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Original Study

Sedatives and Sedation at the End of Life in Nursing Homes: A Retrospective Multicenter Cohort Study

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A B S T R A C T

Objectives: There is scarce information about sedation in nursing homes at the end of life. We aimed to assess (1) the use of sedatives generally and "sedatives with continuous effect," based on objective operational criteria, within the last week of life in nursing homes and (2) factors associated with this treatment.

Design: Retrospective cohort study, using the nursing homes' medical records.

Setting and Participants: Residents who died in 4 German nursing homes from January 2015 to December 2017 and whose medical records were available (n = 512).

Methods: Sedatives analyzed were those recommended by guidelines for "palliative sedation": benzodiazepines, levomepromazine, haloperidol (≥5 mg/d), and propofol. The definition of "sedatives with continuous effect" and doses judged as at least moderately sedating were consented by palliative care clinicians and pharmacists, based on the literature. Descriptive statistics and multivariate logistic regression analysis were performed (R version 3.6.1).

Results: Overall, 110/512 (21%) deceased residents received a sedative at least once during the last week of life, 46/512 (9%) "sedatives with continuous effect." Oral lorazepam was used most frequently. Eleven of 512 (2%) residents received doses judged as at least moderately sedating. The term *sedation* was not used. Most frequent indications were agitation (58/110; 53%) and anxiety (35/110; 32%); no indication was noted for 36/110 (33%) residents. The resident's involvement in the decision for sedatives was documented in 3/110 (3%). Multivariate logistic regression analysis showed significant associations between use of sedatives and age (OR = 0.94, $P < .001$) as well as institution ($P < .001$).

Conclusions and Implications: Our data indicate a lower prevalence of sedation compared to international data and considerable differences regarding prevalence between institutions. These differences, potential setting-specific challenges, and need for support measures for consistent best practice of sedation in nursing homes should be further explored.

Introduction

Sedation at the end of life is a debated, but accepted, practice in palliative care (PC).[1–8] "Sedation in PC" or "palliative sedation" has been defined as "monitored use of medications intended to induce a state of decreased or absent awareness (unconsciousness) in order to relieve the burden of otherwise intractable suffering."[3] However, definitions and concepts of "palliative sedation" and similar terms differ, as do recommendations on good practice.[9–15]

Most research on sedation at the end of life focuses on specialist palliative care (SPC). However, many people die in nursing homes, and this number is predicted to increase, based on the demographic developments.[6,16,17] Until now, data on sedation at the end of life in nursing homes are scarce and focus on continuous deep sedation.[6,18–23] It has been shown that this specific type of sedation was used in 6% to 9% of Belgian nursing home residents and in 14% of dying persons treated by Dutch older adult care physicians.[6,23,24] Because of different health systems and ethicolegal backgrounds

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regarding end-of-life practices, these data cannot be transferred to other countries.[13,25,26] Given the lack of research on the whole range of sedation practices (ie, practices other than continuous deep sedation) in nursing homes internationally and a scarcity of data from Germany, this study has the following aims[27]: (1) to assess the use of sedatives generally and of "sedatives with continuous effect" (based on objective operational criteria) within the last week of life in nursing homes and (2) to assess factors associated with this treatment.

Methods

Design, Setting, and Participants

We conducted a multicenter retrospective cohort study of residents who died in 4 German nursing homes between January 2015 and December 2017 (as part of a mixed-methods study). Nursing homes differing regarding number of residents, affiliation (municipal, Protestant, and Catholic), and location (urban and suburban) were selected by respective contact persons for municipal, Protestant, and Catholic nursing homes and asked for participation. The 4 participating nursing homes provide between 102 and 216 beds each, have Protestant (n = 2), Catholic (n = 1), and municipal (n = 1) affiliation, and are located in a large city (n = 3) and a suburb (n = 1). The study was approved by the relevant Research Ethics Committee.

Data Collection

Methods for data collection have been described for a previous single-center study.[27] Data were retrieved from the nursing homes' medical records, which contained drug sheets and nurses' notes. General practitioners and specialist PC teams kept separate records, which were not accessible for us. The data extraction tool was developed based on the literature, piloted using 15 residents' records and successfully used in the previous single-center study.[27–30] A detailed instruction sheet was developed for data extraction, and data extractors were thoroughly trained.[27] Two researchers jointly extracted data for randomly selected 20% of all records, in accordance with guidelines for data collection from medical records.[31]

As in the single-center study, we analyzed drugs recommended in guidelines for "palliative sedation": benzodiazepines, levomepromazine, haloperidol ≥5 mg/d (as lower doses are unlikely to be sedating) and propofol.[3,10,27,32–34] For readability purposes, they are called "sedatives" in this article. We collected details on the use of sedatives including doses per day, indication, routes of administration and labeling of the treatment in the medical records. Additionally extracted demographic and clinical data included age, gender, length of stay, diagnoses, need for care, support by SPC services, artificial nutrition and hydration, prescription of opioids, and use of the words "palliative", "sedation", and "palliative sedation" in the medical records.

