Characteristics of awareness and behavior of medical staff for prevention of falling accidents among inpatients

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Abstract
The purpose of this study is to clarify the characteristics of awareness and behavior for falling accident prevention according to medical profession. We used a questionnaire called “Self-Evaluation of Awareness and Behavior for Falling Accident Prevention,” which was originally designed for nurses. In October and November 2016, the questionnaire was administered to 1,670 medical staff (nurses, doctors, lab technicians, nursing assistants, radiological technicians, pharmacists, physical therapists, nutritionists, and occupational therapists, among others) at a hospital in Japan, using a 5-step scale and a not applicable (N/A) option. Valid responses were obtained from 923 (55.3%) participants, and all seven factors extracted by factor analysis had Cronbach’s α coefficients greater than 0.9. Using cluster analysis based on principal component analysis, four categories were identified. According to the results of the N/A χ² (chi-square) test question item and occupation, nurses answered N/A the least, followed by doctors, physical therapists, and occupational therapists. Nursing assistants’ awareness and behavior were both low, suggesting the necessity of education on preventing falling accidents. By applying the “Self-Evaluation of Awareness and Behavior for Falling Accident Prevention” to all medical staff, we succeeded in clarifying their characteristics of awareness and behavior for falling accident prevention.

Introduction
Falling accidents in hospitalized patients can lead to severe injury or even death. The Japan Council for Quality Health Care reported that, from 2010 to 2016, 2% of patients who had fallen during hospitalization died as a result, and 8% developed severe injuries. With the risk of fracture, which is especially high in the elderly, and the prediction of an increase in elderly hospitalization in Japan, falling accident prevention is becoming an increasingly important issue.

According to the Japan Council for Quality Health Care’s medical accident information, in 2015, 275 medical institutions had a total of 3,374 reported medical accidents. The accidents most frequently occurred during “care in medical treatment” (1,229, 36.4%) and “treatment/procedures” (1,018, 30.2%). Among the 1,229 accidents, 744 were “falling accidents” (60.5%), 398 occurred during “medical administration/conducts” (32%) and 23 were “mis-swallowing” (1.8%). In total, there were 3,485 multiple responses received for the causes of the accidents occurred during “care in...
The differences and characteristics of occupations are not concerned about falling. The assessment of many of the patients assessed as being at high risk focuses on the risk factors of nurses and other medical staff who surround and observe the patients, rather than focusing on the patients. The completed questionnaires were placed in collection bags at each workplace, and were then sealed and collected.

Kinoshita, an author of this thesis, created the SEABFAP in 2002. It is an evaluation sheet of the awareness and behavior of nurses on fall prevention. It has been reported that the SEABFAP was used in many hospitals by nurses, in order to study the awareness and behavior of nurses regarding fall prevention. However, there have been no reported cases where it was used by hospital medical staff other than nurses. As no assessment indicator that can assess/evaluate the characteristics of the awareness and behavior for falling accident prevention according to occupation has yet been reported, we decided to evaluate these characteristics by applying the SEABFAP to a wider range of medical staff. Although the content and number of items in the SEABFAP remained unchanged, the word “nurse” previously used in the items was changed to read “medical care provider” so that it applied to professions other than nursing.

Each question was answered from six choices, primarily using a scale of five possible answers, with an answer of 1 corresponding to fully understood/implemented, and an answer of 5 corresponding to not understood/implemented. The sixth option was “not applicable” (N/A), which basically means “not relevant to my job”. Furthermore, in order to verify the reliability of the questions, the extracted factors were further analyzed by Cronbach’s α formula. Apart from these, with the intention of clarifying the characteristics classified by job category, cluster analysis was performed using the principal component analysis score. Additionally, in order to clarify the differences in the answers, we performed the $\chi^2$ (chi-square) test and analysis of the adjusted
residuals of N/A by occupation.

**Results**

**Attributes of Respondents**

The questionnaire was distributed to 1,670 medical workers at Hospital A, 1,005 of whom responded. Eighty-two respondents who failed to answer all questions were excluded from the analysis. As a result, 923 responses were eligible, and the effective response rate was 55.3%.

