Mal J Nutr 23(3): 385 - 396, 2017

Quality Coding of Malnutrition under the Casemix System in Hospital Universiti Sains Malaysia

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ABSTRACT

Introduction: Detailed clinical information is important for the Casemix System to generate valuable Case Based Group (CBG) for malnourished geriatric patients. Clinical coding for malnutrition provides useful information on the nutritional health of patients for treatment purposes. **Methods:** This cross-sectional study with purposive sampling involved a total of 130 geriatric patients (>60 years) at Hospital Universiti Sains Malaysia (USM). Nutritional assessments were performed such as anthropometrics measurement, Subjective Global Assessment (SGA), and biochemical assessment. The patients' medical records and coded data were systematically reviewed to observe the documentation of nutritional information and coding criteria based on the International Classification for Diseases (ICD-10). **Results:** The prevalence of malnutrition among the geriatric patients was 35.4%. Proper documentation of required nutritional information was found in less than 50% of the cases. None of the malnourished patients were documented and coded with malnutrition diagnosis, despite being given nutritional interventions. The reasons given for this omission were related to the lack of awareness (50%) and incomplete medical documentation (50%). Further analysis revealed that uncoded diagnosis, miscoding, missing, and unavailable codes for nutritional counselling and oral nutritional supplementation were the main contributors to the incomplete records. **Conclusion:** The quality of clinical coding for malnourished geriatric patients in the hospital should be improved. A structured assessment and standard documentation is recommended to improve the quality of healthcare provision for malnourished geriatric patients.

Key words: Casemix system, clinical coding, documentation, malnutrition, nutritional information

INTRODUCTION

With the advancement and sophistication of the healthcare system, the evolution of clinical information system has also improved. In conjunction with the implementation of the Casemix system in Hospital USM, all requisite elements must be evaluated to boost the efficiency and quality in the healthcare delivery system. Thus, unequivocally, the nutritional area as part of clinical services has to be addressed. Clinical coding, which is known as a process of translating clinical information of diagnoses and procedures into numeric

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or alpha-numerical codes, facilitates the recovery of all medical histories for various purposes as secondary data are used. Therefore, it is very important to present the correct diagnosis and procedure coding for the Casemix grouper to generate the right Case Base Group (CBG) for each patient. Meanwhile, standardised storage data in the form of indexed clinical information is highly in demand to retain the quality of the raw data prior to storage. Hence, clinical documentation has become one of the factors that could potentially influence the completeness and accuracy of coded data at the end of the care episode. Moreover, clinical data play a vital role in various aspects in healthcare management such as planning and evaluation of services, resource allocation, policy development, and reimbursement (Marco *et al*., 2011; Ockenga *et al*., 2005). Thus, the quality of clinical coding has become the main agenda discussed at the higher level of hospital management, primarily under the Casemix System.

Furthermore, in order to clearly comprehend the importance of clinical malnutrition diagnosis and intervention in the context of the Casemix System, various studies have been conducted extensively. These include clinical documentation of nutritional information, the prevalence of malnutrition coding, resource consumption, and reimbursement involving malnutrition. Unfortunately, studies have most often claimed that clinical documentation and coding for malnutrition were under-reported and do not reflect the actual occurrence, despite the intervention given. In fact, malnutrition has been recognised as a major comorbidity and complication (MCC) as well as complication and comorbidity (CC) by the centres of Medicare and Medicaid Services (CMS) in the United States (CMS, 2007). Moreover, malnutrition possesses some relevant criteria to be coded as this condition requires professional skills and cost-related intervention (Steinbusch *et al*., 2007; Raja *et al*., 2004). Malnutrition is also frequently reported to be associated significantly with poor clinical progress such as longer hospitalisation (Vanderwee *et al*., 2010), complications (Sullivan, Bopp & Roberson, 2002), frequent re-admission (Visvanathan, Penhall Chapman, 2004), and higher mortality rates (Stratton *et al*., 2006). Nonetheless, these elements have been translated into another perspective of the malnutrition implication, that is, an increase in healthcare cost management associated with malnutrition events (Lim *et al*., 2012; Marco *et al*., 2011; Raja *et al*., 2004).

