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Estimating the costs associated with malnutrition in Dutch nursing homes

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SUMMARY

Backgrounds & aims: Malnutrition in western health care involves a tremendous burden of illness. In this study the economic implications of malnutrition in Dutch nursing homes are investigated as part of the Health and Economic Impact of Malnutrition in Europe Study from the European Nutrition for Health Alliance.
Methods: A questionnaire was developed, focussing on the additional time and resources spent to execute all relevant nutritional activities in nursing home patients with at risk of malnutrition or malnourished. Results were extrapolated on national level, based on the prevalence rates gathered within the national Prevalence Measurement of Care Problems 2009.
Results: The normal nutritional costs are 319 million Euro per year. The total additional costs of managing the problem of malnutrition in Dutch nursing homes involve 279 million Euro per year and are related to extra efforts in nutritional screening, monitoring and treatment. The extra costs for managing nursing home residents at risk of malnutrition are 8000 euro per patient and 10000 euro for malnourished patients.
Conclusions: The extra costs related to malnutrition are a considerable burden for the nursing home sector and urge for preventive measures.

1. Introduction

A large number of patients in European healthcare organizations are malnourished.[1–7] Therefore since 2005, the European Nutrition for Health Alliance has raised awareness of malnutrition as a significant public health problem that is extensively under-recognized and under-treated.[1] Malnutrition (meaning undernutrition) is a serious burden, leading to increased mortality, longer hospital stays, more GP visits, more intensive nursing care, increased requirement of nursing home care, decreased quality of life and increased complication rates.[3–8] Both in terms of its impact on individuals' health status and their increased needs for care and social services, malnutrition is a tremendous burden of illness in western societies, leading to costs of billions of euro's every year.[9]

Quantifying this burden is a critical step in improving and completing our understanding of how malnutrition manifests itself amongst people of different age groups and clinical conditions. A small number of studies have assessed the economic implications of malnutrition related to hospital stay, residential care and community care. A UK study found that malnutrition costs £7.3 billion each year, more than double the projected £3.5 billion cost of obesity.[10] The bulk of these costs arises from the treatment of malnourished patients in hospital (£3.8 billion) and in long-term care facilities (£2.6 billion). Other associated costs arise from GP visits (£0.49 billion), outpatient visits (£0.36 billion), and enteral and parenteral nutrition, tube feeding and oral nutritional supplementation in the community (£0.15 billion).[10] The Erasmus MC University Medical Centre Rotterdam assessed the total additional health care costs of disease related malnutrition in the Netherlands roughly at 1.7million euro, using the prevalence of malnutrition as an indicator for calculating costs.[11] This is equal to 2.8% of the total care costs in the Netherlands and 5.8% of the total costs in hospitals, care homes and home care.[12] Despite this, no published studies exist, involving more precise economic implications of malnutrition in Dutch care homes.

In the Netherlands, long-term institutional care can be divided into residential homes and nursing homes. Residential homes ($n = 1000$) mainly offer assisted living (a safe living environment) to older people who are still able to do a considerable part of their

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ADLs themselves. In our study we focus on nursing homes. There are about 345 nursing homes in the country. Disabled persons with chronic somatic (i.e., physical) diseases or with progressive dementia, mainly elderly who are not able to do their ADLs and who need plural, more complex continuing care and monitoring, which are beyond the range of home care services or the service in residential homes, are often admitted to a nursing home. The nursing home sector has more than 60,000 beds. 27,000 beds in somatic wards, primarily for patients with physical diseases (e.g. stroke, other neurologic disorders like Parkinsonism and multiple sclerosis, problems affecting mobility and malignancies) and 36,000 in psychogeriatric wards for patients with dementia. Approximately 60,000 new patients (mean age 80 years) are admitted every year. Most of the somatic patients are admitted from the hospital (65%) or by their family physician (26%); psychogeriatric patients primarily come from their own home (53%), from a residential home (23%), or from a hospital (20%). Nursing homes employ their own multidisciplinary staff and this team consists, next to physicians and nurses, of physiotherapists, occupational therapists, speech therapists, dietitians, psychologists, social workers, pastoral workers, and recreational therapists.[13]

This study aims to determine the economic implications of malnutrition more precisely in nursing homes in the Netherlands, using the 'bottom-up' approach, in which costs of individual treatments, use of resources and the time spent on nutritional screening, monitoring and treatment of malnutrition are taken into account.

