ORIGINAL RESEARCH

Nursing explanation skills in education and practice: Development skills and influence on incident occurrence

Manabu Fujimoto*[1], Mika Shimamura[2], Fumiko Yuki[3]

[1] Ritsumeikan University, Kyoto, Japan
[2] Reiwa Health Sciences University, Fukuoka, Japan
[3] Kwassui Women's University, Nagasaki, Japan

ABSTRACT

Inaccurate explanations to patients, their families, and other healthcare professionals can adversely affect the quality of healthcare and patient safety. Despite the significance of good explanatory skills in nursing education and practice, supporting empirical data are limited. This study aimed to develop a psychological scale and investigate the impact of explanatory skills on patient safety by statistically testing the validity of hypothetical models derived from previous studies. In the preliminary investigation, 87 items were obtained from 109 experienced nurses. Study 1 involved an online explanatory skills survey with a sample of 1,000 nursing professionals. Study 2 comprised a field survey of 159 nursing staff working in a comprehensive hospital. Nine sub-skills, including seven common sub-skills and one specific sub-skill for each patient/family and staff, were identified and categorized under "compassion" and "shared mental model." Clinical ladder progression was associated with both compassion and a shared mental model. Furthermore, compassion was identified as a factor that increased the probability of various incidents through interactional failures. Contrastingly, the shared mental model enhanced the probability of severe incidents due to judgmental and minor incidents from conceptual failures. This study developed a psychological scale to measure nursing explanation skills in communicating with patients, their families, and other medical staff and elucidated their impact on incident occurrence through miscommunication. Finally, the importance of accountability skills in nursing education and practice was discussed.

Key Words: Nursing explanation skills, Compassion, Shared mental model, Development skills, Incident occurrence, Miscommunication

1. INTRODUCTION

1.1 Background

Nursing professionals often explain treatment and care by offering decision-making support to patients and their families or ensuring accurate patient handoffs to other medical staff. This highlights the importance of nurses' explanations to patients, families, and colleagues, which has been emphasized in nursing education and practice. For example, "explanation" is an ethically significant concept in healthcare, as shown by its inclusion in the US Belmont Report.[1] Errors in judgment about the communication context or content, neglecting to provide explanations, incorrect information exchange, and a lack of shared understanding may result in explanation failure,[2] which is a type of miscommunication. Globally, miscommunication among medical staff seriously affects incident occurrence.[3, 4] However, the importance of explanations in nursing education and practice has primarily been addressed in anecdotal and instructional contexts

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only, such as communication or informed consent.[5–7] Furthermore, only a few discussions have been conducted with empirical evidence. Therefore, identifying the explanation skills that nursing professionals need and understanding how these skills impact the quality and safety of nursing treatment and care in nursing communication practices remain crucial.

Explaining to patients, family, and medical staff is a pivotal responsibility of nursing professionals. These explanations are integral to the communication skills necessary for fostering the human connections that form the essence of nursing.[8] Nursing professionals' explanations encompass several subjects, including the nature of illnesses, treatment progression, test results, and guidance for daily living. The explanations can be categorized into those directed at patients and families and those intended for medical staff. For patients and families, explanations serve to facilitate decision-making. Specifically, by acting as intermediaries between doctors and patients, nursing professionals ensure that patients can easily access the information they need, securing effective informed consent.[9] Moreover, as part of their accountability, nursing professionals must thoroughly elucidate nursing care procedures to patients.[10] Inadequate explanations during the informed consent can lead to patient dissatisfaction.[11] Conversely, explanations to other medical staff typically occur during handovers among nursing professionals. Handovers frequently occur in hospitals, amounting to over 4,000 times a day.[12, 13] The communication errors in these exchanges are alarmingly high, ranging from 30%–80%. Such errors impact patient outcomes.[7, 12] Between 2006 and 2017, the US Joint Commission warned that communication failures during inadequate handovers are a significant concern for patient safety.[12] Numerous issues require attention, including ineffective handover methods and strategies among nursing professionals,[14] interruptions during handovers, and errors due to nursing professionals' inattentiveness.[15]

