

# SIZE MATTERS! DIFFERENCES IN NUTRITIONAL CARE BETWEEN SMALL, MEDIUM AND LARGE NURSING HOMES IN GERMANY

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**Abstract:** *Objectives:* The aim of this study is to comprehensively describe nutritional care in German nursing homes (NHs) and to examine if nutritional care differs between small, medium and large NHs. *Design:* Nationwide cross-sectional postal survey. *Setting:* Nursing homes. *Participants:* 541 NHs across Germany. *Measurements:* Information on structural NH characteristics and nutritional care (food provision and menu planning, nursing care, and management and quality assurance) was collected by means of a questionnaire addressed to the management of a random sample of German NHs. NHs were grouped by size as small ( $\leq 50$  beds), medium (50 - 100 beds) or large ( $> 100$  beds) institutions. Frequencies were used to describe nutritional care, and Chi<sup>2</sup>-test to identify differences in nutritional care by NH size. *Results:* Aspects in the domain of food provision and menu planning regarding food variety and choice were widely implemented in German NHs (77 - 100 %). Best results were achieved in the domain of nursing care, where all aspects were implemented in at least 68 % of the NHs. Aspects regarding management and quality assurance, especially those concerning staffing, i.e. the availability of an interface manager (14 %), an interdisciplinary nutrition team (12 %) and a dietician (42 %), were only rarely implemented. Differences by NH size were found between small and medium or large NHs. On the one hand, small NHs stated more often to consider individual capabilities of the residents with texture-modified food (81 % vs. 60 %,  $p < 0.05$ ) and produce more often hot meals at ward level on a regular base (46 % vs. 32 %,  $p < 0.05$ ) than large NHs. On the other hand, several aspects regarding food provision and menu planning, and management and quality assurance were significantly more often implemented in larger than smaller NHs. *Conclusion:* Whereas kitchen and nursing-related aspects of nutritional care seem to be widely implemented in German NHs, management and quality assurance demands are often not met. The differences found by NH size support the hypothesis that the number of residents living in a NH has an impact on how nutritional care is performed.

**Key words:** Nursing home, nutritional care, nursing home size, foodservice.

## Introduction

Nutritional care is a large challenge for nursing homes (NHs) as malnutrition is widespread in these institutions and can contribute to impaired health, loss of independence and increased mortality risk (1-3). Causes for the high prevalence of malnutrition are due to individual factors of the residents on the one hand, i.e. poor health status, immobility, and cognitive and physiological impairments (1, 4, 5). On the other hand, institutional factors regarding structural aspects of the NH and the foodservice as well as the way nutritional care is performed, influence malnutrition prevalence (6, 7).

Nutritional care includes a wide range of structural factors and procedures. Thus, it comprises kitchen-related aspects (food provision and menu planning) as well as nursing-related aspects (nursing care). Furthermore, management and quality assurance aspects are an important part of nutritional care to ensure standardized processes, feedback loops and interface management between kitchen and nursing staff. Every NH is individual regarding the building structure, number of residents, and organization of foodservice and care processes. The size of the NH is an important aspect that not only affects the range

of different requirements that result from residents' needs and wishes, but might also influence the availability of resources related to staff, especially specialized personnel, food budget and processes to provide nutritional care.

Strathmann and colleagues (6) identified the NH size as an independent factor that affects the nutritional status of the residents. They reported a significantly higher intake of energy and only 2 % malnutrition in NHs with less than 80 beds compared to 12 % malnutrition in larger NHs and concluded that smaller NHs ( $< 80$  beds) are preferable. The strength of these results is, however, limited by the small number and rather large size of the included institutions ( $n=10, 40 - 174$  beds). Nevertheless, it indicates that the NH size might influence how nutritional care is performed. No other studies regarding nutritional care in relation to NH size are available. It has been reported, however, with respect to other health problems that smaller-sized institutions provide better care quality regarding incontinence care, pressure ulcers, or the frequency of falls (8, 9).

