



Hospital Food and Hospital Malnutrition: What Plate-Waste Audits Reveal About Ward-Level Nutrition Care

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Received: 04 February 2022; Accepted: 22 May 2022; Published: 16 November 2022

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Abstract

Across 32 hospital studies the median plate waste is 30 per cent by weight, with a range from 6 to 65 per cent, far above other food service settings. That aggregate figure conceals the finding that matters. In a ward service evaluation, plate waste at main meals was 4.1 per cent among patients assessed as nutritionally well and 53.1 per cent among those assessed as nutritionally vulnerable, with daily intakes of 1,592 and 643 kcal respectively. The waste is concentrated in precisely the patients for whom the food is treatment. Provision is not the constraint: in a survey of 1,707 hospitalised patients, meals supplied energy exceeding requirement by 41 per cent and protein by 15 per cent, yet 975 patients did not eat enough and the intake of 572 of them, 59 per cent, was not predominantly affected by disease. Plate waste audits therefore measure ward-level nutrition care rather than catering performance.

Keywords: Plate waste; Hospital malnutrition; Food service; Mealtime care; Nutritional intake

Introduction

Undernutrition among hospital inpatients has been recognised for close to half a century, and many studies find between 25 and 40 per cent of acute patients malnourished [1,2,3]. It is now generally accepted that the provision of meals is part of treatment rather than a hotel service [4,5].

That acceptance has a corollary which is less often acted upon. Planning and providing adequate nutritious food achieves nothing if the food is not eaten, and serving larger portions to patients who are already leaving food does not increase intake [4,6]. What reaches the patient, rather than what leaves the kitchen, is the quantity that matters.

Plate waste is the measure of that gap. It is recorded by weighing food before and after service or by visual estimation, and reported as a percentage of served weight or as the energy, protein or monetary value discarded [4,7]. This review examines what those audits show, whose food is being wasted, and what

the figures imply about care at ward level.

Objective

This review sets out to establish four things from the published literature. First, how much food is wasted in hospitals and how consistent that figure is across studies. Second, whether the waste is distributed evenly across patients or concentrated in a subgroup. Third, whether the shortfall in intake reflects inadequate provision or something occurring after the meal is served. And fourth, what has been shown to change the figure.

Literature Review

How much is wasted: A review of 32 hospital studies reported a median plate waste of 30 per cent by weight, with a range from 6 to 65 per cent, substantially higher than in other food service settings (Figure 1). Levels were lower in hospitals using a bulk food delivery system than in those using plated meal delivery [4,7]. An eight-week audit covering almost 8,000 meals at a general hospital found that each patient discarded on average 953 grams of food daily, representing 35 per cent of the food served, with differences between wards [8]. An Australian acute care audit reported plate waste of approximately 41 per cent of food served, with dinner generating the most and breakfast the least [9].

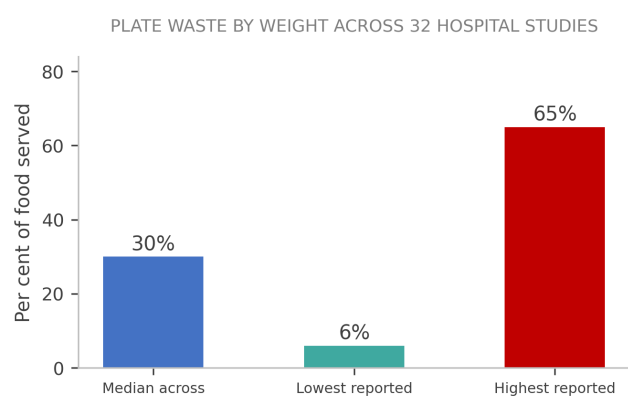


Figure 1: Plate waste by weight across 32 hospital studies [4,7]

Whose food is wasted: A service evaluation on a single ward classified patients as nutritionally well or nutritionally vulnerable and weighed waste separately. Plate waste at main meals was 4.1 per cent in the nutritionally well group and 53.1 per cent in the nutritionally vulnerable group, with pudding waste of 1.7 and 38.6 per cent respectively (Figure 2) [10]. The patients had a mean age of 84 years and the commonest injury was hip fracture at 68.4 per cent.