Analysis

The definition of "sedatives with continuous effect" of the single-center study was used: either continuous parenteral infusion for ≥0.5 hours or repeated application expected to result in sedation for ≥24 hours (see Table 1).[27] This definition was based on the literature, including the drugs' prescribing information, and consensus by SPC pharmacists and clinicians.[34] In addition, doses judged as probably at least moderately sedating in this older adult population were consented by SPC pharmacists and clinicians, based on the drugs' prescribing information and other available literature (see Table 1).[3,30,32,34,35] By using these objective operational criteria, we assessed the use of sedatives independent of its labeling in the medical records.

Opioids were not analyzed as "sedatives" for this article. However, as they may have additional sedating effects, we analyzed median opioid doses in our sample. We used standard equivalence factors to convert opioid doses to oral morphine equivalents (in mg) as follows: fentanyl transdermal (in mg/h) × 100 × 24 h, buprenorphine transdermal (in mg/h) × 75 × 24 h, hydromorphone oral (in mg) × 5, levomethadone oral (in mg) × 16, oxycodone oral (in mg) × 1.5, piritramide s.c. (in mg) × 0.7)/0.3, tapentadol oral (in mg) × 0.4, tilidine oral (in mg) × 0.1, Tramadol oral (in mg) × 0.1.[36,37]

Table 1
Definition of "Sedative With Continuous Effect" and "Dose Judged as at Least Moderately Sedating" for the Analyzed Drugs

Drug	Defined as "Sedative With Continuous Effect," When Administered × Times per Day*	Dose Judged as at Least Moderately Sedating in These Dying Patients (Oral Dose Equivalents, Except for Midazolam),† mg
Clonazepam	1×	Not judged, as no information available regarding sedating effect for certain doses.
Diazepam	1×	5
Flunitrazepam	2×	2
Lorazepam	2×	4
Midazolam	7×	24
Oxazepam	2×	30
Lormetazepam	3×	3
Haloperidol >5 mg/d	1×	Not judged because of large variability in individual sedating effect
Levomepromazine	1×	30
Propofol	—	Continuous administration judged as always used for at least moderate sedation

*Consented between specialist palliative care (SPC) clinicians and pharmacists, based on the available data regarding the half-life and duration of action of the drugs in weak and/or older adult patients, as stated in the drugs' prescribing information as well as a widely used textbook for drug therapy in palliative care.[34]

†Consented between SPC clinicians and pharmacists, based on the drugs' prescribing information and other available literature.[3,30,32,34,35] For the drugs that are licensed for anxiety and agitation, we chose the highest licensed dose for older adult and weak patients. For the drugs licensed for sleep disorders, we made a clinical-pharmaceutical judgement which total daily dose would probably result in at least moderate sedation over 24 hours, based on the doses licensed for sleep disorders. For midazolam and levomepromazine, the judgment was based on the licensed doses for sedation in anesthesia or acute agitation, respectively, as well as the lowest doses recommended or recorded for "sedation in palliative care."[3,32] We aimed for conservative judgements, in order to rather underestimate than overestimate the number of residents with moderately sedating doses. For comparison, in 2 previous studies, cutoff doses of midazolam 10 mg and levomepromazine 25 mg per 24 hours were used for defining a sedating dose.[30,35]

We conducted descriptive statistics, bivariate analysis, and multivariate logistic regression analysis using R, version 3.6.1. Prevalence of use of sedatives, indications, routes of administration, and doses were analyzed as well as the labeling of the treatment in the medical records. For determining medians, interquartile ranges, and ranges of drug doses, values of 0 were excluded. We analyzed differences in prevalence of the use of sedatives between the different institutions. In addition, differences in sociodemographic and clinical characteristics between "use of sedatives" and "no use of sedatives" as well as between "use of sedatives with continuous effect" and "no use of sedatives with continuous effect" were analyzed. Relative frequencies are reported in valid percentages. We used the chi-square test or Fisher exact test (if frequencies <5) for categorical and the Mann-Whitney *U* test for continuous data.

