Title

Care workers' view on factors leading to unplanned hospitalizations of nursing home residents: A cross-sectional multicenter study

Short Title

Hospitalizations from nursing homes

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Highlights

- Nursing staff and ward supervisors in Swiss nursing homes identified several modifiable factors that seem related to fewer unplanned hospitalizations, mainly the implementation of advance care planning (ACP) and better physician availability.

- Whereas residents in acute situations are asked about their wishes and treatment preferences, there is still a lack of continuous conversations between nursing home residents, their families and health professionals to better prepare decision-making.

- The unavailability of physicians familiar with residents and nursing homes in acute situations, mainly at nights and on weekends, call for a better 24/7 availability of medical services with a structured access, e.g. in the form of a closed physician system or a team of advanced practice nurses.

Abstract

Nursing home residents have a high risk of adverse events during hospitalizations. Since up to two-thirds of hospitalizations of nursing home residents are rated as potentially preventable, this study aimed to describe factors related to unplanned hospitalizations and to describe rates of unplanned hospitalizations, comparing differences between high- and low-hospitalization nursing homes. This cross-sectional multicenter study was conducted in 19 Swiss nursing homes and used questionnaire surveys of ward supervisors (n= 33) and nursing staff (n=146) and retrospectively assessed hospitalization data.

The study revealed several issues regarding unplanned hospitalizations, mostly concerning limitations regarding physicians' availability, lack of acquaintance of on-call physicians with the residents, and health professionals' lack of knowledge about the residents' wishes concerning therapeutic decisions. Our findings suggest that standardizing advance care planning processes and better physician availability might further reduce hospitalizations and improve quality of care in nursing homes.

Keywords

Aadvance care planning; cross-sectional studies; hospitalizations; nursing homes

Introduction

Emergency hospital admissions of older, often frail nursing home residents tend to be accompanied by adverse events such as falls, delirium and functional and cognitive decline.[1] Despite these dangers, admissions are increasing both progressively and disproportionately to overall admissions.[2] Approximately half of nursing home residents' hospital admissions are due to respiratory, cardiovascular, neurological and gastrointestinal symptoms; a quarter result from injuries, with the remainder reflecting urogenital, dermatological, ear-nose-throat, fever, psychiatric and social conditions.[2] However, between 18 and 67% of all hospitalizations are rated as potentially preventable or avoidable.[3-5] A potentially preventable hospitalization refers to a transfer for either a condition that was manageable in an ambulatory or nursing home setting or preventable via adequate chronic disease management.[6]

Interpretations of data on the prevalence of potentially preventable hospitalizations vary according to the measurement tools used.[7-9] Overall, assessment tools measuring the appropriateness of hospitalizations cover six aspects: diagnosis, severity of symptoms, resident's condition, resident and family wishes, availability of resources and existence of advance care plans.[8] In addition to nurses' appraisals of residents' care needs, financial incentives and reimbursement policies influence hospitalization decisions.[10-12] Since avoidability is difficult to discern, the measurement of unplanned hospitalizations is recommended as an approximation.[6]

In the literature, three modifiable factors influencing hospitalization are discussed: availability of advance directives (e.g. living will, do-not-resuscitate order or physician order of life-sustaining treatment (POLST)) and residents' wishes; availability of diagnostic and pharmacy services; and the health care team's composition and interactiveness including

physician availability. The findings of a review by Trahan and colleagues concerning contributing factors to emergency department (ED) visits confirm these points.[13] While the lack of advance directives or the lack of following them contribute to ED visits, both advance care planning or do-not-hospitalize orders help to reduce hospitalizations, as the decision of whether to admit a resident to hospital often hinges on the availability of such information.[11,14] Moreover, it has been shown for Ireland that the systematic, nation-wide implementation of an advance care planning program could result in a cost reduction of 17.7 to 42.4 million Euros due to reduced hospitalizations.[15]

The review by Trahan and colleagues also shows that the lack of diagnostic tools and equipment in nursing homes, the limited options to treat residents in place and the unavailability of physicians or nurse practitioners add to ED visits.[13] Physicians' eminent role in diagnostic and decision-making processes gives them the greatest influence on the rate of acute care hospitalizations.[16] Still, their decisions depend strongly on accurate and timely information exchange with other health team members. Poor communication between care workers and physicians leads to misunderstandings and incorrect assessments of situations[9,17]; while educating staff on effective communication with physicians decreases hospitalizations.[18]

In the Swiss context, we were interested in assessing nursing staff's opinions on these three modifiable factors influencing hospitalizations. Accordingly, the primary objective of this study was to describe factors related to unplanned hospitalizations of nursing home residents in the German-speaking part of Switzerland. The secondary objective was to describe the rate of unplanned hospitalizations and to assess and compare differences between facilities with high and low hospitalization rates.

