Increasing implicit rationing of care in nursing homes: A time-series cross-sectional analysis

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ABSTRACT

Background: Implicit rationing of nursing care is a socio-ecological problem where care workers, due to lack of resources, have to leave necessary nursing care activities undone. Cross-sectional studies on implicit rationing of nursing home care revealed associations with organizational and work environment characteristics. However, little is known on how implicit rationing of nursing care varies over time in nursing homes.
Objective: This study's purpose was to describe changes in levels and patterns of implicit rationing of nursing care in Swiss nursing homes over time, while accounting for key explanatory factors related to organizational, work environment, and individual characteristics.
Design: Time-series cross-sectional analysis.
Setting: Nursing homes in Switzerland.
Participants: A convenience sample of 47 nursing homes and 3269 care workers from all educational levels participating in two multicenter cross-sectional studies (the Swiss Nursing Home Human Resources Project) conducted in 2013 and 2018.
Methods: To quantify implicit rationing of nursing care, care workers' data were collected via the nursing home version of the Basel Extent of Rationing of Nursing Care instrument. To control for leadership ability, staffing and resource adequacy, we used the Nursing Work Index–Practice Environment Scale. Objective measures including turnover, staffing and skill mix levels were aggregated at the nursing home level. Our analyses included multiple linear mixed models, using time as a fixed effect and nursing home as a random effect.
Results: We found overall increases of rationing of care activities over the five-year period studied, with documentation and social activities most rationed at both measurement points (overall coefficients varied between 0.11 and 0.23, as well as the 95%-confidence intervals between 0.05 and 0.30). Moreover, a considerable increase in rationing of activities of daily living (coefficient of 0.47 in 2013 and 0.63 in 2018) was observed.
Conclusions: Alongside long-term deterioration of staff resources, increases in rationing of nursing care are a worrying development, particularly given their potential negative impacts both on residents and on care workers. To assess nursing home care quality and to determine adequate staffing levels and skill mixes, policy makers and nursing home managers should consider regular monitoring of rationing of nursing care.
Tweetable abstract: Time-series cross-sectional analysis reveals increasing rationing of nursing care activities in Swiss nursing homes from 2013 to 2018.

What is already known

- Studies have shown associations between higher staffed nursing homes, less rationing of nursing care, and higher quality of care.
- Data on rationing of nursing home care are drawn exclusively from cross-sectional studies, which do not depict natural changes in organizational structures, nursing home residents, and care workers over time.

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What this paper adds

- This time-series cross-sectional analysis reveals that in the five years between measurements, the numbers of rationed nursing care activities increased while staffing levels decreased.
- Our study shows that patterns of rationing have remained similar, i.e., care workers' approaches to task prioritization/ranking have remained generally consistent.
- In addition to large increases in rationing of social care and documentation tasks, our results show considerably more rationing regarding activities of daily living.

1. Background

Raising workforce shortages and an increase in complexity of nursing home residents care needs are known to foster conditions that make the rationing of nursing care activities more likely to occur (Mercay and Grünig, 2016; OECD, 2011). The concept of implicit rationing of nursing care, used in this study, was defined by Schubert et al. (2007) as "withholding or failure to carry out necessary nursing tasks due to inadequate time, staffing level and skill mix". Implicit as opposed to explicit rationing means that the individual decision of care workers at the micro level to not carry out certain nursing care activities is made in absence of explicit criteria (Breyer, 2012). In their daily practice, nursing home care workers assess residents' care needs and make decisions about how or to which extent necessary nursing care can be provided. This leads to a process of prioritization in which care workers make professional judgments (i.e., clinical reasoning) and set nursing care activities in an order of importance. Rationing occurs, when care workers no longer have a choice to build an order of care activities and are forced to omit necessary nursing care (Ludlow et al., 2021; Schubert et al., 2007; Tragakes and Vienonen, 1998). Such decisions have serious and far-reaching consequences: implicit rationing of nursing care negatively affects not only nursing home residents but care workers at every level of training and education as well (Braun et al., 2018; Papastavrou et al., 2014).

Implicit rationing of nursing care is not rare. In a 2015 survey of Swiss nursing home care workers, 30% to 75% of respondents reported rationing one or more nursing care activities. And while levels vary within and between countries (Knopp-Sihota et al., 2015; Zúñiga et al., 2015b), the most commonly rationed nursing care activities are those related to communication, emotional support, documentation, and rehabilitation care (Henderson et al., 2016; Nelson and Flynn, 2015; Zúñiga et al., 2015b). This indicates that nursing care activities set up within an organization's daily routines and with immediate negative impacts on residents are less rationed (e.g., leave residents in urine/stool) (Morin and Leblanc, 2005). Nevertheless, when and what type of care activities are provided most often depend on the decision-making process of individual care workers (i.e., clinical reasoning). As care workers are embedded in organizational structures, implicit rationing of care is also influenced by management decisions, the nursing home's care workers and residents' characteristics, as well as by the political, economic, and social considerations that shape its work environment. All of these interrelated human and organizational factors contribute to the complex socio-ecological phenomenon of implicit rationing of nursing care (Jones et al., 2019; Kaplan et al., 2010).

