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Physicians’ opinions regarding the criteria for resuming oral intake after aspiration pneumonia: A questionnaire survey and cluster analysis of hospitals across Japan

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Aim: To investigate the items that are considered by physicians when making decisions regarding the resumption of oral intake among patients with aspiration pneumonia who have undergone short-term fasting.

Methods: We surveyed 2490 Japanese hospitals that had internal medicine and respiratory medicine departments. We mailed questionnaires that contained 24 items related to oral intake resumption after aspiration pneumonia to the head of the department at each hospital. Cronbach statistics, principal component analysis and cluster analysis were used to analyze the results.

Results: We received responses from 350 hospitals; 89.7% of the respondents answered that they “Strongly agree” that “level of consciousness” is a useful criterion for resuming oral intake. Furthermore, 66%, 66%, 63.4%, 58.5% and 51% of the respondents answered that they “strongly agree” regarding the use of SpO2, the discretion of the attending physician, body temperature, swallowing function test results, mental state and respiratory rate, respectively. In the cluster analysis, level of consciousness, body temperature, SpO2, respiratory rate, mental state and the discretion of the attending physician belonged to the first cluster. The second cluster consisted of the patient’s request, the family’s request, the opinions of the medical staff and non-physician healthcare providers, and performance status.

Conclusions: Physicians consider several criteria during decision-making regarding oral intake resumption, which can be assigned to two clusters. Future studies are required to develop generalizable and objective criteria.

Keywords: aspiration pneumonia, consciousness, decision-making, fasting, resumption of oral intake.

Introduction

The number of deaths as a result of pneumonia has steadily increased with the aging of the Japanese population. According to recent statistics, pneumonia has overtaken cerebrovascular disease as the third leading cause of death, after malignant neoplasms and heart disease.1 Furthermore, the number of deaths as a result of pneumonia is predicted to continue to increase. Based on a Japanese report, most patients with aspiration pneumonia have central nervous system disease and/or dementia as their underlying diseases.2 In addition, older patients with aspiration pneumonitis often have reduced swallowing function.3 Furthermore, aspiration pneumonia is especially common among elderly patients with pneumonia; among patients who are hospitalized as a result of pneumonia, aspiration pneumonia is observed in one-third of patients who are aged in their 50s, in 50% of patients who are aged in their 60s and in 80.1% of patients who are aged ≥70 years.2 Another study has also reported that aspiration pneumonia is the strongest predictor of 30-day mortality among...
patients with pneumonia. Therefore, the treatment and prevention of aspiration pneumonia is very important for the management of pneumonia among elderly patients.

There are some reports about the usefulness of antibiotic selection, swallowing assessment, oral care, rehabilitation and pneumococcal vaccination in aspiration pneumonia patients. Combination therapy with olfactory stimulation (e.g. black pepper and capsaicin), stimulation of oral cavity pain with the resumption of meals and drugs (e.g. angiotensin-converting enzyme inhibitor and cilostazol) can reduce the recurrence of aspiration pneumonia after resuming meals.

Furthermore, our research has shown that 89.4% of medical institutions implemented short-term fasting while treating patients with aspiration pneumonia. However, the resumption of oral intake is critical to the quality of life and likelihood of recurrence among patients with aspiration pneumonia. Nevertheless, the factors that are used to determine the timing of oral intake resumption have not been discussed, and this timing is typically based on the attending clinician’s judgment and experience. Thus, clarifying the items that affect these decisions can help clinicians select an appropriate timing for effective oral intake resumption. Therefore, the current study aimed to identify the criteria that clinicians use to indicate resuming oral intake after short-term fasting during the treatment of aspiration pneumonia.

**Methods**

**Design and ethical considerations**

The present cross-sectional study evaluated questionnaire responses. The Research Ethics Committee and Epidemiological Ethics Committee of Jichi Medical University determined that an ethical review was unnecessary, and waived the requirement for written informed consent.

**Implementation**

In Japan, patients with aspiration pneumonia are typically treated by a pulmonologist or general internal physician. Therefore, we surveyed all Japanese hospitals that were listed as having both departments of internal medicine and respiratory medicine in a national directory of medical institutions. However, there is no list of all physicians in Japan; therefore, we collected one response from the head of the department at each hospital. Questionnaires regarding aspiration pneumonia treatment were sent to each hospital during September 2014, and were addressed to the physician who oversaw pneumonia treatment. We requested that the participants return the completed questionnaires to our research office by November 2014.

