data are missing for 6 persons (10%) in the control group.
[c] Data are missing for 1 person (2%) in the intervention group.

Table 3
Perception of communication difficulty[a]

Perception of communication difficulty	Day 2 (n = 98)		Day 4 (n = 89)		Day 6 (n = 73)	
	Control (n = 57)	Intervention (n = 41)	Control (n = 51)	Intervention (n = 38)	Control (n = 37)	Intervention (n = 36)
Mean (SD)	37.42 (8.39)	20.93 (9.69)	33.71 (10.13)	17.84 (8.97)	35.51 (9.89)	17.19 (8.21)
Score						
Minimum	17.0	10.0	14.0	10.0	11.0	10.0
Maximum	50.0	50.0	50.0	42.0	50.0	39.0

[a] Lower scores indicate increased ease in communicating.

The Frustration With Communication tool[16] was used 3 times during the study period to measure the frustration of trying to communicate while experiencing sudden speechlessness (n = 101). Compared with participants in the control group, those in the intervention group reported lower mean frustration levels (-2.68; SE, 0.17; 95% CI, -3.02 to -2.34; P<.001) in association with the ability to communicate needs while suddenly speechless.

The Satisfaction With Communication Method tool was used to measure the participants' degree of satisfaction with using strategies provided to

communicate (n = 97). Participants in the intervention group reported a higher mean satisfaction level with their communication method (0.59; SE, 0.16; 95% CI, 0.27 to 0.91; $P < .001$) than did participants in the control group. In order to establish internal consistency of the instrument, reverse wording was used for 2 items on overall satisfaction with communication. These items were analyzed by using the covariates time, APACHE II score, and random subject effect (mixed model). The slope estimate was equivalent to 0.67 (SE, 0.12), indicating moderate agreement (95% CI, 0.43 to 0.91). The 2 items were also tabulated against each other, with repeated measures ignored; agreement was moderate ($\kappa = 0.44$).

The unit clerks' understanding of messages generated by participants by activating a hot button while communicating via the hospital call system was evaluated. The clerks understood the message generated by the study participants 96% of the time (131 of 136 messages).

Use of the Communication Methods

The communication methods used most often by participants in the intervention and control groups were gestures and mouthing words, methods that are particularly pertinent to many yes-no questions that participants were asked. The next most common methods were paper and pencil for the control group and the communication system for the intervention group (approximately 25% of the time for each group).

Participants in the intervention group demonstrated ability to activate requested communication strategies during data collection. (Content analysis of messages activated, written, or typed will be discussed in another publication.)

Consistent accessibility, location of technology within arm's reach, and functionality of the communication methods were observed in 99.5% of 192 data collection points. A total of 2 participants were unable to activate the communication system because of motor coordination issues when pushing or activating the hot button of preference within the area delimited for access on the screen.

Discussion

The primary purpose of this study was to evaluate the impact of a revised technology-based intervention on suddenly speechless critically ill patients' communication with nursing staff. Participants in the intervention group reported higher ratings of satisfaction with communication method, lower frustration levels, and a progressive increase of perception of communication ease than did participants in the control group. The effectiveness of communicating messages with the communication intervention via the traditional call light system was validated.

Despite the acuity of illness of the study participants and limited training, independent use of the communication system was achieved by most participants. Consistent with published findings,[24,25] independent performance was demonstrated by most participants who communicated with the aid of the communication system until completion of the study. Developing alternatives to further assist participants with limited coordination was identified as a priority for future development and research.

Although the exposure of participants in the intervention group to use of the communication system was limited to a maximum of 10 days, participants reported progressive increase in perception of the ease of communication. This perception may be associated with the consistent accessibility of a multifunctional device tailored to the suddenly speechless population,[6,25] thus enabling communication while admitted to a critical care unit. Moreover, frustration, an adverse emotional outcome reported by suddenly speechless patients,[9,10,14-17] decreased because self-report of needs was possible.

> Independent use of the communication system was achieved by most participants.

Communication challenges experienced by participants in the usual care control group required the use of multiple nonverbal communication strategies to communicate the participants' needs. However, the urgent button was not an option selected by most participants. Possibly, the constraint of having only a single message enunciated and an inability to maintain a conversation with a staff member once the member's attention had been obtained resulted in limited use of the button.

Published articles[18,19,22,24,25] document the challenges faced during the integration of communication systems in the critical care environment. Despite the demands of conducting the study in an equipment-dense environment, the communication system was consistently accessible to facilitate communication of needs in a timely manner. These findings support advancing the use of technology-based communication interventions at the bedside.

The rate of success was high when participants generated messages with the communication intervention that were enunciated after activating the standard call light system. This finding has important implications for suddenly speechless patients in need of communicating expeditiously, at times when a nurse is not at the bedside. Moreover, the potential of providing continuity in the communication process is feasible, because the option to respond to the clerk's inquiries is available.

Implications for Research and Nursing Practice

Our study had several limitations that may affect the generalizability of the results. All participants enrolled in the study had no cognitive impairment and had a minimum education level of 8th grade. The lack of random assignment associated with a quasi-experimental design is also a weakness. Future research in this area must consider exploring the effect of using technology-based interventions in patients with worse cognitive status and lower literacy levels.

Exploring the impact of early introduction of the communication intervention at times when sudden speechlessness is anticipated (eg, after surgery for head and neck cancer) should be considered. Moreover, the impact of bedside communication systems on management of signs and symptoms, patients' ability to participate in health-related decisions, and end-of-life issues should be explored.

Facilitating expeditious communication for suddenly speechless patients' results in perceived ease of communication and satisfaction, no small thing when faced with challenges that emerge at different phases of recovery after surgery, a medical condition, or procedure that results in sudden speechlessness. Training nurses on use of reliable technology-based options and having consistent access to those options at the bedside are needed to help nurses enhance communication in patients who are suddenly speechless. The integration of simple and reliable communication interventions at the bedside is essential to decrease the vulnerability faced by hospitalized suddenly speechless patients and the communication challenges faced by nurses in critical care.

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