

The Relationship between Communication and Nursing Performance in Simulation-based Team Learning

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Abstract

Effective communication is a necessary component of nursing practice and can affect the quality of performance of medical teams. Communication failures within the healthcare team can compromise both patient safety and medical outcomes. This study examined how the performance of a team of nursing students was affected by the way they communicated within the team. Nursing students attended a simulation-based training session on oxygenation therapy for COPD (Chronic Obstructive Pulmonary Disease) patients, and their participation in the class was video recorded. The videos were analyzed according to a nursing performance and communication scale that included 5 categories relating to nursing processes (assessment, diagnosis, planning, implementation, and evaluation) plus a miscellaneous communication category. We determined a positive relationship between the performance of the team and the frequency of comments in all communication categories except for that of diagnosis. A negative relationship was identified between the performance of the team and the frequency of miscellaneous comments. A multiple regression analysis revealed that comments regarding planning as well as miscellaneous comments were strong independent predictors of the team's performance. These findings indicate that the performance of a nursing team has a significant relationship with team communication related to the assessment, planning, implementation, and evaluation of nursing care.

Keywords: Communication, Nursing, Performance, Simulation

1. Introduction

The provision of nursing care is achieved via teamwork. Thus, communication within the team is of great importance within the clinical nursing practice. Since members of the medical team share information with each other, make joint decisions, and practice common tasks, communication plays a significant and decisive role^{1,2}. The Joint Commission³ reported that a failure in effective team communication could lead to negative outcomes such as medical accidents.

Simulation-based learning, such as computer programs, role playing, or games, can be used by students to learn effective communication techniques⁴. In practice,

training that employs simulations with a greater focus on particular situations has been reported to be more effective in enhancing complicated behavioral skills such as communication within teams⁵. Standardized patient simulations are often used in the training and evaluation of communication⁶.

Previous studies have highlighted the importance of communication¹, but have been limited by a lack of inductive research investigating the link between communication and the performance of nursing teams. The aim of the present study is to demonstrate, using simulation-based learning, the effect of communication among nursing students on their overall performance as a team.

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2 Method

2.1 Subjects

The subjects in this study were all nursing students in the second semester of their third grade. Forty-seven students agreed to participate in our study, out of a total of 55 students who had enrolled in the Simulation-based Integrated Practicum. The videos of ten teams, out of a total of twelve, consisting of those students who had agreed to participate in the study, were analyzed. Students were assigned to a team by their student number, for convenience, and each team consisted of four to five members.

2.2 Ethical Consideration

The class guidelines were explained to all subjects, and they were informed that the class would be video-recorded for debriefing purposes. Prior to the class, the study objectives were explained to the students, and they were informed that the videos would be used as research materials. It was also explained to the students that participation in the study was not compulsory, that it was possible to withdraw during the course of the study that they would not be disadvantaged if they wished to withdraw, and that the results of the study would not be used for any other purpose. All students participating in the study submitted written consent forms.

2.3 Procedure

Simulation-based team learning was developed for nursing students to enhance the core communication and problem-solving skills that would be required in a clinical setting. The particular module used in this study was a simulated training session on oxygenation therapy for COPD patients, and was one of twelve available modules. Prior to attending the class, the nursing students were required to understand the scenario by reading through the accompanying guide. A SimMan 3G simulator (Laerdal Medical Ltd, Orpington, Kent, UK) was used for the training session, and was programmed to complain of dyspnea, insomnia, lack of appetite, and continuous coughing. The goal of the class was to assess the patient and then practice effective nursing care by communicating properly both with teammates and the patient.

2.4 Instruments

2.4.1 Team Communication

The Healthcare Team ADPIE Communication Index (ACI) developed by Hirokawa, Daub, Lovell, Smith, Davis, & Beck⁷ was used to analyze verbal conversation among the nursing students and with the patient. The ACI is divided into six categories: assess, diagnose, plan, implement, and evaluate, as well as a miscellaneous conversation category. The “assess” category includes conversations relating to data collection, while “diagnose” includes conversations relating to the nursing problem, its severity, and its cause. The “plan” category includes decisions related to nursing intervention, while the “implement” category includes decisions as to how to carry out the care plans. The “evaluation” category includes reference to the patient’s current progress according to the planned result, and to the monitoring of the effects of intended methods of intervention. Conversations that were not directly related to nursing and were not relevant to any of the five nursing categories were grouped into the miscellaneous category.

Two assessors watched the videos recorded during the group activity and counted the frequency of verbal conversation in each category of the ACI. The reliability of the evaluators in assigning conversation to a particular category during video analysis ranged from 0.884 to 0.973.

