Nutritional Screening and Treatment of Malnutrition at a Haematological Ward

An economical perspective

A thesis submitted for the degree

Master of Clinical Nutrition

Marte Almenning Trollebø

Institute of Medicine, Faculty of Medicine and Dentistry
University of Bergen
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Abstract

Background: When a patient is admitted to the hospital he or she should be screened for malnutrition within the first 24 hours. If the patient is identified as being at risk, appropriate treatment should be given, and then the patient receives the appropriate ICD-10 code for malnutrition at discharge. This tells us that malnutrition has been treated, and should ensure that the ward receives reimbursement for the treatment given. The Norwegian health authorities gave the recommendations for prevention and treatment of hospital malnutrition in 2009, but are these guidelines being followed in clinical practice?

Malnutrition is present in 19% - 60% of hospitalized patients, depending on the population under study and the screening tools used. Malnutrition is known to increase morbidity and length of stay (LOS), and therefore result in increased health care and hospital costs.

It is estimated that it is possible to save an annual amount of 800 million Norwegian kroner, by identifying and treating malnutrition in Norwegian hospitals.

Aims: The aim of this study was to evaluate the screening routines and nutritional treatment given at a haematology ward in a Norwegian university hospital, to evaluate if better routines can have an economic impact based on identification and coding for malnutrition, length of stay, and nutritional treatment.

Methods: The thesis had a retrospective part where the above mentioned outcomes were studied, and a prospective part to evaluate the impacts of an intervention consisting of an instructive course. The routines for nutritional screening and treatment were evaluated by collecting data from the electronic medical record. The intervention was aimed towards the nurses. They received guidance and lectures on screening and nutritional treatment.

Results: Medical records of 302 patients were retrospectively evaluated during two periods. 137 patients in the first period, and 165 patients in the second. In the first period no patients were screened for malnutrition, while 15 (9%) were screened in the second period ($p < 0.001$). There was not a significant difference in routines for coding malnutrition (8 in the first, 12 in second. P-value = 0, 651), and hence no difference in potential reimbursement. A significant decrease in LOS was observed, from a median of 5 to 4 days ($p = 0,015$), which was estimated to give a potential reduction of costs equivalent to NOK 7 289 350.00 annually. There was no significant difference in patients receiving nutritional treatment, individual nutritional plan or referral to clinical dietician. At the same time there was no significant difference in the kind of nutritional treatment given (parenteral nutrition, enteral nutrition, and oral nutritional supplements).

Conclusions: An intervention consisting of an instructive course, with relevant lectures and training nurses in screening, resulted in a significant increase of screened patients. The intervention had no impact on routines for the coding of malnutrition, and the diagnosis related group (DRG) reimbursement for malnutrition. LOS was reduced, and this could potentially result in reduced costs. Our study indicates that the routines for nutritional screening are deficient, and that there is still room for improvement of nutritional routines at the haematology ward.

List of abbreviations

AML:	Acute Myeloid Leukemia
A.S.P.E.N.	American Society of Parenteral and Enteral Nutrition
CLL:	Chronic Lymphocytic Leukemia
CML:	Chronic Myelogenous Leukemia
DRG:	Diagnosis Related Groups
DVT:	Deep Vein Thrombosis
ESPEN:	European Society of Parenteral and Enteral Nutrition
HCT:	Haematopoietic Cell Transplantation
HSCT:	Haematopioetic Stem-Cell Transplantation
LOS:	Length Of Stay
MDS:	Myelodysplastic Syndrome
MM:	Multiple Myeloma
MPN:	Myeloproliferative Neoplasms
NPC:	Norwegian Patient Classification
NRS:	Nutritional Risk Screening
PBF:	Performance Based Financing
WHO:	World Health Organization

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1. Introduction

1.1 Haematological malignancies

Haematological malignancies are a group of different conditions, which originate from the cells of the bone marrow and the lymphatic system. These malignancies can be divided into myeloid or lymphoid processes, according to the cell-line involved. They can in addition be classified as being acute or chronic depending upon the maturation phase of the cell in which the malignant transformation occurs (1, 2). The myeloid malignancies usually originate from the bone marrow progenitors that are restricted to developing into erythrocytes, granulocytes (neutrophils, basophils, and eosinophils), monocytes and megakaryocytes. The exception is chronic myeloid leukaemia (CML), where the cell of origin is a pluripotent haematopoietic stem cell capable of giving rise to lymphoid cells as well (3). This could be exemplified by the arise of acute lymphoblastic leukaemia (ALL) with Philadelphia chromosome, the same chromosomal change seen in CML. These malignancies include three broad clinicopathologic categories: acute myeloid leukaemia (AML), myelodysplastic syndrome (MDS), and myeloproliferative neoplasms (MPN). There is also a overlap category MDS/MPN, for patients who present with features of both MDS and MPN (3, 4). Lymphoid malignancies are derived from cells that normally develop into T lymphocytes (cytotoxic T lymphocytes, helper T lymphocytes, or regulatory T lymphocytes) or B lymphocytes (lymphocytes or plasma cells). The lymphoid malignancies are divided according to the maturity of the lymphoid precursors, and they are further grouped depending upon whether they are of B or T cell derivation (3). Worldwide, more than 250 000 people are diagnosed with leukaemia each year. All age groups can be affected, but most cases occur in older adults; more than half after 65 years of age. The incidence rates for all types of leukaemia are slightly higher among males than among females (1). In Norway leukaemia is one of the 10 most common types of cancer in the period 2010 – 2014. Leukaemia accounts for 4 % of the male cancer incidence, and 3 % for women (5).

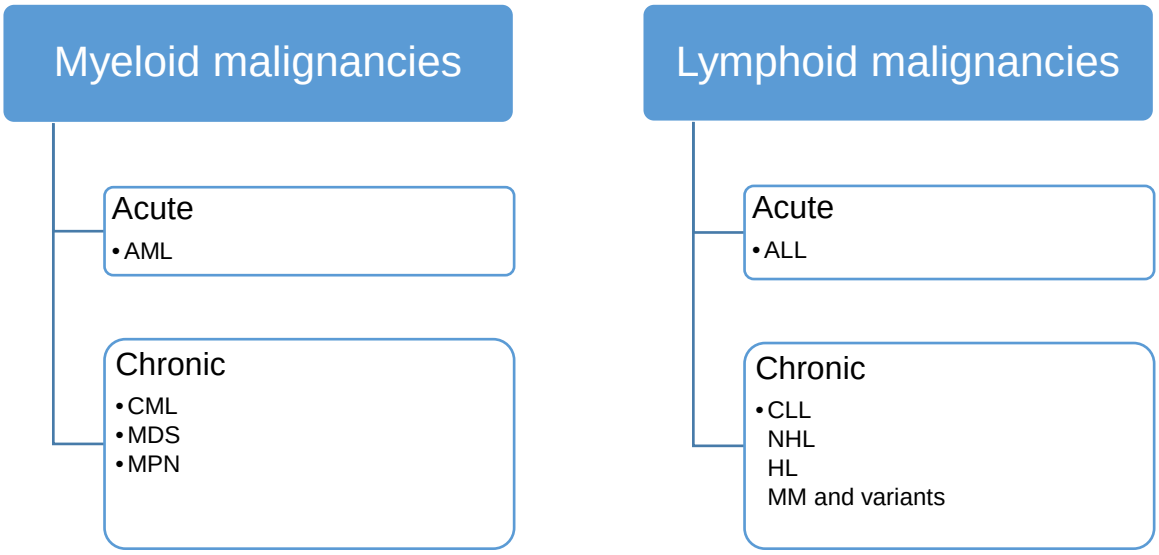

Figure 1. Classification of haematological malignancies

AML = acute myeloid leukemia; CML = chronic myeloid leikeamia; MDS = myelodysplastic syndrome; MPN = myeloproliferative neoplasms; ALL = acute lymphoblastic leukaemia; CLL = chronic lymphocytic leukaemia; NHL = non-Hodgkin lymphoma; HL = Hodgkin lymphoma; MM = multiple myeloma.

1.2 Treatment of haematological malignancies

The approach of treatment depends on the type and severity of the disease. It ranges from observation of asymptomatic patients, supportive care with blood transfusion and venesectio, to corticosteroids, radiotherapy, combination chemotherapy and hematopoietic cell transplantation (HCT) (2). Acute leukaemia requires immediate treatment to induce remission. This first phase of therapy includes high dose intensive combination chemotherapy to reduce or eradicate leukemic cells from the bone marrow and re-establish normal haematopoiesis (2). HCT is recommended for selected adult patients, to prevent relapse of the disease (2, 6). HCT is a wide description of treatments where hematopoietic cells are intravenously infused with the intention to establish marrow and immune function, mainly in patients with haematological malignancies (2, 7). These treatments are used in the hope of curing or substantially prolonging remission, but they also have severe side effects (2). In autologous HCT the patient´s own stem cells are harvested and used to repopulate the bone marrow after high-dose chemotherapy (2, 8). While allogenic hematopoietic stem cell

transplantation (HSCT) uses HCT from a human leucocyte antigen (HLA) matching sibling donor or volunteer unrelated donor (2, 6). The treatments are initiated with a conditioning therapy (chemotherapy ± radiotherapy) before the transplantation to help eradicate the malignant disease and to cause immunosuppression. This also reduces the risk of marrow rejection in the case of allogenic HSCT. The stem cells are then infused to prevent bone marrow failure (2). The transplanted immune system in allogenic HSCT have a strong anti-leukemic effect, the so-called graft versus leukaemia effect exerted by donor T cells, and this is the major way it eliminates the malignant disease. However, the alloreactive T cells can also harm healthy tissues, a complication known as graft-versus-host-disease (GVHD), which might predispose patients to treatment-related mortality (2, 6, 9). A known side effect due to this intensive treatment is an increased risk for malnutrition (10, 11).

1.3 Nutritional aspects

1.3.1 Malnutrition

Malnutrition can be a result of starvation, disease or aging. It has been defined as "a state resulting from a lack of uptake or intake of nutrition leading to altered body composition (decreased fat free mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease" (12). Although the term can be said to refer both to over- and under-nourished individuals, it is often used synonymously with undernutrition, and this is also the case in this thesis (12). Malnutrition is associated with reduced quality of life, a lower activity level, increased treatment-related adverse reactions in cancer patients, and reduced tumor response to treatment, in addition to reduced survival. However, there has still not been established a cause-effect relationship (13).

1.3.2 Prevalence

Malnutrition is present in 19% - 60% of hospitalized patients, depending on the population under study and the screening tools used (14-16). Not only is malnutrition prevalent in hospitals, but it is also a common feature in the community and in care homes. A study with 401 oncology patients in Spanish hospitals showed that 33.9% patients were at nutritional risk according to Nutritional Risk Screening (NRS 2002) at admission, and 36.4% in risk at

discharge. The haematology department had one of the highest prevalence of patients in nutritional risk (46.2%). In patients with haematological neoplasms the prevalence of nutritional risk at admission was 36.8%, and 51.6% at discharge (17). At Haukeland University Hospital in Norway, the overall prevalence of nutritional risk was 29%. Looking further prevalence in hospital departments and units, the highest prevalence were in intensive care (74%), oncology (49%) and pulmonology (43%) (18).

