

原著論文

看護師による集中治療領域人工呼吸器装着患者のメッセージ内容 の理解：ビデオ録画による記述的観察研究

Messages Nurses Understand When Communicating with Mechanically Ventilated Patients in Critical Care: A Video-Based Descriptive Observational Study

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Abstract

Objective: This study was performed to clarify how long it takes nurses to understand the message content from mechanically ventilated critically ill patients during patient-initiated two-way communication, as well as the specific message content understood by the nurses.

Methods: This was a video-based observational study involving seven patients and seven registered nurses. Communications between patients and nurses were video-recorded in three critical care units of two hospitals in Japan from July 2019 to June 2020. Patient-initiated two-way communication scenes were extracted from the video footage. The message content understood by the nurses in these scenes and the duration required to understand the content were descriptively analyzed.

Results: A total of 668.0 minutes of footage was videotaped, from which 36 patient-initiated two-way communication scenes were extracted. Nurses understood the patients' message content in 30 of these scenes. The message content comprehended by the nurses included "Pain" (n = 7), "Question" (n = 5), and "Go home" (n = 2). Regarding the duration required for comprehension, "Go home" took the longest at 195.2 seconds and "Pain" took the shortest at 3.6 seconds.

Conclusion: Patients actively convey their distress symptoms and personal concerns, and nurses take time to understand these personal concerns.

要旨

目的：集中治療領域の人工呼吸器装着患者が開始したコミュニケーション場面において、看護師が患者メッセージ内容を理解するために要した時間及び理解したメッセージ内容を明らかにした。

方法：ICU、CCU、HCU で治療を受けた人工呼吸器装着患者 7 名とその患者の日勤担当看護師 7 名を対象に、患者-看護師間コミュニケーション場面をビデオで録画した。得られた録画データから患者が開始したコミュニケーション場面を抽出し、それらの場面で看護師が理解したメッセージ内容と理解に要した時間を記述的に分析した。

結果：総録画時間は 668.0 分であった。録画記録から 36 の患者が開始したコミュニケーション場面を抽出した。36 場面中 30 場面で看護師は患者メッセージを理解した。看護師は、「痛み (n=7)」や「質問 (n=5)」や「家に帰りたい

い (n=2) 」といった内容を理解していた。患者のメッセージ内容の理解に要した時間は、「家に帰りたい」が 195.2 秒と最も長く、「痛み (喉の痛み)」は 3.6 秒で最も短かった。

結論：患者は苦痛症状や個人的懸念事項を能動的に伝えるが、看護師は患者の個人的懸念事項の理解には時間がかかる。

キーワード：患者-看護師間コミュニケーション 人工呼吸 重篤患者 クリティカルケア看護 ビデオ録画

Keywords: patient–nurse communication, mechanical ventilation, serious illness, critical care nursing, video recording

1. Introduction

One of the key communication aims within a hospital is to improve patient outcomes (Sitzer, 1996). Nurses communicate with patients to understand their thoughts and feelings, clarify their needs, and provide appropriate care to help them recover. Communication in the critical care area is also an essential element in supporting patient recovery.

Critically ill patients experience a variety of physical and psychological problems that need to be addressed, including pain and anxiety. Furthermore, the patient's condition can change rapidly over a short period of time, and interventions for those problems must be implemented quickly. Therefore, communication in critical care settings requires understanding patient messages accurately and quickly to provide appropriate nursing care. However, messages from mechanically ventilated patients in critical care areas are often not presented verbally but rather in the form of gestures or other signals, and thus are not always understood accurately and immediately.

Previous studies have clarified that mechanically ventilated patients desire to communicate a wide variety of message contents, including physical, psychological, and social contents (Leung et al., 2018; Wallander Karlsen et al., 2019). The findings suggest nurses are expected to grasp a broad spectrum of message content that patients desire to convey. Nevertheless, several studies have reported that patients are often not understood by health care providers (Carroll, 2004; Yamaguchi et al., 2015) or that nurses find it difficult to understand what patients are trying to say (Yamaguchi et al., 2013; Akroute et al., 2022). Moreover, the prompt comprehension of patients' message content is also crucial because mechanically ventilated patients in critical care areas are typically in critical condition and their physical or psychological condition can rapidly fluctuate. However, prior reports have shown that it takes longer than patients expect for nurses to understand them (Yamaguchi et al., 2015), or that nurses take too long to understand what patients are trying to say (Yamaguchi et al., 2013). However, the best approach to solving these problems remains unexplored. By analyzing specific scenarios in an actual hospital setting, it should be possible to develop communication strategies that support accurate and prompt communication by nurses.

In light of the above background, the aim of this study is to clarify the duration of time required for nurses to understand the patients' message content in patient-initiated two-way communication scenes and the patients' message content that nurses understand. We focus on patient-initiated two-way communication scenes because message content voluntarily uttered by patients who require a great deal of energy to communicate are typically urgent ones that nurses must accurately and promptly understand.

2. Methods

We previously studied the frequency and duration characteristics of communication between mechanically ventilated critically ill patients and nurses. In the current work, we utilize the same dataset and classify the recorded data in the same way as our previous study, and the method description below includes some parts quoted from our original paper (Yamaguchi et al., 2022; Yamaguchi, 2023).

