

Cwm Taf Morgannwg University Health Board (CTM UHB)

Quantifying food-waste in patient feeding in an acute setting and identifying opportunities for reduction



Topic Area

Please identify (more than one option may be selected)

Adaptation <input type="checkbox"/>	Communications and engagement <input type="checkbox"/>	Estates and facilities (energy, waste, water) <input type="checkbox"/>	Food, catering and nutrition <input checked="" type="checkbox"/>
Funding and financial mechanisms <input type="checkbox"/>	Medicines <input type="checkbox"/>	Research, innovation and offsetting <input type="checkbox"/>	Strategic ambition <input type="checkbox"/>
Supply chain and procurement <input type="checkbox"/>	Sustainable models of care <input checked="" type="checkbox"/>	Travel and transport <input type="checkbox"/>	Workforce, networks and system leadership <input type="checkbox"/>
Green/blue space and biodiversity <input type="checkbox"/>	Digital transformation <input type="checkbox"/>	Sustainability education <input type="checkbox"/>	
Other (please specify):			

**Topics aligned with the 12 Greener NHS workstreams (NHS England) are shaded.*

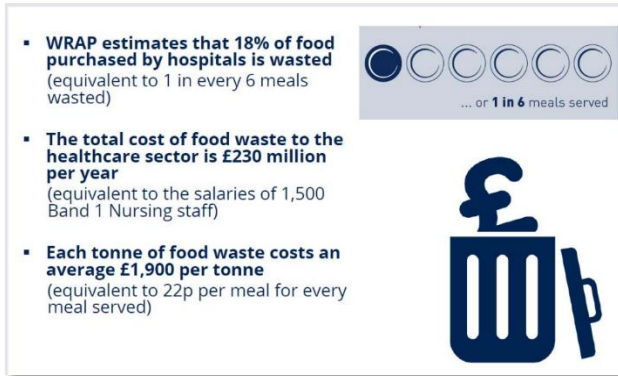
Key message / aim

The six-month project aim was to engage with Catering and Nursing colleagues to quantify the generation of food-waste in patient feeding. The pilot was conducted at Princess of Wales Hospital (POWH) where the site has non-ward hostess (n=16) and ward hostess (n=4). The data collection methodology was to establish the number of wasted meals, cost and environmental impact to the Health Board between ward hostess and non-ward hostess. The medium term goal is to develop a SusQI project to educate staff the need to prevent this waste from occurring – thus reducing all associated costs with producing and manufacturing food that is not consumed by patients, and re-measure. Ultimately we are aiming to improve patient care through nutrition, and reducing the carbon footprint of the Catering department in CTM UHB through minimising food-waste.

What is the problem?

Food and catering accounts for approximately 6% of the NHS’s total carbon emissions – 1,543 ktCOe annually¹. WRAP Cymru highlight the following figures diagrammatically (Figure 1):

