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Enhancing the Communication Process of Suddenly Speechless Patients in the Critical Care Setting

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Abstract

Background—Sudden speechlessness is common in critically ill patients with airway intubation or head and neck cancer surgery. Sudden inability to speak poses significant challenges for hospitalized patients as strategies to facilitate communication are often limited and unreliable. Technology- based communication interventions have the potential to facilitate the communication process of hospitalized patients experiencing health events resulting in sudden speechlessness.

Methods—A quasi-experimental, 4-cohort (control and intervention) repeated measures design was used, with data points occurring daily up to 10 days. The study was conducted in adult critical care units and participants were followed as they were transferred to other units within institutions selected for the study. The impact of a technology-based communication system (intervention) in comparison with a control group (Usual care + Urgent Button) was evaluated. Patient communication outcomes pertinent to communication with nursing staff evaluated in this study included: perception of communication ease, satisfaction with methods used for communication, and frustration with communication.

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Results—A comparison of the intervention and control group indicates that subjects in the intervention group reported lower mean frustration levels (-2.68, SE=0.17; 95% CI -3.02 to -2.34, p=<0.001), and a higher mean satisfaction level (0.59, SE=0.16; 95% CI 0.27 to 0.91; p<0.0001) with use of the communication intervention. Consistent increase of perception of communication ease over the hospital stay was reported by subjects in the intervention group.

Conclusions—This study facilitated the evaluation of a bedside technology-based communication intervention tailored to the needs of critically ill suddenly speechless patients.

Keywords

sudden speechlessness; communication intervention; critical care

Introduction

Currently, patients in the critical care setting who have become suddenly speechless (SS) due to airway intubation or during the recovery period after head and neck cancer surgery face significant challenges when trying to communicate their needs. These challenges exist despite national recognition of the vulnerability of these patients and the development of guidelines to improve safety and quality of care in the clinical setting.[1,2,3,4] At present, SS patients continue to face the difficult task of attempting to communicate their needs with limited and often unreliable methods.[5,6]

When health events result in a sudden inability to speak, patients can only express their needs using non-verbal communication techniques including gestures, mouthing of words, writing with paper and pencil, and, when accessible, pointing to various styles of alphabet boards. [5,6,7,8] Patients also have the option to activate the standard electronic call light system. However, the call light system is of limited assistance during sudden speechlessness events, as staff responding to the call expect a verbal response from the patient.[9] These strategies present significant challenges for both patients and nurses, as expeditious communication of patients' needs is compromised and nurses' abilities to interpret non-verbal communication is restricted by lack of time[9,10] or training.[11,12] Both experienced and inexperienced nurses struggle to understand SS patients' attempts to communicate, and contend with time constraints and ineffective strategies to facilitate the communication process.[10] As a result, the inability to communicate leaves patients at risk for unsafe situations, preventable adverse events, [13] and causes significant frustration.[9-10, 14-17]

Potential benefits of integrating technology-based communication interventions (e.g., speech-generating devices) to facilitate the communication process for hospitalized SS patients in the critical care setting include the expeditious communication of needs between patients and healthcare staff, as they emerge, and decreasing negative emotional outcomes (e.g., frustration) resulting from inability to communicate for both patients and healthcare staff. [6, 9-10, 19] However, the evolution of technology-based communication interventions has been limited by challenges associated with integrating technology in a hospital environment, lack of nursing staff familiarity with the technology, and pre-programming requirements of the devices for use by each patient.[6, 18-24] Most recently, efforts have been directed towards

tailoring technology-based communication interventions to the needs of SS patients, including efforts to decrease challenges identified in previous studies.[25]

Rodriguez et al.,[25] documented the feasibility and usability of a communication intervention prototype that integrated messages and other strategies to meet the needs of SS patients. Eleven SS patients admitted to the critical care setting were able to independently use three communication strategies integrated in a technology-based communication intervention: icons with pre-recorded messages, and separate screens to handwrite and type during communication episodes. Using a 1-5 range on a Likert scale (1=strongly agree to 5=strongly disagree), study participants reported a high degree of satisfaction with the use of the intervention during the hospital stay (1.5 with n=11; SD=0.29; range= 1.16-2.0). However, researchers identified the need to continue adapting the intervention to better serve the SS population and improve accessibility of the communication intervention in the acute care environment. Feedback provided by SS patient participants was used to improve the communication intervention prototype.