2-1. Study design

We conducted a video-based descriptive observational study. An observation using video recordings is a useful and powerful data acquisition tool that can accurately record the complex nature of nursing phenomena (Spiers et al., 2000). Because of their inability to speak, mechanically ventilated patients rely on facial expressions and gestures to communicate with nurses, making patient-nurse communication a complex phenomenon. To accurately analyze the time it takes nurses to understand patients' message contents and nurses' understanding of patients' message contents, we need an accurate method to capture this complex patient-nurse communication.

2-2. Setting and participants

We conducted data collection in three units of two western Japanese hospitals: an 8-bed intensive care unit (ICU) and 4-bed coronary care unit (CCU) in a 150-bed cardiovascular hospital, and a 4-bed high care unit (HCU) in a 240-bed general hospital. Patient-to-nurse ratios per 24-hour day were 2:1 in the ICU and CCU, and 4:1 in the HCU.

We included mechanically ventilated critically ill patients and the registered nurses assigned to them as participants in the study. Patients were eligible if they were receiving mechanical ventilation through intubation or tracheostomy at an ICU, CCU, or HCU, and had a Glasgow Coma Scale (GCS) score of E3VTM6 or higher. If the patients were sedated, they needed to have a Richmond Agitation Sedation Scale (RASS) score ranging from -1 to 1. RASS assesses sedation and agitation in adult ICU patients with a 10-point scale ranging from -5 to 4 (Sessler et al., 2002). A score of -1 indicates a slightly impaired state of alertness but with sustained awakening, while a score of 0 indicates an alert and calm state. A score of 1 indicates an anxious/apprehensive but not aggressive state. Patients with RASS scores ranging from -1 to 1 can usually communicate with nurses.

Nurses were eligible if they were registered nurses on the day shift assigned to the patients who consented to participate in the study.

2-3. Data collection

Data was video recorded using a GoPro HERO6 Black ® camera (GoPro, Inc.) between July 2019 and June 2020. We set up two fixed-point video cameras at the head and foot of each patient's bed and recorded from 8 a.m. to 4 p.m., on only one day during the mechanical ventilation period; however, recording was stopped during physical examination of the chest and abdomen, excretion care, bathing care, family visits, and nurse break times. We ended recording at the time of extubating if the endotracheal tube was extubated before 4 p.m. The records stored 2.4K and 30 frames per second.

We collected information about patients and nurses before recording was started. The patients' information included age, diagnoses, treatments, number of days on mechanical ventilation, and sedatives, as taken from electronic medical records. We evaluated the GCS status and RASS status by observing patient-nurse interactions at the beginning of data collection. The nurses' information included age and years of experience as a nurse and as a critical care nurse, as determined by an interview.

The study included seven patients and seven registered nurses on the day shift assigned to the patients in pairs. Table 1 lists the characteristics of the patients and nurses for each case. Participant recruitment began by contacting 12 patients who met the inclusion criteria. These patients were already equipped with mechanical ventilation or planned to use mechanical ventilation postoperatively. Of these 12, three did not wish to participate in the study and nine consented to participate; however, two of the consenting patients were weaned off mechanical ventilation by the day of data collection, so the final total of participants was seven. We then contacted the seven registered nurses on the day shift assigned to those patients, and all agreed to participate in the study.

Table 1. Characteristics of patients and nurses for each case.

Case		Patient							Nurse			
ID	Age	Sex	Airway	Days on mechanical ventilation	Unit	Sedatives	RASS Score ^{a)}	GCS ^{b)}	Age	Sex	Years of experience as a registered nurse	Years of experience in critical care area
1	80s	Female	Intubation	13	HCU	Dexmedetomidine	-1	E4VTM6	20s	Female	1.3	1.3
2	60s	Female	Intubation	1	ICU	No-sedation	-	E3VTM6	30s	Female	5.0	6.0
3	60s	Male	Intubation	1	ICU	Propofol	0	E3VTM6	20s	Male	2.6	2.6
4	40s	Male	Intubation	1	ICU	Propofol	0	E4VTM6	30s	Male	10.7	5.7
5	80s	Female	Intubation	1	ICU	No-sedation	-	E3VTM6	30s	Female	4.9	0.9
6	70s	Male	Intubation	1	ICU	No-sedation	-	E3VTM6	20s	Male	2.9	2.9
7	70s	Male	Tracheostomy	23	CCU	No-sedation	-	E4VTM6	30s	Male	11.0	2.0

- a) RASS score: The RASS status was evaluated only in the three sedated patients.
- b) GCS: Verbal Response, one of the elements of the GCS, could not be tested in all patients because of intubation or tracheostomy. Therefore, Verbal Response is denoted as VT: Verbal Tube.

2-4. Data analysis

We analyzed the time required for nurses to understand patients' message contents and how the nurses interpreted them in patient-initiated two-way communication scenes as follows.

1) Annotation of patients' and nurses' communication-related actions

We identified patients' and nurses' communication-related actions on video footage. Communication-related actions in patients were all head, upper limb, lower limb, trunk, and facial movements. However, we excluded eye movements (opening / closing eyes, gazing) because they could not be extracted from the footage reliably due to postoperative patients' eyelid edema. The patient's communication-related actions were annotated as one action unit from when a patient's body part started moving to when it stopped. First, all observed actions were descriptively labeled as observed (e.g., "nodding with the head" and "making a gesture with the right hand"). The labels were then compared for each case and across all cases, and similar actions were given similar labels. The only communication-related actions in nurses that were annotated were those pertaining to utterances to patients. All observed nurses' utterances to patients were listened to repeatedly and transcribed descriptively (e.g., "Wound?" and "Does it hurt?").