Materials and Methods

Design and setting

This cross-sectional multi-center sub-study was carried out in the context of the ProQuaS study (Identification and Development of Interfaces and Processes to Improve Quality of Life of Nursing Home Residents), which is embedded in a convenience sample of 19 nursing homes. All of them were members of a group exclusively operating in the German-speaking part of Switzerland. They offer mostly long-term and dementia care. Each nursing home's administrators, ward supervisors and care workers were surveyed. In the overall survey, care workers of all educational levels (registered nurses (RN), licensed practical nurses (LPN), nurse aids) were included if they had worked in direct care for at least one month in the facility at the time of the survey. Only RNs and LPNs were included in this sub-study. If they did not understand German, they were excluded. As for hospitalizations, we included all entries of nursing home residents from these facilities between June 1st 2015 and May 31st 2016.

Variables and measurement

Data were collected from questionnaires (cf. table 1 for more detailed information about the items covering the three modifiable factors influencing hospitalization and their sources) and the electronic administrative registry. **Facility questionnaire** were filled out by the nursing home administrators or directors of nursing, including questions about the availability of medical technology and physician services in the facility.[19-21] **Ward questionnaire** were completed by the ward supervisor including questions about their assessment concerning e.g. the presence of advance directives or documented residents' wishes and preferences and reasons for hospitalizations.[19,20] In the **care worker questionnaire,** we asked registered nurses and licensed practical nurses employed at the participating facilities to assess the handling of advance directives and residents' wishes on

their unit.[21] From the **electronic administrative registry** the institutions extracted retrospectively administrative data on all hospitalizations taking place within the one-year study period mentioned above. Date and time of each hospital transfer was noted, as well as whether the hospitalization was planned or unplanned, where the latter refers to an unexpected admission to the hospital with the need for attention at the earliest possible time. Hospitalization rates were calculated counting the ratio of unplanned hospitalizations with admission to stationary care (at least 24h stay) per 1000 resident days.

[insert table 1 here]

Data collection

Nursing homes were invited to participate via personal communication at regional meetings of the overall nursing home group and by mail. Participating homes' directors signed an informed consent form for their facility. The survey data were collected from July to August 2016 with paper and pencil questionnaires. The local coordinators distributed them internally to all employees fulfilling the inclusion criteria. In consideration of the questions' sensitive nature and to protect the privacy of the employees, pre-addressed and pre-stamped envelopes were provided to return the completed questionnaires directly to the research team. The return of the completed questionnaire was considered informed consent. Data concerning hospitalizations of residents in the participating nursing homes were extracted retrospectively in August 2016 from an administrative database.

Residents' data were anonymized, leaving no possibility to retrace respondents' identities. The study was approved by the Swiss ethics committee (EK Nordwest- und Zentralschweiz, Ref. 2016-00621).

Analysis

The R version 3.1.1 statistical software was used to perform the statistical analysis.[22] To fulfill the primary objective, data were analyzed with descriptive statistics (numbers, percentages, means, standard deviations). For our secondary aim, to describe and compare unplanned acute hospital admissions, we first calculated the rate of unplanned hospitalizations per facility per 1,000 care days. To compare differences between facilities we applied a mean split, building two groups with high and low hospitalization rates (mean: 1.65 hospitalizations / 1000 resident days). These groups were integrated in the facility, ward and care worker questionnaire data. All answers to the questionnaire items were dichotomized into two groups (i.e., agreement vs. neutral/non-agreement). We used Chi-square tests to compare all dichotomized variables. To adjust the significance level for multiple comparisons, we used the Holm-Bonferroni method with a first significance level at $p < .0008$.

