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Impact of care level, setting, and accommodation costs on a newly developed oral care nursing plan format for elderly patients with care needs – Results from a cross-sectional study

Bleiel, Dirk ; Nitschke, Ina ; Noack, Michael J ; Barbe, Anna Greta

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DOI: <https://doi.org/10.1111/idh.12525>

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ZORA URL: <https://doi.org/10.5167/uzh-211391>

Journal Article

Published Version

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Originally published at:

Bleiel, Dirk; Nitschke, Ina; Noack, Michael J; Barbe, Anna Greta (2022). Impact of care level, setting, and accommodation costs on a newly developed oral care nursing plan format for elderly patients with care needs – Results from a cross-sectional study. *International Journal of Dental Hygiene*, 20(3):543-552.

DOI: <https://doi.org/10.1111/idh.12525>

ORIGINAL ARTICLE

Impact of care level, setting and accommodation costs on a newly developed oral care nursing plan format for elderly patients with care needs – Results from a cross-sectional study

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Funding information

No funding to report.

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Results: Oral care nursing plans were collected from seven dentists ($N = 747$; 94.5% from inpatient and 5.5% from outpatient care). The plans enabled documentation of well-known oral health and hygiene problems among elderly patients. In their current form, the plans provided recommendations for obvious oral hygiene tasks such as toothbrushing or fluoridating, rather than specialized tasks such as nutritional advice or dry mouth asymptomatic therapeutic approaches. Although accommodation costs were associated with the need for oral hygiene support (not with oral care condition), the care level influenced both measures.

Conclusions: The oral care nursing plan can facilitate documentation of oral health and hygiene among elderly individuals with care needs. Further clarification of the plan would help promote careful documentation by dentists.

KEYWORDS

ageing, home care services, housing for the elderly, oral diagnosis, oral hygiene

Trial registration. German Clinical Trials (Deutsches Register Klinischer Studien): (https://www.drks.de/drks_web/; DRKS00018795).

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1 | INTRODUCTION

The overwhelming need for dental preventive and therapeutic outpatient care among elderly individuals (65 years and older) has been documented in numerous studies, but this demand remains largely unaddressed.^{1–5} Standard, control-oriented dental care in outpatient settings and preventive oral hygiene approaches have both been shown to be inadequate in this regard.^{6–8} “Control-oriented” is a well-established term in Germany that refers to the fact that a patient regularly visits the dentist for preventive check-ups even when no oral problems exist. In contrast, dental care in the later phases of life shifts to a “problem-oriented” pattern, wherein patients only visit dental practices when oral health problems occur.⁹ Elderly patients aged 75–100 years with care needs have poorer oral health than other individuals of the same age group.⁹ They have higher rates of caries and gingivitis with gum bleeding and fewer natural teeth and require more help with daily oral hygiene.⁹ The DMS V, the largest cross-sectional study on oral health in Germany, suggested that in addition to an improvement in clinical management, an improvement in routine diagnostics is required in this special group of patients.¹⁰

To address the fundamental problem of inadequate dental care for patients who need such care, legislatures in Germany created incentives to increase contact between dentists and elderly patients in inpatient settings.¹¹ To promote the number of dental visits, additional billing positions for dentists have been generated for seeking out elderly patients in need of care and limited everyday skills.¹² At the end of 2012, the collaboration between dental practices and inpatient care was strengthened, and stimuli were provided to improve significantly poorer oral health of older patients. These new billing positions included oral health status assessments, oral health plans, oral health education of caregivers and regular calculus removal. In addition, the involvement of nursing homes or support staff was increased, and provisions were made to document individualized oral care nursing plans on a standardized form. These nursing plans were aimed at providing nursing home staff, caring relatives and the patients themselves with specific information in a short, simple and easy-to-understand format.¹³ They included visual documentation of the oral health status and condition of the teeth, mucous membranes and dentures; determination of individual requirements for additional help with daily oral hygiene and dental treatment needs and assessment of coordinative tasks and the patient's consent to treatment.

