GREEN TEAM COMPETITION
CENTRE FOR SUSTAINABLE HEALTHCARE

NHS Gloucestershire Managed Services

NHS Gloucestershire Hospitals NHS Foundation Trust

STREAMLINING ENTERAL FEEDING EQUIPMENT, HOME ENTERAL FEEDING TEAM.

TEAM MEMBERS:

- Sarah Williams, Home Enteral Feeding Team Manager (job share) and Dietitian Training Lead
- Laura-Marie Baldwin, Advance Home Enteral Feeding Team Dietitian and Adult Team Lead



Background:

Gloucestershire Home Enteral Feeding Team (HEFT) provide dietetic and nursing care to approximately 500 patients who are enterally fed (fed via a medically inserted tube into their gastrointestinal tract).

The practice of enteral feeding uses a lot of different equipment, including multiple plastic devices which, depending on an individual's needs, vary between patients. Many of these products are single use, and some patients may require multiple single use items within one day, generating a lot of plastic waste.

Enterally fed patients in Gloucestershire have been raising concerns with clinicians of the HEFT about the amount of waste generated by their enteral feeding. These included concerns over cardboard waste, plastic waste- generated by both the feed bottles and the giving sets (the plastic tubing from the bottle of feed to the feeding tube) and fuel emissions produced by their supply deliveries. The HEFT clinicians took on board these concerns and were keen to seek alternative options to improve the patients' experience.

The contracted supplier of the enteral feeding products, NUTRICIA, has recently procured a re-useable plastic bottle reservoir (Sterifeed bottle) as an alternative to a single use reservoir (Flo-care bottle) which is currently in use by many of our patients. Recent research undertaken by Nutricia has also shown their giving sets, previously advised to be single use only, are safe to be re-used within a 24 hours period with no contamination concerns (Nutricia, 2021). Applying these changes would lead to a reduction in the amount of single-use plastic bottles and a reduction in the number of giving sets needed by some HEF patients. The HEFT therefore launched a pilot project to trial the use of the re-useable Sterifeed bottles and trial the extended life of the giving set.

Specific Aims:

1. To evaluate the environmental, financial, social and clinical impacts of
   a. Replacing the use of single use Flo-care feed bottles with reusable Sterifeed bottles for appropriate patients in the Neurologiocal Centre
   b. Extending the life of giving sets from single use to 24 hour use for appropriate patients in the Neurological Centre.
2. Raise the awareness on the impact of health care on the environment amongst staff at the Neurological Centre, HEFT staff, enterally fed patients and their relatives.

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Methods:

The pilot project was conducted in a local Neurological Centre where the HEFT care for 32 patients. Eligible patients were identified using the below criteria:

a) Reusable bottles: Any patient using the single use Flo-care containers
b) Giving sets: Patients who are using >1 giving set per 24-hour period

Patient equipment orders were changed with the supplier and the next delivery was amended to include the new bottles and reduced number of giving sets. While the bottles are reusable, they require a single-use adapter which cannot be cleaned and re-used. The change was not implemented immediately to give the staff chance to use up the remaining old stock to avoid unnecessary waste.

Two training sessions for staff were provided at the Neurological Centre to education staff to announcing the change to re-usable products, demonstrating how they are used and also how re-usable equipment should be safely cleaned between uses**.** Presentation slides and pictorial guides were used. We also used these sessions to raise awareness of the impact of health care on the environment.

The centre was chosen as a pilot site as there are several patients who are eligible to change to the new products. The sample of patients at the centre is representative of the wider population of enterally fed patients within Gloucestershire allowing for the impact of the change to be extrapolated to the entire HEF population and the carbon emissions saving estimated. The Neurological Centre is ideal for gathering feedback from service users before and after the launch of reusable enteral feeding products and it is also an ideal venue for training of multiple staff members over 2 pre-arranged training sessions.