Despite these challenges, standardized handover education is lacking.[16, 17] Notably, nursing professionals' handover skills are primarily influenced by practical experience.[14] Handover skills are considered a form of nursing practice knowledge that nursing professionals learn through trial and error or by observing the behaviors of more experienced colleagues. Nurses with limited practical experience are susceptible to errors due to inadequate information transfer.[18] This vulnerability can engender a fear of causing adverse events, diminishing their self-assurance.[19] A decline in confidence, compounded by stress, may precipitate burnout, contributing to elevated attrition rates among nursing staff.[20, 21] The global nursing workforce is confronting a deficit of 5.9 million nurses.[22] This negative cascade, owing to deficient

nursing explanations, underscores the imperative for systematic training in critical communicative competencies within nursing education, encompassing novice nurses, students, and continuing professional development. The World Health Organization (WHO) reports that, as of 2020, global nursing professionals comprise approximately 28 million individuals, representing the most substantial contingent within the healthcare workforce.[22] Nursing care caliber is pivotal to healthcare services' overall quality and safety. Therefore, it is paramount to elucidate the explanatory skills requisite for nursing professionals and determine their impact on healthcare quality and safety. Despite this, there is a paucity of empirical discourse on the structure of nursing explanatory skills—traditionally conveyed as tacit knowledge—and the mechanisms by which they influence healthcare outcomes. Empirical investigations into the systematic pedagogy of nursing communicative skills are thus essential.

1.2 Objectives

Given the above background, this article aims to gather empirical evidence on the importance of explanations provided by nursing professionals. Our objectives are to highlight the required essential skills of nurses when explaining treatment and care-related matters to patients, their families, and other healthcare professionals, confirm whether they reflect nursing careers in the context of nursing practice knowledge, and demonstrate whether poor nursing explanation skills increase the risk of patient safety.

1.3 Hypotheses

We anticipate that the factors we identify will correspond with the definition of "explanation" and include elements related to the "shared mental model." This term, borrowed from cognitive psychology, refers to a knowledge structure that enables team members to form accurate task understandings and predictions, coordinate their activities, and respond appropriately to the task and others' needs. Given the rising prominence of team-based medicine, this concept has gained considerable traction in the medical field.[23] We also expect to uncover technical factors related to nursing practice in addition to cognitive and informational factors. In line with numerous previous studies on nursing communication, we distinguish between explanation recipients, categorizing them into "patients and families" and "medical staff".[24, 25] Consequently, we predict the existence of specialized explanation skills associated with "informed consent" for communication with patients and families and with "handoff" for interactions with medical staff.

Regarding the impact of inadequate nursing explanation skills on the incidence of medical errors, prior research

has suggested that a significant number of healthcare incidents—events or circumstances during healthcare that could have or did result in unintended or unnecessary harm to a person and a complaint, loss, or damage[26] —are attributable to miscommunication.[3,4] Notably, failures in explanation constitute a severe form of miscommunication.[2] Thus, we hypothesize that poor explanation skills can lead to miscommunication, increasing the likelihood of incident occurrence through a causal process involving communication avoidance, situation misjudgment, or misunderstanding. Our overarching hypothesis is that the inadequacy of explanation skills among nursing professionals as the explainers leads to miscommunication and precipitates incidents.

1.4 Declarations and ethics statements

This study was conducted with the approval of the Human Research Ethics Committee affiliated with the first author's institution. Informed consent was obtained in written form or online answers from all participants involved in the research. The authors declare that no conflicts of interest are directly pertinent to the content of this article.

2. METHODS AND DESIGN

2.1 Participants

2.1.1 *Web-based survey*

The preliminary survey aimed to recruit 100 nursing professionals who work in hospitals in Japan with at least 20 beds and hold clinical ladder positions of level II (nurse manager) or higher, with more than 20 years of experience. A total of 109 participants responded to the survey. For the main survey, nursing professionals working in hospitals in Japan with at least 20 beds were invited to participate, and the survey was terminated when the goal of 1000 participants was reached.

2.1.2 *Hospital survey*

Participants were 173 nursing professionals working in a single comprehensive hospital with 350 or more beds located in a government-designated city in Japan with a population of more than 1.5 million. The response rate was 31.57%. They must meet the following criteria to be eligible for inclusion: (1) currently working full-time or part-time at the hospital; (2) possessing a valid nursing license and having at least one year of practical experience; and (3) engaging in duties at their workplace during the survey period. Of the participants, 159 responses were considered valid (85 from the patient/family group and 74 from the medical staff group).

2.2 Procedure and survey contents

2.2.1 *Web-based survey*

In the preliminary survey conducted between February 3 and 6, 2023, we collaborated with an Internet company with considerable survey experience and expertise. That company provided access to a panel of medical staff, enabling us to collect data swiftly without influencing organizational or local culture. Panel registrants received an introductory email that outlined the survey's purpose and ethical considerations. Those who consented to participate clicked a link in the email to access a dedicated internet survey site, where they completed the survey by submitting their responses.

The survey included items about participants' demographic information (see Table 1). Subsequently, they were asked to share their opinions based on the instruction: "Please provide your thoughts on the behaviors, attitudes, and necessary skills (techniques and abilities) you consider important for explaining and conveying information about treatment and care to patients, their families, and other medical staff."