Results

Nineteen nursing homes with 33 ward supervisors (registered nurses) and 291 care workers participated in the overall study (care worker response rate: 67.3 %); in this paper, answers of 146 RNs and LPNs were used. Across all participating institutions, 430 unplanned hospitalizations took part over the study period. The average nursing home hospitalization rate was 1.65 hospitalizations per 1000 care days (standard deviation (SD) 1.04 with a range from 0.5 to 3.9). No significant differences were found concerning the time of transfer to the hospital between high- and low-hospitalization facilities (cf. Table 2).

[insert table 2 here]

Availability of advance directives / residents' wishes

The ward supervisors' data indicated that on 82% of the wards (n=27) the presence of advance directives was assessed with newly admitted residents. However, only 55% (n=18) assessed residents' wishes regarding resuscitation and fewer than half of the wards (n=15; 45%) clarified at admission whether their residents wished to be hospitalized (cf. table 3 for detailed results). The factors rated as most important by ward supervisors in all institutions when deciding to transfer a resident into the hospital were: *'the resident's wishes'* (100% agreement, n=32)*; 'possibility to improve the residents' quality of life'* (100% agreement, n=32); and *'family members want the resident to go to the hospital'* (97% agreement, n=31), while the prospect for a *higher life expectancy* was rated less important (25% agreement, n=8).

[insert table 3 here]

Among nursing staff, 98% (n=131) agreed that family caregivers were informed when the condition of the resident deteriorated significantly and that the preferences and wishes of residents were considered in such situations. However, the statement that end-of-life issues were discussed together with residents and family caregivers was confirmed by only 49% of the nursing staff (n=64) with 60% agreeing in low-hospitalization facilities vs. only 38% agreeing in high-hospitalization facilities.

Availability of diagnostic services

Only three of the participating nursing homes (17%) reported providing weekday access to a physician for on-site, face-to-face resident assessments within one hour, whereas 58% of homes could provide this service within four hours (cf. Table 4). Only three (17%) reported a capacity to carry out medically assessed electrocardiograms during the week (on- or off-site). In seven homes (39%), laboratory results could be provided within four hours.

Medically evaluated x-ray examinations (on- or off-site) were available within four hours during the week in 56% of nursing homes. Intravenous access for fluid and antibiotics during the week is available in 44% of the nursing homes. The availability of these services did not differ between nursing homes with low and high hospitalization rates.

[insert table 4 here]

Composition and interaction of members of the health care team

Many ward supervisors (88%, n=29) reported timely detection of residents' medical problems and clear and accurate information flow from nurses to physicians (91%, n=30, cf. Table 5). Fewer ward supervisors reported the carrying out of thorough investigations when a resident was ill in high-hospitalization facilities (56%, n=9) than in low-hospitalization facilities (88%, n=15). The most prevalent reason given for sending fewer residents to hospital was if the physicians covering nights and weekends were better acquainted with the situations of the residents concerned (70%, n=23), followed by a higher accessibility of physicians (58%, n=19) and if family members were less anxious (58%, n=19). Least important were the accessibility of lab results (30%, n=10) and if physicians could better bill their visits (24%, n=8).

[insert table 5 here]

Overall, several variables differed between nursing homes with high hospitalization rates and those with low rates. However, none of the variables showed significant differences according to the Holm-Bonferroni correction with the adjusted p-value.

Discussion/Conclusion

We analyzed hospitalization data of 19 privately-owned nursing homes and surveyed data of 33 ward supervisors and 146 care workers. Further, to compare nursing homes with

high hospitalization rates with those with low hospitalization rates, we assessed statements about the avoidance of hospitalizations regarding three factors: *availability of advance directives / residents' wishes; availability of diagnostic services;* and *composition and interaction of the members of the health care team.* For all three of these factors we found issues regarding unplanned hospitalizations, mostly concerning the lack of timely availability of physicians – as was also observed in a recent survey on safe medication use in Swiss nursing homes[23] – the lack of on-call physicians' acquaintance with the residents, lack of knowledge of and communication with residents and their families about their wishes and insufficient knowledge of the legally authorized representatives or close persons about possible consequences of therapeutic decisions (in Switzerland, decisions on behalf of residents not able to express their desires for treatment and with no DNR orders or other advance directives, are taken by close persons if no legal representative is assigned).