Besides this issue, the geriatric population has been well-reported to be malnourished in clinical settings due to a number of complex factors, such as physiological changes of ageing (Vanderwee *et al*., 2010), disease condition (Mudge *et al.,* 2000), and socio-economic factors (Sakinah *et al*., 2012). Further, worldwide prevalence of malnutrition among hospitalised geriatrics has been reported to be 20% to 60% (Stratton *et al*., 2006; Vanderwee *et al*., 2010; Volkert *et al*., 2010). Meanwhile, in Malaysia, the prevalence is reported to be between 10.5% and 55% (Sakinah *et al*., 2010; Suzana, Wong & Wan Chik, 2002). Hence, it is crucial to produce complete and detailed clinical information for malnutrition to ensure the quality of patient care information in this area and improvements in the healthcare delivery system. A practical mechanism to improve clinical coding of malnutrition is needed to present a clear understanding of how each of the related components play a vital role to generate complete and accurate clinical coding.

Therefore, this study focused on quality coding of nutritional aspects of malnutrition with the aims of (1) exploring the completeness of documentation for nutritional information, and (2) identifying the causes of coding issues for malnutrition among hospitalised geriatrics in Hospital USM.

METHODS

Setting and sample

This cross-sectional study was conducted from September 2012 to March 2013 at Hospital USM, Kubang Kerian, Kelantan. Hospital USM is a 786-bed teaching and referral hospital. Two sample size calculations were performed using the formula given by Daniel (1999). The sample size calculation was based on the prevalence of malnutrition among hospitalised geriatrics (Sakinah *et al.*, (2012) and documentation of nutritional information among hospitalised geriatrics (Volkert *et al.*, 2010). As a result, a minimum sample size was set at 138 with a maximum of 165 subjects, which was adequate to achieve the aims of this study.

The subject area included ten wards of various clinical disciplines: medical, surgical, oncology, ophthalmology, and orthopaedics. Geriatric patients aged 60 years and above were recruited based on the purposive sampling technique. Other inclusion criteria in this study were: able to communicate verbally or assisted by a caregiver, newly admitted within 72 hours, not in a critically ill condition, consented to participate, and mentally competent, and not physically deformed. Meanwhile, the exclusion criteria for this study were admission before September 2012, oral communication difficulties and no caregiver, critically ill patients and those who refused to take part in this study.

Data collection procedures

Two trained researchers were assigned to the data collection process. A structured questionnaire was used to record the data on socio-demographics, clinical, nutritional information and coding details. The coded data were retrieved from the medical record department (MRD) of Hospital USM. The coding process was performed by clinical coders in MRD. This study deloberately did not code any diagnosis or procedure.

Ethical consideration

This study was approved by The Human Research Ethics Committee, Universiti Sains Malaysia [ref: USMKK/PPP/JEPeM 249.4.(4.9)]. Eligible participants were explained the purpose and procedure of the study prior to obtaining their informed consent.

Nutritional Assessments

Subjective Global Assessment (SGA)

A multidimensional nutritional assessment tool of SGA (Detsky *et al.*, 1987) was used in this study to identify the well-nourished and malnourished patients. SGA consists of five features of history and physical examination assessments. Individual nutritional status was further classified into one of these categories; A (well-nourished), B (moderately malnourished), and C (severely malnourished).

Anthropometry measurements

Anthropometry measurements included weight, height, body mass index (BMI), mid upper arm circumference (MUAC), and calf circumference (CC) measurements. An estimation weight formula (Chumlea *et al.*, 1988) was applied to those where the standard weight measurement was difficult. Meanwhile, individual height was standardised by using an alternative formula (Ngoh, Sakinah & Harsha Amylia, 2012) due to the kyphosis condition among geriatrics. The derived weight and height were then used to obtain the BMI. A universal cut-off point for BMI of less than 18.5kgm^{-2} indicator was used to classify individuals into malnutrition or chronic energy deficiency (CED) (WHO, 2006).

