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Mixed-method acceptability evaluation of a co-designed bundled intervention to support communication for patients with an advanced airway in the ICU during a pandemic

## **Original research**

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**Keywords:** COVID-19, communication, intensive care units, acceptability, nursing

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### **Authors' contributions**

LI collected the data and all authors (CD, YY, LR) contributed to the design of the research, the interpretation of the findings, and the writing of the manuscript.

### **Data availability statement**

Data sharing will be considered upon reasonable request.

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### **Conflict of interest disclosure**

The authors declare no competing interests.

### **Ethics approval statement**

Ethical approval for the study was given by the Michael Garron Hospital (820-2010-Mis-347) and the University of Toronto Research Ethics Boards (40495). Informed consent was obtained from all participants.

### **Patient consent statement**

All patient participants provided informed consent.

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Not applicable.

**Abstract (300/300)**

**Background:** Although bundled communication interventions are recommended to address communication barriers for patients with an advanced airway in the intensive care unit (ICU) such interventions have not been evaluated in pandemic conditions.

**Aim:** To evaluate the acceptability, appropriateness, and feasibility of a co-designed bundled intervention to support communication with adult patients with an advanced airway in ICU in pandemic conditions.

**Design:** Prospective, convergent mixed method design in a single centre medical-surgical ICU in Toronto, Canada between September 2021–March 2022.

**Methods:** After use of the co-designed bundled communication intervention quantitative data were collected from health care providers using validated acceptability, appropriateness, and feasibility measures and analyzed using descriptive statistics. Qualitative data were collected from providers, patients and families using semi-structured interviews and analysed using content analysis applying the theoretical framework of acceptability. Joint table analysis enabled integration of the two data sets.

**Results:** A total of 64 (41.3%) health care providers responded to the survey: 54 (84.4%) rated the intervention acceptable; 55 (85.9%) appropriate; and 49 (76.6%) feasible for use in this context. Qualitative data (23 interviews: 13 healthcare providers, 6 family and 4 patients) and the

joint table analysis extended understanding that intervention acceptability was related to positive affective attitudes and reduced communication frustration. Appropriateness and feasibility were promoted through intervention alignment with values, ability to personalize tools, and ease of access. Recommendations to improve acceptability included adaptation for immobilized and/or restrained patients, additional education, and integration into existing workflows.

**Conclusions:** This mixed method evaluation of a co-designed bundled intervention to support patient communication in the ICU during pandemic conditions demonstrated high rated and described acceptability, appropriateness, and feasibility by participants.

**Relevance to clinical practice:** A co-designed communication intervention demonstrating stakeholder acceptability, appropriateness, and feasibility can be implemented into clinical practice in pandemic and other infection prevention and control contexts.

C3\_NCC\_MainBody

Keywords (5)

COVID-19, communication, intensive care units, acceptability, nursing

## INTRODUCTION

Treatment of patients in the intensive care unit (ICU) with mechanical ventilation via an advanced airway (e.g., endotracheal or tracheostomy tube) contributes to communication difficulty. If unassisted, patients resort to inefficient methods of communication such as gestures and mouthing words to express their basic needs and emotions as well as to report physical (e.g., pain, dyspnea, thirst) and psychological (e.g., sadness, fear, confusion) symptoms (1-3). Unrelieved needs and symptoms contribute to long-term impairments making ICU patient communication an important area of research (4-6). Nurses working in the ICU also report unassisted patient communication to be a source of frustration and stress (6-8).

## BACKGROUND

Recommended augmentative and alternative communication (AAC) tools to support ICU patient communication include non-vocal aides (e.g., communication boards), aides that enable vocalization (e.g., speaking valve) as well as high-tech devices (9-11). Although the arsenal of tools is growing, incorporating them into day-to-day care is challenging; patients, family, and health care providers (HCPs) continue to report extensive barriers to using AAC in the ICU (12). A published study testing a comprehensive communication intervention, the Study of Patient-Nurse Effectiveness with Assisted Communication Strategies (SPEACS) included communication skills training for ICU nurses, a cart stocked with a variety of communication tools, and speech language pathologist (SLP) consultation (13). SPEACS was associated with increased nurse knowledge, satisfaction, and comfort with supporting patient communication (14). A quasi-experimental trial found that SPEACS improved nurse-patient communication

success, frequency, ease, and quality, although results differed across the two study units (13). Nurse receptivity of communication interventions and unit culture may have accounted for the discrepant results (13).

