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Original Article

Protein intake during hospital admission; Dutch national data on protein intake in 339,720 malnourished patients from 2009–2019

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summary

Introduction: To stimulate early recognition and treatment of malnutrition, the Dutch Healthcare Inspectorate obliged all hospitals from 2008–2019 to report the number of malnourished patients with an adequate protein intake on the fourth day of hospital admission. In this article we present results over the past 11 years and discuss success factors and barriers for adequate treatment of malnourished patients in hospitals.
Methods: The annual reports of hospitals on the numbers of patients with a screening result 'malnourished' and an adequate protein intake on the fourth day of admission were analysed. Hospitals were categorized based on the percentage of malnourished patients with an adequate protein intake on the fourth day of admission as 'poor' (<40% of patients in a hospital achieve an adequate protein intake), 'moderate' 40–60% of patients in a hospital achieve an adequate protein intake), and 'good' (>60% of patients in a hospital achieve an adequate protein intake). To identify success factors and barriers for adequate treatment and registration of malnourished patients in hospitals, three focus

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groups were held in June and July 2020. Participants were dietitians and quality employees or nurses who were involved in data collection for malnutrition indicators in their hospitals.
Results: Between 2008–2019, data were reported of 339,720 malnourished patients. The relative number of patients with adequate intake of protein on the fourth day in hospital ranges from 44%-53% between 2011 and 2019. Before 2013, the number of hospitals that reported data was too small to draw conclusions about results of treatment of malnutrition. Data from 2013 to 2019, show a decline in the number of hospitals with a 'poor' score. The number of hospitals with a moderate score increased between 2015 and 2019 and the number of hospitals with a good score remained more or less stable, except for 2018 where more hospitals reached a 'good' score. Sixteen professionals from ten different hospitals participated in the focus groups and revealed several determinants of adequate treatment of malnourished patients in hospitals such as awareness, feeling responsible and the need of clear instructions and good collaboration.
Conclusion: This inventory of the protein intake of 339,720 hospital malnourished patients over 11 years shows that in one out of five Dutch hospitals >60% of malnourished patients had an adequate protein intake on the fourth day of admission. This shows that meeting protein requirements remains a difficult challenge. Early recognition of malnutrition, optimal multidisciplinary treatment and continuous evaluation is necessary to provide optimal nutritional care in the hospital and beyond.

Introduction

In the Netherlands 14–15% of patients are screened as malnourished when admitted to the hospital. Prevalence highly differs between medical departments, with most patients with malnutrition at the departments of geriatrics, oncology, gastroenterology, and internal medicine (27–38%) [1]. Malnutrition is associated with more complications, increased mortality, length of hospital stay and costs. Providing nutritional support during hospital stay improved clinical outcomes of malnourished patients, including survival. This emphasizes the importance of screening patients to identify patients at risk and start treatment early on [2–4].

Since its founding in 2006, the Dutch Malnutrition Steering Group (DMSG) aims to increase attention for malnutrition among health care professionals. This started in 2000 with a measurement of the prevalence of malnutrition in hospitals [5]. As screening by a nurse proved necessary for early recognition and treatment, the Short Nutritional Assessment Questionnaire (SNAQ) was developed, validated and tested for cost-effectiveness [6,7]. Screening on admission to hospital (with SNAQ or MUST) was implemented in all Dutch hospitals from 2006 to 2008 and is still common practice.

For this implementation of early screening and treatment of malnourished hospital patients, the DMSG worked closely together with the Dutch Inspectorate of Health Care. The Dutch Inspectorate of Health Care introduced quality indicators on screening for malnutrition on admission to the hospital in 2007 [1]. In addition, from 2008–2020 Dutch hospitals were required to collect data on screening for and treatment of malnutrition at all hospital wards, and on screening for malnutrition at the outpatient clinics for preoperative geriatric care. The Dutch Inspectorate of Health Care annually collects and publishes data from hospitals regarding all quality indicators. The DMSG publishes fact sheets, also annually, about the quality indicators for malnutrition screening on its website. These fact sheets show

mean scores on quality indicators and scores for each hospital. These scores are used by hospitals to mirror their own results against those of other hospitals and to share experiences and learn from each other.