Annotation of patients' and nurses' communication-related actions were made with reference to Mondada (2018) and Mondada (2022), and the symbols used for annotation are listed in each figure legend (Figures 2 to 6).

2) Extraction of patient-initiated two-way communication scene

Using the annotated communication-related actions as a basis, we extracted the patient-initiated two-way communication scenes. We defined a patient-initiated two-way communication scene as a single continuous scene that started when the patient performed the first action and received feedback on it and ended when the nurse understood the patient's thought or feeling. Initially, we recognized the action showing the patient's intention to start a communication and the nurse's response to the action. Second, we identified the nurse's utterances that reflected the patient's thoughts and feelings, as well as the patient's actions indicating agreement with those utterances. Finally, we extracted patient-initiated two-way communication scenes, where the starting point was the patient's action indicating a desire to communicate. The endpoint was either the patient's action indicating consent to the nurse's utterance representing the patient's thoughts or feelings, or the nurse's response to the patient's consent. Note that the extracted scenes included some in which nurses did not ultimately understand what the patients wanted to convey.

3) Interpretation of patients' message content and creation of codes and categories

The patients' message content that nurses understood in each extracted patient-initiated two-way communication scene was interpreted as follows. First, we identified the nurse's utterances that related to the patient's thoughts or feelings, and interpreted the patients' message contents that were understood by nurses from the identified utterances. Second, codes were created using words that most clearly expressed the interpreted message content. An example is provided in Table 2. One scene

created only one code, the recording footage was repeatedly viewed, and the coding process was carried out by a single researcher. Third, all created codes were compared, classified into the same category if they were similar, and named to represent the patients' thoughts or feelings that nurses understood.

4) Calculation of the frequency and duration of scenes

The number of scenes classified in each category and subcategory was counted. We also calculated the duration of each scene and determined the maximum and minimum duration of the scenes classified in each subcategory. Note that we calculated all scenes on the order of milliseconds, but use seconds for the discussions in this paper.

The analysis process was reported and discussed at regular meetings attended by multiple researchers who were licensed registered nurses and had clinical experience. ELAN version 5.9 was used for annotating the video.

Table 2. Example of the coding process.

Transcript	Identification of nurse's utterances that related to the patient's thought or feeling.	Interpretation of patients' message content understood by nurses	Created code
1. Patient: Raises the right hand.			
2. Nurse: Uh huh.			
3. Patient: Touches the chest with the right hand.			
4. Nurse: Wound?	Wound?	I have a wound	Wound pain
5. Patient: Nods.		pain.	
6. Nurse: Does it hurt?	Does it hurt?		
7. Patient: Nods with a smile.			
8. Nurse: I am going to prepare some pain medication.			
9. Patient: Nods.			
10. Nurse: Uh huh, I see.			

2-5. Ethical considerations

The ethics committee of the Graduate School of Health Sciences, Kobe University, approved this study (approval number: 682), as did the ethics committees of Higashi Takarazuka Satoh Hospital (approval numbers: 1–6) and Kawasaki Hospital (approval number: 1-4-1).

Patients scheduled for mechanical ventilation after surgery were contacted, the study was explained, and written consent was obtained from all patients. Oral consent was obtained from patients already on ventilators, and written consent was obtained from family members. All nurses received an explanation of the study and gave written informed consent. Participants watched the recorded footage after data collection, and every patient and nurse allowed the use of the data.

Access to the recorded data was limited to the researchers involved in the analysis. Recording data was password-protected and stored in locked cabinets.

3. Results

We recorded a total of 668.0 minutes of video and extracted 36 patient-initiated two-way communication scenes with a total duration of 24.2 minutes. In 30 of the 36 patient-initiated two-way communication scenes (83.3%), nurses understood the patients' message content, and in six of the 36 scenes (16.7%), nurses were unable to understand patients' message contents.

3-1 Duration it took nurses to understand patients' message content

The first set of analyses examined the duration of time required for nurses to understand the patients' message content. Figure 1 shows the maximum and minimum duration required for nurses to understand message content. As shown here, "Go home" took the longest at 195.2 seconds, followed by "Question" at 105.8 seconds. In the "Question" scene, which took 105.8 seconds, the nurse ultimately understood the question "Where is my cell phone?". From the data presented in Fig. 1, the minimum duration for "Go home" was 159.1 seconds, which was longer than the maximum duration for the other seven types of message content. As for the minimum duration, "Pain" was the shortest at 3.6 seconds, followed by "Dyspnea" at 3.8 seconds. In the "Pain" scene, which took 3.6 seconds, the nurse understood that the patient had a sore throat, and in the "Dyspnea" scene, which took 3.8 seconds, the nurse understood that the patient had sputum retention. However, some message content took nurses relatively longer to understand, even for "Pain" and "Dyspnea". For example, it took 95.1 seconds to understand communication relating to lower back pain, and 60.9 seconds for difficulty in breathing (Fig. 1). These findings suggest that nurses understood patients' physical symptoms relatively quickly, but it took them longer to understand message contents that indicated patients' personal concerns, such as "Go home" or "Question".

