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Original Article

Identification of communication skills that improve patient safety culture: analysis of a communication skills training program for university hospital staff

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ABSTRACT
Izumi S, Furusawa Y, Bansho M, Tonomura I. Identification of communication skills that improve patient safety culture: analysis of a communication skills training program for university hospital staff. Jpn J Compr Rehabil Sci 2017; 8: 88–97.
Purpose: To elucidate the relationship between patient safety culture and communication skills (CS).
Methods: A CS training program based on coaching theory was conducted at a university hospital, and the relationship between the improvement of patient safety culture and the improvement of CS before and after training was analyzed. The trainees were 57 full-time staff members of the hospital. Each trainee selected around five close coworkers (collaborators; a total of 285). For seven months, the trainees received class lessons via an audio conference system, and at the same time conducted coaching interviews with their collaborators. The collaborators assessed the trainees' CS and patient safety culture using questionnaires before and after training.
Results: Excluding missing data, 259 subjects were analyzed. The patient safety culture improved group showed a higher degree of improvement in CS regarding "suggestions/requests" compared to the non-improved group. Furthermore, improvement of the "suggestions/requests" skill was related to the improvement of patient safety culture regarding "supervisor/manager expectations and actions in promoting safety" and "non-punitive response to errors."
Conclusion: The present results suggest that improvement in "suggestions/requests" skill may be associated with improvement in patient safety culture.
Key words: patient safety, coaching, organizational development, university hospital, multidisciplinary team care

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Conflict of Interest: The first author Shin-Ichi Izumi received a donation of 2.5 million yen from COACH A Co., Ltd. in 2010 for research purposes at the university, and also received technical guidance without charge from COACH A Co., Ltd. in order to implement external medical coaching workshops that he organized for health care personnel. He also serves as facilitator for the Medical Coaching Study Group of the Japan Coach Association, a specific nonprofit corporation affiliated with COACH A Co., Ltd. Before conducting this research, Shin-Ichi Izumi was reviewed and approved by the Tohoku University Conflict of Interest Management Committee.

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Introduction

Patient safety is the most fundamental prerequisite in health care. The Committee on Quality of Health Care in America lists the following five principles for designing safety systems in health care organizations [1].

(1) Provision of leadership placing patient safety as the top priority goal of the health care organization and making patient safety the responsibility of every staff member.
(2) Respect for cognitive and physical limits of humans in system design.
(3) Promotion of effective team functioning through team training of clinical staff with patient

participation.

(4) Anticipation of the unexpected through system design for accident prevention and recovery, and by simulation training.

(5) Creation of an environment conducive to learning by encouraging error reporting and free communication.

Among these principles, (1) is associated with the staff's sense of responsibility, (2) with the patient safety system, (3) and (4) with education and training, and (5) with intra-organizational communication. These are related to the management ability of managers/supervisors who hold the responsibilities of goal setting, staff education, and working environment improvement.

Rehabilitation medicine is team medical care in which multidisciplinary professionals work together toward a common goal, and great importance is placed on the autonomy of individual disciplines as well as close coordination among disciplines [2]. Therefore, teamwork has a powerful influence on the quality of rehabilitation medicine including patient safety.

There are two approaches to clinical team training: simulation training and class training [3]. Simulation training is learning by experiencing simulated clinical settings. Trainees acquire knowledge of fixed procedures such as preoperative briefing and learn the thinking process of clinical decision-making using clinical scenarios. In class training, trainees acquire knowledge and communication skills (CS) through lectures and discussions among participants. In simulation training, although team behavior is improved during the training period [3], whether there is an actual effect on patient safety has not been validated. For class training, the effect has been demonstrated by the participants' evaluation [4, 5] and the frequency of actions leading to error prevention observed in the clinical setting [5]. However, the training items that contribute to such effect remain unknown. In addition, while it is relatively easy to set a common goal for all participants when training is conducted within a specific department such as the emergency department [6], department of surgery [5] or department of radiology [4], this is not the case when various professional disciplines across departments participate in training as the relationship between the goals of the participants' departments and the training tasks tends to become diluted. For that reason, there are no reports that verify the effect on patient safety of team training for an entire health care organization including the administrative staff. Moreover, we found no studies that elucidate the relationship between training that improves the management skills of managers/supervisors and patient safety in health care organizations.

