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Review

Plate waste in hospitals and strategies for change

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SUMMARY

Plate waste in hospitals refers to the served food that remains uneaten by patients. High levels of plate waste contribute to malnutrition-related complications in hospital, and there are also financial and environmental costs. Plate waste is typically measured by weighing food or by visual estimation of the amount of food remaining on the plate, with results presented as the percentage by weight of the served food, or by calculating the protein, energy or monetary value of the waste. Results from 32 studies in hospitals show a median plate waste of 30% by weight (range: 6–65%), much higher than in other foodservice settings. Levels are lower in hospitals using a bulk food delivery system compared to plated meal delivery. Reasons for these high levels can relate to the clinical condition of patients, food and menu issues (such as poor food quality, inappropriate portion sizes, and limited menu choice), service issues (including difficulty accessing food and complex ordering systems), and environmental factors (such as inappropriate meal times, interruptions, and unpleasant ward surroundings). Strategies to minimize waste include reduced portion sizes with food fortification, bulk meal delivery system, feeding assistance, provision of dining rooms, and protected meal times.

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1. Introduction

Undernutrition of hospital inpatients has been a problem recognised for nearly 40 years¹ and many studies find from 25 to 40% of acute hospital patients are malnourished.² It is therefore now acknowledged that provision of meals should be regarded as an essential part of treatment of patients and not just a hotel service.³ However simply planning and providing adequate nutritious food is ineffective if it is not eaten and serving larger portions is not a valid strategy to improve energy intake.^{4,5} High food wastage is associated with reduced energy and protein intakes and has an impact on malnutrition-related complications.⁶ There is a two-fold increase in the risk a patients dying during a hospital admission if they eat only one-quarter of the food provided.⁷ Unfortunately there is still a disappointing lack of evidence to support interventions to improve this problem.⁸

In hospitals, food can make up to 50% of the total waste generated in a ward environment,^{9,10} and in addition to the nutritional implications of this waste, there are financial and environmental concerns as well. It has been estimated that in 2000 the food

wasted in British hospitals was worth £28 million¹¹ Virtually all food waste in hospitals today is thrown away, with very little composting or recycling¹² and the resultant organic is both expensive to dispose of¹³ and in landfill produces methane – a potent greenhouse gas.¹⁴ Furthermore, patient satisfaction can be affected, since patients report being upset by the amount of food being wasted.^{15,16} For all these reasons, reducing food waste has become a priority in hospital foodservice management.^{17–19}

Although food waste can occur at all steps in the foodservice system, including storage, ingredient preparation, cooking and service, the largest losses are at the last step, at the point of consumption.²⁰ Measures of plate waste – that is food that is served but not eaten – have been used to provide feedback on food acceptability to help plan menu changes²¹ and to monitor the adequacy of food intakes.²² They also provide one measure of the efficiency of the meal provision. Plate waste in hospitals has always been much higher than other foodservice sectors. Restaurants, cafes, schools and workplace canteens usually have levels of plate waste of less than 15%^{23–28}; in hospitals, plate waste can be two or three times higher.²⁹

The aim of this narrative review is to summarise the literature on the extent of plate waste in hospital inpatient populations and methods for its measurement, and to examine the likely causes and possible strategies to reduce plate waste. To identify relevant articles a search of the literature for original studies and reviews was carried out in the following databases: Scopus; Pubmed, Medline

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and Cinahl over all dates to March 2011, using combinations of the search terms: “hospital”, “food”, “waste” and “plate waste”. Studies were limited to those published in English. The references in retrieved papers were examined individually to supplement the electronic search.

For the purposes of this review, articles were primarily chosen which reported results for plate waste with inpatients in hospital settings. Results from some other healthcare settings such as nursing homes were included for comparison purposes only. A total of 274 articles were identified from the initial search and their abstracts reviewed. Of these only 60 were directly relevant to the topic. Hand searching of bibliographies added a further 29 primary references.

2. Methods to assess plate waste

Plate waste refers to the volume or percentage of the served food that is discarded. There are two main measurement methods that have been used: weighing or visual estimation. Weighing involves collecting all food waste and recording either the total bulk amount for a population (eg, all meals from one ward), or the total food remaining on each individual tray, or the weights of each food component on each plate. The latter system is necessary if the data is to be analysed for its nutrient content – either by calculation or analysis. The weighed method is the most accurate, but requires significant resources and time to complete and can therefore be difficult to implement without disrupting or delaying normal foodservice operations. However it has been used successfully in many studies.^{30–33}