In this paper, we report on the impact of the revised technology-based communication intervention (communication system) on patient outcomes pertinent to communication with nursing staff: perception of communication ease, satisfaction with methods used for communication, and frustration with communication.[25] We hypothesized that study participants using the intervention would report higher ratings of communication ease and satisfaction with communication method and lower frustrations levels than a control group (Usual Care + Urgent Button; UC+UB).

Methods

Design

This study was undertaken in conjunction with development of the communication system using funding from a Small Business Innovation Research award. A design was chosen that allowed for sequential sampling of an initial control (UC + UB) and intervention group (Cohorts 1 and 2), followed by a technology-development phase to optimize the communication system as needed before implementing a sequential sampling of a second control (UC+ UB) and intervention group (Cohorts 3 and 4). The sequential sampling was needed to control for exposure of the UC+ UB group patients to the intervention condition, as there was no option to control patient bed assignments to separate the intervention from the UC+ UB group. A repeated measures design was used with data points occurring daily up to 10 days after participants entered the study.

Two tertiary care institutions in the southeast region of the United States were selected as study sites. The study was conducted in adult critical care units (cardiac, medical, surgical, and trauma), but participants were followed as they were transferred to other units if their study interval was still in process at the time of the transfer.

Intervention group—A speech-generating device (software incorporated in an iPad with three communication functions) was provided to participants in the intervention group. The communication functions were: 1) touch selection of pictorial hot-buttons (graphic pictures/

symbols associated with a message) with premade spoken messages each representing symptoms or basic needs commonly experienced by SS patients; 2) handwriting on a separate screen by using a finger or stylus; and 3) typewriting on a separate screen using an onscreen keyboard. A freestanding Urgent Button (UB; a push button that announced "I need help" when activated) was also provided to patients in the intervention group as a back-up communication method in case the technology intervention failed and participants needed to summon help in the event of an emergency. [25]

A total of 78 participants were screened during enrollment in the two intervention cohorts. The initial plan was to assess the usability of the device after use by the first 20 intervention participants, at which time any necessary technology refinements would be made. It was found, however, that after enrolling the first 7 participants of the intervention group at Study Site 1, technical difficulties involving the stand used to hold the device, made it difficult for participants to access the technology. At this point the technology refinements were made and data from these 7 participants in cohort 2 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, at Study Site 2. Sixty-seven patients were screened with a total of 52 patients meeting criteria for enrollment.

UC+ UB Group (control)—Usual care at the study sites typically consisted of giving SS patients access to a call light and providing pen and paper on which to write messages. Because the investigators were interested in conducting content analysis of communication events, the UC+ UB group participants at each site received a pad of bound paper that facilitated saving used sheets for analysis. To account for the impact of the UB used in the intervention group, an UB was also available for each participant of the UC+ UB group. A total of 126 participants were screened for the UC+ UB group with 64 participants enrolling in the study. Fifty-eight percent of the participants (n=37) met criteria for enrollment in cohort 1 at Study Site 1 and 42% (n=27) in cohort 2 at Study Site 2.

Study Participants

All participants signed a consent form prior to participating in the study. Spanish translation of consent and study forms during the last phase of the intervention study facilitated enrollment of 13 participants (25%; out of 52 enrolled participants) who were primarily Spanish-speaking. Inclusion criteria consisted of the following*:* 1) intubated airway, surgery, or other event causing sudden speechlessness lasting for at least 8 hours; 2) age ≥ 21 years; 3) able to read English or Spanish; 4) ability to see and use of at least one arm; 5) no permanent speech disability for which the patient already used adaptive speech devices; 6) Richmond Agitation-Sedation Scale (RASS)[26] scores within acceptable range of +1 to -1; and 7) absence of delirium as measured by the Confusion Assessment Method-ICU (CAM-ICU) [27]. Patients who had participated in a previous cohort of the study or had an admitting diagnosis of a DSMR-IV [28] major mental illness documented in patient's medical record were excluded. Institutional Review Board approval was obtained at each study site as well as applicable universities before study implementation.