As a scale to evaluate patient safety in health care organizations, the Hospital Survey on Patient Safety Culture was developed and validated by the Agency for Healthcare Research and Quality (AHRQ) [7]. The Japanese version of this scale has been developed, and the reliability and validity have also been confirmed [8, 9]. Taneda et al. [8], who developed the Japanese version of the scale, stated that diffusion of the attitude and concept of making patient safety the top priority for all staff members throughout the medical organization, in other words fostering a patient safety culture, is essential for providing safe medicine.

There is probably no dispute that a close association exists between patient safety and managers/supervisors' management capability. However, the relationship between specific manager/supervisor skills and patient safety remains unclear. With the consideration that CS is an important ability required of managers/supervisors to improve patient safety, we conceived the idea of CS training. Then, we hypothesized that improving the CS of managers/supervisors would activate the organization that they manage, which would in turn improve patient safety. Consequently, we organized a 7-month CS training program based on coaching theory at T University Hospital [10]. Coaching was defined as communication that supports other persons' voluntary action and goal attainment [11], which was also used in other training programs [3, 4]. In that study [10], CS assessment by others (score for a questionnaire assessed by 5 to 10 persons selected by each trainee as close coworkers) after training showed improvement compared to before training although the effect size was small, and only 55% of all trainees showed improvement in the CS assessment by others. Nevertheless, trainees' improvement in CS assessment by others was related to enhancement of organizational activity, which was related to improvement in safety evaluation. However, in this previous study [10], we evaluated safety using the question "I think my department is very safe" scored on a 7-point scale. In addition, we did not analyze the direct relationship between CS and safety.

Based on the hypothesis that training aimed at improving CS would improve trainees' CS and enhance patient safety culture among the staff working in the departments managed by the trainees, the aims of the present study were to elucidate the relationship between CS and patient safety culture scales, and to extract the factors in patient safety culture showing a strong relationship with individual items of CS included in the training.

Methods

1. Subjects

Full-time employees at T University Hospital (approximately 2,200 full-time employees in total) with managerial responsibilities who participated voluntarily in the CS training program (CSTP) (herein referred to as trainees) and the main persons working with the trainees (subordinates or colleagues; herein

referred to as collaborators) were included in the present study. Each trainee selected around five coworkers who were considered important in the execution of the trainee's duties, and requested their cooperation as described below. The number of trainees was 57 and the number of collaborators 285, making a total of 342 subjects participating in the study.

2. Methods

The trainees attended class lessons in the form of audio conferences of 55 minutes per session, 4 sessions per module, for a total of 9 modules (Table 1). The purpose of the class lessons was to improve the trainees' CS, and not to solve specific health care issues such as patient safety. Each lesson consisted of a lecture presented by a facilitator, role play, and discussion. Each trainee applied the skills learned in the lessons to communication in their routine work, and conducted coaching interviews of approximately 30 minutes per session with each of his/her collaborators as part of the routine work, for a total of 9 sessions. The coaching interviews were not conducted for the purpose of assessing the trainee's CS learning outcome. In the interview, the trainee clarified the collaborator's goal and motivated the collaborator's initiative to bridge the gap between the goal and the present status. The goal of the collaborator was to be achieved by the collaborator him/herself in the workplace, and the goal was not limited to promotion of team care or improvement of clinical safety by staff members including the trainee. In addition, each trainee received 9 one-on-one coaching sessions given by the learning coach during the CSTP period, and continued to work towards achieving his/her own goal.

Within one month before the trainee started the CSTP (pre-CSTP) and between one and two weeks after the trainee completed the program (post-CSTP), each collaborator performed an assessment of the corresponding trainee's CS (CS assessment by others) and responded to a questionnaire on patient safety culture. The questionnaires were filled out anonymously on the Internet. Responses to all the questions were required.

For CS assessment, Coaching Skill Assessment Plus (CSAplus, Appendix 1) developed by COACH A Co., Ltd. was used. CSAplus consists of 12 categories and 24 questions, and is scored on a 7-point scale. The average score of all collaborators and the distribution of the responses obtained for each trainee were communicated to the trainee by the learning coach.