In the main survey conducted between April 21 and 24, 2023, we employed the same company and recruitment method used in the preliminary survey. Participants were randomly assigned to either the "patient/family" or the "medical staff" group. Demographic information was first collected (see Table 1), followed by participants rating the 87 items identified through the preliminary survey on a seven-point scale ranging from "very poor" to "very proficient." The instructional text, however, varied between the two groups. Depending on their group assignment, participants were instructed to assume that they were explaining to the patient/family or medical staff. If a respondent deemed a particular item inapplicable (e.g., questions about explanations to medical staff for the patient/family group), they could answer "not applicable" instead of providing a rating.

2.2.2 *Hospital survey*

From July 14 to August 13, 2023, a guide detailing the study's purpose, ethical considerations, and a participation request was disseminated to the participants. Only those who read the guide and consented to participate was able to access the web survey page via the URL provided in the consent form. The website displayed the same content as in the guidebook. Only those who consented to participate in this study could access the "Patient/Family Questionnaire" or the "Medical Staff Questionnaire," presented randomly via JavaScript.

Participants provided demographic information (see Table 1). Next, they completed the nursing explanatory skill scale, one for patient/family (seven common sub-skills and "agreement") and another for medical staff (seven common sub-

skills and "handoff"). As in the web-based main survey, these sub-skills were rated on a seven-point scale from "very poor" to "very proficient." Patients want healthcare providers, when offering explanations, to establish a relationship of trust, allocate ample time, convey empathy, and communicate in clear and comprehensible language.[27] Thus, it is necessary to build a trusting relationship (relationship adjustment), exercise self-control (self-regulation), observe the other party (decoding ability), and consider the other party's position and feelings (other acceptance) while conveying information clearly (expressivity) and assertively (self-assertion). Therefore, to confirm the criterion-rated validity of the developed scale, the ENDCOREs scale[28] was utilized to measure general communication skills. This scale assesses six skills: self-control, expressivity, sensitivity, assertiveness, responsiveness, and regulation, giving 24 items. Ratings for these factors were collected using a seven-point scale from "very poor" to "very proficient." Finally, participants completed items regarding miscommunication and patient outcomes.[2] For miscommunication, six "situational failure type" items and two "conceptual failure type" items were rated on a seven-point scale from "never" to "always." Patient outcomes were evaluated using a seven-point interval scale from "none" to "always."

Table 1. Participants' demographic information

	Web-based survey		Hospital survey
	Preliminary survey	Main survey	
Sex			
Female	95	903	138
Male	14	97	18
Unanswered	0	0	3
Age, y			
20s	0	208	80
30s	0	300	41
40s	68	301	24
50s	36	169	6
60s	5	22	2
Unanswered	0	0	6
Clinical ladder			
I	0	45	33
II	10	206	30
III	35	290	49
IV	42	159	18
V	22	67	1
None	0	233	28
Job title and employment status			
General staff	70	843	137
Deputy chief nurse	15	60	11
Chief nurse	12	40	8
Deputy director of nursing and above	7	9	0
Non-regular staff	5	48	3
Occupation			
Nurse	104	926	158
Public health nurse	0	4	0
Midwife	2	24	0
Licensed practical nurse	3	46	1
Hospital size			
Hospital (20–199 beds)	8	296	---
Hospital (200–399 beds)	76	308	159
Hospital (>400 beds)	25	396	---

2.3 Statistical analysis

2.3.1 Web-based survey

First, a hierarchical factor analysis was conducted to identify the factor structure of common items regarding explanations to both patients/families and medical staff. An exploratory factor analysis [EFA] was undertaken initially. Subsequently, a sub-factor analysis was conducted for factors with many items. Second, EFA was conducted to identify the structure of specific items regarding explanations for either the patient/family or the medical staff. Third, their scale scores were calculated to determine the overall structure of the identified sub-skills of nursing explanation skills (sub-factors of common items and factors of specific items) and an EFA was conducted. Fourth, the fit of the hierarchical factor analysis model was confirmed by structural equation modeling. The Omega coefficient (w) was also calculated to verify internal consistency. Finally, a multivariate regression analysis was conducted to test the impact of qualitative (clinical ladder) and quantitative (years of practical experience) aspects of the nursing career on explanatory skills.

2.3.2 Hospital survey

A correlation analysis with general communication skills confirmed the scale's criterion-related validity. Next, a model was established, incorporating miscommunication as a mediator, to clarify the impact of nursing professionals' lack of explanatory skills on patient safety. This model was subsequently tested using a multiple population simultaneous analysis.

3. RESULTS

3.1 Web-based survey

3.1.1 Item selection

In the preliminary survey, 143 responses were obtained (some participates gave multiple thoughts). Item selection was performed in collaboration with all authors, led by the second author, who had extensive experience as a nurse manager. This selection process followed three steps. First, items in each category ("common," "patients/families," and "medical staff") were organized by eliminating duplicate items based on content similarity. Next, two involved aligning items with identical content across categories. Finally, item phrasing was modified. Through these processes, 87 items were organized.