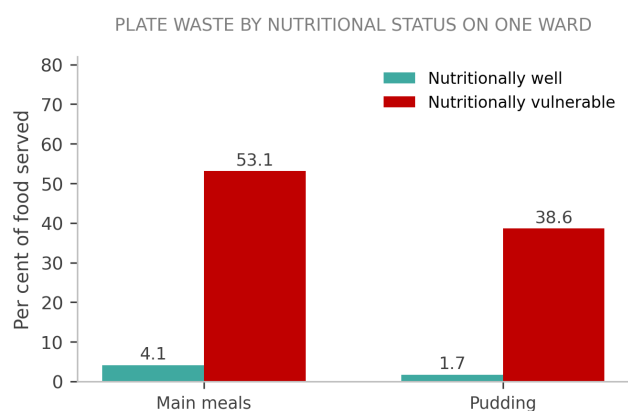


Figure 2: Plate waste by nutritional status on one ward [10]

What that meant for intake: In the same evaluation, mean intake in the nutritionally well group was 1,592 kcal and 65.7 grams of protein daily, against 643 kcal and 24.8 grams in the nutritionally vulnerable group of 15 patients (Figure 3). Compliance with oral nutritional supplements was 28.3 per cent. Combined mealtime plate waste weighed 6.2 kilograms daily and food trolley waste a

further 6.2 kilograms [10].

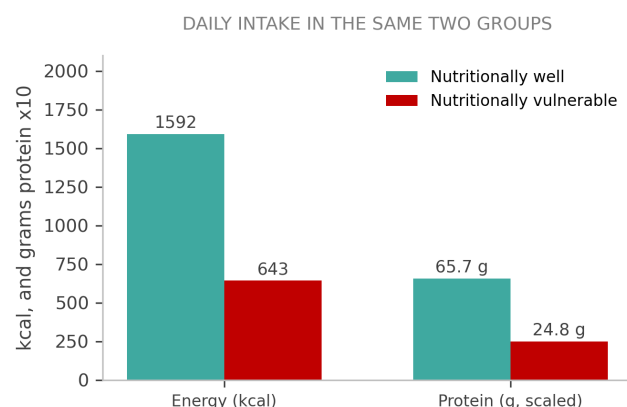


Figure 3: Daily energy and protein intake in the same two groups [10]

Table 1: Waste and intake by nutritional status in a ward service evaluation [10]

Measure	Nutritionally well	Nutritionally vulnerable
Plate waste, main meals	4.1%	53.1%
Plate waste, pudding	1.7%	38.6%
Energy intake	1,592 kcal/day	643 kcal/day
Protein intake	65.7 g/day	24.8 g/day

Provision is not the constraint: A prospective survey of 1,707 hospitalised patients found that daily meals provided 2,007 kcal and 78 grams of protein, exceeding patients' requirements by 41 and 15 per cent respectively (Figure 4). Nonetheless 975 patients did not eat enough, and plate waste amounted to 471 kcal and 21 grams of protein per patient per day (Figure 5) [11].

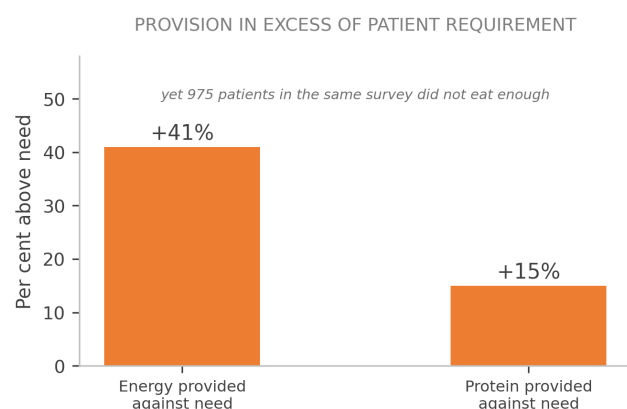


Figure 4: Provision in excess of patient requirement [11]

Table 2: Provision, intake and shortfall in a prospective survey of 1,707 patients [11,13]

Table 3: Strategies examined and their reported effect

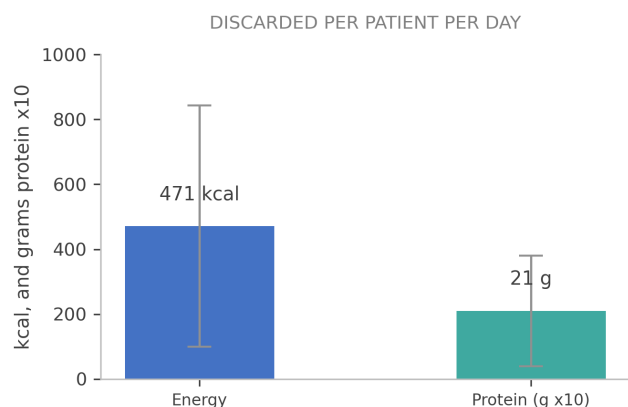


Figure 5: Energy and protein discarded per patient per day [11]

Nor is illness the whole explanation: In the same survey, the food intake of 572 of the underfed patients, 59 per cent of them, was not predominantly affected by disease. Logistic regression identified elevated body mass index, male sex, a modified diet prescription, length of stay under eight or at least ninety days, and an inadequate supper as further risk factors [11]. An earlier study found 40 per cent of food provided daily was wasted with average energy intake below 80 per cent of estimated needs, and work in 1,416 patients consuming three meals over 24 hours found that 70 per cent of the general care and 85 per cent of the acute care population did not meet energy or protein requirements [12,13].