We conducted multivariate logistic regression analysis to predict the use of sedatives. Variables were entered into the model as predictors when statistically significant group differences were detected in bivariate analyses. An exception was "care by SPC team," which was not entered into the model because the number of cases was small. Additionally, gender was entered as a predictor. We ran no logistic regression model to predict "use of sedatives with continuous effect" because (1) relatively few patients received "sedatives with continuous effect", and thus the possible number of predictors was reduced, and (2) cross tabulations with predictors showed very small cell sizes, which would have limited stability of estimations.

Alpha level was set at 0.05. Because of the study's exploratory nature, we did not adjust for multiple testing.

Results

From January 2015 to December 2017, 555 residents died in the 4 nursing homes. Medical records of 43 residents were missing for unknown reasons. Therefore, the data of 512 residents could be analyzed. Their median age was 89 years (range 55-107), and 70% were female. The majority had multiple diagnoses, the most frequent diagnosis was dementia (273/512, 54%). Sixteen of the 512 residents (3%) received support by an SPC team (see Table 2 for sociodemographic and clinical variables). The nursing homes provided additional information that 21% (range 15%-23%) of all deceased residents had died in hospital in 2017.

Use of Sedatives

Overall, 110 of the 512 residents (21%) received a sedative at least once during the last week of life. Within the 3 years, lorazepam was used for 98/512 residents (19%); lormetazepam for 7/512 (1%); oxazepam and haloperidol for 4/512 (0.8%) each; and diazepam, midazolam, and levomepromazine for 1/512 (0.2%) each (see Supplementary Table 1). Six of the 512 residents (1%) received 2 different sedatives, in combination or subsequently. The terms "sedation" or "palliative sedation" were used in none of the analyzed medical records.

Most frequently noted indications for sedatives were agitation (53%) and anxiety (32%). In single cases, sedatives were given because of pain or groaning. For 33% of residents receiving sedatives, no indication was recorded (see Table 3). Involvement of the patient or family members in the decision about sedatives was documented for 3/110 (3%) and 5/110 (5%) residents, respectively.

Lorazepam, lormetazepam, oxazepam, and levomepromazine were administered orally; midazolam subcutaneously; diazepam rectally; and haloperidol orally, intravenously, or subcutaneously. The median total daily dose of lorazepam within the last week of life was 1 mg [interquartile range (IQR) 1-2, range 0.5-6]. Eleven of the 110 residents receiving sedatives (10%, corresponding to 2% of all deceased residents) received total daily doses judged as at least moderately sedating (see Supplementary Table 1). Symptoms and consciousness level were not systematically recorded. Sixty-four of the 110 residents receiving sedatives (58%) were also prescribed opioids in the last week of life. The median total daily oral morphine equivalent was 28.8 mg/d (IQR 16.7-60.0, range 0.6-460.0).

The proportion of residents receiving sedatives at least once during their last week of life differed significantly between the nursing homes, ranging from 14% to 36% ($P < .001$). Residents who received sedatives and those who did not differed significantly regarding their age ($P < .001$), the diagnosis of dementia ($P = .006$) and support from an SPC team ($P = .011$). In the group receiving sedatives, residents were younger, dementia was less prevalent, and support from an SPC team was more frequent (Table 2). Multivariate logistic regression analysis showed a significant association between use of sedatives and age (OR = 0.94, $P < .001$) as well as institution (nursing home B: OR = 0.26, $P < .001$; nursing home C: OR = 0.28, $P < .001$) (Table 4).

Use of "Sedatives With Continuous Effect"

Forty-six of the 110 residents who were prescribed sedatives (42%, corresponding to 9% of the total sample) received these "with continuous effect" on at least 1 day within the last week of life, mostly lorazepam (n = 41) (see Supplementary Table 1). Median number of days of this treatment was 3 (range 1-7). Twenty-five of the 46 residents (54%) received the "sedatives with continuous effect" until death. The number of residents receiving this treatment increased from 20 (6 days before death) to 25 on the day of death (see Supplementary Figure 1).

The most frequently noted indications for use of "sedatives with continuous effect" were agitation (54%) and anxiety (50%). For 14 of the 46 residents receiving "sedatives with continuous effect" (30%), no indication was documented in the records (see Table 3). The median total daily dose of lorazepam "with continuous effect" within the last 7 days of life was 2 mg (IQR 2-3.5, range 1-6). It varied between 3 mg (IQR 2-4, range 1-5) 6 days before death and 2 mg (IQR 2-3, range 1-6) on the day of death (see Figure 1). Nine residents (2% of all deceased residents) received "sedatives with continuous effect" in doses judged to be at least moderately sedating (see Supplementary Table 1). None of these 9 residents received support by an SPC team.

Residents receiving "sedatives with continuous effect" and those not receiving this treatment differed significantly regarding their age ($P < .001$) and the diagnosis of chronic kidney disease ($P = .015$). In the group receiving this treatment, residents were younger and chronic kidney disease was more prevalent (Table 2).