**Details of the questionnaire**

Question 1 used the following wording: “We would like to ask about items that are used for decision-making regarding oral intake resumption after aspiration pneumonia. Please indicate your degree of agreement for each of the 24 items that might influence this decision.” Responses were based on a four-point Likert scale, with the following options: “1. strongly agree”, “2. agree”, “3. disagree” and “4. strongly disagree”. The 24 items were selected based on our researchers’ use of these items to make clinical decisions regarding oral intake resumption after aspiration pneumonia (Table 1). The items included factors that are related to pneumonia severity, clinical stability, and the characteristics and wishes of the medical institution, the patient, and the patient’s family. Given the possibility that other items were used for decision-making, we also asked question 2: “Please describe any additional factors that are not listed in Table 1 and are used for decision-making regarding oral intake resumption after aspiration pneumonia.”

**Table 1** Items that are considered when making decisions regarding the resumption of oral intake after aspiration pneumonia

| Body temperature | Heart rate (pulse rate) | Respiratory rate |
|------------------|-------------------------|-----------------|
| Systolic blood pressure (or average blood pressure) | SpO₂ | Administration of oxygen |
| Mental state | Level of consciousness | Visual impression |
| Discretion of the attending physician (based on experience and feeling) | Patient’s request | Family’s request |
| Opinion of a non-physician healthcare provider (e.g. nurse, physical therapist or speech therapist) | Day of the week (weekday or weekend) | White blood cell count |
| C-reactive protein levels | Albumin levels | Pneumonia severity |
| Performance status (Eastern Cooperative Oncology Group performance status or impaired activities of daily living) | Period of fasting | Whether swallowing function has been evaluated |
| Adequate urination frequency (suggests that dehydration is absent) | Normal bowel movements | Dehydration |
**Data analysis**

We carried out reliability analysis regarding the responding facilities using Cronbach statistics and simple tabulation. We also calculated the capacity (number of beds) of each hospital, and compared the capacities of the facilities that did and did not respond to our questionnaire using the χ²-test. Furthermore, we carried out a simple tabulation of questions 1 and 2.

The major 14 items that influenced oral intake resumption (>80% of respondents indicated “strongly agree” or “agree”) were subjected to principal component analysis and hierarchical cluster analysis using the group average method. All analyses were carried out using SPSS software (version 22.0; SPSS, Chicago, IL, USA), and the level of statistical significance was set at <0.05.

**Results**

Questionnaires were sent to 2525 Japanese medical institutions, although questionnaires for 35 facilities were returned because they had incorrect addresses. We received responses from the heads of the departments at 350 of the 2490 facilities that presumably received the questionnaire (response rate: 14.1%). The reliability analysis of the questionnaire items showed a Cronbach α value of 0.859, which shows good consistency.

Table 2 shows the number of responding and non-responding hospitals, and the hospitals’ capacities. The responding hospitals had a significantly greater capacity, and >50% of the responding facilities had a capacity of >200 beds. Table 3 shows the characteristics of the responding hospitals. Among these facilities, 26.2% of the hospitals had a respiratory disease specialist and 64.0% of the hospitals had an infectious disease specialist. More than half of the responding facilities treated >100 patients with pneumonia each year.

Table 4 shows the questionnaire results for the items regarding oral intake resumption. The majority of the respondents answered “strongly agree” regarding the importance of the level of consciousness, SpO₂, the discretion of the attending physician, body temperature, whether swallowing function testing had been carried out, mental state and respiratory rate. In addition to those seven factors, >80% of the respondents answered either “strongly agree” or “agree” regarding the importance of visual impression, pneumonia severity, performance status, the opinion of a non-physician healthcare provider, administration of oxygen, the patient’s request and the

| Hospital capacity | Response rate | No. responding facilities | No. non-responding facilities | P-value |
|-------------------|--------------|---------------------------|-------------------------------|---------|
| <100 beds         | 8.3%         | 52 (14.9)                 | 576 (26.5)                    | <0.001  |
| 100–199 beds      | 10.6%        | 81 (23.1)                 | 672 (30.9)                    |         |
| 200–299 beds      | 15.1%        | 49 (14.0)                 | 276 (12.7)                    |         |
| 300–499 beds      | 17.6%        | 85 (24.3)                 | 399 (18.3)                    |         |
| ≥500 beds         | 24.8%        | 83 (23.7)                 | 252 (11.6)                    |         |

Number of facilities: 2525; number of responses, n (expressed as proportion, %). The χ²-test was used to compare the responding facilities and non-responding facilities.