However, to our knowledge, no previous study has investigated the informative content of these oral care nursing plans or determined their conclusions in relation to the following aspects: oral health status, the needs of those requiring care according to care level, differences between outpatient and inpatient settings and the accommodation costs of nursing homes. Therefore, our retrospective, cross-sectional, explorative study examined oral care nursing plans completed by cooperation between dentists, their nursing home patients and patients in outpatient care under the conditions of everyday clinical practice. The aims of our study were as follows:

(1) describe these new oral care nursing plans for elderly individuals with care needs, (2) investigate the prevalence of oral health problems documented by the oral care nursing plans for elderly individuals with care needs and the dentists' recommendations derived from them and (3) investigate whether the accommodation costs of the included nursing homes or the care needs of patients influenced the oral care quality or the need for oral hygiene support documented in the oral care nursing plan.

2 | MATERIALS AND METHODS

2.1 | Ethics

The University of Cologne's Local Ethics Review Board (19–1494) approved the study, which was registered in the German Clinical Trials register (https://www.drks.de/drks_web/; DRKS00018795).

2.2 | Calibration

No scientific data on the oral care nursing plans are currently available. To evaluate the basic ability to complete these plans and ensure consistent quality, a pilot examination was performed before data analysis in the present study. Ten representative geriatric sample cases were distributed as PowerPoint slides to nine individuals with different levels of experience in dentistry. All nine individuals were actively asked to participate, and they voluntarily completed the form. The first group consisted of three dental students preparing to take the state examination (defined as “beginners”); the second group included three general dentists with no special focus on senior dentistry (defined as “experienced dentists without explicit experience in gerodontology”) and the third group consisted of three dentists who specialized in gerodontology and belonged to a network practice of the University of Cologne in the senior dentistry department. All focus groups were able to understand and complete the plan, with minimal disagreements concerning questionnaire results. These disagreements mainly concerned the column of the “Recommendations” sheet, where recommendations on oral hygiene were ticked by some dentists, but not others. Overall, we concluded that the ability to complete the form and the resulting quality were consistent. The participants in this pilot study were different from the dentists evaluated later.

2.3 | Study dentists

Members of the research team attended the 29th annual conference of the German Society for Geriatric Dental Medicine, where they invited dentists to voluntarily participate in the study. Dentists were recruited to participate if they had more than ten years of professional experience in private practice in Germany, with either a focus on gerodontology or a specialization in this topic. Seven dentists

were asked to voluntarily participate, and all were willing to do so. They submitted oral care nursing plans from their practices during the period from July 2018 to December 2019. Each study dentist was asked to send all available forms for this period. The corresponding sheets were sent to the trial centre, in accordance with data protection guidelines.

2.4 | Oral care nursing plan

Patient data were anonymized by the study dentists, although the names of the report providers and retirement homes were pseudonymized and numbered. Billing for the oral care nursing plan (Item 174a) in the fee schedule for statutory health insurance in Germany was proposed for people with statutory health insurance and their carers or supporting persons. This was part of the cooperation agreement between dentists and nursing homes and was intended to improve communication regarding oral health and oral hygiene requirements with the nursing home staff and other caregivers. The goal of the oral care nursing plan is to provide a simple, schematic representation of oral findings and oral health needs, for example, by using simple icons such as “smilies” (Figure 1). The oral care nursing plan items were divided into three

areas: (1) oral health, (2) oral hygiene needs and (3) coordination needs and dental therapy.

2.4.1 | Oral health

Information about existing removable dentures and their condition was documented. In addition, prosthetic bases or other features of the oral findings were sketched onto a simplified dental scheme. The care status of the teeth, mucous membranes and dentures was defined in three categories by using simple smilies (good, fair or poor). The patient's care level was also documented (classified according to German law concerning care for the elderly into grades 1 [little impairment of independency] to 5 [highest impairment of independency with special needs for nursing care]).

