Received: 13 November 2023 | Revised: 11 February 2024 | Accepted: 19 February 2024

DOI: 10.1002/jgf2.681

Journal of General and Family Medicine Open Access WILEY

ORIGINAL ARTICLE

# Use of artificial hydration in patients diagnosed with senility as the cause of death by home care physicians: A cross_sectional study

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**Funding information**
Yuumi Memorial Foundation for Home Health Care, Grant/Award Number: 549800yen

## Abstract

**Background:** The aim of this study was to investigate the frequency, effectiveness, and reasons for the use of artificial hydration (AH) in senile patients in the last week, and patient-related factors associated with its usage.

**Methods:** Between April and May 2023, I conducted a cross_sectional study among medical institutions affiliated with the Japan Network of Home Care Supporting Clinics. Eligible cases included those in which senility was listed as the cause of death on the death certificate from January 1, 2022, to December 31, 2022. The questions asked use of AH, reasons for AH, and symptoms that improved or worsened with AH. Patient characteristics, including age, gender, place of death, length of treatment, and complication of dementia, were also asked. Descriptive statistics were performed. Univariate and multivariate analyses were conducted to examine the association between patient characteristics and the use of AH.

**Results:** Eighty-three medical institutions (12.5%) provided responses, contributing a total of 714 cases. AH was administered in 236 cases (33.1%). The most common reason was "due to family preference" in 110 cases (46.6%). One hundred thirty-five cases (57.2%) reported "no improved symptoms," while symptom worsening was reported as "no worsened symptoms" in 176 cases (74.6%). Multivariate analysis on 699 cases using complete-case analysis identified age (risk ratio [RR]:0.98, 95% confidence interval [CI]: 0.96–0.99) and female (RR:0.73, 95% CI:0.58–0.92) as factors associated with the use of AH.

**Conclusion:** This study revealed that AH was commonly used based on family preferences and to alleviate psychological burdens on the family.

KEYWORDS
artificial hydration, end-of-life care, home medical care, senility

## 1 | INTRODUCTION

In Japan, the number of deaths attributed to senility is on the rise, with senility ranking as the third leading cause of death.[1] The treatment and care of senile patients in the terminal stage of their lives are crucial aspects of palliative care, yet there remains a lack of clarity regarding the best approach.

Because the majority of senile patients significantly reduce their oral intake before their passing, decisions need to be made about whether to use artificial hydration. However, there is currently insufficient evidence to definitively determine the impact of artificial hydration in the final days of life.[2] The use of artificial hydration during this time is a subject of controversy and often presents a challenging decision in clinical practice. In addition to medical considerations, patient and family concerns play a significant role in deciding whether to administer artificial hydration.[3,4] An internet survey among the general public using a senile patient scenario revealed that preferences for artificial hydration are highly individualized and more varied compared to preferences for tube feeding and cardiopulmonary resuscitation.[5] This highlights the complex and personalized nature of decisions surrounding artificial hydration. The decision-making process can be especially challenging given the lack of clear medical benefits and the highly individualized preferences of patients and their families.

This study focuses on artificial hydration as one of the treatments for senile patients. Currently, there is insufficient understanding of how frequently and for what reasons artificial hydration is used for senile patients and how effective it is. Furthermore, the factors related to the use of artificial hydration in senile patients remain unclear. It is our belief that shedding light on these matters will contribute to a more informed discussion regarding the use of artificial hydration for senile patients.

The aim of this study is to investigate the frequency and reasons for the use of artificial hydration in senile patients in their last week of life, as well as its effectiveness and patient-related factors associated with its usage.

## 2 | METHODS

### 2.1 | Participants

Between April and May 2023, I conducted a cross-sectional study using a postal questionnaire survey among 719 medical institutions affiliated with the Japan Network of Home Care Supporting Clinics. Eligible cases included those individuals who were documented as having senility listed as the cause of death in column I of the death certificate. These cases encompassed those occurring from January 1, 2022, to December 31, 2022, within each medical institution. No exclusion criteria based on complications, age, or other factors were established, prioritizing the clinician's judgment of the cause of death. Physicians at each institution reviewed the medical records of the respective cases to provide responses.