The indicator on adequate protein intake on the fourth day of admission reflects the early recognition and treatment of malnutrition in the hospital. It is assumed that patients who are recognized and treated as malnourished early in the admission process, are also more likely to achieve adequate protein intake.

It is a big challenge for malnourished patients, who often have complex problems and feel sick, to achieve an adequate protein intake. Expert opinion revealed that it is not realistic to achieve adequate protein intakes in all malnourished patients on the fourth day of admission. Hence, the standard of this indicator was set at 60% and not 100%. Throughout the years, it turned out to be very difficult for hospitals to meet this standard. Moreover, there were large differences between hospitals in their achievements of reaching adequate protein intakes. For example, in 2019, the relative number of malnourished patients with adequate protein intakes on day 4 of admission, ranged from 15% to 84% between hospitals. Reasons for these differences between hospitals were unclear.

This article will present results of Dutch hospitals on early recognition and treatment of malnutrition, based on data retrieved from the Dutch Inspectorate of Health Care over the past 11 years. In addition, we will discuss success factors and barriers for adequate treatment of malnourished patients in hospitals.

Methods

Indicator of adequate protein intake

From 2008 to 2019, Dutch hospitals annually submitted data to the Dutch Inspectorate of Health on the protein intake of malnourished patients on the fourth day of admission. Data were retrieved from electronic patient records by the hospitals and are available on the website of the Dutch Ministry of Health. In early years, 2008–2011, hospitals without electronic patient records, reported data from random sampling. Data from random sampling and data from hospitals that reported data from <250 patients were excluded in our analyses.

The quality indicator states that protein intake should be assessed in all adults with positive screening results for malnutrition. All hospitals screened all patients for malnutrition on admission to the hospital. Over 80% of the hospitals screened with the Short Nutritional Assessment Questionnaire (SNAQ) [6] and about 20% of the hospitals used the Malnutrition Universal Screening Tool (MUST) [8]. A score of 3 or higher for the SNAQ and a score of 2 or higher for the MUST indicates malnutrition. According to these screening tools, patients who scored positive should be referred to a dietitian to start dietetic treatment to improve nutritional status. On the fifth day of admission, protein intake of the previous day was measured by a dietitian in an unstructured way, mostly with a 24 hour recall method.

The hospitals had to answer the following questions for the quality indicator:

- How many patients, hospitalized for more than 4 days, were at risk of malnutrition on admission as indicated by a screening tool?
- How many patients who had a screening result 'malnourished' at admission and hospitalized for more day than 4 days, had an adequate protein intake on the fourth day of admission?

Adequate protein intake was defined as a protein intake of 1.2 g/kg bodyweight for patients with BMI$\leq$27g/m^2. For patients with BMI >27g/m^2, body weight at BMI 27 was used to calculate adequate protein intake [9]. For the quality indicator, hospitals are categorized based on the percentage of malnourished patients with an adequate protein intake on the fourth day of admission and categorized as follows: if <40% of patients in a hospital achieve an adequate protein intake, this is indicated as 'poor'; if 40–60% of patients in a hospital achieve an adequate protein intake, this is indicated as 'moderate', and if >60% of patients in a hospital achieve an adequate protein intake, this is indicated as 'good'. The average score per year of all hospitals was calculated by dividing the total

number of malnourished patients with adequate protein intake by the total number of malnourished patients. In the Netherlands, ethical approval is not required for registry-based research with anonymous data.

Descriptive statistics were performed using IBM SPSS statistics for Windows (version 27). Data are presented as mean ± SD or as numbers (%).