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**Table 2** Hospital capacities and response rates

**Table 3** Characteristics of the 350 responding hospitals

- Specialists at the hospital
- Respiratory disease specialist(s) 224
- Infectious disease specialist(s) 92
- Certified by the Japanese Antimicrobial Chemotherapy Society† 74
- Regular physicians at the hospital ≤5 53
- 6–10 43
- 11–20 41
- 21–30 32
- 31–50 40
- 51–100 58
- ≥101 80
- No response 3
- Physicians who treat CAP and HCAP at the hospital ≤5 171
- 6–10 103
- ≥11 71
- No response 5
- Patients with pneumonia at the hospital each year ≤50 54
- 51–100 64
- 101–150 47
- 151–200 48
- ≥201 130
- No response 7

†Physicians who are certified by the Japanese Antimicrobial Chemotherapy Society are recognized as experts in the use of antimicrobial agents. CAP, community-acquired pneumonia; HCAP, healthcare-associated pneumonia.
family’s request. Therefore, we carried out principle component analysis of these 14 items (items for which >80% of the respondents answered “strongly agree” or “agree”; Table 5), which showed that the responses of “disagree” and “strongly disagree” greatly affected the principal component. The following factors were extracted as the first principal component: performance status, administration of oxygen, SpO2, the family’s request and the patient’s request. The following factors were extracted as the second principal component: pneumonia severity, visual impression and mental state.

A hierarchical cluster analysis was carried out for the 14 items that showed a response of “strongly agree” or “agree” from >80% of the respondents. Figure 1 shows a dendrogram that was created using the group average method. Figure 2 and Table 6 show the results of the hierarchical cluster analysis. The following factors were assigned to the first cluster: level of consciousness, body temperature, SpO2, respiratory rate, mental state, the discretion of the attending physician and whether swallowing function testing had been carried out. The following factors were assigned to the second cluster: the patient’s request, the family’s request, the opinion of a non-physician healthcare provider and performance status. The following factors were assigned to the third cluster: administration of oxygen and pneumonia severity. Visual impression was assigned to the fourth cluster. When we examined the responses to question 2, we found that the respondents had listed several additional factors that affected their decision to resume oral intake after aspiration pneumonia. These factors were sputum volume (7 respondents, 2.0% of all responses), oral hygiene status (5 respondents, 1.4%), a history of aspiration pneumonia (3 respondents, 0.9%), improvement in general appearance (2 respondents, 0.6%), being able to maintain a seated position (2 respondents, 0.6%), improvement in chest auscultation sounds (2 respondents, 0.6%), improvement in chest imaging findings (2 respondents, 0.6%), the original underlying disease (e.g. cerebrovascular disorders or malignant tumors; 2 respondents, 0.6%), patient’s ability to participate in a conversation (2 respondents, 0.6%) and circulation agonist use (1 respondent, 0.3%).

