Original article

How can screening for malnutrition among hospitalized patients be improved? An automatic e-mail alert system when admitting previously malnourished patients☆

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SUMMARY

Background & aims: Screening for malnutrition is not often done in the management of hospitalized patients. An original computer tool was developed at the Dunkerque hospital to detect readmissions of patients with malnutrition during a previous stay and generate e-mail alerts to the nutrition department. The aim of the study was to describe and evaluate this tool and the activity of the nutrition department in connection with the alerts sent.
Methods: The number of alerts sent, dietary consultations conducted, assessments of the nutritional status and the number of malnourished patients diagnosed were collected from September 1st to November 30th 2012. The positive predictive value (PPV) of the malnutrition screening tool was estimated. The evolution of the nutritional status between the last and the current hospitalization was also evaluated.
Results: A total of 531 e-mail alerts were sent (mean of 8.2 per working day), leading to 205 dietary consultations but only 144 recorded assessments of the nutritional status (lack of information in medical records). Of the latter, 128 diagnoses of malnutrition were made, i.e. a PPV of 88.9%, 95% Confidence Interval = [83.8%, 94%]. Overall, only one quarter of readmitted patients had improved nutritional status.
Conclusions: The automatic e-mail alert system is operational and useful to effectively detect patients at risk of malnutrition and make follow up possible. In addition, an unfavorable evolution of the nutritional status of malnourished patients was observed.

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1. Introduction

Protein-energy malnutrition is caused by an imbalance between nutritional intake and need. It is responsible for an increase in morbidity and mortality and a decline in the quality of life for inpatients [1–3], especially the elderly [4–6], patients with cancer [7,8], chronic diseases [9,10] or after surgery [11,12]. In addition, malnutrition contributes significantly to the increase in frequency, duration and cost of hospital stays [1–3,13,14].

Nevertheless, the assessment of the nutritional status is not routinely carried out in the management of patients [15–17].

Studies have shown that clinical parameters for this evaluation were rarely traced and followed up in the medical record of hospitalized patients [18,19] and that this lack of nutritional assessment was in part related to a lack of physicians and caregivers knowledge in the field of nutrition [15].

To improve the nutritional care of hospitalized patients, the American Society for Parenteral and Enteral Nutrition (ASPEN) and the European Society for Clinical Nutrition and Metabolism (ESPEN) made recommendations for good clinical practice in screening of malnutrition [20,21]. These recommendations insist especially on the implementation of systematic screening for nutritional disorders in hospitalized patients on admission, regardless of their age. This screening must be done using simple tools and based on evidence-based medicine. Some tools are commonly used to screen for malnutrition, as Nutritional Risk Screening (NRS 2002), Subjective Global Assessment (SGA), and Mini Nutritional Assessment (MNA) [22–24].

In France, measures on nutrition care are listed in the National Health and Nutrition Program (PNNS) [25]. It proposes in particular the systematic screening of nutritional disorders in hospitalized patients by collecting three indicators within 48 h of admission: weight measurement, calculation of body mass index (BMI) and weight change before hospitalization [26]. This screening is part of the French Indicators for Improving Care Quality and Safety (IPAQSS). However, IPAQSS results in 2011 showed that only 20% of hospital medical records contained these three indicators [27]. In addition to this systematic screening, the PNNS recommends "the design of practical tools for the identification and treatment of malnutrition and the analysis of the procedures for their provision" (action 22.2) [25].

Data of the Program for the Medicalization of Information Systems (PMSI) could effectively contribute to the design of these tools. The PMSI, French equivalent of DRG (Diagnosis-related groups) case mix system in the United States [28,29], is indeed a systematic collection of medical and administrative data during any hospitalization [30]. All diagnosed malnourished inpatients are therefore recorded.