Measurement:

Patient outcomes:

Based on research from Nutricia (Nutricia 2021), the changes being implemented will not compromise patient care and safety. Extensive testing on the safety of extending the life of the giving sets has been completed and extending the useable life will reduce the amount of set needed in a 24hour period for some patients.

The swap to the re-useable Sterifeed bottles will not alter the standards of patient care however currently there is not a 1000ml Sterifeed bottle available, therefore patients who receive 1000ml Flo-care containers will instead receive 2 500ml Sterifeed bottles. This is not anticipated to alter the patient care and there are plans to launch a 1000ml Sterifeed bottle in the future.

Environmental sustainability:

CO2e was calculated for each individual item using a bottom up (process based) methodology. Individual materials were weighed and appropriate carbon emissions factors allocated to each material from the UK Government GHG conversion factor database, and the greenhouse gas emissions associated with transport from production to our service site estimated. Emissions associated with waste disposal were obtained from Rizan et al 2021.

CO2e for each item was applied to our patient data to identify actual savings from changes implemented at the Neurological Centre.

The reduction in CO2e was then used to extrapolate to all patients under the HEFT who are receiving single use bottles to ascertain the overall impact of changing to re-useable containers throughout the patient population.

Economic sustainability:

Price comparison of the single use containers compared to the re-useable containers will be conducted, however, as these are both contracted items the overall cost will remain unchanged.

Social sustainability:

We aim to improve patient and staff experience by reducing the amount of plastic waste generated in enteral feeding practice without compromising patient safety or care. This will be measured by qualitative feedback from staff at the Neurological Centre.

A short questionnaire for staff members was conducted before and after the training session to understand staff's awareness and concerns surrounding health care impact on the environment and enteral feeding practices.

Following implementation of the new equipment, a second questionnaire was conducted and qualitative remarks from the staff were gathered by the Dietitian.

The subsequent impact of the project will reduce the volume of products being made and shipped, therefore reducing the quantity of raw materials consumed and fuel emissions of shipping. This will be an additional consideration and something which this project is unable to calculate.

Results:

Patient outcomes:

Results following the implementation of the Sterifeed bottles show that:

- 100% of staff reported the bottles were easy to use
- 100% staff reported that the set-up of the equipment (each element: universal bottle adapter, giving set, stand and pump) was "fairly easy".
- 100% of staff agree the Sterifeed were easy to clean. Staff commented that the wide bottle opening made cleaning particularly easy.
- Staff reported on average cleaning the Steribottle took 0-5mins and overall there was no-difference in the set-up time compared to the Flo-cares. Staff did highlight that the initial set-up of the Steribottle takes longer, but this was balanced out by the Steribottles being easy to access as they are able to be kept in the patient's room (as opposed to the Flo-care containers being in the stock room).
- Staff reported that there was no change in the convenience of using the Sterifeed over the flo-care containers and no change in patient care.

Environmental sustainability:

Caseload screening showed there were 4 patients eligible for a switch to reusable bottles, and 2 patients eligible for extended use of giving sets.

The tables below show the individual products carbon production emissions and the carbon emission savings which can be made by switching to the Sterifeed bottles and extending the useable life of the giving sets the Neurological Centre.

An estimation of the overall carbon saving to the whole HEF patient cohort using Flo-care containers was extrapolated by using recent total monthly usage data of the Flo-care containers and also by assessing monthly usage of giving sets for each individual enterally fed patient. One-hundred-and-one patients were found to be eligible for changing from Flo-care containers and 77 patients for reducing the number of giving sets used each year. From this, we calculated the annual usage.