1.3.3. Associated Causes

Hospital malnutrition is multifactorial, and associated with type and severity of disease, high age and poor food intake (15). A greater risk of nutritional decline in medical patients may also be associated with a low BMI at admission, simultaneous illnesses and infection, reduced food intake and a perceived low food quality and presence of illness affecting food intake (19). Norwegian studies based on point prevalence surveys found that nutritional risk also is present in younger patients and overweight patients (18). In a group of oncology patients with lung cancer, concurrent radiotherapy and chemotherapy, advanced-stage tumours and tumour size were independently associated with weight loss ≥5% (20). HSCT is associated with severe gastro toxicity and symptoms which may compromise food intake. Treatment with high dose chemotherapy can cause severe vomiting and lead to mucositis the gastrointestinal tract. Taste and smell perception is altered, and use of narcotic analgesics can lead to intestinal dysmotility. Diarrhoea caused by loss of functioning intestinal epithelium, leads to malabsorption (21, 22). All these factors can contribute to a reduced food intake as well as reduced uptake of nutrients, resulting in risk of malnutrition. The two types of HSCT treatments can affect nutritional status to different extents. Both receive high-dose chemotherapy, but patients receiving autologous transplantation have a reduced time to engraftment, duration of neutropenia, and as a result, a reduced duration of neutropenic mucositis. Unless severe complications occur, sufficient oral food intake can be frequent in these patients (23). The total-body irradiation to induce immunodepression in patients receiving allogenic transplantation, induce a more severe and prolonged mucositis. In addition, the patient could not respond to immunosupptrssive therapy, and develop acute GVHD, resulting in severe diarrhoea and abdominal pain. These, among other factors, can futher contribute to the development of malnutrition (23).

1.3.4 Dealing with hospital malnutrition

With a high prevalence of malnutrition in hospitals, and several associated causes there is need for a way of identifying the patients in risk of malnutrition in order to give nutritional treatment to the right patients. Screening tools have been developed for use in different settings (24, 25). These are designed to be rapid and easy to use by busy nurses and other medical staff in a community setting or in hospitals. They usually involve an assessment of weight and height, food and fluid intake, and duration of health status (26). Routine screening of patients to identify risk of malnutrition has been recommended by many national, international and specialist organisations (26-28). The European Society for Parenteral and Enteral Nutrition (ESPEN) recommends the use of the NRS-2002 for hospitalised patients (26). When being identified as being in risk, the next step is to give nutritional treatment. It is recommended that an estimate of energy and protein requirements, as well as a prescription of food, oral supplements, tube feeding, parenteral nutrition or a combination of these, should be documented in a nutritional care plan (26).

1.3.4 Enteral and parenteral nutritional therapy

One way of increasing energy intake in malnourished patients with a reduced energy intake, is to give enteral nutrition (EN) by means of oral nutritional supplements (ONS) and tube feeding (TF) (13). In a hospital setting TF is often referred to as EN, and this is also the case here. It is recommended that ONS or EN should be started if malnutrition already exists or if the food intake is markedly reduced for more than 7-10 days (13). EN is usually preferred to parenteral nutrition (PN), as EN has fewer complications, has better outcomes and is also the cheaper alternative (29, 30). The ESPEN (European Sosciety of Parenteral and Enteral Nutrition) guidelines concluded however that routine use of EN was not recommended for patients undergoing HCT. Further they comment that parenteral nutrition (PN) may be preferred to EN in situations where there might be a risk of complications with enteral tube placement, like increased risk of haemorrhage an infections in immuno-compromised and thrombocytopenic patients (13). These statements are both grade C recommendations, meaning that the evidence is based on expert opinions and/or clinical experience of respected authorities, including the view of the working group (31). However, the A.S.P.E.N. (American Sosciety of Parenteral and Enteral Nutrition) guidelines report that EN is safe as a transition step from PN to oral diet, to patients undergoing HCT, when neutrophil and platelet counts have returned and gastrointestinal tissues have healed. When PN is used, it should be

discontinued after stem cell engraftment when it is possible to achieve an adequate intake by EN or orally (32).

1.4 Haukeland University hospital

1.4.1 Haematology ward

The haematology ward at the university hospital treats and examines inpatients with haematological diseases, in addition to some general medicine. The most common diseases are acute leukaemias, multiple myeloma (MM), myelodysplastic syndrome (MDS), deep venous thrombosis (DVT) and pulmonary embolism, aplastic anaemia, Waldenström's macroglobulinemia, hairy cell leukaemia and other rarer haematological diseases. Other patients are admitted if there is extra capacity. The ward has 16 beds; two 4-bed rooms, one-day treatment room, and seven single rooms. Three of the single rooms are overpressure isolates with HEPA filters. The staff consists of nurses, oncology nurses, nursing assistants, postal secretary and eight haematologists, two of which are professors and doctors in training. They also have a physiotherapist present at the ward on a daily basis, and they have the opportunity to have a social worker and a pharmacist present when needed anomg others, as well as clinical dieticians. The ward performs autologous stem cell transplantation, and serves as a regional/national institution for allogenic stem cell transplantation (33).

1.4.2 The Haukeland University Hospital's nutritional strategy

In 2006 Haukeland University Hospital introduced a nutritional strategy, with guidelines to improve routines for prevention and treatment of disease related malnutrition. This strategy was focused towards adult, inpatients in somatic medicine. The vision was described as: "Optimal nutrition for all patients, "and initiatives were described as follows:

1) Improve food availability
2) Improve knowledge
3) Improve nutritional treatment
4) Document the effect of the initiatives

Guidelines implemented in 2007 gave clear recommendations that all patients admitted at the hospital should be screened for malnutrition with the validated screening tool Nutritional Risk Screening (NRS) 2002 (26). The patients in nutritional risk shall receive an appropriate nutritional treatment based on an evaluation and a collaboration between physicians, nurses, and clinical dieticians (34). Other measures described in the nutritional strategy were interactive tools like website, electronic learning course in clinical nutrition and dedicated forms for screening and nutritional plan in the electronic patient journal system (appendix 1. and 2.). Another important part was to increase flexibility of food services by opening dining areas for patients near the wards, with a buffet and kitchen personnel who could customize and improve the serving. Clearly defining responsibilities in planning and managing nutritional care is recognized as important for proper nutritional care in hospitals (28). The nutritional strategy defines that nurses are responsible for screening the patients, and the physicians are responsible for starting nutritional treatment and document the appropriate ICD-10 code for malnutrition. Both nurses and physicians can contact clinical dieticians if patients require additional nutritional assessment and expertise (34).

1.4.3 Point prevalence surveys

To evaluate the effect of the implemented nutritional strategy, point prevalence surveys are conducted 3-4 times a year. All eligible patients are screened for malnutrition according to NRS 2002, and this information as well as information about nutritional treatment is registered in a separate registration programme by each of the participating departments. These point prevalence surveys identify malnutrition as a risk factor with disease in the whole hospital population as well as each of the hospitals departments. The final results are available for all employees at Haukeland University Hospital on their intranet. These results are to be considered as raw data, as they have not been further evaluated and processed. A PhD thesis has been conducted based on data from the point prevalence surveys from 2008 to 2009. These data showed that 34% of the hospitalized patients were at nutritional risk. Further it was estimated that 70% of the eligible patients (adult patients) were screened, 53% of the at risk patients received nutritional treatment and only 5% were seen by a dietician (35). The last survey in 2015 was performed November 19th.

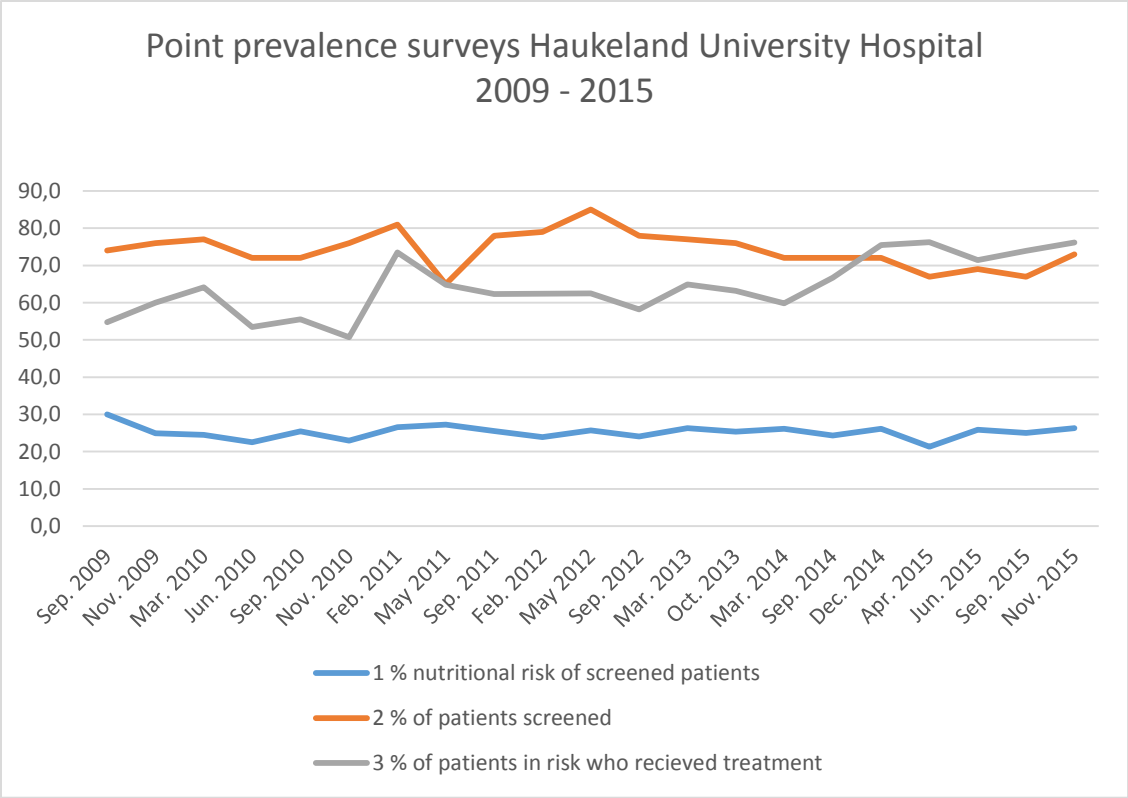

Figure 2. Overview of point prevalence surveys conducted at Haukeland university hospital from 2009 to 2015.

1. % nutritional risk is defined as the number of patients with a score ≤ 3 according to NRS 2002, of the number of patients screened.

2. % screened is defined as number of patients screened of the total number of patients admitted at the departments.

3. % of patients in risk who received treatment is defined as the number of patients receiving nutritional treatment of the patients in risk.

The point prevalence surveys showed that on average 74% of the patients were screened. Average nutritional risk of the screened patients from 2009-2015 was estimated to be 25%, and of the patients in risk of malnutrition 64% received treatment.