Discussion

Main Results

These are the first multicenter data on different sedation practices at the end of life in nursing homes, based on previously published objective operational criteria.[27,28] Within the last week of life, about a fifth of all residents received a sedative, about half of these "with continuous effect." Median doses were low, but 2% of residents received "sedatives with continuous effect" in doses judged as at least moderately sedating. The terms "sedation" or "palliative sedation" were never identified in the nursing homes' records. For a third of residents receiving sedatives, no indication was noted, and involvement of the resident and/or family members in the decision was only recorded for 3% and 5%, respectively. The prevalence of use of sedatives differed significantly between the nursing homes, and multivariate analysis showed a significant association between use of sedatives and institution.

Table 2
Comparison of Sociodemographic and Clinical Characteristics of Residents With and Without Use of Sedatives and of Residents With and Without Use of "Sedatives With Continuous Effect" Within the Last 7 Days of Life

	Total Group	Use of Sedatives			Use of "Sedatives With Continuous Effect"		
	All (n = 512)	Yes (n = 110)	No (n = 402)	*P* Value	Yes (n = 46)	No (n = 466)	*P* Value
Age				**<.001**			**<.001**
Median (IQR; range)	89 (83-93; 55-107)	87.5 (79-92; 59-103)	90 (84-94; 55-107)		83 (75-91; 67-95)	90 (84-93; 55-107)	
Mean (SD)	87.8 (7.9)	85.2 (8.2)	88.5 (7.7)		82.9 (8.1)	88.3 (7.7)	
Sex, n (%)				.28			.78
Female	355 (70)	81 (74)	274 (68)		30 (67)	325 (70)	
Missing, n	2	1	1		1	1	
Legal guardian appointed, n (%)				—[*]			—[*]
Yes	89 (17)	17 (16)	72 (18)		10 (22)	79 (17)	
No	420 (83)	92 (84)	328 (82)		35 (78)	385 (83)	
Missing, n	3	1	2		1	2	
Length of stay, d, median (IQR; range)	455 (58-1580; 1-6610)	385 (38-1215; 7-6610)	466 (74-1693; 1-5940)	.16	479 (45-1005; 9-6610)	455 (60-1610; 1-5940)	.50
Diagnoses (multiple diagnoses possible), n (%)							
Dementia	273 (54)	45 (42)	228 (58)	**.006**	19 (43)	254 (56)	.16
Other neurologic and neurovascular disease[†]	218 (43)	42 (39)	176 (45)	.38	17 (39)	201 (44)	.61
Chronic heart failure	104 (21)	15 (14)	89 (23)	.07	5 (11)	99 (22)	.16
Other cardiovascular disease excluding chronic heart failure[‡]	272 (54)	53 (50)	219 (55)	.33	23 (52)	249 (54)	.91
Chronic kidney disease	143 (28)	38 (36)	105 (27)	.09	20 (46)	123 (27)	**.015**
Mental + behavioral disorders	141 (28)	38 (36)	103 (26)	.07	16 (36)	125 (27)	.27
Malignant disease	95 (19)	26 (24)	69 (18)	.14	10 (23)	85 (19)	.64
Chronic respiratory disease	96 (19)	25 (23)	71 (18)	.26	13 (30)	83 (18)	.10
Missing, n	10	3	7		2	8	
Need for care,[§] n (%)				.46[‖]			.75[‖]
No or little need for care	20 (4)	5 (5)	15 (4)		2 (4)	18 (4)	
Medium to high need for care	282 (55)	55 (51)	227 (57)		23 (51)	259 (56)	
Very high need for care	207 (41)	49 (45)	158 (40)		20 (44)	187 (40)	
Missing, n	3	1	2		1	2	
Care by specialist palliative care team, n (%)				**.011**[‖]			.17[‖]
Yes	16 (3)	8 (7)	8 (2)		3 (7)	13 (3)	
No	495 (97)	101 (93)	394 (98)		43 (94)	452 (97)	
Missing, n	1	1	0		0	1	
Artificial hydration,[**] n (%)				.45			.97
Yes [parenteral/enteral]	62 [57/5] (12)	16 [15/1] (15)	46 [42/4] (11)		5 [4/1] (11)	57 [53/4] (12)	
No	449 (88)	93 (85)	356 (89)		41 (89)	408 (88)	
Missing, n	1	1	0		0	1	
Artificial nutrition,[**] n (%)				.23[‖]			.23[‖]
Yes [parenteral/enteral]	10 [1/9] (2)	4 [1/3] (4)	6 [0/6] (2)		2 [0/2] (4)	8 [1/7] (2)	
No	501 (98)	105 (96)	396 (99)		44 (96)	457 (98)	
Missing, n	1	1	0		0	1	
"Palliative situation" or "palliative treatment" documented,[**] n (%)				.22			.13
Yes	146 (29)	37 (34)	109 (27)		18 (39)	128 (28)	
No	366 (71)	73 (66)	293 (73)		28 (61)	338 (73)	