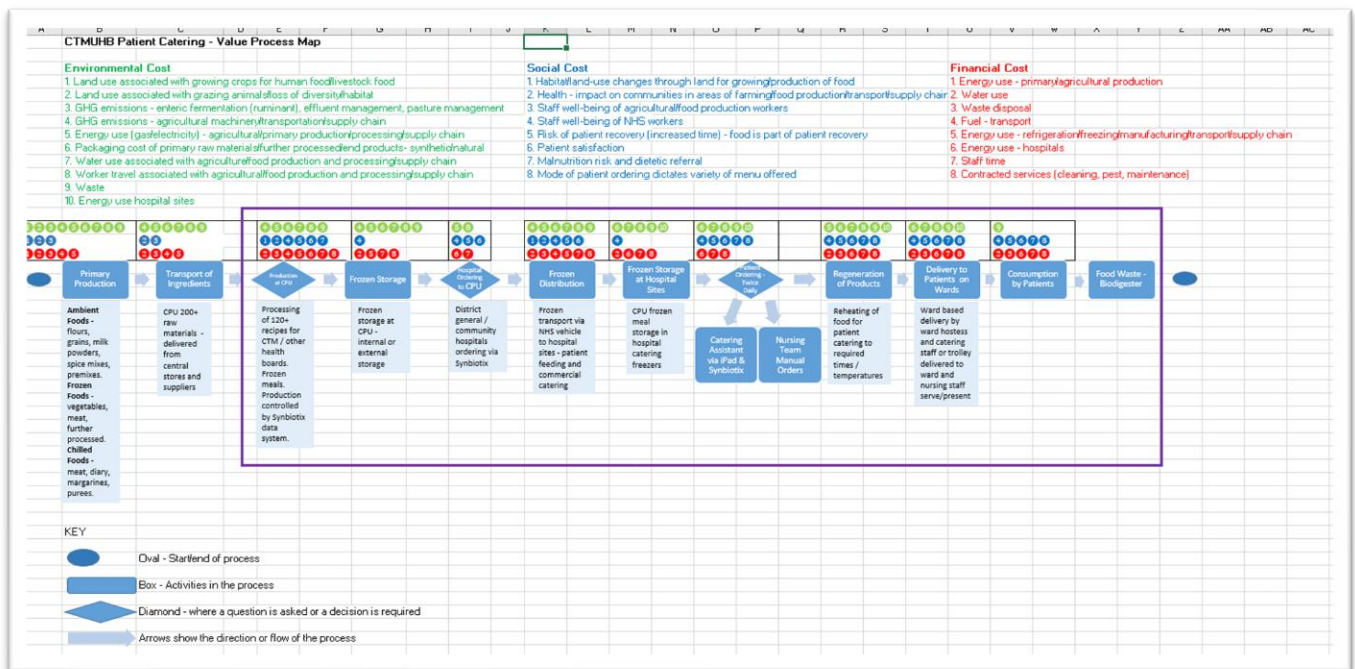
Figure 1: WRAP Food-waste Diagram



Source: WRAP Cymru (2017), Preventing Food-waste in the UK Health Sector, Food-waste in Healthcare.

It is particularly pertinent to note that the NHS is wasting 18% of purchased food or one in every six meals. Food-waste in the NHS is directly linked to climate change – food as a whole is responsible for a quarter of the United Kingdoms (UK) carbon footprint.² This can be at any stage of the food production or supply chain e.g. fertiliser use, livestock food production, transport, manufacturing or food-waste. The accompanying CTM UHB patient catering value process map gives an overview of the social, economic and environmental impact of food production (Figure 2). Food is also a vital part of a patient’s recovery and health: if this food is not being consumed and is subsequently wasted, potentially this can lead to extended recovery times in hospital.

Figure 2: CTM UHB Patient Catering Value Process Map



The reason for choosing this project scope is the impact wasted or uneaten food has in CTM UHB in terms of financial, environmental and social aspects. The key strategic reason for attempting to quantify the amount of food-waste generated in an acute site is to explore areas for reducing food-waste and providing a methodology and model for all sites to follow (hopefully with a pan-Wales approach). However it was not possible to provide solutions until the extent of the problem had been measured. The Sus QI Step 1 approach setting the goals changed significantly and the study focused on Sus QI Step 2 – studying the system.