Generally, institutional factors of nutritional care in NHs have as yet hardly been investigated. An observational study in New Zealand described the foodservice, menu and meals of

50 rest homes and identified inadequate amounts of protein-rich food, lack of perceived choice in menus and meal service, and lack of training for foodservice staff as potential barriers to meet residents' needs (10). Another study, conducted in Austria, described nutritional care in 45 NHs and identified screening, assessment and treatment of malnutrition as aspects that need to be improved (11). Carrier and colleagues (7) analyzed the association between several foodservice factors and the malnutrition risk of 132 NH residents. The foodservice factors "food packages, lids, and dishes that were difficult to manipulate", bulk food delivery system, and overall food satisfaction were positively, and a longer menu cycle and porcelain dishes negatively associated with malnutrition risk. Thus, little is known on how nutritional care is performed in NHs. Data from German NHs are completely lacking.

Therefore, the aim of the study was to comprehensively describe nutritional care in German NHs, considering kitchen and nursing-related aspects as well as overarching aspects regarding management and quality assurance. In addition, differences in nutritional care according to NH size are of interest to test the hypothesis that smaller NHs provide better nutritional care than larger ones.

## **Methods**

### ***Study design***

As part of a larger project on behalf of the German Nutrition Society, a nationwide postal survey was conducted from March to April 2014. A printed questionnaire was sent to a random sample of German nursing homes. Contact information of 10,589 (97 % of all German) nursing homes was provided from the scientific institute of a large German health insurance company (AOK, Allgemeine Ortskrankenkasse). In order to achieve equal participation throughout Germany, five regions with similar number of NHs were predefined according to federal states: South (Bavaria, Baden-Württemberg), East (Berlin, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia), North (Bremen, Hamburg, Lower Saxony and Schleswig-Holstein), Mid (Hesse, Rhineland-Palatinate and Saarland) and NRW (North Rhine-Westphalia). The questionnaire was first sent to the management of 5,000 (1,000 of each region) randomly selected nursing homes with the request to complete the questionnaire in cooperation with the head of the nursing service and the kitchen manager. As the return rate was below 5 % after 4 weeks, all nursing homes with available e-mail information received a reminder or a new invitation for the survey via e-mail. In total, 8,172 nursing homes were invited to participate. The questionnaire could be completed online or forwarded by postal mail as hardcopy.

### ***Questionnaire***

The questionnaire was developed by the authors and pilot-tested in ten nursing homes. The final questionnaire consisted of 48 questions with mostly predefined answer categories. For

this analysis 25 questions covering institutional and foodservice characteristics of the NHs, different aspects of food provision and menu planning, nursing care, and management and quality assurance were analyzed.

To characterize the NHs and their food service system, the following items were used: city size ( $\leq$  /  $>$  20,000 inhabitants), partnership (non-profit / for-profit), NH size (number of beds), location of hot meal production (in-house / external), hot meal production at ward level (regularly / rarely or never), operator of the kitchen (owner- / externally-operated), and type of meal distribution system for lunch (tray / bulk / family style / buffet / pre-plated system; multiple-choice).

Food provision and menu planning was assessed by: 1. Variety / food choice: menu cycle length (weeks), number of available menus at lunch, free choice of side dishes at lunch (yes / no), availability of snacks at any time (yes / no); 2. Food frequencies: average number of provided portions of fruit per day, vegetables per day and fish per week; 3. Special diets and delivery forms: availability of special diets (vegetarian / Muslim / energy-dense; multiple-choice), availability of fingerfood (yes / no); availability of "eat by walking" (yes / no); 4. Texture modification: availability of texture-modified diets (soft / pureed / strained / "smoothfood"; multiple-choice), preparation aspects (meal components are separately visible / components are re-shaped / individual capabilities of the residents are considered; multiple-choice); 5. Availability of recipes (yes, for all dishes / yes, for most dishes / yes, for some dishes / no).

Nursing care was queried by: 1. Feeding assistance: availability of special feeding devices (yes / no), eating-dependent residents are supported if necessary (yes / no); 2. Nutritional services: residents' wishes and portion sizes are requested (yes / no), availability of a dietetic counseling service (yes / no), routine assessment of personal nutrition history of the residents (yes / no); 3. Malnutrition screening: frequency of routine malnutrition screening (at admission / 1 - 2 times annually / 4 - 6 times annually / monthly / never).

Management and quality assurance was assessed by: 1. Staffing aspects: availability of dietician, interface manager, interdisciplinary nutrition team, quality circle for nutritional care and regular staff training, (yes / no respectively); 2. Framework regulations: availability of process instructions for nutritional care, interface descriptions, regular quality audits and resident satisfaction surveys (yes / no respectively).