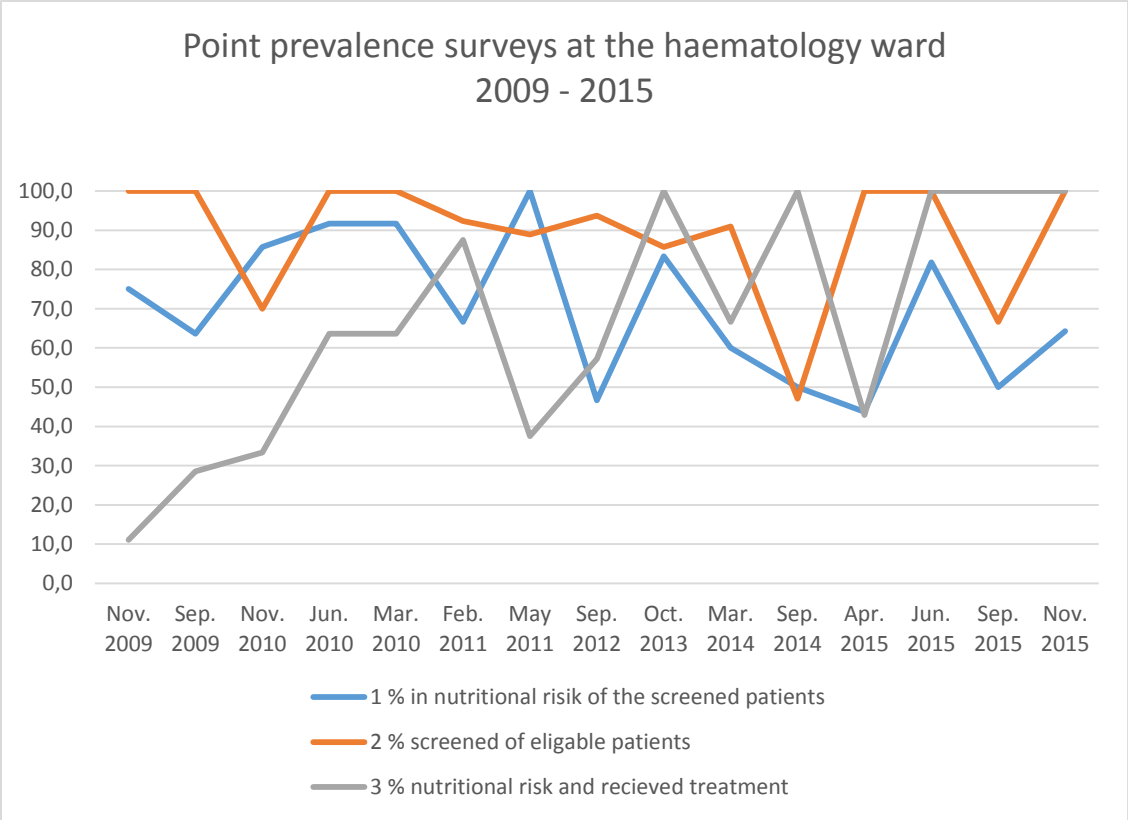

Figure 3. Overview of point prevalence surveys at the haematology ward from 2009 to 2015.

1. % nutritional risk is defined as the number of patients with a score ≤ 3 according to NRS 2002, of the number of patients screened.

2. % screened is defined as number of patients screened of the total number of patients admitted at the departments.

3. % of patients in risk who received treatment is defined as the number of patients receiving nutritional treatment of the patients in risk.

Based on the point prevalence surveys, 89 % of the eligible patients at the ward were screened. Average risk of malnutrition in the screened patients from 2009 to 2015 was 70%, and of the patient identified as being in risk of malnutrition, 66% received nutritional treatment.

1.5 Economical aspects

To derive the greatest benefits from the available recourses in the health services it is necessary to perform some form of economical evaluation. The economical evaluation assesses the efficiency and use of recourses that may improve health care and health outcomes. We want to estimate the relationship between costs related to a given measure and the effects of these measures (36). There are different ways of evaluating this. A cost analysis compares net costs of different strategies with the same outcome on a patient or population level. A cost-benefit analysis compares the costs of implementing strategies with different units of outcome and says something about net health benefit or net monetary benefit at patient or population level. Cost-utility analysis compares implementation strategies that have morbidity and mortality outcomes and gives the cost per quality adjusted life year. A cost-effectiveness analysis compares implementation strategies that produces a common outcome measured in a cost-effectiveness ratio (36).

1.5.1 Economic costs of hospital malnutrition

Malnutrition among hospitalized patients has been known to increase morbidity and mortality, hospitalization rates and LOS, and result in increased hospitalization costs (37-39). A review from 2015 found that economic costs of hospital malnutrition in Europe lead to an increased LOS ranging from 2.4 to 7.2 days, and that malnutrition led to an additional individual cost ranging between 1640 EUR to 5829 EUR (NOK 15 336 – NOK 54 510) (kurs 9,3514 12.01.16)). At a national level, the costs ranged between 32.8 million EUR and 1.2 billion EUR (NOK 3.06 milliard and NOK 11.2 milliard). Looking at percentages of national health expenditures, the value ranged between 2.1% and 10% (40). A Norwegian estimate from 2010 calculated that is would be possible to save NOK 800 million per year, by preventing and treating malnutrition in Norwegian hospitals. This would represent about 1% of the costs in specialized health care (41).

1.5.2 Norwegian hospital financing

Norwegian hospitals are divided into four health regions with regional hospitals responsible for ensuring the population specialized health care. The state owns and finances the regional hospitals (42).

Performance-based financing (PBF) was introduced for somatic specialized health care services 1. July in 1997. The financing of the regional hospitals is divided into a basic allocation and an activity based funding. The size of the basic allocation is determined partly by the population of the region and their age, and is independent of the hospitals activity. PBF, however, depends on the number of patients receiving treatment and the kind of patient and treatment. The basis for calculating the PBF refund is the Diagnosis Related Group (DRG) system (43).

DRG is a patient classification system where hospitalization or outpatient consultations in somatic institutions are classified into groups that are medically meaningful and whose resources are virtually homogenous. Based on medical and administrative information about the patient, each hospital stay is placed in one DRG. DRG provide a clear description of a hospitals activity and the composition of its patients. It carries both medical and financial information, and makes it possible to compare different hospitals with different patients. All treated patients are classified into 860 different groups, and each DRG is then placed in one of 26 main diagnostic groups. DRG operates at a population level, and that is why there can be quite a broad range of resourced used and activity within the same DRG. For individual patients or subgroups, it is common that resource usage is different from the average. DRG includes all of the hospital costs, including medical service, management and more. The Norwegian version of the DRG system is based on the Nordic system NordDRG. A software called Norwegian Patient Classification (NPC) is used to conduct the DRG grouping and score the activity data from the hospitals, according to PBF rules.

It is hospital stays and not ward stays which is the basis for the reimbursement, although it is the ward stays that are reported in NPC. After the ward stays are DRG grouped, there is a further aggregation of ward admissions to hospital stays. If a patient has been transferred to other departments within the same hospital stay, all the ward stays will be merged into one hospital stay (43).

1.6 Practical uses of coding and reimbursement

The international classification of diagnoses in specialiced health care, ICD-10 has three codes for malnutrition; E.43, E.44, and E.46. The norwegian health authorities have suggested new criteria for the use of this coding (27):

E.43: Severe malnutrition.

A patient is defined as severely malnourished if he or she meet at least one of the following criteria:

- 15% unintentional weight loss during the last 3 – 6 months, or more than 5% weight loss the last month
- BMI <16 kg/m^2 (> 70 years: BMI <18.5 kg/m^2)
- BMI <18.5 kg/m^2 (> 70 years: BMI <20 kg/m^2) and a simoultaneous unintentional weight loss > 5% during the last 3 months
- Food intake < a quarter of calculated nutritional needs during the last week

E.44: Moderate malnutrition.

A patient is defined as moderately malnourished if he or she meet at least one of the following criteria:

- Unintentional weight loss > 10% during the last 3 – 6 months or > 5% during the last 2 months
- BMI <18.5 kg/m^2 (> 70 years: BMI < 20 kg/m^2)
- BMI <20 kg/m^2 (> 70 years: BMI < 22 kg/m^2) and a simultaneous weight loss > 5% during the last 6 months
- Food intake < half of the calculated nutritional needs during the last week

E.46: Nutritional risk

A patient is defined as being in nutritional risk if he or she scores the following:

- NRS2002: score 3 or more
- MUST: score >1
- MNA: score < 11
- SGA: grade B x

As described earlier the reimbursement is based on the patients diagnoses and LOS, and this results in different amounts of reimbursement. Further different main diagnoses give different reimbursement for additional diagnoses (bidiagnoser). For some main diagnoses this additional reimbursement is minimal, while for others it is substantial. These examples, illustrates this, using the code given if the patient is in nutritional risk E.46:

J15.9 Unspecified bacterial pneumonia → DRG reimbursement = NOK 9 840 ,-
J15.9 + E.46 → DRG reimbursement = NOK 20 686 ,-

C90.0 Multiple Myeloma → DRG reimbursement = NOK 23 053 ,-
C90.0 + E.46 → DRG reimbursement = NOK 40 218 ,-

C92.0 AML → DRG reimbursement = NOK 73 699 ,-
C92.0 + E.46 → DRG reimbursement = NOK 73 699 ,-

1.7 Aims of the study

The overall purpose of this master thesis was to investigate nutritional practice at the haematology ward at Haukeland University Hospital, and these factors economic impact.
The specific aims were:
To evaluate if an instructive course on screening and treatment of malnutrition among the nurses would improve routines for screening of patients.
To evaluate if an instructive course on screening and treatment of malnutrition among nurses would improve physicians' routines for coding for malnutrition, and if coding would result in an increased DRG reimbursement.
To evaluate if an instructive course on screening and treatment of malnutrition among nurses would reduce length of hospital stay as a result of better nutritional treatment, and to further investigate if this would have any economic impact.

2. Methods

2.1 Population

Inclusion criteria were all inpatients at the haematological ward at Haukeland University Hospital, that spent 24 hours or more at the ward. Two equal time periods a year apart were selected, November 2014 to January 2015, and November 2015 to January 2016.
If patients had more than one admission during the two periods, the longest stay was chosen, to better reflect the wards clinical practise. If two or more stays were of the same length, the first stay was chosen. Exclusion criteria were day-care patients, patients included in other nutrition studies, pregnant women and patients admitted as either terminal or comatose. In addition, patients without a medication curve from the ward and patients without a discharge summary were excluded. The patients who did not have a discharge summary were patients admitted for suspected DVT. The lists of inpatients at 5N included 449 patients in total. In the first period 165 patients were admitted, and 284 patients in the second period. Of the total number of inpatients, 147 (33%) patients did not meet the inclusion criteria, and in the final analysis 137 patients were included in the first period and 165 patients in the second period.

2.2 Study design

This study is based on retrospectively and prospectively collected patient information from the patient administrative electronic database. A three-month period (Nov. 2014 – Jan. 2015) was used as reference, and a second three-month period (Nov. 2015 – Jan. 2016) was included to evaluate the impact of an intervention. Two students in clinical nutrition were given access to reading and collecting all the data. The information was mainly collected from the electronic patient record system DIPS (DIPS ASA, Bodø, Norway), and additional information about height and weight was collected from Cytodose (CSAM Health AS, Oslo, Norway), an electronic system for managing cytostatic treatment. In the first period, medical curves containing information about medications, ONS, EN and PN (referred to as TPN in the curves) were handwritten paper curves scanned into DIPS. In the second period a new electronic system for registering the same information had been introduced; MEONA (MEONA GmbH, Freiburg, Germany).