Recognizing this complexity, an increasing number of cross-sectional studies are finding relationships between organizational, work environment, and individual characteristics and rationing of nursing home care. In Canada, Knopp-Sihota et al. (2015) reported significant associations between higher levels of rationed care and nursing home characteristics such as smaller size, public administration and rural locations; and in Australia, Henderson et al. (2018) reported that public sector care workers were less likely than their private-sector counterparts to report rationed care activities. One of the most studied factors associated with rationed care activities is staffing adequacy, particularly in the

context of residents with complex care needs. Most studies measure this at the individual care worker level, that is, as perceived by the care staff. The results typically confirm a relationship between perceived staffing adequacy and rationing of nursing care (Arling et al., 2007; Henderson et al., 2018; Zúñiga et al., 2015b). Yet, when Arling et al. (2007) in the USA and Zúñiga et al. (2015b) in Switzerland looked for similar relationships between rationed care activities and objective unit-level staffing levels, they found none. Contrary to staffing levels, grade mixes correlate well with implicit rationing of nursing care (Arling et al., 2007; Henderson et al., 2018; Slettebo et al., 2010). Similarly, teamwork and interdisciplinary collaboration are both well-investigated: lack of support and poor communication between team members both correlate with higher levels of rationing (Henderson et al., 2018; Tou et al., 2019; Zúñiga et al., 2015b). However, while Slettebo et al. (2010) and Knopp-Sihota et al. (2015) put forth inadequate leadership as an explanatory factor for rationing of nursing care, Zúñiga et al. (2015b) found no such relationship.

These findings from cross-sectional studies reflect only a "snapshot" of the situation at a certain time, but do not take into account the possibility of socio-ecological changes over time and how these might influence rationing of care. For instance, previous research demonstrated that residents enter nursing homes in a frailer state than before, with multiple co-morbidities and dementia (Andreani et al., 2019; OECD, 2011), or receive treatments (e.g., complex wound care) which were formerly restricted to the acute care setting (Amalberti et al., 2016; Bundesamt für Statistik, 2019a). Consequently, the complexity of and demand for nursing home care continue to rise while at the same time nursing homes are struggling with the recruitment and retention of skilled personnel to meet this increasing demand (Mercay and Grünig, 2016).

It remains unclear how or how much such multi-level changes influence the levels (i.e., frequencies) and patterns (i.e., type of activities) of rationing of nursing care over time (see Fig. 1 for this study's conceptual model). However, as rationing of nursing care impacts residents as well as care workers negatively, understanding its development within the context of ongoing changes in the long-term care sector is important and should be investigated over time. Therefore, the aim of this study was to explore changes in levels and patterns of implicit rationing of nursing care over time in a large sample of nursing homes, while accounting for variations in key explanatory factors related to organizational, work environment, and individual characteristics.

2. Methods

2.1. Study design

We conducted an observational time-series cross-sectional analysis of data from two cross-sectional, multicenter studies: the initial Swiss Nursing Home Human Resources Project (SHURP) Project (conducted between 2011 and 2013), and the SHURP Project 2018 (conducted between 2018 and 2020) (Schwendimann et al., 2013; Zúñiga et al., 2013; Zúñiga et al., 2021). Both studies aimed to explore the relationships among various nursing home characteristics in Swiss nursing homes (Schwendimann et al., 2013; Zúñiga et al., 2013).

2.2. Setting and sample

According to the Swiss Federal Statistical Office, in 2017 there were 1550 nursing homes in Switzerland, with an overall occupancy rate of 93.3% (Bundesamt für Statistik, 2020). Swiss nursing homes offer general long- and short-term care, as well as more specialized services for residents with dementia, gerontopsychiatric, palliative, rehabilitation and transitional care needs. They normally have several care units, which they staff with fixed core teams made up of various levels of care workers. The overall average proportion of registered nurses (3–4 years of education) in Swiss nursing homes is 30.4%, licensed practical
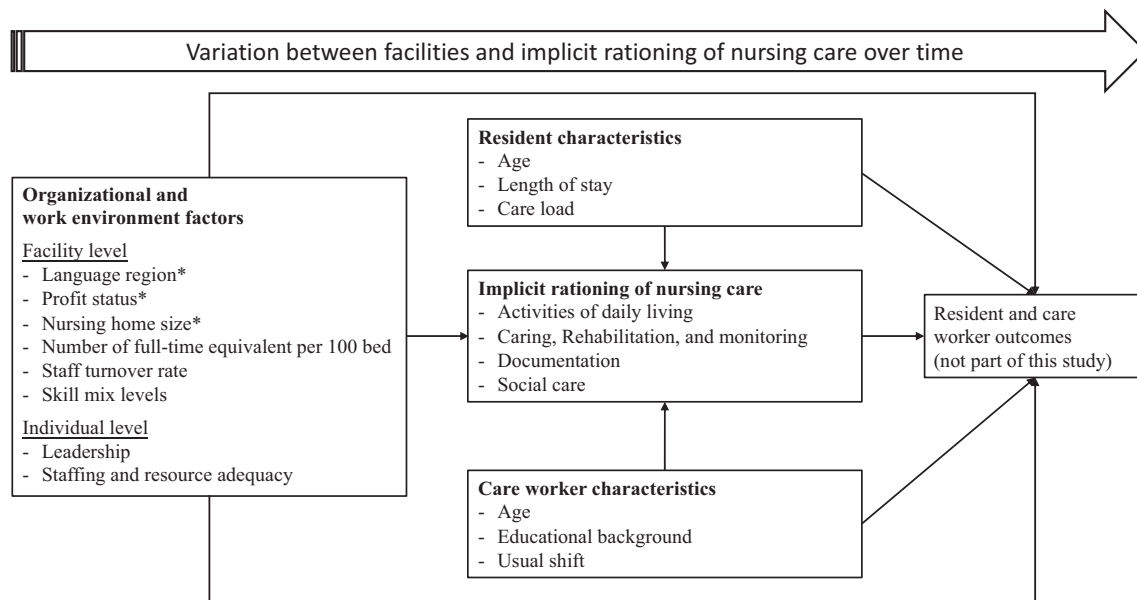
Fig. 1. Conceptual model of the study.