The demographic details of the respondents were 594 nurses (response rate, 72.8%), 171 doctors (response rate, 30.5%), 37 laboratory technicians (response rate, 49%), 31 nursing assistants (response rate, 53%), 17 radiological technicians (response rate, 41%), 12 physical therapists (response rate, 63.2%), seven nutritionists (response rate, 78%), five occupational therapists (response rate, 100%), and 33 others (response rate 78.6%). The median amount of years of experience of the 923 subjects was 8 years, with a range of 0 to 40 years. The occupation with the most experience was lab technicians, with a median of 12.5 years and a range of 0 to 40 years. The occupation with the least experience was nursing assistants, with a median of 3 years and a range of 0 to 15 years (Table 1).

**Reliability of SEABFAP**

Seven factors were extracted as a result of a factor analysis (maximum likelihood with promax rotation) of SEABFAP. Cronbach’s α coefficients for each factor were determined as: Factor 1 - “Situational judgment and action for prevention”; Factor 2 - “Recognition of necessity for teamwork”; Factor 3 - “Recognition of necessity for decision-making”; Factor 4 - “Behavior as a team”; Factor 5 - “Recognition of communication necessary for falling prevention”; Factor 6 - “Improvement of the environment for falling prevention”; and Factor 7 - “Communication for falling prevention”. The Cronbach’s α coefficient of all subscales was greater than 0.9. (Table 2)

**Cluster analysis and distribution by occupation**

The principal component analysis of the SEABFAP question items extracted eight principal components. The first and second principal component factor loadings were 48.3% and 12.3%, respectively. The cumulative contribution rate was 60.6%. The internal structure of the data was sufficiently explained by these two components (Table 3). Therefore, these two components were employed as the X- and Y-axes in the present study. As shown in Fig. 1, the X-axis represents “Behavior for falling prevention”, the first principal component, and the Y-axis represents “Awareness for falling prevention”, the second principal component. From further principal component analysis, cluster analysis resulted in four clusters grouped by characteristics. The clusters were as follows: Group 1, respondents with “Low awareness and behavior”; Group 2, respondents with “Moderate awareness and behavior”; Group 3, respondents with “Moderate–high awareness and low behavior”; and Group 4, respondents with “Moderate awareness and high behavior” (Fig. 1).

Next, the most distributed cluster group for each occupation was as follows: Group 1 - nutritionists (42.9%), nursing assistants (41.9%); Group 2 - doctors (46.2%), physical therapists (58.6%), occupational therapists (80%); Group 3 - pharmacists (75%), nutritionists (42.9%), laboratory technicians (56.8%), radiological technicians (76.5%), and others (54.5%); and Group 4 - nurses (52.7%) (Table 4).

**N/A by each occupation**

For each question item and occupation, the ratio of those who responded N/A was examined using a chi-square test, and adjusted residuals were calculated. With an adjusted residual value greater than 1.96 and a P value of <0.05, a significant number of respondents answered that the question did not apply to them. Each of the seven factors revealed by a factor analysis is organized in Table 5.

The number of N/A responses by doctors was significantly high regarding two items in both Factors 1 and 7. Nurses rarely responded with N/A. A significant number of pharmacists and nutritionists responded with N/A to most items concerning behavior in Factors 1, 4, 6, and 7. Physical therapists responded with N/A to six items in Factor 1, and occupational therapists answered N/A for four Factor 1 items, three Factor 4 items, and one Factor 7 item. Nursing assistants answered N/A for seven Factor 1 items, all items in Factors 2, 3, 4, and 5, one Factor 6 item, and four Factor 7 items. It is also worth noting that lab technicians answered N/A for items in almost all Factors. Radiological technicians responded with N/A to all items in Factors 1, 4, and 7, one item in Factors 3 and 5, and two items in Factor 6. In the remaining occupations, an N/A response was significantly high in almost all of the factors (1, 3, 4, 6, and 7) (Table 5).
Table 1. Basic Attributes of Respondents by Occupation