We found an overall hospitalization rate of 1.65 ± 1.04 per 1 000 care days, which is congruent with the results of an investigation in Georgia, USA (1.62 hospitalizations / 1000 resident days)[4] or Norway (1.71)[24] but higher than in a Swedish study (0.96).[25] Data from a retrospective study on admissions of nursing home residents to an academic urban hospital's emergency department (ED) in Switzerland's French speaking region show that, following their ED visits, 37.6 % of residents returned directly to their nursing homes without hospitalization.[2] Those data indicate a potential to reduce hospitalizations through changes in the nursing homes.

Regarding the hospitalization of residents, not only the possibility to improve their quality of life but also the wishes of the affected residents and their legal representatives or persons close to them were rated as the most important factors of the decision-making process. These results are very similar to the findings of Buchanan et al.,[19] who surveyed

directors of nursing and medicine in 420 US nursing homes with questions comparable to those used here. Decisions about hospitalization must often be made on short notice, frequently in front of nursing home residents with limited functional and cognitive capacities. To better integrate resident's wishes and preferences for likely future health care scenarios and end-of-life care, continuous conversations between residents, family and health professionals in the form of advance care planning (ACP) is an important measure.[26,27] Our results suggest that while residents' wishes were considered in acute situations, continuous conversations with the persons involved happen less often. Further emphasis on ACP would thus be advisable for the Swiss setting. The issue has been taken up to varying degrees in US states since the nineties with the introduction of POLST that support decision-making concerning life-sustaining treatment preferences of patients with advanced illnesses.[28] Its use in nursing homes is related to a reduction of hospitalizations,[29] and overall, patients' wishes put down in POLST forms are honored to a high degree by health professionals.[30] In nursing homes, clear information about residents' and their legal representatives' wishes for care is associated with reduced end of life hospitalizations.[31] However, lack of time, resources and health care staff training hinder the application of ACP conversations.[32] Therefore, a successful intervention must include staff education and standardization of ACP processes within each nursing home. This includes the provision of opportunities for residents and close persons to discuss ACP, clearly assigning the conversations to specific health professionals who are trained for the task and using appropriate tools to support the process.[27,33] Guidance at policy level can enhance its uptake, as shown in the US National POLST Paradigm Task Force's support for its implementation.[34] While Switzerland has a national strategy for Palliative Care that supports ACP, working with ACP in nursing homes is in its beginnings

277 with first national recommendations being recently developed, e.g. for ACP in persons with
278 dementia.[33]

279 All ward supervisors (n=32) agreed with the statement that the wishes of the residents
280 are important; 97% (n=31) agreed that family members' wishes are important in hospital
281 transfer decisions. Previous studies have also acknowledged the importance of legal
282 representatives' or close persons' wishes in decisions to admit residents to hospital.[17,35] In the
283 current study, 58% of ward supervisors (n=19) agreed to the statement that residents' close
284 persons usually prefer that acute conditions be treated in hospital. Of course, each
285 hospitalization decision also depends on the physical and mental status of the affected
286 resident. However, family, friends and partners who better understand residents' prognosis
287 and the meaning of end of life choices tend to request fewer life-prolonging measures.[26] This
288 leads back to the importance of ACP not only for residents, but for all their close persons,
289 since it reduces their uncertainty in decision-making.[36]

290 The availability of diagnostic services was generally rather low: only 58% of surveyed
291 nursing homes could provide medical face-to-face assessments within four hours; and only
292 44% could provide intravenous fluids and antibiotics during the week. However, while
293 resource scarcity correlated with higher hospitalization rates, delayed access to on-site-
294 assessment appears to be only modestly important.[19] Nonetheless, to avoid preventable
295 hospitalizations, it is recommended that the infrastructure and strategies surrounding
296 diagnostic services be improved.[4] In our findings, regarding the statement, '*in our*
297 *department, thorough investigations are carried out when a resident is ill,'* the small but
298 conspicuous difference in responses by staff from nursing homes with low vs. high
299 hospitalization rates (respectively 88% vs. 56%; $p=0.039$; $X^2=4.251$) supports this
300 recommendation.