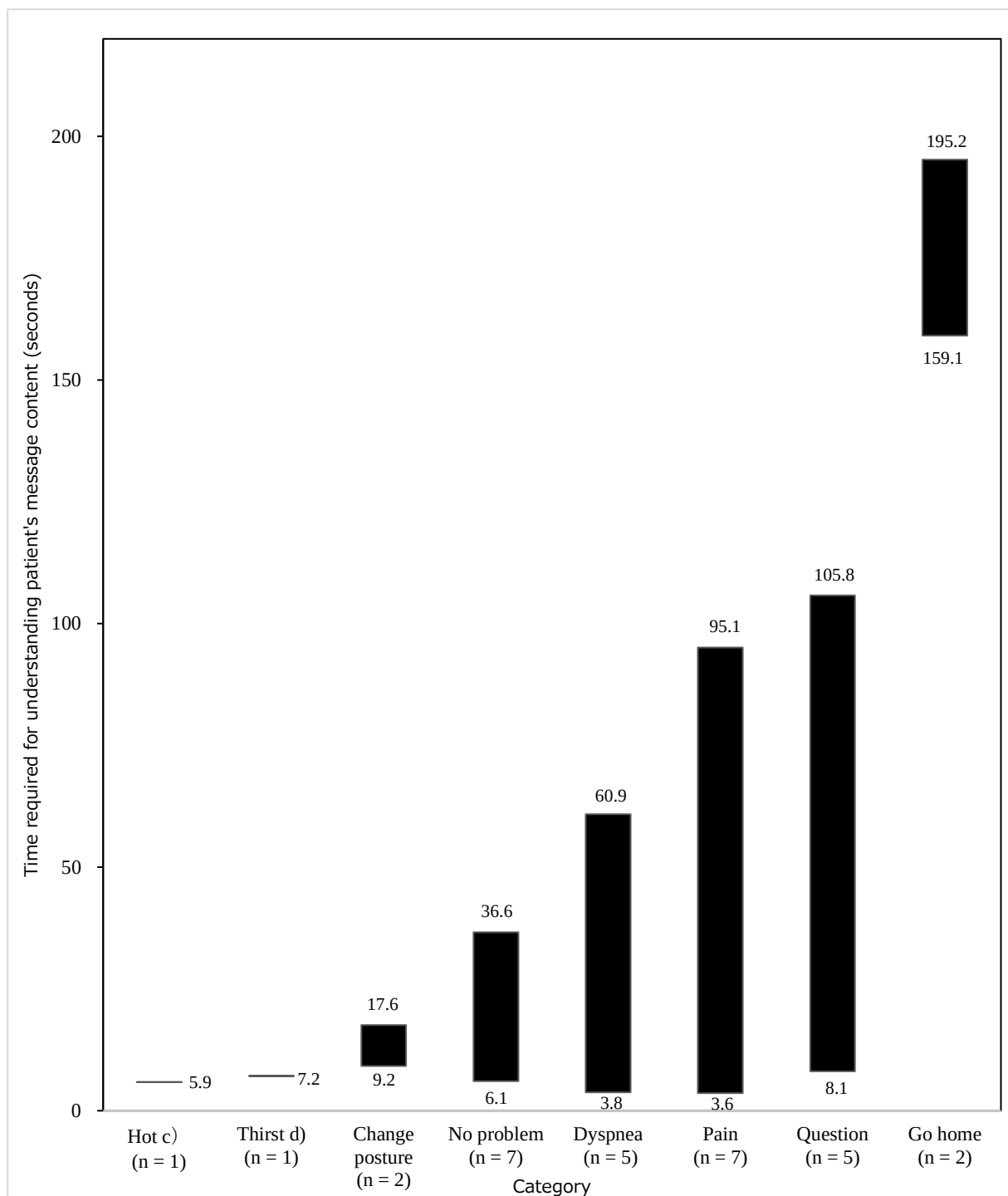


Figure 1. The maximum (top of bar) and minimum (bottom of bar) duration required for nurses to understand each subcategory (message content). The number written under each subcategory indicates the number of scenes included in that category.

c) d): Subcategories of Hot and Thirst each had only one scene, so their maximum and minimum durations were the same.

3-2 Patients' message content that nurses understood and the scene frequency

The second set of analyses examined the patients' message content that nurses understood and the scene frequency. As shown in Table 3, nurses understood physical symptoms such as pain and dyspnea in 16 out of 30 scenes, and they less frequently understood the patient's questions in five scenes and desire to go home in two scenes. Our data suggests that patients actively convey their physical problems and, in addition, their personal concerns.

Figures 2 to 4 are excerpts from scenes in which nurses understood patients' message contents, such as "Physical symptom", "Question", and "Go home". Figure 2 shows an extracted scene in which a nurse understands about a patient's sore throat. Here, by observing the patient's mouth-opening action (line 5), the nurse understood that the patient had a sore throat (line 10). Figures 3 and 4 are extracts of scenes in which the nurse understood a question about the location of a cell phone and in which the nurse understood the patient's desire to go home, respectively. These nurses guessed the message content from the patient's lip movements (lip reading) and gestures, but ultimately figured it out using the alphabet board (lines 21 to 25 in Fig. 3 and lines 4 to 49 in Fig. 4). These results indicate that nurses understood the patients' message content from the patients' gestures and lip movements (lip readings), but when they could not understand, they obtained text-based information by using the alphabet board, after which they understood the message.

Our results also showed that there were seven scenes in which nurses understood that the patients were communicating "No problem" (Table 3). Figure 5 is an extracted scene where the nurse understands that the patient is not in pain. The nurse noticed the patient's grimacing face (line 1), checked for pain (line 3), and finally understood that the patient had no problem. Our findings indicate that nurses reliably respond to patients' communication-related actions that seem to be telling something.