MUAC (men <23.0cm; women <22.0cm) and CC (men <30.1cm; women <27.3cm) indicates muscle wasting (Sakinah *et al.*, 2012). The MUAC measurement was taken around the arm without compressing the soft tissue, perpendicular to the long axis of the arm. Meanwhile, the CC measurement was taken by using a measuring tape

Table 1. Coding issues

Coding issue	*Definition*
Uncoded	The malnutrition code was not assigned.
Miscoding	Incorrect code at the third digit level coding for malnutrition.
Missing code	Patient's diagnosis- and procedure-related codes were not coded by the coder.
Unavailable code	Related malnutrition code is not available in ICD catalogue

around the calf at the widest part. The readings were recorded to the nearest 0.1cm.

Biochemical assessment

The biochemical data of haemoglobin and albumin were obtained from the medical records. The individual participant was classified as anaemic (men <13g/L; women <12g/L) and hypo-albuminemia (<35 g/L) based on the available results.

Clinical coding for malnutrition

The codes for diagnosis and procedure were based on the ICD-10 and the International Classification for Diseases Clinical Modification (ICD-9-CM) (WHO, 2010a; 2010b), respectively. This study did not deliberately code the participants' diagnoses and procedures; however, a series of coded diagnoses and procedures were obtained from MRD with permission and audited by the head of the department. Furthermore, malnutrition codes of E43 (unspecified severe protein-energy malnutrition), E44 (moderate protein-energy malnutrition), E44.1 (mild protein energy malnutrition), and E46 (unspecified protein-energy malnutrition) were systematically identified. Besides, nutrition-related procedures available in ICD-9-CM with codes 96.6 for enteral feeding and 99.15 for total parenteral nutrition (TPN) were also noted if they were available in the list. In addition, this study also looked into blood transfusion procedures (99.0 – 99.04) if available. This was deliberately carried out to notify that this intervention was done by a physician due to an acute malnutrition condition (despite the nutritional intervention prescribed) to help correct the short term nutritional deficits. Besides, this study used intervention indicators which represented participants who were identified as malnourished by a healthcare provider in the absence of malnutrition diagnosis.

In addition, individual series of coded diagnoses and procedures were reviewed. Hence, a further analysis of the coded data was conducted and the cases were classified into predefined issues listed in Table 1. Systematic findings of the reasons for coding issues found pertaining to malnutrition are presented via the algorithm structure to clearly present the sources of error occurrences.

Statistical analysis

The data were analysed by using Statistical Package for the Social Sciences (SPSS) version 20. Descriptive data were presented in frequencies and percentages for categorical data, while means and standard deviations (SD) were used to present continuous data. The independent sample *t*-test and Pearson Chi-square test were employed to examine the differences between continuous and categorical data. Level of significance was set at $p<0.05$ for all statistical analyses.

Table 2. Socio-demographic characteristics of patients

	Men (n=49)	*Women (n=81)*	*Total (n=130)*
	Frequency (%)		
Age (year) mean (SD)	69.6 (6.76)	69.7 (7.15)	69.7 (66.99)
60-74	34 (69.4)	62 (76.5)	96 (73.8)
≥75	15 (30.6)	19 (23.5)	34 (26.2)
Ethnicity			
Malay	48 (98.0)	71 (87.7)	119 (91.5)
Chinese	1 (2.0)	10 (12.3)	11 (8.5)
Marital Status[a]			
Single or widowed	5 (10.2)	45 (55.6)	50 (38.5)
Married	44 (89.8)	36 (44.4)	80 (61.5)
Educational Status			
None	11 (22.4)	41 (50.6)	52 (40.0)
Primary	26 (53.1)	27 (33.3)	43 (33.1)
Secondary	9 (18.4)	12 (14.8)	21 (16.2)
Tertiary	3 (6.1)	1 (1.3)	4 (3.0)
Living Arrangement			
Alone	2 (4.1)	8 (9.9)	10 (7.7)
With children or relatives	47 (95.9)	73 (90.1)	120 (92.3)
Employment Status[a]			
Unemployed	26 (53.1)	74 (91.4)	100 (76.9)
Employed or Pensioner	23 (46.9)	7 (8.6)	30 (23.1)