Several ward supervisors (n=33, 58%) would send fewer residents to the hospital if physicians were more readily accessible; and 94% of ward supervisors in the nursing homes with high hospitalization rates believed they would send fewer residents to the hospital if physicians covering nights and weekends were better acquainted with their residents' situations. Similar observations were reported in a US study, where nursing homes with higher physician coverage and physician extenders had fewer hospitalizations.[37] Most nursing homes in our study had an open physician system with several general practitioners treating just a few residents per nursing home and emergency services covering evening and night shifts. This open system is related to each resident's right to choose his or her own physician in Switzerland, but raises the question about the need of 24/7 availability of medical services. One possible solution for these matters would be employing either a structured medical service accountable for all residents per facility (a closed system as described by Katz and colleagues[38]) or a team of APNs specialized in geriatric and chronic care who could be accountable for medical management of all residents. Data from the Missouri Quality Initiative (MOQI) show a 30% reduction of hospitalizations with advanced practice registered nurses (APRN) embedded full-time in nursing homes. They have the training to intervene early when residents' situations begin to deteriorate, stabilize the acute condition and plan care approaches that avoid hospitalization.[39] In addition, APNs can improve the overall quality of care in nursing homes by guiding less experienced teams and supporting them in essential skills.[39]

One of this study's strengths is the care workers' and ward supervisors' survey statements regarding the avoidance of hospitalizations. The chief limitation is the small convenience sample of nursing homes owned by a single private for-profit chain, the location of the nursing homes (only in the German speaking part of Switzerland), the use of

retrospective hospitalization data with a lack of clinical and diagnostic data of the affected residents. Still, the results might apply to other nursing homes in Switzerland with similar structures of no 24h/7d physician record access and no face-to-face on-site physician visit within 30 minutes. Most studies about nursing home residents' hospitalizations contain several limitations, e.g., missing clinical status, missing pre- and post-hospitalization diagnoses (ICD-10), retrospective data acquisition, and missing data regarding appraisals by involved personnel, mainly care workers.

Because we wanted an overview of factors modifiable by the nursing homes themselves, we focused on surveying the care workers, not residents and their families. Nevertheless, our study gives a first insight into the Swiss nursing home environment: the results can be used for further investigation and planning of interventions to increase nursing home residents' quality of life by reducing avoidable hospitalizations.

In summary, hospitalization rates and factors related to unplanned nursing home residents' hospital admissions in Switzerland are comparable to those of other countries. Our findings suggest that accountable 24/7 medical service and interprofessional care are key elements for residents' safety and avoidance of unplanned hospitalizations. Moreover, standardization of advance care planning processes might further avoid unplanned hospitalizations and improve residents' quality of life in the surveyed nursing homes.

343 **Table 1: Detailed information about variables and measurement**

Variable	Description	Answer options/ measurement
Availability of advance directive		
Advance directive or other treatment instructions such as wishes for hospitalization or the clarification of palliative care situations (self-developed)	5 questions about the assessments made with newly admitted residents regarding the presence or wishes for the clarification for situations when the resident's situation is deteriorating such as the presence of advance directives or their wish concerning hospitalizations.	Five point Likert frequency scale (*never - always*). Level of measurement: Ward supervisor
Factors influencing the decision making of hospitalizing a resident (based on Buchanan et al. 2006 and Young et al. 2010)	Seven statements about the reasons for admitting a resident to the hospital such as *The resident wants to go to the hospital* or	Four point Likert importance scale (*not at all important-very important*).

Variable	Description	Answer options/ measurement
	Opportunity to improve the residents' quality of life.	Level of measurement: Ward supervisor
Residents' and family's wishes, management of deterioration in a resident's status (based on Ampe et al. 2015)	13 questions such as: *"We ask a resident if he or she has an advanced directive in the first weeks after admission to the nursing home."*	Four point Likert agreement scale (*strongly disagree – strongly agree*). Level of measurement: Care worker
Availability of diagnostic services		
Availability of medical assessment and selected therapies (based on Buchanan et al. 2006 and Young et al. 2010)	Availability of: *on site assessment of residents by a physician, performance and medical assessment of an ECG, laboratory services, availability of*	*easy / difficult but possible / impossible* Level of measurement: Facility