In Canada, approximately 27% of hospital stays for COVID-19 included an ICU admission and of those, 63% received mechanical ventilation (15). COVID-19 pandemic and associated infection prevention and control (IPAC) practices include personal protective equipment (PPE) such as face masks, visors and in-person visiting restrictions. These practices present additional barriers to supporting communication with patients using AAC and for patients using virtual technology to enable family visits (16-22). Worsening of mental health for ICU nurses, and specifically, their worries about meeting patient care needs such as communication while staying safe have been recently reported (16, 23). It is currently unclear how to best address the communication needs of ICU patients, family, and health care providers in the COVID-19 pandemic context or indeed in any situation when PPE is required. Evidence based communication programs have not been evaluated in pandemic and/or IPAC conditions, nor has acceptability theory been used to understand inconsistent adoption of AAC (24).

#### Theoretical framework of acceptability

This study used the Theoretical Framework of Acceptability (TFA) to understand end-user acceptability of a co-designed communication intervention for use in the ICU during COVID-19 pandemic conditions. According to the TFA, acceptability is defined as a multifaceted construct which reflects the cognitive and emotional responses of people delivering or receiving a healthcare intervention beyond “satisfaction” (25). The seven constructs of the TFA are: *affective attitude, burden, ethicality, intervention coherence, opportunity costs,*



*perceived effectiveness*, and *self-efficacy* (25). The TFA posits that stakeholder (i.e., patient, family, and HCPs) judgements about acceptability impacts their engagement with, or commitment to, an intervention. The design and acceptability evaluation of a communication intervention that addresses pandemic associated barriers may therefore improve AAC adoption and outcomes.

### Intervention

Our previously published (26) co-design approach to communication bundle intervention development and implementation are described using the TiDieR checklist in Supplementary File 1 (27). Our process involved iterative cycles of incremental intervention development and positioned end-users as design partners (28). The bundle comprised three main components. 1. A physical communication cart located in the ICU stocked with IPAC approved and stakeholder selected communication tools, and a virtual tool cart on the study site intranet with printable tools and links to websites with evidence-based communication tools (29, 30). 2. Patient communication skill education for ICU HCPs including in-person brief training and links to websites with evidence-based training modules (29). 3. Up-to-date information for family about in-person and online visiting. Implementation lasted eight weeks and included evidence-based strategies for introducing bundled interventions in the ICU (i.e., multi-modal education, reminders, audit-feedback, internal and external facilitators) and implementation theory (i.e., iPARIHS) (e.g., evidence, facilitation, context) (31, 32).

## AIM AND RESEARCH QUESTIONS

The aim of this study was to evaluate the acceptability, appropriateness, and feasibility of a co-designed bundled COmmunication intervention for adult ICU patients with an advanced airway during the COVID-19 PandEmic (COPE) from the perspective of ICU HCPs, patients, and family.

### Research questions

1. What proportion of ICU HCPs report COPE to be acceptable, appropriate, and feasible to support communication for adult ICU patients with an advanced airway in the ICU during COVID-19 pandemic conditions?
2. How do ICU HCPs, patients, and family members describe the acceptability of COPE for use in this context and what do they identify as areas for improvement?
3. How does ICU HCP, patients, and family descriptions of acceptability expand our understanding of the acceptability, appropriateness, and feasibility ratings for the COPE intervention in this context?

## DESIGN AND METHODS

### Design

Following the implementation of COPE, a prospective convergent mixed-method acceptability study was conducted (33, 34). Convergent mixed-method designs use two or more concurrent phases of data collection in one study (34). In this study, qualitative semi-structured results were used to expand understanding of the quantitative questionnaire results. The full protocol for this study is published elsewhere (26).