| Attributes                  | All          | Doctor       | Nurse        | Pharmacist   | Nutritionist | Physical Therapist | Occupational Therapist | Nursing Assistant | Lab-technician | Radiological Technician | Other Note 1 |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------------|------------------------|-------------------|----------------|--------------------------|---------------|
| Recovery %                  | 55.3%        | 30.5%        | 72.8%        | 41%          | 78%          | 63.2%              | 100%                   | 53%               | 49%            | 38%                      | 78.6%         |
| Years of Experience         | Median (Range) | 8 (0,40) | 10 (0,36) | 9 (0,40) | 6 (0,36) | 5 (0,28) | 8 (0,10) | 3 (0,15) | 12.5 (0,40) | 11 (0,35) | 3 (0,17) |
| Gender*                     | Male         | 223 (24.2%) | 127 (74.3%) | 37 (6.2%) | 7 (43.8%) | 3 (42.9%) | 7 (58.3%) | 3 (60.0%) | 9 (24.3%) | 14 (82.4%) | 16 (48.5%) |
|                            | Female       | 683 (74.0%) | 37 (21.6%) | 548 (92.3%) | 9 (56.3%) | 4 (57.1%) | 5 (41.7%) | 2 (40.0%) | 31 (100%) | 28 (75.7%) | 2 (11.8%) | 17 (51.5%) |
| Job Position Note 2)       | Position 1   | 30 (3.3%) | 11 (6.4%) | 17 (2.9%) | 1 (6.3%) | | | | | | |
|                            | Position 2   | 39 (4.2%) | 9 (5.3%) | 29 (4.9%) | 1 (6.3%) | | | | | | |
|                            | Position 3   | 197 (21.3%) | 16 (9.4%) | 152 (25.6%) | 3 (18.8%) | 1 (14.3%) | 1 (8.3%) | | | 14 (37.8%) | 5 (29.4%) | 5 (15.2%) |
|                            | Position 4   | 217 (23.0%) | 86 (50.3%) | 77 (13.0%) | 2 (12.5%) | 2 (28.6%) | 1 (8.3%) | 2 (40.0%) | | | 1 (2.7%) | 3 (17.6%) | 1 (3.0%) |
|                            | Position 5   | 482 (52.2%) | 49 (28.7%) | 319 (53.7%) | 9 (56.3%) | 4 (57.1%) | 10 (83.3%) | 3 (60.0%) | 31 (100%) | 22 (59.5%) | 8 (47.1%) | 27 (81.8%) |
| Main places of contact with | Hospital Ward | 485 (52.5%) | 106 (62.0%) | 327 (55.1%) | 7 (43.8%) | 5 (71.4%) | | 1 (20.0%) | 26 (83.9%) | 1 (2.7%) | | 12 (36.4%) |
| patients                   | Outpatient   | 222 (24.1%) | 52 (30.4%) | 159 (26.8%) | 4 (25.0%) | | | | | | | |
|                            | ICU, NICU    | 51 (5.5%) | | 42 (7.1%) | | | | | | | | 8 (24.2%) |
|                            | Operating Room | 60 (6.5%) | 10 (5.8%) | 45 (7.6%) | | | | | | | | 4 (12.1%) |
|                            | Treatment Room | 31 (3.4%) | 2 (1.2%) | 6 (1.0%) | | | | | | | | 3 (13.6%) | 2 (6.1%) |
|                            | Laboratory   | 62 (6.7%) | 1 (0.6%) | 10 (1.7%) | | | | | | | | 35 (94.6%) | 13 (76.5%) | 3 (9.1%) |
|                            | Other        | 12 (1.3%) | | 5 (0.8%) | 5 (31.3%) | | | | | | | | 2 (6.1%) |