To evaluate the safety culture, the Japanese version of the Patient Safety Culture Scale (Appendix 2) was used. The scale consists of 12 factors and 42 items scored on a 6-point scale (5 choices plus "not applicable"). A valid questionnaire response was defined as having less than 22 items scored as "not applicable." To calculate the score for an item with a missing value ("not applicable"), the sum of the scores excluding "not applicable" for that item was divided by the total number of responses excluding "not applicable," according to Taneda et al. [8]. The trainee and collaborator were not notified of the response results.

Other variables including gender, age, and profession of the trainees and collaborators were extracted from the questionnaires.

3. Statistical analysis

Based on the pre-CSTP CSAplus scores, Cronbach's coefficient alpha was obtained and internal consistency was assessed.

The paired *t*-test was conducted to compare the collaborators' pre-CSTP and post-CSTP scores including the overall score (average score of 24 items) and scores by category for CSAplus as well as the overall score (average score of 42 items) and scores by factor (12 factors) for the Patient Safety Culture Scale.

Table 1. Class contents of the communication skills training course.

Module		Contents
1	Observation and Communication types	Tools for understanding the communication type of other persons
2	Active listening	Purpose and method of listening, creating an environment for listening, conversation flow
3	Building trust	Principles of communication, creating an environment for conversation, interest in other persons
4	Strategic questioning	Questions that are effective in shifting the viewpoint of other persons and broadening the range of choices
5	Accountability	Awareness of independent thinking and action
6	Setting the foundation	Complete unfinished matters pertaining to personal affairs, work, health, and human relationships
7	Influence	Skills of approval, suggestions, and requests
8	Case study	Coaching by other participants
9	Coaching in medical fields	Leadership in a health care team, coaching in a medical interview

Collaborators whose post-CSTP overall scores for the Patient Safety Culture Scale increased compared to the pre-CSTP scores were classified into the improved group, while collaborators who showed no increase were classified into the non-improved group. The two groups were compared with respect to the degree of CS improvement (post-CSTP CSAplus − pre-CSTP CSAplus) for the overall score and scores by category. For the CSAplus category that showed a significant intergroup difference, collaborators were again divided into improved and non-improved groups, and compared with respect to the degree of improvement of patient safety culture (post-CSTP score − pre-CSTP score) for each of the 12 factors. Analysis of covariance with the pre-CSTP score as the covariate was used in the study. Statistical analyses were conducted using IBM SPSS Statistics 19.0.0 (International Business Machines Corporation, Armonk, New York). A p-value less than 0.05 was considered significant.

This study was conducted after approval was obtained from the Ethics Committee of the Tohoku University School of Medicine (Approval No. 2011-632).

Results

Among 285 participants, those with invalid questionnaire responses were excluded. Eventually, the data of 259 participants comprising 50 trainees and 209 collaborators was analyzed (Table 2). Both the trainees and collaborators were multidisciplinary

Table 2. Demographics of the subjects analyzed.

Trainees: n = 50		Number of subjects	%
Gender	Male	34	68.0
	Female	16	32.0
Age (years)	20–29	1	2.0
	30–39	6	12.0
	40–49	23	46.0
	50–	20	40.0
Professional discipline	Doctor, dentist	16	32.0
	Nurse	10	20.0
	Co-medical staff[a]	16	32.0
	Office staff	5	10.0
	Others[b]	3	6.0
Collaborators: n = 209		Number of subjects	%
Female	Male	108	51.7
	Female	101	48.3
Age (years)	20–29	47	22.4
	30–39	74	35.4
	40–49	63	30.3
	50–	25	20.0
Professional discipline	Doctor, dentist	43	20.5
	Nurse	51	24.4
	Co-medical staff[c]	86	41.1
	Office staff	25	12.0
	Others[d]	4	1.9