2.3 Variables

The primary outcomes in this study were change in clinical practice, and the economic benefits of this change. This was measured as the proportion of patients screened, proportion of patients receiving a diagnose for malnutrition (E46, E44 or E43), proportion of patients receiving nutritional treatment, the use of EN, PN and ONS, and the patients´ LOS. In addition, we collected information about the patients' demographics, diagnosis, treatment received, weight and height, and comorbidities. Table 1 presents the variables and their defined criteria:

Table 1. Overview of variables and the defined criteria for collected information from the medical records.

Variable	Criteria
Height	Height documented in DIPS; in patient records, discharge notes or medical curves.
Weight	Weight documented in DIPS; in patient records, discharge notes or medical curves.
Diagnose	ICD-10 diagnoses collected from the patients discharge notes.
Length of stay	Days at the ward recorded from first day to the day of discharge.
Cytostatic treatment	Recorded as a dichotomous variable; yes or no.
GVHD	Only relevant for the patients receiving allogenic HCT.
Mucositis	Registered if documentation of infection/fungi in the mouth, or stating mucositis in the patient records.
Diarrhoea Obstipation Nausea/vomiting Fasting	If the patient had at least one occurrence during the hospital stay.
Infection	Infections that could potentially influence nutritional status were registered.
Supplements	ONS, enrichment of food, and vitamin and mineral supplements. Potassium and sodium not included.
Nutritional treatment	ONS, EN, PN or TNP, registered at least once during the hospital stay. Vitamin and mineral supplements not included here.
Referral to clinical dietician	If referred at the haematology ward, but also if receiving follow up during stay at the haematology ward.
Nutritional plan	Document describing nutritional treatment planned during the patients hospital stay.
Coding of treatment	Recieved a code for malnutrition; E43, E44 or E46.

ONS = Oral Nutritional Supplements, EN = Enteral Nutrition, PN = Parenteral Nutrition, TPN = Total Parenteral Nutrition.

2.4 Intervention

The intervention was aimed towards the nurses, to improve routines for detecting patients in nutritional risk and routines for nutritional treatment. A total of 14, lectures were given to the nurses and nursing assistants. The nurses were given the opportunity to influence which subjects would be addressed, and the following topics were chosen:

Table 2. Overview of the lectures and topics discussed.

Sep. 2015	Nutritional screening What the ward cafeterias can offer x 2 Implementation of nutritional screening at an oncological ward
Oct. 2015	Consequenses of malnutrition, nutritional screening and nutrition treatment
Dec. 2015	Energy- and protein enrichment x 2 Nutritional supplements x 2 Enteral nutrition an parenteral nutrition x 2 The nurses role in nutritional treatment x 2

Some of the lectures were given twice to make sure all the nurses had the chance to attend at least one of them. The lecture in October was a 45-minute lecture given by a clinical dietician. The lecture on implementation of nutritional screening at an oncology ward was given by a nurse from Oncology post 1 at Haukeland University Hospital. The other lectures were 10-minute lectures given by two students in clinical nutrition.

The lectures were given at the beginning of the work day. Two nurses at the ward was assigned as nutritional contacts, and by this given responsibility for staying up to date on current routines and procedures in the hospitals guidelines for nutritional treatment. The nutritional contacts were given guidance in the screening for malnutrition (NRS2002), and if needed they had the opportunity to receive more guidance on the subject. All of the nurses were also given the opportunity to receive individual guidance in how to use the screening tool correctly, but this was not used. The ward attended the World Nutrition Day survey 19.11.2015, where data on nutritional care, patients' illnesses, food intake history, appetite and weight change was collected. These data were not registered in the patient administrative electronic database, and the nurses and nurse assistants did not collect the information. In November 2015 (in the second period) the ward attended a point prevalence survey, but these results were not registered in the medical records.

2.5 Use of oral nutritional supplements, enteral nutrition and parenteral nutrition

To perform an evaluation of costs related to use of ONS, EN and PN, information about ordered amounts of these products were collected from the hospital kitchen and the hospital pharmacy. Ordered amounts and costs of ONS were added to a total amount per period, and further divided by number of patients admitted in the respective periods. The amounts and costs were also divided by the amounts used of ONS used as documented in the medical records. Ordered amounts and costs of EN and PN were evaluated in the same manner.

2.6 Estimation of diagnosis related group (DRG) reimbursement

An estimation of the potential additional reimbursement was evaluated by looking at the patients receiving nutritional treatment and no nutritional diagnosis. The programme Norwegian Patient Classification (NPC) (Nirvaco AS, Oslo, Norway) was used to calculate the reimbursement the different diagnoses gave. Information about LOS, all patients´ diagnoses recorded in the discharge note and procedures carried out during the stay was plotted. First the reimbursements were calculated with the true diagnoses, and then the reimbursement was calculated again with the addition of the E46 diagnosis.

2.7 Estimation of potential reduced costs related to LOS

An estimation of reduced costs at the haematology ward was conducted based on the number of inpatients admitted at the ward in 2015. The point prevalence surveys at the haematology ward from 2008 – 2015 were used to estimate the number of patients in nutritional risk. Information about hospital costs per day at the haematology ward was calculated by dividing the annual budget for inpatients with the average number of hospital days at the haematology ward. Expenses related to the physician's salaries were divided in two, before being included in the annual budget, as the physicians work both with inpatients and outpatients. Information about the additional costs of initiatives to prevent and treat malnutrition were received from the Norwegian health authorities (Appendix 4).

The calculation used these assumptions:

- Average hospital costs per day at the haematology ward: NOK 9 350 ,- in 2015 .
- Average number of patients admitted at the haematology ward in 2015: 1 303.
- Median LOS at the haematology ward in 2014: 5 days
- Patients in risk of malnutrition can reduce LOS with one day, when receiving nutritional treatment.
- An average of 70% of the patients at the haematology ward are in risk of malnutrition.

Costs of initiatives related to prevention and treatment, were calculated by the Norwegian Health Authorities in 2008. They used the assumption that 30% of the patients are in risk of malnutrition. The following presents the costs per patient per day:

- Screening for malnutrition (all patients every 5^{th} day): NOK 5 ,-
- Investigations (30% of the patients every 5^{th} day): NOK 6 ,-
- Treatment/monitoring (30% of the patients daily): NOK 99 ,-
- Variable costs (products): NOK 14 ,-
- Indirect costs (increasing knowledge): NOK 60 ,-
- Documentation (all patients every 5^{th} day): NOK 6 ,-

2.8 Statistical analysis

SPSS Version 23.0 (SPSS Inc., Chicago, IL, USA) was used for data management and data analysis. The statistical evaluation included descriptive analysis, estimations of number of patients screened for nutritional risk in both periods and number of patients receiving nutritional treatment. The chi-square test was used to test for difference in prevalence of categorical variables, and the Mann – Whitney U test was used to test for difference in medians of the continuous variables. Categorical variables were reported as prevalence (%) and continuous variables as median (min-max). Results were considered significant at a p-value below 0.05.

2.9 Ethics

Approval from the Regional Committee for Medical and Health Research Ethics was exempted from review. Patients were not asked to give consent, as they were not subject to any experimental interventions (Appendix 3).

3. Results

3.1 Population

Of the total number of 449 inpatients admitted and discharged in the two periods, 147 (33%) patients did not meet the inclusion criteria. In the first period 137 patients were included and 31 excluded (19%), and in the second period 165 patients were included and 119 excluded (42%). Significant differences between the two periods were found in LOS (p = 0,015), patients with haematological malignancies (p = 0,001), diagnoses for haematological malignancies (p = 0,009), patients receiving chemotherapy (p = 0,041), patients treated with allogeneic HCST (p = 0,041), number of patients with diarrhoea (p = 0,020), and patients with nausea and vomiting (p = 0,010). The general demographics of the patient population (age, gender, marital status, living condition, and BMI) were similar in the two periods. Characteristics of the study population are presented in Table 3.

Figure 4. Flow chart of included patients.

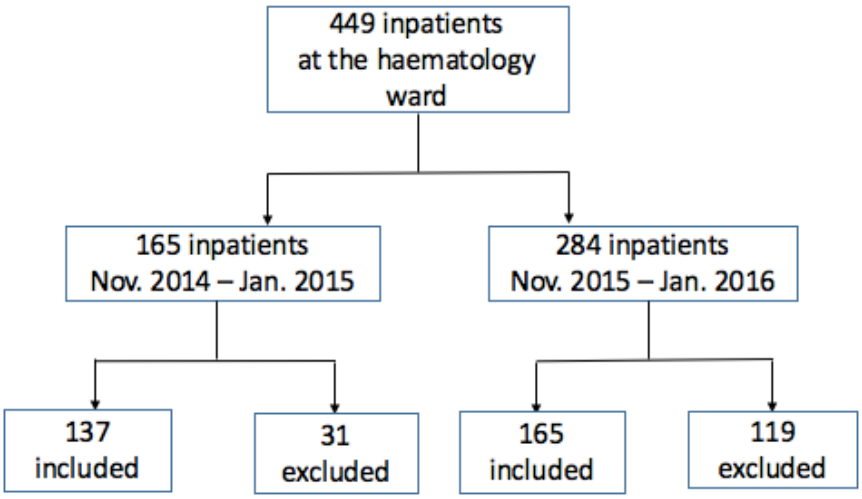

Table 3. Basic characteristics of the study population.

	All patients n = 302	Patients (Nov. 2014 - Jan. 2015) n = 137 (45%)	Patients (Nov. 2015 - Jan. 2016) n = 165 (55%)	P-value
Age (median yrs, min-max)	66 (18-96)	66 (18-95)	67 (20-96)	0.992
Gender (female/male)	139/163	61/76	78/87	0.634
Length of stay (median days, min-max)	5 (2-78)	5 (1-78)	4 (2-54)	0.015
Marital status				
married/cohabiting	168 (56%)	68 (50%)	100 (61%)	
single/divorced/widowed	97 (32%)	49 (36%)	48 (29%)	
unknown	37 (12%)	20 (14%)	17 (10%)	0.153
Living condition				
home	280 (93%)	124 (91%)	156 (95%)	
institution	19 (6%)	11 (8%)	8 (5%)	
unknown	3 (1%)	2 (1%)	1 (0.6%)	0.431
BMI				
BMI admission (mean, SD)	26 (4.9)	26 (4.6)	26.1 (5.2)	0.928
BMI discharge (mean, SD)	26.1 (4.8)	28.9 (6.5)	25.1 (3.6)	0.059
BMI cytodose (mean, SD)	25.6 (4.2)	25.9 (4.4)	25.0 (3.8)	0.414

BMI = Body Mass Index.
P-values are given for t-test for BMI admission, BMI discharge, and BMI cytodose. The Mann-Whitney U test was used for age, length of stay and gender, and the chi-square test (or Fisher's test if cell frequencies <5) for categorical variables.