Actual Number (%)
*N will be different because there are missing values
Note 1) Others include the following occupations (actual number): clinical psychologist (8), clinical engineer (16), childcare worker (1), dental hygienist (1), speech therapist (1), and ward clerk (6)
Note 2) Position 1 includes professor, general manager, assistant manager, and chief resident. Position 2 includes associate professor, assistant manager, and senior resident. Position 3 includes lecturer, director, and section chief. Position 4 includes assistant professor, assistant, and assistant director. Position 5 includes general technician staff, part-time, adjunct, intern, and graduate student.
Table 2. “Falling Accident Prevention Awareness and Behavior Self-evaluation” Factor Structure and Cronbach’s α Coefficients

| Question Items | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 |
|----------------|---------|---------|---------|---------|---------|---------|---------|
| 1              | 0.194   | 0.007   | -0.009  | -0.032  | -0.032  | -0.007  |         |
| 3              | 0.916   | 0.0             | -0.089  | -0.105  | 0.058   | -0.016  | 0.092   |
| 2              | 0.915   | 0.0             | 0.022   | 0.106   | 0.066   | -0.126  | 0.008   |
| 53             | 0.890   | -0.039          | -0.053  | 0.011   | 0.043   | -0.196  | -0.005  |
| 51             | 0.889   | -0.02          | 0.005   | -0.072  | 0.033   | -0.075  | 0.054   |
| 58             | 0.788   | 0.008          | -0.002  | -0.082  | 0.038   | 0.043   | 0.123   |
| 1              | 0.727   | 0.071          | 0.023   | -0.119  | -0.005  | 0.385   | 0.076   |
| 1              | 0.681   | -0.054         | -0.014  | 0.118   | -0.032  | 0.243   | -0.063  |
| 55             | 0.671   | 0.044          | -0.036  | 0.027   | 0.03    | 0.101   | 0.154   |
| 52             | 0.529   | 0.036          | 0.021   | 0.006   | 0.006   | 0.244   | 0.102   |
| 56             | 0.532   | 0.122          | 0.009   | -0.029  | -0.116  | 0.054   | 0.237   |
| 55             | 0.485   | -0.059         | 0.103   | 0.215   | -0.009  | 0.325   | -0.217  |
| 54             | 0.468   | -0.04         | 0.049   | 0.155   | 0.032   | 0.401   | -0.166  |
| 51             | 0.445   | 0.205          | 0.177   | -0.121  | -0.225  | 0.255   | -0.013  |
| 48             | 0.371   | -0.05         | 0.072   | 0.306   | -0.029  | 0.111   | 0.266   |

Factor 1: Situation judgment and action for prevention (15 questions) (Cronbach’s α coefficient 0.959)

Factor 2: Knowledge for post-fall behavior (12 questions) (Cronbach’s α coefficient 0.947)

Factor 3: Recognition for necessary decision-making (9 questions) (Cronbach’s α coefficient 0.947)

Factor 4: Behavioral method (8 questions) (Cronbach’s α coefficient 0.955)

Factor 5: Communication for falling prevention (6 questions) (Cronbach’s α coefficient 0.901)

Factor 6: Improvement of the environment for prevention (5 questions) (Cronbach’s α coefficient 0.903)

Factor 7: Communication for falling prevention (6 questions) (Cronbach’s α coefficient 0.938)

Factor extraction method: maximum likelihood

Rotation method: Kaiser–Promax method with normalization

Kaiser–Meyer–Olkin measure of sample adequacy: 0.977
Table 3. Principal component analysis