[a]Co-medical staff: 5 physical therapists, 3 pharmacists, 3 registered dietitians, 2 radiological technologists, 1 clinical engineer, 1 medical technologist, and 1 social worker.
[b]Others: 1 systems engineer and 1 teaching staff member of medical research in graduate school.
[c]Co-medical staff: 20 pharmacists, 14 physiotherapists, 12 radiological technologists, 9 clinical engineers, 6 medical technologists, 6 dental hygienists, 5 registered dietitians, 5 social workers, 3 occupational therapists, 3 speech-language-hearing therapists, 1 orthotist (outsourced), 1 orthoptist, and 1 clinical psychologist.
[d]Others: 1 systems engineer, 1 teaching staff member of medical research in graduate school, and 2 clinical research coordinators.

professionals from various departments. Paramedical staff (hereinafter referred to as co-medical staff, a term commonly used in Japan) among the trainees consisted of a large percentage of physical therapists, and one trainee had participated in CS training in the past.

The overall Cronbach's coefficient alpha for CSAplus was 0.948 and that for the 12 categories ranged from 0.688 to 0.889, showing adequate reliability.

For CSAplus, significant improvement was observed in the overall score and in individual scores for 9 categories (Table 3). Among the categories showing significant improvement, those that reached the criterion for small effect size were "observation," "tailor-made treatment," "follow-up," "questions," "feedback," "supporting others," and "setting goals."

For the Patient Safety Culture Scale, no significant improvement was observed in the overall score or in the individual scores for the 12 factors (Table 4).

A total of 106 subjects were classified into the patient safety culture improved group and 103 subjects into the non-improved group. Results of analysis of covariance showed a significant difference in improvement for the "suggestions/requests" category

Table 3. Assessment of communication skills by others.

	n	Pre-CSTP		Post-CSTP		Degree of improvement (post-CSTP − pre-CSDP)					
		M	*SD*	*M*	*SD*	*M*	*SD*	*t*	*p*	*Cohen's d*	Effect size criteria
CSAplus, overall score	209	4.97	0.85	5.25	0.87	0.29	0.77	5.39	<.001	0.37	Small
Observations	209	4.83	1.09	5.13	1.03	0.31	1.14	3.89	<.001	0.27	Small
Tailor-made treatment	209	4.80	1.08	5.05	1.06	0.25	1.06	3.42	<.001	0.24	Small
Coaching flow	209	5.29	1.05	5.35	0.96	0.06	1.00	0.90	.367	0.06	—
Listening	209	5.50	1.13	5.62	1.14	0.13	1.09	1.68	.095	0.12	—
Non-verbal	209	5.56	1.05	5.71	0.97	0.15	0.94	2.29	.023	0.16	—
Follow-up	209	4.32	1.48	5.07	1.28	0.75	1.53	7.10	<.001	0.49	Small
Acknowledgement	209	5.35	1.06	5.39	1.08	0.05	0.97	0.72	.475	0.05	—
Questions	209	4.78	1.10	5.24	1.04	0.46	1.04	6.39	<.001	0.44	Small
Suggestions/requests	209	5.03	1.06	5.23	1.00	0.21	1.08	2.74	.007	0.19	—
Feedback	209	4.33	1.23	4.75	1.06	0.43	1.15	5.37	<.001	0.37	Small
Supporting others	209	4.95	1.25	5.26	1.16	0.30	1.16	3.80	<.001	0.26	Small
Setting goals	209	4.88	1.13	5.23	1.14	0.35	1.12	4.55	<.001	0.31	Small

n, number of samples; *M*, mean; *SD*, standard deviation; CSTP, communication skills training program;
Effect size, *Cohen's d* was calculated by subtracting the pre-CSTP score from the post-CSTP score, and then dividing the mean difference by the unbiased standard deviation. Then, the effect size was graded based on the following criteria.
Effect size criteria: small | *d* | >0.20; medium | *d* | >0.50; large | *d* | >0.80.