| Table 4  Degree of agreement for making decisions regarding oral intake resumption after aspiration pneumonia |
|----------------|----------------|----------------|----------------|----------------|----------------|
| Items | 1. Strongly agree | 2. Agree | 3. Disagree | 4. Strongly disagree | Not applicable |
| Level of consciousness | 314 (89.7) | 27 (7.7) | 5 (1.4) | 1 (0.3) | 3 (0.9) |
| SpO2 | 231 (66.0) | 105 (30.0) | 9 (2.6) | 2 (0.6) | 3 (0.9) |
| Discretion of the attending physician | 231 (66.0) | 103 (29.4) | 7 (2.0) | 3 (0.9) | 6 (1.7) |
| Body temperature | 222 (63.4) | 101 (28.9) | 20 (5.7) | 3 (0.9) | 4 (1.1) |
| Swallowing function evaluated | 203 (58.0) | 119 (34.0) | 19 (5.4) | 5 (1.4) | 4 (1.1) |
| Mental state | 194 (55.4) | 128 (36.6) | 21 (6.0) | 2 (0.6) | 5 (1.4) |
| Respiratory rate | 179 (51.1) | 137 (39.1) | 25 (7.1) | 5 (1.4) | 4 (1.1) |
| Visual impression | 169 (48.3) | 155 (44.3) | 13 (3.7) | 8 (2.3) | 5 (1.4) |
| Severity of pneumonia | 145 (41.4) | 148 (42.3) | 42 (12.0) | 12 (3.4) | 3 (0.9) |
| Performance status | 141 (40.2) | 155 (44.3) | 40 (11.4) | 8 (2.3) | 6 (1.7) |
| Opinion of a non-physician healthcare provider | 133 (38.0) | 182 (52.0) | 28 (8.0) | 3 (0.9) | 4 (1.1) |
| Administration of oxygen | 119 (34.0) | 162 (46.3) | 52 (14.9) | 13 (3.7) | 4 (1.1) |
| Patient’s request | 109 (31.1) | 188 (53.7) | 40 (11.4) | 8 (2.3) | 5 (1.4) |
| Family’s request | 99 (28.3) | 187 (53.4) | 54 (15.4) | 6 (1.7) | 4 (1.1) |
| White blood cell count | 92 (26.3) | 163 (46.6) | 71 (20.3) | 21 (6.0) | 3 (0.9) |
| Heart rate (pulse) | 89 (25.4) | 190 (54.3) | 57 (16.3) | 11 (3.1) | 3 (0.9) |
| C-reactive protein levels | 80 (22.9) | 172 (49.1) | 73 (20.9) | 22 (6.3) | 3 (0.9) |
| Day of the week (weekday vs weekend) | 77 (22.0) | 197 (56.3) | 53 (15.1) | 19 (5.4) | 4 (1.1) |
| Dehydration | 66 (18.9) | 176 (50.3) | 82 (23.4) | 22 (6.3) | 4 (1.1) |
| Systolic blood pressure (or average blood pressure) | 59 (16.9) | 165 (47.1) | 104 (29.7) | 18 (5.1) | 4 (1.1) |
| Fasting period | 55 (15.7) | 205 (58.6) | 67 (19.1) | 18 (5.1) | 5 (1.4) |
| Albumin levels | 38 (10.9) | 181 (51.7) | 98 (28.0) | 29 (8.3) | 4 (1.1) |
| Adequate urination frequency | 30 (8.6) | 136 (38.9) | 135 (38.6) | 45 (12.9) | 4 (1.1) |
| Normal bowel movements | 21 (6.0) | 150 (42.9) | 135 (38.6) | 40 (11.4) | 4 (1.1) |

A total of 350 facilities provided responses. The results are expressed as the number of responses (%). The shaded area highlights items that showed an agreement of >80%.
The age-related decline in brain function results in cognitive dysfunction (including dementia), dysphagia and impaired cough reflex. Thus, aspiration pneumonia is more common in elderly patients. Intervention at an early stage, including olfactory stimulation, drugs, stimulation of oral cavity pain upon resumption of meals and functional rehabilitation, for dysphagia and impaired cough reflex is necessary. In contrast, among these older adults, the restriction of food intake that is usually implemented during treatment for aspiration pneumonia might lead to a reduction in swallowing ability, recurrence of aspiration pneumonia and other harmful effects. For example, one study has reported that tentative nil per os treatment resulted in poorer daily nutritional intake for