Variable	Description	Answer options/ measurement
	radiological assessment (thorax x-ray, abdomen x-ray, extremities x-ray) and medical evaluation, intravenous access for fluid and antibiotics, oxygen therapy and monitoring within a specific timeframe (*1 hour, 4 hours*) at different times (*during the week, at evening/night or at the weekend*)	
Composition and interaction of the members of the health care team including physician availability		
Statements about the wards' possibilities when a resident is deteriorating (based on Young et al. 2010)	Seven statements about the ward such as "*Here, medical problems of residents are detected at the right time"* or *"The attending*	Five point Likert scale (*do not agree - agree*). Level of measurement: Ward

Variable	Description	Answer options/ measurement
	physicians treat the residents as long as possible in our institution, hospitalization is only the last means of choice".	supervisor
Avoidance of hospitalizations (Buchanan et al. 2006 and Young et al. 2010)	10 hypothetical questions about the avoidance of hospitalizations such as *"We would send fewer residents to the hospital if the family members were less anxious"*.	Five point Likert agreement scale (*do not agree - fully agree*). Level of measurement: Ward supervisor

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346 **Table 2: Nursing home characteristics, staff characteristics, hospitalizations**

	overall	Low hospitalization rate	High hospitalization rate	missing
Nursing home characteristics:				
Number of long-term care beds, mean (sd)	47.5 (35.5)	44.6 (34.0)	51.5 (39.5)	0
FTE care workers/ 100 beds, mean (sd)	51.4 (17.4)	54.0 (22.6)	48.9 (10.9)	3
Staff characteristics				
Gender: female, n (%)	90 (90%)	69 (93%)	60 (87%)	3
Age in yr, mean (sd)	38.1 (13.9)	38.4 (14.1)	37.8 (13.8)	7
Nursing job category:				0
Nurse with academic education (Bachelor/Master degree), n (%)	6 (4%)	3 (4%)	3 (4%)	
Registered nurse (diploma level), n (%)	50 (34%)	26 (35%)	24 (34%)	

Licensed practical nurse, n (%)	90 (62%)	46 (61%)	44 (62%)	
Years of experience in nursing care, mean (sd)	14.4 (10.0)	14.1 (10.2)	14.7 (9.9)	7
Years of experience in this institution, mean (sd)	3.2 (3.8)	3.1 (3.0)	3.3 (4.6)	14
Hospitalizations	430	198	232	
Time of transfer to hospital				9
8 a.m. – 4 p.m., n (%)	277 (66%)	129 (66%)	148 (65%)	
4 p.m. – 10 p.m., n (%)	104 (25%)	46 (24%)	58 (26%)	
10 p.m. – 8 a.m., n (%)	40 (9%)	19 (10%)	21 (9%)	
Hospitalization rate, hospitalizations per 1 000 care days	1.65 (1.04)	0.96 (0.39)	2.61 (0.88)	

sd: standard deviation, n: number, yr: year

350 **Table 3: Results concerning the availability of advance directives**

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
How often do you assess the following questions with new entering residents? [a] (level: ward supervisor)	often -always	often -always	often -always		
Presence of: advance directives (n=33)	27 (82%)	14 (82%)	13 (81%)	0.935	0.007
Wish regarding:					
creation of an advanced directive (n=33)	22 (67%)	12 (71%)	10 (63%)	0.622	0.243
resuscitation (yes/no) (n=33)	18 (55%)	11 (65%)	7 (44%)	0.227	1.450
hospitalization during nursing home residence (n=33)	15 (45%)	10 (59%)	5 (31%)	0.112	2.528
Clarification regarding: presence of palliative care situation (n=31)	20 (65%)	12 (71%)	8 (57%)	0.436	0.606

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
Factors rated as important in decision making for hospital transfers[b] (level: ward supervisor)	Rather/very important	Rather/very important	Rather/very important		
How important are the following factors when deciding to transfer residents into a hospital:					
resident's wish (n=32)	32 (100%)	16 (100%)	16 (100%)	1	
possibility to improve residents' quality of life (n=32)	32 (100%)	16 (100%)	16 (100%)	1	
family members want residents to go into hospital (n=32)	31 (97%)	16 (100%)	15 (94%)	0.310	1.032
higher degree of discomfort caused by the acute illness (n=33)	29 (88%)	14 (82%)	15 (94%)	0.316	1.005
higher likelihood that the disease leads to increased restriction of the resident (n=32)	21 (66%)	10 (63%)	11 (69%)	0.710	0.139