nurses (3-years of education) 18.4%, certified assistance nurses (1–2 years of education) 22.1%, and nurse aids (training on the job) as well as other trainings represent 29.2% of the workforce (Bundesamt für Statistik, 2019b; Mercay and Grünig, 2016). Residents have a mean age of 84.7 years and an average length of stay of approximately 850 days (Andreani et al., 2019; Bundesamt für Statistik, 2019b; Mercay and Grünig, 2016).

For this time-series cross-sectional data analysis, we included a convenience sample of 47 nursing homes included in both the 2013 and 2018 studies (see the flowchart in Supplementary Fig. S1). Facilities provided data on their organizational structure (e.g., size, staffing level). Care workers of all educational levels (e.g., registered nurses, licensed practical nurses) were invited to participate. They were considered eligible if they provided direct resident care for at least 8 h a week, understood German or French and had worked for at least one full month on their current unit. Care workers in leadership positions were excluded, as their daily routines differed considerably from those of other staff. More detailed information on the methodology of the [anonymous] Project, including the sampling procedure, can be found elsewhere (Schwendimann et al., 2013; Zúñiga et al., 2013).

2.3. Data collection and management

The first study took place between May 2012 and April 2013, the second between September 2018 and October 2019. Data were collected via four sources: (a) a facility-level questionnaire; (b) a unit-level questionnaire; (c) a care worker questionnaire; and (d) residents' routine assessment data. The surveys were distributed as appropriate to (a) the nursing home administrators, (b) unit leaders, and (c) care workers. To ensure the quality of each language version and the validity of the scales used, we followed a forward- and backward translation protocol (Maneesriwongul and Dixon, 2004).

Facility and unit questionnaires (a, b) assessed facility- and unit-level structural characteristics (e.g., size, staffing level). These were completed respectively by nursing home administrators and unit leaders. The *staff questionnaires (c)* consisted of items to assess care workers' work environment (e.g., leadership) and personal data (e.g., age, education). For more information, see Schwendimann et al. (2013) and Zúñiga et al. (2013). The staff questionnaires were distributed on the

units and all employees had roughly six weeks to complete their questionnaires and return them individually to the study team in pre-stamped envelopes. Nursing homes provided *resident data (d)* through their residents' needs assessment data. All data were anonymized and sent electronically to the study team. We used codes to identify nursing homes as well as units. Codes allowed assigning both care workers and residents to the unit level. The nursing home and unit codes were used to identify and merge nursing homes from the two data collections. For both data collections, data quality (i.e., completeness, plausibility) was checked by members of the research team (Zúñiga et al., 2021).

2.4. Variables and measurement

The outcome variable for our analysis was *implicit rationing of nursing care*. To measure this, we used the nursing home version of the Basel Extent of Rationing of Nursing Care instrument (Zúñiga et al., 2015b; Zúñiga et al., 2016). The questions covered six thematic areas of long-term care, which were combined into four subscales: (1) activities of daily living; (2) caring, rehabilitation and monitoring (caring); (3) documentation; and (4) social care. For these four subscales, Cronbach's alpha ranged between 0.75 and 0.85. The central question was "How often in the last seven days, care workers could not perform certain care activities that were necessary and usual, due to lack of time or high workload" (Zúñiga et al., 2015b, p. 1466). Items were rated on a five-point Likert-type scale from "never" to "often", with additional options such as "activity was not necessary", and "not within my competencies." The latter was included for tasks such as setting up care plans, which are outside of nurse aides' scope of work (Zúñiga et al., 2021). Answers in "sometimes" and "often" were set in relation to all valid answers. Responses of "activity was not necessary" and "not within my competencies" were treated as missing values. The mean cumulative score of all subscales indicated the level of implicit rationing of nursing care. Key explanatory variables are described in Table 1.

To illustrate the context, facility characteristics such as language region (i.e., German- or French-speaking), ownership status (i.e., public, public-funded, private), and nursing home size (i.e., small: ≤50 beds, medium: 51–99 beds, large: ≥100 beds) were used.

Table 1
Description of explanatory variables under study.