| Table 5 Principal component analysis of the items with an agreement of >80% |
|---------------------------------|---------------------|---------------------|---------------------|---------------------|
| Items                           | First principal component | Second principal component | Third principal component | Forth principal component |
| Performance status              | 0.588                | -0.042              | -0.397              | 0.044              |
| Administration of oxygen       | 0.581                | 0.512               | 0.047               | 0.024              |
| SpO₂                            | 0.577                | 0.312               | 0.434               | -0.105             |
| Family’s request                | 0.528                | -0.238              | -0.458              | -0.439             |
| Patient’s request               | 0.523                | -0.449              | -0.234              | -0.384             |
| Body temperature                | 0.499                | 0.122               | 0.405               | -0.27              |
| Level of consciousness          | 0.44                 | -0.208              | 0.116               | 0.185              |
| Discretion of the attending physician | 0.418                | -0.122              | 0.035               | -0.185             |
| Opinion of non-physician healthcare provider | 0.385                | -0.32               | -0.089              | 0.035              |
| Severity of pneumonia           | 0.506                | 0.653               | -0.235              | 0.004              |
| Visual impression               | -0.456               | 0.458               | -0.312              | -0.055             |
| Mental state                    | 0.433                | -0.435              | 0.323               | 0.281              |
| Respiratory rate                | 0.497                | 0.029               | 0.532               | -0.037             |
| Swallowing function evaluated   | 0.387                | -0.216              | -0.115              | 0.51               |
| Contributing rate (%)           | 24.12                | 11.92               | 9.67                | 7.39               |

The value of each component is reported after readjustment.

Dendrogram created using the group average method

Figure 1 A dendrogram that was created using the group average method. Grouping by level.

Discussion

The age-related decline in brain function results in cognitive dysfunction (including dementia), dysphagia and impaired cough reflex. Thus, aspiration pneumonia is more common in elderly patients. Intervention at an early stage, including olfactory stimulation, drugs, stimulation of oral cavity pain upon resumption of meals and functional rehabilitation, for dysphagia and impaired cough reflex is necessary. In contrast, among these older adults, the restriction of food intake that is usually implemented during treatment for aspiration pneumonia might lead to a reduction in swallowing ability, recurrence of aspiration pneumonia and other harmful effects. For example, one study has reported that tentative nil per os treatment resulted in poorer daily nutritional intake for
1 week from the admission, a significantly longer treatment duration and a greater reduction in swallowing ability during the treatment, compared with the results that were observed in patients who started early oral intake. Therefore, it likely advisable to avoid or minimize fasting when treating older adults. Furthermore, Ebihara et al. reported that early meal resumption that was based on a comprehensive protocol prevented the recurrence of aspiration pneumonia after oral intake was resumed. However, the timing of oral intake resumption has not
been discussed, and it would be useful to have factors that could indicate the appropriate timing for oral intake resumption, as this approach might preserve swallowing function and prevent the recurrence of aspiration pneumonia. Therefore, the present study was designed to clarify the criteria that are used by Japanese physicians to indicate oral intake resumption among patients with aspiration pneumonia who have undergone short-term fasting. The present results showed that >80% of the respondents answered “strongly agree” or “agree” regarding the importance of 14 of the 24 items that we evaluated. Interestingly, five of the seven top items are associated with clinical stability in cases of pneumonia.13 Level of consciousness was the most strongly preferred item, and 89.7% of the respondents strongly agreed to its use. Level of consciousness is cited as a criterion for evaluating the severity of pneumonia in various guidelines,12,14,16 and the patient’s ability to adhere to the clinician’s instructions during swallowing evaluation is a predictor of successfully resuming oral intake.17 Furthermore, the patient’s level of consciousness is an important factor for monitoring the severity and course of other conditions, which likely explains why the majority of the respondents strongly agreed that this criterion can be used to indicate the resumption of oral intake. SpO2, body temperature, mental state and respiratory rate are also used to indicate clinical stability in patients with pneumonia, and the majority of our respondents strongly agreed that these factors were important for indicating the resumption of oral intake.13 Furthermore, the judgment of the attending physician was considered important, which is likely because the attending physician can provide a comprehensive and objective evaluation of the patient’s swallowing function. More than 80% respondents also highlighted seven additional factors as being important in their decision-making (“strongly agree” or “agree”): visual impression, pneumonia severity, performance status, the opinion of a non-physician healthcare provider, administration of oxygen, the patient’s request and the family’s request.