Validation of the Communication System

Daily evaluations of the patients' abilities to activate three different messages on the hot-buttons screen, and to use the handwriting and typing communication strategies were obtained starting day 2 of the study period. Patients' performances were scored based on level of assistance needed (1=unable to perform, 2=needs considerable assistance, 3= needs minimal assistance, 4=independent). Additionally, study participants reported about communication methods most commonly used, and data about the accessibility and functionality of the technology used by each group were collected on a daily basis.

Procedures

Potential participants were either recruited during their preoperative visit (head and neck cancer surgical patients) or in the critical care unit. They were pre-screened with the CAM-ICU and the RASS to determine whether they met inclusion criteria. Individuals not experiencing delirium and with an agitation/sedation score of -1, 0 or 1 were approached for participation in the study and those agreeing were consented. Potential participants with unacceptable levels of agitation, confusion, or sedation were re-evaluated for potential inclusion at a later date. Once enrolled in the study, participants were screened each study day with the CAM-ICU and RASS to determine whether they still met data collection criteria of absence of delirium or agitation. Participants not meeting criteria were approached at another data collection point.

Education in Use of Technology by Study Participants

Education about how to use the communication system was provided to all participants enrolled in the intervention group. After completion of the consent process, participants received a demonstration about how to use each one of the strategies incorporated in the communication system (direct selection of hot-buttons, handwriting and typing), how to navigate between communication strategies, how to adjust position of the iPad and maneuver stand holding the device, and how to activate the UB.

Participants in the UC+ UB group were instructed about how to activate the UB. Additionally, participants were instructed about the option of using a notepad provided by the researchers to communicate their needs. Information about the goal of analyzing data documented in the notepad was also provided.

Measures

Demographics—*The Demographic Tool and Clinical Survey* was used to collect demographic data. The following data were collected for each study participant: age, education, ethnicity, gender, reason/previous sudden speechlessness experience.

Ease of Communication—*The Perception of Communication Difficulty Questionnaire* [29-30] was used to measure the level of perceived difficulty or ease in communication experienced by study participants. The instrument consists of 10 questions related to perceived ease when communicating about physical needs, thoughts, and with staff. A Likert scale is used to rate each question with a rating of 0 indicating “not hard at all” or absence of perceived communication difficulty, and a score of 4 indicating “extremely hard” or

increased perception of communication difficulty. The instrument has been examined for content validity by experts who care for patients being mechanically ventilated, and pilot tested with intubated patients, demonstrating internal consistency between 0.81-0.96.[29-30]

Satisfaction with Communication—*The Satisfaction with Communication Method Tool*, adapted from *The Quebec User Evaluation of Satisfaction with Assistive Technology* [31-32] was used to measure the participants' degree of satisfaction with method of communication being used. The instrument includes a general item where study participants list the communication method(s) used at data collection point and 11 items to rate satisfaction with communication method, ability to report needs, and communication with healthcare staff and relatives. A Likert scale (1-5) facilitates rating the level of satisfaction, with 5 indicating greater satisfaction with communication method.

In order to establish internal consistency of the instrument, reverse wording was used for two items included in the *Satisfaction with Communication Method Tool* that measured the same concept: overall satisfaction with communication. The first item, "*Overall I am pleased with how (the communication method) helped me to communicate*," and the second item, "*Overall I am dissatisfied with how (the communication method) helped me to communicate*," were analyzed with covariates time, the APACHE 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 two items were also tabulated against each other, ignoring repeated measures, with moderate agreement identified (Kappa=0.44).