2.4.2 | Oral hygiene needs

In this assessment, the examining dentist determined the extent to which the patient can independently practice oral hygiene, the extent of additional support required and whether oral hygiene has to be fully supported. Oral hygiene measures related to the mucous

First name, Last name,		Handed over to:		Date of examination:	
Status Dental Status Maxilla Full denture ☐ right left Partial denture ☐ Debris right side ☐ Debris left side ☐ Mandibula Full denture ☐ right left Partial denture ☐ Debris right side ☐ Debris left side ☐ Please draw in the denture base		Oral health plan Need for oral hygiene support none ☐ partial ☐ full ☐ Individual recommendation plan to prevent dental /oral disease Teeth cleaning (twice daily) ☐ Manual toothbrush ☐ Electric toothbrush ☐ Triple-head-brush ☐ Fluoride toothpaste (twice daily) ☐ Fluoride gel (once weekly) ☐ Interdental hygienic measures (once daily) ☐ Oral mucosa cleaning (once daily) ☐ Tongue cleaning (once daily) ☐ Denture cleaning (twice daily) ☐ Stimulate salivation ☐ Mouthwash _____ daily Nutritional advice _____ Other _____		Coordination Consultation of the dentist required with Patient ☐ Legal representative ☐ Relative ☐ Family doctor ☐ Nursing staff ☐ Other dentist ☐ Pharmacist ☐ Other _____ Location of treatment Dental practice _____ ☐ Nursing home _____ ☐ Other _____ Treatment under anaesthesia ☐ Patient transport ambulance (PTA) ☐ Consent of treatment Yes ☐ No ☐ Special features and comments _____ _____ _____ _____ _____ _____ Signature dentist _____	
Oral care condition Teeth ☐ ☐ ☐ Mucosa, Tongue, Gingiva ☐ ☐ ☐ Denture ☐ ☐ ☐		Treatment requirements/recommendations Fillings ☐ Gingiva/Mucosa ☐ Extraction ☐ Dentures, fixed or removable ☐ Other _____ ☐			

FIGURE 1 Oral care nursing plan developed for people with statutory health insurance and their carers or supporting people as part of the cooperative agreement between dentists and nursing homes. The plan aims to improve communication regarding oral health and oral hygiene requirements with the nursing home staff and other caregivers

membranes, tongue, teeth and dentures were evaluated in this regard. Toothbrushes, pastes and rinsing solutions were recommended, and these recommendations formed a part of the patient's personal oral hygiene plan. Finally, the dentist defined the need for treatment ("filling," "mucous membrane/mucosa," "extraction," "denture" or "other") using a simple checkbox.

2.4.3 | Coordination needs and dental therapy

Additional coordinative enquiries are routinely necessary before treatment in this patient group. For example, caregivers, relatives or nursing staff need to be informed about the vulnerability of this patient group and the need for regular consultation with other medical professionals, for example, with the pharmacist or dental technician, in relation to therapy implementation. This part of the form records the patient's consent to treatment or such potential care. Finally, the local setting in which the treatment should take place is determined.

2.5 | Description of nursing homes

All study participants submitted oral care nursing plans from different institutions. No selection for nursing homes was performed, and all of the nursing homes that cooperated with the study dentists were included. The nursing homes were divided into three categories: low, medium and high cost. In this context, it is important to examine these costs and the underlying organizational concepts in Germany in more detail. Along with their employer, almost every German employee pays contributions to the national social insurance system (which covers health, accident, pension and unemployment). In 1995, nursing care insurance was added to this system. Benefits are paid to people in need of care, depending on who is providing the care (relatives or trained care professionals) and the place of care (at home or in a nursing home). These funds are thus used to pay part of the nursing costs (Table S1). However, the funds are insufficient to cover all costs, so individuals in need of care must also make their own contribution, for example, from their pension or assets. This additional contribution was determined for the care facilities by the relevant study dentists who participated in this study. The facilities were then grouped according to the personal contributions required from residents after deducting the costs paid from statutory health insurance, that is, low (≤ 2300 Euros), medium (up to 2900 Euros) and high (≥ 3000 Euros) costs. The total cost per resident in the nursing home was the standardized amount depending on the degree of care needed (Table S1) plus the additional costs contributed by the patient in need of care. Although the personal contribution is presented transparently on the corresponding website, the reasons for higher or lower individual contributions are not. Prices for accommodation in Germany are regularly published online and were determined using the care navigator of a statutory health insurance company (AOK; www.pflege-navigator.de).