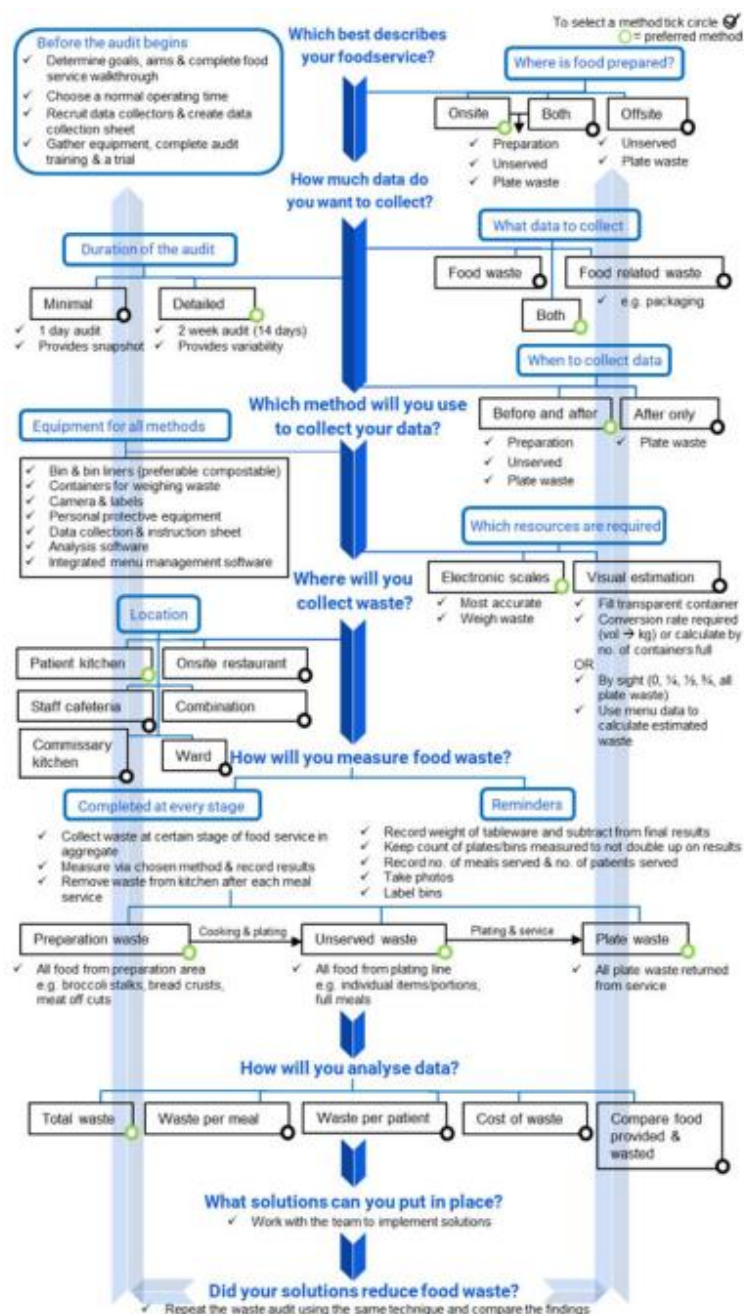
The acute site POWH where this exercise was conducted is located in South Wales, and has a bed capacity of 454 and 2315 staff (this is approximately 19% of staff in CTM UHB and 27% of bed capacity). It is worth noting it is the only acute site in CTM UHB that does not have a fully integrated ward hostess Catering model. The site is unique in CTM UHB in that only four of the wards are ward-hostess: Catering assistants take digital food orders via an iPad from a pre-populated menu twice per day. The remaining sixteen wards have nurses ordering from a reduced menu the day before and the Catering team deliver to the ward, nursing teams serve the food to patients (referred to as non-ward hostess). A key point here is that patients in “non-ward hostess wards” are not offered the same choice as ward hostess serviced wards, due to a reduced menu, also nursing staff choose food on behalf of a patient due to the structure of service in place. Approximately 60% of the UK has moved to ward-hostess Catering due to improved efficiencies on nursing time.

The key staff involved were the Catering team onsite and Facilities Technical Compliance Hub. Reducing food-waste in CTM UHB will have positive impacts not only on cost savings, reduced carbon emissions but also food eaten rather than wasted which support patient nutrition recovery. A report by The British Association for Parental and Enteral Nutrition (BAPEN) (2012) highlighted this link. The study stated 40% of adult hospital inpatients and 15% of children are malnourished on admission, and the majority continue to lose weight in hospital.³ They estimated between 30-50% of hospital food is wasted and average food intakes are less than 75% of that recommended (particularly in the elderly). The link was that clinical outcomes are impaired in conjunction with the wasted food resource.

What was the solution?