Frustration with Communication—*The Frustration with Communication Tool* is a 1-item scale that measures how frustrating it is to communicate needs while experiencing sudden speechlessness. This item was adapted from *Patak's Frustration Survey*, which was successfully used with mechanically ventilated patients. [16] Patients rate their frustration level by using a Likert scale (1-5), with 5 indicating extreme frustration with the inability to communicate their needs.

Usability of Communication Method—This is a researcher-generated instrument to document the patient's ability to use the communication methods, accessibility, and acceptability of physical characteristics of the computer platform. This instrument was successfully used in another study associated with the development of the communication system evaluated in this study.[25]

APACHE II—The *APACHE II* is an instrument used to predict individual survival by grading the severity of illness in critically ill patients. A point score is generated ranging from 0 (minimum) to 71 (maximum) based on 12 physiologic variables, age, and underlying health, with an increasing score associated with increasing risk of hospital death.[33] This instrument was used to evaluate the participants' severity of illness upon enrollment in the study.

Confusion Assessment Method-ICU (CAM-ICU) and Richmond Agitation Sedation Scale (RASS)—The *CAM-ICU* [26] and the RASS[27] are established instruments to assess for the presence of delirium, and agitation or sedation. Absence of delirium as

measured by the *CAM-ICU*, and a score between 1 and -1 as measured by the *RASS*, was necessary to participate in the consent process and before collecting data at each study day.

Data Collection

Data collection was conducted in the critical care setting where participants were admitted and extended to units where participants were transferred. Each study day, trained research staff visited the units where subjects were enrolled and administered study questionnaires. Participants were provided with a printed, enlarged Likert scale for each questionnaire used. The research staff read each question out loud, and participants pointed at their selection on the scale. To ensure collection of essential study data from participants who became easily fatigued, questions were organized to obtain the most critical data first. Research staff closely monitored the participants and delayed data collection if participants displayed or reported fatigue.

Data Management

The data was managed using the Research Electronic Data Capture (REDCap©) [34] software (Vanderbilt University, 2009). Research staff who had no financial conflict of interest (FCOI) entered data on forms created in REDCap© and monitored data quality and completeness. Analytic datasets were drawn from the data by staff without (FCOI). The final database was exported to the Statistical Analysis Systems (SAS®) for analysis. The primary analyses were conducted by a research team member who did not have a FCOI in the technology intervention.

Statistical Analysis

The first interventional cohort was stopped early because technical difficulties with the mounting device made the device too difficult for critically ill patients to use. The sample size of the second interventional cohort was expanded to achieve the sampling goals. After a comparative analysis of clinical and demographic factors, the two UC+ UB group cohorts were combined since no significant differences were identified.

SAS® version 9.3 was used for data analysis. The intervention group (n=52) was compared to the UC+ UB group (n=63) using two-sided t-tests. The study had sensitivity to a difference of 0.63 SD with 80% power at P=0.05 two-sided for sample sizes of 20 evaluable subjects per cohort (80 total). One-way analysis of variance was used for the following variables: age, education, APACHE total, and baseline RASS score. The Fisher's Exact Test was used to compare gender, ethnicity, and diagnosis. A mixed model approach (repeated measures) with compound symmetric covariance matrix was used to analyze the following primary outcomes: communication ease, frustration, and satisfaction with communication method. The APACHE score was used as a baseline covariate in the analysis.

Results

Sample Characteristics

A total of 123 participants were enrolled in the study. One subject from cohort 1 (control group at Study Site 1) was identified as a screen failure, and seven subjects enrolled in

cohort 2 (intervention group at Study Site 1) were removed from the analytic sample due to technology development requirements. From the remainder participants, 45% (n=52) comprised the intervention group, and 55% (n=63) integrated the UC + UB group. Participants without APACHE data (n=2), screen failures from cohorts at Study Site 2 (n=3), and without at least one completed measure for the primary outcomes evaluated in this study were not included in the final analytical sample. The final analytical sample associated with the primary outcomes comprised between 97 to101 participants.