[a] (p<0.05) Pearson Chi-square test significant difference between sexes

RESULTS

Baseline characteristics of subjects

The study consisted of 130 geriatric patients, withh 37.7% being men and 62.3% women with the racial breakdown being 91.5% Malays and 8.5% Chinese. The mean (SD) age of the subjects was 69.6 (6.76) years for men and 69.7 (7.15) years for women. Table 2 illustrates the socio-demographic characteristics of the geriatric patients involved in this study. The three most common Casemix Major Group (CMG) among the patients were found to be CMG of the cardiovascular system (32.3%), followed by respiratory system groups (10.8%), and CMG of the eye and adnexa (6.2%).

Nutritional status

Table 3 illustrates the details of nutritional status of patients based on anthropometrics measurements, SGA, and biochemical assessment. Of the 130 patients, 16.9% were classified as having CED (BMI<18.5kgm^{-2}). Meanwhile, the GA assessment revealed that 35.4% of the patients were malnourished with SGA-B (moderately malnourished; 26.2%) and SGA-C (severely malnourished; 9.2%). Both BMI assessments (underweight men 8.2%, women 22.2%) and SGA (men 22.4%, women, 43.2%) indicated that women had a higher prevalence of malnutrition compared to men (p<0.05). The assessment of MUAC and CC measurements demon-strated that 15.4% to 25.4% of the patients had muscle wasting. Furthermore, 42.3% and 62.5% patients suffered from hypoalbuminemia and anaemia, respectively.

Documentation of nutritional information

Table 4 shows the frequency of the documentation for nutritional parameters

Table 3. Nutritional status of patients

Variables	*Men (n=49)*	*Women (n=81)*	*Total (n=130)*
		Frequency (%)	
BMI (kgm^{-2}), mean (SD)	23.43 (4.05)	23.21 (5.75)	23.29 (5.16)
Underweight (<18.5 kgm^{-2})	4 (8.2)	18 (22.2)[b]	22 (16.9)
Normal (18.5-24.99 kgm^{-2})	27 (55.1)	31 (38.3)	58 (44.6)
Overweight (25.0-29.9 kgm^{-2})	15 (30.6)	22 (27.2)	37 (28.5)
Obese (≥30.0 kgm^{-2})	3 (6.1)	10 (12.3)	13 (10.0)
MUAC, mean (SD)	27.00 (3.41)	25.87 (4.64)	26.29 (4.23)
Normal (men ≥ 23.0 ; women ≥22 cm)	43 (87.8)	67 (82.7)	110 (84.6)
Muscle wasting (men <23.0 ; women <22 cm)	6 (12.2)	14 (17.3)	20 (15.4)
CC, mean (SD)	31.77 (3.32)	29.88 (4.57)[b]	30.59 (4.23)
Normal (men ≥ 30.1 ; women ≥27.3 cm)	39 (79.6)	58 (71.6)	97 (74.6)
Muscle wasting (men <30.1 ; women <27.3 cm)	10 (20.4)	23 (28.4)	33 (25.4)
SGA			
A : Well nourished	38 (77.6)	46 (56.8)	84 (64.6)
B : Moderately malnourished	10 (20.4)	24 (29.6)	34 (26.2)
C : Severely malnourished	1 (2.0)	11 (13.6)	12 (9.2)
Albumin (g/L), mean (SD)	36.63 (4.83) (n=46)	35.27 (5.33) (n=77)	35.78 (5.17) (n=123)
Normal (≥35 g/L)	29 (63.0)	42 (54.5)	71 (57.7)
Hypoalbunemia (<35 g/L)	17 (37.0)	35 (45.5)	52 (42.3)
Haemoglobin (g/L), mean (SD)	12.1 (1.83) (n=49)	10.89 (2.04)[a] (n=79)	11.35 (2.04) (n=128)
Normal (men ≥13 g/L ; women ≥ 12 g/L)	16 (32.7)	32 (40.5)	48 (37.5)
Anaemia (men <13 g/L; women <12g/L)	33 (67.3)	47 (59.5)	80 (62.5)