2. Materials and methods

In this study the economic costs of malnutrition were calculated for Dutch nursing homes by integrating 4 different approaches. For the calculation of economic costs, data were collected on time spent performing activities such as nutritional screening, diagnostics, monitoring, prevention, treatment, (multidisciplinary) communication and on which disciplines executed the activities (approach 1). To extrapolate these data, further data on at risk of malnutrition or malnourished prevalence (approach 2), salary costs and nutritional support costs (approach 3), were required. Finally to extrapolate the results to the total nursing home population, data on the number of patients that are living in the Dutch nursing homes were obtained (approach 4).

These 4 approaches more precisely included:

1. A questionnaire based on a literature review and open interviews (with ten dieticians specialized in nutritional care for nursing home patients for at least ten years).

   This questionnaire was developed to measure all general time and actions taken and involvement of different disciplines in patients that are at risk of malnutrition or malnourished in nursing homes. To map all costs the questionnaire included questions concerning the whole nutritional cycle: nutritional screening, diagnostics, monitoring, prevention and treatment and (multidisciplinary) communication. Monitoring was defined as systematically examining the nutritional status of the patient by examining weight, nutritional as well as fluid intake, reporting of eating or swallowing disorders, repeating nutritional screening. Communication was defined as multidisciplinary meetings in which the assessment results and treatment plan of patients are discussed and evaluated within a group of different disciplines including a nurse, physician, dietician, physiotherapist, speech therapist, occupational therapist etc. General costs include costs of nutritional screening, weight measurements, monitoring weight and nutritional intake and costs for meals. Extra costs include the extra time (costs) spent on patients at risk of malnutrition or with malnutrition concerning diagnostics, extra monitoring, treatment and communication.

   The questionnaire consisted of 41 questions (mostly using Likert scales). In all parts of the questionnaire the questions focused on the time spent to perform activities and on the disciplines executing the activities. The questionnaire consisted of twelve questions on screening at admission, monitoring, diagnosing and screening after admission. A distinction was made between patients at risk of malnutrition and patients with malnutrition. Per part, five extra questions were asked about screening, diagnostics and monitoring. Next to that, four questions were asked about the investment of time and disciplines in multidisciplinary meetings and finally thirteen questions on nutritional interventions/treatment (diets, oral nutritional support, consultation of dietician, weighing policy, nutritional screening, and time spent with help during mealtime etc.) The questionnaire was disseminated as a web-based questionnaire to another 30 dieticians randomly chosen from nursing homes throughout the Netherlands, which participated in the LPZ.
2. Data of the annual independent National Prevalence Measurement of Care Problems of Maastricht University (LPZ: Landelijke Prevalentiemeting Zorgproblemen www.LPZ-UM.eu) of 2009 were used to obtain prevalence rates of malnutrition and prevalence rates of patients at risk of malnutrition in nursing homes.[14]

   Malnutrition was defined according to one of the three following criteria: 1) BMI $\leq$ 20 kg/m^2, 2) unintentional weight loss ($\geq$6 kg in the last six months or $\geq$ 3 kg in the last month), or 3) no nutritional intake for three days or reduced intake for more than ten days combined with a BMI of 21–23 kg/m^2. Risk of malnutrition was defined according to one of the two following criteria: 1) BMI of 21–23 kg/m^2, 2) no nutritional intake for three days or reduced intake for more than ten days. This operationalization was tested positively for face validity and criterion validity.[15]

   Furthermore data were also derived from LPZ about the patients' mobility, since mobility influences the time to weigh a patient. Patients were divided in two categories of mobility: being bed/chair bound (0) and walking frequently/occasionally (1). For further nutritional interventions insight was achieved in percentages of patients using nutritional support including enriched foods, nutritional supplements and tube feeding.
3. As personnel costs of the disciplines were required for the costs calculations, the Dutch 2009 national collective labour agreement was used. A standard surcharge of 40% was used for overhead and social insurance costs. Data on costs of oral nutritional support, nutritional supplements, tube feeding, energy and protein enriched diets and snacks were obtained using official 2009 price lists of wholesale and different food companies.
4. To extrapolate the results to the total nursing home population, data on the number of patients living in Dutch nursing homes were gathered by using official Dutch government publications of the Statistics Department Netherlands (CBS) and the National Institute for Public Health and the Environment (RIVM).

3. Analysis

Data gathered by these 4 different approaches were combined in one Excel file. Salary costs were calculated per discipline per minute since the information of the time spent to perform activities was registered in minutes. The minutes were extrapolated to years

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to get an overview on how many minutes per year an activity was performed per patient.