2.4.2 Nursing Team Performance

In order to measure the performance of the team of student nurses, the researchers constructed a checklist of 28 questions that were based on the nursing intervention practice checklist for the COPD patient scenario proposed by the National League for Nursing (NLN)⁸. Three nursing college professors selected 28 questions with an Item Content Validity Index (I-CVI) of greater than 0.8 after examining each question’s content validity. The Scale CVI (S-CVI) of each question was 0.86. The literature recommends that 3 to 10 experts examine the validity of the question contents⁹, and also that the S-CVI ranges between 0.80 and 0.90 or greater¹⁰.

The checklist consisted of 10 items relating to general nursing, including hand washing, introducing oneself to the patient, and identifying the patient, along with 8 items relating to oxygenation therapy nursing, including the measurement of oxygen saturation and the administration of oxygen, and a further 10 items

relating to suctioning, including accurate preparation prior to suctioning and an explanation of the suction procedure.

The checklist used a two-point scale, with two points being given for the complete performance of the item, one point for insufficient performance, and zero points for non-performance. The total score ranged from zero to 56 points, with higher total scores reflecting better nursing performance. In this study, the reliability coefficient (Cronbach's alpha) of the measurement tools used for the simulation-based team learning was 0.737.

2.5 Statistics

The data was collected and statistically analyzed using the R statistical computing software (v.3.2.0, R Foundation for Statistical Computing, Vienna, Austria)¹¹, and a plot of the data was created with the ggplot2 data visualization package¹².

- General patient characteristics were measured in terms of frequencies and percentages, and means and standard deviations were calculated.
- To evaluate if the communication among the nursing students was predictive of their performance, a descriptive analysis was used to compare the categorical frequencies of communication and to sum the scores for the performance of the team. The reliability of the assessor for each category was analyzed with Cronbach's alpha.
- Correlation analysis was used to assess the relationship between the nursing students' communication and their performance.
- Multiple regression analysis was used to identify the communication predictors that influenced the performance of the nursing team.

3. Results

3.1 General Characteristics of the Subjects

The subjects were all female students, with 76.6% of them aged between 20 and 23 years, 12.8% between 24 and 27 years, and 10.6% 28 or more years. Considering their educational backgrounds, 83% were high school graduates, and 17% had graduated from college. The students had already completed 24 credits of a regular clinical practicum over the previous three semesters and had had no prior experience of simulation-based learning.

3.2 Frequency of Team Communication and Nursing Team Performance

Table 1 gives the frequency of communication for each team as the mean of the observational values from two evaluators. The team nursing performance scores are given as the mean values of the observational values of the two assessors.

Comparing the communication score subtotals for the assess, diagnose, plan, implement, and evaluate nursing-related communication categories with the overall team nursing performance score, the highest-scoring team for the five communication category subtotals also had the highest nursing performance score, the second-highest-scoring team for the subtotals had the second-highest nursing performance score, and the lowest scoring team had the lowest nursing performance score.

3.3 Correlation between Communication and Nursing Team Performance

Table 1 also shows the correlation and significance level between communication and the performance of the nursing team. A positive relationship was identified between the nursing performance score and the conversation scores for the planning, evaluation, assessment, and implementation categories; a negative relationship was identified between nursing performance and the miscellaneous conversation score for comments that were not directly related to nursing.

3.4 Nursing Team Performance Predictor

To identify that each of the communication categories could predict nursing team performance, Tables 2 and 3 show the analysis of the influence of each of the communication categories on the overall nursing performance of the team. With multiple regression analysis, backward elimination was used in which all independent variables were first included, and then eliminated one by one in the order of the level of least contribution. Using an *F*-test to compare the big model with the small model, the level of contribution of each of the eliminated variables was evaluated. Via this process, Model 5, which included two independent planning and miscellaneous variables from among the six communication categories, was selected. Comparing the five regression models using an adjusted- R^2 coefficient, the adjusted- R^2 coefficient of Model 5 provided the highest value.

Table 1. Frequency and Correlation of Communication and Team Nursing Performance

Group	Communication Categories						ADPIE Subtotal	Misc
	Perform	Assess	Diagn	Plan	Implem	Eval		
1	34.5	6.5	1.0	7.5	10.5	4.0	29.5	1.5
2	34.5	7.0	1.0	12.0	9.5	2.5	32.0	6.0
3	37.0	9.0	3.0	13.5	14.0	5.5	45.0	4.5
4	31.5	6.0	1.0	7.0	13.5	2.5	30.0	5.0
5	43.0	22.0	2.5	18.0	15.0	4.5	62.0	3.0
6	37.0	10.0	1.0	16.0	10.0	1.5	38.5	3.0
7	24.5	6.5	2.0	6.5	8.5	2.0	25.5	8.0
8	26.5	4.5	1.5	10.0	13.5	2.5	32.0	6.0
9	46.5	11.5	2.0	19.0	26.0	9.5	68.0	2.0
10	34.0	8.5	1.5	7.5	9.5	1.0	28.0	1.5
Average (%)	34.9	9.2 (23.2)	1.7 (4.4)	11.7 (29.8)	13.0 (33.9)	3.6 (8.6)	39.1 (100.0)	4.1
Intercoder reliability	.882	.889	.884	.905	.928	.973	.950	.828
Y		.713	.303	.837	.683	.714	.877	-.693
p		.021	.395	.003	.030	.020	.001	.026

