ORIGINAL RESEARCH

Feasibility of a microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants: A mixed-methods study

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ABSTRACT

Background and objective: Hospital and home care nurses and nursing assistants do not provide optimal nutritional care to older adults, which is due to several factors that influence their current behaviour. To successfully target these factors, we developed a microlearning intervention. The next step is to assess its feasibility to achieve the best fit with nursing practice. The aim of this study was to test the feasibility of the microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants.

Methods: In a multicentre study, we used a mixed-methods design. Feasibility was determined by assessing 1) recruitment and retention of the participants and 2) the acceptability, compliance and delivery of the intervention. Data about the use of the intervention (consisting of 30 statements), and data from a standardised questionnaire and two focus group interviews were used to measure the feasibility outcomes.

Results: Fourteen teams with a total of 306 participants (response rate: 89.7%) completed the intervention and the median (Q1, Q3) score for completed statements per participant was 23 (12, 28). The mean proportion of correct answers was 72.2%. Participants were both positive and constructive about the intervention. They confirmed that they mostly learned from the intervention. Overall, the intervention was acceptable to the participants and compliance and delivery was adequate.

Conclusions: The microlearning intervention is mostly feasible for hospital and home care nurses and nursing assistants. Based on participants' constructive feedback, we consider that the intervention needs refinement to improve its feasibility.

Key Words: Behaviour change, Factors that influence behaviour, Feasibility, Home care, Hospital care, Microlearning intervention, Nursing nutritional care, Older adults

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1. INTRODUCTION

Hospital and home care nurses and nursing assistants have a crucial role in the coordination and delivery of continuous and high-quality nutritional care to the growing number of older adults with multiple long-term health conditions.[1–4] These nurses and nursing assistants can stimulate intake of good nutrition in older adults, prevent them from deterioration of nutritional status and development of malnutrition by early recognition and risk assessment, and identify and treat potential malnutrition.[3,5–7] In this way, they essentially contribute to reducing disease risk, promoting good health and well-being, preserving functionality and independence of older adults.[3,5,8,9]

In current practice however, hospital and home care nurses and nursing assistants do not manage to provide proper nutritional care and hence affect the quality of nutritional care older adults receive.[10–12] Previous studies have shown that suboptimal nutritional care is the result of, among other things, various factors that influence nurses' and nursing assistants' current behaviour including moderate awareness of the importance, lack of fundamental knowledge and predominantly neutral attitudes.[10,12–14] As a result, they give nutritional care lower priority, undervalue nutritional care activities and lack to take their full responsibility.[10,11,15,16] Here, behaviour can be defined as "any observable or measurable movement or activity of an individual. Behaviour can be verbal or nonverbal, overt or covert. Covert responses are private or unobservable events that can be cognitive, emotional, or physiological".[17]

To promote behaviour change, the key emphasis is on affecting the factors that influence nurses' and nursing assistants' current behaviour in nutritional care and education is suitable for this purpose.[18,19] This can eventually enhance nutritional care and impact older adults' health and well-being.[11,12] To increase the likelihood of successfully targeting these factors in the specific context of the Dutch hospital and home care setting,[19–22] we developed an evidence-based microlearning intervention consisting of 30 statements about nursing nutritional care for older adults.[23] Microlearning is defined as "short forms of learning and consists of short, fine-grained, inter-connected and loosely-coupled learning activities with microcontent".[24]

In accordance with the Medical Research Council (MRC) framework, an essential next step in the research process is assessing feasibility of our microlearning intervention to achieve the best fit with routine practice. Besides estimating recruitment and retention of participants for following the microlearning intervention, this also includes determining the acceptability, compliance and delivery of the intervention.[21] Conducting a feasibility study allows us to gain insight into the extent to which our microlearning intervention is a sufficient strategy to promote nurses' and nursing assistants' behaviour change. Also, it increases the chance of successful implementation of the microlearning intervention in nursing practice.[19,21] The aim of this study was to test the feasibility of our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants. Therefore, we assessed 1) recruitment and retention of the participants for following the microlearning intervention and 2) the acceptability, compliance and delivery of the intervention.