Prevalence rates of (risk of) malnutrition were derived from the LPZ 2009 database. Data on the total number of patients that were living in Dutch nursing homes were derived from CBS after which we able to calculate the total amount of nursing home patients in the Netherlands being at risk of malnutrition or malnourished. This figure was multiplied with the minutes per year per patient spent on nutritional activities and further multiplied with the salary costs. For the nutritional treatment interventions information on costs of the nutritional products themselves was also added (approach 3). If necessary, weighted averages were used. For example for the multidisciplinary meetings not every discipline contributes the same amount of time every meeting.

Costs were calculated in general costs (costs for screening, monitoring, weighing patients etc), and specific costs for patients with a risk of malnutrition or with malnutrition (diagnostics, monitoring, nutritional treatment intervention and communication).

Table 2
Extra costs per year for malnourished patients and patients at risk of malnutrition (excluding general nutritional costs).

Costs risk of malnutrition (N = 18240)	
Costs diagnostics	€12,163,964.97
Costs monitoring	€2,797,119.80
Costs treatment	€136,196,062.17
Costs MDO	€1,204,072.08
Total	€151,157,146.94
Costs per client	€8,287.12
Costs malnutrition (N = 12180)	
Costs diagnostics	€10,160,536.66
Costs monitoring	€701,224.90
Costs treatment	€116,997,270.50
Costs MDO	€1,218,768.96
Total	€127,859,032.06
Costs per client	€10,497.46
Total costs	
Total costs of preventing and managing malnutrition	€279,016,179.00

4. Results

Twenty two dieticians, representing 110 nursing home organizations including 9855 patients (who were measured in the LPZ 2009 additionally), answered the questionnaire.

Furthermore, at the time of research a total of 60,000 patients are living in nursing homes in the Netherlands, of which according to the LPZ 30.4% were at risk of malnutrition and 20.3% were malnourished. 70% of the patients were mobile (walk frequently or occasionally) and 30% immobile (bed or chairbound).

In Table 1 the general costs of nutritional screening, weight measurements, monitoring weight and nutritional intake and costs for meals are presented. This table shows that for the nursing home setting the general costs total 319 million Euro per year.

Table 2 shows the extra costs related to extra nutritional care for malnourished patients or for patients at risk of malnutrition in total and per resident.

The table indicates that the total extra costs for managing the problem of malnutrition in Dutch nursing homes is 279 million Euro per year, which is 3% of the total costs annually spent by the Dutch nursing home sector and almost 0.7% of the total Dutch health care budget.

The additional cost per patient for managing those at risk of malnutrition is more than 8000 euro per patient and for those already identified as malnourished 10000 euro.

5. Discussion

Since 2005, the European Nutrition for Health Alliance (ENHA) has raised awareness of malnutrition as a significant public health problem because in daily practice this problem is extensively under-recognized and under-treated.[1] In addition, the ENHA has conducted some studies related to the overall health economic impact of malnutrition in Europe. This study involves the Dutch part of the Health and Economic Impact of Malnutrition in Europe Study and the was the first study determining the economic implications of malnutrition more precisely in nursing homes in the Netherlands, in terms of extra use of resources and time spent on nutritional screening, monitoring and treatment of malnutrition. Concerning the calculated costs, the study indicated that the total extra costs for managing the problem of malnutrition in Dutch nursing homes is 279 million Euro per year, which is comparable to the roughly calculated Dutch economic study of Koopmanschap (2008) that reported a total annual cost figure of 352 million for managing malnutrition in the Dutch nursing home setting.[12] However, the study of Koopmanschap (2008) used only considered the prevalence of malnutrition and the estimated total disease costs, to roughly estimate the costs of malnutrition.[12] Whereas this study uses a much more detailed 'bottom-up' methodology, in which costs of individual treatments, use of resources and the time spent on nutritional screening, monitoring and treatment of malnutrition are taken into account. The present study is also comparable to the costs indicated by Elia et al. (2005) in long-term care facilities, which employed the 'Malnutrition Universal Screening Tool' ('MUST') as the basis of calculating the health care cost of malnutrition and any associated disease.[11]

Moreover this study revealed that the costs of managing patients at risk of malnutrition is approximately 2000 euro less per patient than managing malnourished patients, meaning preventing patients from becoming malnourished might be very cost effective.

Both in terms of its impact on individuals' health and their needs for more health and social care, malnutrition is a tremendous burden of illness for our societies. Quantifying this burden is undoubtedly a critical step in furthering our understanding of how malnutrition manifests itself amongst people of different age groups and clinical conditions, what impact it has on their health and social care needs and what measures and treatments may be effective in preventing and reversing it.