[a] (p<0.05); Independent t-test, [b] (p< 0.05); Pearson Chi-square test significant difference between sexes
BMI- Body Mass Index; MUAC- Mid Upper Arm Circumference; CC- Calf Circumference; SGA- Subjective Global Assessment

assessed in the study based on nutritional status. Out of 130 cases, 51.5% were not measured and documented for their weight. Meanwhile, more than 70% of the participants had no record of height. On evaluation of height documented among malnourished subjects, only 15 (32.6%) patients had their height documented. Moreover, only a small number of the subjects had comments regarding weight loss, and all these cases were classified as severely malnourished.

Next, the documentation of current dietary intake was available for 43% of the total number of patients. For the malnourished patients, only 21.7% had

Table 4. Documentation of nutritional information of patients

Parameters	*Well-nourished (n=84)*	*Malnourished (n=46)*	*χ2*	*p-value*
	Frequency (%)			
Weight				
Documented	40 (47.6)	23 (50.0)	0.067	0.795
Undocumented	44 (52.4)	23 (50.0)		
Height				
Documented	21 (25.0)	15 (32.6)	0.859	0.354
Undocumented	63 (75.0)	31 (67.4)		
Weight loss				
Documented	0	4 (8.7)	-	0.014[b]
Undocumented	84 (100)	42 (91.3)		
Current dietary intake				
Documented	26 (31.0)	30 (65.2)	14.232	0.000[a]
Undocumented	58 (69.0)	16 (34.8)		
Loss of appetite				
Documented	5 (6.0)	10 (21.7)	7.257	0.007[a]
Undocumented	79 (94.0)	36 (78.3)		
Digestion problem				
Documented	20 (23.8)	22 (47.8)	7.839	0.005[a]
Undocumented	64 (76.2)	24 (52.2)		

[a]($p < 0.05$) Pearson Chi square test, [b]($p < 0.05$) Fisher Exact test; significant different between well nourished (SGA-A) and malnourished (SGA B and C).

been reported with loss of appetite in their medical records. The statistical comparison performed revealed that the frequency of documentation for weight loss, current dietary intake, loss of appetite, and digestion problems between the well-nourished and the malnourished patients was significant with a *p*-value of less than 0.05.

The study found that only 50% of the malnourished patients received nutrition intervention in the form of both medical (vitamin and blood transfusion) and nutritional interventions (dietary counselling and oral nutritional support). Meanwhile, the other 50% remained untreated. On the other hand, none of the malnourished patients were diagnosed and documented with malnutrition diagnosis as part of a medical problem. Despite a total of 83.8% of discharge summaries being found to be complete with details of diagnoses and procedures, none had any information related to malnutrition.

Clinical coding for malnutrition

None of the subjects were diagnosed and coded with malnutrition. A detailed assessment conducted at every single stage from documentation to coding process identified the root causes for coding issues among the malnourished participants (Figure 1). At the documentation level, the study discovered two reasons that directly influenced the quality of coding for malnutrition. Half of the malnourished participants were unrecognised. Hence, due to lack of awareness, nutritional evidence was not available to support the judgement in the coding process.

