Accurate identification and prognostication of end-of-life state in Japan using a guideline-based diagnostic method

Supplemental file

Text S1: Japanese guidelines for the end-of-life medical decision-making process

In 2007, the Japanese Ministry of Health, Labour and Welfare developed guidelines to establish a process for determining EOL status. This text is the guidelines translated into English by the researchers. Therefore, this translated version is not a formal document. The original guidelines can be obtained from the official website: https://www.mhlw.go.jp/shingi/2007/05/s0521-11.html.

Guidelines for the decision-making process for end-of-life care

1. Appropriate end-of-life care

(1) It is important that the patient discusses their condition with medical staff based on the provision and explanation of appropriate information from medical staff (e.g., doctors). The end-of-life care should be based on the patient's decision.

(2) The initiation or non-initiation of medical treatment in end-stage medical care, changes in medical treatment, discontinuation of medical treatment, and other aspects should be judged carefully according to treatment adequacy and appropriateness by a medical/care team comprising different types of medical professionals.

(3) The medical/care team should relieve pain and other unpleasant symptoms as much as possible and provide comprehensive medical care, including mental and social support for patients and their families.

(4) Aggressive euthanasia with the intention of shortening life is not covered by these guidelines.

2. Procedures for determining end-of-life care and care policies

End-of-life care and care policy decisions are made as follows.

2-1. When the patient's intention can be confirmed

(1) Decisions should be made by the medical/care team, which should be multidisciplinary. The decision-making process should include the patient, who should provide informed consent for any treatment plans, and incorporate the findings of specialized medical examinations.

(2) Patients should make a decision about the treatment policy after sufficient discussion with healthcare professionals, and this agreement should be documented. It is necessary to explain and reconfirm the patient's decision, according to the time, the medical conditions, and changes in medical evaluation, and consider the possibility that patients' intentions can change.

(3) During this process, it is advisable to inform the family of the decision unless the patient refuses.

2-2. When the patient's intention cannot be confirmed

Careful judgment needs to be made by the medical/care team by following the steps below.

(1) When the family can estimate the patient's intention, the treatment policy that is best for the patient, and that respects their estimated intention, should be selected.
(2) If the family cannot estimate the patient's intentions, it is essential to fully discuss what is best for the patient with the family and to select the treatment policy that is best for the patient.
(3) If there is no family or if the family leaves the decision to the medical/care team, it is essential to select the treatment policy that is best for the patient.

2-3. Establishment of a committee of multiple experts

In the case of 2-1 and 2-2 above, when selecting the treatment policy, particularly when…

- it is difficult for the medical/care team to determine the policy because of the patient's medical condition or other factors,
- discussions between the patient and medical staff produce no consensus on adequate or appropriate medical care,
- there is disagreement within the family, or there is no consensus on adequate and/or appropriate medical care among healthcare professionals,

it is necessary to establish a separate committee comprising multiple specialists to examine treatment policies and provide advice.

Table S1: Regular members of the end-of-life case conference

Qualification (name of medical society)	2010	2011	2012	2013	2014	2015	2016	2017
Infectious disease specialist (the Japanese Association for Infectious Diseases)	1	1	1	1	1	1	0	0
Gastroenterologist (the Japanese Society of Gastroenterology)	1	0	1	2	2	2	2	2
Pulmonologist (the Japanese Respiratory Society)	1	1	1	1	1	1	1	1
Diabetologist (the Japan Diabetes Society)	1	1	1	1	1	1	1	1
Cardiologist (the Japanese Circulation Society)	1	0	0	0	0	0	0	0
Nephrologist (the Japanese Society of Nephrology)	0	1	1	1	1	1	0	0
Hematologist (the Japanese Society of Hematology)	0	0	0	0	0	1	1	1
Family physician (the Japan Primary Care Association)	0	0	1	1	2	2	1	1
[a]Fellow (the Japanese Society of Internal Medicine)	5	5	5	6	5	5	6	6
General internist without specialty	5	5	5	5	5	6	4	4
Resident	2	0	2	3	1	2	3	2

Footnote

Number of people as of January 1 for each year.

[a]Fellowship of the Japanese Society of Internal Medicine status can be concurrent with another qualification.