The figures are column numbers and percentages. Percentages are reported in "valid percent," that is, based on the number of residents for whom data for the respective variable were available. Figures in bold denote statistically significant differences between residents with and without use of sedatives or between residents with and without use of "sedatives with continuous effect."

[*]Test for difference judged as not clinically important.

[†]Including intracranial hemorrhage and stroke, excluding dementia.

[‡]Not recorded were arterial hypertension and atrial fibrillation.

[§]"Pflegestufe": until December 2015 official grading of the need for care (in activities of daily living) used by the insurance companies (1 = medium, 2 = high, 3 = very high need of care); "Pflegegrad": from January 2016 official grading of the need for care (in activities of daily living) used by the insurance companies (1 = low, 2 = medium, 3 = high, 4 = very high need of care, 5 = very high need of care with special requirements for nursing care). Summarization of the 2 grading systems into: no or little need for care (no "Pflegestufe"/"Pflegegrad" or "Pflegegrad 1"), medium to high need for care ("Pflegestufe 1-2" or "Pflegegrad 2-3"), and very high need for care ("Pflegestufe 3" or "Pflegegrad 4-5").

[‖]Fisher exact test was used to assess group differences (expected frequencies < 5).

[**]Within the last 7 days of life.

Table 3
Documented Indications for the Use of Sedatives

Indication (Multiple Indications Possible; Documented in Any Part of the Residents' Medical Records, Including the Daily Nursing Records)	For Use of Sedatives, n (%) (n = 110)	For Use of "Sedatives With Continuous Effect," n (%) (n = 46)
Agitation	58 (53)	25 (54)
Anxiety	35 (32)	23 (50)
Dyspnoea	7 (6)	3 (6.5)
Sleeping difficulties	4 (4)	2 (4)
Pain	4 (4)	2 (4)
Delirium/hallucinations	2 (2)	2 (4)
Other	11 (10)*	7 (15)†
No indication reported	36 (33)	14 (30)

*Calling out, n = 3; groaning, n = 3; spasticity, n = 2; cough, n = 1; lamenting, n = 1; weeping, n = 1; aggressiveness, n = 1; not feeling legs any more, n = 1.
†Calling out, n = 3; groaning, n = 1; spasticity, n = 2; cough, n = 1; weeping, n = 1; aggressiveness, n = 1.

Table 4
Factors Associated With Use of Sedatives Estimated From a Multivariate Logistic Regression Model

	OR (95% CI)	*P* Value
Age	0.94 (0.92-0.97)	**<.001**
Sex (female)	1.56 (0.94-2.66)	.09
Dementia (no)	1.56 (0.99-2.48)	.06
Institution		
Nursing home A	Ref (Ref)	
Nursing home B	0.26 (0.14-0.47)	**<.001**
Nursing home C	0.28 (0.15-0.54)	**<.001**
Nursing home D	0.52 (0.24-1.06)	.08

Ref, reference.
Although the frequency of "Care by specialist palliative care team" differed significantly between use of sedatives and no use of sedatives, it was not entered into the model because of the small number of cases. Figures in bold denote statistically significant associations.

Comparison With Data From SPC

Two main differences between the use of sedatives in these nursing homes and SPC settings can be noted. While in the nursing homes, 21% of the dying residents received sedatives and 9% "sedatives with continuous effect," 69% to 86% of patients dying in British SPC settings received sedatives, and 78% of patients dying on a German PC unit received "sedatives with continuous effect."[28,35,38,39] This lower prevalence of sedative use at the end of life in nursing homes may be explained by the more complex needs of patients in SPC settings compared to nursing home residents. However, other factors such as the need to comply with specific legal regulations for use of sedatives in German nursing homes and associated uncertainties of staff may also contribute to the lower frequency. Less overall experience regarding the use of sedatives among general practitioners and nursing home staff compared to SPC professionals might be another contributing factor. The second difference relates to drugs and routes of administration. While parenteral midazolam was used most frequently on the German PC unit, oral lorazepam was the drug of choice in nursing homes.[28] Similarities in both settings were the low median doses, probably mainly used for anxiolysis and mild sedation, and the increasing number of persons receiving "sedatives with continuous effect" towards death.[28,30,39,40] Besides, the most frequently documented indications for the use of sedatives—agitation and anxiety—were the same in both settings.[28]