Of the patients admitted to the haematology ward in the two periods, there was a significant difference ($p = 0.001$) in the number of patients with haematological malignancies. MM (C90.0) was the most frequent diagnose in both periods, with 31% of the patients in the first period, and 17% in the second (Table 3). The second most frequent diagnose was AML (C92.0), with 9% of the patient population in the first period, and 7% in the second. There was a significant difference in patients receiving chemotherapy in the two periods ($p = 0.041$), and the number of patients receiving allogenous HCT ($p = 0.041$) (Table 3). Of the comorbidities documented in the medical records, the only statistically different were diarrhoea ($p = 0.020$) and nausea/vomiting ($p = 0.010$) (Table 3).

Table 3. Registered information about the population according to haematological cancer, ICD-10 codes, treatment and comorbidities**.**

	Patients (Nov. 2014 - Jan. 2015) n = 137	Patients (Nov. 2015 - Jan. 2016) n = 165	P-value
Haematological cancer			
Yes	77 (56%)	61 (37%)	
No	60 (44%)	104 (63%)	0.001
Diagnosis			
C53.0	1 (0.7%)	0	
C82.3	1 (0.7%)	0	
C83.0	1 (0.7%)	0	
C83.3	0	1 (0.6%)	
C88.0	6 (4%)	3 (1.8%)	
C90.0	42 (31%)	28 (17%)	
C90.1	0	2 (1.2%)	
C91.0	2 (1.4%)	4 (2.4%)	
C91.1	6 (4%)	4 (2.4%)	
C91.7	0	1 (0.6%)	
C91.9	1 (0.7%)	0	
C92.0	12 (9%)	12 (7%)	
C92.1	2 (1.4%)	0	
C92.4	2 (1.4%)	2 (1.2%)	
C92.5	0	1 (0.6%)	
C92.6	1 (0.7%)	0	
C92.8	0	1 (0.6%)	
C93.1	0	1 (0.6%)	
C94.6	1 (0.7%)	0	
C94.7	0	1 (0.6%)	0.009
Treatment			
Cytostatic treatment	40 (29%)	31 (19%)	0.041
Radiation	6 (4%)	2 (1.2%)	0.147
Allo-HSCT	4 (3%)	0	0.041
Auto-HSCT	9 (6.5%)	7 (4%)	0.443
Comorbidities			
GVHD	2 (1.4%)	2 (1.2%)	0.713
Infection (sepsis + other)	41 (30%)	38 (23%)	0.190
Diarrhoea	23 (17%)	13 (8%)	0.020
Nausea/vomiting	38 (28%)	25 (15%)	0.010
Fasting	22 (16%)	25 (15%)	0.874
Mucositis	11 (8%)	10 (6%)	0.650

Allo-HSCT = Allogenic Hematopoietic Stem Cell Transplantation, Auto-HSCT = Autologous Hematopoietic Stem Cell Transplantation. P-values are given for the chi-square test (or Fisher's test if cell frequencies <5) for all the categorical variables.

3.2 Screening for malnutrition and treatment

Comparisons of screening and nutritional treatment given are presented in Table 4. There was a significant difference in screening of patients after the intervention ($p < 0{,}001$). No patients were screened in the first period, while 15 (9%) patients were screened in the second period. Looking at whether the patients had haematological cancer or not, there was a significant difference patients being screened. 12 of the 15 (80%) screened patients had haematological cancer, 3 of the 15 (20%) had no haematological cancer. There was no significant difference between the two periods when comparing nutritional plan, referral to clinical dietician, use of coding for malnutrition, type of nutritional treatment given, and use of supplements.

	Patients (Nov. 2014 - Jan. 2015) n = 137	Patients (Nov. 2015 - Jan. 2016) n = 165	P-value
Nutrition			
Patients screened	0	15 (9%)	0.000
Received nutritional treatment	18 (13%)	29 (17.6%)	0.340
Received nutritional plan	2 (1.5%)	0	0.205
Referral to clinical dietician	3 (2%)	5 (3%)	0.732
Nutritional diagnosis	8 (5.8%)	12 (7%)	0.651
E46	5 (3.6%)	4 (2.4%)	
E44	2 (1.4%)	3 (1.8%)	
E43	1 (0.7%)	5 (3%)	0.522
Nutritional treatment			
PN	9 (6.5%)	12 (7%)	
EN and PN	2 (1.5%)	1 (0.6%)	
EN	0	2 (1.2%)	
None	126 (92%)	150 (91%)	0.647
Supplements:			
ONS	3 (2%)	8 (5%)	
Vitamins and minerals	44 (32%)	49 (30%)	
More than one supplement	11 (8%)	17 (10%)	
None	79 (58%)	91 (55%)	0.575

Table 4. Screening, coding for malnutrition, and nutritional treatment.

ONS = Oral Nutritional Supplements, EN = Enteral Nutrition, PN = Parenteral Nutrition.

P-values are given for the chi-square test (or Fisher's test if cell frequencies <5) for all the categorical variables.

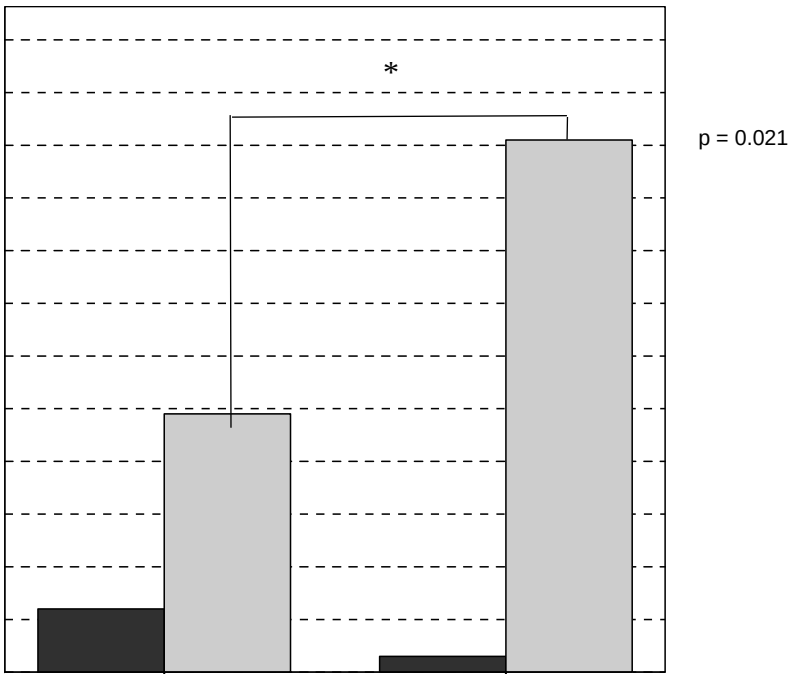

Figure 5. Distribution of haematological cancer in screened patients
P-value calculated with the Fisher's test (cell frequencie <5).
* p < 0,05

Ordered amounts of ONS, EN and PN are presented in Table 5. When comparing use divided by the number of patients in the respective periods, there seems to be an increase in ordered amounts of ONS. 1.3 ONS was ordered per patient in the first period, and 2.27 ONS was ordered in the second period. There seems to be no large difference in ordered amounts of PN, but EN was not ordered at all in the first period, while in the second period 30 bags of EN was ordered. Looking at costs of the different kinds of nutritional treatment, it is obvious that PN is substantially more expensive than EN and ONS.

Table 5. Overview of costs related to treatment of malnutrition.

Ordered nutritional supplements	First period (Nov. 2014 - Jan. 2015)		Second period (Nov. 2015 - Jan. 2016)	
	n	Cost	n	Cost
PN	39	kr 37543.80	34	kr 40574.00
EN	0	kr -	30	kr 1209.10
ONS	174	kr 2567.00	374	kr 5563.11
Use calculated per patient[1]				
Patients	137		165	
PN	0.3	kr 274.04	0.21	kr 245.90
EN	0.0	kr -	0.18	kr 7.33
ONS	1.3	kr 18.74	2.27	kr 33.72
Use calculated per patient recievng treatment[2]				
ONS	14	kr 183.36	25	kr 222.52
EN	2	kr -	3	kr 403.03
PN	10	kr 3754.38	13	kr 3121.08

ONS = Oral Nurtitional Supplements, EN = Enteral Nutrition, PN = Parenteral Nutrition.

[1] Ordered nutritional supplements divided by number of patients admitted

[2] Ordered nutritional supplements divided by the number of patients receiving nutritional treatment according to the data collected from the medical records and curves.

3.3 Coding for malnutrition

There was not a significant difference in patients receiving a diagnosis for malnutrition when comparing the two periods (p = 0,651). The ICD-10 code, E46 was the most frequent used diagnosis in the first period (5 patients), and E43 was the most frequent used in the second period (5 patients). Of the 15 patients who were screened for malnutrition, 6 (40%) were classified as being in risk of malnutrition with a sore of 3 or more according to the NRS 2002. Five of the nine (56%) patients in risk of malnutrition received a diagnosis for malnutrition, two received the E46 diagnosis, two received the E44 diagnosis, and one patient got the E43 diagnosis.

3.4 Diagnosis Related Group-reimbursement

In total 31 of 47 (66%) patients receiving nutritional treatment, were not coded with a diagnosis for malnutrition. In the first period 13 of the 18 (72%) patients receiving nutritional treatment, were not coded with a diagnosis for malnutrition. In the second period 18 of the 29

(62%) patients receiving nutritional treatment, were not coded with a diagnosis for malnutrition. This difference was not statistically significant.

Based on our data, calculated additional DRG-reimbursement was only given to one patient. The ICD-10 diagnosis code J15.9 Unspecified bacterial pneumonia gave a reimbursement of NOK 16046.00, and with the addition of a E46 diagnosis the reimbursement would have been NOK 26805.00, with a loss of reimbursement to the ward of NOK 10759.00.

3.5 Costs related to length of stay

Operating expenses per day at the haematology ward was NOK 9 350 ,- in 2015.

Presumed that 70 % of the patients can reduce LOS with 1 day:

N patients	912
Costs for patients in nutritional risk (5 days)	NOK 42 636 000.00
Costs for patients in nutritional risk (4 days)	NOK 34 108 800.00
Savings	NOK 8 527 200.00

Costs of initiatives:

Screening: 1303 x 5 x 5 NOK	NOK 32 575.00
Examination: 1303 x 5 x 6 NOK	NOK 39 090.00
Treatment/monitoring: 1303 x 5 x 99 NOK	NOK 644 985.00
Enrichment (ONS, EN, PN): 1303 x 5 x 14 NOK	NOK 91 210.00
Increasing knowledge: 1303 x 5 x 60 NOK	NOK 390 900.00
Documentation: 1303 x 5 x 6 NOK	NOK 39 090.00
	NOK 1 237 850.00

Annual net savings for reducing LOS with one day would be:

NOK 8 527 200.00 – NOK 1 237 850 = NOK 7 289 350.00

4. Discussion

In the present study, the aims were to evaluate the screening routines and nutritional treatment at a haematology ward, and further to evaluate if an intervention in the form of an instructive course for nurses could improve nutritional practice and have an economic impact. This was done by collecting data on screening for malnutrition, nutritional treatment documented in the medical records, LOS, coding of diagnoses and treatment. To evaluate economic impact, information was also collected about the haematology wards orders of EN, PN and ONS. With limited time and recourses, an estimation of possible reduction of costs as a result of reduced LOS, was conducted using data from the Norwegian Health Authorities (Appendix 4). In the following section I will discuss the results of the study as well as the limitations of this study model.