2.6 | Data analysis

Absolute and relative frequencies were obtained for the qualitative variables, and mean (standard deviation, SD) values were obtained for quantitative variables. Group differences were tested using Pearson's chi-square test. Associations between the accommodation cost and care level and the items of the oral care nursing plan were measured by using Spearman's rank correlation coefficient ρ (p), with the level of significance set at $p < 0.05$. All calculations were performed with SPSS Statistics 25 (IBM Corp.). Data were entered twice, and in the case of inconsistencies, the person entering the data into the SPSS database reconciled the inconsistent data by using the corresponding oral care forms.

3 | RESULTS

3.1 | Clinical characteristics

In total, 747 forms from 27 different care facilities were collected: 706 (94.5%) from inpatient care in nursing homes and 41 (5.5%) from outpatient care. The mean number of forms submitted per study dentist was 104 (range, 9–249), which represented the frequency with which the examiner was involved in the management of people in need of care during the corresponding period. The distribution of care levels was as follows: 190 (25%) forms for Level 2, 213 (29%) for Level 3 and 159 (21%) for Level 4 (representing greater care needs). The highest care level, Level 5, was the least represented, with 72 (10%) forms. The presence of plaque was reported in 23%–25% of cases, in the upper and lower jaws and on the right and left (Table 1). Patients who received outpatient care showed a greater proportion of visual plaques (32%–46%) than those who were under nursing home care.

3.2 | Documentation

Denture bases were drawn on 203 (27%) of the forms; 309 (41%) forms included dental treatment needs; the tooth diagram was completed on 381 (51%) forms and 718 (96%) forms included indications for oral hygiene recommendations.

3.3 | Conditions of oral care and need for support

The care condition of the teeth, dentures and mucous membranes/gums was generally equally distributed in the three categories of good, fair and poor. The condition of the mucous membranes was rated as good on 372 (52%) forms. Overall, 330 (45.5%) participants required complete support of dental, oral and prosthetic care: 46.5% in nursing homes and 25% in the outpatient setting (Table 2). Altogether, three quarters of nursing home residents and more than half of patients in an outpatient setting needed support.

TABLE 1 Clinical characteristics and oral health characteristics from the oral care 174a forms (N = 747)

	Setting, N (%)			p
	Total N = 747	Nursing home N = 706	Outpatient care N = 41	
Total prostheses – upper jaw	283 (38)	277 (39)	6 (15)	0.002
Partial prostheses – upper jaw	118 (16)	108 (15)	10 (24)	0.121
Visual plaque – upper jaw right	168 (22)	153 (22)	15 (37)	0.026
Visual plaque – upper jaw left	172 (23)	153 (22)	19 (46)	<0.001
Total prostheses – lower jaw	189 (25)	185 (26)	4 (10)	0.019
Partial prostheses – lower jaw	172 (23)	160 (23)	12 (29)	0.329
Visual plaque – lower jaw right	181 (24)	168 (24)	13 (32)	0.250
Visual plaque – lower jaw left	190 (25)	173 (25)	17 (41)	0.015
Care level ^a 1	90 (12)	84 (12)	6 (15)	0.565
Care level 2	190 (26)	182 (27)	8 (21)	0.403
Care level 3	213 (29)	203 (30)	10 (26)	0.594
Care level 4	159 (22)	150 (22)	9 (23)	0.863
Care level 5	72 (10)	66 (10)	6 (15)	0.243

^aThe degree of care was only known for 724 (not 747) people. Thus, information regarding the level of care is based on N = 724, of which 685 patients were nursing home residents and 39 were under outpatient care.