### Setting and sample

Using convenience sampling, we recruited participants (HCPs, patients, and family) from a single 17-bed medical-surgical ICU in a community teaching hospital in Toronto, Canada (September 2021 to March 2022). HCPs were recruited via email invitation. HCPs who completed the questionnaire were invited on the consent form to participate in a follow-up interview. Discharged ICU patients and family who experienced any component of the COPE intervention were also recruited to participate in an interview. Recruitment continued until information power was achieved (35-37).

The study setting uses a closed medical model, a 1:1 to 1:2 nurse-to-patient ratio to manage patient care, and respiratory therapists (RTs) at a 1:8 RT-to-patient ratio to manage ventilator support. The setting has a total staff of 155 including nurses, interprofessional team members, leadership, and critical care physicians. The study unit followed COVID-19 IPAC standards set by the Government of Ontario, Canada including patient isolation, visitor restriction, and the use of PPE (38). There was no formal training on patient communication for staff available prior to the study.

### Eligibility

Eligible HCPs included full, part, or casual employees of the study setting. For interviews, eligible participants also included adult ( $\geq 18$  years of age) patient and family members who had been: 1. Admitted to the study unit during or following the implementation of COPE; 2. Treated with an advanced airway while in ICU; 3. Able to communicate in English; and 4. Discharged from ICU within 3 months and able to recall communication experiences with

any element of COPE. 5. Family member participants were adult family of a patient meeting the above criteria.

### Data collection

**Quantitative.** Questionnaire data were collected and managed using REDCap electronic data capture tools hosted at the XXX (39, 40). REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies. HCPs who consented to participate were emailed an electronic demographic questionnaire and the validated Acceptability of Intervention, Feasibility of Intervention, and Appropriateness of Intervention Measures (AIM, FIM, and IAM, respectively) (see Supplementary File 2 for questionnaire) (41). Weekly reminders were sent to all staff for a total of four weeks (42). The target sample size was 60-65 of the 155 total HCP staff based on recommended targets of over 30% of the study population (42). A sample size of 60 permitted the proportion of affirmative responses for the setting population to be estimated 95% confidence (43).

The AIM, FIM, and IAM are scored using Likert scale response values for each item ranging from 1 to 5, with 1 = completely disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = "agree" and 5 = "strongly agree." Item scores are totalled and averaged across each measure (41). A mean score for each measure of  $\geq 4$  signifies an affirmative response (44).

**Qualitative.** Interviews were conducted by an experienced critical care nurse (XX) between Dec 2021 – March 2022 at a time and in a method (e.g., in-person, videocall, or telephone) based on participant preference (see Supplementary File 3 for interview guide). The interviewer was not employed in the study unit.

### Data analysis

**Quantitative.** We analysed quantitative data using descriptive statistics and IBM SPSS v28.0. Number and percentage of participants with mean scores  $\geq 4$  were calculated for each measure (44).

**Qualitative.** All interviews were recorded and transcribed verbatim using transcription software. NVIVO 12 software was used to assist with coding of transcripts (45). Transcripts were analyzed using the four stages of deductive content analysis (i.e., decontextualization, recontextualization, categorization, and compilation) (46). Definitions for the TFA constructs were adapted to communication with adult ICU patients (47). Author coders worked in pairs with multiple rounds of group discussions to identify and code themes related to acceptability (46). A code book was created and modified using an audit trail to enhance credibility of the analysis (36, 47). The interviewer kept reflexive notes to identify where tensions occurred during interviews or when experiences were shared that either converged or diverged with her own critical care nursing experience (48).