### ***Data analysis***

Relative frequencies are used to describe the NH characteristics and all aspects of nutritional care. The seven non polar questions (menu cycle length, number of menus at lunch, food frequencies, availability of recipes, frequency of malnutrition screening) were dichotomized based on national recommendations (12). According to the number of available beds, the NHs were divided into small ( $\leq$  50 beds), medium (51 - 100 beds), and large ( $>$  100 beds). Differences between small,

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**Table 1**

Structural nursing home characteristics of the total group and stratified according to nursing home size [%]

|                                      | Nursing home size |              |                |               | p                      |
|--------------------------------------|-------------------|--------------|----------------|---------------|------------------------|
|                                      | Total (n=541)     | Small (n=94) | Medium (n=291) | Large (n=156) |                        |
| <b>Institutional Characteristics</b> |                   |              |                |               |                        |
| City size                            |                   |              |                |               |                        |
| ≤ 20.000 inhabitants                 | 50.6              | 61.7         | 55.7           | 34.6          | < 0.001 <sup>b,c</sup> |
| > 20.000 inhabitants                 | 46.8              | 34.0         | 42.3           | 62.8          |                        |
| Responsible body                     |                   |              |                |               |                        |
| Non-profit                           | 58.2              | 53.2         | 57.7           | 62.2          | 0.304                  |
| For-profit                           | 41.0              | 46.8         | 41.6           | 36.5          |                        |
| <b>Foodservice Characteristics</b>   |                   |              |                |               |                        |
| Hot meal production                  |                   |              |                |               |                        |
| In-house                             | 82.4              | 60.6         | 85.2           | 90.4          | < 0.001 <sup>b,c</sup> |
| External                             | 15.9              | 36.2         | 13.4           | 8.3           |                        |
| Operator of the kitchen              |                   |              |                |               |                        |
| Owner-operated                       | 68.2              | 71.3         | 70.1           | 62.8          | 0.136                  |
| External-operated                    | 29.4              | 23.4         | 28.2           | 35.3          |                        |
| Hot meal production at ward level    |                   |              |                |               |                        |
| Regularly                            | 34.9              | 45.7         | 33.0           | 32.1          | 0.044 <sup>a,b</sup>   |
| Rarely/Never                         | 60.3              | 48.9         | 63.2           | 61.5          |                        |
| Meal distribution system for lunch   |                   |              |                |               |                        |
| Tray food                            | 45.5              | 45.7         | 44.3           | 47.4          | 0.819                  |
| Bulk food                            | 79.9              | 61.7         | 81.1           | 88.5          | < 0.001 <sup>a,b</sup> |
| Family style meals                   | 24.6              | 28.7         | 25.4           | 20.5          | 0.305                  |
| Buffet                               | 14.8              | 7.4          | 14.4           | 19.9          | 0.027 <sup>a</sup>     |
| Pre-plated meals                     | 43.6              | 47.9         | 43.6           | 41.0          | 0.572                  |
| Number of distribution systems       |                   |              |                |               |                        |
| ≥ 3 different distribution systems   | 31.6              | 23.4         | 31.6           | 36.5          | 0.096                  |

Differences between small, medium and large nursing homes were tested with Chi<sup>2</sup>-test; a. significant difference between small and medium nursing homes (post-hoc z-test, p < 0.05); b. significant difference between small and large nursing homes (post-hoc z-test, p < 0.05); c. significant difference between medium and large nursing homes (post-hoc z-test, p < 0.05)

medium and large NHs were tested by Chi<sup>2</sup>-test. To specify differences, a post hoc analysis was conducted with z-test and Bonferroni correction. Missing values were not included in statistical tests. Statistical significance was set at a p-value < 0.05.

Statistical analyses were performed using SPSS version 23.0.

**Results**

In total, 590 questionnaires were received of which 45 were excluded from further analyses as more than 10 % of the values of interest were missing, and four as data on NH size was missing. The remaining 541 questionnaires were from 94 small (17.4 %), 291 medium (53.8 %) and 156 large NHs (28.8 %). NH size ranged from 9 to 390 beds with a mean size of 89 ± 50

beds, 50 % had more than 80 beds.

**Structural NH characteristics**

Half of the NHs were located in cities with less and half in cities with more than 20.000 inhabitants. More NHs were operated by a non-profit organization (58.2 %) than by a for-profit organization (41.0 %). Large NHs were significantly more often located in larger cities than medium or small NHs, whereas no difference was found in the number of non-profit and for-profit NHs by their size (table 1).