Finding	Value
Energy provided against requirement	41% above [11]
Protein provided against requirement	15% above [11]
Patients not eating enough	975 of 1,707 [11]
Of those, intake not disease-driven	572, or 59% [11]
Not meeting requirements, acute care	85% [13]

Why food is left: Reported reasons span the clinical condition of patients, food and menu issues including poor food quality, inappropriate portion sizes and limited menu choice, service issues including difficulty accessing food and complex ordering systems, and environmental factors including inappropriate meal times, interruptions and unpleasant ward surroundings (Figure 6) [4,7]. In one audit, not being hungry was the most common reason given for not consuming everything offered [14].

Waste beyond the plate: An Australian audit measuring both kitchen and plate waste found that unserved waste at 149 grams per meal made up approximately 88 per cent of total kitchen waste, and noted that most studies examine plate waste alone while overlooking kitchen waste [9]. Auditing only what returns from the ward therefore understates the total, though it is the portion that bears directly on patient intake [9,15].

REASONS REPORTED FOR FOOD BEING LEFT

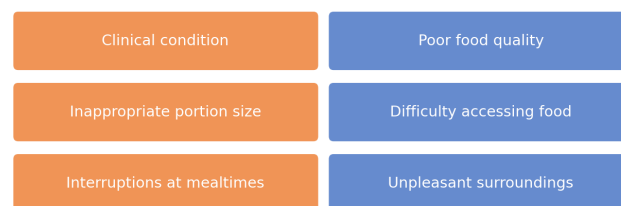


Figure 6: Reasons reported for food being left [4,7,14]

What has been tried: Strategies proposed to reduce waste include reduced portion sizes with food fortification, bulk meal delivery, feeding assistance, provision of dining rooms and protected mealtimes [4,7]. Smaller but energy and protein enriched meals have been shown to improve intake in elderly patients [16,17], eating in a dining room on an acute elderly medical ward increased energy intake [18], and bedside menu ordering has been reported to increase energy and protein intake while reducing waste and cost [19]. A quality improvement project testing standardised meal sizes reduced average waste from 70.16 to 65.75 per cent, a decrease of 4.41 percentage points, and its authors observed that the implementation of protected mealtimes had done little to solve the problem [20]. An evaluation of protected mealtimes measuring the ward environment, patient experience and nutrient intake reported a similar picture [21], and a prospective study of patient factors associated with inadequate intake in older medical patients identified determinants beyond the food itself [22].

Strategy	Reported effect
Bulk rather than plated delivery	Lower waste levels [4,7]
Smaller energy-enriched meals	Improved intake in elderly patients [16,17]
Dining room on the ward	Increased energy intake [18]
Bedside menu ordering	Higher intake, less waste and cost [19]
Standardised meal size	Waste fell 70.16% to 65.75% [20]
Protected mealtimes	Little effect reported in one project [20]

Who does what at the mealtime: Qualitative and observational work has examined access to food from the patient side, finding that reaching, opening and managing a tray is itself a barrier for some inpatients [23], and has asked directly who is responsible for the mealtime on a ward [24]. A cluster randomised trial of protected mealtimes with or without additional nursing feeding assistance reported improved nutritional intake in older medical patients, which locates the benefit in the assistance rather than in the protection of the hour alone [25]. A national task force report set out the barriers to food intake in acute care systematically [26].

The service side: Staff involved in serving meals describe practices that contribute to trolley waste independently of patient appetite [27], and analyses of catering practice and public procurement have examined waste at the system level [28]. An integrative systematic review of food waste in hospitals brought these strands together and noted the same measurement inconsistency described above [29]. Patient perception of hospital food has been surveyed separately [31], and theoretical models of patient experience and satisfaction with food service have been developed [32].

Room service and on-demand models: Systems allowing patients to order when they wish rather than at fixed times have been evaluated in several settings, with reported improvements in intake and satisfaction alongside reductions in waste and cost [19,33]. European survey data covering 21,007 patients described how nutritional risk is assessed and managed across hospitals, providing the context in which any of these service changes operate [30].

Method

Search strategy: PubMed and the archives of the major clinical nutrition, dietetics and food service journals were searched for studies of plate waste and nutritional intake in hospital inpatients. Search terms combined plate waste and food waste with hospital, nutritional intake, protected mealtimes, food service and ward audit. Reference lists of the review of 32 studies [4] and the prospective intake survey [11] were screened by hand for primary sources.