Variable name	Description	Measurement
Facility-level organizational factors		
Objective staffing levels	Full-time equivalent staff divided by number of beds, multiplied by 100	Number
Turnover	Number of persons who left the facility in the last six months in relation to the current number of team members at the time of data collection	Number
Skill mix levels	Proportion of registered nurses	Number
Work environment factors on an individual level from the Practice Environment Scale – Nursing Work Index (Lake, 2002)		
Leadership	5-Item subscale assessing direct nursing leaders in terms of e.g., learning opportunities, recognition, or a competent leader	4-point Likert scale from 1 = strongly disagree to 4 = strongly agree Cronbach's α (in this study) = 0.84
Staffing and resource adequacy	3-Item subscale assessing staff resources individually (e.g., time and opportunity to discuss resident care problems or enough staff to get the work done)	4-point Likert scale from 1 = strongly disagree to 4 = strongly agree Cronbach's α (in this study) = 0.74
Individual factors: care worker characteristics on individual level		
Age	Care worker age in years	Years (in three categories; ≤30 years of age, 31–50 years of age, ≥51 years of age)
Usual shift	Care workers type of shift	Two categories of shifts: either regularly changing between days and evening or nights only
Educational background	Care worker professional education	Registered nurses (3–4 years of education), licensed practical nurses (3 years of education), certified nurse aides (1–2 years of education), nursing aides (training on the job or short courses), and others (other professions were taken together)
Individual factors: resident characteristics on facility level		
Care load	Residents' care load	Scale 1 to 12, where 1 unit increase indicates an additional 20 min of care per day (mean per facility)
Age	Residents' mean age	Years (mean per facility)
Length of stay	Residents' mean length of stay	Days (mean per facility)

2.5. Data analysis

Due to the structural changes that occurred within the participating nursing homes over the five years between the two data collection periods, data could not be merged at the unit level but at the facility level. Therefore, all structural factors (i.e., full-time equivalent/100 beds, skill mix, and turnover) were aggregated at the facility level. We used means, standard deviations (SDs), frequencies, and percentages to describe all variables of interest. Care worker characteristics and perceptions of both the work environment and rationing of nursing care were assessed at the care worker level 1 and organizational as well as resident characteristics at the facility level 2. To increase the two measurements points' comparability, as the numbers of missing responses for most items were quite low (i.e., <10%), we used complete cases for further analysis.

Given the hierarchical structure of the data, intraclass correlation coefficients 1 were calculated for the four Basel Extent of Rationing of Nursing Care's subscales (i.e., activities of daily living, caring, documentation, and social care) with nursing homes as a random effect. Due to an intraclass correlation coefficient 1 greater than 0.05 in all of the four subscales, generalized linear mixed models were applied to control for the nestedness of care workers within facilities (LeBreton and Senter, 2008; Snijders and Bosker, 2012). Rationing of nursing care, as well as care worker characteristics (i.e., age, profession, and usual shift) and work environment factors were modeled on level 1; organizational factors (e.g., full-time equivalent per 100 beds) on level 2.

First, to examine variations in potential time-varying predictors (e.g., perceived leadership and staffing, full-time equivalent per 100 beds), simple generalized linear mixed-effect models were applied for each individual predictor and timepoint as a fixed effect and nursing homes as a random effect for linear, binomial, and Poisson distribution families according to the outcome of interest (reported as difference in Table 2). Second, based on our conceptual model (Fig. 1), six multiple generalized linear mixed-effect models, each using timepoint as a fixed effect and nursing homes as a random effect, were computed: a "time model" with timepoint only (Model A); an "organizational factor model" (Model B); a "work environment model" (Model C); and "care

workers and residents individual factors models" (Model D and E). Finally, all variables were included in Model F (see Supplementary Table S3). Across all models, neither the individual nor the facility level indicated multicollinearity (variance inflation factors < 5) (Yu et al., 2015). Relationships and variations over time were considered statistically significant at p < 0.05. As we worked only with complete cases, we evaluated our models according to the Akaike information criterion, where lower values indicate a more suitable model (Gelman and Hill, 2006). An alternative approach to modeling, which was based on listwise deletion considering only the variables included in each of the model yielded similar results. Data were analyzed using R version 4.0.2 for Mac OS (R Core Team, 2020). For our random effect models, we used the R package lme4 version 1.1-23 (Bates et al., 2015); and for intraclass correlation 1 we used the R rptR package version 0.9.22 (Stoffel et al., 2017).

2.6. Ethical aspects

The first study (2013) was approved by all Swiss cantonal ethics committees; the second (2018) was granted an ethics waiver by the appropriate Swiss ethics committee (Northwest and Central Switzerland ethics committee, [anonymous Nr]). For both studies, each participating nursing home gave written consent to participate before the study started. Individual respondents were informed regarding the study; participation was voluntary. Respondents' returning of the filled questionnaire was considered informed consent. All resident data were anonymized before being forwarded to the study team.

3. Results

3.1. Study sample, organizational, work environment, and individual factors

Our analysis included survey data of 3269 care workers (1580 in 2013, 1689 in 2018) from 47 nursing homes from Switzerland's German- and French-speaking regions. Across all facilities the care workers' mean response rate was 69% in 2013 and 78% in 2018. Most nursing

Table 2
Characteristics of the facility and care worker sample and the variables under study.