Success factors and barriers for adequate treatment of malnourished patients in hospitals

In June and July 2020, three focus groups were held to identify success factors and barriers for adequate treatment and registration of malnourished patients in hospitals. Inclusion of hospitals was based on previous scores on the quality indicators, and included three categories of hospitals: hospitals with high scores, hospitals low scores and hospitals that showed improvements over time. We asked dietitians involved in data collection for malnutrition indicators in their hospital to participate. We also asked the dietitian to invite a quality employee or nurse who was involved in data collection for malnutrition indicators in their hospital. . In addition, hospitals were selected based on their location, making sure that the different Dutch regions were represented. All hospitals that were invited to participate, agreed to do so.

Focus groups were held online, due to covid-19 measures, through Microsoft Teams and video recorded with permission of all participants. Participants received a report of their discussion afterwards and were asked to correct misinterpretations. The final reports were read by two researchers. Of each report, text fragments that illustrated success factors and barriers for adequate treatment and registration of malnourished patients in hospitals were selected. Selected fragments of the three reports were combined to identify success factors and barriers for adequate treatment and registration of malnourished patients in hospitals.

Results

Indicator of adequate protein intake

In 2020, there were 81 general hospitals and eight university hospitals in the Netherlands. This number has changed frequently in recent years for example through mergers. In addition, some of the hospitals did not deliver data, because they are highly specialised hospitals, for example for eye surgery. The number of hospitals that reported to the health inspectorate ranged from one to 68 in the period of 2008–2019 (Table 1). Since only one hospital met our inclusion criteria in 2008, we excluded data collected in 2008 from our analyses.

The number of recorded malnourished patients increased over the years (Table 2). The mean relative number of patients with adequate intake of protein on the fourth day in hospital ranges from 44%-53% between 2011 and 2019, with no clear increase over time. In 2019, an adequate protein intake was achieved in almost 29000 (50%) patients who were malnourished on admission.

When looking at the achievements on the quality indicator in different hospitals, the number of participating hospitals before 2013 was too low to draw conclusions. Data from 2013 to 2019 show a decline in the number of hospitals with a 'poor' score (<40% of patients reaches adequate protein intake on the fourth day in hospital) (Table 2). The number of hospitals where adequate protein intakes was reached in 40–60% of the patients increased between 2015 and 2019. The number of hospitals where over 60% of patients reached adequate protein intakes remained more or less stable, except for 2018 when more hospitals, for unknown reasons, reached a 'good' score (Fig. 1).

Success factors and barriers for adequate treatment of malnourished patients in hospitals

Sixteen professionals from ten different hospitals participated in the focus groups; nine dietitians, three quality employees, three team managers (e.g. of dietetic departments), one nurse. Participating hospitals had diverse scores on the quality indicator on treatment of malnutrition: in three hospitals $\leq$ 40%, in 4 hospitals 40–70%, and in 3 hospitals $\geq$ 70% of patients who were screened as malnourished had an adequate protein intake on day four of hospitalization.

Table 1
Hospitals included in analyses, based on continuous data collection and number of patients

Year of data collection	Number of hospitals that indicated to collect continuous data	Number of excluded hospitals with samples of < 250 patients	Number of hospitals included in the analysis
2008	25	24	1
2009	54	49	5
2010	68	60	8
2011	11	1	10
2012	73	71	2
2013	33	6	27
2014	44	10	34
2015	80	17	63
2016	80	14	66
2017	79	14	65
2018	74	8	66
2019	74	6	68

Focus group discussions revealed that several determinants may contribute to successes or barriers for adequate treatment of malnourished patients in hospitals. The electronic patient files can and should be constructed in a way that it facilitates easy registration of data on malnutrition and protein intakes. For example, real-time information facilitates early adjustment to treatment and policies. A reason for differences in achievements between hospitals may be differences in inclusion or exclusion of data from patients from specific departments, like the obstetrics or palliative department. Also, some hospitals excluded information from patients with missing data on protein intake on the fourth day of admission, while other hospitals included all patients, even if data on protein intake on the fourth day of admission were not available. The latter will result in lower scores on the quality indicator. Awareness among health professionals about the importance of treatment of malnutrition and the feeling of being responsible, as well as the way health professionals are instructed to register data on the quality indicator, are all considered important to make registration of treatment of malnutrition a success. This also requires good collaboration between health professionals and sufficient knowledge