Table 1: Carbon emissions data prior to changing to re-usable equipment:

	Carbon emissions per item (kgCO2e)	Number of items used per year at the Neurological centre	Total carbon emissions/year (kgCO2e) at the Neurological Centre	Number of items used per year for the entire HEF patient population	Total carbon emissions/year (kgCO2e) for the entire HEF patient population
500ml Flo-care	0.20	1,008.00	205.8	80,508	16,102
1000ml Flo-care	0.27	1,008	270.7	6,264	1,691
Giving set	0.18	1,344	245.8	74,208	13,357
TOTAL			**722.3**		**31,150**

Table 2: Carbon emissions data after changing to re-usable equipment:

	Carbon emissions per item (kgCO2e)	Number of items used per year at the Neurological centre	Total carbon emissions/year (kgCO2e) at the Neurological Centre	Number of items used per year for the entire HEF patient population	Total carbon emissions/year (kgCO2e) for the entire HEF patient population
Giving set	0.18	672	120.96	27,381	4,929
500ml Sterifeed *	0.17	108	18.36	2,832	481
Universal Adapter	0.03	1344	40.32	33,936	1,018
TOTAL			**179.64**		**6,428**

*Carbon emissions associated with cleaning the reusable bottles has not been included, so may be slightly underestimated.

The carbon foot printing has demonstrated a saving of 417.82 kgCO2e by changing from disposable 500ml and 1000ml containers to 500ml reusable containers at the Neurological centre. If this data were to be extrapolated out to all 101 patients currently using Flo-care containers, this would result in a further saving of 16,293.08kgCO2e per year.

By implementing the new giving set guidance of one item per 24 hour period, a saving of 124.84 kgCO2e per year could be predicted at the Neurology centre. A total saving of 8,428.8kgCO2e per year would be made throughout the entire HEF patient population on an annual basis.

The carbon savings in total are **24,722 kgCO2e** per year, equivalent to driving 71,204 miles, which is equivalent to driving from Lands end to John O'Groats 107.5 times, or driving around the UK coastline 9.2 times.

Economic sustainability:

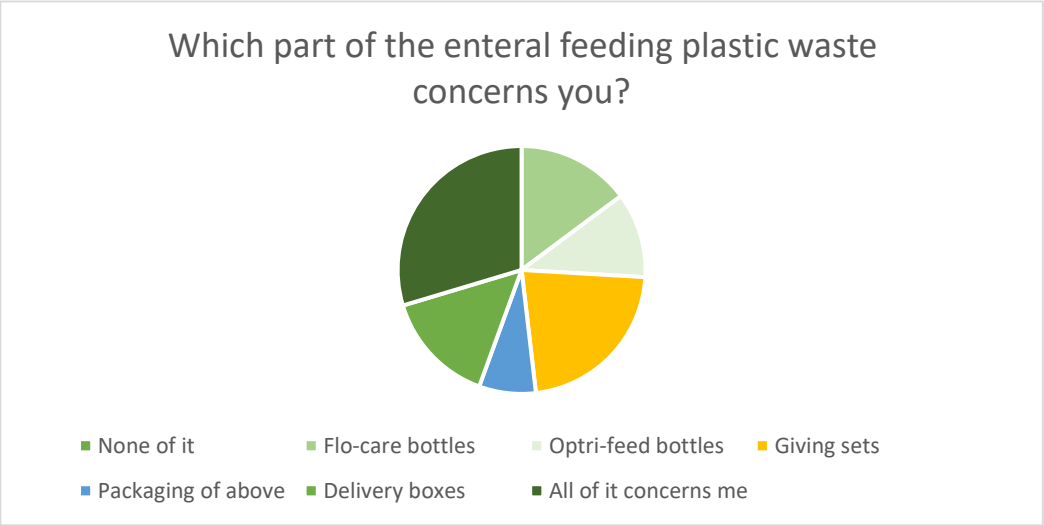
The cost of the disposable and re-usable containers are the same. The financial impact for these products is therefore neutral. However, by swapping patients to the reusable products and adding a daily universal adapter in order for the product to fit the giving sets, there is an additional cost of £368.65 per year to the healthcare commissioners for Home Enteral Feeding services.

There may be benefit to supplier and further up in the supply chain as less products are being made, less products are being transported and overall, less products are needing to be recycled. However, this will also result in less product being purchased therefore the financial impact here may also be neutral. This was unable impact was unable to be evaluated within the scope of this project.