Participants' ages ranged from 22 to 85 years with a mean of 57 (*SD*=15.80; Table 1). Most participants were male (60.9%), with White Non-Hispanics as the predominant group (76%). Blacks (11%) and Hispanics (11%) were represented equally. All participants had completed at least the 8th grade, with the majority reporting completion of 12 years of education (n=49; 42.6%), followed by additional years of education ranging from 13 to 21 years (n=44; 38.3%). Fifty-four percent (n=62) of the participants reported having a previous hospitalization for surgery that resulted in a sudden inability to speak, and a range of 1 to 7 times when the hospitalization resulted in temporary respiratory intubation (n=21, 18.3%) or placement of a tracheostomy (n=20; 17.4%). The two most common diagnoses associated with the development of sudden speechlessness included head and neck cancer surgery and respiratory failure. The majority of patients experienced sudden speechlessness as a result of a tracheostomy placement (Table 1).

There were no significant group differences identified for age or education (Table 1). In terms of primary diagnosis (p=0.16), ethnicity (p=0.49), and gender (p=0.71), there were no significant between group differences. The APACHE score was the only clinical variable indicating a significant difference between the intervention and UC+ UB groups, with a higher mean APACHE total for the intervention group (Table 1), indicating a greater severity of illness in this group.

Primary Outcomes

Participants in the study reported their perceptions about the following primary outcomes: ease of communication, frustration with communication and satisfaction with communication method. Data related to the unit clerk's understanding of messages generated by patients using the intervention system were also collected.

Ease of Communication—Using *The Perception of Communication Difficulty Questionnaire*, the participants (n=101) reported their level of perceived difficulty or ease in communication on their second day in the study and twice before completion of the study (maximum period in the study=10 days). The estimated difference between the intervention and the UC+ UB groups did not reach significance (-0.06, SE=0.039; 95% CI -0.136 to 0.020; p=0.14). However, subjects in the intervention group reported consistent increase of perception of communication ease, represented by progressively lower rating scores (scale 0-4 where 0=not hard at all and 4= extremely hard) over the course of the hospital stay (Table 2).

Frustration with Communication—Study participants (n=101) used *The Frustration with Communication Tool* to report how frustrating it was to communicate while

experiencing sudden speechlessness. Frustration levels were compared between the UC+ UB group and participants comprising the intervention group. Patients in the intervention group reported lower mean frustration levels (-2.68, SE=0.17; 95% CI -3.02 to -2.34, p=<0.001) in association with their ability to communicate needs during the period where they were SS.

Satisfaction with Communication Method—Study participants (n=97) reported their degree of satisfaction with method of communication being used. Participants in the intervention group, using the new communication technology, reported a higher mean satisfaction level with their communication method than did the UC+ UB group (0.59, SE=0.16; 95% CI 0.27 to 0.91; p<0.0001). The questionnaire items having the greatest group difference included: using the communication intervention with relatives, communicating about comfort needs and feelings, and reporting symptoms (Table 3).

Secondary Outcome

Clerk's Understanding of Messages—The unit clerks' abilities to understand messages generated when participants in the intervention group activated a hot-button, as instructed by research staff and communicated via the hospital call system, was also evaluated. This test occurred during the period of time when participants were transferred to step-down or medical surgical units while still participating in the study. Ninety-six percent of the times the data were collected (n=131/136), the clerks understood the message that was initiated by the study participants. The research assistants were unable to conduct this test with the unit clerks approximately 4% (n=5) of the times data were collected.

Use of the Communication Methods

Participants in the intervention and UC+ UB group used gestures and mouthing words most frequently, which is particularly pertinent to many yes/no questions that patients were asked. The next most common was paper/pencil for the UC+ UB group, and the communication system for the intervention group, each approximately 25% of the time.