Table 2
Results from the quality indicator on protein intake of malnourished patients Dutch hospitals from 2009-2019

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of hospitals	5	8	10	2	27	34	63	66	65	66	68
Number of malnourished patients on the fourth day in hospital (denominator)	2.965	4.497	6.784	2.967	17.677	24.692	49.218	54.365	59.433	59.429	57.693
Number of malnourished patients with adequate protein intake on the fourth day in hospital (numerator)	1.427	1.264	3.209	1.451	8.957	10.734	21.919	24.744	28.570	30.446	28.908
Percentage of patients with adequate protein intake	48.1%	28.1%	47.3%	48.9%	50.7%	43.5%	44.5%	45.5%	48.1%	51.2%	50.1%
Categorisation of hospitals by protein intake percentage											
<40% - poor	3 (60%)	6 (75%)	4 (40%)		6 (22%)	14 (41%)	20 (32%)	28 (42%)	19 (29%)	11 (17%)	11 (16%)
40%–60% – moderate	0	1 (12%)	2(20%)		14 (52%)	17 (50%)	29 (46%)	26 (39%)	32 (49%)	34 (51%)	43 (63%)
>60% - good	2 (40%)	1 (12%)	4 (40%)	2 (100%)	7 (26%)	3 (9%)	14 (22%)	12 (18%)	14 (22%)	21 (32%)	14 (21%)

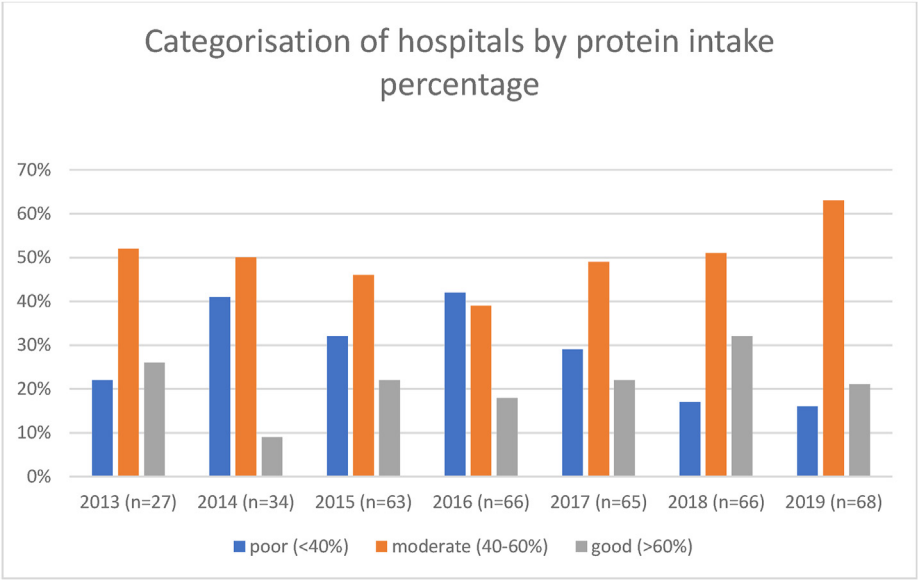

Fig. 1. Percentage of hospitals reaching adequate protein intakes on day 4 of hospital admission (poor: <40% of patients achieves adequate protein intake; moderate: 40–60% of patients achieves adequate protein intake; good: >60% of patients achieves adequate protein intake).

and time of all professionals and patients involved. The way the food system in a hospital is organized may also affect the outcomes of malnutrition treatment. An important barrier for reaching adequate protein intakes in the fourth day of hospitalization, may be the short length of stay in hospitals. The mean length of hospital stay in the Netherlands is 5.2 days [10]. The short time of being able to treat malnutrition, in combination with illness of patients that lead to increased requirements and/or reduced intakes, may be a reason for not reaching adequate intakes in hospitals.