Perform=team nursing performance; Diagn=diagnosis; Plan=planning; Implem=implementation; Eval=evaluation; ADPIE Subtotal= Assess, Diagnosis, Planning, Implementation, & Evaluation Subtotal; Misc=miscellaneous
 Team communication was measured by noting the frequency of utterance using the five categories of the ADPIE(Assess, Diagnosis, Planning, Implementation, & Evaluation) Communication, with an additional Miscellaneous category.

Table 2. Model Comparison for Multiple Regression Analysis of Communication factors for Team Nursing Performance

	Number of Independence Variables	R2	Adjusted-R2	P value (F test)
Model 5 : Plan+Misc	2	.892	.861	_____
				.625
Model 4 : Assess+Plan+Misc	3	.897	.846	_____
				.358
Model 3 : Assess+Plan+Implem+Misc	4	.919	.854	_____
				.379
Model 2 : Assess+Plan+Implem+Eval+Misc	5	.938	.860	_____
				.551
Model 1 : Assess+Diagn+Plan+Implem+Eval+Misc	6	.946	.838	_____

Perform=team nursing performance; Diagn=diagnosis; Plan=planning; Implem= implementation; Eval=evaluation; Misc=miscellaneous

The significant predictors for nursing performance were determined to be conversations regarding planning and also miscellaneous conversations (Figures 1). In other words, as comments relating to planning increased, the performance of the nursing team increased; however, as miscellaneous conversations increased, the performance of the nursing team decreased.

Table 3 Predictors of Team Nursing Performance

Parameters	β Coefficient (95% CI)	t	P value
(Intercept)	29.365 (21.778~36.953)	9.152	<.001
Plan	0.959 (0.520~1.398)	5.169	.001
Misc	-1.404 (-2.347~-0.461)	-3.520	.01

Plan=planning; Misc=miscellaneous

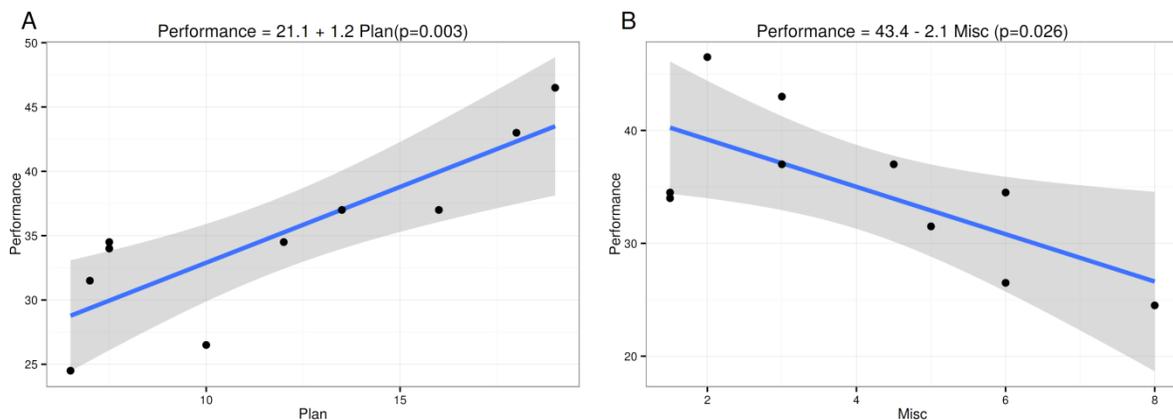
4. Discussion

The communication skills of registered nurses are highlighted in various aspects of their role. They must not only be able to establish a therapeutic relationship with their patients, but also solve problems through mutual cooperation with a team of healthcare providers. Therefore, communication is a basic and essential skill for nursing students to acquire. Our study was conducted to investigate whether the communication of nursing

students directly influences their performance as a nursing team with respect to patient care using simulation-based group learning. The results indicate that nursing performance scores increased as the teams' communication become more actively focused on patient care. In particular, conversations regarding planning were identified as an important predictor for overall nursing performance.