In this context, we have developed an original computer tool at the Dunkerque hospital (DH), Northern France: (i) detecting readmissions of patients with diagnosis coding of malnutrition during a previous hospitalization at the DH from the PMSI data and (ii) generating alerts by e-mail to the dietary department of the hospital. This tool was designed to target the detection of nutritional disorders in hospitalized patients at risk of malnutrition, in order to quickly provide nutritional care and help with organizing the dietary monitoring.

The objective of this study was to describe and evaluate this system and the activity of the nutrition department in connection with the alerts.

2. Materials and methods

2.1. Usual screening and coding of malnutrition at the Dunkerque Hospital

DH has 570 beds in medicine, surgery and obstetrics (MCO) activity. It also has 10 beds for rehabilitation care and 361 long-term beds. It recorded 54,321 stays in 2012 for MCO activity, of which 14,614 were hemodialysis sessions and 5,165 chemotherapy sessions for cancer. Nutritional management is performed by the nutrition department of the hospital with 9 dietitians, i.e. 7.3 Full Time Equivalents.

Usual screening for nutritional disorders is done using the following circuit: in the first 48 h of hospitalization, nutritional risk assessment is carried out by the carer or nurse, based on the recommendations of the French National Authority for Health (HAS) [31]. Depending on the results, the physician or nurse requests a dietary consultation which is performed within 24 h, and a dietary care plan is implemented.

The International Classification of Diseases, in its 10th revision (ICD-10) defines three stages of protein-energy malnutrition in adults: severe, moderate and mild, respectively codes E43, E44.0, E44.1. The coding of malnutrition in the PMSI is done by the dietitian after dietary consultation and can be modified if necessary by the physician who treated the patient. Classification of severity of malnutrition is based on the recommendations of the HAS [31]. Data are collected in Cora PMSI software (McKesson, version 3.7.701) in use since 2005.

2.2. Description of the automatic e-mail alert system

Every day, data of interest from Cora PMSI are automatically extracted using Talend Open Studio (Talend, version 4.0.2). Two data tables are built. Firstly, the table of patients with malnutrition during a previous hospitalization (since 2005) is obtained by SQL (Structured Query Language) query on the ICD-10 codes E43, E44.0 and E44.1. Secondly, the table of patients admitted in the last 24 h is obtained by SQL query on the date of entry <24 h.

These two tables are linked in order to identify stays of patients admitted in the last 24 h and previously coded as malnourished at the DH. Patient stays in hemodialysis sessions are excluded here, because these patients are routinely monitored by the nutrition department. In addition, the high number of stays in hemodialysis session — an average of three per week per patient — might cause an unnecessary load of the e-mail alert system.

For each identified stay, an e-mail alert is sent to the nutrition department from the mail server of the hospital (IBM Lotus Domino). The e-mail alert consists of two attachments summarizing information, firstly on the patient's current stay, secondly on his previous hospitalizations for which the diagnosis of malnutrition was coded.

In order not to send multiple alerts for the same stay, an exclusion table listing the stays for which an alert has been sent is incremented after each alert sent.

Algorithms for identifying stays and sending e-mail alerts were coded in PHP (Hypertext Preprocessor, version 5.4.3) and are executed from the command line interface (CLI) of Talend.

Finally, dashboards describing the alerts are built using the statistical R software (R Development Core Team, version 2.14), itself run from the CLI of Talend.

The steps described above are executed from a batch processing generated by Talend (.bat file) and executed automatically every day — including Saturday and Sunday — at 8:45 AM via the Task Scheduler in MS Windows (Microsoft, version XP pro).

The software tool was tested during the months of July and August 2012, which allowed, firstly to debug it, secondly to quantify the increase in workload for the nutrition service. The system was completely ready to use in September 1st 2012.

2.3. Evaluation of the automatic e-mail alert system

Data on sending and processing alerts by the nutrition department were collected for three months from September 1st to November 30th 2012.

Alerts were considered analyzed after reading and making contact with the hospital department in which the identified patient was hospitalized. A dietary consultation was carried out if necessary, during which an assessment of the nutritional status was established, if the medical record contained enough clinical or biological variables (weight, BMI, weight variation, serum albumin