### 2.2 | Questionnaire

#### 2.2.1 | Characteristics of the patients

The questions asked about the patient's age at the time of death, the patient's gender, the length of time the patient had been treated at the respondent's medical institution (selected from less than 1 week, 1 week to 1 month, 1 month to 6 months, 6 months to 1 year, and 1 year or more), and the place of death recorded on the death certificate, presence or absence of complication of dementia (within 90 days before death). In one study, being female, dying in a care home or hospital, and suffering from nervous system diseases (including dementia) or malignancies were the most important patient-related factors positively associated with a decision to forgo artificial nutrition and/or hydration.[3] The presence of malignancies or nervous system diseases other than dementia would not make senility the cause of death. But dementia was reported to be a common complication of senility as the cause of death.[6] Consequently, I included the patient's age, gender, the place of death, and the presence or absence of complication of dementia as question items. And one study demonstrated an association between increased family physician continuity of care and decreased odds of several acute care outcomes in late life.[7] Based on these results and clinical experience, I hypothesized that continuity of practice might influence the use of artificial hydration. Therefore, I included the length of time the patient had been treated at the respondent's medical institution as a question item.

#### 2.2.2 | Use of artificial hydration

The first question asked whether artificial hydration was used in the last week of life. The following questions were asked only of those cases in which artificial hydration was used. Those questions included the route of administration, frequency (in the last week of life), and reasons for artificial hydration (multiple choice). Additionally, respondents were asked to indicate whether any symptoms improved or worsened with artificial hydration (multiple choice).

The choices for the question regarding reason(s) for artificial hydration were developed with reference to previous studies.[4,8] These choices included “for symptom relief,” “to prolong survival,” “due to the patient's own preference (including advance directive),” “due to the family's preference,” “to alleviate the psychological burden on the family,” “to alleviate the psychological burden on the medical staff,” “because the referring medical institution was employing artificial hydration,” and “other.” The choices for questions regarding symptoms that improved or worsened were also developed with reference to the previous study.[4] The choices for the question regarding symptoms that improved were “thirst,” “delirium,” “fatigue,” “anorexia,” “nausea/vomiting,” and “no improved symptoms.” The choices for the question regarding symptoms that worsened were “dyspnea,” “edema,” “nausea/vomiting,” “delirium,” “sputum,” and “no worsened symptoms.”

## 2.3 | Ethical considerations

The questionnaire did not include the patient's name or date of birth and was mailed to the author in an anonymized form so that specific individuals could not be identified. Both the institution collecting the questionnaire and the institutions submitting the questionnaire displayed opt-out policies in this study. This study was approved by the Ethical Review Committee of the Japanese Association for Home Care Medicine.

## 2.4 | Statistical analysis

Responses to the questions were summarized using standard descriptive statistics. Given the negative association between dying in a care home or hospital and the use of artificial nutrition and/or hydration,[3] the place of death was categorized into two groups: "dying at home" and "all other locations," including care homes and hospitals where professionals consistently provide care. To explore the associations between the use of artificial hydration and patient characteristics, bivariate analyses were conducted. The Chi-square test was used for gender, the place of death, and complication of dementia, while the Mann–Whitney *U* test was used for age. Additionally, the Cochran-Armitage test for trend was applied to analyze the relationship between the length of time the patient had been treated at the respondent's medical institution and the use of artificial hydration. Subsequently, a multivariate analysis was carried out using modified Poisson regression. Cases with unanswered questions were excluded from the analyses, and complete case analysis was performed. A two-tailed test was used with a significance level of <5%. All analyses were performed using SPSS, version 23, software for Windows.

# 3 | RESULTS

Out of the 719 medical institutions that originally dispatched the questionnaires, 55 medical institutions had to return the mail because of unknown addresses. Therefore, the questionnaires were successfully delivered to 664 medical institutions. Among these, 83 medical institutions, constituting 12.5% of the total, provided responses, contributing a total of 714 cases.

## 3.1 | Characteristics of the patients

Characteristics of the patients are shown in Table 1. The mean age at the time of death was 92.8 years (±6.2 SD), and the majority of patients were female by gender. the length of time the patient had been treated at the respondent's medical institution was more than 1 year in the largest number of 471 cases (66.0%). The most common place of death was home in 402 cases (56.3%). Complications of dementia were observed in 424 cases (59.4%).