Items marked as not applicable by a certain number of participants were excluded through the following process. On average, 5.45 participants in the patient/family group and 5.33 in the medical staff group marked items as not applicable. Therefore, items marked as not applicable by five or fewer participants were categorized as "applicable (A)," and items marked as not applicable by six or more participants were

categorized as "not applicable (NA)." These categories were then combined for patient/family and medical staff interactions. Overall, 49 items in the "applicable-applicable (A-A)" category were shared items, 12 items in the "applicable-not applicable (A-NA)" category were patient/family-specific items, and eight items in the "not applicable-applicable (NA-A)" category were medical staff-specific items. The remaining 18 items in the "not applicable-not applicable (NA-NA)" category were excluded. Data for participants who answered "not applicable" were treated as missing values, resulting in sample sizes for subsequent analyses of 940 participants for shared items (A-A), 467 for patient/family-specific items (A-NA), and 473 for medical staff-specific items (NA-A).

Subsequently, a sub-factor analysis was performed on the same analysis options (see Table 2), which identified seven sub-skills: "interplay," "empathy," "respect," and "acceptance" under Compassion, and "clarity," "logic," and "flexibility" under Shared mental model.

Further, EFA was applied to the 12 patient/family-specific items (A-NA) and the eight medical staff-specific items (NA-A) (see Table 3). These analyses identified "agreement" as a sub-skill for the patient/family group and "handoff" for the medical staff group.

3.1.2 Identification of sub-skills

The main survey utilized data from Survey 2 to conduct an EFA on the 49 shared items (A-A; see Table 2). The EFA employed the maximum likelihood estimating method with Promax rotation, guided by the scree criterion. The analysis identified two primary factors, "compassion" and "shared mental model."

Scale scores for each sub-skill were calculated to ascertain the inclusion of these specific skills within the two primary factors. An additional EFA incorporating the scale scores for the seven shared skills and one specific skill, along with the particular skill "agreement" for the patient/family group and "handoff" for the medical staff group, was conducted. The results confirmed that both specific skills were statistically aligned with the shared mental model.

3.1.3 Reliability of the Model and Internal Consistency of Sub-Factors

A hierarchical factor analysis, which included EFA and sub-factor analysis, identified seven common sub-skills. Each sub-skill was specific to the patient/family or medical staff. The results are depicted in Figure 1. This model's fit was confirmed for both the patient/family group (goodness of fit index [GFI] = .975, comparative fit index [CFI] = .992, root square error of approximation [RMSEA] = .087) and the medical staff group (GFI = .977, CFI = .992, RMSEA = .083).

Table 2. Factor loading and w-weights for A-A items

Item Number	Items included in Compassion	F1 Compassion	F2 Shared mental model	Sub1 Interplay	Sub2 Empathy	Sub3 Respect	Sub4 Acceptance
47	Speaking in a voice that is easy for the other person to hear	.591	.186	.772	.091	.018	-.067
58	Making eye contact with the other person	.581	.101	.733	-.023	.073	-.053
66	Starting the conversation with a greeting	.726	.021	.714	-.040	.125	.015
72	Adjusting the speaking speed appropriately	.613	.219	.471	.149	-.120	.366
67	Building a good relationship with the other person beforehand	.680	.138	.458	.335	.055	.025
69	Explaining while observing the other person's reactions	.607	.278	.442	.324	-.019	.066
52	Inferring the other person's emotions from their expressions	.608	.157	.065	.693	.103	-.046
86	Explaining according to the other person's personality and character	.552	.317	.108	.628	-.075	.241
48	Considering the other person's position and individuality	.664	.200	.356	.465	.107	-.010
23	Confirming the other person's way of speaking and the content	.545	.300	.067	.432	.243	.136
19	Respecting the other person	.840	-.062	.100	-.139	.855	.096
21	Adopting the other person's perspective	.730	.084	-.134	.320	.637	-.017
11	Explaining politely	.511	.294	.295	.054	.532	-.032
44	Empathizing with the other person's feelings	.912	-.225	.123	.135	.500	.162
14	Repeating the explanation multiple times	.378	.352	.072	.163	.442	.076
87	Not imposing the other's thoughts	.769	-.026	-.080	.160	.009	.753
73	Not denying the other's claims	.865	-.092	.184	-.083	.082	.707
24	Not becoming emotional	.452	.114	-.168	.032	.277	.491
63	Actively listening to the other person	.957	-.214	.251	-.054	.274	.386
	ω			.912	.894	.909	.841

