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How frequently are patients weighed in hospital ? Results from a five-year cross-sectional audit of clinical practice in nine hospitals

Abstract

Background and aims: Knowledge of a person's weight is important for identifying malnutrition; occupational safety reasons; medication dosing and evaluating effectiveness of medical nutrition therapy. However, weighing of patients in hospitals is known to be problematic and suboptimal. **Methods:** Five annual cross-sectional audits of patients admitted to nine hospitals were conducted to determine the frequency that patients were weighed (i) on admission and (ii) during admission. Characteristics such as age, length of stay, the presence of cognitive impairment, culturally and linguistically diverse (CALD) background, mobility status and single room isolation were also recorded. **Results:** The frequency of weighing patients on admission was only 20.3%. Approximately 62.4% of patients had been weighed at least once during their admission. Individuals who were admitted to rehabilitation wards or those with independent mobility had significantly higher odds of being weighed during the admission, in addition to those with a longer length of stay (Odds Ratios 5.98 (95% CI: 2.51-10.3); 2.34 (95% CI: 1.60-3.4); and 1.05 (95% CI: 1.03-1.07) respectively, all $p < 0.001$). Differences between ward types were also evident with rehabilitation, paediatric, renal and mental health wards exhibiting a higher incidence of weighing patients during their admission. **Conclusions:** The practice of weighing patients in this health district was suboptimal and places patients at high risk of a deterioration in their clinical condition. Strategies to ensure all patients are weighed including those who have a short hospital stay and those with poor mobility is required.

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Title page

How frequently are patients weighed in hospital ? Results from a five-year cross-sectional audit of clinical practice in nine hospitals

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19 **Abstract**

20 Background and Aims

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22 safety reasons; medication dosing and evaluating effectiveness of medical nutrition
23 therapy. However, weighing of patients in hospitals is known to be problematic and
24 suboptimal.

25 Methods

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27 conducted to determine the frequency that patients were weighed (i) on admission
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29 of cognitive impairment, culturally and linguistically diverse (CALD) background,
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36 addition to those with a longer length of stay (Odds Ratios 5.98 (95% CI: 2.51-10.3;
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43 patients at high risk of a deterioration in their clinical condition. Strategies to ensure

44 all patients are weighed including those who have a short hospital stay and those
45 with poor mobility is required.
46 Key words: body weight; clinical audit; Malnutrition; health care surveys; inpatients;
47 hospitals
48

Introduction

The importance of recording patient's weight to diagnose malnutrition in hospital was first described more than forty years ago (1). Over time, reasons to weigh patients in hospital have grown, from identification of malnutrition to predicting patient outcomes, medication dosing and safe movement and transfer of patients. Weight change is now a standardised component of nutrition screening tools. Once a nutrition care plan has been implemented for patients diagnosed as malnourished, completion of ongoing weight reviews is essential to demonstrate efficacy of the medical nutrition therapy.

Previous reports on the prevalence of weighing hospital patients is highly variable ranging from 1 to 72% (2-8) in adults, but as high as 98% for children (9). However, there are several factors that make comparisons between studies difficult. A number of studies have quantified the prevalence of weighing patients using audits of medical notes (2-9) whereas other studies directly interviewed nursing staff and physicians about their behaviours related to weighing patients (2,3). Similarly, there are variations in weighing prevalence according to ward specialty. Studies of medical, acute admission and surgical wards report weighing rates between 51-69% (2-5,9); but only 1% on critical care and intensive care wards (8). Patients prescribed renally excreted drugs such as heparin, enoxaparin and gentamicin had their weight recorded in 26% (6) and 50% of cases (7).

Several studies have explored factors associated with weighing on and during admission. These studies indicated that patients are more likely to be weighed in the case of planned compared to emergency surgery (10, 3), as are those patients with

multiple comorbidities (10). Other factors described in the literature that predict the likelihood of weighing include inadequate and poor calibration of equipment (2); competing priorities for nurses' time and confusion about where to record patient weight (10) and concerns about manual handling of patients (6). Factors that have not yet been examined include patients from culturally and linguistically diverse (CALD) background where language may present a barrier, and those in isolation due to infection control. The association of weighing status and other factors such as length of stay (LOS), mobility status, and cognitive impairment have limited exploration. This project evolved from the implementation of a state wide policy that mandated weighing all patients on admission to hospital (11). The project also coincided with hospital accreditation, whereby reporting of compliance with this policy was required. Given these gaps in the local knowledge and the broader literature, the aims of the current study were to (i) determine the proportion of patients who had a weight obtained on and during admission to nine public hospitals in a regional area of Australia over a five year period and (ii) to explore the demographic and clinical characteristics that predict patients who are weighed.