Comparison With International Data on Continuous Deep Sedation in Nursing Homes

In our sample, 2% of residents received "sedatives with continuous effect" in doses judged as at least moderately sedating. The terms "sedation" or "palliative sedation" were never used in the analyzed records, that is, neither for the sedatives analyzed in this study nor for any other prescribed medication. This stands in contrast to Belgian and Dutch data that demonstrated the use of continuous deep sedation in 6% to 14% of nursing home residents or persons treated by older adult care physicians.[6,23,24,41] The comparison of these data to our data is problematic because the cited studies are based on clinicians' self-labeling of their practice as "continuous deep sedation." Therefore, the practice analyzed in these studies covers different drugs, doses, and modes of administration.[6,23,24,41] In contrast, we extracted data on specific sedatives, which are recommended in guidelines for sedation, from the nursing homes' records and applied objective criteria for "sedatives with continuous effect" and "at least moderately sedating effect." Acknowledging these different approaches, the main difference to the cited studies is the lack of documentation of "sedation", "palliative sedation", or equivalent terms in the medical records of our sample. In addition, our data seem to indicate a lower prevalence of moderate or deep continuous sedation, as defined by the criteria mentioned above. Reasons for this lower prevalence in our sample might include transfers of residents with more complex symptoms to hospitals, different perceptions regarding the need for sedation, and uncertainties regarding its use. However, our definition of "sedatives," based on the guidelines' recommendations, may not cover the whole spectrum of drugs actually used in practice for the purpose of sedation. In particular, it has been demonstrated that opioids were used as a sole drug for sedation in Belgian nursing homes.[6,41] Opioids were not analyzed as "sedatives" in the present study, neither were antipsychotics other than haloperidol and levomepromazine. Our analysis may therefore underestimate the prevalence of—not accordingly labeled—moderate or deep sedation in our sample.

Factors Associated With the Use of Sedatives

Our data demonstrate a significant difference in the prevalence of use of sedatives between different nursing homes, ranging between 14% and 36%. Multivariate logistic regression analysis showed a significant association between institution and use of sedatives, controlled for age, gender, and diagnosis of dementia. To our knowledge, this is the first study demonstrating such differences between individual nursing homes. It has been shown that differences in sedation practice generally may be associated with differences in specialties, training in PC as well as religious beliefs of the responsible physicians.[6,42]

Bivariate analyses as well as multivariate logistic regression analysis found a significant association between use of sedatives and age. This corresponds to findings for continuous deep sedation from SPC settings as well as studies covering all health care settings, which also showed higher sedation rates in younger patients.[18,42–44] Although the observed difference in age between residents receiving sedatives (median 87.5 years) and those not receiving sedatives (median