4.1 Preventing and treating hospital malnutrition

This study showed that screening frequency increased from 0 in the first period to 15 (9%) in the second period. This was a statistically significant increase ($p < 0{,}001$), but still it is a very low number of screened patients when you consider the Norwegian Health Authorities' guidelines for preventing and treating malnutrition. According to these guidelines all patients should be screened for malnutrition at admission, and then repeatedly on a weekly basis (27). Despite these Norwegian guidelines, and consensus statements of the ESPEN and the A.S.P.E.N. on the recommendations and advantages of detecting patients in risk of malnutrition, it seems that there is a mismatch between recommended practice and clinical practice in hospitals (26, 44). Our findings correspond with previous studies, showing that nutritional assessment and interventions to treat malnutrition are not sufficiently applied (45-47). The study based on point prevalence surveys from Haukeland University Hospital showed that screening performance improved from 54 – 77% after implementation of the nutritional strategy, but when we look at the raw data on screening performance from 2009 – 2015, there is no clear trend in improved screening performance (35). The percentage of screened patients ranges from 64.8% to 85%, with an average of 74%. The data from Randi J. Tangvik's study are not directly comparable with the raw data we have used, as her study used a database which was considerably processed with removed duplication and exclusion of unsuitable data. Another study based on the same data, examining the nutritional risk profile at Haukeland University Hospital, found that the prevalence of nutritional risk in cancer in the lymphoid, hematopoietic and related tissues was 50% (18). According to the raw data from

point prevalence surveys conducted at the haematology ward, the percentage of patients in nutritional risk of the screened patients ranged from 46,7% to 100%, with an average of 70%. Screening performance ranged from 47% to 100%, with the average being 89%, and patients in nutritional risk receiving nutritional treatment ranged from 11 to 100%, on average 66%. In our limited data on screened patients, six of the 15 (40%) screened patients were classified as being in risk of malnutrition. Ten of the 15 (67%) screened patients received nutritional treatment according to the medical records, but only five (33%) received an ICD-10 code for malnutrition. There seems to be a lack of nutritional awareness, and this is also reflected in documentation and coding of malnutrition. The lack of coding may have two important consequences, the first one is insufficient surveillance of disease and impact of the patient's health and the second is the lack of economic compensation for the cost of treatment.
In Danish hospitals the use of a screening tool (NRS2002) in patients with malnutrition was poorly documented (48). This was alto the case in another university hospital in Norway, where they concluded that undernourished older people are not identified and treated properly. They also identified five barriers for the nurses to ensuring adequate nutritional care: loneliness in nutritional care, a need for competence, low flexibility in food services, system failure in nutritional care, and the neglect of nutritional care (49).

4.2 Oral nutritional supplements, enteral and parenteral nutrition

Our intervention did not include the physicians at the haematology ward, and therefore we did not expect any difference in the use of EN and PN (referred to as TPN at the ward). Ordered amounts of ONS, EN and PN give an estimate of the demand for the different kinds of nutritional treatment. In the first period, no EN was ordered, while in the second 30 Easybags (500 ml) were ordered. If this reflects an increased attention to use of EN over PN is unknown. Looking at ordered amounts calculated per patient at the ward in the respective periods, there seemed to be an increase in ordered ONS (1.3 in the first period vs. 2.27 in the second). However, when we look at documented use of nutritional treatment in the medical records, there is no significant difference. A limitation with these data are that even if these are the ordered amounts in the two periods, we cannot know if they have been used or stored for later use. Most likely the numbers will deviate from reality. Of the documented treatments given PN was used more frequently than EN in both periods, and ONS more frequently than EN and PN. In patients undergoing HCT TPN is largely used because of the gastrointestinal

complications presenting during this treatment. Moreover, TPN allows for better modulation of fluid, electrolytes and micronutrients, and almost all patients undergoing HCT already have a central venous catheter placed (10, 23). In patients undergoing high-dose conditioning and autologous HSCT, this treatment is also associated with a reduced nutritional status, quality of life and physical activity levels (50). Oral nutritional interventions have been shown to be effective in increasing nutritional intake and improving some aspects of quality of life in patients with cancer (51).

4.3 Economical evaluation

4.3.1 Diagnosis Related Group reimbursement

With limited data on patients in nutritional risk, it was difficult to determine which of the patients should have received a diagnosis for malnutrition. An attempt was made to evaluate if the patients should have had a nutritional diagnosis based on BMI, food intake and change in weight in accordance with NRS 2002, but this was not possible due to lack of information in the medical records. As a result of this, the number of patients who should have received an ICD-10 code for malnutrition (E43, E44 or E46) was estimated using the assumption that all patients receiving nutritional treatment are given this on the basis of being in nutritional risk, and because of this should have received a diagnosis for malnutrition. The reason E46 was chosen, is because this theoretically would be the most common diagnosis for malnutrition, and the fact that the other diagnoses (E43 and E44) resulted in the same additional reimbursement, even though these are given to patients with more severe cases of malnutrition, and hence would need a more comprehensive treatment whit additional costs. Calculated additional DRG-reimbursement was only given to one patient with the ICD-10 diagnosis code J15.9 Unspecified bacterial pneumonia. In the remaining 46 (98%) patients the comorbidity malnutrition made no difference because these patients already had other complex comorbidities. The effect of coding in different patient groups may differ, and hence the different financial benefit observed (52, 53). In a gastroenterology ward 27% of the coded patients gave an increased DRG reimbursement (54). Our data suggests that there might be a discrepancy between screening done by the nurses and coding made by physicians. In the first period 8 patients received an ICD-10 code for malnutrition although none of them were screened. In the second period 12 patients received a code, but only five (42%) of them were

screened. This discrepancy is probably a result of physicians' attitude towards coding in general since it has long been considered extra unnecessary workload. This area deserves further study.

4.3.2 Potential reduced costs related to a reduction in length of stay

Annual savings for reducing LOS with one day was estimated to be NOK 7 289 350.00. This estimation is based on several questionable factors. The estimates of costs received from the Norwegian Health Authorities are now eight years old, and as a result a bit outdated. These estimates are also based on the assumption that 30% of the patient population in the hospital are in nutritional risk. At the haematology ward an average of 70% of the screened patients in the point prevalence surveys were in risk of malnutrition. With more time and recourses, it would be preferable to calculate better suited numbers, to give a more accurate estimate of costs. A significant decrease in LOS was observed, from a median of 5 to 4 days ($p = 0,015$). The reasons for this have not been investigated, but it might be a result of a larger number of patients with haematological cancer in the first period (56%) compared with the second period (37%) ($p = 0.001$). Previous studies have estimated that it is possible to reduce LOS with about 20% in patients diagnosed with and treated for malnutrition (55, 56). This was also the assumption used in the Norwegian study estimating a potential reduction of costs of 800 million NOK annually (41).

4.4 Strengths and limitations of the study

The strength of this study is the relatively large study sample included from two 3 month periods, which makes this a representative sample of patients from the haematology ward. The patients at this ward are often severely ill and under intensive treatment, and as a result likely have a decline in nutritional status (10). Taking into consideration the number of screened patients in the first period (0 patients), meant that the ward had tremendous potential for improvement. Although it was not possible to show an improvement in documented treatment and coding for malnutrition by giving lectures to nurses, this study suggests that an intervention needs to be more comprehensive to induce change in routines. The study has several limitations. It cannot confirm causality given that the study is based on data recorded in medical records by nurses and physicians. It cannot give conclusions as to why there was a small increase in screening for malnutrition, and it cannot explain the reduction of LOS from

the first period to the second period. Due to the nature of the collected data, and sample size limitations, it was not possible to conduct multivariate analyses to examine the relationship between considered variables. This is because the study was based on the medical records of patients admitted to the haematology ward in two time periods, and as a result of this the data might include the same patients in both periods. The variables included were also subject to multicoliniearity. The true relationship between these factors needs to be clarified with interventional studies. The reduction in LOS might be explained by the fact that there were more patients with haematological malignancies in the first period (56%) compared with the second period (37%). Another limitation is that this study includes patients admitted at the ward for only 24 hours or more, and this might limit the chance of patients being screened for malnutrition, and given the appropriate treatment. Other studies have suggested a threshold of seven days or more (19, 57). Other limitations include the fact that haematology patients comprise a small fraction of the population in a hospital, with specialized treatments and medical challenges, and because of this the results are not generalizable. But still this study contributes with valuable information about screening and nutritional treatment at the haematology ward. Another limitation to this study is the fact that there were two students collecting the data, and manually plotting them into SPSS. This allows room for mistyping and errors. An attempt to limit this confounding factor was done by defining criteria for the variables collected, and checking for errors using SPSS. The final limitation is that it is based on data collected from the medical records, and therefore reflects the physicians and nurses documentation of treatment, not necessarily general practice at the ward.

4.5 Future aspects

Ten years have now gone by since the implementation of the nutritional strategy at Haukeland University Hospital, and based on the point prevalence surveys it seems that there are is still room for improvement in screening patients and giving nutritional treatment in the whole hospital population. Our data suggest that the haematology ward especially need to increase their focus on nutrition. Further work should investigate the reasons why there is still a lack of routines for preventing and treating malnutrition. The Council of Europe has identified common barriers to proper nutritional care in hospitals, and these include clearly defining responsibilities, sufficient education, influence the patient, cooperation between various health care groups, and involvement from hospital managers (28). These barriers are likely to be present in this hospital as well, but there is a need to evaluate where to increase focus next.

4.6 Conclusion

The key findings of this study was the significant increase in screened patients, but no significant difference in routines for treating malnutrition and coding for malnutrition, after an intervention consisting of guidance and lectures on screening and treatment of malnutrition. The lack of significant difference in nutritional treatment between the two time periods indicate that a small intervention aimed towards the nurses, with lectures on relevant topics is not enough to change documented practice in a ward. These findings suggest that there is still room for improvement of nutritional routines at the haematology ward, and that nutrition should remain a focus area in the years to come. Better routines for preventing and treating malnutrition could potentially lead to a reduction in hospital costs, but our findings did not show an increased reimbursement after coding for malnutrition as these patients already had other complex comorbidities.

5. References

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6. Appendix

Appendix 1: Document for nutritional screening in DIPS

Appendix 2: Document for nutritional plan in DIPS

Appendix 3: Approval from the Regional Committee for Medical and Health Research Ethics

Appendix 4: Estimations of costs related to treatment of malnutrition by the Norwegian Health Authorities

Appendix 1

Vurdering av ernæringsmessig risiko Opprettet dato 13.05.2016 Opprettet av: Syot

Godkjent dato	Godkjent av
	Synne Otteraaen Ystad

INNLEDENDE SCREENING	
Undersøkelsesdato	
Tidspunkt	
Vekt (kg)	
Høyde (cm)	
BMI	
Ødem, amputasjon, spiseforstyrrelser problem, stråleskade, allergi/intoleranse	
Er BMI < 20,5	
Har pasienten tapt vekt de siste tre månedene	
Har pasienten hatt redusert næringsinntak den siste u	
Er pasienten kritisk syk? Info	

Dersom JA på ett eller flere av disse spørsmålene, fyll ut hovedscreening under.
Dersom NEI på alle, gjennomfør ny screening om en uke. Nytt skjema må opprettes.