With current policy mainly focussing on obesity (a status of imbalanced and excessive nutritional status) with subsequent advice to decrease our daily intake of fat, sugar and salt—malnutrition (undernutrition) is often forgotten or under-recognized. In fact, malnutrition costs more than obesity and as this study demonstrates is a far more significant problem among the care home population.[11] Calculating costs of malnutrition aims to

Table 1
General costs for regular nutritional care in nursing homes.

	Total costs	Per patient
Total costs for nutritional screening per year (mean N of screening per year 3×)	€281,808.97	€4.70
Total costs for weight measurements per year (mean N of measurements per year 6.5×)	€1,151,617	€19[a]
Total Costs monitoring weight and nutritional intake per year	€11,774,134.88	€196.24
Total cost for meals per year (3×pd)	€306,588,000.00	€5,109.80
Total costs	€319,795,561.22	€5,329.93

[a] For mobile patients costs are 14.58 euro and for immobile patients 29.96 euro.

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create awareness of this problem to policy makers who are often more sensitive to costs and it is hoped will therefore effect the undertaking of structural actions to prevent malnutrition sooner. For example, the Dutch LPZ study raised awareness as well and triggered the initiation of two national government sponsored improvement programs on malnutrition, one for hospitals and one for nursing homes and residential homes. These programs and the annual prevalence measurement (LPZ) have had a positive impact on decreasing the prevalence rate of malnutrition during the last 5 years.[16] Moreover, the landmark cost study conducted in the UK by BAPEN in 2005 (Elia et al., 2005) led to governmental awareness and subsequently resulted in the production of guidelines on nutritional care by the National Institute for Health and Clinical Excellence in England.[17]

Despite the insight in the general costs and extra costs of managing malnutrition in nursing home patients, there are a few possible drawbacks of the present study that need to be considered. The study is based on answers of 30 dieticians and not on opinions of other disciplines which could bias our results. To address this possible bias we used mean results of these opinions, so outliers in time would be excluded. Furthermore these dieticians represented a large amount of nursing homes (the dieticians worked in110 nursing homes).

As mentioned before, there are about 345 nursing homes in the Netherlands. In most cases a group of nursing homes is part of a larger Elderly Care Organization. In our study 30 dieticians participated representing about 110 nursing homes. There are about 100 dieticians working in the total nursing home sector.

Most European nursing homes have immobility rates higher than 70%, which seems opposite to our results. In our study however, mobility was defined by being not bed bound/chair bound but walking frequently/occasionally. Indeed, most nursing home patients in the Netherlands have mobility problems as well but they are mobilized by the staff, meaning that most patients are out of their beds during day time. This might explain the difference in mobility rates.

We used figures of the LPZ study and extrapolated these data (30.4% are at risk of malnutrition and 20.3% are malnourished) but did not include other prevalence studies/rates. However, the LPZ figures represent an overall stable picture during the LPZ measurements from 2004 to 2009 and also fit in published European prevalence rates.[4,7,15]

Our study design moreover limits the estimation of resources, since it does not follow resource use throughout the entire patient journey. To establish the true impact of malnutrition, one must identify individuals who are malnourished through nutritional screening and then determine their utilization of resources (use of health care, social care etc.) over a given period of time, either prospectively (through patient diaries) or retrospectively (through medical records) until their nutritional problem has been solved.

Finally, this study only focuses on one single country, making results difficult to extrapolate to a European level. A broader view of how malnutrition is treated in a number of different countries may be of interest in guiding European policies and helping to understand the heterogeneity underlying how malnutrition arises and is treated in different national contexts.

Since this study is part of the larger Health and Economic Impact of Malnutrition in Europe study of the European Nutrition for Health Alliance, our study results and the results of other country studies will provide a more complete and comprehensive insight into the burden of illness posed by malnutrition in Europe.

Recommendations for further research could focus on using an integrated complete economic analysis as the journey of the malnourished patient inevitably crosses a number of healthcare settings, e.g. community care, hospital, primary care and nursing care.

An integrated economic analysis is essential for future research so that the cost impact of malnutrition is clearly understood across health care, social care and housing budgets.

Conflict of interest statement & statement of authorship sections

J. M., R. H, L.W. and J. S. contributed to the design of the study. J. M., R.H. and J.S. helped in data collection. Data analysis was done by J. M., R.H. and J.S. The manuscript was written by J. M., R. H, L.W. and J. S. all provided significant advice or consultation. The final manuscript was approved by all authors. Furthermore we would like to state that there here was no conflict of interest and no further involvement.

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