**Mixed-methods.** After respective analysis of each dataset, quantitative data (HCPs) and qualitative data (HCPs, patients, and family) were merged with mirrored content areas i.e., TFA constructs aligned with acceptability, feasibility, and appropriateness scores. This enabled comparing, contrasting, and synthesizing results in a joint table format (33, 34). Convergences and divergences in the datasets were analysed for a deeper understanding of quantitative results and to identify recommendations to improve the acceptability of the COPE intervention (33, 34)

### Ethical approval

Ethical approval for the study was given by the XXX (820-2010-Mis-347) and the XXX Research Ethics Boards (40495). Informed consent was obtained from all participants.

## RESULTS/FINDINGS

### Quantitative

**Sample description.** Of the eligible participants, 64 (41.3%) provided questionnaire data. Of the 64, 45 (70.3%) identified as women, and 46 (71.9%) worked full-time. Nurses comprised 37.4% of the sample. Over half of the sample had completed at least a baccalaureate degree (see Table 1).

**AIM, FIM, IAM.** A scree plot was used to confirm unidimensionality of each measure. Reliability was confirmed using alpha coefficient, which was calculated for this sample (AIM = 0.939; FIM = 0.917; IAM = 0.954) (49). The COPE bundle was rated as acceptable for use in the COVID-19 ICU context by 54 (84.4%) participants and appropriate by 55 (85.9%). Slightly fewer (49, 76.6%) participants rated COPE as feasible. The mean (SD) scores for acceptability, appropriateness and feasibility of the COPE intervention in this context are presented in Table 2.

### Qualitative

**Sample description.** We conducted 23 in person (11, 48%), telephone (7, 30%), and video (5, 22%) interviews. The average duration of interviews was 43 minutes. Data were collected from HCPs (13, 57%), patients (4, 17%), and family (6, 26%). HCPs were most commonly women (12, 92%); patient participants were most commonly men (3, 75%). Family

members were most commonly women (5, 83%) and adult children (5, 83%) of patients who experienced elements of the COPE intervention (see Table 1).

*Acceptability to HCPs.* HCPs' descriptions of COPE's acceptability with exemplar quotes are provided in Supplementary Files 4. *Affective attitudes* about COPE were overwhelmingly positive. Participants reported COPE reduced some *burdens* of supporting patient communication in this context through making tools "... more readily available" (SLP 7). Training all HCPs, and not just nurses, reduced *burden* by sharing the accountability for communication across all HCPs. Participants reported that COPE enabled them to meet professional practice expectations and values such as promoting patient autonomy and safety (*ethicality*). HCPs also reflected that the cart placement "...front and center..." demonstrated the unit's commitment to supporting patient communication (RN 2). Most participants reported that because communication with patients who are treated with an advanced airway require consistent and skilled use of communication tools, implementing COPE felt natural and offered relief from frustration.

Participants felt COPE was feasible to use in COVID-19 ICU IPAC conditions. Nurse participants recommended more hands-on training such as during skills development days and orientation and further clarification about SLP roles to improve reported *intervention coherence*. The acceptability construct of *opportunity costs* exposed the competing priorities (e.g., time and emotional energy) HCPs balanced when deciding to communicate with patients using COPE. Despite strong ethical and professional endorsement for COPE, participants explained that communication takes time and emotional energy, both of which were limited during the pandemic. Strategies to improve efficiencies such as better integration of COPE at the bedside

and into existing workflows (i.e., place tools in patient rooms and add automated communication risk scores for ICU patients) were recommended to improve acceptability and feasibility.

The *perceived effectiveness* of COPE to support patient communication in this context was mixed. Participants celebrated the variety of tools available in COPE for a heterogeneous patient population but brought up shortcomings including insufficient support for patients who can't use their hands. Tools translated into languages other than English were felt to improve the effectiveness of communicating with non-English speakers. The inclusion of pre-made 8-square blank pointing boards permitting quick personalization was also reported to improve communication effectiveness. Although HCPs felt the tools chosen to be part of COPE were intuitive, they also felt more practice was needed to improve confidence and skills (*self-efficacy*).