	2013	2018	Missing %	Difference p-value
Facility characteristics (facility level) (valid n (%))	n = 47	n = 47		
Language region				
German-speaking	41 (87.2)	41 (87.2)	0	–
French-speaking	6 (12.8)	6 (12.8)	0	–
Profit status				
Public	19 (40.4)	19 (40.4)	0	–
Private subsidized	10 (21.3)	8 (17.0)	0	–
Private	18 (38.3)	20 (42.6)	0	–
Facility size				
Small (20–49 beds)	16 (34)	15 (31.9)	0	–
Medium (50–99 beds)	20 (42.6)	20 (42.6)	0	–
Large (100 and more beds)	11 (23.4)	12 (25.5)	0	–
Number of full-time equivalent per 100 beds (mean (SD))	50.07 (12.42)	46.27 (13.78)	2.1	0.011
Turnover overall (%) (mean (SD))	10.91(7.33)	13.52 (8.39)	0	0.108
Proportion of registered nurses (skill mix levels) (%) (mean (SD))	31.25 (9.68)	25.92 (8.5)	2.1	<0.001
Resident characteristics (per facility)				
Mean age (years) (mean (SD))	84.92 (2.72)	85.93 (2.53)	2.1	<0.001
Mean length of stay (days) (mean (SD))	1321.5 (434.44)	1225.9 (327.75)	2.1	0.058
Mean care load (scale from 1 to 12) (mean (SD))	5.99 (1.53)	6.10 (1.50)	3.2	0.375
Care worker characteristics (individual level) (valid n (%))	n = 1580	n = 1689		
Age			1.2	<0.001
≤30 years of age	330 (21.3)	446 (26.5)		
31–50 years of age	540 (34.9)	598 (35.6)		
≥51 years of age	678 (43.8)	638 (37.9)		
Educational background			0.5	0.316
Registered Nurse (3–4 years of education)	459 (29.9)	453 (26.8)		
Licensed practical nurse (3 years of education)	411 (26.3)	561 (33.2)		
Certified assistant nurse	258 (16.5)	283 (16.8)		
Nurse aide (training on the job)	436 (27.9)	392 (23.2)		
Usual shift			3.6	0.028
Regular change of shifts	1305 (89.0)	1532 (90.9)		
Night shift	161 (11.0)	153 (9.1)		
Work environment (scale 1–4) (individual level)				
Nurse manager ability, leadership, and support of care workers (mean (SD))	3.21 (0.59)	3.19 (0.61)	0.4	0.043
Staffing and resources adequacy (mean (SD))	2.84 (0.63)	2.72 (0.68)	0.4	<0.001
Implicit rationing of nursing care (scale 0–3) (individual level)				
Activity of daily living (mean (SD))	0.47 (0.52)	0.63 (0.63)	2.1	<0.001
Caring, rehabilitation, and monitoring (mean (SD))	0.87 (0.63)	0.96 (0.69)	0.9	<0.001
Documentation (mean (SD))	1.14 (0.82)	1.29 (0.87)	1.7	<0.001
Social care (mean (SD))	1.00 (0.92)	1.21 (0.95)	20.8[a]	<0.001

Notes: If not stated as (mean (SD)), valid numbers (with percentages in parentheses) are reported. Differences were measured using random effect models with time as a fixed effect and nursing homes as a random effect. SD = standard deviation.

[a] Missing values > 10% were due to high rates of *not within my competencies* and *not necessary* responses, because the corresponding activities are not undertaken by the whole nursing home staff. There have been structural and political changes over the five-year period studied (i.e., profit status, facility size).

homes had between 50 and 99 beds and were either privately or publicly funded. Residents' mean age in 2013 was 84.92 years and 85.93 years in 2018 but care load remained similar, with a mean rating of roughly 6 (of a possible 12) in both studies.

Variations in organizational and work environment factors are presented in Table 2. Leadership was rated just above "rather agree" in both studies with means of 3.21 (of a possible 4) (SD 0.59) in 2013 and 3.19 (SD 0.61) in 2018. In contrast, perceived staffing and resource adequacy was rated below "rather agree" in both studies, producing means of 2.84 (SD 0.63) in 2013 and 2.72 (SD 0.68) in 2018. Overall, full-time equivalent per 100 beds showed decreasing numbers of staff between 2013 and 2018 (mean of 50.07 in 2013 and 46.27 in 2018). Medium and large nursing homes showed a mean of 51.15 and 52.8 full-time equivalent per 100 beds respectively in 2013 (SD 11.1–11.52), thus displaying higher staff resources than small nursing homes, see Supplemental material Table S2. However, in 2018, the means of medium and large nursing homes dropped to the same level as the mean of small nursing homes (means between 45.98 and 46.63 (SD 11.06–15.44)) (see Table S2). Regarding the overall staff resources, the proportion of registered nurses (i.e., skill mix levels) per facility decreased (from 31.25% in 2013 to 25.92% in 2018). In 2013, publicly funded nursing homes presented the highest proportion of registered nurses (36.02%), but this proportion declined to 27.64% in 2018, a level similar to those of private and private subsidized nursing homes (24.62% and

25.01% respectively). Overall staff turnover increased between 2013 and 2018 (from 10.91% to 13.52%), with a larger increase in large (11.72% in 2013 to 15.93% in 2018) and publicly funded (10.32% in 2013 to 15.57% in 2018) nursing homes. While respondents in 2013 were mainly registered nurses and ≥51 years of age, the majority of respondents in 2018 were licensed practical nurses and the proportion of younger care workers ≤ 30 years of age increased from 21.3% to 26.5%.