Consistent accessibility, location in the room within arm's reach, and functionality of the communication methods provided to participants during the study period was observed in 191 of 192 data collection points (99.5%). Instances when the interventional communication methods were reported as non-functional were associated with time delay between communication strategies and patients' inability to activate device due to motor coordination issues (n=2).

Data about participants' ability to activate the UB independently was obtained for a total of 136 data collection points. Intervention and UC+ UB group participants demonstrated an independent level of ability to activate the UB in 81% (n=110) of the times data were collected. Approximately 13% of the participants (n=18) required minimal assistance, 4% (n=5) required considerable assistance, and 2% (n=3) were unable to perform the activity upon request. Participants requiring significant assistance or unable to perform the activity upon request were unable to physically activate the UB. Patients' performance during day 2 assessments were consistent with independent performance for the majority of the patients

(n=22; 82%), minimal assistance needed by 4% (n=5), considerable assistance for 1.5% (n=2) and inability to perform by 2 participants (1.5%).

Intervention Group—Data associated with ability to activate hot-buttons upon request were collected for a total of 136 data collection points. Independent ability to activate the requested hot-buttons was observed for approximately 63% of the data collection points (n=86), minimal assistance for 22% of the data collection points (n=30), and considerable assistance was needed for approximately 14% of the data collection points. Participants requiring considerable assistance demonstrated inability to push and activate the hot-buttons within the area delimited for access on the screen due to shakiness of hands and/or lack of coordination. Response trends over time indicated that time only explains 4% of the variance related to ability to activate messages to report pain, suction needs, and need for nurse assistance. Data associated with thirty-one participants monitored during day 2 of the study indicates that 52% of the sample (n=16) demonstrated independent ability to activate requested hot-buttons, 13% (n-4) required minimal assistance, 32% (n=10) required considerable assistance, and one participant (3%) was unable to activate the hot-buttons upon request. Inability to activate hot-buttons upon request was not observed after day 2 of the study.

A total of 5,889 pictorial hot-buttons were activated by SS patients using the communication intervention. The most frequently activated pictorial hot-buttons facilitated communication about symptom management needs (31%). Symptoms reported most frequently included: pain (n= 1267; 22%), and respiratory needs (n=539; 9%). Patients frequently activated hot-buttons to communicate their need for assistance (n=1119; 19%), including help from a *nurse* (60%) or a general request for *help* (39%). Other messages frequently used by patients facilitated communication about expressing thanks (n=446; 7.6%); bathroom needs (n=343; 5.82%); affection/I love you (n=328; 5.6%); agreement/Yes (n=249; 4.23%); position changes (n=203; 3.45%).

Overall of 136 data collection points, 66% (n=90) were associated with independent ability to use the handwriting strategy, and 59% (n=80) were associated with independent use of the typing strategy. Data associated with thirty-one participants monitored during day 2 of the study indicates that 55% of the sample (n=17) demonstrated independent ability to use the handwriting strategy, and 52% (n=16) independently used the typing strategy on request. Ten participants were unable to demonstrate how to use the handwriting and typing strategies during the study due to inability to coordinate use of their fingers (n=9) or inability to follow directions when using the strategies (n=1). Study participants used the typing strategy to communicate 6,448 messages, and the handwriting strategy to communicate 770 messages. Content analysis of messages written or typed by study participants will be discussed in another publication.

Discussion

The primary purpose of this study was to evaluate the impact of a revised technology-based communication intervention on critically ill SS patients' communication with nursing staff. Patients assigned to the communication intervention reported higher ratings of satisfaction

with communication method and lower frustration levels than patients in the control (UC+ UB) group. Intervention participants also reported a progressive increase of perception of communication ease with the use of the technology-based intervention during the hospital stay. The effectiveness of communicating messages with the technology-based communication intervention via the traditional call light system, when patients were transferred outside of the critical setting, was validated.