Table 4. Responses of collaborators to the Patient Safety Culture Scale.

	n	Pre-CSTP		Post-CSTP		Degree of improvement (post-CSTP − pre-CSTP)					
		M	*SD*	*M*	*SD*	*M*	*SD*	*t*	*p*	*Cohen's d*	Effect size criteria
Patient safety culture: overall score	209	142.55	17.60	142.11	17.88	−0.44	11.38	−0.56	.575	−0.04	—
Frequency of event reporting	209	11.13	2.37	11.02	2.53	−0.11	2.71	−0.59	.555	−0.04	—
Overall perception of safety	209	13.28	2.40	13.40	2.31	0.12	1.90	0.92	.358	0.06	—
Supervisor/manager expectations & actions promoting safety	209	15.16	2.19	15.13	2.20	−0.03	1.91	−0.26	.794	−0.02	—
Organizational learning/continuous improvement	209	10.16	1.91	10.37	1.86	0.21	1.69	1.80	.073	0.12	—
Teamwork within hospital units	209	14.82	2.41	14.66	2.56	−0.15	2.41	−0.92	.358	−0.06	—
Communication openness	209	10.00	2.17	9.83	1.95	−0.17	1.81	−1.37	.174	−0.09	—
Feedback and communication about errors	209	10.71	2.37	10.77	2.25	0.05	2.00	0.38	.702	0.03	—
Non-punitive response to errors	209	9.96	2.16	10.06	2.10	0.10	1.78	0.80	.422	0.06	—
Staffing	209	11.09	2.64	11.05	2.48	−0.04	2.25	−0.25	.804	−0.02	—
Hospital management support for patient safety	209	10.67	2.00	10.70	2.03	0.02	1.64	0.22	.829	0.01	—
Teamwork across hospital units	209	12.89	2.41	12.65	2.55	−0.24	2.11	−1.66	.099	−0.11	—
Hospital handoffs & transition	209	12.67	1.98	12.47	2.11	−0.20	2.04	−1.41	.159	−0.10	—

n, number of samples; *M*, mean; *SD*, standard deviation; CSTP, communication skills training program;
Effect size, *Cohen's d* was calculated by subtracting the pre-CSTP score from the post-CSTP score, and then dividing the mean difference by the unbiased standard deviation. Then, the effect size was graded by the following criteria.
Effect size criteria: small | *d* | >0.20; medium | *d* | >0.50; large | *d* | >0.80.

of CSAplus, but the effect size was graded as small (Table 5).

There were 95 subjects in the CSAplus "suggestions/requests" improved group and 114 in the non-improved group. Results of analysis of covariance showed that compared to the non-improved group, the improved group had significantly greater degrees of improvement in "supervisor/manager expectations & actions promoting safety" and "non-punitive response to errors" among the 12 factors in the Patient Safety Culture Scale, but the effect size was graded as small (Table 6).

Discussion

We conducted a 7-month CS training program based on coaching theory by enrolling university hospital staff who were in leadership positions as trainees, and evaluated the outcome using CS assessment by others as well as the Patient Safety Culture Scale scored by the collaborators before and after the training. The following results were obtained. (1) Significant improvement was observed in CS assessment by others although the effect size was small, while no difference was observed in the Patient Safety Culture Scale. (2) The CS for "suggestions/requests" was related to improvement in the Patient Safety Culture Scale. In the group with improved "suggestions/requests" skill, the scores for "supervisor/manager expectations & actions promoting safety" and "non-punitive response to errors" in the Patient Safety Culture Scale were improved to a greater extent compared to the non-improved group, although the effect size was small. This is the first report indicating the relationship between CS and patient safety culture revealed by conducting health care team training with participation by approximately one-sixth of the full-time university hospital staff. The novelty of this study is that our analysis proposes the CS category that contributes to improvement of patient safety culture and the patient safety culture factors that are affected by the CS category. However, since the results were obtained from a specific training program implemented in one institution, further studies are required to examine whether the CS category and patient safety culture factors identified in this study also apply to other clinical environments or training programs.

Some possible reasons why the overall score of the Patient Safety Culture Scale did not change are that the scale was not dependent only on communication, and that the trainees' CS improvement was not sufficient. In fact, the effect size of CS assessment by others was small. In previous studies on CS training [10, 12–14], many subjects also showed no improvement in CS assessment by others. There are individual differences in the attributes of transferring learning contents to actions, and the mechanism linking "acquiring knowledge" to "putting it into practice" needs to be studied. In the present study, improvement of the "suggestions/requests" skill, which was included in the "influence" module of the CSTP, was shown to be related to the improvement

Table 5. Comparison of coaching skills improvement in patient safety culture (overall) improved group and non-improved group.

