Clinical Nutrition xxx (2015) 1–5

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Validity of diagnostic coding for undernutrition in hospitals

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ARTICLE INFO

Article history:
Received 14 July 2014
Accepted 28 March 2015

Keywords:
Undernutrition
Nutritional screening guidelines
Positive predictive value
Validation
Danish National Registry of Patients

SUMMARY

Background & aims: We examined the accuracy of ICD-10 diagnostic coding for undernutrition in Danish Hospitals, including the use of Nutritional Risk Screening 2002 guidelines.
Methods: We investigated a random sample of hospitalized patients registered in the Danish National Registry of Patients with a discharge diagnosis of undernutrition between 2002 and 2011 in the North Denmark Region. Based on medical record review we estimated the positive predictive value (PPV) of the undernutrition diagnosis. Stratification was made by calendar period, hospital type (local vs. university), gender, age, speciality and type of diagnosis code. Subsequently, we evaluated the use of Nutritional Risk Screening 2002 as recommended by the European Society of Clinical Nutrition and Metabolism and the Danish National Board of Health.
Results: We could retrieve the medical records of 172/200 sampled patients with undernutrition (86%). Nineteen patients were classified as being definite (screening-confirmed) cases and another 103 patients as probable (clinically-confirmed) cases of undernutrition, yielding a PPV of 11.0% (95% confidence interval [CI]: 6.8–16.7) for definite undernutrition and 70.9% (95% CI: 63.5–77.6) for any confirmed undernutrition. Only 26.2% of patients coded with undernutrition had been screened according to the Nutritional Risk Screening 2002.
Conclusions: This population-based study found modest agreement between ICD-10 codes for undernutrition compared to a standard method (Nutritional Risk Screening 2002) as documented in medical doctors' records in Danish hospitals. Diagnoses of undernutrition contained in hospital discharge registries should be used with caution.

1. Introduction

Undernutrition is a debilitating condition, which is very common in hospitalized patients [1,2]. Approximately 20–50% of patients in European hospitals are undernourished [1–3]. Loss of weight or a decreased energy- and protein intake during hospitalization has been associated with four-fold increased mortality [4–6]. Therefore, a targeted nutritional effort to improve the clinical course of patients with undernutrition has received increasing attention in recent years in European countries [7–9]. However, efforts have been hampered by lack of a general accepted definition of undernutrition or gold standard method of identification [3]. In 2002, the European Society of Clinical Nutrition and Metabolism (ESPEN), recommended the Nutritional Risk Screening 2002 (NRS 2002), which are guidelines to assess nutritional risk via screening. This should be linked to nutritional planning, monitoring, and communication in all hospitalized non-terminal patients [10,11]. In association with the Danish National Board of Health the NRS 2002 was applied in Danish Hospitals that same year [1,10].

A range of diagnostic codes are used for undernutrition in administrative health care databases [12]. These databases may be a valuable tool in epidemiological studies of the occurrence, risk and prognosis of undernutrition, if the validity of diagnosis coding is sufficient [13,14]. To our knowledge, no study has validated the undernutrition diagnosis codes in hospital registries. We therefore conducted this validation study to estimate the positive predictive value (PPV) of the undernutrition diagnosis in the population-based Danish National Patient Registry (DNRP). In addition, we

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http://dx.doi.org/10.1016/j.clnu.2015.03.017

determined whether the validity of the undernutrition diagnosis varied by type of diagnosis code, calendar year of admission, hospital or department type, patient sex and age. Subsequently, we examined the use of NRS 2002 among patients who had been coded with a diagnosis of undernutrition in Danish hospitals.

2. Materials and methods

Since 1968 Danish residents or emigrants have been assigned to a unique 10-digit civil registry number (the CPR number) [15]. Patients are identified by their CPR number in Danish registries. This enabled us to link national data on hospital diagnoses and medical records using the CPR number and identify all patients hospital-diagnosed with undernutrition between 2002 and 2011 residing in the North Denmark Region [16]. The region is inhabited by 580,000 people, approximately one tenth of the total population in Denmark and is demographically well-defined [17]. There are four major hospitals in the region of which Aalborg University Hospital also serves as the region's referral hospital and approximately 200 patients are admitted per 1000 inhabitants per year.

2.1. Identification of patients with coded undernutrition

In 1977 the DNRP was established and tracks each hospital admission in Denmark. The registry covers 99.4% of all admissions and discharge records from Danish hospitals including private and public hospitals [18]. Physicians use the Danish version of the International Classification of Diseases, 8th revision (ICD-8) (1977–1993) and 10th revision (ICD-10) (1994 onward) to code diagnoses.