Materials and Methods

Data for this study was obtained from five cross sectional surveys conducted across all nine public hospitals and forty-four patient wards in the Illawarra Shoalhaven Local Health District, NSW Australia. These cross-sectional surveys were undertaken as annual audits from 2011, 2012, 2013, 2015 and 2016.

Wards included in the audit are shown in Table 1. In brief, this consisted of any acute and sub-acute wards in any of the nine hospitals in the health district excluding

99 maternity and palliative care. Additional assistance with auditing enabled the
100 inclusion of paediatric, intensive care, and mental health wards in the final two years.
101 .

102

103 Ethics approval for the audits were obtained from the local ethics committee. Audits
104 of weighing of patients were conducted by dietitians and student dietitians. The
105 period of data collection across the nine hospitals occurred over two to nine days
106 each survey year. Data collected included ward type, clinical specialty, weighed on
107 admission (yes/no), weighed during admission (yes/no), age, length of stay (LOS),
108 mobility status (independent, assistance), CALD status, presence of cognitive
109 impairment or delirium and isolation status. Information on weight was obtained by
110 reviewing and auditing medical notes, observation charts, medication charts, surgical
111 checklists, operation notes, fluid balance charts, weight books, manual handling
112 assessments, anaesthetic records. Preadmission weights recorded on clinical notes
113 for surgical patients were excluded.

114

115 Statistical analysis was performed using SPSS (version 21; SPSS, Chicago, IL,
116 USA). The Shapiro-Wilk Test was used to assess normality. Data is reported as
117 median and interquartile range. Categorical variables are expressed as counts and
118 percentages (%) and were evaluated using Pearson's Chi Square test. Binary
119 logistic regression was used to determine predictors of weight on admission. All
120 independent variables with a $p < 0.20$ in univariate analyses or variables known to be
121 associated with weighing on admission were included in the final model. The
122 confounder of LOS was controlled for in all models. Statistical significance was set at
123 a p value of < 0.05 .

Results

In total, 2799 participants were included in the study across five years. Half (50%) of the patient data was collected in the last two survey years. Expansion of auditing in the latter two years was undertaken and included all patients on paediatric, intensive care and mental health wards in addition to patients admitted on acute and subacute wards. The median age of patients in the study was 77 years (interquartile range:63-84), with 73.1% (n=1259) of patients over 65 years. The median LOS was 8 days (interquartile range:4-17), 10.8% (n=150) were from a CALD background and 25.6% (n=354) were cognitively impaired. A total of 10% (n=75) patients were isolated for infection control and 41.4% (n=573) required assistance with mobility or were bed bound.

The proportion of patients weighed on admission over the five years of auditing was 20.3% (Figure 1). Approximately 62.4% were weighed at least once during their admission (Figure1). The proportion of patients weighed on admission varied significantly according to year, with more patients weighed on admission in 2016 than other years ($p<0.05$). Similarly, the proportion of patients weighed at any time varied according to year of audit, with the proportion in 2016 significantly higher ($p<0.05$).

There were significant variations in the rates of weighing on and during admission according to ward specialty. More than half of patients admitted to mental health wards had a weight completed on admission (Table 2; 52.9%). In contrast, while

94.3% of paediatric patients had a weight on admission, only 4.3% of patients admitted to an aged care ward had this completed (Table 2). In regard to having a weight recorded at any time during the admission, there were also large discrepancies in practice between wards and specialty area. Low rates of weighing were recorded on neurology (42.9%), medical (45.2%) and surgical wards (50.3%) compared to renal (81.3%) and rehabilitation wards (88.2%) ($p < 0.05$).

Logistic regression analyses indicate that after controlling for LOS, being admitted to a rehabilitation ward and being independently mobile predicted whether a patient was weighed *on* admission (Table 3, Model 3, Odds Ratio 2.00 (95% Confidence Interval: 1.31-3.08, $p < 0.001$ and Odds Ratio (2.46 (95% Confidence Interval: 1.76-3.44, $p < 0.001$ respectively). Age, and CALD background did not predict whether a patient was weighed in the final statistical model.

Variables associated with greater odds of weighing a patient *at any time* during the admission included being admitted to a rehabilitation ward (Table 4, Model 3, Odds Ratio 5.08 (95% Confidence Interval: 2.51-10.3, $p < 0.001$) and length of stay (Odds Ratio 1.05, 95% Confidence Interval: 1.03-1.07, $p < 0.001$). Being independently mobile was associated with 2.3 times greater odds of being weighed (Table 4, Model 3, Odds Ratio 2.34 (95% confidence Interval: 1.60-3.40, $p < 0.001$). In the final model, being cognitively impaired or isolated did not predict weighing at any time.

