Design for Life Project

Hampshire Hospitals NHS Foundation Trust

CSH is working with the Design for Life team, in collaboration with key partners in the NHS to explore the potential for switching from single-use to reusable products. This initiative aims to identify barriers, opportunities, and the benefits of such a transition, focusing on sustainability, cost savings, and improving healthcare efficiency. By quantifying these benefits, the project supports the NHS's broader goal of reducing waste and promoting a circular economy in medical technologies.

Contributors:

- Victoria Williams - Procurement Specialist
- William Garvey - Procurement Manager
- Krithea Baker - Recovery Nurse Practitioner
- Zoe Wild - Senior Scrub Nurse
- Colin Woodward and Rod Florentino - Sterilisation
- Miranda Chubb - Sustainability Manager
- Joanna Chapman - Infection prevention and control

Background:

Tray wrap is a sterile packaging material used to wrap surgical instruments and other medical equipment to ensure they remain sterile during storage and transport. It is most commonly used in surgical departments, where maintaining sterility is essential for patient safety. Reusable surgical instruments are typically arranged in sets tailored to specific procedures or groups of procedures, then placed in trays or containers. After use, these instruments undergo a decontamination process, which includes cleaning followed by microbial inactivation through disinfection or sterilisation (usually steam sterilisation). Tray wraps allow sterilisation agents to permeate while preventing microorganisms from entering the packaging after the sterilisation process, thus maintaining sterility until the point of use. Tray wraps typically consist of one to three layers of materials such as polypropylene and paper. However, the single-use nature of tray wraps contributes to ongoing waste within the NHS. (Rizan et al, 2022).

Over 150,000 sets were processed across the two main hospital sites in Hampshire Hospitals NHS Foundation Trust (HHFT) in the past year. Sterile services at RHCH supply 12 theatres across 3 departments, which are main theatres, TC, Labour ward, and Gynae/Breast. Sterile service at Basingstoke and North Hampshire Hospital (BNHH) supplies 16 theatres over similar departments with more trauma orthopedics and large specialist cases. This accounts for the increased rate of wrapped trays they produce compared to RCHC. Supplementary items at both sites have been excluded from this project as they are packaged differently after sterilisation. The aim of this report is to explore options and sustainable value of switching to a reusable, washable tray wrap.

Single-use tray wrap is used across the Trust, introduced when items are prepared in the back of the theatre. Following a surgery, the surgical team places any "dirty" instruments into the sluice area, where they are taken to a pre-wash station for rinsing (usually a Band 2 level staff member). Following this, instruments are brought to the decontamination area and are processed through a dedicated washer to ensure they are properly cleaned. After cleaning, the instruments enter a sterile field maintained under pressure to ensure sterility is not compromised. A sterile services technician is responsible for then wrapping the instruments in tray wrap. Wrapped instrument sets are then placed on a trolley and transported to the autoclave, where it is sterilised using steam.

Following this process, trays are taken back to the theatre's cleanroom ready for use. Two staff members are involved in unwrapping the sets. After sterilisation, the tray wrap must be removed carefully and this often involves two staff members. One will remove the outer packaging, while a second member of staff who is scrubbed in for surgery will open the sterile wrap to expose and remove the instruments. Once the instruments are used in surgery and the procedure is complete, the tray wrap is disposed of as clinical waste.

Each sheet is a different colour so that any holes in the wrap can be identified clearly at the earliest opportunity. For some procedures (e.g. n Trauma) double bonded sheet wraps are used.

All sterilisation wraps (for sets) and sterilisation reels/bags (for supplementaries) come from the Theatre Sterile Services Unit (TSSU) budget. The majority of wraps are ordered directly however some also come through NHS Supply Chain. There is a mix of 5 suppliers. There are variations to the single use wraps procured and used such as sheets in a pack (of approximately 60 wraps) or reels (up to 1000 wraps) ordered.

Process and approach taken to support transition.

Supplier and product options

As a first port of call, the team engaged with incumbent suppliers to explore if they have a reusable product available for Trial. The Trust currently purchases Tray wrap from several suppliers. NHS Supply Chain was reviewed with no dedicated framework or provision identified.

Option 1: Containers

Reusable containers for sterilising and storing surgical instruments are typically made from materials such as stainless steel, aluminium, or high-quality plastics, designed to withstand multiple cycles of sterilisation.

Barriers to use of containers:

- Due to the rigidity of the material and size of the containers, use would reduce the number of surgical instruments that could be sterilised in each wash cycle by approximately one third. For each tray there would be an extra lid and base that would need their own space in the washer.
- Single use filters would still be required for each container (the filter allows sterilisation agents to circulate effectively during the sterilisation process while preventing contaminants from entering the container afterward, ensuring the sterility of the instruments inside).
- It would be very expensive to buy all the containers required for all the trays that the hospital has.