The majority of the NHs produced their hot meals in-house (82.4 %) and the kitchens were mostly owner-operated (68.2 %). Approximately one third regularly prepared hot meals at ward level. About two thirds of all NHs (65.4 %) used more than one meal distribution system for lunch, bulk food system

**Table 2**

Food provision and menu planning aspects of the total group and stratified according to nursing home size [%]

| Food Provision and Menu Planning      | Nursing home size |              |                |               | p                      |
|---------------------------------------|-------------------|--------------|----------------|---------------|------------------------|
|                                       | Total (n=541)     | Small (n=94) | Medium (n=291) | Large (n=156) |                        |
| Variety/Food Choice                   |                   |              |                |               |                        |
| Menu cycle length $\geq$ 6 weeks      | 77.3              | 70.2         | 77.3           | 81.4          | 0.095                  |
| missing                               | 3.1               | 3.2          | 3.1            | 3.2           |                        |
| $\geq$ 2 menus available at lunch     | 89.8              | 73.4         | 91.8           | 96.2          | < 0.001 <sup>a,b</sup> |
| missing                               | 0.7               | 2.1          | 0.3            | 0.6           |                        |
| Free choice of side dishes at lunch   | 86.1              | 84.0         | 85.2           | 89.1          | 0.282                  |
| missing                               | 3.5               | 4.3          | 3.1            | 3.8           |                        |
| Snacks available anytime              | 99.6              | 100.0        | 99.7           | 99.4          | --                     |
| missing                               | 0.4               | 0.0          | 0.3            | 0.6           |                        |
| Food Frequencies                      |                   |              |                |               |                        |
| $\geq$ 3x vegetables daily            | 34.4              | 27.7         | 37.1           | 33.3          | 0.259                  |
| missing                               | 2.2               | 2.1          | 1.4            | 3.8           |                        |
| $\geq$ 2x fruit daily                 | 87.1              | 81.9         | 88.3           | 87.8          | 0.470                  |
| missing                               | 1.5               | 3.2          | 1.0            | 1.3           |                        |
| $\geq$ 2x fish weekly                 | 74.9              | 56.4         | 78.7           | 78.8          | < 0.001 <sup>a,b</sup> |
| missing                               | 0.6               | 0.0          | 0.7            | 0.6           |                        |
| Special diets and delivery forms      |                   |              |                |               |                        |
| Vegetarian diet                       | 76.0              | 66.0         | 76.6           | 80.8          | 0.027 <sup>b</sup>     |
| Muslim diet                           | 28.5              | 20.2         | 28.9           | 32.7          | 0.104                  |
| Energy-dense diet                     | 59.5              | 54.3         | 61.5           | 59.0          | 0.454                  |
| Fingerfood                            | 54.3              | 48.9         | 53.6           | 59.0          | 0.284                  |
| “Eat by walking”                      | 59.7              | 51.1         | 59.5           | 65.4          | 0.252                  |
| missing                               | 6.7               | 12.8         | 5.5            | 6.7           |                        |
| Texture modification                  |                   |              |                |               |                        |
| Soft texture available                | 59.9              | 63.8         | 58.1           | 60.9          | 0.585                  |
| Pureed texture available              | 95.2              | 95.7         | 94.8           | 95.5          | 0.917                  |
| Strained texture available            | 43.6              | 40.4         | 45.0           | 42.9          | 0.723                  |
| “Smoothfood” available                | 17.0              | 9.6          | 16.2           | 23.1          | 0.019 <sup>b</sup>     |
| Components separately visible         | 84.3              | 76.6         | 85.9           | 85.9          | 0.079                  |
| Components re-shaped                  | 27.9              | 19.1         | 27.5           | 34.0          | 0.040 <sup>b</sup>     |
| Individual capabilities considered    | 63.2              | 80.9         | 59.5           | 59.6          | < 0.001 <sup>a,b</sup> |
| Recipes                               |                   |              |                |               |                        |
| Available for most dishes/ components | 58.2              | 45.7         | 60.5           | 61.5          | 0.045 <sup>a,b</sup>   |
| missing                               | 2.0               | 4.3          | 1.4            | 1.9           |                        |

Differences between small, medium and large nursing homes were tested with Chi<sup>2</sup>-test; a. significant difference between small and medium nursing homes (post-hoc z-test,  $p < 0.05$ ); b. significant difference between small and large nursing homes (post-hoc z-test,  $p < 0.05$ )