**TABLE 1** Characteristics of the patients ($n = 714$).

| | *n* | % |
|---|---|---|
| Age at the time of death, mean (SD) | 92.8 years (±6.2) | |
| Gender | | |
| Male | 181 | 25.4 |
| Female | 533 | 74.6 |
| The length of time the patient had been treated at the respondent's medical institution | | |
| Less than 1 week | 34 | 4.8 |
| 1 week to 1 month | 63 | 8.8 |
| 1 month to 6 months | 88 | 12.3 |
| 6 months to 1 year | 56 | 7.8 |
| 1 year or more | 471 | 66.0 |
| No response | 2 | 0.3 |
| The place of death recorded on the death certificate | | |
| Hospital | 8 | 1.1 |
| Clinic | 12 | 1.7 |
| Integrated facility for medical and long-term care/geriatric health services facility | 17 | 2.4 |
| Care home | 271 | 38.0 |
| Home | 402 | 56.3 |
| Others | 1 | 0.1 |
| No response | 3 | 0.4 |
| Complication of dementia | | |
| Presence | 424 | 59.4 |
| Absence | 281 | 39.4 |
| No response | 9 | 1.3 |
| Artificial hydration | | |
| Use | 236 | 33.1 |
| No use | 478 | 66.9 |
| Administration frequency per week Median (interquartile range) | 5.0 (2.5–7.0) | |

## 3.2 | Use of artificial hydration

Artificial hydration was used in 236 cases (33.1%). With regard to route of administration, 11 cases (4.7%) utilized central venous access, 133 cases (56.4%) utilized peripheral venous access, 79 cases (33.5%) utilized subcutaneous administration, 1 case (0.4%) involved a combination of central venous and subcutaneous routes, 5 cases (2.1%) utilized peripheral venous and subcutaneous routes, and there were 7 cases (3.0%) with unanswered information. In terms of frequency, during the last week of life, the most common administration frequency was seven times per week, observed in 96 cases (40.7%). The median administration frequency, with an interquartile range, was 5.0 (2.5–7.0).

As shown in Figure 1, with regard to the reason(s) for the use of artificial hydration, the most common reason given was "due to the family's preference" in 110 cases (46.6%), followed by "for symptom

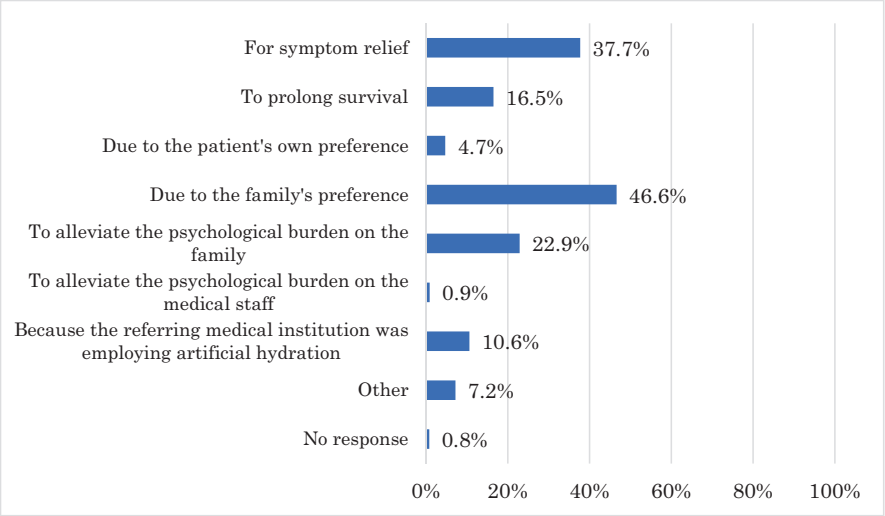


**FIGURE 1** The reason(s) for the use of artificial hydration ($n = 236$).

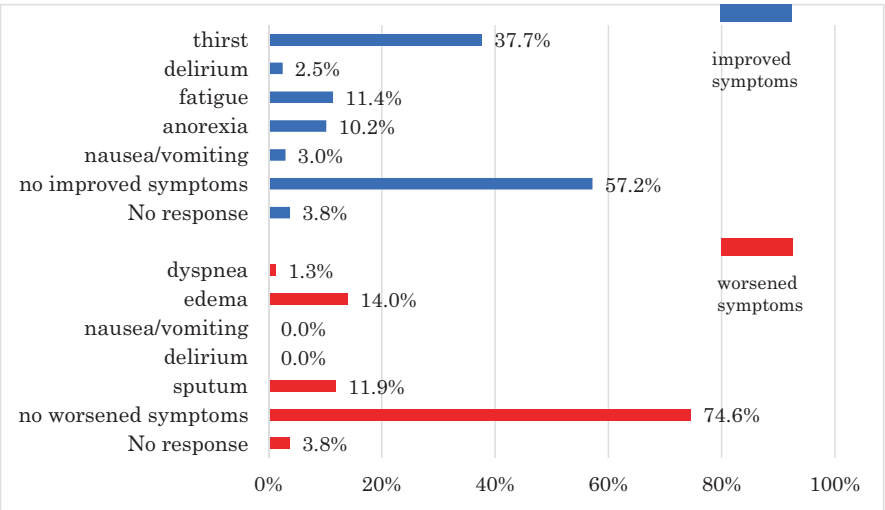


**FIGURE 2** Symptoms that improved or worsened with artificial hydration ($n = 236$).

relief" in 89 cases (37.7%) and "to alleviate the psychological burden on the family" in 54 cases (22.9%).