Visual estimation uses a scale to measure approximately what proportion of food is left. A number of different scales have been used. The most extensive are a 7-point scale (all, one mouthful eaten, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, one mouthful left, none)³⁴ and the Comstock 6-point scale³⁵ (all, one bite eaten, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, none). Other scales that have been used are the 5-point scale (all, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$ or less, none or almost none),³⁶ a 4-point scale (all, $\frac{1}{2}$, $\frac{1}{4}$, none)⁷ and a 3-point scale (all, $\geq 50\%$, $< 50\%$).³⁷

Visual estimation methods introduce problems of subjectivity into the assessment, and inter-observer reliability can be a problem, but they have been validated against weighed waste and found to give reasonably good approximations.^{34,36,38} However there are some inaccuracies with this method that can reduce the statistical significance of results.^{39–41} A recent innovation has been to use digital photography to record the food waste, which can minimise disruptions and allow unhurried estimates of portion sizes at a later time.⁴²

Results of plate waste estimates are most commonly presented as the percentage by weight of the served food remaining uneaten. However, in some studies the results are presented in terms of the energy value of the meal or the protein content,³² or even the monetary value of the waste.^{6,43} Clearly, to calculate these values requires information on each different food type wasted. If percentage food weight is the only measure, then methods where all waste is combined together before weighting can be used to simplify measurement. This aggregate method has been used extensively in studies of school children⁴⁴ but relatively rarely in hospital studies, where most researchers have wanted to calculate the energy and protein value of wasted food, which requires measurement of individual food components.⁴⁵

3. Extent of plate waste in hospitals

Some previous articles have reported on studies of food waste in hospitals, but they have only presented a few selected results. In 2003 Edwards and Hartwell summarised four studies in the UK²⁹

and Williams et al reported the results from six hospital and three nursing home studies.⁴⁶ Table 1 summarises the results of 32 studies, carried out in 29 countries over the past 50 years.

The range of the results is wide (from 6 to 65%), but the median reported waste was 30% of the plated food weight, 27% of the energy content served and 26% of the protein provided. Furthermore, there does not seem to have been any general trend to lower levels of waste over time. There was no significant difference in the mean reported waste (percent by weight) comparing studies before and after 2000 (29.4 ± 12.3 vs 29.8 ± 15.0 ; $p = 0.943$). These levels are higher than those found in other healthcare settings. In nursing homes, where patients more typically eat in dining room settings, plate waste has been reported between 7% and 27%.^{34,47–52}

In six of the hospital studies, plate waste was compared between a plated meal service and a bulk service (where meals were plated and served in the ward). All six studies found significantly less plate waste with the bulk system – typically around 50% less – but often there was considerable unserved bulk waste in the food trolleys.^{31,32,53–56}

The median level of waste of energy and protein was usually somewhat lower than the food weight, suggesting that the foods not eaten were those that are less nutrient dense.

3.1. Sources of waste

The amount of food wasted varies by meal and by food type. Most studies have found that there is less plate waste at breakfast compared to other main meals,^{31,43,49,57–60} although this is not a universal finding.⁶¹ Only a few studies have reported the actual foods wasted, but there seems to be more waste of vegetables compared to main meat dishes. Frakes et al found over 40% of served vegetables remained uneaten compared to only 18% of entrées,³⁰ and others have found a similar pattern.^{47,62} This may reflect a generally lower liking for vegetables by inpatients,⁶³ or it might be a result of poor cooking practices.

4. Reasons for plate waste

There are many reasons why plate waste in hospitals is higher than in other settings – some related to the nature of the patient population, and some to the foodservice systems.¹⁸ Table 2 summarises the variety of reasons identified in the literature under four broad categories: clinical, food, service and environmental issues.

Several studies have used patient interviews or observational methods to understand the issues affecting food consumption in hospital. In one UK study, low appetite accounted for 40% of all patients' reasons for leaving food, meal quality issues made up 27%, and 19% stated it was because portion sizes were too large.⁵⁷ Loss of appetite was also the most common reason in a US study which found that this, along with taste loss, made up 28% of the reasons patients consumed less than half of the main entrée.⁶⁴ In a Swiss study, half of the patients declared they had less appetite than at home.⁶⁵ This is not unexpected, since illness can often affect appetite and the senses of taste or smell. Reduced activity while in hospital, and drugs causing anorexia, nausea or gastrointestinal symptoms, can also interfere with the normal desire to eat. Many diet prescriptions, such as texture modification or low salt, reduce the sensory appeal of food, and it has been estimated that being on a special diet doubles the risk of insufficient energy intake.⁶⁶ Furthermore, physical constraints such as eating in bed, having immobilised limbs, or age-related declines in functional ability and dental problems, can all significantly affect food consumption.⁵⁰

There is probably only limited opportunity to overcome these clinical barriers to consumption, but the issues related to food

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