After the value process mapping exercise on CTM UHB patient Catering supply chain (figure 2) highlighted the complexity of the project, it was decided to refocus the project on measuring patient food-waste only at one acute site. The next step was the compilation of a methodology for ward audits conducted by Facilities Technical Compliance. *Cook et.al (2021)* developed a scientific hospital food-waste audit consensus tool from the most common food-waste audit methods and this assisted in identifying the types of food-waste to focus on (Figure 3).⁴

Figure 3: Schematic of Hospital Food Waste Generation



Source: Cook et al. (2021) Schematic of Hospital Food-waste Audits

The data collection involved recording the number of meals that were supplied to all wards at POWH (n=20) spanning breakfast, lunch and supper service. This was already in progress by the Catering department at POWH, and was verified by the Technical Compliance Team. The calculated waste focused on meals that were uneaten by patients or unserved to patients. It did not include plate

waste or scrapings on plates – as essentially it is deemed the food had been supplied to patients. This was collated on a daily basis across all 20 wards in POWH and then totalled for the month, and the data collection spanned seven months in duration. Figures were collected after Catering trolleys were returned to the central kitchen. All unserved food is left in the original packaging with number of portions per pack making a visual estimation of the waste food reasonably accurate. The number of meals was then converted to a percentage to calculate number of meals wasted/returned against number of meals supplied. A weight in Kg was then calculated from menu data on portion size. An average monetary value per meal was also calculated. It is worth noting that packaging waste was not calculated as part of this study.

The model by *Cook et.al. (2021)* provided a usual mapping exercise in how after this study is complete we can take the study forward and look at all food waste from patient feeding and commercial Catering.

What were the challenges?

- Training of Catering staff – the waste figures were already being gathered at POWH but consistency and understanding between staff was the key challenge. In future quantification trials weight (Kg) will be a consideration.
- Nursing staff on non-ward hostess wards commented about minimal quantities of food supplied and the number of choices, however this contradicted waste figures.
- Time – the ward audits were challenging as multiple repeats were required to get a more accurate assessment of the true picture and figures.
- Constraints – on the non-ward hostess ward time was the biggest constraint to Nursing teams. Typically food service is taking 2-4 staff up to three hours a day (dependent on size of ward) so topics like food-waste are of a lower priority.
- Lack of understanding and education – staff do not genuinely understand the monetary and environmental impact of food-waste, especially the scale in an acute site.
- Patients willingness to discuss the food and their thoughts/feelings (possibly dependent on the reason for admittance and length of stay)
- Plate waste – it was decided not to measure plate waste due to resource constraints but also to focus on whole meals that were uneaten/not served to patients.

What were the results/Impact?

The results of the food-waste quantification study over a seven-month period were measured and key data can be viewed in the table below. The total number of meals issued or returned is shown by number on a monthly basis. The data also shows the number of meals returned for a ward-hostess and non-ward hostess and by percentage. The final column shows the total percentage of meals returned (wasted) per month.