3.4 | Dentist's recommendations

In the personal preventive plan for oral and prosthetic care, 464 (62%) patients consented to brushing teeth twice a day, and interdental care was recommended for 193 (26%) patients. Fluoridated toothpaste was recommended for 213 patients (29%), with a higher rate of recommendation in outpatient settings, and weekly fluoride administration was recommended for 40 patients (5%). The manual toothbrush dominated as a recommendation (266 patients; 36%) compared to electric (51 patients; 7%) or three-headed brushes (47 patients; 6%). The highest recommendation was for prosthesis cleaning (363 [49%]) and oral mucosa cleaning (309 [41%]). Tongue cleaning was rarely recommended. There were almost no recommendations for mouthwash solutions, salivation promotion or nutritional advice (Table 3).

3.5 | Dental treatment needs

A need for dental treatment was identified in 50% of the completed plans for nursing home residents, and this need was greater in an outpatient setting (80%). The need for prosthetic action was rated higher in nursing homes (110 cases; 16%), and the need for extraction showed a higher prevalence in the outpatient setting (5 cases; 12%).

3.6 | Associations between the form results, care level and nursing home costs depending on settings

In nursing homes, 394 forms were assigned to the low-cost category, 107 to the medium-cost category and 208 to the high-cost

category. The mean amount for personal contribution was 2005 (SD 132) Euros in the low-cost category, 2414 (SD 62) Euros in the medium-cost category and 2713 (SD 237) Euros in the high-cost category.

Among nursing home residents, there were associations among care level and visual plaque, care condition of the mucosa and prostheses, the need for support in oral hygiene, certain oral hygiene recommendations and prosthetic treatment needs (Table 4). Regarding accommodation costs and items of the oral care nursing plan, there were also associations among accommodation costs and visual plaque, the need for support in oral hygiene, certain oral hygiene recommendations and the need for tooth removal. The data could not confirm an association of accommodation costs with the oral care condition. Among outpatient care patients, there were associations among care level and visual plaque in the upper jaw right, care condition of the mucosa, the need for support for oral hygiene and cleaning prostheses as a care recommendation.

4 | DISCUSSION

In this explorative investigation, we were able to show that an oral care nursing plan such as the one described herein may enable documentation of oral health and hygiene problems that are present among elderly patients. In its current form, the recommendations provided by the dentists in this study were for obvious oral hygiene tasks such as toothbrushing or fluoridation, rather than for specialized tasks such as nutritional advice or therapeutic approaches for asymptomatic dry mouth. Although accommodation costs were associated with the need for oral hygiene support but not with the oral care condition, the care level was associated with both measures.

TABLE 2 Oral care condition of the teeth, mucosa and prostheses, categorized as smiles from good to fair to poor, and the documented need for support in daily oral hygiene (N = 747)

	Setting, N (%)			p
	Total N = 747	Nursing home N = 706	Outpatient care N = 41	
Care condition of the teeth				0.042
Good	174 (32)	162 (33)	12 (31)	0.815
Fair	185 (35)	165 (33)	20 (51)	0.022
Poor	177 (33)	170 (34)	7 (18)	0.038
Care condition of mucosa				0.273
Good	372 (52)	347 (51)	25 (63)	0.170
Fair	143 (20)	135 (20)	8 (20)	0.996
Poor	201 (28)	194 (29)	7 (18)	0.126
Care condition of prostheses				0.022
Good	219 (39)	204 (38)	15 (65)	0.008
Fair	157 (28)	152 (28)	5 (22)	0.512
Poor	190 (34)	187 (34)	3 (13)	0.033
Need for support for oral hygiene				0.007
None	187 (26)	169 (25)	18 (45)	0.004
Partly	208 (29)	196 (29)	12 (30)	0.850
Completely	330 (46)	320 (47)	10 (25)	0.007