	Degree of improvement of coaching skills (post-CSTP − pre-CSTP)						Parallel test of regression lines		Significance of regression		Comparison of coaching skills improvement between patient safety culture (overall) improved group and non-improved group			
	Patient safety culture (overall) improved group			Patient safety culture (overall) non-improved group										
	n	*M*	*SD*	*n*	*M*	*SD*	*F*	*p*	*t*	*p*	*F*	*p*	partial η^2	Effect size criteria
CSAplus, overall score	106	0.30	0.76	103	0.28	0.78	0.25	.614	−6.75	<.001	0.29	.590	.001	—
Observations	106	0.29	1.09	103	0.32	1.19	0.05	.816	−10.13	<.001	0.52	.472	.003	—
Tailor-made treatment	106	0.24	1.08	103	0.27	1.05	0.53	.469	−8.52	<.001	0.27	.606	.001	—
Coaching flow	106	0.15	0.91	103	−0.03	1.08	0.78	.377	−9.69	<.001	1.39	.239	.007	—
Listening	106	0.28	1.16	103	−0.03	1.00	0.25	.616	−7.67	<.001	3.03	.083	.014	Small
Non-verbal	106	0.18	1.07	103	0.11	0.78	3.13	.078	−9.03	<.001	0.45	.504	.002	—
Follow-up	106	0.68	1.48	103	0.83	1.59	0.05	.816	−11.86	<.001	0.13	.720	.001	—
Acknowledgement	106	−0.06	1.03	103	0.16	0.88	0.77	.382	−6.74	<.001	1.59	.208	.008	—
Questions	106	0.47	0.92	103	0.45	1.16	6.27	.013	—	—	—	—	—	—
Suggestions/requests	106	0.34	1.04	103	0.06	1.12	0.06	.809	−9.93	<.001	4.14	.043	.020	Small
Feedback	106	0.37	1.03	103	0.48	1.26	3.37	.068	−10.91	<.001	0.28	.596	.001	—
Supporting others	106	0.32	1.12	103	0.29	1.20	1.07	.302	−9.14	<.001	0.37	.545	.002	—
Setting goals	106	0.33	1.14	103	0.38	1.11	0.35	.555	−8.10	<.001	0.01	.932	.000	—

n, number of samples; *M*, mean; *SD*, standard deviation; CSTP, communication skills training program;
Effect size criteria: small: partial eta squared >0.01; medium: partial eta squared >0.06; large: partial eta squared >0.14.
Parallel test of regression lines: presence or absence of interaction between patient safety culture (overall) improvement and pre-CSTP coaching skills. Parallel lines were not observed for "questions."
Significance of regression: presence or absence of regression between pre-CSTP coaching skills and coaching skills improvement. All items showing parallel regression lines were significant.

Table 6. Comparison of degree of patient safety culture improvement in the CSAplus (suggestions/requests) improved group and non-improved group.