2. METHODS

2.1 Study design

In a multicentre study, we used a mixed-methods design to evaluate the feasibility of our microlearning intervention in the hospital and home care setting. The design of this feasibility study and overview of this intervention is depicted in Figure 1. The reporting of this study was based on the checklist with items to include when reporting a pilot study, which is adopted from the CONSORT statement (see Appendix 1).[25]

2.2 Participants and setting

Nurses and nursing assistants, working in two hospitals and two home care organisations in the central region of the Netherlands, participated in this study and received our microlearning intervention. The nurses and nursing assistants were selected using a purposive sampling method[26] on team level. Nursing teams of two general nursing wards (geriatrics and internal medicine) of a university hospital, two general nursing wards (both general surgical and internal medicine) and an outpatient department for preoperative preparation for hospital admission of a general hospital were included. In addition, nine nursing teams from two home care organisations participated. Overall, fourteen nursing teams with a total of 341 nurses and nursing assistants participated in the study. Inclusion of these nursing teams ensured a representation of hospital and home care nurses and nursing assistants providing nutritional care for older adults, including those with (risk for) malnutrition.[26] Members of the research team (DtC, MS) recruited the nursing teams between February and first half of April 2018 by contacting the head of the nursing teams in the hospital, or district manager or nurse team coordinator in the home care organisation. Subsequently, these persons invited the nurses and nursing assistants of their team to participate in our microlearning intervention sending an email to inform their team about the intervention and the study.

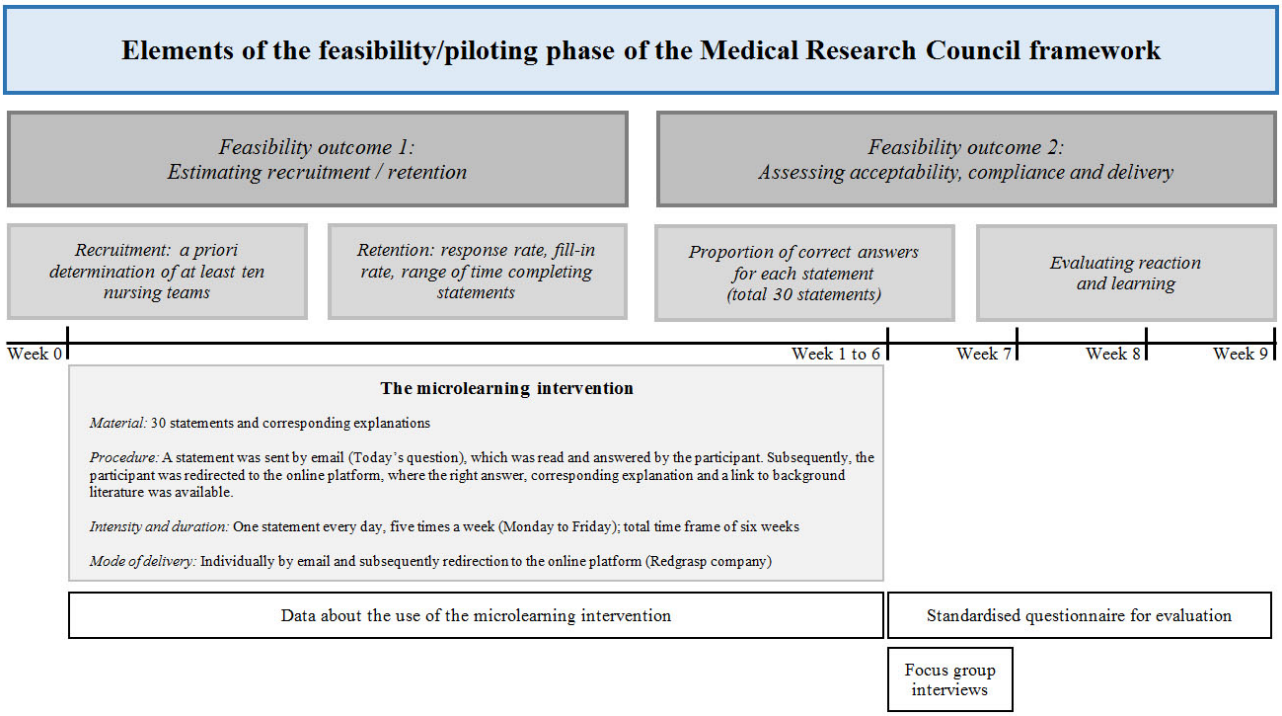

Figure 1. Design of the feasibility study and overview of the microlearning intervention

2.3 The microlearning intervention

Our microlearning intervention is aimed to promote nurses' and nursing assistants' behaviour change by affecting factors that influence current behaviour in nutritional care for older adults. The microlearning intervention included 30 statements and corresponding explanations about nursing nutritional care for older adults. The statements were presented in a snack-sized way, one statement per day, five times a week from Monday to Friday for a total duration of six weeks (16 April till 25 May 2018). Daily, each participant received one statement by email individually (Today's question). The statement was read and answered (true or false) in the email. The participant was subsequently redirected to an online platform from Redgrasp B.V. (Utrecht, the Netherlands), a company providing an online platform to certify healthcare professionals, where the right answer and corresponding explanation was given together with positive rewards expressed in points. For each statement, the total time investment was circa three minutes. Also, a link to background literature and a discussion forum was made available. In addition, each participant received weekly updates about the average response of all participants on the statements and an individual total response score for all statements up until that time point.