The second cause at this level was due to incomplete documentation of malnutrition

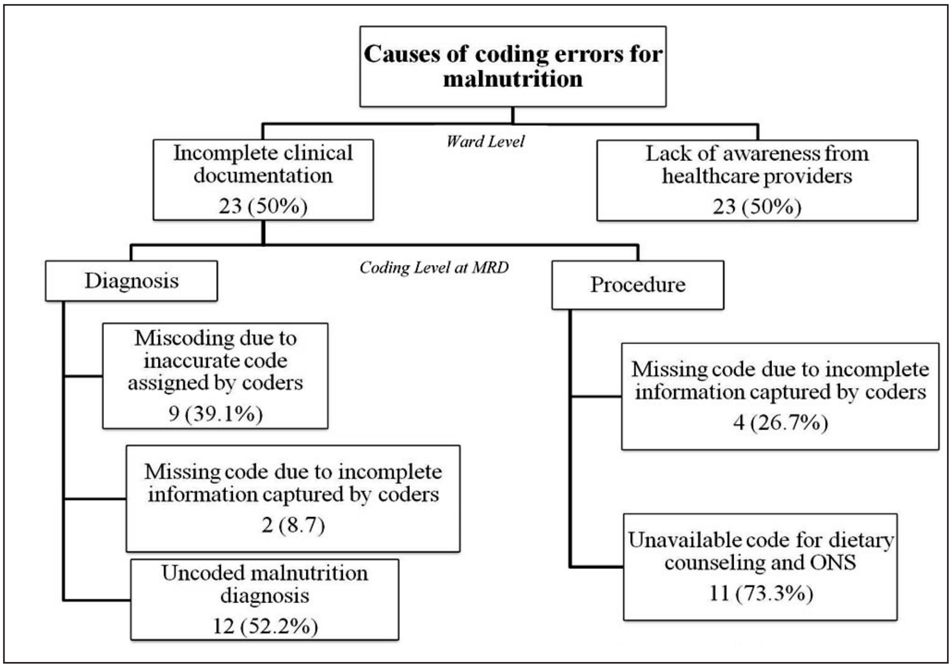

Figure 1. Causes of coding issues for malnutrition
Note: ONS- Oral nutritional supplement, MRD- Medical Record Department

diagnosis, despite the assessment and interventions mentioned.

At the coding level, the study found that 52.2% of the cases were classified as uncoded diagnosis and all the miscoding cases were related to incorrect codes at the third digit level for Diabetes Mellitus (DM). In fact, the two common codes assigned for DM were E11.9 (non-insulin-dependent DM without complications) and E14.9 (unspecified DM without complications). However, the code E12 (malnutrition-related DM) with the inclusion of insulin and non-insulin dependent characteristics was available in ICD-10.

Lastly, the third issue related to diagnosis coding was the missing of codes, whereby related diagnoses failed to be coded. Meanwhile, for procedure coding, the two issues found were missing codes for the related procedures and non availability of codes for dietary counselling as well as for oral nutritional supplement in the ICD catalogue.

DISCUSSION

The present data confirms malnutrition prevalence data which had been previously revealed by Malaysian studies (Sakinah *et al*., 2010; Suzana *et al*., 2002). In addition, the higher prevalence of malnutrition found was also compounded by a higher number of muscle wasting, hypoalbuminemia, and anaemia cases as emphasised by Sakinah *et al*. (2010). This indicates that malnutrition is still prevalent in the clinical setting among geriatrics. However, the documentation of nutritional information found in this study was suboptimal. Documentation of anthropometry for weight and height clearly indicated that the basic and essential indicators of nutritional information are often being neglected as previously highlighted (Vanderwee *et al.*, 2010; Volkert *et al.,* 2010). Although pre-printed columns for weight and height were found in the medical records, they either remained blank or had the word '*Unfit*' stated, as observed by Waiztberg, Caiaffa & Correia (2001). This suggests that the clinical staff did provide details concerning basic nutritional information, but lacked the will to complete the form.

Meanwhile, only a small number of patients had comments regarding their weight loss. The use of this indicator might be challenging as geriatrics were frequently reported to have difficulty in memorising their weight changes (Stratton *et al*., 2006). Hence, in the absence of weight measurement, the use of this basic indicator may impair future nutritional care process. Furthermore, the assessments of dietary intake, loss of appetite, and digestion problems revealed that the majority of the subjects were not assessed for these nutritional indicators as less than 50% of the patients were observed to have documentary evidence of these parameters.. Likewise, a previous study noted that less than 37% of the cases had their nutrition-related problems documented although the researcher found that half of the subjects suffered from nutritional problems (Volkert *et al*., 2010). These four indicators which were found to be significantly higher among those who were malnourished compared to well-nourished patients (p<0.05) are invaluable for monitoring those with a high risk of developing nutritional deterioration during hospitalisation.