***Acceptability to patient and family.*** Patient and family descriptions of COPE's acceptability with exemplar quotes are provided in Supplementary File 5. Family members who were exposed to an element of COPE expressed *affective attitudes* such as relief that tools were available so that loved ones could report symptoms. Patients described the tools included in COPE were "... building blocks [and] ... a good start" (Patient 7), however, others were frustrated and impatient about inefficiencies of the tools compared to vocalization. Features that reduced the *burden* of using COPE were tool simplicity and familiarity. Patient autonomy and safety were felt to be supported using COPE (*ethicality*).

Patients and family could recall tools such as pointing boards brought in 'right away' (Family 6) and that instructions for their use were provided by HCPs (*intervention coherence*). *Opportunity costs* included trade-offs between using a tool to communicate and the energy required to do so emphasizing the need to have short communication sessions with options to



take breaks. As with HCP participants, *perceived effectiveness* of the tools used was mixed. Being able to report symptoms (*perceived effectiveness*) and the ability to personalize tools made COPE acceptable to patients and families. Conversely, the tools were perceived to be less effective with patients who were sedated or with limited movement of the hands due to illness or treatment (e.g., sedation, paralytics, physical restraint). *Self-efficacy* associated with use of communication tools reportedly improved with consistent use.

### Mixed-method analysis

Joint table analysis including convergences, divergences, and recommendations to improve acceptability of COPE are presented in Table 3.

***Convergences.*** Features of COPE that were both rated and described as acceptable included the ability to personalize tools according to patient need, language, and ability, as well as easy bedside accessibility. Personalization was often done by family members. Other data convergences included stakeholder input for the design of the COPE intervention, clear IPAC instructions for communication tool handling, as well as the benefit and ongoing need for skill development for patients, family, and all ICU HCPs.

***Divergences.*** Features of COPE that were rated *but not* described as acceptable included the lack of tools to facilitate communication with immobile or physically restrained patients, and a lack of topic organization of communication pointing boards. HCPs also reported that greater clarity of the SLP role in enabling communication could improve acceptability of COPE. Emotional support for HCPs and strategies to integrate communication assessment and treatment into existing workspace and flow were also reported opportunities to improve the acceptability of COPE in this context.

## DISCUSSION

The aim of this mixed-method acceptability study was to evaluate the acceptability of COPE in pandemic conditions, from the perspective of ICU HCPs, patients, and family. Quantitative evaluation confirmed that most HCPs rated COPE as highly acceptable, appropriate, and feasible to implement. Intervention acceptability was related to positive affective attitudes and reduced communication frustration. Appropriateness and feasibility were promoted through intervention alignment with professional values, the ability to personalize tools, and ease of access. Recommendations to improve the acceptability, appropriateness, and feasibility of COPE included adaptation for immobilized and/or restrained patients, additional education, and integration into existing workflows.

Ease of access was noted by participants to be a feature of COPE that increased its acceptability. Orienting all members of the ICU team including the ward clerk to the components of the COPE bundle ensured that staff in an isolation room could easily ask any other team member to bring in a specific tool without having to leave the room and doff and don PPE; addressing reported challenges of patient care and supporting patient communication in this context (16, 21). IPAC conditions, however, highlighted the importance of further integrating COPE even more proximal to workspaces and integrating communication assessment and treatment into existing workflow and documentation practices. Automating a prompt to assess communication needs risk was suggested to ensure patient communication was assessed and treated. Findings align with those from the SPEACS-2 study, which included the recommendation to integrate communication assessments in the electronic medical record (50). Further local tailoring of COPE implementation focussing on integration of communication

assessment and treatment into workflow practices can further improve acceptability and feasibility of adopting COPE to support patient communication in this context.

The professional context within which interventions like COPE are introduced can also have a positive impact on intervention acceptability and adoption (51). Supporting patient communication using an intervention such as COPE was described as a necessity for safe and ethical patient care. The cart's central location symbolized leadership endorsement to participants, however, participants also described that, unaddressed, barriers such as insufficient access to tools, time, and emotional energy prevented them from using COPE. COVID-19 pandemic conditions have also accelerated emotional fatigue or crisis for ICU HCPs. A recent Canadian study from Crowe et al. (2021) demonstrated psychological symptoms affecting 75% of nurses working in COVID-19 ICUs. A survey from a single centre in Wuhan, China showed similarly disturbing rates of psychological crisis for ICU nurses (52). Mental health support for ICU HCPs may reduce the burden of patient communication in pandemic conditions and therefore have a protective effect on patients and HCPs.