Discussion

This inventory of the protein intake of 339,720 hospital malnourished patients over 11 years shows that meeting protein requirements remains a difficult challenge. In 2019, only in 14 out of 68 hospitals over 60% of their malnourished patients had an adequate protein intake on the fourth day of admission. Moreover, in 11 hospitals, less than 40% of patients had adequate protein intakes. On the other hand, in 2019, almost 29000 patients (50%) had an adequate protein intake on the fourth day of admission. It should be taken into account that reaching adequate food intake in hospital patients usually is a challenge, because of presence of complex diseases that affect food intake. It should also be realized that these conclusions are based on registration of food intake and on registration of data in patient records. Errors in these registrations could not be ruled out and may have affected the results. Moreover, since the performance indicator was limited to protein intake, we do not have results on energy intakes. Protein intake was chosen as a performance, because research showed that if protein requirements are achieved, patients usually also have sufficient energy intakes.

In this study, information on the reasons that requirements were not met, were not available. Previous studies, however, identified nausea, cancer, acute infections, BMI, age, chronic lung disease and tube feeding as predictors for not achieving protein and energy requirements. [11]. [11] In recent years, a lot of hospitals changed their nutrition concept: protein-rich main meals, protein-rich snacks, and more flexibility in supply improved food intake. [12–14]

Over more than 10 years, the DMSG worked on optimal recognition and treatment of malnutrition in Dutch hospitals. Therefore, the results presented here may be somewhat disappointing. However, due to the introduction of a quality indicator by the Dutch Inspectorate of Health, malnutrition became

a recognized health problem. In addition, the quality indicator contributed to implementation of screening and early treatment of malnutrition in all sectors of healthcare. Continuous attention is necessary to keep malnutrition on the agenda. Recommendations to do this are:

- Provide a well-established electronic patient record that supports the process of screening and treatment of malnutrition.
- Monitor the number of patients screened and the number of patients with a sufficient nutritional intake to be able to adjust interventions when necessary. Integrate this into the hospital's quality system.
- Ensure that staff involved is sufficiently trained to carry out their tasks properly. Record everyone's role and required knowledge.
- Share the quality information on screening and treatment of malnutrition with all concerned, including management staff and all disciplines involved in the nursing department.
- Provide a nutritional concept in the hospital that facilitates to meet the nutritional needs of the malnourished patient.
- Involve patients in treatment. Provide good information and encourage self-management.
- Work together in a multidisciplinary manner; discuss the process in order to come to joint improvements.
- Provide training on the importance of good nutrition during illness to all healthcare professionals.
- Share knowledge and expertise between hospitals.
- Appoint a nurse per department as nutrition contact person.

It should also be realized that length of stay in hospital is short. Optimal nutritional care therefore should also include optimal transfer regarding nutritional care on hospital discharge. Early recognition of (the risk of) malnutrition, optimal intensive multidisciplinary treatment and continuous evaluation is necessary to provide optimal nutritional care in the hospital and beyond. Malnutrition is also prevalent at discharge. A recent study showed that 30% patients who were admitted well-nourished, became malnourished during stay and 82% of patients remained malnourished during stay. [15] Optimal nutritional care therefore should also include optimal transfer regarding nutritional care on hospital discharge.

Conclusion

This inventory of the protein intake of 339,720 hospital malnourished patients over 11 years shows that in one out of five Dutch hospitals >60% of malnourished patients had an adequate protein intake on the fourth day of admission. This shows that meeting protein requirements remains a difficult challenge. Early recognition of malnutrition, optimal multidisciplinary treatment and continuous evaluation is necessary to provide optimal nutritional care in the hospital and beyond to support the patients' recovery.

Contribution to authorship

HK, MS and EN designed the research; HK and CD analysed data; all authors wrote the article.

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Conflicts of interest

All authors report no conflict of interests. ICMJE disclosure of interest forms are submitted as supporting information.

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