Item Number	Items included in the Shared Mental Model	Compassion	Shared mental model	Clarity	Logic	Flexibility
65	Confirming how well the other person understands after explaining	.437	.447	.886	-.060	.059
46	Confirming how the other person perceives the current situation	.374	.508	.699	.128	.063
78	Providing accurate information to the other person	.355	.514	.638	.204	.025
41	Considering how much detail to provide	.207	.648	.578	.136	.178
83	Checking for questions at the end of the explanation	.217	.567	.550	.272	-.026
22	Conveying facts without inserting subjectivity	.235	.542	.186	.643	-.037
25	Providing explanations based on evidence	-.093	.894	.053	.594	.240
54	Concisely explaining the basis and policies	.054	.780	.238	.548	.091
32	Providing information gradually when there is a lot of it	.131	.648	.334	.524	-.046
15	Conveying information in the order of the situation, background, thoughts, and proposals	−.020	.806	.130	.412	.316
2	Considering the order of priority in the explanation	-.238	.899	-.097	.134	.754
1	Creating an environment conducive to conversation	.207	.458	.204	-.199	.712
9	Explaining with an analysis of the progress and situation	-.214	.963	-.050	.285	.639
10	Adapting communication to the individuality of the other person	.326	.490	.169	.070	.609
	ω			.917	.899	.866

Note. The items were placed on the questionnaire based on their respective item numbers. Any items lacking numbers were omitted through the analysis processes. F1 and F2 are factors, and sub1-4 are subfactors. Bold items indicate factor loadings above .400. Factor loadings are the degree to which a factor influences an item; closer to 1 is a positive influence, and closer to -1 is a negative influence). w indicates that the item consistently measures the same characteristic. It is a reliability index that expresses the system's reliability and is generally judged highly reliable when it is .700 or higher.

Table 3. Factor loading and w-weights for A-NA and NA-A items

Item Number	Items included in the Agreement	F1 Agreement
84	Align the image with the other party if it deviates	.849
13	Convey sufficient information to reach an agreement	.843
62	Ask the same question differently	.805
49	Confirm in what state the other wants to be	.794
77	Encourage open expression of requests	.764
26	Explain using materials	.763
	ω	.916
Item Number	**Items included in Handoff**	**Handoff**
31	Utilize notes for evident explanations	.795
27	Maintain records for information sharing	.788
88	Ensure effective communication through reports and messaging	.771
81	Confirm the understanding of specialized matters	.742
8	Thoroughly implement reporting, contacting, and consulting practices	.712
	ω	.873

Note. The notations and symbols in the table are the same as in Table 2.

The omega coefficients (see Tables 2 and 3) indicated the reliability of the explanation skills. The omega coefficients for the subfactors demonstrated high values, ranging from $w = .841$ to $.917$.
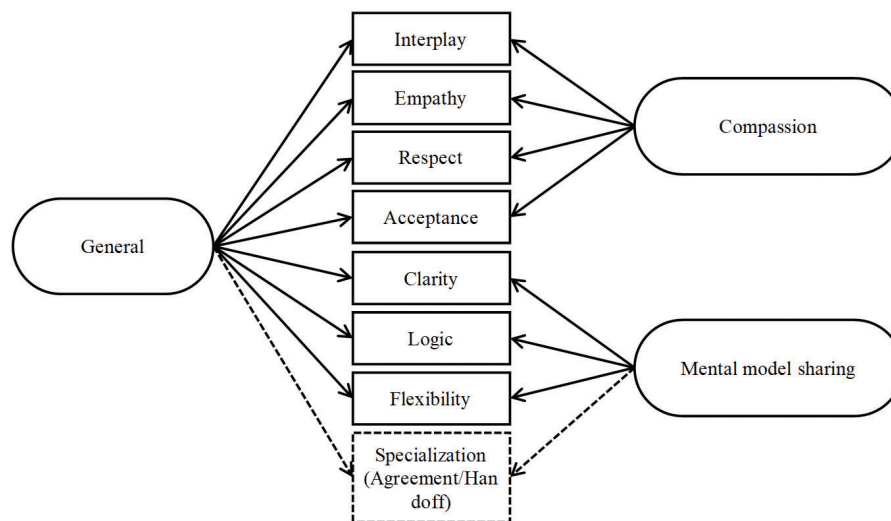

Figure 1. Hierarchical factor model of nursing professionals' explanation skills
Squares denote the observed variables, and ovals denote the latent variables. Solid lines represent factors specific to A-A items, and dotted lines represent factors specific to A-NA and NA-A items. "General" represents the general factor of the latent variable set in the hierarchical factor model, and in this model, it represents the commonality of the eight sub-skills.

3.1.4 Relationship to Nursing Career

A multivariate regression analysis was conducted to assess the impact of a nursing career on explanation skills. The independent variables included the target of the explanation (either the patient/family group or the medical staff group), years of practical experience, clinical ladder, and an interaction term. The dependent variables were the scale scores for the explanation sub-skills. The overall model was statistically significant ($R^2 = .220$; Pillai's trace = .237; F(56,6489) = 4.06, $p < .001$).