Table S2: Baseline characteristics (for diagnostic accuracy analysis)

Variables	All (n = 297)	Terminal illness (n = 138)	Frailty (n = 98)	Organ failure (n = 37)	Unclassifiable cases (n = 24)
Age, median (range), y	89 (54–107)	85 (54–101)	91 (70–107)	90 (81–107)	92 (79–99)
Women, No. (%)	179 (60.3)	73 (52.9)	69 (70.4)	21 (56.8)	16 (66.7)
Hospitalized patients, No. (%)	234 (78.8)	101 (73.2)	78 (79.6)	33 (89.2)	22 (91.7)
CCI, median (range)	8 (4–17)	10 (5–17)	6 (4–11)	7 (5–13)	7 (5–11)
Physical functions					
Barthel Index, No. (%)					
0	170 (57.2)	43 (31.2)	88 (89.8)	19 (51.4)	20 (83.3)
5–80	91 (30.6)	63 (45.7)	10 (10.2)	14 (37.8)	4 (16.7)
85–100 (independent)	7 (2.4)	7 (5.1)	0	0	0
NA	29 (9.8)	25 (18.1)	0	4 (10.8)	0
[a]Bedridden level, No. (%)					
Level J or A	14 (4.7)	13 (9.4)	0	1 (2.7)	0
Level B or C	283 (95.3)	125 (90.6)	98 (100)	36 (97.3)	24 (100)
Cognitive functions					
FAST, No. (%)					
≤5	83 (27.9)	73 (52.9)	0	10 (27.0)	0
6a–6e	25 (8.4)	17 (12.3)	2 (2.0)	1 (2.7)	5 (20.8)
7a–7c	44 (14.8)	10 (7.2)	22 (22.4)	8 (21.6)	4 (16.7)
7d–7f	109 (36.7)	13 (9.4)	72 (73.5)	12 (32.4)	12 (50.0)
NA	36 (12.1)	25 (18.1)	2 (2.0)	6 (16.2)	3 (12.5)
HDS-R, No. (%)					
0	187 (63.0)	50 (36.2)	95 (96.9)	21 (56.8)	21 (87.5)
1–19	39 (13.1)	27 (19.6)	3 (3.1)	7 (18.9)	2 (8.3)
20–30	9 (3.0)	6 (4.3)	0	2 (5.4)	1 (4.2)
NA	62 (20.9)	55 (39.9)	0	7 (18.9)	0
[a]Rating of Dementia, No. (%)					
Normal	23 (7.7)	22 (15.9)	0	1 (2.7)	0
Level I or II	84 (28.3)	65 (47.1)	3 (3.1)	13 (35.1)	3 (12.5)
Level III, IV, or M	190 (64.0)	51 (37.0)	95 (96.9)	23 (62.2)	21 (87.5)

Table S2: Baseline characteristics (for diagnostic accuracy analysis) (continued)

Variables	All (n = 297)	Terminal illness (n = 138)	Frailty (n = 98)	Organ failure (n = 37)	Unclassifiable cases (n = 24)
Eating and swallowing functions					
[b]Eating problems, No. (%)	252 (84.9)	99 (71.7)	97 (99.0)	32 (86.5)	24 (100)
Oral intake, No. (%)					
0	87 (29.3)	21 (15.2)	34 (34.7)	17 (45.9)	15 (62.5)
1–500 kcal/day	113 (38.0)	46 (33.3)	51 (52.0)	9 (24.3)	7 (29.2)
>500 kcal/day	64 (21.6)	46 (33.3)	9 (9.2)	8 (21.6)	1 (4.2)
Dependence on PEG or NG	4 (1.3)	1 (0.7)	1 (1.0)	1 (2.7)	1 (4.2)
NA	29 (9.8)	24 (17.4)	3 (3.1)	2 (5.4)	0
PPS, No. (%)					
10	98 (33.0)	24 (17.4)	38 (38.8)	19 (51.4)	17 (70.8)
20	102 (34.3)	49 (35.5)	40 (40.8)	8 (21.6)	5 (20.8)
30	41 (13.8)	18 (13.0)	20 (20.4)	2 (5.4)	1 (4.2)
40	46 (15.5)	38 (27.5)	0	7 (18.9)	1 (4.2)
≥50	10 (3.4)	9 (6.5)	0	1 (2.7)	0
ADEPT, mean (SD)	16.6 (3.5)	15.4 (3.5)	17.5 (2.9)	18.0 (4.2)	18.0 (3.1)
Residence before EOL-CC, No. (%)					
Home	176 (59.3)	108 (78.3)	25 (25.5)	26 (70.3)	17 (70.8)
Nursing facilities	112 (37.7)	25 (18.1)	70 (71.4)	10 (27.0)	7 (29.2)
Long-term hospitals	8 (2.7)	5 (3.6)	3 (3.1)	0	0
Other hospitals	1 (0.3)	0	0	1 (2.7)	0

Footnote

[a]The scoring methods "Bedridden level" and "Rating of Dementia" are defined by the Japanese Ministry of Health, Labour and Welfare; details are available at http://www.mhlw.go.jp/english/database/db-hss/dl/siel-2010-04.pdf.