| No | Question Items                                                                 | Principal component |
|----|-----------------------------------------------------------------------------|---------------------|
| 29 | When dangerous behavior is predicted, I hold conferences immediately and countermeasures are planned | -0.383             |
| 28 | I review my own behavior on the team when there is a falling accident in a team context | -0.382             |
| 31 | The team staff and I are taking steps from the same viewpoint to develop a plan for fall prevention | -0.382             |
| 41 | If I notice falling risk factors in a patient, I quickly note it in the record | -0.382             |
| 50 | I individually determine the position of the bed and wheelchair for patients who are unstable when standing and must attempt to move on their own | -0.382             |
| 38 | When I am the leader, I convey specific assistance methods to staff | -0.382             |
| 44 | When accidents or incidents occur, I explore the causes together, without placing blame, and develop | -0.382             |
| 24 | I conference to share patient information | -0.382             |
| 25 | I give guidance to other medical professionals as to the underlying risks of actions | -0.382             |
| 49 | I build a wall with futons, etc. to prevent falling | -0.382             |
| 52 | I try to listen carefully to casual remarks of the patient and family and be aware of their actions | -0.382             |
| 17 | I check to make sure the patient is properly using a wheelchair, cane, or adaptive equipment | -0.382             |
| 11 | I observe the behavior of patients with nighttime restlessness while caring for other patients | -0.382             |
| 51 | I check if water or spilled food has fallen on the floor | -0.382             |
| 26 | I care about how staff is engaging with patients at high risk | -0.382             |
| 14 | I proactively gather information on the degree of paralysis/disability of patients who have just been transferred | -0.382             |
| 21 | I recognize it is necessary to ask other medical staff to step in when leaving the patient’s side | -0.382             |
| 57 | I create an environment that will not be dangerous even if patients move on their own | -0.382             |
| 59 | I understand that older people and patients with higher-order dysfunction are prone to falls | -0.382             |
| 8 | I understand that there is a danger of falling for patients who use nighttime sleeping medicine | -0.382             |
| 2 | I know there is a need for predicting the desire of the patient and proactive assistance | -0.382             |
| 6 | I understand that patients who have begun to expand ADL are particularly at risk for falling | -0.382             |
| 32 | I understand it is necessary for information related to patients’ dangerous behavior to be shared among medical staff | -0.382             |
| 36 | I recognize that sharing information on patients who are high risk of falling will lead to the prevention of future falls | -0.382             |
| 47 | I recognize it is important to confirm if everything is okay, especially when in a hurry | -0.382             |
| 27 | If there is a fall, I investigate the cause each time, discuss it, and make and evaluate countermeasures | -0.382             |
| 15 | I quickly respond to nurse calls of patients who are prone to fall | -0.382             |
| 41 | If I notice falling risk factors in a patient, I quickly note it in the record | -0.382             |
| 31 | The team staff and I are taking steps from the same viewpoint to develop a plan for fall prevention | -0.382             |
| 28 | I review my own behavior on the team when there is a falling accident in a team context | -0.382             |
| 22 | I understand the importance of discussing countermeasures towards accident prevention for each patient | -0.382             |
| 9 | I understand that patients who have begun to expand ADL are particularly at risk for falling | -0.382             |
| 3 | I understand the necessity of looking at why a situation happened when a fall occurs | -0.382             |
| 6 | I understand that patients who have begun to expand ADL are particularly at risk for falling | -0.382             |
| 8 | I understand that there is a danger of falling for patients who use nighttime sleeping medicine | -0.382             |
| 2 | I know there is a need for predicting the desire of the patient and proactive assistance | -0.382             |

Note: Coefficients extracted to the same component are shaded.
Table 4. Proportion of Cluster Numbers by Group and Occupation

| Cluster Groups          | Group 1 | Group 2 | Group 3 | Group 4 |
|-------------------------|---------|---------|---------|---------|
| Total Number            | 70      | 316     | 174     | 363     |
| %                       | 7.6%    | 34.2%   | 18.9%   | 39.3%   |

Note: Shaded areas with the most occupation.
Table 5. “Question not applicable” Adjusted Residual Factor by and Occupation