Among the independent variables, both years of practical experience (F = 11.54, $p < .001$) and clinical ladder (F = 6.17, p

< .001) were found to be significant predictors. Specifically, years of practical experience were significantly associated with the common sub-skills within the shared mental model, affecting clarity ($p < .05$), logic ($p < .01$), and flexibility ($p < .01$). The clinical ladder had a significant impact on all explanation skills, including acceptance and seven sub-skills.

3.2 Hospital survey
3.2.1 *Criteria-related validity*
The correlation between explanation and communication skills was examined (see Table 4). A positive correlation was found between explanation and communication skills, with correlation coefficients ranging from $r = .249–.730$. Furthermore, the shared mental model's clear, logical, and flexible aspects showed strong positive correlations with expressive ability and self-assertion within the expressive system. The four compassion sub-skills and the "specific" category demonstrated strong positive correlations with the interpretative ability and acceptance of others in the responsive system and self-regulation and relationship management in the management system.

Table 4. Correlation coefficients between explanation skills and communication skills

	Self-control		Expressivity		Sensitivity		Assertiveness		Responsiveness		Regulation	
Interplay	.493	**	.393	**	.588	**	.529	**	.632	**	.624	**
Empathy	.582	**	.384	**	.730	**	.510	**	.613	**	.660	**
Respect	.572	**	.405	**	.607	**	.506	**	.659	**	.662	**
Acceptance	.627	**	.249	**	.499	**	.332	**	.676	**	.589	**
Clarity	.541	**	.456	**	.623	**	.586	**	.549	**	.658	**
Logic	.528	**	.473	**	.560	**	.577	**	.434	**	.591	**
Flexibility	.589	**	.413	**	.613	**	.539	**	.529	**	.652	**
Specialization	.539	**	.420	**	.617	**	.527	**	.579	**	.609	**

Note. Correlation coefficients range from 1 to -1, with a general criterion of ±.700 or greater representing a robust correlation, ±.500 or greater representing a strong correlation, and ±.300 or greater representing a weak correlation.

3.2.2 *Hypothetical model setup*
A conceptual model was developed to elucidate the relationships between variables obtained in this study (see Figure 2) based on the hypothesis that the lack of explanation skills among nursing professionals who serve as communicators leads to miscommunication and triggers incidents. Interpersonal psychology often dichotomizes concepts into socioemotional and cognitive variables.[29, 30] This study pinpointed socioemotional compassion and a cognitive shared mental model as critical components of nursing professionals' explanation skills. Consequently, the paths in the hypothetical model were delineated along socioemotional and cognitive routes.
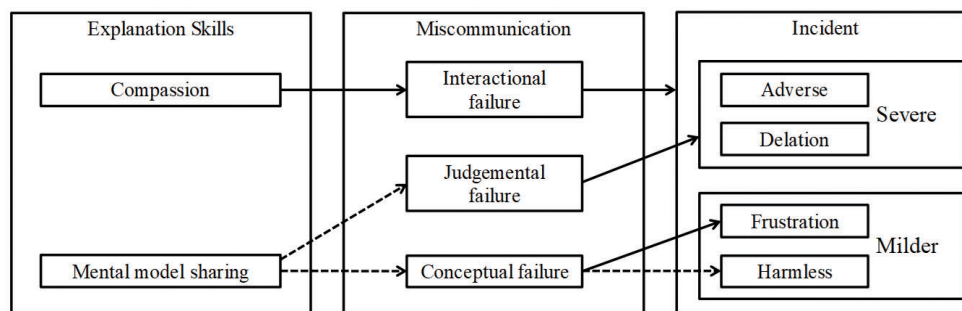

Figure 2. Hypothetical model of incident occurrence
Dotted lines represent stronger associations with explanations for healthcare professionals rather than for patients/families.

To address the hypothesis concerning the "impact of explanation skills on miscommunication," compassion—characterized by its socioemotional nature—was linked to interactional failure, indicating neglected communication. In contrast, the shared mental model—characterized by its cognitive nature—was associated with judgmental failure, which relates to misjudgments in situations, contexts, and information, and conceptual failure, related to inadequate

information exchange and shared understanding.

Next, regarding the part of the hypothesis concerning the influence of miscommunication on incidents, the most common type of communication failure is communication omission. This can lead to various patient outcomes, from near misses to serious events,[2] and reduce patient satisfaction.[31] Therefore, the path in the socioemotional route was set between the interactional failure type and all incident indicators. Within the cognitive route, miscommunication was divided into judgmental and conceptual failure types, with paths delineated according to the severity of incidents. The judgmental failure type, marked by patient misjudges of the situation or conveyed information, has profound implications for treatment and care.[32] Thus, a path was drawn from the judgmental failure type to "adverse" and "delay." The conceptual failure type involves miscommunication, where attempts at information exchange and intention unification fall short, leading to unnecessary frustration for patients and families regarding informed consent.[33] Moreover, a lack of consensus among healthcare providers results in near-misses.[34] Consequently, a path was delineated from the conceptual failure type to "frustration" and "harmless" outcomes.