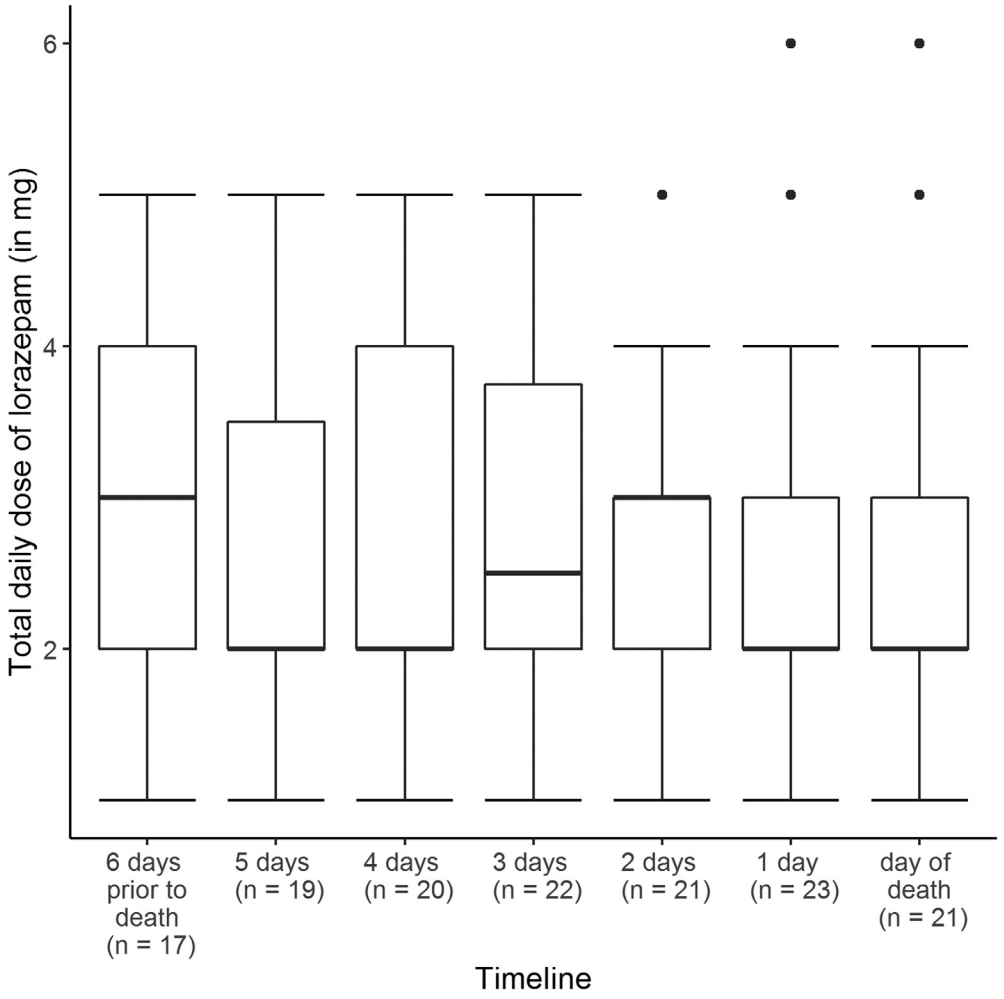

Fig. 1. Total daily dose of lorazepam "with continuous effect" within the last 7 days of life. Bottom of the box: first quartile; top of the box: third quartile; band inside the box: median; "whiskers" with maximum 1.5 × interquartile range. •, outliers: lying beyond 1.5 × interquartile range.

90 years) may not be of clinical importance, we regard the respective difference between residents receiving "sedatives with continuous effect" (median 83 years) and those not receiving this treatment (median 90 years) as potentially clinically relevant. To our knowledge, reasons for the association of sedation rates with age are unclear and should be further investigated. They might include more aggressive disease trajectories in younger patients and a higher rate of spontaneously reduced consciousness at the end of life with increasing age, resulting in less apparent need for sedation.[42] Besides, a higher rate of severe dementia with increasing age might make the assessment of suffering and consequently the identification of the need for sedation more difficult.[42]

According to bivariate analysis, care by an SPC team was more frequent among residents receiving sedatives. However, the 9 residents who were prescribed "sedatives with continuous effect" in doses judged as at least moderately sedating were not seen by an SPC team. This is not in line with current guidelines for sedation in PC, which recommend involvement of PC experts.[3]

Some other deviations from best practice standards were identified in this study. First, the involvement of the residents and family members in the decision regarding sedatives was mostly not documented in the analyzed records. Second, in about a third of cases, documentation of the indication for sedative use was lacking. Third, single indications found in the medical records were not in line with current guidance on sedation in PC. For example, pain without documentation of refractoriness does not justify use of sedatives.[3,9] Finally, treatment that probably resulted in at least moderate sedation was not recorded as "sedation" in the records. If this is not only a problem of documentation but of not perceiving the treatment as sedation, this may be an important reason for nonadherence to relevant guidance.

Strengths and Limitations

The main strength of this study is data collection on use of sedatives and different types of sedation, not only continuous deep sedation, in nursing homes. Objective criteria, established in an earlier study, were further complemented for this study to assess the use of sedatives at the end of life independent of its labeling in the medical records.[27] Additionally, measures were taken to maximize consistency and minimize errors in data extraction, as described in the Methods section.

A main limitation is the study's retrospective design and associated limitations such as unrecorded data, for example, regarding symptoms and level of sedation. As also discussed in our single-center study, this is aggravated by the fact that we only had access to the nursing homes' medical records, not to separate records kept by general practitioners and SPC teams.[27] However, we chose this design to gain a realistic picture of everyday practice. A prospective study could have influenced the decisions of the health care team and the documentation of

their practice.[28,30] Another limitation is data collection from centers in one region, making generalizations difficult. To gain maximum variation, we included nursing homes differing in number of residents, affiliation, and location. The definitions of "continuous effect" and at least moderately sedating doses ultimately depended on judgment and are therefore partly subjective. However, we based these judgements on the available data and consensus by experienced SPC pharmacists and clinicians to gain criteria that are as objective as possible. As this was an exploratory study, we did not correct *P* values for multiple testing. This has to be considered in the interpretation of significant results.