Discussion

Many healthcare professionals utilize the weight of a patient to provide clinical care or for occupational safety reasons (1,3). The aim of this study was to describe the

prevalence and explore the predictors of weighing patients in hospital. The results of this study regarding weighing patients during any stage of their hospital admission are in agreement with the broader literature. We found that 62.4% of patients were weighed at least once during their admission, which mirrors rates of 51-69% found in other studies (2-5,10). Unfortunately, these figures appear to have been stable for more than twenty years (2,3). Strategies to increase the rate of weighing of patients' needs further exploration particularly because there are structural and physical barriers to weighing patients. We also found high rates of weighing in paediatric wards. This is also to be expected because weight is a widely accepted indicator of childhood development and achievement of milestones (9).

In this study, we found that length of stay predicted whether a patient was weighed during admission. This is not surprising as there will be an increased likelihood of recognizing malnutrition or closer monitoring of a patient's condition the longer they remain in hospital. In light of this, being an inpatient on a rehabilitation ward was a significant predictor of being weighed. However, what is most important is whether a patient is weighed on admission because a delay in weighing may prevent appropriate identification and tracking of hospital acquired malnutrition and delay recovery as well as interventions to improve nutritional status.

Previous research has indicated that nurses find weighing patients to be a stressful activity, especially if patients are aggressive or cognitively impaired (12). However, this was not supported by the findings of the present study. Rather, ability to mobilise independently was a significant predictor of weighing on and during admission in this study. We theorize two reasons for this. Firstly, preventing

occupational injury in healthcare staff during patient transfers is a major practical and economic concern (6). Secondly, there is a large body of work around falls prevention in hospital patients, of which impaired mobility is a major risk factor. The literature on nurse attitudes towards weighing patients also suggests that many nurses do not clearly understand the clinical relevance of taking a patient's weight (2,3); and report there are competing demands for their time (10). Weighing patients is often viewed as a manual handling concern (6). Thus, not weighing patients may be an injury prevention strategy for nurses and may prevent patient falls. Unfortunately, this delay in weighing and mobilization may lead to patient deconditioning during admission.

This study provides some insight into wards and specialty areas that could be considered exemplars for the practice of weighing patients. These wards include pediatrics, mental health, rehabilitation and renal disease. One strategy described by staff on these wards to facilitate weighing include the 'www: Weekly Weigh Wednesday' or variations of this concept. On the renal ward, patients who are mobile and stable (such as patients on fluid restrictions or kidney transplant recipients) are invited by nursing staff to take responsibility to record their weights in the context of completing their own fluid balance charts, as part of their self-management. Whilst this is anecdotal information only, it would be beneficial to compare and contrast the attitudes and ward routines that facilitate this practice and compare these findings to wards and specialty areas where weighing is less frequently undertaken such as critical care, neurology and surgical wards.

One of the strengths of this study is the completeness of data across all facilities in a local health district over a longitudinal period. However, reasons for non-weighing of patients were not qualitatively explored with nursing or clinical staff despite policies that make this mandatory. Given the large variability in the incidence of weighing on some wards / and or specialty areas, further qualitative research would provide valuable insights into reasons for differences in weighing practices across different wards. Using the theoretical domains framework (13) to guide such additional research would help guide interventions to improve weighing of patients.

To conclude, only one in five patients were weighed on admission to hospital, while almost two thirds of patients were weighed at least once during admission in a local regional health district in Australia over a five-year period. This data indicates that the practice of weighing patients is clearly suboptimal and places patients at high risk of a deterioration in their clinical condition. Strategies to encourage proactive weighing of all patients who have a short hospital stay and those with poor mobility is required.

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Statement of authorship

Kelly Lambert: Methodology, Data Curation, Formal analysis, Writing – review and editing. Supervision. **Allison Ferguson:** Conceptualization, Methodology, Investigation, Data curation, Writing- Original draft preparation, visualization.

Supervision. **Marissa Meletis:** Data Curation, Formal Analysis, Writing – review and editing. **Karen Charlton:** Supervision, Methodology, Writing- Reviewing and Editing.

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Figure 1. Percentage of patients weighed on admission and during admission.

Legend. Black columns indicate percentage of patients weighed anytime during the admission. Hashed column indicates percentage of patients weighed on admission to hospital.

Table 1. Wards included in the audit during the study period

	2011	2012	2013	2015	2016
Acute wards	Included	Included	Included	Included	Included
Sub-acute wards	Included	Included	Included	Included	Included
Maternity wards	Excluded	Excluded	Excluded	Excluded	Excluded
Palliative care wards	Excluded	Excluded	Excluded	Excluded	Excluded
Paediatric wards	Excluded	Excluded	Excluded	Included	Included
Intensive care wards	Excluded	Excluded	Excluded	Included	Included
Mental health wards	Excluded	Excluded	Excluded	Included	Included