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**Table 3**  
 Nursing care aspects of the total group and stratified according to nursing home size [%]

| Nursing care  | Nursing home size |              |                |               | p     |
|---|-------------------|--------------|----------------|---------------|-------|
|   | Total (n=541)     | Small (n=94) | Medium (n=291) | Large (n=156) |       |
| Feeding Assistance                                  |                   |              |                |               |       |
| Availability of special feeding devices             | 88.2              | 86.2         | 90.0           | 85.9          | 0.349 |
| Support for eating-dependent residents if necessary | 98.0              | 100.0        | 97.9           | 96.8          | 0.220 |
| Nutritional Services                                |                   |              |                |               |       |
| Request of residents' wishes and portion sizes      | 98.9              | 98.9         | 100.0          | 96.8          | 0.009 |
| Dietetic counseling service available               | 74.5              | 69.1         | 74.6           | 77.6          | 0.335 |
| Routine assessment of personal nutrition history    | 67.7              | 67.0         | 65.5           | 71.8          | 0.325 |
| missing   | 3.5               | 4.3          | 3.1            | 3.8           |       |
| Malnutrition Screening                              |                   |              |                |               |       |
| Malnutrition screening ≥ 4-6 times a year           | 79.9              | 76.6         | 80.1           | 81.4          | 0.285 |
| missing   | 5.0               | 4.3          | 4.1            | 7.1           |       |

Differences between small, medium and large nursing homes were tested with Chi<sup>2</sup>-test

being the most common (79.9 %). Tray food system (45.5 %) and pre-plated meals (43.6 %) were equally used by almost half of the NHs, whereas family style meals (24.6 %) and buffet system (14.8 %) were less common (table 1).

Differences between NHs by size were found regarding hot meal production and the use of bulk and buffet meal distribution systems. Whereas most medium and large NHs produced their hot meals in-house, this was the case in less than two thirds of the small NHs. Contrariwise, small NHs produced significantly more often hot meals on ward level on a regular base than medium or large NHs. Medium and large NHs used bulk food system significantly more often than small NHs. Buffet system was significantly more often used by large than by small NHs (table 1).

**Food provision and menu planning**

All aspects of variety and food choice were implemented in more than three quarters of the NHs. Snacks were always available even in all NHs answering this question (table 2). In medium and large NHs it was significantly more common to offer at least two different menus at lunch than in small NHs.

National recommendations for food frequencies for menu planning were met by most NHs for fruit (87.1 %) and fish (74.9 %), but only by one third for vegetables (34.4 %). Medium and large NHs met the recommendations for fish significantly more often than small NHs, while no differences were found by NH size regarding the other two food frequencies (table 2).

A vegetarian diet was the most frequent (76.0 %) available special diet and significantly more often available in large than small NHs. A Muslim diet was least available (28.5 %).

All NHs offered some kind of texture modified meals, whereas pureed texture was most common (95.2 %). Soft

texture was available in 59.9 %, strained texture in 43.6 % and “smoothfood” in only 17.0 % of the NHs. “Smoothfood” was the only texture that was significantly more often available in larger (23.1 %) than in smaller NHs (9.6 %). While it was common for most NHs (84.3 %) to serve texture-modified meals with separately visible components, only one third of large NHs re-shaped these components, of small NHs even less than 20 %. Small NHs (80.9 %) significantly more often stated to consider the individual capabilities of the residents for the production of texture modified meals than medium (59.5 %) and large NHs (59.6 %) (table 2).

Recipes for most dishes or components were more often available in medium (60.5 %) and large (61.5 %) than in small NHs (45.7 %) (table 2).

**Nursing care**

All aspects of nursing care were established in at least two thirds of the NHs with no differences by their size (table 3). Almost all NHs stated to request residents' wishes and portion sizes (98.9 %) and to support eating-dependent residents if necessary (98.0 %). Feeding devices were available in 88.2 % of the NHs and 79.9 % stated to perform malnutrition screening at least four to six times a year. A dietetic counseling service was available in 74.5 % of the NHs and 67.7 % claimed to routinely assess the personal nutrition history of the residents (table 3).