3.2. Levels and patterns of implicit rationing of nursing care over time

While the types of tasks rationed remained similar between the two measurement points, the prevalence of rationing increased considerably (see Table 2). For example, in both 2013 and 2018, the most commonly omitted necessary tasks were documentation activities (with respective means of 1.14 (SD 0.82) and 1.29 (SD 0.87)). However, in 2018 an increase of 10% of respondents reported either "sometimes" or "often" leaving documentation of performed nursing care undone (proportion of 30.1% in 2013; and 40.0% in 2018). Across all subscales for tasks not involving physical resident care, social activities saw the largest increase in rationing: the mean rose from 1.00 (SD 0.92) in 2013 to 1.21 (SD 0.95) in 2018; i.e., slightly below "seldom." Of such tasks, those most commonly reported as undone were scheduled single activities with residents (proportion of 34.6% in 2013; and 42.3% in 2018) (e.g., go for a walk). Regarding physical resident care, activities

of daily living showed the highest percentage increase in rationing with a rising mean from 0.63 (SD 0.63) in 2013 to 0.96 (SD 0.69) in 2018. Regarding bathing/skin care and oral hygiene, rationing rose respectively by 8.6% (p < 0.001) and 7.2% (p < 0.001). In the subscale of caring, rehabilitation, and monitoring the rationing of necessary tasks also showed pronounced increases. For example, for the item adequate monitoring of residents/use of restraints/sedatives, rationing rose by 5.6% (p < 0.001). Nevertheless, necessary conversation with residents' and their family as well as toileting/continence training showed the lowest increase (1.5% and 2.6% respectively) between 2013 and 2018. In both studies, responding promptly to residents who rang ranked within the four most-rationed nursing care activities (respectively fourth and third in 2013 and 2018) (Table 3).

3.3. Implicit rationing of nursing care over time considering key explanatory factors

As Model A indicates, rationing of nursing care increased across all four subscales (activities of daily living, social care, caring, and documentation) from 2013 to 2018 (see Table 4). Considering key explanatory factors related to organizational (Model B), work environment (Model C) and individual characteristics (Model D and E), we consistently observed increases between 2013 and 2018 in the levels of rationing for activities of daily living and social care. In all subscales, intraclass correlation 1 showed small, yet consistent variation (range: 0.06 to 0.08) between facilities. Table 4 summarizes all five models with timepoint as the main explanatory factor. Supplementary Table S3 provides a more detailed view of all models and the regression coefficients for all variables.

4. Discussion

To our knowledge, this is the first time-series cross-sectional analysis to examine levels and patterns of implicit rationing of nursing care over time in the nursing home setting. Overall, implicit rationing of nursing care in Swiss nursing homes increased across all four subscales (activities of daily living, social care, caring, and documentation) from 2013 to 2018. Predominantly, rationing patterns remained very similar, with care activities related to documentation and social care more often rationed than those of daily living and caring. Still, in terms of percentage changes in rationing, items such as bathing/skin care and oral hygiene also showed high increases. The increases in rationing of nursing care accompanied a deterioration of nursing homes' work environment, including perceived staffing adequacy, full-time equivalent per 100 beds, staff turnover rates and proportions of registered nurses (i.e., skill mix levels), while the residents' care loads remained similar. In the analytic models that controlled for organizational, work environment and individual factors, the increase in rationing of care for the time effect remained stable and independent in 21 out of the 24 models. Even in those three models with a non-significant time effect the direction and CI were consistent.

Our study revealed that within this context, activities related to documentation tasks, social activities, and activating or rehabilitation care, as well as unplanned care such as answering call bells, are those most often rationed. This is in line with previous studies (Henderson et al., 2016; Nelson and Flynn, 2015; Slettebo et al., 2010). As our results highlight, the most prevalently rationed tasks in 2013 were even more prevalent in 2018. Although providing support in activities of daily living (i.e., physical tasks) was rationed less in both years than documentation

Table 3
Absolute and relative frequencies of the single rationing of nursing care activities and differences between 2013 and 2018.

Items of implicit rationing of nursing care	2013 (n = 1580)		2018 (n = 1689)		Difference[a]	Missing
	Often/sometimes rationed n (%)	Ranking	Often/sometimes rationed n (%)	Ranking	% (p-value)	%
Activities of daily living						
Sponge bath/partial sponge bath/skin care	250 (16.8)	13	390 (25.4)	12	8.6 (<0.001)	7.6
Oral hygiene	189 (12.9)	15	313 (20.1)	13	7.2 (<0.001)	7.6
Mobilization/change of the position	100 (6.6)	16	189 (11.8)	16	5.2 (<0.001)	4.7
Leave a resident in urine/stool longer than 30 min	87 (5.8)	17	143 (8.9)	17	3.1 (0.001)	4.8
Caring, rehabilitation, and monitoring						
Emotional support	371 (24.4)	7	457 (28.1)	9	3.7 (0.019)	3.7
Necessary conversation with resident or their family	248 (17.9)	12	290 (19.4)	14	1.5 (0.302)	11.9[b]
Toileting/continence training	225 (15.6)	14	276 (18.2)	15	2.6 (0.069)	9.6
Activating or rehabilitation care	414 (28.3)	6	513 (32.9)	6	4.6 (0.006)	7.5
Monitoring residents as care workers felt necessary	292 (20.2)	11	402 (25.7)	11	5.5 (<0.001)	7.8
Monitoring of confuse/cognitively impaired residents/use of restraints/sedatives	296 (21.0)	10	401 (26.6)	10	5.6 (<0.001)	10.7[b]
Respond promptly to resident calls	530 (34.5)	4	657 (40.2)	3	5.7 (0.001)	3.0
Documentation						
Studying care plans at the beginning of shift	539 (35.0)	2	636 (39.6)	5	4.6 (0.010)	3.8
Set up or update residents' care plans	390 (38.8)	1	467 (47.0)	1	8.2 (<0.001)	38.8[b]
Documentation of care	459 (30.1)	5	640 (40.0)	4	9.9 (<0.001)	4.4
Social activities						
Scheduled single activity with a resident	437 (34.6)	3	536 (42.3)	2	7.7 (<0.001)	22.5[b]
Scheduled group activity with several residents	221 (21.3)	9	267 (29.9)	7	8.6 (<0.001)	40.9[b]
Cultural activity for residents with contact outside of nursing home	219 (23.0)	8	220 (28.9)	8	5.9 (0.006)	47.6[b]