Social sustainability:

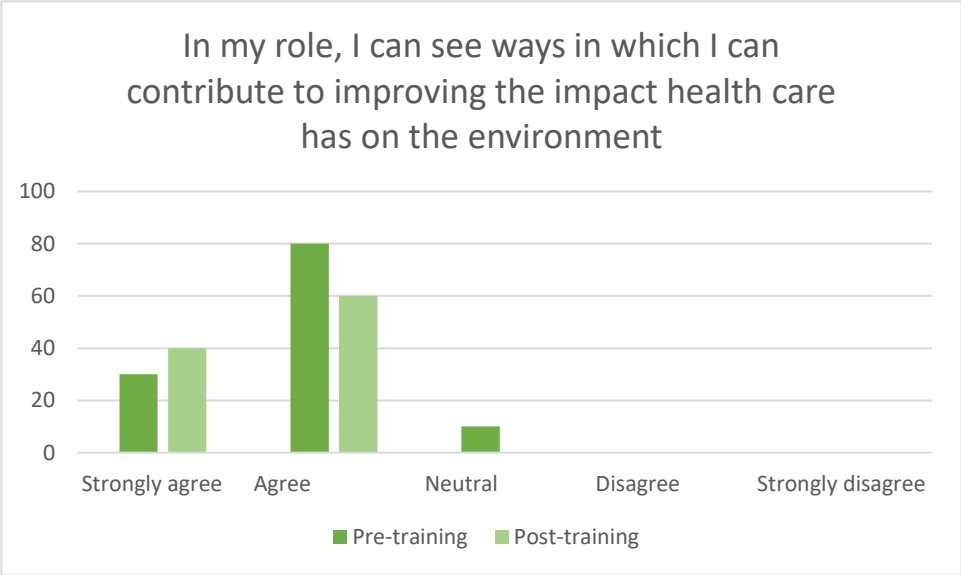
Of the 10 staff members surveyed at the Neurological Centre prior to the training 80% of them reported concerns on the impact of health care on the environment. Following the training this rose to 100% of the staff members strongly agreeing or agreeing that they had concerns on the impact of health care on the environment. 90% of staff reported that the information received changed their thoughts on the impact of health care on the environment.

When asked about products specifically relating to enteral feeding, 90% of those surveyed were concerned by the amount of plastic waste generated. The breakdown of the items which concerned them is displayed in Graph 1.



When asked if they could see ways in which they could contribute to improving the impact health care has on the environment in their role, before the training 30% strongly agreed, 80% agreed and 10% were neither agreed or disagreed. Following the training this rose to 40% strongly agreed and 60% agreed that

they can see ways in which their role can contribute to improving the impact of health care has on the environment as displayed in Graph 2.



Comments on why the plastic waste generated by enteral feeding practices concern staff are displayed below:

As it can be recycled and it is not done enough

Plastics are single use i.e. syringes, giving sets, bottles and packaging.

Because it is all put in normal bins. There is no specific place to recycle it. Mainly because it can go into the Ocean.

We go through a lot of the (enteral feeding plastics) and they are usually thrown away in clinical waste.

Because most of it is one time only.

This project has demonstrated that similarly to our patients, staff members caring for enterally fed patients at the Neurological Centre are also concerned about the amount of plastic waste generate through enteral feeding practices. The majority of staff report that although they have these concerns and they recycle at home, they do not recycle the plastic waste generated from enteral feeding at the Neurological Centre. It is understood that there is limited space available for recycling facilities at the Centre, but it is hoped the results of this survey can demonstrate the need for this to be reviewed and for alternative options to be sought.

Since switching to the containers staff feel that the change has had a very positive impact on the environment, as previously they were very upset about the amount of waste generated through enteral feeding practice. staff commented that they wish the products had been available to them earlier.

Discussion:

The impact of this project has been seen in several different areas. When our patients began to raise their concerns over the amount of plastic generated in the practice of enteral feeding, we knew we needed to consider making changes to reduce the environmental impact. When Nutricia made available

the new re-usable Sterifeed bottles we were keen to trial them with our patients. This coincided with new data on the usable life of the giving sets. This provided a good opportunity for HEFT to change their practice around these two products and respond to our patients concerns.