**Management and quality assurance**

Less than half of the nursing homes (42.3 %) had a dietician available. Rather uncommon was the availability of an interface manager (13.7 %) and the availability of an interdisciplinary nutrition team (11.6 %). A quality circle for nutritional care was established in 59.0 % of the NHs, and regular staff training was



**Table 4**  
 Management and quality assurance aspects of the total group and stratified according to nursing home size [%]

| Management and quality assurance                | Nursing home size |              |                |               | p                    |
|---|-------------------|--------------|----------------|---------------|----------------------|
|   | Total (n=541)     | Small (n=94) | Medium (n=291) | Large (n=156) |                      |
| Staffing aspects                                |                   |              |                |               |                      |
| Dietician available                             | 42.3              | 29.8         | 42.3           | 50.0          | 0.006 <sup>b</sup>   |
| missing   | 4.6               | 5.3          | 4.1            | 5.1           |                      |
| Interface manager available                     | 13.7              | 11.7         | 13.4           | 15.4          | 0.700                |
| Interdisciplinary nutrition team implemented    | 11.6              | 5.3          | 12.0           | 14.7          | 0.076                |
| Quality circle for nutritional care implemented | 59.0              | 50.0         | 61.2           | 60.3          | 0.149                |
| Regular staff training                          | 82.1              | 76.6         | 83.5           | 82.7          | 0.307                |
| Framework regulations                           |                   |              |                |               |                      |
| Process instructions available                  | 64.3              | 52.1         | 64.9           | 70.5          | 0.013 <sup>b</sup>   |
| Interface descriptions available                | 33.1              | 29.8         | 32.0           | 37.2          | 0.405                |
| Regular quality audits                          | 51.9              | 38.3         | 53.3           | 57.7          | 0.010 <sup>a,b</sup> |
| Regular residents satisfaction surveys          | 71.5              | 55.3         | 75.9           | 73.1          | 0.001 <sup>a,b</sup> |

Differences between small, medium and large nursing homes were tested with Chi<sup>2</sup>-test; a. significant difference between small and medium nursing homes (post-hoc z-test, p < 0.05); b. significant difference between small and large nursing homes (post-hoc z-test, p < 0.05)

provided in 82.1 %. Most aspects showed no differences by NH size, merely a dietician was significantly more often available in large (50.0 %) than small NHs (29.8 %) (table 4).

Process instructions for nutritional care were available in almost two thirds of the NHs, interface descriptions in one third. Half of the NHs stated to perform regular quality audits and 71.5 % implemented regular resident satisfaction surveys. Except the availability of interface descriptions, all framework regulations were significantly more often present in medium and large than in small NHs (table 4).

### Discussion

To our knowledge, this is the first study describing nutritional care in a large sample of NHs considering kitchen and nursing-related aspects as well as overarching aspects regarding management and quality assurance.

The study sample comprises 5 % of all German NHs and is representative regarding the distribution throughout the five regions (data not shown) and the relation between non-profit vs. for-profit organizations (13). Compared to information from the Federal Office of Statistics, small NHs were underrepresented (17 % vs. 30 %) and medium-size NHs overrepresented (54 % vs. 44 %) in this study. Unfortunately, no information regarding other NH characteristics is available in Germany to check the representativeness of the sample. It can be assumed that mainly NHs with specific interest in nutrition took part.

#### Structural NH characteristics

More than 80 % of the NHs produced their hot meals in-house and one third of the NHs even produced hot meals

at ward level on a regular base (table 1). This result is in line with a recent Austrian study conducted in 92 % of the NHs in the federal state Vorarlberg (n=45), where 84 % of the NHs produced their meals in-house (11). Hot meal production on ward level, on the other hand, was less common as a small kitchen at ward level was only available in 20 % of the Austrian NHs (11). On-site meal production generally allows more flexibility. The kitchen can react to residents' requests on short notice and personal contact between residents and kitchen staff is possible, which may be beneficial for individual care. Meal production at ward level even offers the residents the opportunity to follow the cooking process, smell the food and take part in meal preparation, which might stimulate appetite and desire to eat.

Two thirds of the NHs operated the kitchen with their own personnel, the other NHs worked with subsidiaries or catering companies. Better control of kitchen processes, direct influence on food selection and menu planning, and better teamwork between kitchen and care staff are clear advantages of an owner-operated kitchen.