Co-design of COPE permitted selection and tailoring of evidence-based tools suitable to the local context as is recommended by implementation scientists (53). Despite using co-design, however, a lack of communication strategies (i.e., partner assisted methods) for non-vocal patients who could not move their hands (e.g., due to critical illness or physical restraints) to point or write were described by participants. North American data reporting 76% of patients restrained for some portion of their ICU admission highlights the extent of this problem (54). Complementary practices while communicating with patients such as releasing restraints, when possible, can be considered among strategies to address this barrier.

Communication training is consistently recommended for HCPs caring for ICU patients treated with advanced airways (2, 10, 12, 20, 55). We found communication training was welcomed by study participants working in COVID-19 IPAC conditions. Practicing simple communication strategies in groups such as asking yes/no questions was a strategy used in COPE and may have contributed to high acceptability ratings. Extending communication training beyond ICU nurses to professionally diverse participants may advance a positive culture of communication (13, 50, 56). The ICU is a highly interprofessional care setting and treatment by all professions should include effective means of communicating with patients who may be voiceless (2).

### LIMITATIONS

This study had limitations. The design included a single centre limiting generalizability. The design also included convenience sampling and the use of a self-report questionnaire, introducing the risk of selection and social desirability bias. The PI also works at the study hospital but not the ICU, which may have also influenced participant responses. The results were interpreted in the context of these limitations.

### FUTURE RECOMMENDATIONS

This study has implications for practice, policy, and future research. Practice implications include the development and evaluation of a communication bundle that is viewed as acceptable, feasible, and appropriate and can therefore be locally tailored and adopted into practice during

and beyond pandemic conditions in the ICU. To promote implementation, policy and operational support of communication training, organization of workflow, and greater awareness of SLP role in communication support should be considered. Future research should include evaluation of COPE on patient reported outcomes such pain, anxiety, and ease of communication.

## CONCLUSION

This theory-based mixed-method evaluation of COPE, a locally tailored co-designed bundled communication intervention, demonstrated good levels of acceptability, appropriateness, and feasibility by patient, family member and HCP participants. The intervention can be adapted and adopted into ICU practice settings using pandemic and other infection control practices.

### **Impacts**

What is known:

- Known recommendations for communication support for adult patients in the ICU includes the provision of a variety of tools, training, and the availability of SLP.

This paper adds:

- A co-designed communication bundle for use in the ICU during COVID is acceptable, appropriate, and feasible to end-users.
- Communication bundles should include tools or strategies to assist patients who have limited movement due to illness or treatment (e.g., physical restraint).
- Communication tools should be kept close to workspaces and integrated into existing workflows to improve acceptability.
- Patient communication support in the ICU during and beyond the COVID-19 pandemic includes the need for supporting ICU HCPs mental health.

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Table 1. Demographic description of participants

Variable	Questionnaire n = 64 n (%)	Interview n = 23 n (%)
Healthcare Provider		13 (57)
<i>Gender</i>		
Woman	45 (70.3)	12 (92)
Man	15 (23.4)	1 (8)
Prefer to not answer	4 (6.3)	
<i>Employment in ICU</i>		
Full-time	46 (71.9)	
Part-time	14 (21.9)	
Casual	4 (6.3)	
<i>Profession or Role</i>		
Multi-professional	30 (46.9)	7 (54)
Nursing	24 (37.5)	3 (23)
Leadership	7 (11)	3 (23)
Physician	3 (4.7)	
<i>Years in profession</i>		
< 1	2 (3.1)	
1 – 10	26 (40.7)	
11 – 20	11 (17.2)	
> 20	25 (39.1)	
<i>Education level</i>		
Diploma	10 (15.6)	
Baccalaureate	32 (50)	
Graduate	18 (28.2)	
Other	4 (6.3)	
Patients and Family		10 (430)
<i>Patients</i>	n/a	4 (40)
<i>Family</i>	n/a	6 (60)
Adult child	n/a	5 (83)
Spouse/partner	n/a	1 (17)
<i>Age</i>	n/a	
30-50	n/a	5 (50)
51 -70	n/a	2 (20)
>70	n/a	3 (30)
<i>Time from ICU discharge</i>		
Days (mean, range)	n/a	13 (4-31)