HOVEDSCREENING

Vekttap Forrige vekt: Dato **Vekt nå:** **Vekttap i %.**

Matinntak i % (På en skala fra 0-10, hvor mye spiser pasienten nå mot normalt? 4 = 4

Score - Ernæringstilstand

0 Normal ernæringstilstand

1 Vekttap > 5% siste 3 mnd *eller* Matinntak 50-75% av behov sist uke

2 Vekttap > 5% siste 2 mnd *eller* BMI 18,5-20,5 + redusert allmentilstand *eller* Matinntak 25-50% av behov sist uke

3 Vekttap > 5% siste mnd *eller* BMI <18,5 + redusert allmentilstand *eller* Matinntak 0-25% av behov sist uke

Score - Sykdommens alvorlighetsgrad

0 Ikke syk

1 Kronisk sykdom eller gjennomgått mindre kirurgisk inngrep
F.eks.leverchirrose, nyresvikt, kronisk lungesykdom, kreftpasienter, pasienter med collum femoris fraktur, etter cholecystektomi og laparaskopiske operasjoner.

2 Tydelig redusert allmenntilstand pga sykdom
F.eks alvorlig pneumoni, inflammatorisk tarmsykdom med feber, akutt nyresvikt, større kirurgiske inngrep som kolektomi og gastrektomi, ileus, anastomoselekkasje og gjentatte operasjoner.

3 Alvorlig/kritisk syk
F.eks pasienter med store apopleksier, alvorlig sepsis, intensivpasienter (APACHE>10), benmargstransplantasjoner, store hodeskader, brannskader >40 % og alvorlig akutt pancreatitt.

Er pas. over 70 år, gi ett score	0
Total score for ernæringsmessig risiko	

25 Ernæringsmessig risiko 8-2013 FF — Sem & Stenersen Prokom AS

Appendix 2

Ernæringsstatus
- Vekt (kg):
- Høyde (cm):
- BMI:
- Diagnose:
- Dato: 13.05.2016

Årsak til ernæringsvansker

Mål med ernæringstiltak
- ☐ Stabilisere vekt / dekke næringsbehov
- ☐ Redusere vekttap
- ☐ Vektøkning

Energibehov
- ☐ Sengeliggende, 30 kcal/kg
- ☐ Oppegående, 35 kcal/kg
- ☐ Oppbygning, 40 kcal/kg
- ☐ Parenteral ernæring, 25 kcal/kg
- ☐ Mager, + 10 %
- ☐ Overvekt, - 10 %
- ☐ Alder 18-30 år, +10%
- ☐ Alder > 70 år, - 10 %

Energibehovet er: 0 **kcal/døgn**

- ☐ Egendefiner — [illegible]:

Proteinbehov
- ☐ Syk og/eller > 65 år (1-1,5 g/kg/døgn)
- ☐ Kritisk syk (voksne og eldre) (1,5-2g/kg/døgn)

Proteinbehovet i g/døgn er: til

[illegible]:

Væske
- ☐ Væsketerapi
- ☐ Væskerestriksjon

Kostform på post
- ☐ Standardkost
- ☐ Spesialkost
- Annet:
- ☐ Dia, D
- ☐ Energi og næringstett, EN
- ☐ Fettredusert, FF
- ☐ Flytende, Fl
- ☐ Glutenfri, G
- ☐ Kaliumredusert, KF
- ☐ Laktoseredusert, LF
- ☐ Melkeallergi, MA
- ☐ Minus fisk, FISK
- ☐ Minus løk/kål, L/K
- ☐ Minus svin, SVIN
- ☐ Moset, M
- ☐ Natriumredusert, Na
- ☐ Proteinredusert, Prl
- ☐ Purinredusert, Purl
- ☐ Vegetar, LOV

Tiltak mat og drikke

Tilskudd av vitamin/mineral
- ☐ Multivitaminmineral
- ☐ Tiamin ved risiko for reernæringssyndrom

Medisinske ernæringstiltak

	Dose / døgn	Varianter/smaker
☐ Næringsdrikker		
☐ Fettilskudd		
☐ Energipulver		
☐ Proteinpulver		
☐ Annet		

☐ Pasienten skal ha næringstilskudd på blå resept, ev. også søknad til Helfo

	Dose / døgn	Type
☐ Sondeernæring		
☐ Parenteral ernæring		

Se egen medisinkurve for fettilskudd, sondemat og parenteral ernæring

Oppfølging/ monitorering

	Når / antall dage
☐ Veiing	
☐ Kostregistrering	

Ernæringsplan utformet av
- Sykepleier: Synne Otteraaen Ystad
- Lege:
- [illegible]:

Appendix 3

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK nord			11.06.2015	2015/1077/REK nord
			Deres dato:	Deres referanse:
			12.05.2015	

Vår referanse må oppgis ved alle henvendelser

Aymen Bsuhra Ahmed
Medisinsk avdeling

2015/1077 Effekt av systematisk screening og tidlig ernæringsbehandling hos pasienter med maligne hematologiske lidelser

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk (REK nord) i møtet 04.06.2015. Vurderingen er gjort med hjemmel i helseforskningsloven § 10, jf. forskningsetikkloven § 4.

Forskningsansvarlig: Hematologisk seksjon- Med avdeling
Prosjektleder: Aymen Bsuhra Ahmed

Prosjektleders prosjektomtale
Hensikten med studien er å undersøke effekten av systematisk ernæringsscreening og tidlig ernæringsbehandling på hematologisk avdeling ved Haukeland Universitetssykehus. Det vil utføres en intevensjon som består av implementering av nye retningslinjer for ernæringsbehandling ved allogen stamcelletransplantasjon i tillegg til undervisning av personal på avdeling. Effekten vil vi undersøke ved å samle inn data fra journaler i Dips. Innsamling av data vil skje både retrospektivt og prospektivt

Vurdering

Data som det planlegges å samle inn
Alder, kjønn, diagnose, dager inneliggende, bruk av koding (ICD-10 systemet), dokumentasjon av ernæringsstatus/screening/plan, bruk av ernæringsstøtte, tidligere innleggelse de siste 12 mnd, kontakt med klinisk ernæringsfysiolog, følger ernæringsplan med i epikrisen, BMI, Blodrpøver, vekttap. Vekt og høyde fra Cytodose-register.

Alle pasienter innlagt ved Med 5N, uavhengig av diagnose innenfor gitt tidsramme inkluderes. Målgruppen er pasienter med hematologiske lidelser. Pasienter med ikke-hematologiske lidelser vil blir brukt som interne kontroller

Det søkes om fritak fra kravet om å innhente samtykke med følgende begrunnelse: *«Denne undersøkelse er en del av kvalitetsfremmende arbeid ved hematologisk seksjon. Det er en retrospektiv del der pasienten ikke lengre er tilgjengelig for samtykke. Dvs, det blir benyttet nye og tidligere innsamlet data. Data skal håndteres anonymisert, bare innhentet helseparametre.»*

De prosjektene som skal framlegges for REK er prosjekt som dreier seg om *"medisinsk og helsefaglig forskning på mennesker, humant biologisk materiale eller helseopplysninger"*, jf. helseforskningsloven (h) § 2. *"Medisinsk og helsefaglig forskning"* er i h § 4 a) definert som *"virksomhet som utføres med vitenskapelig metodikk for å skaffe til veie ny kunnskap om helse og sykdom"*. Det er altså formålet med studien som avgjør om et prosjekt skal anses som framleggelsespliktig for REK eller ikke.

Besøksadresse: MH-bygget UiT Norges arktiske universitet 9037 Tromsø
Telefon: 77646140
E-post: rek-nord@asp.uit.no
Web: http://helseforskning.etikkom.no/

Kvalitetssikring
Grensen mellom forskning og kvalitetssikring kan være noe uklar. I internasjonale retningslinjer fra CDBI i Europarådet, som NEM har anvendt som retningsgivende i klagesaker et det lagt til grunn at det kan være nyttig og relevant å stille tre kontrollspørsmål:

1) Er prosjektets formål å forsøke å forbedre kvaliteten på pasientbehandlingen på lokalt plan, for eksempel en sykehusavdeling?

2) Går prosjektet ut på å prøve praksis mot etablerte standarder?

3) Innebærer prosjektet at noe gjøres med pasientene som ellers ikke ville bli gjort som ledd i klinisk praksis og kvalitetssikring?

I retningslinjene heter det at dersom svaret på de to første spørsmålene er ja og svaret på det siste spørsmålet er nei, så er nok prosjektet kvalitetssikring.

Komiteen har vurdert at prosjektet er kvalitetssikring.

Godkjenning fra andre instanser
Det påhviler prosjektleder å undersøke hvilke eventuelle godkjenninger som er nødvendige fra eksempelvis personvernombudet ved den aktuelle institusjon eller Norsk samfunnsvitenskapelig datatjeneste (NSD).

Dersom prosjektet organiseres på en slik måte at det er nødvendig med dispensasjon fra taushetsplikt så reguleres dette av helsepersonelloven § 29 b. Myndighet til å treffe vedtak som nevnt i bestemmelsen er delegert fra Helsedepartementet til Helsedirektoratet.

Vedtak
Etter søknaden fremstår prosjektet ikke som et medisinsk og helsefaglig forskningsprosjekt som faller innenfor helseforskningsloven. Prosjektet er ikke fremleggingspliktig, jf. hfl §§ *2 og 9, samt forskningsetikkloven § 4.*

Klageadgang
Du kan klage på komiteens vedtak, jf. forvaltningsloven § 28 flg. Klagen sendes til REK nord. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK nord, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Med vennlig hilsen

May Britt Rossvoll
sekretariatsleder

Kopi til:abah@helse-bergen.no

Appendix 4

VEDLEGG til notat om forebygging og behandling av underernæring - potensial for kostnadsbesparelser

Hvorfor?

”Alt for mange sykehus- og sykehjemspasienter er underernærte, og de får kun dekket 60 % av sitt behov for energi og næringsstoffer under innleggelsen. Det er både et menneskelig og et økonomisk problem, dels trekker behandlingen ut, dels lykkes den dårligere” (www.bedremadtilsyke.sst.dk).

Alle individer, friske, syke, unge, gamle har rett til å få et adekvat og tilpasset kosthold i forhold til deres alder og (sykdoms) tilstand. I henhold til forskrift om internkontroll i sosial og helsetjenesten § 4 g, Jf. Lov om helsetjenesten i kommunene § 1-3a, og Forskrift om kvalitet i pleie og omsorgstjenestene § 3, skal institusjonene ha rutiner for å ivareta pasientene sine grunnleggende fysiologiske behov (herunder ernæring) jf. Prof.dr. juris Aslak Syse(1). Dette er også i tråd med Europarådets resolusjon(2) og WHOs globale strategi for kosthold og fysisk aktivitet(3).