Despite the acuity associated with a critical care event resulting in sudden speechlessness, and limited bedside training about the communication intervention for study participants, independent use of the intervention on day 2 of the study was achieved by most participants. Consistent with literature findings, independent performance was demonstrated by study participants communicating with the aid of the intervention until completion of the study.[24, 25] The small number of participants requiring significant assistance to use the technology demonstrated difficulty with coordination when pushing or activating the hot-button of preference within the area delimited for access on the screen. Developing alternatives to further assist participants with limited coordination was identified as a priority for future development and research.

Although intervention group participants' exposure to use of the communication intervention was limited to 10 days or less, patients reported progressive increase in perception of communication ease. The consistent accessibility of a multifunctional device housing strategies tailored to the SS population[6, 25] enabled participants to communicate about needs that surfaced as they occurred, while admitted to a critical care unit. Moreover, frustration, a negative emotional outcome reported by patients experiencing sudden speechlessness, [9-10, 14-17] decreased as self-report of needs was enabled.

Communication challenges experienced by participants in the UC+ UB group required the use of multiple non-verbal communication strategies, often a combination of three strategies, when attempting to communicate their needs. The UB, a device that enunciated the need for help when activated, was not an option selected by most participants. It is possible that the constraint of having only one message enunciated, and inability to maintain a conversation once obtaining the attention of a clerk or other staff, may have resulted in limited use by study participants.

The literature documents the challenges faced during the integration of technology-based communication interventions in the critical care environment.[18-19, 22, 24-25] Despite the demands of having to implement the study in units already subjected to an equipment dense environment, the technology-based communication system was consistently accessible and functional. Study participants had access to reliable communication strategies at the bedside to communicate needs in a timely manner. These findings are supportive of ongoing research to advance the use of technology-based interventions for hospitalized SS patients.

A high rate of success was obtained when messages generated with the communication intervention were enunciated via the standard call light system. Patients transferred to step down or medical-surgical units initiated communication efforts that were understood by the clerks at a time when the nurse was not within reach at the bedside. Successful use of the

communication system to report messages via the standard call light system has the potential to benefit SS patients, especially if in need of reporting needs expeditiously. Moreover, this strategy has the potential of providing continuity to the communication process initiated between the patient and the clerks, as the option to respond to the clerk's inquiries is available.

Implications for Research

There are several limitations associated with this study which may affect generalizability of the results. All participants enrolled in the study were cognitively intact at each data collection point, with a minimum education level of 8th grade. As a result, it is unknown if cognitive status fluctuations and lower literacy levels influence patients' abilities to use the intervention to communicate with nursing staff. The use of a quasi-experimental design posed disadvantages, with the absence of random assignment as one of the major weaknesses. However, even with these limitations, results of this study are supportive of adapting technology-based communication interventions that are tailored to the needs of hospitalized SS patients.

Future research in this area must consider exploring the impact of using technology-based interventions on cognitive status and challenges associated with lower literacy levels. Exploring about the potential impact of early introduction of the communication intervention at times when SS is anticipated (e.g., head and neck cancer) should be considered. Moreover the impact of integrating bedside technology-based communication strategies on symptom management, the patients' ability to participate in health related decisions, and end-of-life issues should be explored.

Implications for Nursing Practice

Hospitalized patients experiencing sudden inability to verbalize needs, and nurses providing care to these patients, continue to face significant challenges to communication in acute and critical care settings. Facilitating expeditious communication for these patients' results in perceived ease of communication and satisfaction, no small thing when faced with challenges that emerge at different phases of the recovery process after surgery, a medical condition, or procedure that results in sudden speechlessness. The integration of reliable communication interventions at the bedside is essential to decreasing the challenges and vulnerabilities experienced by critical care patients recovering from events resulting in sudden speechlessness.

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Summary of key points

- Currently, patients in the critical care setting who have become suddenly speechless (SS) face significant challenges when trying to communicate their needs.
- The inability to communicate during a sudden speechlessness event leaves patients at risk for unsafe situations and preventable adverse events, and results in significant frustration.
- Technology-based communication interventions (e.g., speech-generating devices) have the potential to facilitate the communication process for hospitalized SS patients in the critical care setting.
- Critically ill SS patients who used a technology-based communication intervention for a period of ten days or less, reported less frustration with communication, increased satisfaction with communication method, and progressive increase of perception of communication ease.