Because the factors came from a broad range of components, it was difficult to identify correlations in the principal component analysis. However, the analysis of the first cluster showed a similarity between the level of consciousness, body temperature, SpO2, respiratory rate, mental state, the discretion of the attending physician and whether swallowing function testing had been carried out; these factors indicate clinical stability in cases of pneumonia.13 In the second cluster, we observed a similarity between the patient’s request, the family’s request, the opinion of a non-physician healthcare provider and performance status; these are factors that reflect the patient’s current general condition and general condition before the onset of pneumonia. Therefore, based on the first and second clusters, it appears that the factors that influence decision-making regarding oral intake resumption are comprised of factors that are related to the clinical stability of the pneumonia, the patient’s current general condition and the patient’s general condition from before the onset of pneumonia. The age-related decline in brain function results in cognitive dysfunction (including dementia), dysphagia and impaired cough reflex, which leads to aspiration pneumonia in elderly patients. A survey of the natural history of patients with recurrent aspiration pneumonia showed that these patients are close to the end of life.14 Therefore, the items in the second cluster are more important for elderly patients with recurrent aspiration pneumonia.

The respondents only provided a few answers to question 2. Therefore, it appears that the 24 items that we selected for question 1 were adequate, despite the fact that they were selected based on our researchers’ use of these items in their clinical decision-making. Seven respondents (2.0% of all responses) listed sputum volume as an important factor for decision-making; this factor is related to the pneumonia’s condition. Furthermore, five respondents (1.4% of all responses) listed oral hygiene status, which is associated with swallowing function. Both the swallowing and cough reflexes are improved by maintaining oral hygiene, and maintaining good oral hygiene can help prevent aspiration.18,19 The response rate for the present study (14.1%) was slightly low, as Hagihara et al. reported a response rate of 17.8% for a Japanese questionnaire survey that randomly selected respondents who did not receive a reward.20 However, we believe that our response rate is acceptable, as we did not offer a reward, and we surveyed all Japanese hospitals that were listed as having both an internal medicine department and a respiratory medicine department. Interestingly, the responding hospitals had a significantly higher capacity, compared with the non-responding hospitals, and our findings might only reflect the opinions of physicians who practice at high-capacity hospitals that provide acute-phase care. Alternatively, it is possible that the non-responding physicians, who typically practiced at low-capacity hospitals, had a limited interest in aspiration pneumonia or surveys. In addition, it is possible that we mailed questionnaires to hospitals that did not have a physician that regularly practiced in our departments of interest, which would likely have lowered our response rate. Furthermore, the hospital type (public or private) might be important, although we did not have access to data regarding the type of each hospital. Moreover, we speculate that the responding hospitals typically provided acute-phase treatment; however, it is likely that chronic-phase care hospitals would assign a relatively high value to the patient’s request, the family’s request, the opinion of a non-physician healthcare provider and performance status. Finally, age, dementia, care requirements, nutrition route during short-term fasting and discharge destinations (e.g. home, nursing facilities, or other hospitals) are very important factors among elderly patients with aspiration...
pneumonia. We included dementia, which is related to mental state or consciousness, and performance status, which is related to care requirements. However, we did not include nutrition route during short-term fasting and the discharge destination, although these items might be important for hospitals that provide chronic-phase care. The present study sampled items that are used by clinicians for decision-making regarding oral intake resumption in patients with aspiration pneumonia. These items might help clinicians select an appropriate timing for resuming oral intake, which could help improve the patient’s quality of life. However, use of these items cannot guarantee a reduction in the rate of aspiration or pneumonia relapse during hospitalization, or improvements in other indicators, such as hospital stay or short-term mortality rates. Furthermore, some items are difficult to generalize, such as the discretion of the attending physician, visual impression, opinion of a non-physician healthcare provider and the request of the patient’s family members. Therefore, future studies are required to identify generalizable and objective criteria for indicating oral intake resumption, which is critical to maintaining nutrition, preventing a reduction in swallowing ability and preventing the recurrence of aspiration pneumonia.

In conclusion, we found that physicians consider several items for indicating the resumption of oral intake, which could be assigned to two clusters. The first cluster consisted of the level of consciousness, body temperature, SpO₂, respiratory rate, mental state and the discretion of the attending physician. The second cluster consisted of the patient’s request, the family’s request, the opinion of a medical staff non-physician healthcare provider and performance status. Therefore, we suggest that future studies consider these factors and clusters during the development of generalizable and objective criteria.

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Disclosure statement

The authors declare no conflict of interest.

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