Table 3. Patients' message content understood by the nurses and scene frequency of each content. (n = 30)

Category	Scene frequency	Subcategory	Scene frequency	Code	Scene frequency
Physical symptom	16	Pain	7	Sore throat	5
				Wound pain	1
				Lower back pain	1
		Dyspnea	5	Sputum retention	3
				Difficulty in breathing	2
		Change posture	2	Turn my body to the left	1
				Head up	1
		Thirst	1	Drink water	1
		Hot	1	Feel hot	1
No problem	7	No problem	7	No pain	3
				Only move my body	3
				Not hot	1
Question	5	Question	5	Where is my cell phone?	1
				What time is it now?	1
				Where am I?	1
				What are you going to do?	1
				Where is the nurse call bottom?	1
Go home	2	Go home	2	Want to go home	2
Scene total	30		30		30

1	Pt	→	Grimacing.
2			(0.6)
3	Ns		<i>Are you hurting somewhere now?</i> どこか今痛い？
4			(2.6)
5	Pt		Opens mouth. (0.3) *Opens mouth.--->
6	Ns		<i>Mouth?</i> お口？
7			(1.1)
8	Pt		Nods.
9			(0.1)
10	Ns	⇒	<i>A sore throat?</i> 喉が痛い？
11			(0.6)
12	Pt		Nods.
13			(0.1)
14	Ns		<i>Uh-huh, uh-huh, uh-huh. (0.7) Tube in your mouth. (0.3) It's okay, you can close it. (2.2) If you * extube it,</i> うんうんうん お口の管 良いですよ、閉じて良いよ 抜いたら、
15	Pt		--->*
16	Ns		<i>It # will be easy.</i> 楽、なりますのでね。
17	Pt		# Moves the mouth [lt and rt] ---> [Nods.]
18	Ns		<i>Uh-huh, uh-huh. #</i> うん うん
19	Pt		--->#

Figure 2. An extracted scene from 31:04 to 34:30 in case 6, where a nurse understood about a patient's sore throat. The numbers in parentheses indicate the duration between actions in seconds, with the condition that if the duration is less than 0.1 seconds, it should be omitted. “---” indicates an ongoing action, “[]” indicates an overlap with the previous action, and “*--->” indicates an action continuing across subsequent lines until the same symbol “--->*” is reached. In addition, “→” indicates the action that led the nurse to start a communication with the patient, and “⇒” indicates the utterances that represent the patient's thoughts or feelings. Patient is abbreviated as Pt, nurse as Ns, right as rt, and left as lt. The original Japanese text is included for the nurse's utterances.

1	Pt	→	Beckons with rt hand. Put rt hand on the ear. [-----]
			[Lifts the head.]---
2			(19.8) ((The nurse discussed care coordination with the team nurse.))
3	Pt		Scratches rt eye with rt hand. *Gesture to press a button.--- [-----] --->
			[Moves lips.]
4	Ns		Huh? Remote* control [?]
			え? リモコン?
5	Pt		--->* [Nods.] ---
6			(0.5)
7	Ns		Do you watch [TV?]
			テレビ見ます?
8	Pt		[Shakes the rt [hand.]]
9	Ns		[Different?]
			違う?
10	Pt		# Puts rt [hand on the ear.] --->
11	Ns		[Oh, earphones?]
			あ、耳のやつ?
12	Pt		Moves # lips.---
			--->#
13			(0.5)
14	Ns		What [?]
			うん?
15	Pt		[Moves lips.] ---
16			(1.6)
17	Ns		What?
			何?
18			(0.2)
19	Pt		Moves lips.
20			(24.1) ((The nurse discussed care coordination with the team nurse.))
21	Pt		Points to [the letters] on the [alphabet] board. ---
22	Ns		[Su?] (19.4) [Su and ma?]
			す? すま?
23			(0.1)
24	Ns		Su and ma?
			すま?
25	Pt		Nod [s.]
			[Points] to the letters on the alphabet board.
26			(0.8)
27	Ns	⇒	Cell [phone] ?
			すまほ?
28	Pt		[Nods.]

Figure 3. An extracted scene from 1:55:50 to 1:57:36 in case 7, where a nurse understood a patient's question about the location of a cell phone. The numbers in parentheses indicate the duration between actions in seconds, with the condition that if the duration is less than 0.1 seconds, it should be omitted. “---” indicates an ongoing action, “[]” indicates an overlap with the previous action, and “*--->” indicates an action continuing across subsequent lines until the same symbol “*--->” is reached. “→” indicates the action that led the nurse to start a communication with the patient, and “⇒” indicates the utterances that represent the patient's thoughts or feelings. In addition, “()” indicates notes or explanations provided by the transcriber. Patient is abbreviated as Pt, nurse as Ns, and right as rt. The original Japanese text is included for the nurse's utterances.