Most NHs reported to use different meal distribution systems. The bulk food system, which was the most common system and implemented in 80 % of the NHs, has the advantage that residents can choose the meal and portion size at point of service. A buffet system, which was offered by only 15 % of the NHs, generally provides the same advantage and even more autonomy by taking the food independently, but is limited to mobile residents. Family style meals with plates and platters on the table, implemented in one quarter of the NHs, enable even residents with impaired function more autonomy at mealtimes. The atmosphere is more homelike than with the other delivery

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systems and it has been shown that family style meals increase dietary intake and improve nutritional status (14, 15).

### ***Food provision and menu planning***

In earlier studies, variety and food choice were identified as important factors for adequate food intake (7, 16). The four aspects considered in the present study regarding variety and food choice seem to be widely implemented in German NHs. The choice between at least two menus at lunch was offered in 90 % of the NHs, markedly more often than reported from Austrian NHs (67 %) (11). A menu cycle length of at least six weeks was more common (77 % vs. 20 %) and menu cycle length was less often shorter than four weeks (1 % vs. 10 %) compared to NHs in New Zealand (10). In Canada, 23 % of the NHs that participated in a study in the province New Brunswick (n=38), had a menu cycle length of only three weeks (7).

The composition of the menu with respect to national recommendations of food frequencies seems to be more challenging for German NHs. Whereas the recommendations for fruit and fish were also met by the majority, 87 % and 75 % respectively, only about one third offered the recommended three portions of vegetables daily. In New Zealand, 92 % of the NHs met these recommendations for fruit and vegetables respectively, and 82 % for fish (10).

Besides a Muslim diet, which was available in less than one third of the NHs, other special diets were offered by at least half of the NHs. These figures are difficult to interpret since the necessity of these offers might differ between NHs.

Sixty percent of the NHs stated to offer "eat by walking", but only 54 % fingerfood, which would be the expected form to prepare the food for "eat by walking". A closer look at these answers revealed that surprisingly about one third of the NHs that offer "eat by walking" do not offer fingerfood. Therefore it is unclear which type of food the institutions exactly offer to "eat by walking".

Texture modification of food is very often required in NHs due to chewing and swallowing problems, which affect up to 68 % of NH residents (3). Depending on the type and severity of the problems, different forms of texture modification are required. Unfortunately, there are no international standardized labels and definitions of different textures, which makes a comparison to other studies impossible (17). In this study, all NHs offered some kind of texture-modified food with pureed texture being the most common (95 %). Although most NHs attached importance to separately visible meal components (84 %), only 28 % re-shaped these components to make the meals more visually appealing. Almost two thirds of the NHs stated to consider the individual capabilities of the residents regarding texture-modified food. Although NHs with this statement offered significantly more often at least three different textures (39 % vs. 25 %,  $p < 0.001$ ), still 19 % of the NHs (vs. 38 % without this statement) offered only one texture. Regarding an expected increase in the prevalence of dysphagia in nursing homes due to demographic changes (18), attractive

preparation of texture-modified diets is gaining increasing importance. Further investigation is needed to examine which special diets and texture-modified food are actually required to meet the individual needs.

Fifty-eight percent of the NHs stated to have recipes for most dishes and components. Since recipes are necessary to assure standardized quality and to enable staff to react on food intolerances of residents and answer questions on ingredients, many NHs have to catch up regarding this aspect.

### ***Nursing care***

The domain of nursing care turned out to be the part of nutritional care with the least deficiencies: All inquired aspects were implemented in at least two thirds of the NHs. In our study, it was however not possible by the use of a questionnaire to determine if the residents receive all the assistance and services they actually need. Although the majority of the NHs (80 %) stated to perform regular malnutrition screening, more information is needed on the assessment and treatment that follows positive screening in order to evaluate the quality of nursing care in institutions.

### ***Management and quality assurance***

In the domain of management and quality assurance aspects, the greatest need for improvement was found. Except regular staff training and residents' satisfaction surveys, all aspects were implemented by less than two thirds of the NHs. The four framework regulations reviewed as a score showed that only 14 % of the NHs established all of them, but 30 % had none or just one of the regulations implemented, which underlines the necessity of improvement in this domain.

A dietician was available in only 42 % of the NHs. This result is in line with a large Dutch, German and Austrian multicenter study, where 45 % of the German NHs had a dietician available (19). This is only about half as reported from the Netherlands (92 %), Austria (84 %) (19) and Italy (88 %) (20). Considering the high prevalence of nutritional problems in NHs, it would be advisable for all NHs to have access to specialized nutrition knowledge. Furthermore, a qualitative study, conducted in Canada, showed that one of the main tasks of the dieticians was to promote effective teamwork, which largely contributed to successful resident-focused nutritional care (21). In our study, an interface manager, who actively promotes communication between kitchen and care staff, was only available in 14 % of the NHs.