The development of the 30 statements comprised generating themes and statements, assessing content validity and language, elaborating explanations corresponding to statements, and establishing readability and face validity of both statements and explanations.[27,28] The 30 statements reflect a full range of nutrition and nursing themes covering nursing nutritional care for older adults in hospital and home care. To stimulate active learning, we constructed the statements in a manner to raise the level of conceptual and procedural knowledge, and stimulate cognitive processes that promote transfer of learning, such as understanding, applying, analysing, evaluating and creating. This was based on the revised Bloom's Taxonomy Model and our goal was to stimulate transfer of knowledge to new situations, and meaningful learning, thinking and problem solving.[29] In this way, factors that influence nurses' and nursing assistants' current behaviour were positively affected and as a consequence, behaviour change was promoted. Furthermore, the response option to a single statement was dichotomised[28] into 'true' or 'false'.[30] All answers were based on literature and therefore formulated as absolutely true or false. Because there may be a discrepancy between literature and situations in routine nursing practice, one could argue that some answers were not always absolutely true or false. This enabled us to promote discussion and self-reflection.[29] Also, in ordering the statements, we build up the difficulty level to stimulate continuous learning.[31] The 30 statements can be found in Appendix 2.

2.4 Feasibility outcomes

The first feasibility outcome was recruitment and retention of participants for following the microlearning intervention.[21]

Estimating recruitment of at least ten nursing teams was a priori determined to provide useful information regarding our feasibility outcomes.[25] Estimating retention was established with data about the use of the microlearning intervention collected from the online platform. These included the response rate (overall, per statement), completing statements (total, per participant) and the range of time in which statements were completed.

The second feasibility outcome was the acceptability, compliance and delivery of our educational intervention.[21] We defined this outcome as 1) the proportion of correct answers given on each statement (total 30 statements) and 2) assessing reaction and learning of nurses and nursing assistants using the first two levels of Kirkpatrick's four-level training evaluation model.[32,33]

The proportion of correct answers was calculated as a percentage from data about the use of the microlearning intervention collected from the online platform where a statement was answered correctly or incorrectly. Reaction and learning were measured with 1) a standardised self-reported questionnaire for evaluation of the intervention from the online platform Redgrasp and 2) focus group interviews.

2.4.1 *Standardised self-reported questionnaire for evaluation of the intervention*

A standardised questionnaire for evaluation of the intervention from the online platform Redgrasp was distributed among all participants. They received an email from the online platform with an invitation to fill in the questionnaire together with a link to the questionnaire, which was available on the online platform. The questionnaires were collected for a period of three weeks from three days after the last statement (statement 30) was sent (between May 28 and June 18, 2018). The questionnaire consisted of a set of twenty questions: thirteen questions assessing nurses' and nursing assistants' reaction to the intervention, five questions assessing their learning from intervention and two questions combining reaction and learning. Three questions were open ended and seventeen questions were multiple choice with a five-point Likert scale as answer option (see Appendix 3).

2.4.2 *Focus group interviews*

Two focus group interviews were conducted and held within one week after the last statement of our intervention was sent (between May 25 and June 1, 2018) to increase the probability of recalling solid information about the intervention.[34] Due to nurses' and nursing assistants' busy and irregular work schedule, two focus groups were held at two different time points to increase the chance of participation.[35] All nurses and nursing assistants who took part in the intervention were approached to establish a representative sample of the total group. We aimed to include five till twelve participants per focus group.[26] They were invited by one researcher (DtC) via the head of the nursing teams in the hospital, or district manager or nurse team coordinator in the home care organisation through the work email of each nurse and nursing assistant.

We developed a protocol including a semi-structured interview guide.[35,36] Participants' perceptions regarding reaction and learning towards our microlearning intervention were operationalised into open-ended questions.[34] Moderation of the focus group session was done by MvW and two members of the research team (LvV, IH) observed the discussion and took field notes and made audio recordings. The duration of each focus group interview was 69 minutes and 58 minutes respectively.