Notes. Response options "often" and "sometimes" were set in relation to all valid answers. Options such as "not within my competencies" and "not necessary" were counted as missing. Rationed nursing care activities are ranked based on percentages, ranging from 1 (first-ranked, most-rationed) to 17 (last-ranked, least rationed).
[a] Differences are calculated on the individual level.
[b] Missing values > 10% were due to high rates of "not within my competencies" and "not necessary" responses, as they relate to activities that cannot be undertaken by the entire nursing home staff.

Table 4
Linear mixed models on the time effect for four subscales of implicit rationing of nursing care.

	ADL estimate [CI 95%]	Caring estimate [CI 95%]	Documentation estimate [CI 95%]	Social care estimate [CI 95%]
Null model (facilities as random effect only)				
ICC 1	0.08	0.08	0.07	0.06
Model A (time effect only, n = 2305 observations)				
Timepoint	0.17*** [0.12–0.22]	0.11*** [0.05–0.16]	0.16*** [0.10–0.23]	0.23** [0.15–0.30]
AIC	4081	4648	5808	6330
Model B (controlled for organizational factors, n = 2305 observations)				
Timepoint	0.20*** [0.14–0.25]	0.12*** [0.05–0.18]	0.17*** [0.09–0.25]	0.23*** [0.14–0.32]
AIC	4083	4651	5809	6333
Model C (controlled for work environment factors, n = 2305 observations)				
Timepoint	0.12*** [0.08–0.17]	0.04 [−0.01–0.09]	0.08** [0.02–0.14]	0.16*** [0.09–0.23]
AIC	3711	4055	5213	6028
Model D (controlled for care workers individual factors, n = 2305 observations)				
Timepoint	0.17*** [0.12–0.22]	0.10*** [0.05–0.15]	0.16*** [0.09–0.22]	0.21*** [0.13–0.28]
AIC	4088	4632	5720	6317
Model E (controlled for residents individual factors, n = 2305 observations)				
Timepoint	0.20*** [0.15–0.25]	0.12*** [0.07–0.18]	0.17*** [0.10–0.25]	0.24*** [0.16–0.33]
AIC	3993	4540	5657	6154
Model F (controlled for all factors, n = 2305 observations)				
Timepoint	0.17*** [0.11–0.22]	0.04 [−0.02–0.10]	0.05 [−0.02–0.13]	0.14** [0.06–0.23]
AIC	3738	3971	5046	5856

Notes. AIC = Akaike's information criterion (lower values indicate better model fit) (Gelman and Hill, 2006), ICC1 = intra-class correlation 1 (between-group variability), values > 0.05 indicate an important variation between groups (i.e., between facilities) (LeBreton and Senter, 2008; Snijders and Bosker, 2012), CI = confidence interval, ADL = activities of daily living. Significance levels presented: **p < 0.01, ***p < 0.001.

and social activities, our results showed large increases of rationing of sponge baths and skin care, as well as of oral hygiene. Considering that resident care loads have remained quite constant, increases in the rationing of such fundamental care activities very likely reflect shortfalls in staff resources. Cross-sectional studies have linked rationing of nursing care with lower perceived quality of nursing care, higher incidences of urinary tract infections, and growing dissatisfaction among both residents and care workers (Braun et al., 2018; Nelson and Flynn, 2015; Zúñiga et al., 2015a). Therefore, our measured increases in rationing of high-priority activities of daily living (i.e., fundamental care) will also very likely precurse such negative outcomes for both residents and care workers. However, our results revealed stable results in rationing of necessary conversation with residents and their family as well as toileting/continence training between 2013 and 2018. These nursing tasks have been linked to the provision of person-centered care as described by Ludlow et al. (2021). Since 2014, the Swiss national nursing home association CURAVIVA has emphasized the importance of providing person-centered care in nursing homes (CURAVIVA Schweiz, 2020). The fact that our sample in 2018 included a larger number of younger care workers trained in the last ten years could explain this finding, as they might give these activities higher priority. As many factors on different levels (e.g., changes in long term care policies) influence care workers' decision on rationing, further research is needed to understand how policies, standards of care, or quality improvement initiatives impact care workers' priority setting and rationing of nursing care.