The project has had a positive effecting in raising the awareness of the impact health care has on the environment. It is hoped that this effect will have a sustained effect and staff may continue other sustainability projects at the centre in their job roles. As the majority of staff surveyed recycled in their personal lives too this demonstrated that they are conscious of the environment at home.

Announcing the change to re-usable products, demonstrating how they are used and also how re-usable equipment should be safely cleaned between uses was undertaken during 2 pre-arranged training sessions at the Neurological centre using presentation slides and pictorial guides. A challenge of this arrangement is that not all staff (including night shift staff) could attend the sessions and we have therefore relied on the trained staff training the staff that could not attend. To help upskill the members of staff who could not attend the training sessions, we made our presentation slides and pictorial guides available to all staff at the Neurological centre. A further challenge that was not foreseen was that the Neurological centre had an overstock of the disposable containers. This caused a delay in staff swapping from disposable to re-usable products and a time lapse between the training sessions and swapping to reusable equipment occurred.

Although the overall impact of this project has been positive, there have been some challenges identified. The Sterifeed bottles need a universal bolus adapter to connect them to the giving sets. These are single use items, therefore a new adapter is needed for each bottle, it cannot be cleaned and re-used. So although the bottle can be, the adapter must be discarded after every use. To make the whole process of using the Sterifeeds then most sustainable practice, this product re-useability needs to be reviewed. As a result of this project, we have raised this with Nutricia and hope that this something they can look into.

The limitation that the Sterifeed bottle must be hung on a different frame to the bottles of feed. This is taking up additional space on the patient's bed side table. A possible solution to this could be a flexible hook on the base of the Sterifeed bottle (as per Flocare container design) so that it is compatible with the current hanging frame.

Another comment raised following the implementation was the lack of a 1000ml Sterifeed bottle, which there is in the Flo-care range. One patient was needed a two 500ml Sterifeed bottles in place of one 1000ml Flo-care containers. In practice, at the neurological centre this wasn't a problem because the patient has 1:1 staff member 24hrs per day. However, in a patient's own home this may impact routine, and, as a result may need their feeding regimen altered.

A further consideration for using the Sterifeed is their cleaning. To ensure the feeding system remains as clean and safe as possible, the bottles should be washed thoroughly after every use, preferably as soon as the feed has finished. For more mobile patients in our cohort, this may not be convenient if they are out and about in the community. Therefore, for these patients, the Sterifeeds may not always be suitable.

Conclusions:

The total reduction in the carbon footprint resulting from a change to reusable enteral feeding equipment amounts to 24,722 kgCO2e. This information from the study can be used when negotiating changes to patients enteral feeding supplies and to let service users know of the positive impact the change will have on the environment. The changes are planned to be carried out by the HEF team throughout 2023. The HEF team members are keen to make changes to their practice that would have a positive impact on the environment. We intend to present the pilot results from the Neurological centre to the HEF team and share the training resources we have developed in order for them to be used with enterally fed patients across Gloucestershire. Swapping to re-usable enteral feeding equipment will be discussed with each eligible HEF patient during their scheduled enteral feed reviews which are undertaken as home visits.

References

1. Nutricia. Together we can be better for the planet. (2021). Available at: *https://www.nutricia.co.uk/hcp/where-we-specialise/tube-feeding/reducing-plastic-in-enteral-feeding/together-we-can-be-better-for-the-planet.html?utm_source=solutionsteam&utm_medium=email&utm_campaign=betterforthepla net&utm_content=awarenessb* (accessed 03 January 2023)
2. *Rizan C, Bhutta M, Reed M, Lillywhite R. The carbon footprint of waste streams in a UK hospital. Journal of Cleaner Production 286 (2021) 125446. https://www.sciencedirect.com/science/article/abs/pii/S0959652620354925*

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