	Degree of improvement of patient safety culture (post-CSTP − pre-CSTP)						Parallel test of regression lines		Significance of regression		Comparison of patient safety improvement between CSAplus (suggestions/requests) improved group and non-improved group			
	CSAplus (suggestions/requests) improved group			CSAplus (suggestions/requests) non-improved group										
	n	*M*	*SD*	*n*	*M*	*SD*	*F*	*p*	*t*	*p*	*F*	*p*	partial η^2	Effect size criteria
Patient safety culture: overall score	95	0.50	9.61	114	−1.23	12.66	1.45	.229	−4.49	<.001	1.26	.263	.006	−
Frequency of event reporting	95	−0.07	2.47	114	−0.15	2.90	1.64	.201	−8.52	<.001	0.14	.706	.001	−
Overall perception of safety	95	0.19	1.77	114	0.06	2.01	1.17	.281	−7.07	<.001	0.14	.712	.001	−
Supervisor/manager expectations & actions promoting safety	95	0.33	1.78	114	−0.33	1.98	0.33	.569	−6.79	<.001	5.78	.017	.027	Small
Organizational learning/ continuous improvement	95	0.25	1.62	114	0.18	1.75	0.84	.361	−7.60	<.001	0.21	.647	.001	−
Teamwork within hospital units	95	−0.03	2.23	114	−0.26	2.55	0.28	.596	−6.89	<.001	0.22	.642	.001	−
Communication openness	95	−0.19	1.65	114	−0.15	1.94	1.59	.209	−9.03	<.001	0.01	.918	.000	−
Feedback and communication about errors	95	0.27	1.93	114	−0.13	2.03	0.64	.425	−7.84	<.001	1.67	.198	.008	−
Non-punitive response to errors	95	0.37	1.69	114	−0.13	1.84	0.50	.478	−7.18	<.001	4.39	.037	.021	Small
Staffing	95	−0.16	2.06	114	0.06	2.40	1.84	.177	−8.14	<.001	0.04	.836	.000	−
Hospital management support for patient safety	95	0.06	1.67	114	−0.01	1.62	0.80	.372	−6.14	<.001	0.43	.514	.002	−
Teamwork across hospital units	95	−0.24	1.84	114	−0.24	2.32	2.99	.086	−5.69	<.001	0.04	.847	.000	−
Hospital handoffs & transition	95	−0.27	1.81	114	−0.14	2.22	1.87	.173	−7.16	<.001	0.12	.726	.001	−

n, number of samples; *M*, mean; *SD*, standard deviation; CSTP, communication skills training program;
Effect size criteria : small: partial eta squared >0.01; medium: partial eta squared >0.06; large: partial eta squared >0.14.
Parallel test of regression lines: presence or absence of interaction between CSAplus (suggestions/requests) improvement and pre-CSTP patient safety culture score. Parallel regression lines were observed in all items.
Significance of regression: presence or absence of regression between pre-CSTP patient safety culture score and patient safety culture improvement. All items were significant.

of "supervisor/manager expectations & actions promoting safety" and "non-punitive response to errors" in the Patient Safety Culture Scale. These two are unit-level factors, and they appear to be closely related to daily communication with the manager/ supervisor's subordinates, in comparison with the other unit-level factors of "communication openness," "feedback and communication after errors," "organizational learning/continuous improvement," and "teamwork within hospital units," which are more strongly associated with communication among colleagues, and "staffing," which is an external constraint. The results of this study suggest that improving the skill of "suggestions/requests" is related to the improvement of factors in the Patient Safety Culture Scale, which are related to the leader's routine communication. However, this finding does not mean that other skills are not necessary. This finding should be interpreted as that "suggestions/requests" skill contributes to improvement of patient safety culture upon application of basic skills including "listening," "acknowledgment," and "questions" [15]. In fact, the score for "listening" in CSAplus tended to be higher in the patient safety culture improved group than in the non-improved group. In the future, the CSTP should be improved considering the relationship between clinical safety culture and CS.

The CSTP differs from conventional health care team training in two aspects. First, by practicing coaching on the collaborators, the trainees fostered a culture of free communication in their own workplace, and facilitated their role as a leader including patient safety. Second, learning coaches were available to assist trainees to initiate and continue actions towards achieving their goals.

This research has the following limitations. First, CSAplus used in this study has not been standardized for CS assessment. Since there is no standardized scale for measuring coaching skills, CSAplus was used considering its consistency with the CSTP and because it was used in multiple previous studies [10, 12−14]. Second, the study was conducted at a single institution, and not all the managers/supervisors participated in the training program. Third, the

contents and schedule of coaching interviews with the collaborators were not controlled, but were decided by the trainees. Fourth, it was not possible to show the results of objective safety indices such as the frequency of medical malpractice. Fifth, the long-term training effect after the completion of CSTP was not evaluated. Further studies will be continued to improve and validate the CSTP and the assessment methods, with the goal of contributing to the improvement of patient safety culture.

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Appendix 1. The CSAplus used for the assessment of coaching skill.