A special interdisciplinary nutrition team that might discuss single resident cases to give them the best possible treatment involving all professions (e.g. care staff, kitchen staff, dietician, physician, speech therapist) was only rarely implemented (12 %). Interestingly, only half of these 63 NHs (52 %) had a dietician available.

### **Differences in nutritional care by NH size**

Several differences between small and medium or large NHs were observed in our study, which were related to food choice and special food offers, the availability of specialized staff, and the implementation of management and quality assurance aspects. To our knowledge, there are no other studies analyzing these aspects by NH size. In our study, three categories ( $\leq 50$  /  $51 - 100$  /  $> 100$  beds) were built, to be able to compare the extremes (small vs. large NHs). The cut-off values were set according to national care statistics, considering the mean size of German NHs with 67 beds and assumed differences regarding familiarity, atmosphere and organization.

Small institutions seem to be more resident-centered since they more often produce regularly hot meals at ward level and consider individual capabilities with texture-modified food. On the other hand, small institutions seem to be limited in the variety of their food provision, as they less often offered at least two menus at lunch, a vegetarian diet and “smoothfood”, met the recommendation for fish, and re-shaped texture-modified meal components than large NHs. Furthermore, hot meals are less often produced in-house. The smaller number of residents limits the resources of the NHs regarding food budget and staff as those are usually calculated per resident. Therefore, it is more challenging for small institutions to ensure food provision day by day e.g. due to staff shortages because of illness or increasing food costs because of food waste or special products that are required.

Several regulations (process instructions, quality audits, residents' satisfaction survey, recipes) were also less often implemented in smaller than in larger NHs. This might be also explained by missing resources or specialized know-how. As a dietician is less often available in small institutions, other professions might be missing too. Furthermore, the necessity of these regulations might not be as obvious as in large NHs, where more living quarters and employees need to be coordinated.

The differences found were only significant between small and medium, or small and large NHs. This confirms the hypothesis that the NH size influences how nutritional care is performed in NHs and indicates that some aspects, especially those regarding management and quality assurance, are easier to implement with a higher number of residents. On the other hand, small NHs are able to offer more resident-centered care, which seems to be related to better nutritional outcome (6). Therefore, small NHs should attach more importance to the implementation of management and quality assurance maybe by using external resources, e.g. external subject-specific consulting. That approach would, however, probably require the organizational and financial involvement of the government and the Medical Advisory Service of the German Social Health Insurance.

### **Limitations**

One constraint of the study is the limited information that can be achieved by a written questionnaire. Some questions might be answered as socially expected and not truthfully as the survey was anonymous. The voluntary participation in the study might have led to a bias of institutions with special interest in nutrition. The representativeness of the study population cannot be verified adequately, as comprehensive information on German NHs is missing to compare with. The lower participation rate of small NHs may be also explained by lacking resources for additional tasks. The rather poor return rate of 6.7 % might be explained by the fact that more than one person (head of the NH, nursing staff and kitchen manager) was necessary to answer the questionnaire. Another constraint is the focus on aspects on institutional level without assessing resident-specific aspects, which inhibits any assumptions about the outcome on residents level (e.g. residents' nutritional status, satisfaction, quality of life).

### **Conclusion**

Kitchen and nursing-related aspects were widely implemented in German NHs. Deficiencies were mainly identified regarding management and quality assurance, especially the availability of staff specialized in nutrition, like dieticians and interdisciplinary nutrition teams. Furthermore, more importance needs to be attached to the interface management between kitchen and care by establishing an interface manager and interface descriptions. More frequent provision of family-style meals and the production of hot meals at ward level are desirable. Improvement is additionally necessary regarding the availability and preparation of texture-modified diets as well as providing recipes for all dishes.

The differences found by NH size support the hypothesis that the number of residents living in a NH has an impact on how nutritional care is performed. For small NHs it seems to be easier to provide individualized care. On the other hand, they seem to have limited resources or do not see the need to meet management and quality assurance demands.

All these factors are assumed to affect the quality of nutritional care. Future research should examine to which extent these factors affect nutritional status and well-being of the residents and how they can be used to measure the quality of nutritional care.

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