Conclusions and Implications

Compared with international data, our data indicate a lower prevalence of sedation, without the label "sedation," and considerable differences regarding prevalence between institutions. Further mixed-methods research should focus on gaining more detailed information regarding (1) sedation practices and their documentation in nursing homes, including the use of drugs that are not recommended for sedation in relevant guidelines; (2) reasons for differences between nursing homes and between countries; and (3) potential setting-specific challenges and staff needs for support. Results can inform possible adaptations of guidance to the nursing home setting and development of other support measures for sedation at the end of life in nursing homes.

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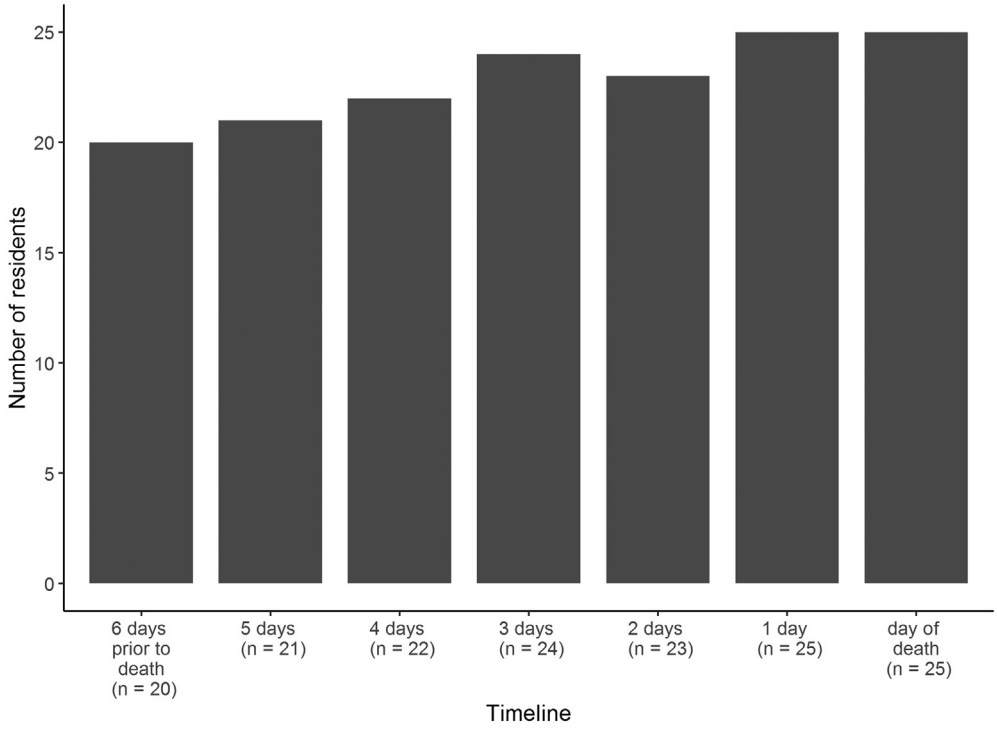
Appendix



Supplementary Fig. 1. Number of residents receiving "sedatives with continuous effect" per day.

Supplementary Table 1
Details of Use of Sedatives in a Group of Deceased Nursing Home Residents Within the Last 7 Days of Life (n = 512)

Drug	Number of Residents Receiving This Sedative	Doses*, mg, Median (IQR) [Range]	Number of Residents Receiving Maximum Doses Judged as At Least Moderately Sedating†	Number of Residents Receiving This Sedative "With Continuous Effect"	Number of Residents Receiving This Sedative "With Continuous Effect" and in Maximum Doses Judged as At Least Moderately Sedating†
Clonazepam	0	—	—	—	—
Diazepam	1	[5.0]	1	1	1
Flunitrazepam	0	—	—	—	—
Lorazepam	98	1.0 (1.0-2.0) [0.5-6.0]	8	41	8
Midazolam	1	10.0 (2.5-18.8) [2.5-22.5]	0	0	0
Oxazepam	4	10.0 (10.0-10.0) [10.0-20.0]	0	1	0
Lormetazepam	7	2.0 (1.0-2.0) [0.5-4.0]	2	0	0
Haloperidol >5 mg/d	4	5.0 (5.0-7.0) [5.0-11.0]	NA	4	NA
Levomepromazine	1	10.0 (10.0-10.0) [10.0-10.0]	0	1	0
Propofol	0	—	0	0	0
Total number, n (% of n = 512)‡	110 (21)		11 (2)	46 (9)	9 (2)

IQR, interquartile range; NA, not applicable.
*Oral dose equivalents except for midazolam.
†Combinations of different sedatives were not considered.
‡Some residents received more than 1 sedative. Therefore, the sum of the numbers in the rows above may exceed the total number of residents receiving sedatives displayed in this row.