| No | Question Items | Doctor | Nurse | Pharmacist | Nutritiologist | Phys. Therapist | Occup. Therapist | Nurse Assistant | Lab. technician | Radiological Tech. | Other |
|----|----------------|--------|-------|------------|----------------|----------------|-----------------|----------------|---------------|------------------|-------|
|    |                |        |       |            |                |                |                 |                |               |                  |       |
| 1.0 | I understand that patients just hospitalized are prone to falling | 1.0 | 2.7 | 3.1 | 6.8 | 2.8 | 2.0 | 6.1 | 4.7 | 7.6 | 6.0 |
| 2.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 2.0 | 2.7 | 2.8 | 2.3 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |
| 3.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 3.0 | 4.3 | 4.5 | 4.0 | 3.4 | 3.6 | 3.7 | 3.7 | 3.7 | 3.7 |
| 4.0 | I understand that excited patients, or patients who are more restless than usual, tend to have a higher chance of falling | 4.0 | 5.1 | 5.1 | 4.6 | 4.0 | 4.2 | 4.3 | 4.3 | 4.3 | 4.3 |
| 5.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 5.0 | 5.2 | 5.3 | 4.8 | 4.2 | 4.4 | 4.5 | 4.5 | 4.5 | 4.5 |
| 6.0 | I understand that patients with foreseeable risky behavior in the bed and wheelchair for patients who are unable when standing and just moving to move on their own | 6.0 | 6.7 | 6.7 | 6.2 | 5.6 | 5.8 | 5.9 | 5.9 | 5.9 | 5.9 |
| 7.0 | I understand that patients who are more at risk of falling will lead to the prevention of falling accidents | 7.0 | 7.7 | 7.7 | 7.2 | 6.6 | 6.8 | 6.9 | 6.9 | 6.9 | 6.9 |
| 8.0 | I understand that people and patients with higher-order dysfunction are prone to falls | 8.0 | 8.7 | 8.7 | 8.2 | 7.6 | 7.8 | 7.9 | 7.9 | 7.9 | 7.9 |
| 9.0 | I understand that there is a danger of falling for patients who use night-time sleeping medicine | 9.0 | 9.6 | 9.6 | 9.1 | 8.5 | 8.7 | 8.8 | 8.8 | 8.8 | 8.8 |
| 10.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 10.0 | 9.3 | 9.3 | 8.8 | 8.2 | 8.4 | 8.5 | 8.5 | 8.5 | 8.5 |
| 11.0 | I understand that people with malnutrition at night have an increased risk of falling | 11.0 | 8.5 | 8.5 | 8.0 | 7.4 | 7.6 | 7.7 | 7.7 | 7.7 | 7.7 |
| 12.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 12.0 | 7.2 | 7.2 | 6.7 | 6.1 | 6.3 | 6.4 | 6.4 | 6.4 | 6.4 |
| 13.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 13.0 | 6.3 | 6.3 | 5.8 | 5.2 | 5.4 | 5.5 | 5.5 | 5.5 | 5.5 |
| 14.0 | I understand that patients just hospitalized are prone to falling down | 14.0 | 5.5 | 5.5 | 5.0 | 4.4 | 4.6 | 4.7 | 4.7 | 4.7 | 4.7 |
| 15.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 15.0 | 4.5 | 4.5 | 3.9 | 3.3 | 3.4 | 3.5 | 3.5 | 3.5 | 3.5 |
| 16.0 | I understand that patients with higher-order dysfunction are prone to falls | 16.0 | 3.3 | 3.3 | 2.7 | 2.1 | 2.2 | 2.3 | 2.3 | 2.3 | 2.3 |
| 17.0 | I understand that there is a danger of falling for patients who use night-time sleeping medicine | 17.0 | 2.1 | 2.1 | 1.5 | 1.0 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 |
| 18.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 18.0 | 1.0 | 1.0 | 0.4 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| 19.0 | I understand that people with malnutrition at night have an increased risk of falling | 19.0 | 0.0 | 0.0 | -0.3 | -0.7 | -0.8 | -0.9 | -0.9 | -0.9 | -0.9 |
| 20.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 20.0 | -0.3 | -0.3 | -0.7 | -1.1 | -1.2 | -1.3 | -1.3 | -1.3 | -1.3 |
| 21.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 21.0 | -1.2 | -1.2 | -1.6 | -2.0 | -2.1 | -2.2 | -2.2 | -2.2 | -2.2 |
| 22.0 | I understand that patients just hospitalized are prone to falling down | 22.0 | -2.0 | -2.0 | -2.4 | -2.8 | -2.9 | -3.0 | -3.0 | -3.0 | -3.0 |
| 23.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 23.0 | -2.7 | -2.7 | -3.1 | -3.5 | -3.6 | -3.7 | -3.7 | -3.7 | -3.7 |
| 24.0 | I understand that people with malnutrition at night have an increased risk of falling | 24.0 | -3.4 | -3.4 | -3.8 | -4.2 | -4.3 | -4.4 | -4.4 | -4.4 | -4.4 |
| 25.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 25.0 | -4.1 | -4.1 | -4.5 | -4.9 | -5.0 | -5.1 | -5.1 | -5.1 | -5.1 |
| 26.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 26.0 | -4.8 | -4.8 | -5.2 | -5.6 | -5.7 | -5.8 | -5.8 | -5.8 | -5.8 |
| 27.0 | I understand that patients just hospitalized are prone to falling down | 27.0 | -5.5 | -5.5 | -5.9 | -6.3 | -6.4 | -6.5 | -6.5 | -6.5 | -6.5 |
| 28.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 28.0 | -6.2 | -6.2 | -6.6 | -7.0 | -7.1 | -7.2 | -7.2 | -7.2 | -7.2 |
| 29.0 | I understand that people with malnutrition at night have an increased risk of falling | 29.0 | -6.9 | -6.9 | -7.3 | -7.7 | -7.8 | -7.9 | -7.9 | -7.9 | -7.9 |
| 30.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 30.0 | -7.6 | -7.6 | -8.0 | -8.4 | -8.5 | -8.6 | -8.6 | -8.6 | -8.6 |
| 31.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 31.0 | -8.3 | -8.3 | -8.7 | -9.1 | -9.2 | -9.3 | -9.3 | -9.3 | -9.3 |
| 32.0 | I understand that patients just hospitalized are prone to falling down | 32.0 | -9.0 | -9.0 | -9.4 | -9.8 | -9.9 | -10.0 | -10.0 | -10.0 | -10.0 |
| 33.0 | I understand that patients who have begun to expand ADL are particularly at risk for falling | 33.0 | -9.7 | -9.7 | -10.1 | -10.5 | -10.6 | -10.7 | -10.7 | -10.7 | -10.7 |
| 34.0 | I understand that people with malnutrition at night have an increased risk of falling | 34.0 | -10.4 | -10.4 | -10.8 | -11.2 | -11.3 | -11.4 | -11.4 | -11.4 | -11.4 |
| 35.0 | I understand that reflection of the situation at the time of falling leads to accident prevention | 35.0 | -11.1 | -11.1 | -11.5 | -11.9 | -12.0 | -12.1 | -12.1 | -12.1 | -12.1 |
| 36.0 | I understand the necessity of looking at why a situation happened when a fall occurs | 36.0 | -11.8 | -11.8 | -12.2 | -12.6 | -12.7 | -12.8 | -12.8 | -12.8 | -12.8 |

