Malnutrition risk prevalence and clinical outcomes among acute hospital inpatients in Hong Kong

ORIGINAL ARTICLE

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ABSTRACT

Introduction. Studies have suggested that 20% to 50% of inpatients are malnourished. This study aimed to investigate the prevalence of malnutrition risk in inpatients at an acute hospital and to evaluate the association between nutritional risk and clinical outcomes.

Methods. Records of 40,105 adult patients admitted to our hospital between January and December 2016 were retrieved. We recorded patient Malnutrition Screening Tool (MST) scores (range, 0–5) and outcomes after discharge from hospital such as length of hospital stay (LOS), 28-day emergency readmission rate, and death. The malnutrition risk was categorised into three levels according to MST score: low risk (0–1), medium risk (2), and high risk (≥ 3). We made comparisons among the three groups, and between the low-risk group and the medium- and high-risk (at-risk) group.

Results. The prevalence of malnutrition risk was 9.2%. Malnutrition risk was 12.0% among those aged ≥ 65 years and 6.1% among those aged 18 to 65 years. The low-, medium- and high-risk groups differed significantly in terms of the mean patient age (64.2 vs. 70.8 vs. 73.7 years, $p < 0.01$) and the mean LOS (4.2 vs. 6.4 vs. 7.4 days, $p < 0.001$). The emergency readmission rate within 28 days was higher in at-risk patients than in low-risk patients (25.1% vs. 14.6%, odds ratio=2.0, $p < 0.001$), as was the mortality rate (8.5% vs. 2.3%, odds ratio=3.9, $p < 0.001$).

Conclusion. Malnutrition is a common problem among hospitalised patients. The use of a validated malnutrition screening tool to lower the malnutrition risk is necessary. A multicentre cross-sectional study on the effect of malnutrition on clinical outcomes is needed for developing service-quality enhancement measures.

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INTRODUCTION

Malnutrition is defined as a state of nutrition in which an excess or deficiency of energy, macro- and micro-nutrients causes adverse effects on clinical, functional, and economic outcomes.¹ Malnutrition is common in health care settings, particularly in an acute care hospitals, when patients reduce their food

intake owing to neurological disorders (including dysphagia) that decrease the ability to self-feed, side-effects of drugs or treatments, or deterioration in taste and smell leading to a poor appetite.² Malnutrition is more likely to develop in older adults with comorbid chronic conditions, impaired adaptation to inflammatory-catabolic states, or a heightened risk of acute diseases.³ By 2050, the number of older

adults worldwide is set to triple from 605 million to 2 billion; a comprehensive system is needed to prevent malnutrition and associated adverse consequences.⁴

The prevalence of malnutrition has been reported to be 20% to 50% among hospitalised patients,⁵⁻⁷ but the sample size in most studies was small. In Hong Kong, two studies more than 10 years ago reported the prevalence of malnutrition among geriatric and stroke patients.^{2,8} The prevalence was likely underreported because of failure to recognise malnutrition in inpatients (60% to 85%) and outpatients (64% to 73%).⁹ Malnutrition is associated with adverse clinical and functional outcomes. Length of hospital stay (LOS) is 1.5- to 2.0-times longer in malnourished patients than in well-nourished patients, after controlling for confounding factors.¹⁰⁻¹² The mortality rate is higher in undernourished inpatients than in those who were not undernourished (66.7% vs. 33.3%).¹¹ The mortality rate of post-discharge malnourished patients is 3-times higher than that of well-nourished patients.¹⁰ Malnutrition is positively associated with readmission rates. The risk of readmission within 15 days of discharge is 60% higher for malnourished patients compared with well-nourished patients.¹⁰ Malnourished patients are 1.5-times more likely to be readmitted within 6 months.¹³ Malnutrition is also associated with complications such as wound dehiscence and infections that lead to increased hospital readmission and LOS.¹⁴

The cost of hospitalisation for malnourished patients increases by 24% to 61%.^{10,15} The extra cost is mostly attributed to a longer LOS owing to increased infection rates and impaired wound healing and thus increased readmissions.¹⁰ Many international organisations, agencies, and governments recommend routine screening of malnutrition in hospital patients.⁹ Malnutrition can be readily treated at a relatively low cost, and nutritional screening can potentially reduce inappropriate referrals. It is suggested that the reductions in malnutrition-induced costs may far outweigh the cost of nutrition screening.⁹ Indeed, nutrition screening has long been the standard of care for patients admitted to hospitals in most countries.