1	Pt	→	Moves lips. (0.9) Moves lips. (1.6) Moves lips.
2			(0.6)
3	Ns		<i>What, what</i> [is it?] 何、何です？
4	Pt		[Moves lips.] --- (7.2) Moves rt hand fingers. (1.1) *Points to the letters on the alphabet board.--->
5	Ns		<i>Ke ?</i> (0.1) <i>Ke and i ?</i> (0.3) <i>Ke and i ?</i> (0.3) <i>Ke, i and *tsu ?</i> け？ け、い？ け、い？ け、い、つ？
6	Pt		--->* (0.4) Waves the rt hand.
7	Ns		<i>Different?</i> 違う？
((In lines 8 to 41, the patient communicated with the nurse using the alphabet board, gestures, and lip movement.))			
42	Ns		<i>Ke, i, and</i> [sa ?] け、い、さ？
43	Pt		[Nods] --- (0.2) # Points to the letters on the alphabet board.--->
44	Ns	⇒	<i>Police?</i> 警察？
45			(0.2)
46	Pt		Nods.
47			(0.2)
48	Ns		<i>What # do you mean the police?</i> 警察がどうしました？
49	Pt		---> # (1.3) Beckons with rt hand. (0.4) Beckons with rt hand.
50			(2.2)
51	Ns		<i>Police? (0.2) You ±mean here is a police</i> [station] , right? 警察？ ここが警察署っていう事、違う？
52	Pt		±Beckons with rt hand.---> [Shakes the head.]
53	Ns	⇒	<i>Call</i> [them?] ± 呼んで？
54	Pt		---> ± [Nods.] ---
55			(0.6)
56	Ns	⇒	<i>Ah, ha, ha. (2.4) Do you have something to do? (0.5) To the police? (2.9)</i> [●Home?] あ、は、は。 なんか、用事ありますか？ 警察に？ 家？
57	Pt		[●Nods.] --->
58	Ns	⇒	<i>Do you mean you want to go home? ●</i> 家、帰りたいからって言う事ですかね？
59	Pt		---> ●
60	Ns	⇒	<i>Are you saying you want the police to take you home?</i> 連れて帰って、もらえる様になって事ですか？
61	Pt		Nods.
62			(0.6)
63	Ns		Smile.

Figure 4. An extracted scene from 2:33:36 to 2:36:15 in case 7, where a nurse understood a patient's desire to go home. The numbers in parentheses indicate the duration between actions in seconds, with the condition that if the duration is less than 0.1 seconds, it should be omitted. “---” indicates an ongoing action, “[]” indicates an overlap with the previous action, and “*--->” indicates an action continuing across subsequent lines until the same symbol “--->*” is reached. “→” indicates the action that led the nurse to start a communication with the patient, and “⇒” indicates the utterances that represent the patient's thoughts or feelings. In addition, “(())” indicates notes or explanations provided by the transcriber. Patient is abbreviated as Pt, nurse as Ns, and right as rt. The original Japanese text is included for the nurse's utterances.

1	Pt	→	Grimacing.
2			(1.2)
3	Ns		<i>Are you hurting somewhere?</i> どっかいたみます？
4			(0.2)
5	Pt		*Shakes [head.] --->
6	Ns	⇒	[Are] * you [alright?] 大丈夫です？
7	Pt		--->* [Nods.] ---

Figure 5. An extracted scene from 44:33 to 44:39 in case 4, where a nurse understood that the patient was not in pain. The numbers in parentheses indicate the duration between actions in seconds, with the condition that if the duration is less than 0.1 seconds, it should be omitted. “---” indicates an ongoing action, “[]” indicates an overlap with the previous action, and “*--->” indicates an action continuing across subsequent lines until the same symbol “--->*” is reached. “→” indicates the action that led the nurse to start a communication with the patient, and “⇒” indicates the utterances that represent the patient’s thoughts or feelings. In addition, “(())” indicates notes or explanations provided by the transcriber. Patient is abbreviated as Pt and nurse as Ns. The original Japanese text is included for the nurse’s utterances.

3-3 Scenes where nurses were unable to understand the patients’ message content

Our findings showed that nurses were unable to understand patients’ message contents in six out of 36 patient-initiated two-way communication scenes (16.7%). The maximum duration of scenes in which nurses were unable to understand patients’ messages was 199.5 seconds, and the minimum duration was 16.8 seconds. Figure 6 shows an extracted scene where the nurse could not understand the patient’s message content. When the nurse saw that the patient was writing in the air using fingers (line 1), the nurse responded to the action. The nurse used the alphabet board to try to understand what the patient was conveying (lines 7 to 12) but still could not understand. Despite the encouragement to use pen and paper for communication, the patient could not write (line 56). The nurse requested once again that the patient use the alphabet board, but the patient could not convey their intended message, leaving the nurse unable to comprehend (lines 61 to 73). This result suggests that there are situations in which nurses are unable to understand patients’ message content, no matter how much time they spend trying to understand it.