As shown in Figure 2, with regard to symptoms that improved with artificial hydration, the most common response was "no improved symptoms" in 135 cases (57.2%). The most common symptom that improved was "thirst" in 50 cases (37.7%).

With regard to symptoms that worsened with artificial hydration, the most common response was "no worsened symptoms" in 176 cases (74.6%).

Symptoms that worsened were "edema" in 33 cases (14.0%), "sputum" in 28 cases (11.9%), and "dyspnea" in 3 cases (1.3%). Both "nausea/vomiting" and "delirium" were no cases. Nine cases (3.8%) were unanswered.

### 3.3 | The associations between use of artificial hydration and patient characteristics

Fifteen cases (2.1%) were excluded because of missing data and complete-case analysis was performed in 699 cases. In 15 cases with missing data, artificial hydration was used in 8 cases.

As shown in Table 2, in bivariate analyses, it was observed that patients using artificial hydration tended to have significantly lower age at the time of death. In addition, being female was significantly less common among those who used artificial hydration. Other variables were not significantly associated with the use of artificial hydration.

As shown in Table 3, in multivariate analysis, higher age at the time of death tended not to use artificial hydration (risk ratio [RR]: 0.98, 95% confidence interval [CI]: 0.96–0.99), and being female was negatively associated with the use of artificial hydration (RR: 0.73, 95% CI: 0.58–0.92).

## 4 | DISCUSSION

The findings of this study indicate that roughly one-third of patients who were diagnosed with senility as the cause of death by home care physicians received artificial hydration in the last week of life. Furthermore, this study suggests that the decision to use artificial hydration was often influenced by the preferences of the patient's family and aimed at alleviating the psychological burden

**TABLE 2** The associations between use of artificial hydration and patient characteristics: bivariate analyses ($n=699$).

| | Use of artificial hydration ($n=228$) | No use of artificial hydration ($n=471$) | *p*-Value |
|---|---|---|---|
| Age, median (interquartile range)[a] | 93 (88–96) | 94 (89–98) | 0.003 |
| Female, *n* (%)[b] | 153 (67.1) | 369 (78.3) | 0.001 |
| The length of treatment, *n* (%)[c] | | | |
| Less than 1 week | 11 (4.8) | 23 (4.9) | 0.06 |
| 1 week to 1 month | 23 (10.1) | 38 (8.1) | |
| 1 month to 6 months | 39 (17.1) | 48 (10.2) | |
| 6 months to 1 year | 16 (7.0) | 39 (8.3) | |
| 1 year or more | 139 (61.0) | 323 (68.6) | |
| Dying at home, *n* (%)[b] | 135 (59.2) | 262 (55.6) | 0.370 |
| Complication of dementia, *n* (%)[b] | 141 (61.8) | 281 (59.7) | 0.580 |

[a]Mann–Whitney *U* test.
[b]Chi-square test.
[c]Cochran-Armitage test for trend.

**TABLE 3** The associations between use of artificial hydration and patient characteristics: multivariate analysis ($n=699$).

| | RR | 95% CI | *p*-Value |
|---|---|---|---|
| Age | 0.98 | 0.96–0.99 | 0.01 |
| Female | 0.73 | 0.58–0.92 | 0.007 |
| The length of treatment | | | |
| Less than 1 week | Reference | | |
| 1 week to 1 month | 1.12 | 0.64–1.98 | 0.69 |
| 1 month to 6 months | 1.35 | 0.79–2.31 | 0.27 |
| 6 months to 1 year | 0.88 | 0.47–1.66 | 0.69 |
| 1 year or more | 0.98 | 0.59–1.62 | 0.93 |
| Dying at home | 1.02 | 0.82–1.28 | 0.85 |
| Complication of dementia | 1.12 | 0.90–1.40 | 0.31 |

on the family. From a medical perspective, artificial hydration was predominantly employed for symptom relief rather than for the purpose of prolonging survival. Additionally, this study suggests that artificial hydration had limited advantages or disadvantages in terms of symptom relief.