3.2.3 *Clarifying Hypothetical Model Reliability*

The hypothetical model for the patient and medical staff groups was jointly verified using a maximum likelihood multi-group path analysis (see Figure 2). Initially, an unconstrained model was verified, yielding a good model fit (minimum discrepancy function divided by degrees of freedom [CMIN/DF]=1.30, p = .129; root mean square residual [RMR] = .065, GFI = .950, CFI = .987, RMSEA = .043, Akaike information criterion [AIC] = 158.86). Consequently, configure invariance was confirmed. Subsequently, we examined differences in parameter estimates between the groups. The results revealed significant differences in the path coefficients from the shared mental model to judgmental failure type (patients: -0.03, medical staff: -0.38; z = 2.33) and conceptual failure type (patients: 0.00, medical staff: -0.46; z = 3.20). This includes the error variances between delay and frustration (patients: 0.38; medical staff: 0.76; z = -2.80), all surpassing the critical value of 1.96.

Therefore, we tested partially constrained equivalence models, which resulted in an acceptable model fit (CMIN/DF = 1.88, p = .001; RMR = .144, GFI = .920, CFI = .956, RMSEA = .043, AIC = 175.77). Additionally, fully constrained equivalence models were assessed for all paths and correlations, demonstrating an acceptable model fit (CMIN/DF = 1.47, p = .018; RMR = .141; GFI = .915, CFI = .967, RMSEA = .055, AIC = 154.67). Hence, measureme nt invariance was established. Finally, the three models were compared. Sig-

nificant differences emerged differences between the unconstrained model and both the partially constrained equivalence model (c2(4) = 24.91, p < .001) and the fully constrained equivalence model (c2(18) = 31.81, p = .023). However, no significant difference was found between the partially and fully constrained equivalence models (c2(14) = 6.91, p = .938). After a comprehensive comparison of the model fit indices of the unconstrained model and the partially or fully constrained equivalence models, the unconstrained model was selected. This finding indicated that while the impact structure was common between patients/families and medical staff, there were variations in the magnitude of influences among certain elements.

4. DISCUSSION

4.1 Two major factors of nursing explanation skills

Study 1 involved interviewing nurses with over 20 years of practical experience to examine their explanation skills. These practitioners conveyed the nursing practice knowledge accumulated throughout their careers.[35] Explanation skills in nursing were divided into two higher-order factors: shared mental models and compassion, aligning with the conceptual definition of explanation. The shared mental model factor comprises cognitive and problem-solving abilities that enhance communication and comprehension with others. In contrast, compassion involves socioemotional skills crucial for maintaining relationships and demonstrating empathy.

Assertive communication requires respecting and acknowledging another's viewpoints while confidently expressing oneself. Effective nursing communication also necessitates accurate information transfer and sensitivity to the recipient's emotions. Hence, the two factors—socioemotional compassion and cognitive shared mental model—are vital for nursing education and professional development. Training should emphasize empathy for the patient's challenging circumstances and emotions beyond the cognitive technicalities of information exchange.

Compassion is a cornerstone of nursing, and its socioemotional importance has grown alongside the demand for high-quality care.[36–38] However, the hospital staff's compassion toward patients is often lacking.[39, 40] Despite its fundamental role, evidence-based interventions to enhance nurses' compassion are scarce.[41] Therefore, healthcare professional education must increasingly focus on compassion to improve healthcare quality and safety.

4.2 Common and specific sub-skills

The major skills identified were further delineated into nine sub-skills associated with the sub-factors. Seven sub-skills were common across interactions with patients/families

and medical staff, demonstrating their relevance to general communication competencies. These shared sub-skills are deemed critical for explanation, transcending the confines of nursing. In healthcare, nontechnical skills such as cognitive, social, and personal resource abilities, which pertain to various psychological themes involving human subjects, are indispensable alongside technical expertise.[42] The field of safety science underscores the importance of nontechnical skills.[43, 44] Furthermore, acquiring broad-based explanatory skills is imperative for nursing professionals to excel and advance their expertise. Specific sub-skills within the shared mental model construct, such as "agreement" for patients/families and "handoff" for medical staff, reflect the distinct communication objectives, content, and the varied specialized knowledge inherent in healthcare.