Helsetilsynet har nylig avdekket svikt i rutiner for å kartlegge og vurdere beboernes ernæringsstatus på sykehjem og hjemmebasert omsorg i Hordaland, Rogaland og Telemark (www.helsetilsynet.no). Retningslinjer for veiing ved innkomst blir ikke fulgt og det er avdekket store kunnskapsmangler når det gjelder beboernes grunnleggende ernæringsbehov og - tiltak.

En underernært pasient har opp til tre ganger så lang liggetid i institusjon som en velernært pasient (tall fra Sveits)(4). Beregninger fra Danmark viser at en døgnpris for en underernært pasient koster i gjennomsnitt 22% mer enn døgnprisen for en ikke-underernært pasient (www.sst.dk).

Underernæring koster det norske samfunn milliarder: Gitt en døgnpris på 7800 kr (SINTEF-helse 2006). Regner vi at 50 000 pasienter (30 % av 164 000) av pasientene har over 1.5 – 3 ganger så lang liggetid enn velernærte. Man kan anta at gjennomsnittlig liggetid for velernærte 4 dager, og for underernærte vil liggetiden være 1.5- 3 ganger så lang = 2- 8 dager ekstra. Ekstrakostnad for å ha disse pasientene i sykehus vil være et sted mellom:

7800 x 2 x 50 000 = 780 millioner
7800 x 8 x 50 000 = 3,1 milliarder

I Storbritannia har de beregnet kostnadene av sykdomsrelatert underernæring i ulike settinger, liggetid og kostnader i forhold til ernæringsprodukter samt komplikasjoner. Behandling av pasienter enten moderat eller i høy risiko for underernæring ble estimert i 2003 til å koste Storbritannia mellom 7 og 10 milliarder Euro (ca 68 milliarder kroner, omregnet til Norske forhold: 68 x 5/60 = 5.6 milliarder kroner)(5).

Behovet for en innsats er klar. Politikere, sykehusledere og dem som til daglig står med ansvaret for maten og for at pasientene får den, bør derfor i høyere grad sette fokus på maten til de syke. Dette gjelder også innen primærhelsetjenesten. Hjemmebaserte tjenester og andre tilbud innen pleie og omsorg er også viktige aktører i tillegg å forhindre eller utsette innleggelse i sykehus.

Hvordan?

For å minske forekomsten av underernæring må man ha verktøy for å diagnostisere. Det kan man ikke ved å bare ”se” pasienten.
For å forebygge underernæring må man ha to delmål: a) diagnostisering av ernæringsmessig risiko for å unngå underernæring, b) fange opp underernærte så tidlig som mulig, for å redusere omfang av komplikasjoner som følge av underernæring.

Det finnes ingen pålitelige laboratorietester for å diagnostisere ernæringsmessig risiko. Vekt og høyde kombinert med vekthistorie (vekttap) og evt. spiseproblem vil avdekke om en person er i ernæringsmessig risiko eller ikke. Det finnes en rekke screeningsverktøy og de fleste er en variasjon over samme tema (vekt, ufrivillig vekttap, matlyst).

Når en person er vurdert til å være i ernæringsmessig risiko, skal vedkommende ha målrettede tiltak med oppfølging. Det kan være alt fra behandling av underliggende årsaker til dårlig matinntak, kostholdsråd, tilrettelegging av måltider, mellommåltider, næringsdrikker, sondeernæring og/eller intravenøs ernæring.

Diagnostisering og behandling av underernæring er nå innført som en standard på flere sykehus i store deler av den vestlige verden. Sykehusene som har innført dette systemet blir akkreditert for god ernæringspraksis, og de har muligheter for å dokumentere hvor mange som er i ernæringsmessig risiko, i hvilken grad pasientene blir screenet, hvor mange som får dekket sitt ernæringsbehov o.s.v. (www.bedremadtilsyke.sst.dk; www.jointcommission.org)

Kostnadsbesparelser
Sundhetsstyrelsen og Fødevaredirektoratet i Danmark har nylig gjennomført en kost-nytte analyse av ernæringsinnsats til underernærte medisinske og kirurgiske pasienter. Analysen viser at den årlige nasjonale besparelsen ved ernæringsinnsats i form av næringsdrikker, sonde- og parenteral ernæring på danske sykehus vil beløpe seg fra 0,6 til en milliard danske kroner, hovedsakelig i form færre sykehusinfeksjoner, lavere medisinforbruk, mindre matsvinn, færre reoperasjoner og kortere liggetid (www.sst.dk).

I Storbritannia har man beregnet kostnad-nytte effekten av systematisk bruk av næringsdrikker på pasientgrupper i medisinske og kirurgiske avdelinger i sykehus. Analysen viste at besparelsen var på over 800 £ (ca 8000 kroner) per pasient i forhold til liggetid og komplikasjoner(5). I Nederland har man beregnet at ekstrakostnadene ved innføring av screening og behandling av underernæring til omlag 76 Euro per pasient, for å oppnå en dag kortere liggetid for disse pasientene. Døgnprisen var estimert til å koste mellom 337 og 476 Euro (2003 priser) (6)

Studier viser at man kan redusere liggetiden for de som blir diagnostisert og behandlet for underernæring med om lag 20 % (tall fra Danmark og Nederland og USA)(6-8).

Tiltakskostnader

Forutsetninger:
Diagnostisering
Man må anta at man har vekt lett tilgjengelig. Gjennomføring av veiing og diagnostisering (tre spørsmål) skal utføres innen første døgn. Prosedyren vil kunne ta få minutter, beregnet her til å ta gjennomsnittlig 5 minutter per pasient. Sykepleier foretar undersøkelsen. I kostnad utgjør dette: (minutter /gitt gjennomsnittslønn for sykepleiere inkl sosiale utgifter 500 000/år, 52 uker/ 35,5 t/uke/60 minx5) = 22,50 kr. Gitt at man diagnostiserer alle pasientene hver 5. dag. Totalt per pasient per dag: **22,5 kr/5 = 5 kr per pasient per dag.**

Utredning
Gitt at gjennomsnitt 30 % av pasientene blir funnet til å være i ernæringsmessig risiko. Disse skal ha en *ernæringsplan*: Dette estimeres til å ta 20 minutter for hver underernært pasient (tilsvarer sykepleierlønn på 100 kroner). Ekstrakostnad totalt per pasient = 30 kr. Denne prosedyren gjennomføres hver 5.dag: 30 kr/5 = **6 kr per pasient per dag.**

Behandling/oppfølging:

Postens egne pleiere (helsefagarbeidere, kostombud, primærsykepleier eller ernæringsansvarlige) vil kunne stå for hoveddelen (90 %)av ernæringsoppfølgingen på post mens en liten del (10%) henvises videre til ernæringsfysiolog, ernæringsteam eller lege/spesialist. Gitt at hver underernært pasient får en times oppfølging daglig av pleier (tilsvarer kr 300 i sykepleielønn). 10 % av pasientene får konsultasjon av annen instans (ernæringsfysiolog, ernæringsteam) som bruker en time per pasient (600 kr spesialist/legelønn). 300 kr/ 90 % + 600 kr/10 % = 270 kr + 60 kr = 330 kr. Ekstrakostnad totalt på avdelingen til monitorering fordelt på alle pasienter per dag: **99 kr per pasient**.

Variable kostnader (kostnader knyttet til ernæringsprodukter):
Studier fra Nederland indikerer at fleste (3/4) kun trenger enkle tiltak som tilpasset kosthold (konsistens, måltidsordning). Dette utgjør liten eller ingen ekstrakostnad for maten. Omtrent 20 % vil trenge spesialprodukter (berikning eller en næringsdrikk) som tilsvarer om lag 75 kr ekstra per dag. En liten andel (5 %) vil trenge sondeernæring eller intravenøs ernæring. Sondeernæring koster mellom 100 og 500 kr /dag og intravenøs ernæring koster mellom 500 og 1000 kr/dag (estimert gjennomsnitt: 400 kr/dag).
Kostråd og tilpasset kosthold: 15 kr x 75 % = 11 kr
Næringsdrikker/spesialprodukter 75 kr x 20 % 15 kr
Sondeernæring/intravenøs ernæring: 400 kr x 5 % = 20 kr
Totalt: 46 kr per underernært pasient/dag - fordelt på alle pasientene: **14 kr per pasient**.

Indirekte kostnader (kompetanseheving)
For å gjennomføre diagnostisering og behandling av underernæring trengs kunnskaper og kompetanse i alle ledd. Personalet skal få trening i verktøy for å diagnostisere, iverksette og dokumentere ernæringsstatus, tiltak og resultat. Det vil være behov for å implementere kunnskap om dette både i grunnutdannelsen og interne kurs i rutiner og kompetanseheving på den enkelte institusjon. Hvis man tar utgangspunkt i at *en* sykepleier kan bli tatt ut av tjenesten en time daglig for kompetansehevende tiltak vil det tilsvare 300 kr (sykepleielønn); Fordelt på antall pasienter, gitt at pleier har ansvar for 5 pasienter den dagen vil det per pasient per dag koste **60 kr.**

Dokumentasjon
Dokumentasjon i epikrise: 3 min (legelønn 1000000)= 30 kr /fordelt utgift på alle pasienter: 30 kr per pasient /5 = **6 kr per pasient per dag**

Oppsummering kostnad (per pasient per dag):

- Diagnostisering: 5 kr
- Utredning: 6 kr
- Behandling: 99 kr
- Ernæringsprodukter: 14 kr
- Kompetanse 60 kr
- Dokumentasjon: 6 kr

- **Sum: 190 kr per pasient per dag**

Kostnadsbesparelse

Studier viser at man kan redusere liggetiden for de som blir diagnostisert og behandlet for underernæring med om lag 20 % (tall fra Danmark og Nederland og USA)(6-8). I følge Statistisk sentralbyrå er gjennomsnittlig liggetid 5 dager i Norge. Et pasient-liggedøgn i norske sykehus er estimert til å koste 7800 kroner (SAMDATA rapport 2006).

Gitt at de underernærte pasientene oppnår en dag kortere liggetid på grunn av målrettet ernæringsbehandling, vil sykehuset spare 7800/5 x 30 % :

- **Sum: 468 kr per pasient per dag**

Sum besparelse per pasient per dag: 468- 190 = 278 kr.

Sum kostnad-nytte besparelser per år:
87196 døgnopphold i somatiske sykehus per år (SAMDATA 2006): x 278 =

= 242 millioner kroner per år

- *I dette ligger en frigjøring av 52 500 liggedøgn i løpet av et år*
- *Andre økonomiske effekter: Flere pasienter blir diagnostisert og kodet med underernæringskoder som gir DRG-poeng.*
- *De helsemessige gevinster er ikke beregnet inn, men disse vil gi en økonomisk tilleggsgevinst i forhold til blant annet færre komplikasjoner, mindre bruk av medikamenter og antibiotika, færre reinnleggelser og bedret overlevelse* (9).
- *Når vekt og vektutvikling er kjent vil det også være lettere å følge med på væskebalanse, dosere medisiner riktig, og følge med på overvekt og tilstander relatert til dette.*

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