One systematic review found that reported percentages of patients receiving artificial hydration in the last week of life varied from 12% to 88%.[9] In this systematic review, authors stated that cultural differences in end-of-life decision making and legal issues may influence the utilization of artificial hydration. Another study also identified variations in the frequencies of artificial hydration usage across different countries.[10] In Japan, the frequency of using artificial hydration has been reported at 46.2% in a study involving care home residents[11] and at 35% in a study focusing on terminally ill patients with abdominal malignancies.[12] In addition to country characteristics, the frequency of using artificial hydration may vary by disease and practice setting. This study reveals the frequency of artificial hydration in patients diagnosed with senility as the cause of death by home care physicians in Japan, although it has not been clear until now.

With regard to the reasons for the use of artificial hydration, previous reports have indicated that family's preference and alleviating the psychological burden on the family are common reasons.[4,8] A similar trend was observed in this study of senile patients. Additionally, this study indicates that artificial hydration had limited advantages or disadvantages in symptom relief. These findings may imply that physicians tend to opt for artificial hydration based on the preferences of the patient's family and the desire to alleviate the family's psychological burdens, rather than perceiving significant medical advantages or disadvantages associated with this treatment choice. This highlights the complex interplay between medical decisions and family dynamics in end-of-life care. This situation raises the concern that artificial hydration may be employed primarily for the comfort and peace of mind of the patient's family, rather than primarily for the well-being and benefit of the patient themselves. It underscores the need for careful consideration of the patient's best interests and dignity in end-of-life care decisions, particularly when the patient may not be able to express their own preferences. We previously investigated what kind of medical care the general public would like to receive when they become senile.[5] Scenarios were presented and

questions were asked if the patient was themselves or family members. Regarding artificial hydration, there was not a high degree of agreement between themselves and family members. I think that attention needs to be paid to decision making to protect the patient's dignity, especially when the patient lacks decision-making capacity. It also suggests that advance care planning is important. In a study of bereaved families of cancer patients, many family members reported emotional distress in patients who become unable to take nourishment orally.[13] I believe that how to reduce family emotional distress is important in decision making regarding the use of artificial hydration. Reducing the emotional distress of family members may allow for discussions that focus on the patient's dignity.

In multivariate analysis factors associated with the use of artificial hydration were the patient's age and gender. One study found that older age appeared to be a patient-related predictor of decisions to forgo artificial nutrition and/or hydration.[14] A similar result was observed in this study of senile patients. In senile patients, if they are older, only comfort care may be provided without artificial hydration. With regard to gender, previous studies found that female was a patient-related predictor of decisions to forgo artificial nutrition and/or hydration.[3,14] Female was significantly less likely to use artificial hydration in this study as well. A study in Japan reported that female significantly preferred palliative care compared to men in end-of-life care.[15] The result of this study may reflect differences in end-of-life care preference by gender.

This study has some limitations. As this study involves cases from medical institutions affiliated with the Japan Network of Home Care Supporting Clinics, the subjects may not be fully representative of patients diagnosed with senility as the cause of death by home care physicians in Japan. Additionally, the response rate from medical institutions is low (12.5%), which may lead to sampling bias. In these respects, this study is limited in its generalizability. Furthermore, it is important to note that in this study, details such as the volume of fluid administration, family presence, and the level of care needed were not included in the questionnaire for the sake of simplification to improve the response rate. And complete-case analysis was performed, so there would be a possibility of missing data bias. However, since the proportion of missing data in this study was 2.1%, which is below the generally accepted threshold of 5%,[16] its impact is considered to be minimal. Finally, the present study is based on medical record review, which may reduce the reliability of the responses.

## 5 | CONCLUSION

This study suggests that artificial hydration is frequently employed because of family preferences and to alleviate the family's emotional burden. It underscores the necessity of establishing a clear decision-making process for artificial hydration to preserve the dignity of senile patients. The consideration for family preferences and the alleviation of psychological burdens on the family is more important with regard to whether to provide artificial hydration. Further research is warranted to uncover the effects of artificial hydration in the last week of life, which can contribute to establishing a consensus on the pros and cons of artificial hydration in end-of-life care.

## ACKNOWLEDGMENTS

This work was supported by the Yuumi Memorial Foundation for Home Health Care.

## CONFLICT OF INTEREST STATEMENT

The author has no conflict of interest to disclose.

## ETHICS STATEMENT

This study was conducted under the Japanese Ethical Guidelines for Medical and Health Research involving Human Subjects, and the protocol was approved by the Ethics Review Committee of the Japanese Association for Home Care Medicine.

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**How to cite this article:** Imanaga T. Use of artificial hydration in patients diagnosed with senility as the cause of death by home care physicians: A cross_sectional study. J Gen Fam Med. 2024;25:121–127. https://doi.org/10.1002/jgf2.681