4.1 | Oral health and hygiene

Total prostheses were more common than partial prostheses in the upper and lower jaws, and the distribution of total prostheses for the lower jaw in those requiring care showed a similar picture as recent data from Germany.^{10,14} When considering care levels, our data appear to be representative because they correspond to data on the distribution of care levels in Germany.¹⁵ However, when aiming for the organization of improved oral care for elderly patients with care needs, one has to consider that in Germany, elderly patients remain at home for as long as possible, and outpatient care in nursing homes is reserved for patients with the highest care needs. Therefore, people with increasing care needs will transition to inpatient care at a later point, which can affect their oral health and hygiene status. In our study, a quarter of the oral care plans provided information on existing visual plaques, with most of these forms completed in an outpatient setting. The right half of the jaws performed slightly better, which has already been described in the literature.¹⁶ The presence of greater plaque accumulation in outpatient elderly patients may indicate the benefits of regular oral hygiene provision by care staff. However, the majority of these findings were collected during the course of routine examinations performed by an experienced cooperative dentist who focused on plaque control. Thus, it remains unclear how nursing homes without a cooperating dentist would perform in relation to the visual plaque level. Nevertheless, patients who enter nursing homes with high care needs and have greater needs for oral hygiene provision as a result experience significant

benefits in relation to their oral hygiene. The distribution of forms across care levels showed that the oral care condition was distributed from good to poor. Outpatient care performed slightly better in investigating the need for support in dental, oral and prosthetic care. This may be due to the fact that a greater number of patients with lower care levels seek treatment at an outpatient setting, and they receive more intensive support from relatives, consistent with the findings in other studies.^{17,18} However, few studies have focused on elderly patients who require the help of homecare services, and further research is required to compare the need for dental treatment and oral hygiene provision by different caregivers on an outpatient versus inpatient basis.

4.2 | Recommendations described in the oral care nursing plans

An assessment of the evaluations of oral care and the recommendations of support needs described in the forms showed an overall need for improvement in oral hygiene. The information on the personal oral hygiene plan appeared to vary greatly, depending on the examiner. Toothbrushing was recommended to 60% of patients, with cleaning of the prosthesis recommended in about half of the cases. Overall, 39% of patients had a full upper denture and 26% had a total lower denture; 40% of the patients were edentulous, and so the toothbrush recommendation was unnecessary in these patients. In contrast, hyposalivation and xerostomia problems showed a high prevalence in elderly patients.¹⁹ Therefore, the low number of recommendations (2%) regarding the need for symptomatic dry mouth treatment is incomprehensible but is consistent with earlier investigations in this group where dentists did not know about asymptomatic treatment options and therefore rarely informed their patients.²⁰

4.3 | Treatment needs

The main need in nursing home settings was for prosthetic treatment. In the outpatient setting, the highest need was for extraction, which may be due to the transition from preventive to problem-oriented outpatient care. Patients developing high care needs are less likely to go to the dentist. Dentists who submitted questionnaires from patients in a continuous care situation were likely to have developed these extraction needs relatively quickly. Nitschke et al.¹ reported in 2001 that only 40% of all prostheses were fully functional when tested in 170 residents from eight nursing homes. In particular, the insufficient use of dental services in the nursing care field was noted.^{1,21,22} Our data showed associations between the care level and oral hygiene and the need for nursing staff to assist with oral hygiene. This finding is often described in the literature: higher care needs combined with cognitive impairment lead to a deterioration in self oral hygiene²³ and necessitate increased support from the nursing staff or the dental team.^{24–26}

TABLE 3 Recommendations from the dentists for measures provided by the nursing home staff

	Setting, N (%)			p
	Total N = 747	Nursing home N = 706	Outpatient care N = 41	
Cleaning the teeth twice a day	467 (63)	432 (61)	35 (85)	0.002
Using a manual toothbrush	266 (36)	241 (34)	25 (61)	<0.001
Using an electric toothbrush	51 (7)	37 (5)	14 (34)	<0.001
Using a three-head toothbrush	47 (6)	46 (7)	1 (2)	0.296
Using fluoridated tooth paste daily	213 (29)	178 (25)	35 (85)	<0.001
Using fluoridated gel once a week	40 (5)	37 (5)	3 (7)	0.566
Cleaning interdental areas	193 (26)	175 (25)	18 (44)	0.007
Cleaning oral mucosa	309 (41)	299 (42)	10 (24)	0.023
Cleaning the tongue	108 (14)	103 (15)	5 (12)	0.672
Cleaning prostheses	363 (49)	350 (50)	13 (32)	0.026
Promote salivation	16 (2)	13 (2)	3 (7)	0.019
Mouthwash recommended	24 (3)	19 (3)	5 (12)	<0.001
Nutritional advice necessary	16 (2)	10 (1)	6 (15)	<0.001