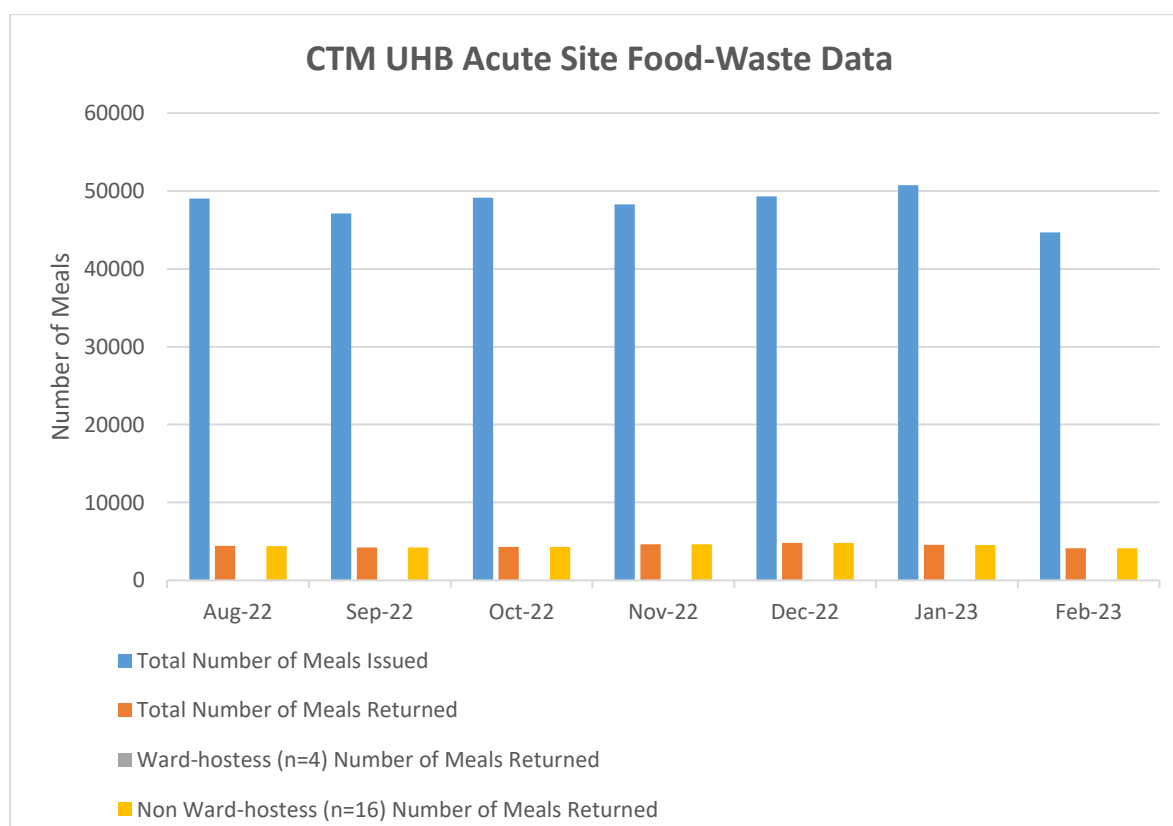
Table 1 – Food-waste data for one acute site over a seven month study

Month	Total Number of Meals Issued	Total Number of Meals Returned	Ward Hostess (n=4) Number of Meals Returned	Non Ward-hostess (n=16) Number of Meals Returned	Total (%) Meals Returned per Month
August 2022	49033	4415	4 (0.16%)	4411 (8.84%)	9.00%

September 2022	47110	4224	9 (0.47%)	4215 (8.50%)	8.97%
October 2022	49142	4303	5 (0.20%)	4298 (8.56%)	8.76%
November 2022	48258	4631	4 (0.20%)	4627 (9.40%)	9.60%
December 2022	49299	4823	6 (0.30%)	4817 (9.48%)	9.78%
January 2023	50734	4552	3 (0.13%)	4549 (8.84%)	8.97%
February 2023	44680	4123	0 (0%)	4123 (9.23%)	9.23%
	338256	31071	31	31040	Average (9.19%)

The data shows a range of 0-0.47% returned meals for ward hostess service model and a range of 8.50-9.48% returned meals for non-ward hostess wards. There is consistency of the data for both ward model types over the seven-month study. The data is significantly higher for non-ward hostess each month in terms of number of returned meals and percentage. Graph 1 shows the food waste data in a bar format – the ward hostess returned meals data (grey bar) does not feature as the numbers are so low.

Graph 1 – Food-waste data for one acute site over a seven month study



Patient outcomes:

- Ward hostess versus non-ward hostess – the data collected clearly identifies a lower return of meals to the Catering department via the ward hostess service model. This is desirable for the patient as they get a choice of food from a dietetically assessed menu with Catering staff

dedicated to taking orders and serving the meal. They are ordering what they want to eat from a patient feeding menu.

- Protected meal times – the protected meal time outcome is essential to patient recovery and contributes to the overall care plan.
- Recovery and nutrition as medicine – this is an essential part of patient care plan and links to recommendations by the BAPEN 2012 report. All three points under patient outcomes are directly linked to a positive patient experience, adequate nutrition and recovery to facilitate getting the patient home.

Population outcomes:

The population outcomes of food-waste in a non-ward hostess Catering model in an acute site are far reaching, and stretch further than financial, social and environmental. The BAPEN (2012) highlighted the clinical outcomes of patient choice, food intakes and malnutrition as intrinsically linked to food-waste. These drivers ultimately lead to longer patient recovery times, increased stays in hospital and a larger population of 'nutritionally at risk patients'. Malnourished patients at intake or who become malnourished during their hospital stay are more prone to nutrition related diseases. This has then impacts when patients are eventually released from hospital for the general population, and places more pressure on Community nursing teams. The CTM UHB has a corporate strategy of improving patient nutrition and this is particularly imperative when 85% of the staff population live in the three regions of Rhondda, Merthyr and Bridgend – hence our staff population are our future patient population.