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
higher likelihood that resident can die from the disease (n=32)	19 (59%)	8 (50%)	11 (69%)	0.280	1.166
higher life expectancy (n=32)	8 (25%)	3 (19%)	5 (31%)	0.414	0.667
Agreement to the following statements [b] (level: care workers)	Rather/strongly agree	Rather/strongly agree	Rather/strongly agree		
When physical or mental condition of a resident deteriorates significantly, family caregivers will be informed (on their request) (n=133)	131 (98%)	65 (97%)	66 (100%)	0.157	2.000
Preferences and wishes of residents to be considered in state of deterioration (n=133)	131 (98%)	67 (100%)	64 (97%)	0.151	2.061

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
Preferences for participation in advance care planning are respected (n=132)	129 (98%)	64 (98%)	65 (97%)	0.577	0.311
Findings are documented in the residents' files (n=133)	118 (89%)	63 (94%)	55 (83%)	0.051	3.802
Inquiry about the advance directives within the first weeks (n=132)	116 (88%)	55 (85%)	61 (91%)	0.258	1.280
Family caregivers have contact persons they can turn to when they have questions about end-of-life issues (n=133)	111 (84%)	57 (85%)	54 (82%)	0.613	0.255
Preferences about end-of-life issues are explored with residents (such as: hospitalization, resuscitation, pain treatment and goals of care) (n=133)	106 (80%)	56 (85%)	50 (75%)	0.143	2.147

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
Family caregivers' attitudes towards end-of-life issues are explored (n=134)	103 (77%)	55 (82%)	48 (72%)	0.152	2.056
There are frequent informal contact between the nursing home staff and the family caregivers, facilitating communication about end-of-life issues (n=132)	100 (76%)	53 (80%)	47 (71%)	0.223	1.485
Preferences are assessed continuously (not at one time only) and adapted if needed (n=132)	94 (71%)	51 (77%)	43 (65%)	0.124	2.365
Preferences for participation in advance care planning are explored with all residents (n=130)	86 (66%)	43 (68%)	43 (64%)	0.624	0.241
Family caregivers' attitudes towards end-of-life issues are explored systematically, for family caregivers of all residents (n=132)	75 (57%)	40 (61%)	35 (53%)	0.380	0.772

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[c]	X^2 (df=1)
We discuss end-of-life issues together with residents and family care givers (e.g. at roundtable discussions) (n=131)	64 (49%)	39 (60%)	25 (38%)	0.011	6.413

351 Notes**:** [a] number of agreeing ward supervisors, [b] number of agreeing care workers, [c] chi-square test

352 **Table 4: Results concerning the availability of diagnostic services**

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
Easy access to (n=19)[a] (level: nursing home administrator)	Easy access	Easy access	Easy access		
Face-to-face assessment of residents on site by a doctor					
within **four** hours: during the week (n=19)	11 (58%)	7 (64%)	4 (50%)	0.552	0.353
within **four** hours: evening/night (n=19)	9 (47%)	5 (45%)	4 (50%)	0.845	0.038
within **four** hours: during the weekend (n=19)	9 (47%)	5 (45%)	4 (50%)	0.845	0.038
within **one** hour: during the week (n=18)	3 (17%)	2 (18%)	1 (14%)	0.829	0.047
within **one** hour: evening/night (n=18)	2 (11%)	2 (20%)	0 (0%)	0.180	1.8
within **one** hour: during the weekend (n=19)	1 (5%)	1 (9%)	0 (0%)	0.381	0.768

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
Generating and medical assessment of an ECG					
during the week (n=18)	3 (17%)	3 (27%)	0 (0%)	0.130	2.291
evening/night (n=16)	1 (6%)	1 (11%)	0 (0%)	0.632	0.830
during the weekend (n=17)	1 (6%)	1 (10%)	0 (0%)	0.389	0.744
Availability of laboratory results within four hours					
during the week (n=18)	7 (39%)	4 (36%)	3 (43%)	0.783	0.076
evening/night (n=17)	2 (12%)	1 (10%)	1 (14%)	0.787	0.073
during the weekend (n=18)	2 (11%)	1 (9%)	1 (14%)	0.732	0.117
Availability of radiological assessment (thorax x-ray, abdomen x-ray, extremities x-ray) and medical evaluation					
within **four** hours: during the week (n=18)	10 (56%)	6 (55%)	4 (57%)	0.914	0.012