Eligibility: Studies were included if they measured plate waste or nutritional intake in defined hospital populations, or evaluated an intervention intended to alter either. Service evaluations and quality improvement reports are included where they report measured quantities and are identified as such.

Data extraction and handling: Setting, population, method of measurement, whether kitchen waste was included, and the reported figure were extracted as published. Whether a waste figure was obtained by weighing or by visual estimation is stated where reported, since the two methods do not yield identical results, and whether the population was stratified by nutritional status is stated in every case, because that stratification is the central point of this review. This review reports published findings and does not constitute guidance on the nutritional management of any individual patient or on the design of any food service. No pooling or re-analysis was performed. Figures 1 to 6 and Tables 1 to 3 reproduce published values only. This is a narrative synthesis of published literature and was not registered as a systematic review.

Concluding Remarks

The single most useful thing in this literature is a comparison rather than a total. On one ward, patients assessed as nutritionally well left 4.1 per cent of their main meals and patients assessed as nutritionally vulnerable left 53.1 per cent [10]. A ward-level figure averaging the two would report something near the 30 per cent median found across 32 studies and would describe neither group [4,10].

That distribution inverts the usual reading of a waste figure. Waste is ordinarily treated as an efficiency problem, a matter of portion sizes and menu planning. Here it is concentrated in the patients whose intake is already inadequate, whose daily energy intake was 643 kcal against 1,592 in the comparison group [10]. For those patients the uneaten food is not surplus; it is untaken treatment.

The provision data settle a question that might otherwise absorb the effort. Meals supplied energy 41 per cent and protein 15 per cent above requirement, and 975 patients still did not eat enough [11]. Providing more food to a ward where half of what is served already returns uneaten will increase waste rather than intake, which is consistent with the finding that reducing portion size while fortifying it improves intake [16,17].

The observation that 59 per cent of underfed patients had intake not predominantly affected by disease is the one that assigns responsibility [11]. If most of the shortfall were explained by illness, appetite and symptom burden, the audit would be measuring case mix. Since it is not, the audit is measuring something about how mealtimes are conducted, whether help is available, whether the patient can reach the tray, and whether the meal arrives at a moment when eating is possible [4,14].

That is why plate waste deserves to be read as a nutrition care indicator rather than a catering one. The reasons reported for food being left include difficulty accessing food, interruptions and unpleasant surroundings alongside poor food quality [4,7], and the interventions with measured benefit are largely about the circumstances of eating: dining rooms, feeding assistance, bedside ordering [18,19]. The quality improvement project that reduced waste by 4.41 percentage points with standardised meal sizes also recorded that protected mealtimes had achieved little, which suggests the label matters less than what actually happens during the hour [20].

Three limitations belong with these conclusions. Plate waste is measured by weighing in some studies and by visual estimation in others, and reported variously as a percentage of weight, energy or monetary value, so figures are not directly comparable across the 32 studies pooled [4,7]. The stratified ward evaluation is a service evaluation of 19 patients on one ward, of whom 15 were classed as nutritionally vulnerable, so its striking contrast rests on small numbers [10]. And most studies

measure plate waste alone, omitting the unserved kitchen waste that in one audit accounted for around 88 per cent of kitchen losses, so the totals presented here describe the ward rather than the system [9].

There is a framing question underneath all of this. If meals are part of treatment rather than hospitality, then food left uneaten by a nutritionally vulnerable patient is a treatment not delivered, and would be recorded as such were it a drug [5,34]. Plate waste is currently reported to catering managers and sustainability teams far more often than to clinical governance, which is a choice about who owns the problem rather than a fact about the data [4,29].

What would improve the evidence is a change in how the audit is reported rather than more audits. Stratifying waste by nutritional risk, as the ward evaluation did, turns an efficiency statistic into a clinical one and costs nothing extra to collect [10]. Reporting energy and protein discarded alongside weight, as the prospective survey did, makes the figure interpretable against requirement rather than against the size of the portion [11]. Neither requires a trial.

Acknowledgements

The authors thank the ward teams who weighed food before and after every meal for consecutive days, and particularly those who reported waste separately for nutritionally well and nutritionally vulnerable patients rather than as a single ward figure.

Funding

No dedicated funding from public, commercial or charitable sources supported the preparation of this review.

Conflict of Interest

The authors declare no competing interests.

Ethics Statement

This article reviews previously published studies only. No new patient data were collected and no participants were recruited, so ethical approval was not required.

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Citation: Fitzmaurice E, Sikorska M, Havran D. "Hospital Food and Hospital Malnutrition: What Plate-Waste Audits Reveal About Ward-Level Nutrition Care." *J Clin Nutr Heal* (2022);3: 001-006