A validated malnutrition screening tool can help identify high-risk patients for early intervention.¹⁶

The effectiveness of screening tools is maximised if used appropriately, based on the settings, target population, and local resources. For example, the Malnutrition Universal Screening Tool¹⁷ is suitable for adults in a community setting, whereas the Simplified Nutritional Appetite Questionnaire¹⁸ is useful in predicting weight loss in institutionalised older adults. The Nutrition Risk Screening and the Mini Nutritional Assessment consider body mass index.^{19,20} The Malnutrition Screening Tool (MST) is widely used in hospital settings because it has been validated among adult inpatients and considers current and past weight status of patients, linking to their appetite.²¹ The MST is a 2-question screening tool with scores ranging from 0 to 5. Questions are about weight loss history and recent oral intake amount.

Although well reported internationally, local research on how hospital malnutrition affects the clinical outcomes is limited.¹⁻⁴ Therefore, this cross-sectional study aimed to determine the malnutrition prevalence and clinical outcomes of patients at an acute hospital in Hong Kong.

METHODS

This study was approved by the Joint Chinese University Hong Kong-New Territories East Cluster Clinical Research Ethics Committee. The North District Hospital is a 600-bed acute district hospital serving approximately 315,270 people. The hospital has used an electronic patient assessment form since 2016. Nursing staff are required to use the MST to screen all adults admitted to the hospital within 48 hours. The MST was introduced to our hospital in 2011. Training and refreshment briefings on how to use the MST are provided to frontline nurses on a regular basis. The Clinical Management System is used to record patient data, including MST scores and outcomes after discharge such as the LOS, 28-day emergency readmission rate, and death.

Adult patients were categorised into three groups according to malnutrition risk levels (MST score): low risk (0-1), medium risk (2), and high risk (≥ 3) [TABLE 1]. We made comparisons among the three groups, and between the low-risk group and the medium- and high-risk (at-risk) group. For patients with cognitive impairment or dementia, their caregivers, relatives, or records from their care home

were queried, according to the guideline Nutrition Care for Patient with Malnutrition Risk.

Records of 40,105 adult patients admitted between January and December 2016 were retrieved from the Hospital Authority Clinical Data Analysis and Reporting System. The low-risk group and the at-risk group were compared using the independent t-test and one-way analysis of variance for the LOS, and using the Pearson Chi-squared test for the readmission rate and mortality rate. A p value of <0.05 was considered statistically significant. Statistical analyses were performed using SPSS (Windows version 21; IBM Corp, Armonk [NY], US).

RESULTS

Patients were admitted to the medical (42%), surgical (37%), accident and emergency (11%), or orthopaedic (10%) departments. 54% of patients were men. The mean patient age was 64.9 (standard deviation, 18.5; range, 18–109) years; 47.6% of patients were aged 18 to 65 years.

TABLE 1
Malnutrition Screening Tool²⁰

Malnutrition Screening Tool	Total score
How much weight (kg) have you lost recently without trying?	Weight loss score
No	0
1-5	1
6-10	2
11-15	3
>15	4
Unsure	2
Have you been eating poorly because of a decreased appetite?	Appetite score
No	0
Yes	1

Among patients in the medical department, 14.1% were at risk of malnutrition (6.1% at medium risk and 8.0% at high risk). Among patients in the surgical department, 7.3% were at risk of malnutrition (4.2% at medium risk and 3.1% at high risk). Among patients in the accident and emergency department, 3.6% were at risk of malnutrition (2.1% at medium risk and 1.5% at high risk). Among patients in the orthopaedic department, 2.4% were at risk of malnutrition (1.4% at medium risk and 0.9% at high risk) [TABLE 2].

The prevalence of malnutrition risk was 9.2% (4.5% at medium risk and 4.7% at high risk); it was 12.0% among those aged ≥65 years and 6.1% among those aged 18 to 65 years. Older patients were at higher risk of malnutrition; the mean patient age for the low-, medium- and high-risk groups differed significantly (64.2 vs. 70.8 vs. 73.7 years, $p<0.01$, TABLE 3). Among women, 89.9% were at low risk, 4.4% at medium risk, and 5.7% at high risk. Among men, 91.6% were at low risk, 4.5% at medium risk, and 3.9% at high risk.

The LOS was longer in patients with higher risk of malnutrition; the mean LOS differed significantly among the low-, medium-, and high-risk groups (4.2 vs. 6.4 vs. 7.4 days, $p<0.001$, TABLE 3). Compared with low-risk patients, the LOS was 76% longer in high-risk patients, 52% longer in medium-risk patients, and 64.2% longer in at-risk (medium and high risk) patients.

The emergency readmission rate within 28 days was higher in at-risk patients than low-risk patients (25.1% vs. 14.6%, odds ratio=2.0, $\chi^2=280.43$, $p<0.001$, TABLE 3).