Note: The shaded portion shows that P < 0.05 with the adjusted residual + (plus) r > 1.96, which is significantly larger.
Discussion

In the SEABFAP used in the current study, seven factors were identified by factor analysis. In addition, the Cronbach’s $\alpha$ coefficient for measuring internal consistency was 0.9 or more, indicating high reliability. We confirmed that SEABFAP can be used as a questionnaire to investigate fall prevention awareness and behavior. Our cluster analysis showed that nurses were strongly associated with the prevention of patient falls, as indicated by the significant number of nurses that were categorized into Group 4. However, nursing assistants, who are similar to nursing professionals in their engagement in operations with patients, were mostly categorized into Group 1, which was exactly the opposite to the result of nurses. In particular, the adjusted residual values of the nursing assistants’ N/A responses resulted in a significant increase in all the items in Factors 2, 3, 4, and 5, compared to other occupations. Because nursing assistants also work closely with hospitalized patients, they are expected to prevent accidents such as falls; however, the nursing assistants who took part in the survey showed both low awareness and low behavior. We suspect that the cause of this is related to the differences in situations between nurses and nursing assistants. One such difference is years of experience. The median experience of the nurses in this survey was 9 years, whereas that of the nursing assistants was 3 years. Another difference is work contents. While nurses are required to relay patients’ information to those working the following shift, nursing assistants are not. The nursing assistants may also be unaware of the importance of their involvement in patient falling prevention. The SEABFAP results can be utilized to consider increasing the number of opportunities for nursing assistants to share relevant information.

The proportion of N/A responses from the laboratory technicians was high all of the factors. In particular, the proportions of their N/A responses in Factor 2, “Recognition of necessity for teamwork”, and Factor 5, “Recognition of communication necessary for falling prevention”, were significantly higher than the other occupations. Laboratory technicians have limited contact with patients, and their work style might not be as a teamwork style. Therefore, the way of working and the frequency of communication might have caused a high number of N/A responses in these two factors. We believe that laboratory technicians may need to enhance their awareness more than any other occupations.