Nonetheless, none of the geriatric patients in this study were diagnosed with malnutrition as a significant medical problem. This is not surprising since studies in both Singapore (Raja *et al.,* 2004) and Australia (Lazarus & Hamlyn, 2005) found that only one out of 105 and 137 malnourished subjects, respectively, was documented with malnutrition diagnosis in the medical folder. Obviously, the diagnosis of malnutrition is often missing and neglected in the daily clinical routine among geriatric patients. Thus, it can be concluded that despite the nutritional judgements, clinicians either unintentionally or are unaware of the importance of listing malnutrition diagnosis in the medical records.

In light of poor nutritional assessment and documentation, it is not surprising that only half of those malnourished were provided with intervention measures. The inadequate intervention may suggest that the problem of malnutrition either failed to be identified or viewed as clinically unimportant due to lack of awareness among healthcare providers (Marco *et al*., 2011; Lazarus & Hamlyn, 2005). In fact, the benefit of nutritional intervention does not apply to individuals only but also extends to health care cost, resource consumption, and quality of services provided (Ockenga *et al*., 2005; Rypkema *et al.,* 2003).

The present study indicates that none of the malnutrition cases were coded. Undeniably, lack of standardised diagnostic characteristics and documentation practices of nutritional information have contributed to the confusion and ambiguity for coders to interpret, thus increasing the potential for misdiagnosis of malnutrition (White *et al.,* 2012). In addition, the present findings support previous literature emphasising that the quality of clinical coding is highly influenced by the completeness and accuracy of medical records maintained by healthcare professionals (Cassidy, 2012; Marco *et al*., 2011; Ockenga *et al*., 2005; O'Malley *et al.,* 2005). Level of knowledge, interest, priority, responsibilities, and attitude towards this issue may explain the barriers of nutritional care practice at ward level (Vanderwee *et al.,* 2010).

The optimum use of available nutritional information is potentially questionable. Coding practice that does not allow the use of dietician assessment to extract the diagnosis may also explain the absence of coding for malnutrition diagnosis. In fact, recently, it has been recommended that documented confirmation of malnutrition, which is obtained from the discharged summary, physician or Nutritional Support Team, is a valid document for coders to generate the appropriate code (Alvarez *et al.*, 2010; Cassidy, 2005). This suggestion is practical with appropriate training and knowledge dissemination among healthcare professionals and clinical coders. In order to facilitate the efficiency and effectiveness of nutritional care for malnutrition, the coding procedures for nutritional intervention in the form for dietary counselling and oral nutritional supplement must be presented together with the diagnosis. However, the universal concept of ICD may explain the absence of related codes at the moment.

Several limitations of the study are acknowledged. First, the reasons for the coding issues concerning malnutrition had limited interpretations. The results obtained through a summary of the key findings were only measured by a single party observation. Notably, the complexity of the coding process involves a multidisciplinary approach. Therefore, perceptions from all parties involved would be valuable to add information on the barriers to generate good quality clinical coding pertaining to malnutrition.

CONCLUSION

The quality of clinical documentation and coding for malnutrition were found to be suboptimal. The study found that the main sources of coding error occurred at two levels: the ward and the medical record department where the coding process takes place. A standardised system to routinely document nutritional information is critically important to facilitate the communication index among healthcare providers, the continuum of monitoring a patient's nutritional status, and most importantly, the coding process. Therefore, it is recommended that the barriers to producing good quality coding should be adequately addressed.

ACKNOWLEDGEMENTS

We would like to thank all participants who participated in this study, the staff from Hospital USM and clinical coders of the medical record department of Hospital USM, who readily shared their knowledge and expertise in clinical coding.

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