2.5 Feasibility criteria

A priori, we set no criteria for assessing success of the feasibility objectives.[25] With several researchers from our team, we critically reflected on the study results and agreed consensus on success factors and key considerations.

2.6 Data analysis

We quantitatively analysed 1) response rate, fill-in rate and range of time in which statements were completed, 2) the proportion of correct answers of each statement, 3) questions with multiple-choice options from the standardised questionnaire for evaluation of the intervention and 4) demographic characteristics of the participants of the focus groups. The quantitative data were reported as frequency (percentage) for categorical variables. Continuous variables were expressed as mean (SD) or median (Q1, Q3) in case of normal or skewed distribution respectively. The data from the open-ended questions of the standardised questionnaire were categorised and displayed as frequency (percentage). Data analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp, Armonk, NY).

Qualitative data from the focus group interviews were transcribed verbatim. The focus group interviews were analysed using thematic analysis.[37] Therefore, QSR International's NVivo 12 qualitative data analysis software (NVivo qualitative data analysis software version 12, QSR International Pty Ltd., 2018) was used. Both focus group interviews were analysed independently by two members of the research team (DtC, IH). After each focus group, they held a face-to-face meeting to discuss the codes. Also, one additional consensus meeting was held with two other members of the research team (JD, LvV), after the second focus group, to discuss and confirm codes, themes and sub-themes, and their potential relationships. Also, the themes were defined and named. The

analysis process was data driven, but the research question was kept in mind.[37]

2.7 Trustworthiness

Trustworthiness of both focus group interviews was ensured by writing a protocol with a semi-structured interview guide, collaboration with participants, prolonged engagement with the data during the data collection and data analysis, member checking and researcher triangulation.[34]

2.8 Ethical aspects

This study was approved by the Medical Research Ethics Committee of the University Medical Center Utrecht, the Netherlands (18-236/C) and the local Ethics Committee of the St. Antonius Hospital Nieuwegein, the Netherlands (P18.009). All participants gave implied consent for the use of their data from the intervention and standardised questionnaire for evaluation of the intervention from the online platform Redgrasp after being informed completely. Implied consent was sufficient because the data was not traceable to specific participants and the potential risk of participating in this study was estimated low.[38] The collected data was treated with appropriate confidentiality. For the focus group interviews, nurses and nursing assistants obtained written informed consent at the start of data collection.[34]

3. Results

3.1 Participant flow and characteristics

Of the 341 nurses and nursing assistants who received the statements daily in their mail, (hospital: n = 252; home care: n = 89), 306 (89.7%) actively participated (hospital: n = 227; home care: n = 79). Of these participants, 87.9% was female and 73% worked as a nurse (see Table 1).

Table 1. Demographic characteristics of participants

Characteristics	Total (n = 306)	Hospital (n = 227)	Home care (n = 79)
Female, n (%)	269 (87.9)	199 (87.7)	70 (88.6)
Position, n (%)			
Nurse†	222 (73.0)	187 (83.1)‡	35 (44.3)
Nursing assistant	40 (13.2)	0 (0)	40 (50.6)
Nurse student	42 (13.8)	38 (16.9)	4 (5.1)
Setting, n (%)			
University hospital	51 (16.7)		
Geriatrics department		29 (56.9)	
Internal medicine department		22 (43.1)	
General hospital	176 (57.5)		
General surgical/Internal medicine department 1§		96 (54.6)	
General surgical/Internal medicine department 2¶		68 (38.6)	
Outpatient department preoperative preparation		12 (6.8)	
Home care organisation A	45 (14.7)		
Nursing team 1			9 (20.0)
Nursing team 2			8 (17.8)
Nursing team 3			9 (20.0)
Nursing team 4			7 (15.6)
Nursing team 5			7 (15.6)
Nursing team 6			5 (11.1)
Home care organisation B	34 (11.1)		
Nursing team 1			10 (29.4)
Nursing team 2			10 (29.4)
Nursing team 3			14 (41.2)

† Educational level of the nurses was either EQF level 4, EQF level 6 or EQF level 7 (Abbreviation: EQF, European Qualifications Framework).
‡ Eight nurses combined their work as a nurse with the function of coordinator of the nursing department.
§ This department is specialised in Gastro-intestinal surgery, and Gastroenterology and liver disease.
¶ This department is specialised in Haematology and Nephrology.