The doctors, physical therapists, and occupational therapists who were classified into Group 2 responded with N/A to Question 15, “I quickly respond to nurse calls of patients who are prone to fall”, and Question 39, “I quickly report to my leader when behavior indicative of falls occurs”. The above-mentioned doctors, physical therapists, and occupational therapists considered that questions other than Questions 15 and 39 were applicable to them. The pharmacists, nutritionists, laboratory technicians, radiological technicians, and other medical professionals in Group 3 had limited contact with patients. Given the reports of accidents, such as falling from the examination bed or falling when moving to the examination bed\textsuperscript{16-18}, those in Group 3 require improved awareness and behavior related to teamwork, communication, and situational judgment. The Group 3 occupations had high awareness, but it is possible that they may not react to situations accordingly, or at all.

It will be necessary for us to consider and seek the best solution/practice for fall prevention by identifying the different characteristics among occupations. In a meta-analysis by Cameron et al., they stated that implementing multi-disciplinary teamwork, training and a team care plan for fall prevention showed good results\textsuperscript{21}. The essential factors in multi-disciplinary cooperation are communication and teamwork, and we need to develop approaches to improve multi-disciplinary communication, and cognitive ability and actions of the team, which was found to be the weakness of some professions. Furthermore, education of all medical staff for fall prevention is considered to be necessary to raise their awareness of participating in fall prevention without isolating awareness and behavior for fall prevention as nurse-specific.

Lastly, the SEABFAP is seen to have a lot of common parts/items with non-technical skills (NTS), which Flin et al.\textsuperscript{20} introduced in 2008. Flin defines the NTS in medical safety as “the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance”\textsuperscript{20}. Flin et al. introduced the conceptualization of NTS which influence safe and efficient operational performance. Some examples of NTS are “situation awareness”, “decision making”, “communication”, “teamwork”, “leadership”, “managing stress”, and “coping with fatigue”. Further, Flin et al. said that we know that human error cannot be eliminated, but efforts could be made to minimise, catch and mitigate errors by ensuring that people had appropriate NTS to cope with the risks.
and demands of their work. White et al. stated that NTS are an important element for decreasing human error, presenting an example of a grave accident that happened due to insufficient communication between the nurse and doctor. Oxford NO-TECHS II is an assessment tool of NTS, developed to evaluate teamwork such as that in the operating room. Furthermore, at WHO, a checklist based on NTS for operation rooms was developed and offered to countries. These suggest that for medical safety, acquisition of NTS and prevention of falling accidents by medical workers are current issues. For medical safety, acquisition of NTS and prevention of falling accidents by medical workers have become an issue. In order to acquire NTS appropriately, we consider that the use of SEABFAP is an option to identify NTS necessary for falling accident prevention among medical workers.

Conclusion
The results of the current study indicate that nurses showed high awareness and were able to perform the behavior necessary for preventing accidental falls in patients. Many nurses responded to all items as “relevant to my job”. Doctors, physical therapists, and occupational therapists showed an intermediate level of awareness and behavior necessary for prevention of accidental falls, except for duties that are related specifically to those of nurses. The awareness of pharmacists, nutritionists, laboratory technicians, radiological technicians, and other medical professions was assessed to be better than their actions. Many answered “not relevant to my job” to questions other than those in Factors 2 and 5. Furthermore, many of the laboratory technicians answered “not relevant to my job” to items in Factors 2 and 5 as well. Nursing assistants were evaluated to have low awareness and behavior regarding fall prevention. Also, many nursing assistants answered as “not relevant to my job” to most questions. By applying the SEABFAP to all medical workers, we revealed their characteristics of awareness and behavior for falling accident prevention.

Limitations
One limitation of this study is that it was conducted in one hospital only. In the future, further studies and analyses are needed in different types of hospitals, as the approach for fall prevention should vary depending on the characteristics of the in-patients.

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Conflict of Interest Disclosure
The authors declare no conflict of interest in this work.

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