The significance of communication within a health care team has been reported in numerous studies. Many researchers have suggested effective communication to be the main factor in determining the success or failure of a nursing team¹³. Nurses in healthcare teams connect with various medical staff and experts, and play a supervisory role in the dissemination of information, ensuring that the task at hand is not interrupted but maintains continuity through the collection and combination of scattered data from among the medical team within complex clinical situations, where the continuity of tasks cannot be guaranteed¹⁴. Therefore, it is essential that registered nurses develop and improve their communication skills in order for the team to perform successfully.

Studying the effects of communication on the performance of nursing tasks within a healthcare team suggests that open communication among team members can foster shared understanding, can effectively manage stress due to the hierarchical environment of a clinical setting, and can ultimately maximize the team's ability to perform tasks¹⁵. Other reports have also suggested that the turnover rate of nursing staff becomes lower¹⁶ and that the security of patients improves with the effective use of communication¹⁷. In addition, in jobs requiring a higher



Plan = planning; Misc = miscellaneous

Figure 1. Planning and Miscellaneous as Predictors of Team Nursing Performance.

performance ability, communication has been identified as the most important factor for improving executive ability¹⁸. Emergency technicians who successfully practice CPR are reported to have excellent communication skills¹⁹ and, therefore, it has been suggested that effective communication skills can result in positive outcomes in the performance of medical tasks.

There have been only a few inductive or exploratory studies investigating how to develop effective communication for improved nursing performance. Among these, Hirokawa et al.⁷ have reported a positive correlation between verbal/nonverbal communication among nursing students and their nursing performance in a simulation-based scenario involving nursing acute myocardial infarction patients. In the same context, our research also demonstrated a significant positive correlation between nursing performance scores and the frequencies of comments in all categories of communication, except for diagnosis.

At the beginning of data analysis, the students' communication with their patients and with the teammates, was analyzed separately to study the differences between those teams that sensitively responded to the reactions or complaints of the simulated patient and the teams that only focused on conversations with their co-workers. However, after comparing these two relationships, we identified no significant differences, and thus did not include these relationships in the results of our study.

During the simulation algorithm suggested for our group activity class, the extent to which the students mutually interact with one another in order to make decisions and solve nursing problems while simultaneously collecting and sharing data is important for enabling them to understand the scenario. Therefore, our study focused on how actively the students communicated with each other and with the patient within a limited time frame. According to our results, the content and frequency of communication were the factors that most influenced nursing performance, when we considered the question "To what level are the nursing students communicating intensively about the nursing care plan?" Examples of conversations attributed to the miscellaneous category included "What did you say?", "What are we going to do next?", and "How are we supposed to do this?" These conversations did not focus on the simulated scenario, and this reflected that students were not paying attention to the patient's response. Similar to that of Hirokawa et al.⁷, our study demonstrated that miscellaneous-categorized

conversations that are not directly related to the practice of nursing were negatively correlated with the performance of the team. When the simulated scenario was treated as seriously as if it were real, and the focus of the conversation was on treating the patient with team members actively interacting with one another for the purposes of problem solving, the teams' nursing performance score was observed to improve.

In this study, the assessors had difficulty in assigning verbal expressions into either the assessment or evaluation categories. Such a process was necessary in order to decide on the categorical standard and enable the repeated checking of scoring consistency related to the ACI. Hirokawa et al.⁷, the original author of the ACI tool, revealed via email that it was also difficult for them to differentiate between the assessment and evaluation categories, and confirmed that it was therefore necessary to verify the effectiveness of the tool.

Communication is a very important skill for all nursing staff, but it is difficult for nursing students to gain sufficient training in this area before graduation. Training in effective communication and teamwork is not commonly included in the regular curriculum for nursing students, but it has been agreed that such programs are important for educating and training healthcare staff¹. Team training using teammates to solve nursing problems within a simulation-based learning environment has recently been suggested as an innovative method for improving the communication skills of nursing students²⁰. In some nursing colleges in Korea, simulation-based methods are actively employed to complement the students' experience of clinical practice, and it has been speculated that such programs would be a useful learning tool for improving not only individual skills such as problem-solving, critical thinking, and core nursing skills, but also communication skills.

5. Conclusion and Suggestions

This study revealed that effective communication relating to nursing tasks positively affected the performance of a team of student nurses and was associated with higher team nursing performance scores. In particular, conversations regarding nursing care planning appeared to be the most important predictor for improving overall nursing performance scores during simulation-based team classes. The results of this study are consistent with earlier studies reporting that effective communication resulted

in better performance. This study also demonstrated that miscellaneous conversation unrelated to nursing led to a decrease in performance. This result corresponds with the results of Hirokawa et al.⁷

Given that communication consists of verbal and non-verbal modes²¹, the development of tools to measure the nonverbal aspects aside from the verbal contents and frequencies is recommended, along with further in-depth studies regarding the influence of various aspects of communication on the performance of nurses.

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