4.4 | Accommodation costs

Regarding accommodation costs and items of the oral care nursing plan, there were among between accommodation costs and visual plaque, the need for support for oral hygiene, certain oral hygiene recommendations, and the need for tooth removal. These findings probably represent the inherently higher costs of accommodation patients with higher care levels. The data could not confirm an association of accommodation costs and oral care condition. This might be interpreted to imply that the care condition of the teeth, mucosa and prostheses is less influenced by accommodation costs, but rather by the care level, as shown in our results. When analysing the descriptive data and their presentation within the cost groups, the result is a fairly homogeneous picture. Thus, from our perspective, there should be no overinterpretation of these statistical findings, and the costs of accommodation tend to play a minor role.

4.5 | Completion of oral care nursing plans

Although more than half of the patients had removable dentures, only 27% had denture bases drawn in the plans. In approximately half of the plans, no information was given in the tooth diagram. The diagrams are intended to serve as an information interface for the nursing home staff or caring relatives and are an informative document in a retirement home or outpatient setting. We believe that documenting the exact tooth status and the positions and types of prostheses in the mouth is essential for care staff. Prostheses are often heavily soiled, resulting in detrimental consequences on general health and increased incidence of pneumonia with high mortality rates.^{27,28} Therefore, this section of the plan should be completed in detail by the dentists. There may be a need

for guidelines on completing the form comprehensively and measures to assess the quality of completed forms. However, the ten sample geriatric cases completed prior to the study revealed comprehensive and detailed completion, but this does not appear to represent the real-life situation.

Our data showed that the design of the documentation led to stereotypical completion of the sheets, especially in the "recommendation" section. This is likely to be a common problem during serial examinations that are often carried out in nursing homes under economically constrained conditions. However, such stereotypical completion contradicts the intention of the sheet, which is to create an individual oral health plan while also providing a communicative information interface for nursing staff and caring relatives. Therefore, it is important to consider how the examination form could be even more supportive and useful for dentists and for the understanding of care staff and relatives, rather than simply be used for filing in the index card. The sheet could be simplified, shortened and made clearer by using simple symbols and vectors (eg infographics): the design should be clear, motivating and easily recognizable. Such a clear visual representation could possibly lead to better implementation, as has been shown in other medical fields.²⁹ Given mHealth solutions (medical and public health practice supported by mobile devices), apps with the oral care plan itself and corresponding teaching material could improve the quality of the filling out as well as the understanding of the nursing staff.³⁰ The intention of the questionnaire is certainly welcome and appears to be the first sensible step to allow the formation of an individualized oral hygiene and oral health plan for every patient in need of care in Germany. However, its application in daily clinical practice will require simplification of the form and insistence on implementation of the measures; otherwise, the form might lead to demotivation among the health professions involved.

	Nursing home residents		Outpatient care
	Spearman's rho		Spearman's rho
	Care level	Costs	Care level
Care level	—	.17 ^b	—
Visual plaque – upper jaw right	.12 ^b	.21 ^b	.36 ^a
Visual plaque – upper jaw left	.13 ^b	.23 ^b	.18
Visual plaque – lower jaw right	.14 ^b	.24 ^b	.28
Visual plaque – lower jaw left	.14 ^b	.22 ^b	.23
Care condition of the teeth	-.06	-.01	.23
Care condition of mucosa	-.09 ^a	-.07	.36 ^a
Care condition of prostheses	-.12 ^a	-.08	.40
Need for support for oral hygiene	.22 ^b	.15 ^b	.54 ^b
Using a manual toothbrush	-.13 ^b	.08 ^a	-.17
Using an electric toothbrush	.08 ^a	.06	.18
Using a three-head tooth rush	.11 ^a	.13 ^b	.24
Using fluoridated tooth paste daily	.18 ^b	-.09 ^a	.24
Using fluoridated gel once a week	.06	.26 ^b	-.02
Cleaning interdental areas	.26 ^b	-.04	-.03
Cleaning prostheses	-.05	-.05	-.40 ^a
Fillings required	-.07	-.03	.05
Treatment need mucosa or gingiva	.04	-.05	-.14
Need for tooth removal	.03	.11 ^b	.18
Requires prosthetic care	-.09 ^a	.04	-.28

Note: Bold values represent medium or strong correlations with Spearman's rho values ≥ 0.3 and statistical significance < 0.05 .