Nursing (Registered nurse, registered practical nurse, nurse practitioner, personal support worker). Multi-professional (Respiratory therapy, physiotherapy, occupational therapy, speech and language therapy, registered dietitian, pharmacy, spiritual care, social work, ward clerk) Leadership (Manager, educator, supervisor). N/A not applicable

Table 2. Central tendency and dispersion scores for acceptability, appropriateness, and feasibility of the intervention.

Measure	Mean (SD)	Median (IQR)	95% CI	$\geq 4$ n (%)
Acceptability	4.23 (0.66)	4 (4, 4, 4.75)	4.1 – 4.4	54 (84.4)
Appropriateness	4.19 (0.67)	4 (4, 4, 4.75)	4 – 4.4	55 (85.9)
Feasibility	4.13 (0.65)	4 (4, 4, 4.69)	4 – 4.3	49 (76.6)

Table 3. Convergent and divergent ratings and descriptions with recommendations to improve acceptability, appropriateness, and feasibility.

Quantitative N (%) ≥ 4	Qualitative (Theoretical framework of acceptability constructs)		
Health care provider	Health care provider	Patient and Family	
Acceptable 54 (84.4)	Affective attitude		
Convergences	Feel excited to use it Feel ownership	Feel relief	
Divergences	Feel frustration/impatient		
<i>Recommendations: Stakeholder consultation for components and implementation.</i>			
Appropriate 55 (85.9)	Ethicality		
Convergences	Supports patient autonomy, safety, professional practice Reflects unit values (supporting patient communication)	Supports patient autonomy/safety/identity	
Divergences	Perceived effectiveness		
Convergences	Ability to personalize tools	Improves accuracy of communicating needs Ability to personalize tools	
Divergences	Less effective with patients who have limited movement of the hands due to illness or treatment (e.g., sedation, paralytics, physical restraint)	Less effective with patients who have limited movement of the hands due to illness or treatment (e.g., sedation, paralytics, physical restraint)	
Burden			
Convergences	Tools easy to access Shared accountability	Simple tools Familiarity reduces cognitive burden	
Divergences	Additional recommendations to reduce cognitive burden (See below)		
<i>Recommendations: Simple and easily accessible communication tools/cart, train all ICU HCPs. Include tools that can be personalized and translated, and tools that restrained/paralyzed (i.e., unable to use hands) can use. Include a topics page to guide conversation, increase font size, fewer options on pages.</i>			

Feasible 49  
(76.6)

Intervention coherence

	Convergences	Most staff aware of bundle (day shift only) Disposal and cleaning instructions clear	Tools in room Simple instructions
	Divergences	Not all staff aware of bundle Ongoing training needed Need to further clarify role of speech language pathology	
Self-efficacy			
	Convergences	Tools intuitive	Tools intuitive Consistent use improves self-efficacy
	Divergences	More practice needed	
Opportunity costs			
	Convergences		
	Divergences	Competing priorities Not automated or integrated into workflow Closer to bedside would be better Emotional cost of communication	Trade-off safety and energy of using tools during recovery

*Recommendations: Longer implementation, include all shifts, training beyond implementation, SLP role clarity, integrate communication assessment and treatment into workflow, communication tools at bedside, emotional support of HCPs. Clear instructions about cleaning multi-use and disposing single use tools (follow local infection control recommendations).*

ICU Intensive care unit; HCP Health care provider; SLP Speech and language pathologist