The essence of explanation skills is not encapsulated by "conveying," "confirming," or "questioning" but instead by their underlying intent. These encompass elucidating concepts with clarity and empathetically receiving information. For instance, the act of confirming encompasses eight items, distributed among "clarity" in mental model sharing (three items), "agreement" (two items), and "handover" (one item). Additionally, "compassion" includes two items about "empathy." This distribution highlights the importance of teaching students to grasp the intent behind their actions rather than merely focusing on behaviors (e.g., "let us confirm thoroughly") to bolster explanatory communication skills in nursing education and professional development. Confirmation, as previously mentioned, is vital for gauging the other person's comprehension, aligning with their level of expertise, and empathizing with their emotions.

The scale developed in the above processes in Study 1 was confirmed to be reliable and valid. We named this scale the Scale of Nursing Explanation Skills (SNES).

4.3 Relationship with nursing careers
The analysis of the impact of nursing careers revealed that accumulating quantitative career experience could enhance the techniques in the shared mental model (clarity, logic, flexibility), which could be improved by accumulating quantitative career experience. However, acquiring and practicing a shared mental model and compassion enhances the quality of a nurse's career. This aligns with the clinical ladder criteria and the organization's nursing education philosophy to acquire and practice a shared mental model and compassion.

4.4 Impact of the occurrence of incidents
Regarding influence on patient safety, nursing professionals facing challenges in demonstrating compassion are prone to increased interactional failures. These individuals often

avoid engaging with patients, families, and medical staff, which contributes to a spectrum of incidents, including adverse events, delays in treatment and care, patient and family frustration, and non-harmful medical errors. Incidents are significantly influenced by the socioemotional route, with compassion serving as a critical starting point.

On the cognitive front, nursing professionals with hesitations about engaging in shared mental model practices tend to encounter miscommunication, particularly types characterized by judgmental and conceptual errors, during interactions with other medical staff. Situational and informational judgment errors lead to serious incidents, including adverse events and delays in treatment and care. Conversely, inadequate information sharing and agreement typically leads to less critical incidents, including frustration among patients and their families and medical errors that do not harm them. These cognitive issues are more pronounced in medical staff interactions than in patients. The patient safety movement in Japan, catalyzed by incidents like fatalities due to handoff deficiencies during surgery, highlights the importance of effective mental model sharing and communication among medical staff to ensure patient safety.[45]

Furthermore, the detrimental effects of inadequate shared mental model practices on patients and their families are less severe compared to those on medical staff. This observation underscores the necessity for healthcare professionals who have adopted a common language, including medical terminology and communication styles such as the SBAR technique,[46] to integrate compassion and shared mental model skills. This integration ensures consistency in information delivery. Nurses must be cognizant of the limited medical knowledge of patients and their families and their potential reluctance to accept unfavorable information. Nurses must prioritize compassion, considering the perspectives and emotions of the individuals receiving explanations.[47]

4.5 Limitations
This study had limitations. One was the credibility of these insights. Therefore, further investigations with samples from various countries, regions, and hospitals are needed. Another was that the findings were from a survey and statistical analysis, representing only part of the process.

5. CONCLUSION
This study developed a psychological scale to measure nursing explanation skills. Then, it elucidated the development of these skills throughout nurses' careers and their impact on incident occurrence mediated by miscommunication. The five key points of this paper are as follows: 1) Effective explanatory communication in nursing practice requires skills

regarding "compassion" and "shared mental models. " 2) Except for "agreement" and "handoff," the subskills of the explanation skill are shared among the explanation target. 3) Nursing staff higher on the critical ladder can provide explanations with compassion. 4) Nursing explanations require compassion for patients/families and both compassion and a shared mental model for healthcare professionals. 5) A conscious understanding of the purpose of actions to enhance explanation skills in nursing education is essential. These empirical findings that nurses need to have compassion for others in their explanation work, which requires accurate communication and sharing of information, suggest that future nursing education and practice will require mental and technical guidance.

Besides basic research, exploring how to apply these findings concurrently is imperative, as nurse attrition is a serious issue worldwide. Compassionate communication with patients, families, and other staff may foster positive relationships for nurses. Furthermore, accurate sharing of mental models can eliminate discrepancies and avoid conflicts. We hope to use these findings as evidence for practical considerations in supporting nursing professionals in building successful careers. For example, based on the sub-skills identified and the items they contain, a nursing education curriculum on explaining to patients, families, and other staff, as well as an evaluation and feedback system in nursing practice, could be developed. The scale could also be used as an evaluation criterion for certifying clinical ladders.

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AUTHORS CONTRIBUTIONS

Prof. Fujimoto was responsible for the study design, data analysis, and manuscript writing. Lect. Shimamura conducted the literature search and provided advice on nursing duties. Prof. Yuki managed the research project. All authors have read and approved the final manuscript. The study was conducted by consensus among all authors, who contributed equally.

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