1	Pt	→	Write in the air with rt	[hand.]					
				[Moves]	lips. (1.4)	Turn the head. (1.9)	Move	[lips.]	
								[Makes a]	pointing gesture with rt hand.
2			(7.4)						
3	Ns		<i>I'm sorry.</i> (0.1)	[<i>Just,</i>]		[<i>I don't understand.</i>]			
			ごめんなさい	ちょっと		分からないので			
4	Pt			[Turns the head.]		[Moves fingers of rt hand.]	→ (0.1)	Turns	[the head.]
								[Moves]	fingers of rt hand.→
5			(1.0)						
6	Ns		<i>Can * I have you point your finger?</i>						
			指、指してもらって良いですか？						
7	Pt		* Points to the letters on the alphabet board→						
8			(0.8)						
9	Ns		<i>What you want to say.</i> (0.7)	<i>A word would be fine.</i> (6.4) *					
			言いたいこと	単語でもいいです					
10	Pt						→	*	
11			(1.8)						
12	Pt		Points	[to the]	letters on	[the alphabet]	board.→	[-----]	→
13	Ns			[<i>Ni?</i>] (1.7)		[<i>Ni and Shi?</i>] (11.1)		[<i>Ni, shi, and u?</i>]	
				に？		に、し？		に、し、う？	
14	Pt		Shakes rt	[hand.]					
15	Ns			[<i>Different?</i>]					
				違う？					
16	Pt		Makes	[a gesture]	to make 2 and 4 with rt fingers.				
17	Ns			[Two laps?]					
				2周？					
((In lines 18 to 55, a physical therapist came and three-way communication began. The patient tried to communicate through lip movements. The physical therapist facilitated pen and paper communication.))									
56	Ns		<i>You can't write?</i> [Smile]						
			書かれへん？						
57	Pt			[Grimacing.]	→				
58			(27.0)	((The nurse discussed with the physical therapist what communication method would be best for the patient.))					
59	Pt		Opens the mouth and sticks out the tongue.						
60			(0.7)						
61	Ns		<i>Can I ask you to point to the alphabet</i> [board again?]						
			もう一回、指してもらって良いですか？						
62	Pt			[Turns the head.]					
63			(0.5)						
64	Ns		<i>What you said earlier.</i> (0.7)	<i>Ni?</i> (0.4)	<i>What comes after "ni"?</i> (0.3)	<i>Ni?</i>			
			さっき、言うてはったこと	に？	に、何ですか？	に			
65			(1.4)						
66	Pt		Moves rt fingers.						
67	Ns		<i>Different?</i>						
			違う？						
68			(7.8)						
69	Pt		Points	[to]	the letters on	[the] alphabet	[board.]	→	
				[I?] (9.2)		[A?] (0.5)	[I ?]		
				い？		あ？	い？		
70			(0.3)						
71	Ns		<i>You don't know, right?</i>						
			分かんない？						
72	Pt		Nods.						
73	Ns		Smile. <i>You are all right.</i>						
			大丈夫。						

Figure 6. An extracted scene from 1:18:09 to 1:21:28 in case 7, where a nurse could not understand the patient's message content. The numbers in parentheses indicate the duration between actions in seconds, with the condition that if the duration is less than 0.1 seconds, it should be omitted. "→" indicates an ongoing action, "[]" indicates an overlap with the previous action, and "*→*" indicates an action continuing across subsequent lines until the same symbol "→*" is reached. "→" indicates the action that led the nurse to start a communication with the patient. In addition, "()" indicates notes or explanations provided by the transcriber. Patient is abbreviated as Pt, nurse as Ns, and right as rt. The original Japanese text is included for the nurse's utterances.

4. Discussion

Our analysis clarified the duration of time it took for nurses to understand patients' message content and the details of the message content that nurses understood in patient-initiated two-way communication scenes. To date, since few studies have explored this topic using data obtained from video recordings, the results of our study represent key findings that provide suggestions for nurses to help them understand patients' message content both accurately and promptly. Our main findings are as follows.

First, we found that nurses were able to understand patients' physical symptoms relatively quickly. Physical symptoms commonly experienced by mechanically ventilated patients (e.g., pain, dyspnea, and thirst) have been reported in multiple studies (Li & Puntillo, 2006; Campbell & Happ, 2010; Samuelson, 2011). It is presumed that nurses can understand physical symptoms relatively quickly because they have a deep understanding of disease and treatment in the critical care area, and they are quite familiar with those reported symptoms. On the other hand, we found that it took time for nurses to understand patients' personal concerns. Previous research has shown that communication between patients and nurses features the exchange of an average of 2.63 ideas per minute (Happ et al., 2011), and based on this result, it presumably takes about 20 to 30 seconds to understand one idea. In the current study, we found that nurses took as long as two to three minutes to understand message content such as the desire to go home, which clearly indicates that understanding patients' personal concerns takes time. Patients may experience a variety of concerns during a long period of treatment, and these concerns will vary from patient to patient in accordance with their background. Therefore, it is thought that it takes time to narrow down and understand the wide range of personal concerns expressed by patients.

Second, we found that in patient-initiated two-way communication scenes, nurses were able to understand approximately 80% of the patients' messages. The most common messages nurses understood were those related to physical symptoms such as pain; less frequently, they also understood patients' questions and desire to go home. It has been reported that most of the communication content of patients on ventilators is related to pain (Happ et al., 2004), and that patients also communicate messages about their homes, families, gratitude, and religion (prayer), in addition to physical symptoms (Happ et al., 2004, Leung et al., 2018). Mechanically ventilated patients can be expected to experience many physical symptoms due to their critical condition and the fact that they are undergoing invasive treatment. It is also assumed that patients who are forced to stay in the critical care ward for a long period of time will have various social concerns. This supports the belief that patients actively communicate both their distress symptoms and personal concerns.

Finally, our research revealed that there were a few patient-initiated communication scenes where nurses were unable to understand the patients' message content. These findings are consistent with previous research showing that nurses experience difficulty understanding patients' messages (Carroll, 2004; Yamaguchi et al., 2015), and that patients often experience not being understood by health care providers (Yamaguchi et al., 2013; Akroute et al., 2022). In addition, our study clarified that while nurses made an effort to understand patients' message content by utilizing various communication methods, there were still instances where they could not grasp them. The message content that patients actively try to communicate is naturally important to them, which means there is an important need that require intervention. It is therefore vital to consider methods for accurately understanding the patients' message content.