^a $p < 0.05$.

^b $p < 0.01$.

TABLE 4 Spearman's rank correlation of results of Form 174a with the care level and nursing home accommodation costs for nursing home residents and patients receiving outpatient care

4.6 | Limitations

The main bias in our study is that the study participants were volunteers, which may represent an "over-motivated" population of committed cooperative dentists. In this respect, one has to assume that the average dentist would complete the sheets with less care. Thus, our results may show a positive/exaggerated picture of the current situation that is too distorted. In addition, the group sizes were different, but this could not be changed due to the retrospective study schedule. The underrepresented group of outpatient care patients should be considered when planning further prospective studies, since both the scientific discussion and clinical dental care are still in need of improvement. A further limitation is the high variation in the number of submitted forms per study dentist (9–249). The differences in the numbers of forms submitted per study dentist may result in a cluster effect, especially for the recommendations part. This may occur when a dentist always recommends a certain measure across the board. If this dentist was only active in the smaller group, the impression would very quickly arise that a certain measure is indicated much more frequently there than in the larger group. However, this additional variable could only be taken into account in multi-level analyses

(including regressions). This "problem" primarily only affects the comparisons in the recommendation section (Table 3). Due to the exploratory nature of this study, however, we decided to dispense with these analyses since only proportions are compared with one another and correlations are calculated and described sufficiently. Based on the results of our initial pilot study, we believe that the quality of the completed forms is consistent even in students before state examination. The cross-sectional design of our study, where study dentists submitted the forms they completed a priori over a given period, makes such variance inevitable.

4.7 | Conclusion

We have shown that an oral care nursing plan is useful and could serve as an interface for communication between dentists and nursing staff or caregivers in the future. The recommendations provided in the current form of the plan are for obvious oral hygiene tasks such as toothbrushing or fluoridating measures, rather than specialized tasks such as nutritional advice or therapeutic approaches to asymptomatic dry mouth. Clarification of the form using simple symbols, more training for dentists and staff

regarding its meaning and changing its intention from a recommended form to a mandatory requirement would help promote careful documentation by dentists as well as daily implementation by the nursing staff.

ACKNOWLEDGEMENTS

The manuscript was edited by Deborah Nock (Medical WriteAway, Norwich, UK), with full review and approval by all authors.

CONFLICT OF INTEREST

No conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

Barbe AG, Bleiel D and Noack MJ conceived the ideas; Barbe AG and Bleiel D collected the data; Barbe AG analysed the data; Barbe AG, Nitschke I and Bleiel D led the writing and Noack MJ critically revised the manuscript.

CLINICAL RELEVANCE

SCIENTIFIC RATIONALE FOR STUDY

An oral care nursing plan for elderly patients with care needs was developed to identify oral health and hygiene problems. The impact of the care level and accommodation costs was investigated.

PRINCIPAL FINDINGS

The plan highlights the insufficient oral health and hygiene in this population. While accommodation costs are associated with the need for oral hygiene support (not with oral care condition), care level influenced both measures.

PRACTICAL IMPLICATIONS

The plan documented the oral health and hygiene problems among elderly individuals. With simplified better visualization, it could facilitate communication between dentists and caregivers in the future.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Bleiel D, Nitschke I, Noack MJ, Barbe AG. Impact of care level, setting and accommodation costs on a newly developed oral care nursing plan format for elderly patients with care needs – Results from a cross-sectional study. *Int J Dent Hygiene.* 2021;00:1–10. <https://doi.org/10.1111/idh.12525>