Environmental impact:

GHG emissions associated with food production and food waste disposal emissions have been estimated.

GHG Emissions – Waste Disposal

Food waste is transported from Bridgend to Aylesbury (formally Carmarthen) to be disposed of via anaerobic digestion. To estimate the GHG emissions associated with food waste disposal, a process based carbon foot printing methodology has been used. It was decided not to use the BEIS database emission factor for anaerobic digestion as the factor excluded emissions associated with the anaerobic digestion process itself and only included transport emissions for an average distance to an anaerobic digester. Instead, a new transport emission factor was created using the BEIS database and actual distance data to the anaerobic digester located in Aylesbury.

WTT emissions factor for HGV average laden (from BEIS database, on WTT tab): 0.02599 kgCO₂e/tonne.km⁵

HGV average laden emissions factor: 0.41 kgCO₂e/tonne.km

Total HGV emission factor: 0.43599 kgCO₂e/tonne.km

Carbon emissions of **waste disposal** = 20.48640 tonnes * 0.43599 kgCO₂e/tonne/km * 231.75 km = **2069.95 kgCO₂e (7 months)**

GHG Emissions – Food-waste Production

GHG emission associated with the production of the food wasted has been estimated based on an Environmentally Extended Input Output Analysis (EEIOA) where cost is converted into carbon emissions. An emission factor for food and catering, 1.483 kgCO₂e/£, was taken from the 20/21 GreenerNHS database.⁶

Carbon emissions of **food production/procurement** = £3.25 * 1.482631 kgCO₂e/£ = 4.82 kgCO₂e * 31071 = **149762.2 kgCO₂e (7 months)**

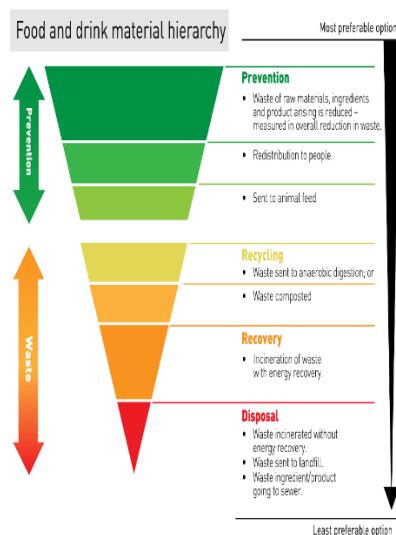
£3.25 average cost of a wasted patient meal

Total GHG emissions

151832.15 kgCO₂e (7 months) or 151.83 tonnes CO₂e (7 months)

It can be summarised that the GHG emissions associated with food production and food waste disposal emissions have been estimated at a total of 151,832.15kgCO₂e (151.83 tones CO₂e) in 7 months. From an environmental impact perspective the study of this highlights the need to quantify this figure and now it is known work towards the prevention of this food-waste in the first instance. The food waste hierarchy in England (Figure 4 below) highlights schematically the importance of prevention as the top factor in preventing food-waste.

Figure 4 – England Food Waste Hierarchy



Source: Food Waste Hierarchy [Food waste in England - Environment, Food and Rural Affairs Committee - House of Commons \(parliament.uk\)](https://www.parliament.uk/commons/debates/2018/06/12/food-waste-in-england)

Social impact:

The social impact of food-waste incurs the barriers to change highlighted in challenges section. Covid-19 had a big impact on space in hospitals both ward hostess and non-ward hostess, the social activity of eating was removed to bedside and a mind-set change is now required. Bed shortages have meant space formerly used for patient eating/socialising are no longer available or have been turned into cubicles. In some hospital settings protected meal times are not a priority which again has an impact on food intake and associated food-waste, it can limit nutrition intake.