Table 2. Fill-in rate and proportion of correct answers for the 30 statements of the microlearning intervention

No.	Difficulty*	Statement[#] (correct answer)	Response rate, n (%)	Proportion correct answers, n (%)
1.	Easy	For a nurse/nursing assistant, an important intervention is always to monitor what and how much a frail older care recipient has eaten (T)	188 (64.4)[†]	176 (93.6)
2.	Easy	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse/nursing assistant (F)	206 (70.5)[†]	201 (97.6)
3.	Easy	It is the task of the nurse/nursing assistant to set up the environment in such a way that the older care recipient can eat well (T)	202 (69.2)[†]	189 (93.6)
4.	Easy	At admission/intake, nurses/nursing assistants must provide information to older care recipients about the importance of protein intake through normal food (T)	208 (71.2)[†]	167 (80.3)
5.	Easy	As a nurse/nursing assistant, you barely have influence on changing eating patterns resulting from a form of dementia (F)	197 (67.5)[†]	185 (93.9)
6.	Moderate	During the anamnesis/intake, it is undesirable to ask supplementary questions about personal eating habits and food preferences, because it compromises the older care recipient's privacy (F)	204 (69.9)[†]	201 (98.5)
7.	Moderate	The best way of screening for malnutrition is to keep checking with the older care recipient himself/herself if he/she has lost weight in the past month (F)	200 (65.4)	124 (62.0)
8.	Moderate	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss (F)	204 (66.7)	193 (94.6)
9.	Moderate	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern (F)	202 (66.0)	148 (73.3)
10.	Moderate	It is primarily the dietitian's job to prescribe interventions for malnutrition (F)	207 (67.6)	149 (72.0)
11.	Difficult	It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan) (T)	192 (62.7)	133 (69.3)
12.	Difficult	When it has been determined that an older adult is malnourished, the first priority is to start with energy- and protein-enriched drinks (F)	211 (69.0)	47 (22.3)
13.	Difficult	The older care recipient always carries prime responsibility for his/her nutrition (F)	198 (64.7)	78 (39.4)
14.	Difficult	Older people chew less well than younger people, causing them to feel saturation earlier (T)	199 (65.0)	81 (40.7)
15.	Difficult	It is important to let older care recipients take their medicines with a glass of water before meals (F)	199 (65.0)	129 (64.8)
16.	Easy	Physical recovery following hospital treatment is more important than sufficient dietary intake (F)	210 (68.6)	198 (94.3)
17.	Easy	An older care recipient eats less when a nurse/nursing assistant is present at the scene, because this disturbs the older care recipient in his/her eating ritual (F)	213 (69.6)	180 (84.5)
18.	Easy	In older care recipients of, for example, Turkish or Moroccan descent, providing information about medication is more important than about nutrition, because they are by nature susceptible to type 2 diabetes mellitus (F)	211 (69.0)	204 (96.7)
19.	Easy	Only when there is weight loss can we speak of malnutrition (F)	223 (72.9)	195 (87.4)
20.	Easy	It is the task of the nurse/nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends or at an association (T)	209 (68.3)	185 (88.5)
21.	Easy	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation (F)	213 (69.6)	158 (74.2)
22.	Moderate	When an older care recipient is malnourished, it is important to recommend sweet snacks, as desired, so that they at least consume something (F)	210 (68.6)	128 (61.0)
23.	Moderate	Measuring the albumin blood level is the most reliable method to identify malnutrition (F)	210 (68.6)	171 (81.4)
24.	Moderate	It is conducive to the general health of an older adult with a BMI > 25 kg/m^2[‡] that he/she loses 5 kg of weight in a short period of time due to disease (F)	208 (68.0)	191 (91.8)
25.	Moderate	The main cause of malnutrition is poor oral health (F)	198 (64.7)	159 (80.3)
26.	Moderate	Also in the palliative phase it is important for older care recipients to maintain current dietary restrictions to ensure that this situation will not be worsened (F)	201 (65.7)	147 (73.1)
27.	Moderate	It is important always to follow the protocol to keep older care recipients fasting before surgery (F)	196 (64.1)	57 (29.1)
28.	Moderate	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake (F)	185 (60.5)	121 (65.4)
29.	Difficult	Because the sense of smell and taste diminishes in older adults, they can enjoy food less (F)	200 (65.4)	53 (26.5)
30.	Difficult	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation (T)	192 (62.7)	69 (35.9)

Note. Abbreviations: T, true; F, false.

*Difficulty of statements was a priori set at: easy (proportion well-answered statements ≥ 0.83), moderate (proportion well-answered statements between 0.5 and 0.83) and difficult (proportion well-answered statements ≤ 0.5).

[#]The statements were presented to the participants in the Dutch language (see Appendix 2).

[†]For statement 1 through 6, a total of 292 participants filled in these statements. One home care team (n = 14) participated in the study from statement 7.