Implementation for communication practices

Our analysis clarified that it takes time for nurses to understand message content indicating personal concerns (such as the desire to go home) and some physical symptoms (such as lower back pain). While it is important to take the time to understand, mechanically ventilated patients in critical care areas are in serious condition, and prolonged communication can exhaust them. Therefore, it is vital to consider communication practices that enable nurses to understand patients' message content quickly.

First, it is necessary to improve the Augmentative and Alternative Communication (AAC) methods utilized by mechanically ventilated patients. In this context, non-technical AAC (e.g., lip-reading) and low-technical AAC (e.g., paper and pen, alphabet board) are currently the mainstream communication methods in mechanically ventilated patients. Prior research has

indicated that these communication methods have not changed much over the past three decades (Happ et al., 2011), and indeed, the patients in our study sometimes used these AACs to convey their messages. However, patients may have difficulty using these methods due to muscular weakness, poor vision, or tiredness (Bergbom-Engberg & Haljamäe, 1993; Tolotti et al., 2023). In our study, one of the reasons it took nurses time to understand patients' messages contents was that the patients' physical condition was quite serious, making it difficult and time-consuming for them to use AACs. It is thus imperative to introduce and implement high-tech AAC, such as computers with communication support software, that enables patients to convey their messages quickly and with minimal effort. Researchers have recently studied lip-reading techniques that use facial expression features (Shirakata & Saitoh, 2020). Although this study did not specifically involve mechanically ventilated patients, its findings could apply to patients with tracheotomies who have unrestricted lip movement. Critical care areas should also consider the development and implementation of high-tech AAC, such as lip-reading using facial expression features. An easy-to-use AAC method for patients will not only reduce the communication effort on the part of the patient but also help nurses quickly and accurately understand the patient's message content.

Next, there is a need to develop an education program that helps nurses acquire the knowledge and skills required to communicate with mechanically ventilated patients. Prior research has shown that there are not enough training opportunities for physicians and nurses related to communication skills with ventilated patients, even though such patients experience significant communication problems (IJsennagger et al., 2018). Recently, knowledge about the practice of communicating with mechanically ventilated patients is growing. For example, our current study reveals that patients actively communicate their personal concerns as well as the physical symptoms they are experiencing. It is therefore necessary to develop and implement educational programs that incorporate the knowledge revealed in this and similar studies.

Interestingly, we found that when nurses asked questions of patients in response to their behavior, patients often told them that they were okay or that there was nothing wrong with them. Although this study is primarily focused on communication strategies that support the accurate and prompt understanding of the content of patients' messages, we also suggest the communication strategy of actively asking questions whenever the patients' actions seem to be communicating something. We feel that this approach gives patients a sense of security in that they are always being watched over by nurses. Therefore, in addition to the habit of accurately and quickly understanding the content of a patient's message, nurses should take up the communication habit of proactively asking questions when they think a patient's behavior is communicating something.

5. Strength and limitations

Communication occurring between individuals is based on unique expressions and understandings that can only be understood between those individuals. Additionally, mechanically ventilated patients do not actually speak—they communicate using nonverbal means such as gestures and facial expressions, which further complicates communication. Therefore, it is necessary to accurately capture the phenomenon of communication as it really is. It is also necessary to properly analyze the captured data. Video recording is said to be capable of accurately documenting complex nursing phenomena (Spiers et al., 2000), and utilizing video footage allows multiple researchers to examine the data simultaneously during the analysis process (Caldwell & Atwal, 2005). The results of our study accurately capture the complexity of communication, and the data were repeatedly presented and discussed by multiple researchers before arriving at the results. We can therefore state with confidence that the results of this study, which were based upon the analyzed content of communication between patients and nurses from video recordings, are highly objective and reliable. Additionally, we utilized the recorded data to measure the duration it took for nurses to understand patients' message content, which we were able to extract in milliseconds to calculate the exact time.

However, this study has some limitations. First, the patients we examined had variations in terms of the time spent on ventilators, ranging from 1 to 23 days. Patients will have different needs when using a ventilator for the short-term versus the long-term, and what patients convey to nurses might also differ. Deeper insights could be gleaned if we analyzed the content of messages conveyed by patients depending on the length of time they wore the ventilator. Second, our findings revealed that nurses primarily used AAC to understand patients' message contents, but the relationship between the use of each AAC and the

nurses' speed of understanding was not analyzed. We should therefore analyze, for example, the nurses' comprehension speed when using the alphabet board versus when using written (pen and paper) communication. Adding this perspective to the analysis will accelerate the development of AAC for mechanically ventilated patients.

6. Conclusion

In this study, we clarified that nurses typically understood patients' active message content relating to pain, dyspnea, thirst, and feeling hot, and that they understood this content in a short amount of time. We also showed that, while nurses understood message content such as a patient's desire to go home or to ask a question, it took some time for them to understand. It is therefore important for nurses to recognize that patients actively communicate both their symptoms and personal concerns, and to understand these message content accurately and quickly. There is also a need to develop and implement new AAC methods that enable patients to send message content quickly and accurately, as well as nurse education programs to improve their communication practices. Further research should examine how patients' message content varies depending on their ventilated period and the relationship between each AAC usage and nurses' speed in understanding patients' message content.

Data availability statement

The data are not publicly available due to privacy or ethical restrictions.

Conflict of interest statement for all authors

The authors have no conflicts of interest directly relevant to the content of this article.

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