Category	Contents of question
Observations	The subject notices my growth and results and communicates this to me.
	The subject understands my way of thinking and values.
Tailor-made treatment	The subject matches his/her way of speaking and praise to my personality and characteristics.
	The subject draws out and develops my strengths and field of expertise.
Coaching flow	The subject finishes our conversations with definite conclusions.
	The subject doesn't go off topic, but instead keeps the goal in mind and works on having a productive conversation.
Listening	The subject doesn't interrupt or end conversations early, but instead listens to me until I finish.
	The subject doesn't jump to conclusions or anticipate what I am saying, but instead listens calmly to what I have to say.
Non-verbal	The subject is easy to talk to and approach for advice.
	The subject uses responsive gestures and sounds when having a conversation with me.
Follow up	The subject sets up regular times and places to speak to me.
	The subject speaks to me about my progress towards my goals.
Acknowledgement	The subject returns emails and telephone calls in a timely manner.
	The subject communicates his/her appreciation to me.
Questions	The subject asks about what I am thinking before communicating his/her own thoughts.
	The subject asks questions to help me come to my own realizations.
Suggestions/requests	The subject's proposals, requests and the contents of his/her assertions are clear and easy to understand.
	The subject makes proposals and requests that motivate me.
Feedback	The subject asks for feedback about his/her own behavior.
	The subject gives feedback to me about the progress of my goals.
Supporting others	The subject helps to facilitate me in reaching my goals.
	The subject supports my success and growth.
Setting goals	The subject and I share the same goals as the organization.
	The subject understands the goals that I am aiming for.

Note:

Appendix 2. Hospital Survey on Patient Safety Culture (Cited from Reference 8 with modification of the order of factors)

Factor		Contents of question
Unit level	Communication openness	Staff will freely speak up if they see something that may negatively affect patient care.
		Staff feel free to question the decisions or actions of those with more authority.
		Staff are afraid to ask questions when something does not seem right.
	Feedback and communication about errors	We are given feedback about changes put into place based on event reports.
		We are informed about errors that happen in this unit.
		In this unit, we discuss ways to prevent errors from happening again.
	Non-punitive response to errors	Staff feel like their mistakes are held against them.
		When an event is reported, it feels like the person, not the problem, is being written up.
		Staff worry that mistakes they make are kept in their personnel file.
	Organizational learning/ continuous improvement	We are actively doing things to improve patient safety.
		Mistakes have led to positive changes here.
		After we make changes to improve patient safety, we evaluate their effectiveness.
	Staffing	We have enough staff to handle the workload.
		Staff in this unit work longer hours than what is best for patient care.
		We use more agency/temporary staff than what is best for patient care.
		We work in “crisis mode,” trying to do too much, too quickly.
	Supervisor/ manager expectations & actions promoting safety	My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures.
		My supervisor/manager seriously considers staff suggestions for improving patient safety.
		Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts.
		My supervisor/manager overlooks patient safety problems that happen over and over again.
	Teamwork within hospital units	People support one another in this unit.
		When a lot of work needs to be done quickly, we work together as a team to get the work done.
		In this unit, people treat each other with respect.
		When one area in this unit gets really busy, others help out.
Hospital level	Hospitalhandoffs & transition	Things “fall between the cracks” when transferring patients from one unit to another.
		Important patient care information is often lost during shift changes.
		Problems often occur in the exchange of information across hospital units.
		Shift changes are problematic for patients in this hospital.
	Hospital management support for patient safety	Hospital management provides a work climate that promotes patient safety.
		The actions of hospital management show that patient safety is a top priority.
		Hospital management seems interested in patient safety only after an adverse event happens.
	Teamwork across hospital units	Hospital units do not coordinate well with each other.
		There is good cooperation among hospital units that need to work together.
		It is often unpleasant to work with staff from other hospital units.
		Hospital units work well together to provide the best care for patients.
Outcome	Frequency of event reporting	When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?
		When a mistake is made, but has no potential to harm the patient, how often is this reported?
		When a mistake is made that could harm the patient, but does not, how often is this reported?
	Overall perception of safety	It is just by chance that more serious mistakes don’t happen around here.
		Patient safety is never sacrificed to get more work done.
		We have patient safety problems in this unit.
		Our procedures and systems are good at preventing errors from happening.