[‡]In the Netherlands, BMI cut-off point for normal weight and overweight in adults is 25 kg/m^2. This may differ between countries or populations.

3.2 Feasibility outcome 1: Retention of participants

The overall response rate was 89.7% (response rate hospital: 90.1%; home care: 88.8%). In total, 6,096 out of 9,180 (66.4%) of the statements were completed. The lowest response rate was 60.5% for statement 28 and the highest response rate was 72.9% for statement 19 (see Table 2). The median (Q1, Q3) score for completed statements per participant was 23 (12, 28), with a minimum of 1 statement and a maximum of 30 statements. Of all the participants, 78.8% replied to the statements within three days (median (Q1, Q3): 1 (1, 3) days).

3.3 Feasibility outcome 2: The acceptability, compliance and delivery of our microlearning intervention

3.3.1 *The proportion of correct answers*

The proportion of correct answers ranged from 22.3% to 98.5% with a mean of 72.2% (see Table 2).

3.3.2 *Evaluating reaction and learning*

1) Standardised self-reported questionnaire for evaluation of the intervention

Of the 306 participants, 94 filled in the questionnaire (hospital: n = 57; home care: n = 37), which is a response rate of 30.7% (hospital: 25.1%; home care: 46.8%). More than 90% of the participants was female and 75.5% worked as a nurse. Of all the participants, 66% was (very) satisfied with the microlearning intervention. More than 69% of the participants (totally) agreed that they learned something new and 70.2% (totally) agreed that they refreshed their knowledge with the intervention. Over 45% of the participants stated they usually or always discussed a question with a colleague and 71% (totally) agreed that the intervention can contribute to improve quality of care. More than 57% explained they thought it was a pity that the intervention was over and 64.1% underlined they would continue filling in statements when these were asked daily.

As positive aspects of the intervention, 12.8% of the participants pointed out that the intervention was a fun way to gain knowledge and 12.8% stated that they appreciated that a good explanation was given immediately. As key considerations, 22.3% of the participants reported that statements were not always well formulated or unambiguous, 5.3% indicated that statements were too much focused on the hospital setting and 4.3% mentioned that the total time frame of six weeks was too long or too many statements were presented. Over 8% of the participants underlined that answers of particular statements were not always absolutely true or false and 3.2% stated that statements were too simple. More results from the questionnaire can be found in Appendix 3.

2) Focus group interviews

A total of seven participants (five nurses, one nursing assistant and one nurse student) were engaged in the focus group interviews. Their median age was 28 years and 57.1% was female. The median duration of the participants' current employment was 2.4 years (see Table 3).

Table 3. Demographic characteristics of participants of the focus group interviews

Characteristics	Participants (n = 7)
Age (years), median (Q1, Q3)	28 (23, 29)
Female, n (%)	4 (57.1)
Position, n (%)	
Nurse	5 (71.4)
Nursing assistant	1 (14.3)
Nurse student	1 (14.3)
Setting, n (%)	
Hospital	2 (28.6)
Home care	5 (71.4)
Highest level of education, n (%)	
NLQF/EQF level 4	3 (42.9)
NLQF/EQF level 6	4 (57.1)
Work experience (years), median (Q1, Q3)	
In current employment	2.4 (0.8, 4.7)
In nursing (total)	3.2 (0.8, 8.8)

Note. Abbreviations: Q1, first quartile; Q3, third quartile; NLQF, Netherlands National Qualifications Framework; EQF, European Qualifications Framework.

Two key themes (with sub-themes) emerged from the focus group interviews: reaction (two sub-themes: 'positive response' and 'constructive criticism') and learning (two sub-themes: 'way of learning' and 'acquired knowledge'). A complete overview of the themes, sub-themes and explanations are presented in the Appendix 4.

Reaction

The participants gave both positive responses and constructive criticism to our intervention. Examples of positive responses were that the intervention was fun, it took little (time) investment and was easily accessible. The participants valued the rewarding, game element and competition of the online platform. Furthermore, they pointed out that the statements were relevant, concrete, diverse and educational.

"In the team . . . everyone really enjoyed doing it [participate in the intervention]. [It was] easily accessible, [it] takes little time." (home care nursing assistant)

Examples of constructive criticism were that a few participants considered the intervention caused too much strain and that the total time frame of the intervention was too long. Also, they pointed out that non-rewarding cues and failing intervention technology were demotivating. They mentioned

that statements were not always well formulated or matched with the corresponding explanations.