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
within **four** hours: evening/night (n=17)	4 (24%)	3 (30%)	1 (14%)	0.452	0.565
within **four** hours: during the weekend (n=18)	4 (22%)	2 (18%)	2 (29%)	0.605	0.267
within **one** hour: during the week (n=18)	5 (28%)	3 (27%)	2 (29%)	0.952	0.004
within **one** hour: evening/night (n=17)	3 (18%)	2 (20%)	1 (14%)	0.761	0.093
within **one** hour: during the weekend (n=18)	2 (11%)	1 (9%)	1 (14%)	0.732	0.117
Intravenous access for fluid and antibiotics					
during the week (n=18)	8 (44%)	3 (27%)	5 (71%)	0.066	3.378
evening/night (n=17)	4 (24%)	2 (20%)	2 (29%)	0.682	0.168
during the weekend (n=18)	5 (28%)	3 (27%)	2 (29%)	0.952	0.004
Oxygen therapy and monitoring					

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
during the week (n=18)	17 (94%)	11 (100%)	6 (86%)	0.197	1.664
evening/night (n=17)	15 (88%)	9 (90%)	6 (86%)	0.787	0.073
during the weekend (n=18)	17 (94%)	11 (100%)	6 (86%)	0.197	1.664

353 Notes**:** [a] number of institutions, [b] chi-square test

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356 **Table 5: Results concerning the composition and interaction of the members of the health care team and availability of physicians**

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
Agreement to the following statements (n=33)[a] (level: ward supervisor)	Rather agree / agree	Rather agree / agree	Rather agree / agree		
Within our department, the wishes of the residents regarding hospitalization are considered.	32 (97%)	17 (100%)	15 (94%)	0.295	1.096
The nurses of this department can differentiate urgent from non-urgent medical problems.	30 (91%)	15 (88%)	15 (94%)	0.582	0.303
Nurses are able to provide physicians with clear, accurate and appropriate information when a resident's condition deteriorates.	30 (91%)	15 (88%)	15 (94%)	0.582	0.303

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
Here, medical problems of residents are detected at the right time.	29 (88%)	15 (88%)	14 (88%)	0.948	0.004
In our department, thorough investigations are carried out when a resident is ill.	24 (73%)	15 (88%)	9 (56%)	0.039	4.251
The attending physicians treat the residents as long as possible in our institution, hospitalization is only the last means of choice.	21 (64%)	9 (53%)	12 (75%)	0.188	1.733
Family members of residents usually prefer that acute conditions are treated in hospital.	19 (58%)	9 (53%)	10 (63%)	0.579	0.308
We would send fewer residents to the hospital if … , (n=33)[a] (level: ward supervisor)	Rather / fully agree	Rather / fully agree	Rather / fully agree		

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
... physicians covering nights and weekends were better acquainted with the situation of the residents	23 (70%)	8 (47%)	15 (94%)	0.004	8.508
... our physicians would be more readily accessible	19 (58%)	6 (35%)	13 (81%)	0.008	7.127
... the family members were less anxious	19 (58%)	7 (41%)	12 (75%)	0.049	3.861
…the residents and their relatives would receive more information and support regarding the end of life care	16 (48%)	4 (24%)	12 (75%)	0.003	8.742
... the physicians would have better access to the medical history, laboratory results or ECGs of residents	15 (45%)	5 (29%)	10 (63%)	0.056	3.640
... there would be better communication between nurses and physicians	15 (45%)	5 (29%)	10 (63%)	0.056	3.640

Variable	All Institutions, n (%)	Low hospitalization rate, n (%)	High hospitalization rate, n (%)	p-value[b]	X^2 (df=1)
... the nursing and care staff would be better trained in end of life care	15 (45%)	5 (29%)	10 (63%)	0.056	3.640
... we would have a better staffing with regard to the level of education at night and on weekends	15 (45%)	5 (29%)	10 (63%)	0.056	3.640
… lab results would be more readily accessible in this company	10 (30%)	4 (24%)	6 (38%)	0.383	0.762
... physicians could better bill a site visit with residents	8 (24%)	1 (6%)	7 (44%)	0.011	6.436

357 Notes**:** [a] number of agreeing ward supervisors, [b] chi-square test

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