Using the DNRP, we identified all patients except children < 15 years with a first-time hospital discharge in the period 2002–2011 associated with any undernutrition or malnutrition diagnosis (ICD-10 codes: E12 Malnutrition-related diabetes mellitus, E41 nutritional marasmus, E42 marasmic kwashiorkor, E43 Unspecified severe protein-energy malnutrition, E44 Protein-energy malnutrition of moderate and mild degree, E46 Not specified protein-energy malnutrition, E47 Unspecified protein-energy malnutrition, E64 Sequelae of malnutrition and other nutritional deficiencies and Z038F Clinical suspicion of malnutrition). According to the codes, the type of undernutrition was categorized as “unspecified undernutrition” (ICD-10 codes E42, E43, E44, E46, and E47), “complications of undernutrition” (ICD-10 codes E12, E41, and E64), or “suspected undernutrition” (ICD-10 code Z038F).

2.2. Medical record validation

To validate the diagnoses of undernutrition identified in the DNRP, we randomly selected 200 patients using the SAS RANUNI function (SAS Institute, Cary, NC). We used the CPR numbers to identify the corresponding medical records. All available information in the medical records was assessed using a detailed evaluation form according to NRS 2002 standards [7,10]. The records were reviewed by the first author (NHR), and all cases with uncertain diagnoses based on the available information were discussed with a nutrition specialist (HHR) and diagnoses were made according to consensus.

According to ESPEN and the Danish National Board of Health NRS 2002 we used this as a reference standard for validating ICD-10 diagnostic codes for undernutrition. Within 24 h of hospitalization all non-terminal patients should be evaluated by a primary nutritional screening (NRS 2002). Based on the results of the initial screening, a second screening with more detailed questions may be performed. On the basis of the screening results it is assessed that whether the patients are at nutritional risk and what actions to take. Patients scoring 3 points or higher in the second screening are defined as being at nutritional risk and should have administrated a nutritional plan which is carefully monitored throughout hospitalization. Finally, all activity regarding undernutrition should be noted in the discharge summary to further communication in hospital auspices [1,7,10].

We classified patients with undernutrition as either definite, probable or no evidence of undernutrition (diagnosis rejected). *Definite undernutrition* was accepted only in patients with ≥3 points in the second nutritional screening according to NRS 2002. Patients with clinical symptoms suggestive of undernutrition who did not meet the criteria for definite undernutrition were classified as *probable (clinically-confirmed) undernutrition*. Clinical confirmation was based on subjective and objective assessment made by the physicians and noted in the medical records. Subjective criteria included a clinical notion of undernutrition in the medical record, or undernutrition described and listed in the discharge summary. Objective criteria consistent with undernutrition included decrease in BMI during admission, current or planned nutritional treatment such as high protein meals, enteral nutrition and parenteral nutrition or, recent weight loss of more than 5% during the last 3 months, current BMI < 21.5, reduced food intake during the last week corresponding to less than 75% of requirements, or reduced muscle strength and weakening noted by the patient. We rejected the undernutrition diagnosis, when none of the above was present. Also, patients who in the second nutritional screening had received 2 points or less were rejected.

2.3. Statistical analyses

First, we calculated the PPV with 95% confidence interval (CI) of an undernutrition diagnosis defined as the proportion of patients with a code for undernutrition in the DNRP who had definite or probable undernutrition according to their medical records. PPVs were calculated for the whole study period and then stratified by calendar period (2002–2006 and 2007–2011), to examine whether the PPV has changed over time. In addition, PPVs were calculated according to type of undernutrition diagnosis code, age group (15–39, 40–64, 65–79, 80 years or older), hospital type (university vs. local), department type (medicine vs. surgery), and gender. Subsequently, we evaluated the proportion with NRS 2002 [11] among all patients with a discharge diagnosis of undernutrition in the DNRP.

We analyzed the data with Stata Software (v. 11.1; Stata Corp. College Station, TX). The study was approved by the Danish Data Protection Agency (Journal no. 2010-41-4969).

3. Results

3.1. Description of study population

We identified 511 patients >15 years in the North Denmark Region who were registered with a first-time diagnosis code for undernutrition in the DNRP between 2002 and 2011. Among the 511 patients with a diagnosis of undernutrition 95 (18.6%) were classified as having unspecified undernutrition, 350 (68.5%) had complications of undernutrition, and 66 (12.9%) had suspected undernutrition. In 142 (27.7%) of the 511 patients the ICD-10 diagnosis of undernutrition was the primary diagnosis code indicating that undernutrition was the condition that prompted patient admission and the main condition responsible for the completed diagnosis and treatment course. In the remaining 369 (72.2%) patients the diagnosis was given as a secondary diagnosis. Among patients with undernutrition as a secondary diagnosis, the most frequent primary diagnoses were E00–E80 endocrine, nutritional

Please cite this article in press as: Rasmussen NH, et al., Validity of diagnostic coding for undernutrition in hospitals, Clinical Nutrition (2015), http://dx.doi.org/10.1016/j.clnu.2015.03.017