Table 1

Demographic Statistics

	Intervention group n=52	UC+ UB Group*** n=63	Test of UC+ UB
Mean age in years (SD)	57.28 (15.94)	57.14 (15.82)	F=0.17; p=0.8419
Mean education	12.96 (2.038)	13.14 (2.56)	F=0.08; p=0.92
Mean APACHE total	14.32 (6.40)	11.15 (4.83)	F=5.27; p=0.0065
Education *			
<8	0	0	
8-12	31 (59.61%)	34 (59.64%)	
13-17	20 (38.46 %)	21 (35.08%)	
18-21	1 (1.92%)	2 (3.50%)	
Gender			
Male	32 (60.4%)	38 (60.3%)	
Female	20 (37.7%)	25 (39.7%)	
Racial Group **			
White (non-Hispanic)	36 (67.9%)	52 (82.5%)	
Black	8 (15.1%)	5 (7.9%)	
Hispanic	7 (13.2%)	6 (9.5%)	
Diagnosis associated with SS			
Head-neck cancer surgery	11 (20.8%)	25 (39.7%)	
Respiratory failure	14 (26.4%)	20 (31.7%)	
Cardiac surgery	9 (17.0%)	4 (6.3%)	
Abdominal surgery	2 (3.8%)	5 (7.9%)	
Transplant surgery	6 (11.3%)	3 (4.8%)	
Trauma	3 (5.7%)	4 (6.3%)	
Sepsis	4 (7.5%)	2 (3.2%)	
Tracheal stenosis	1 (1.9%)	0 (0.0%)	
Myasthenia Gravis	1 (1.9%)	0 (0.0%)	
Stroke	1 (1.9%)	0 (0.0%)	
Rationale for SS event			
Tracheostomy	45 (86.5%)	58 (92.1%)	
Endotracheal tube	7 (13.5%)	3 (4.8%)	
Glossectomy		1 (1.6%)	
Stoma		1 (1.6%)	

* Missing data UC+ UB Group=6 (5.2%)

** Missing data Intervention Group =1 (1.9%)

*** UC + UB= Usual Care + Urgent Button

Table 2

Means Control and Intervention Groups: Perception of Communication Ease* Days 2, 4 and 6

	Control UC+ UB	Intervention	Control UC+ UB	Intervention	Control UC+ UB	Intervention
	Day 2		Day 4		Day 6	
Perception of communication ease	37.42 ± 8.39	**20.93** ± 9.69	33.71± 10.13	**17.84** ± 8.97	35.51 ± 9.89	**17.19**±8.21

*Lower scores are associated with increased ease to communicate.

UC + UB= Usual Care + Urgent Button

Table 3

Satisfaction with Technology-based Communication Method Components (N=97)

Variable	Point Estimate (SE)	95% CI	P Value
Satisfaction with ability to get someone's **attention**	0.45 (0.16)	0.13 to 0.77	0.0072
Satisfaction with **relatives/significant others** understanding of what was needed	0.37 (0.14)	0.09 to 0.65	<0.011
Satisfaction with communication of **comfort needs**	0.48(0.14)	0.20 to 0.76	<0.001
Satisfaction with ability to communicate with the **doctor**	0.40 (0.18)	0.04 to 0.76	0.028
Satisfaction with **ease** of communication	1.19(0.21)	0.77 to 1.61	<0.001
Satisfaction with ability to communicate **feelings**	0.84(0.17)	0.50 to 1.18	<0.001
Satisfaction with **how the communication method helped to communicate**	0.35(0.13)	0.09 to 0.61	0.0099
Satisfaction with the **nurse's** understanding of what was communicated	0.44 (0.14)	0.16 to 0.72	0.0018
Satisfaction with **report of symptoms**	0.87(0.18)	0.51 to 1.23	<0.001