Financial impacts:

The financial impact of this wasted food is estimated to be in the region of £100,000 over a 7-month period. This is based on the purchase price of the food at approximately £3.25 a meal and 31071 wasted meals in a 7-month period. It could be higher or lower dependent on the meal choices. It should be noted that the financial impact just not take into account waste packaging or the actual disposal costs charged by the company collecting the waste-food for anaerobic digestion.

What were the learning points?

- The first learning point was how to conduct value process mapping for patient catering.
- I expanded my knowledge in Sustainable QI and Carbon foot printing methodologies
- The project caused me to instigate networking with Hywel Dda colleagues and others on Sustainability platforms like GreenerNHS and FutureNHS
- I deepened my knowledge on our food-waste generation in patient feeding and subsequent disposal.
- I understand how prevention is the key to reducing this food-waste figure – in terms of environmental, financial and social impacts.
- In-depth learning of the challenges of “ward hostess” and “non-ward hostess” in acute sites
- The anaerobic digester was moved from Carmarthen to Aylesbury which impacted the carbon footprint calculation negatively.
- How much more scope there is to impact CTM UHB Sustainability initiatives with this topic of food-waste.

Next steps

- Potential collaborations with Cardiff University and WRAP Cymru on further projects/funding/resource.
- The finalisation of a food-waste audit process and training of a methodology for consistency
- A further paper utilising the proposal on our acute site to move to “ward-hostess” based on environmental figures of food-waste, monetary figures and social factors in patient care.
- Developing a uniform waste-audit methodology for CTM sites (acute and community).
- Step 3 SusQI Designing the improvement and Step 4 SusQI Measuring the Impact - training for all Catering staff on food-waste and digital recording.
- A pan-Wales approach!

What the team and/or patients and carers had to say

- Nursing staff interviewed on non-ward hostess wards commented on how much time of their day feeding patients, including orders, plating and cleaning up took of their day. They felt it detracted from other nursing care duties they needed to carry out. When short staffed a matron commented they have to serve food occasionally.
- Nursing staff and HCAs commented they had not had food hygiene training and they stated they did not have time to consider things like food-waste.
- The majority of patients spoken too said the food was of a good quality but they did not get the choices and the food was chosen for them the day before. This is common on ward-hostess wards.

Resources and references

[1] WRAP Cymru, Preventing Food-waste in the UK Health Sector, Food-waste in Healthcare. Hugh Jones, June 2017. Available from: [Microsoft PowerPoint - WRAP Presentation-Brussels-1706-v1.pptx \(noharm-europe.org\)](#)

[2] Food and Nutrition England NHS, Where you can make a positive impact towards net zero. Available from: <https://www.england.nhs.uk/ahp/greener-ahp-hub/specific-areas-for-consideration/food-and-nutrition/>

[3] The British Association for Parental and Enteral Nutrition (BAPEN) (2012). Hospital Food as Treatment. Available from: [Hospital Food as Treatment \(bapen.org.uk\)](#)

[4] Cook N, Collins J, Goodwin D and Porter J (2021). A Systematic review of food-waste audit methods in hospital foods services. *Journal Hum Nutr Diet*, 35: 68-80.

[5] Department of Business, Energy and Industrial Strategy (BEIS) (2022). UK Government GHG Conversion Factors for Company Reporting. Available from: [ghg-conversion-factors-2022-condensed-set.xls \(live.com\)](#)

[6] GreenerNHS Database 2020/21. Available from: [Greener NHS \(england.nhs.uk\)](#)

Further Reading

Navarro D, Boaz M, Krause I, Elis A, Chernov K, Giabra M et al. Improved meal presentation increases food intake and decreases readmission rate in hospitalized patients. *Clinical Nutrition*. 2016;35 (5):1153-1158.

Want to know more?

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- Location & NHS Region if within the UK: Cwm Taf Morgannwg University Health Board, Wales
- Partner organisations involved: *[Name of partner organisation(s); links to relevant info/resources]*
- Has this project or story been made public in any form before? No

If available, please provide details of an additional contact to best enable others interested in your project to reach you in future.

Contact 2:

- Name: [Russell Hoare](#)
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