The mortality rate was higher in at-risk patients than low-risk patients (8.5% vs. 2.3%, odds ratio=3.9, $\chi^2=445.90$, $p<0.001$, TABLE 3).

TABLE 2
Prevalence of malnutrition risk in different specialty departments

Malnutrition risk	Prevalence (%)				
	Medical (n=16,559)	Surgical (n=15,225)	Orthopaedic (n=4023)	Accident & emergency (n=4298)	Overall (n=40,105)
High	8.0	3.1	0.9	1.5	4.7
Medium	6.1	4.2	1.4	2.1	4.5
Low	85.9	92.7	97.6	96.4	90.8

TABLE 3
Comparison of patients at low, medium, and high risk of malnutrition*

	All (n=40,105)	Malnutrition risk			Odds ratio	p Value
		Low risk (n=36,417)	At risk			
			Medium risk (n=1793)	High risk (n=1895)		
Age, y	64.9±18.5 (18-109)	64.2±18.5 (18-109)	70.8±16.8 (18-109)	73.7±15.6 (19-103)	-	<0.01
Women	18,449 (46.0)	16,588 (89.9)	817 (4.4)	1044 (5.7)	-	-
Men	21,656 (54.0)	19,829 (91.6)	976 (4.5)	851 (3.9)	-	-
Length of hospital stay, d	4.4±6.9	4.2±6.5	6.4±9.0	7.4±10.8	-	<0.001
Readmission within 28 d	6218 (15.4)	5294 (14.6)	924 (25.0)		2.0	<0.001
Mortality	1163 (2.9)	851 (2.3)	312 (8.5)		3.9	<0.001

* Data are presented as mean±standard deviation (range), mean±standard deviation, or no. (%) of patients

DISCUSSION

Among inpatients in the present study, the prevalence of malnutrition risk was 9.2% (4.5% at medium risk and 4.7% at high risk), which is lower than the 20% to 85% reported in other studies.⁵⁻⁸ Among patients in the medical department, 14% were at risk of malnutrition, which is lower than the 24% to 69% reported in other studies.²²⁻²⁵ In a study of 850 accident and emergency patients, the prevalence of malnutrition was 20%,²⁶ which is higher than the 3.6% reported in our accident and emergency patients. Among patients in the surgical and orthopaedic departments, the prevalence of malnutrition risk was 7.3% and 2.5%, respectively, which is generally lower than the 5.5% to 57% reported in other studies.^{24,25,27}

One possible reason for the differences in prevalence among studies is the use of different screening tools. The MST was used in the present study, whereas the Mini Nutritional Assessment, Malnutrition Universal Screening Tool, Nutrition Risk Screening, and Simplified Nutritional Appetite Questionnaire were used in other studies. There are significant discrepancies in the malnutrition prevalence estimated by different screening tools.²⁷⁻²⁹ A large age range can be another reason for the low prevalence of malnutrition risk in our patients. Elderly patients are more likely to have malnutrition.^{23,30,31} In the present study, patients aged 18 to 65 years accounted for 47.6% of all patients, and their prevalence of malnutrition risk was 6.1%, which was half that of the elderly patients (12.0%).

In addition, the weight loss aspect of the MST score may underestimate the prevalence of malnutrition, because it was developed for Western populations and may not be accurate for Chinese populations owing to smaller body frames. For example, a 40-kg woman losing 4 kg (10%) would receive an MST score of 0, but this is substantial weight change for a woman with small body frame, and unintentional loss of >10% of weight in 6 months is one of the diagnostic criteria for undernutrition.³²

Elderly patients are at higher risk of malnutrition.^{23,30,31} Patients with higher malnutrition risk have 1.5- to 2-times longer LOS than well-nourished patients.^{10,11} Patients with malnutrition have longer LOS because of their medical or surgical problems.^{33,34} Among at-risk patients in the present study, the readmission rate and mortality rate were 2.0- and 3.9-times higher, respectively, compared with low-risk patients. This finding is similar to that reported in other studies.^{10,11,13,14}

One limitation of this study is the narrow patient population that included only four specialty departments. Findings of this study may not be generalised to other specialty patients in acute and sub-acute hospitals. In addition, the MST score has not yet been validated in Asian or Chinese populations. Reasons for losing weight were not recorded for further analysis. Dietetic assessment was not performed to confirm the malnutrition. Confounding factors (disease severity and type) that may affect the LOS, readmission, and mortality were not investigated.

CONCLUSION

Malnutrition is a common risk problem among hospitalised patients. The use of a validated malnutrition screening tool to lower the malnutrition risk is necessary. A multicentre cross-sectional study on the effect of malnutrition on clinical outcomes is needed for developing service-quality enhancement measures.

DECLARATION

The authors have no conflict of interest to disclose.

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