"... The question [statement] was not always logical. ... And the answer to that was sometimes, was not quite right." (hospital nurse)

Learning

The participants expressed how and what they learned from the intervention. They stated that they learned individually but also within the team by scheduling time and filling in the statements together, discussion, and evaluation of the content of the statements.

"At some moment, ... there was a question [statement] about responsibility. And my colleague who is home care nurse, ... yes that the older care recipient carries prime responsibility. She had filled in 'yes' while the answer was 'no'. ... It ... is a debatable point. But the nice thing is that we discussed it with each other." (home care nurse)

Furthermore, they pointed out that they learned from the content, formulation and careful reading of the statements and corresponding explanations, and through the kind of learning via the online platform.

"Well, I think with the questions [statements] you answered wrong, it triggers to read the key [corresponding explanation] anyway. Because then you want to read why you made the mistake." (home care nurse)

The participants mentioned they learned about all the themes included in the intervention or specific topics regarding nutritional care for older adults.

"There was also a question [statement] about a palliative care recipient for example. ... About the amount of food I think. Whether it was important or not. ... I considered that educational." (home care nurse)

The participants stated that they were more aware and increased self-reflection about nutritional care for older adults and enhanced their own expertise.

"It makes you a bit aware of nutrition and ... how important it is in the disease process. You already knew it, but now ... it just makes you aware and more alert about it." (hospital nurse)

4. DISCUSSION

In this study, we assessed the feasibility of our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants in fourteen nursing teams using a mixed-methods approach. First, a total of 306 nurses and nursing assistants participated actively and retention, which was operationalised in response rate, completion of statements and time of filling in statements, was satisfactory. Second, the proportion of correct answers was overall more than sufficient. Reaction on the intervention was both positive and constructive and nurses and nursing assistants confirmed they mostly learned from the intervention and that they learned in different ways. Overall, the intervention was acceptable to the participants and compliance and delivery was adequate.

We found a proportion of correct answers of 72.2%. This percentage is higher than in other studies, where, although other measurements used, the percentage of correct answers was between 51.9% and 61.9%.[11,39] Furthermore, the proportion of correct answers for nine statements scored above 90%. In addition, although the majority of the nurses and nursing assistants stated that they had learned something new or at least refreshed their knowledge, this was not the case for some participants. On the one hand, we used dichotomous answer options in our intervention and compared to the other studies, where multiple answer options were used,[11,39] this increases the guessing percentage and may explain the high percentage of correct answers. Furthermore, some statements may have been too easy for one or more subgroups of the participants with specific characteristics. For our sample, we did not collect this data, but from the literature it is known that the proportion of correct answers is unrelated to work experience,[39,40] but is related to higher education[41] and following additional training in nutrition.[40,41] On the other hand, previous studies have shown that nurses and nursing assistants lack to provide appropriate nutritional care to older adults in daily practice, even if it concerns easily accessible or small-time activities.[10,12–15] Evidently, their knowledge applied in practice may to some extent be absent.[29] In our study, participants' knowledge about nursing nutritional care in theoretical context through the 30 statements of our intervention seems to be present, as well as their ability to remember information, explaining the high proportion of correct answers. However, it is inconclusive how their knowledge applied in practice is, because measuring participants' behaviour in providing nutritional care to older adults was outside the scope of this feasibility study.

An interesting finding from our study was that nurses and nursing assistants mentioned that statements and explanations did not always correspond and answers were not always absolutely true or false. Concerning the statements and explanations, this may be the case and is a point of reflection for the research team. Indeed, some answers to individual statements were not always absolutely true or false, but we aimed to promote discussion and self-reflection, which we regarded as adequate strategies to enhance active learning.[29] On the one hand, in some nursing teams, statements and cor-

responding answers and explanations were indeed discussed and that some answers were not absolutely true or false may have contributed to the discussion. On the other hand, it may be that participants were not fully aware that answers were not absolutely true or false, which resulted in that they insufficiently demonstrated self-reflection.[29] This may imply that nurses and nursing assistants were not fully able to comprehensively learn and that additional strategies may be required.

The participating nurses and nursing assistants in our study were largely positive towards the online and snack-sized delivery of the intervention, which they considered easily accessible. This in turn facilitated incorporation of the intervention into their workplace. When developing the intervention, we addressed high workload as one of the priorities to realise an optimal fit between the intervention and its context of the hospital and home care setting. Surely, in their daily work, nurses and nursing assistants are confronted with a high workload mainly due to complex care activities to be performed in a short period of time and shortage of staff.[42,43] As a result, there is a lack of time to take staff off their workplace to educate them.[19,44] It seems confirmed that our intervention made it possible that nurses and nursing assistants spent only three minutes approximately a day on one statement, at a time that suited them. At the same time, they had the opportunity to learn about nutritional care for older adults in the busy hours of their routine practice.