Regarding organizational and work environment factors, our descriptive findings indicate an overall deterioration of the nursing home context, with poor care worker perceptions of staff adequacy, statistically significant decreases in staffing (full-time equivalent per 100 beds) and skill mix levels, and higher turnover rates. Considering that our timepoint beta remained statistically significant through almost all of our models (Models A–D), our models did not indicate that the time differences in organizational and work environment factors explained the increases in rationing of nursing care. Nevertheless, the deterioration in these organizational and work environment factors fosters conditions which can lead to increasing levels of rationing of nursing care. In line with other studies that investigated reasons for rationing of nursing care (Henderson et al., 2018; Knopp-Sihota et al., 2015; Slettebo et al., 2010), our findings support an explanation that, within the context of an increasing workforce shortage, care workers are finding it increasingly difficult to fulfill all necessary nursing care activities. However, adequate staffing is a complex concept to assess: understanding the relationships between organizational and work environment factors (i.e., skill mix levels, turnover) and the provision of nursing care will require further research.

As noted, while rationing levels increased, the 2018 pattern of specific care activities rationed (i.e., their types and rankings) remained very similar to that of 2013: care workers prioritizing physical activities (e.g., toileting) for which rationing could be directly harmful for residents (e.g., leaving a resident in urine or stool longer than 30 min). Our results add to the findings of Liu et al. (2021) and Ausserhofer et al. (2013), which indicated similar patterns of rationing in hospital settings both over time and across twelve European countries' healthcare systems. Interestingly, the item attending promptly to residents who ring ranked within the five most rationed nursing care activities in both studies. As keeping residents waiting potentially impacts their physical and psychological well-being, its high ranking is surprising, but might be explained by the fact that answering residents' call bells is, in contrast to most care tasks, unplanned. Wiersma and Dupuis (2010) investigated the tendency of long-term care routines to transform "residents into institutional bodies" by handling their care needs when the daily structure allows (e.g., oral hygiene every morning and evening). Both residents and care workers rely (perhaps too heavily) on such regularity; but residents' bells signal nonspecific resident needs with unclear acuity and the potential for longer interruption of scheduled tasks. Especially in a work environment where resources are scarce and scheduling flexibility is low, care workers might be more inclined to prioritize their scheduled tasks above the unscheduled ones. Such an explanation fits with Mantovan et al. (2020) findings regarding care workers' experience with implicit rationing of nursing care in acute care hospitals. In the absence of guidelines, they noted that decisions about rationed nursing care activities were often made intuitively and situationally. Since most care workers feel guilty about deciding which nursing activities they are able to provide (Braun et al., 2018), it is important to prepare future nursing home care workers

for the phenomenon of implicit rationing of nursing care, its impact on both residents and care workers, and ways to approach it.

4.1. Strengths and limitations

This study's major strength is its incorporation of a time series cross-sectional data analysis, which we applied to examine variations in rationing of nursing care over time in a large sample. Moreover, by using data from a range of measurement tools (surveys as well as objective measures), we were able to minimize issues with common method variance described elsewhere (Griffiths et al., 2016).

This study also has several notable limitations; therefore, caution is advised in interpreting our results. First, while our data were collected from the same set of nursing homes, only two timepoints were used, with differing care worker sets providing data from each facility. This heterogeneity could limit the stability of our results. Although patterns of rationing remained similar between 2013 and 2018, data on rationing of nursing care was self-reported and could be biased by context (e.g., policies, guidelines, quality improvement initiatives) and social desirability. Therefore, further longitudinal research will be needed to verify our findings. Second, our facility-level aggregation of key explanatory factors could have limited the identification of relationships between implicit rationing of nursing care and organizational and work environment characteristics (Norton et al., 2014). Third, as our data are derived from a convenience sample, an under- or overestimation of implicit rationing of nursing care as well as work environment and organizational characteristics is possible, limiting generalizability of the results. Nevertheless, this analysis revealed a deterioration of staff resources and a concurrent increase in rationing of nursing home care, leading to hypotheses regarding a possible negative relationship between changes in staff resources and rationing of nursing care over time. The effect of increasing rationing of nursing home care on certain resident outcomes such as avoidable hospitalization or mortality remains unclear as we did not collect or have access to such data in our Swiss nursing home sample. In the medium term, they will inform other studies and findings on implicit rationing of nursing care in nursing homes; and in the long term, they will help not only to reduce such rationing but to minimize its impacts both on residents and on care workers.

5. Conclusion

Based on data gathered from the same 47 nursing homes but separated by five years, this study revealed two worrying developments: a significant overall increase in rationing of necessary nursing care activities, and the concurrent deterioration of staff resources in Swiss nursing homes. Given the known negative impacts of rationing on both residents and care workers, policy makers and nursing home managers need to collaborate to develop sustainable ways to strengthen staffing levels, limit rationing of nursing care and maintain high quality of nursing home care.

CRediT authorship contribution statement

Anja Renner: Conceptualization, Methodology, Formal analysis, Writing – original draft. **Dietmar Ausserhofer:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – review & editing, Supervision. **Franziska Zúñiga:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – review & editing, Project administration, Funding acquisition. **Michael Simon:** Conceptualization, Methodology, Formal analysis, Writing – review & editing. **Christine Serdaly:** Writing – review & editing. **Lauriane Favez:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijnurstu.2022.104320.

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