Table 2 Characteristics of patients weighed by clinical area and ward type

Ward Type (number of patients)	Weighed on admission n (%)	Weighed during admission n (%)	Median age years (IQR)	Median length of stay days (IQR)	Independent mobility n(%)
All patients (2799)	567 (20.3)	1747 (62.4)	77 (63-84)	8 (4-17)	812 (58.6)
Acute (1869)	327(17.4)	973 (52)	75 (62-83)	6 (3-12)	501 (56.2)
Sub-acute (792)	145 (18.3)	648 (81.8) *	82 (73-87)	17 (8-30)	189 (51.4)
Mental health (85)	45 (52.9) *	74 (87.1) *	44 (33-57)	16 (9-48)	85 (100)
Paediatrics (53)	50 (94.3) *	52 (98.1) *	5 (<1-9)	2 (2-4)	37 (90.2)
Specialty wards					
Renal (107)	24 (22.4)	87 (81.3) *	71 (61-79)	8 (5-15)	29 (59.2)
Aged care (349)	15 (4.3)	243 (69.6)	86 (81-90)	13 (7-21)	70 (48.3)
Cardiology (138)	52 (37.7)	96 (69.6)	74 (62-82)	5 (3-8)	48 (65.8)
Oncology (93)	17 (18.3)	64 (68.8)	67 (53-78)	7 (4-13)	37 (82.2)
Intensive Care (40)	7 (17.5)	16 (40)	66 (52-79)	5 (3-12)	15 (46.9)
Surgical (584)	132 (22.6)	294 (50.3) *	72 (59-81)	6 (3-12)	152 (58)
Neurology (140)	16 (11.4) *	60 (42.9) *	71 (54-82)	6 (3-12)	38 (52.1)
Medical (712)	78 (10.9) *	322 (45.2) *	78 (68-85)	6 (3-11)	179 (53.6)
Rehabilitation (498)	131 (26.3)	439 (88.2) *	79 (68-85)	17 (9-33)	122 (50)

* p<0.05 significant difference amongst patients weighed on admission and during admission amongst ward type and speciality.

Table 3. Predictors of weighing patients on admission to hospital.

Variables in model						
	Model 1		Model 2		Model 3	
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Mental health specialty	21.99 (10.99-43.95)	<0.001	-	-	-	
Subacute care specialty	3.98 (2.30-6.9)	<0.001	-	-	-	
Rehabilitation ward	6.90 (3.89-12.24)	<0.001	-	-	2.00 (1.31-3.08)	0.001
Renal ward	1.4 (0.87-2.24)	0.16	-	-	-	-
Paediatric ward	319.85 (88.6-1154.4)	<0.001	-	-	-	-
Length of stay (LOS)	1.00 (0.99-1.00)	0.79	1.005 (1.0-1.009)	0.03	1.004 (1.00 -1.008)	0.06
Age (>75 years)	-	-	1.20 (0.87-1.67)	0.26	1.07 (0.77-1.48)	0.68
Independent mobility	-	-	2.25 (1.61-3.15)	<0.001	2.46 (1.76-3.44)	<0.001
Cognitively impaired	-	-	0.84 (0.57-1.24)	0.38	-	-
CALD background	-	-	0.57 (0.33-1.00)	0.05	0.57 (0.33-0.99)	0.05
Isolated for infection control	-	-	1.14 (0.61-2.14)	0.68	-	-
Predictive value of model	81.5%	<0.001	78.9%	<0.001	74.5%	<0.001

OR (odds ratio) adjusted for length of stay

Table 4. Predictors of weighing patients *during admission* to hospital.

Variables in model						
	Model 1		Model 2		Model 3	
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Mental health specialty	4.09 (2.11-7.92)	<0.001	-	-	-	
Subacute care specialty	2.08 (1.55-2.78)	<0.001	-	-	-	
Rehabilitation ward	2.41 (1.64-3.55)	<0.001	-	-	5.08 (2.51-10.3)	<0.001
Renal ward	4.12 (2.51-6.82)	<0.001	-	-	-	-
Paediatric ward	66.1 (9.1-479.6)	<0.001	-	-	-	-
Length of stay (LOS)	1.04 (1.03-1.05)	<0.001	1.05 (1.03-1.06)	<0.001	1.05 (1.03-1.07)	<0.001
Age (>75 years)	-	-	2.38 (1.76-3.22)	<0.001	-	-
Independent mobility	-	-	2.03 (1.50-2.74)	<0.001	2.34 (1.60-3.4)	<0.001
Cognitively impaired	-	-	0.98 (0.69-1.39)	0.90	0.72 (0.48-1.11)	0.13
CALD background	-	-	0.91 (0.58-1.42)	0.91	0.93 (0.52-1.67)	0.82
Isolated for infection control			0.64 (0.38-1.1)	0.11	0.59 (0.34-1.03)	0.06
Predictive value of model	67.6%	<0.001	68.8%	<0.001	70.1%	<0.001

OR (odds ratio) adjusted for length of stay