[b]Eating problems were defined as swallowing or chewing problems (need to change food types), behavioral problems such as refusal to eat or drink, dependence on help for eating, suspected dehydration, and persistently reduced oral intake.

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool; CC, case conference; CCI, Charlson Comorbidity Index; EOL, end-of-life; FAST, Functional Assessment Staging Test; HDS-R, Hasegawa Dementia Scale–Revised; kcal, kilocalorie; NA, not available; NG, nasogastric tube; PEG, percutaneous endoscopic gastrostomy; PPS, Palliative Performance Scale; SD, standard deviation.

Table S3: McNemar chi-square test for end-of-life diagnosis by the end-of-life case conference and other prognostic tools

Index values	Sensitivity Chi-squared test statistic (P value)	Specificity Chi-squared test statistic (P value)
EOL diagnosis by EOL-CC	Reference	Reference
CCI ≥6	228 (P <0.001)	9.09 (P=0.003)
CCI ≥7	195 (P <0.001)	2.08 (P=0.15)
CCI ≥8	147 (P <0.001)	0.00 (P=1.00)
CCI ≥9	102 (P <0.001)	1.23 (P=0.27)
CCI ≥10	70.4 (P <0.001)	1.23 (P=0.27)
PPS =10	69.3 (P <0.001)	1.45 (P=0.23)
PPS ≤20	166 (P <0.001)	0.94 (P=0.33)
PPS ≤30	200 (P <0.001)	9.39 (P=0.002)
PPS ≤40	244 (P <0.001)	16.1 (P <0.001)
ADEPT ≥15	159 (P <0.001)	7.69 (P=0.006)
ADEPT ≥16	127 (P <0.001)	0.31 (P=0.58)
ADEPT ≥17	101 (P <0.001)	0.00 (P=1.00)
ADEPT ≥18	82.8 (P <0.001)	0.90 (P=0.34)

Footnote

The sensitivity and specificity of EOL diagnosis by EOL-CC were compared with those of CCI, PPS, and ADEPT with several cut-off values using McNemar chi-squared test. The column of sensitivity shows that there was a statistically significant discordance of proportions of positive examinations between EOL diagnosis by EOL-CC and other prognostic tools in any cut-off point.

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool; CC, case conference; CCI, Charlson Comorbidity Index; EOL, end-of-life; PPS, Palliative Performance Scale.

Table S4: Logistic regression analysis of overall survival

Variables	Univariate OR (95% CI)	P	Multivariate OR (95% CI)	P
Age	1.06 (1.01–1.11)	0.03	Excepted	-
Sex, male	0.53 (0.24–1.18)	0.12	Excepted	-
CCI	0.72 (0.60–0.87)	<0.001	0.66 (0.52–0.82)	< 0.001
Barthel Index (BI)	0.99 (0.97–1.01)	0.22	Not applicable	-
Bedridden Level, C	0.52 (0.22–1.18)	0.12	Not applicable	-
FAST, >7c	1.77 (0.84–3.76)	0.14	Not applicable	-
HDS-R	0.99 (0.93–1.06)	0.80	Not applicable	-
Rating of Dementia, III, IV, or M	3.37 (1.26–9.00)	0.02	Not applicable	-
PPS	1.02 (0.99–1.05)	0.27	Not applicable	-
ADEPT	0.98 (0.89–1.09)	0.72	Not applicable	-
Type of trajectory to EOL				
Terminal illness (advanced cancer)	0.19 (0.04–0.79)	0.02	Excepted	-
Frailty (advanced dementia)	1.54 (0.49–4.92)	0.46	Excepted	-
Organ failure	0.68 (0.15–2.96)	0.60	Excepted	-
Severe condition, element 1 (Almost bedridden); BI = 0, or Bedridden Level = C.	1.35 (0.56–3.24)	0.50	Excepted	-
Severe condition, element 2 (Unable to communicate); HDS-R = 0, Rating of Dementia = IV or M, or FAST >7c.	4.06 (1.39–11.9)	0.01	Excepted	-
Severe condition, element 3 (Severe eating problem); oral intake <500 kcal/day	0.58 (0.26–1.33)	0.20	0.36 (0.15–0.89)	0.02
Severe conditions, all elements 1–3	1.24 (0.58–2.67)	0.58	Not applicable	-

Footnote

"Excepted" in the column of multivariate OR means that the variable was tried to adopt as an independent variable but was excepted by the stepwise regression method.

Abbreviations: ADEPT, Advanced Dementia Prognostic Tool; BI, Barthel Index; CCI, Charlson Comorbidity Index; CI, confidence interval; EOL, end-of-life; FAST, Functional Assessment Staging Test; HDS-R, Hasegawa Dementia Scale–Revised; OR, odds ratio; PPS, Palliative Performance Scale.