We found that besides learning on an individual level through content and careful reading, several nursing teams scheduled joint time to focus on the statements to learn in different ways on team level. The participants mentioned they filled in the statements together, they discussed and evaluated statements, corresponding answers and explanations, and the weekly score update of their and other participating teams. We may conclude that the participating nurses and nursing assistants adequately learned in different ways in different situations. But also, evidently, several environmental and team factors, such as workplace culture supporting learning, social support and support from the management may have enhanced learning.[44–46] It seems that these nursing teams both actively learned and contributed to successful integration of the intervention in their daily practice.

Participating hospital and home care nurses and nursing assistants also mentioned some barriers in delivering our intervention, such as non-rewarding cues, failing intervention technology and ambiguity towards the total time frame of six weeks. Most participants were satisfied with this time frame, but some mentioned it was too long. We chose six weeks and for some participants, this may be a suitable period, but for others this may be too much time. What is important is to deliver the intervention in a reasonable period of time to facilitate successful learning but to avoid learning demotivation due to longevity.[29,47] Furthermore, all these barriers are important to consider and should be evaluated and dealt with in collaboration between the research team, nursing teams and other stakeholders. Further fine-tuning to overcome these barriers is necessary to prevent nurses and nursing assistants from dropping out and that further implementation becomes a challenge.[21,22]

4.1 Strengths and limitations

A strength of our study is that we systematically and vigorously conducted a feasibility study by using the MRC framework and following a mixed-methods approach to gain insight into the feasibility of our microlearning intervention.[21] Another strength is that our study included a large sample of 306 nurses and nursing assistants from fourteen teams who participated actively and response rates were high. Also, we applied methodological triangulation using multiple data collection methods resulting in increasing validity of the study results.[26]

This study had several limitations. First, we used a purposive sampling method. This could have led to researcher bias due to assessing subjectively during inclusion and consequently for an adequate representation of the hospital and home care nurses and nursing assistants providing nutritional care to older adults.[26] However, study inclusion of the fourteen nursing teams was based on the judgement of multiple researchers of this study increasing validity. Also, the number of included participants exceeded what was necessary for a feasibility study.[25] During recruitment, we approached quite some nursing teams and contrary to expectation, more teams participated. Second, validation of the used standardised self-reported questionnaire was unclear. However, the questionnaire gave us more insight into one of the feasibility outcomes of our study and subsequently contributed to methodological triangulation by complementing the other data collection methods used in this study.[26] Third, the number of participants in both focus group interviews was relatively low. This possibly led to an underrepresentation of participants and hence the results from the two focus groups interviews should be interpreted with caution.[26,34] However, the data from the standardised questionnaire showed similar results, which may suggest that the data from the focus group interviews are valid.

4.2 Future research

First, we suggest that some of the statements, their explanations and answer options need to be reconsidered and

in addition the number of statements about nursing nutritional care for older adults specifically tailored to subgroups within the nursing teams may be expanded. Second, additional strategies to further stimulate self-reflection should be explored. Third, eliminating non-rewarding cues, optimalisation of the intervention technology and an appropriate time frame for delivering the statements for all participants should be addressed. Then, focus should be on re-examining feasibility outcomes and even nurse-related outcomes in a feasibility or pilot study emphasising implementation, context and system fit through a hybrid feasibility or pilot – implementation design.[21,22] An iterative approach in the development – evaluation – implementation process of complex interventions such as our educational intervention is also recommended by the MRC framework.[21] Fourth, for legitimising the standardised questionnaire, it should be further validated to ensure that it measures reaction to and learning from the intervention.[28]

5. Conclusion

In this study, we demonstrated that our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants is mostly feasible. Feasibility outcomes regarding recruitment and retention for following the microlearning intervention, and acceptability, compliance and delivery were generally satisfying. There were some constraints to take into account such as statement formulation and explanation, stimulating self-reflection, non-rewarding cues, failing technology and the length of the total time frame. This means that the intervention needs refinement to improve feasibility by repeating the development phase and subsequently the feasibility phase concurrently considering implementation, context and system fit during both phases. This microlearning intervention holds the promise to successfully promote hospital and home care nurses' and nursing assistants' behaviour change in nutritional care eventually supporting older adults' health, well-being and nutritional status.

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Conflicts of Interest Disclosure

The authors declare that they have no competing interests.

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