- Theatres would at least need to double the storage space for all their sets.
- The current steriliser machines at HHFT are not powerful enough to dry these types of container. This would increase the likelihood that theatres would be opening sets to find out they are wet inside and therefore unusable.
- An additional trolley drape would be needed to keep the container and instruments sterile when they are opened in theatre (this is not required with use of tray wrap which provides the cover of the trolley).

Option 2: reusable laundered tray wrap

The supplier for HHFTs reusable gowns, Ellis, offers a reusable tray wrap that can be laundered. Ellis has a set of sizes that they offer.

Process: HHFT does not have laundering facilities on site with Ellis based in Camberwell, London (approx 55 miles from BNNH and 71 miles from RHCH). Reusable tray wrap would need to be sent off site. It would be assumed that all wraps could be infected and they would go through a laundry process that will kill off any infection and deactivate any prion related diseases (this is standard for surgical laundry e.g., gowns). The wraps will then be packaged in bulk in one plastic wrap and sent back to the hospital. Unlike the gowns, the tray wraps do not need to be sterilised before being returned to the hospital as they will be sterilised with the surgical tray once wrapped in the onsite sterile services. The reusable wraps are delivered clean but not sterile, and once the tray is wrapped, they will then be sterilised in the autoclave. This is the same practice as the current disposable wraps that are used. Ellis repairs damaged wraps (e.g. with a hole) using patches to extend their lifespan.

Implementation considerations

The first step would be to engage with stakeholders such as theatre management, surgeons, scrub teams and clinical governance. If all are in agreement then a trail of the reusable tray wraps can be undertaken with Elis. Following this feedback would be collected from staff, and If the trial proved successful, the next steps would involve preparing for full implementation and a wider roll-out across the surgical departments. Since Elis is already a supplier to the Trust for reusable gowns, this would primarily involve a change to the existing contract, rather than initiating a new one. Ellis, as the supplier, would create a contract change notice to formalise this adjustment.

Several actions would need to be taken. The clinical team would be responsible for drafting updated guidance, which would then be reviewed and signed off by the clinical governance team to ensure alignment with patient safety protocols and best practices. Infection Prevention and Control (IPC) would also be involved to confirm the reusable tray wraps meet the necessary hygiene standards. TSSU would need to be fully involved with trials initially taking place in TSSU to assess the permeability and robustness of the reusable wrap.

On the procurement side, the contract would be updated to reflect the new product and new clinical guidance and circulated to ensure proper dissemination of information. Funding approval would need to be obtained from the Operating Service Manager (OSM), with final sign-off from senior management and the Chief financial officer CFO to secure the necessary resources.

A key component of the implementation process would be effective communication and robust change management. Staff feedback from the trial would be gathered to address any concerns and ensure that all departments are informed of the changes and their benefits. Training would be

crucial to ensure staff are fully aware of the new protocols and the reusable trays are used correctly to reduce potential teething issues such as accidental disposal.

A product review group (PRG) could be considered. This is a procurement led approach to implementation of new products which ensures representation from all relevant staff groups (IPC, Matrons, Medical devices, Sustainability, etc) and can support in approval for change. However, as this change is required across surgical departments, rather than Trust wide, this may not be required.

Perceived barriers to the transition

It appears that very few hospitals currently use reusable wrap. There may be risks that stock would be more susceptible to shortages with challenges to identify alternatives at short notice - which may lead to use of single use. There is also a risk of reduced engagement from the team without evidence of success shown in other sites. We are awaiting feedback from Trusts currently using reusable wraps as reported by Ellis.

Orthopaedics is an area of surgery that has historically been more reluctant to switch to reusable linen. This has been for reasons such as infection control concerns, comfort and durability. It could be assumed that the orthopaedic department would require more evidence and reassurance before making the switch to reusable wraps.

As per financial impact below, the change is projected to be an annual cost increase and requires the Trust to engage either via an established framework route or conduct a local competitive tender involving a minimum of three suppliers.

Perceived change to patient experience or safety (including infection prevention and control considerations).

There are no anticipated clinical impacts associated with the switch to reusable wraps, and therefore no ongoing clinical measures are required following governance sign-off. While formal measurement is not necessary, a short trial period would be beneficial to allow for staff feedback and ensure no unforeseen clinical issues arise during implementation.

Infection prevention and control considerations

Regarding the IPC's consideration of switching from disposable to reusable items, it is essential that they ensure the reusable items will not pose any harm or contribute to the transmission of infection. The primary method by which they address this concern is through research and evidence pertaining to the specific piece of equipment. This information can be obtained through reviewing guidance/guidelines, previous studies, or engaging with Trusts that have already implemented the change. Additionally, they assess the processes involved in decontaminating and sterilising the reusable items. Ellis has informed HHFT of two sites who are currently using reusable tray wrap and HHFT awaiting feedback from them.

Elis has a return policy with a form and clear bag that is required for any wraps that may have a hole in. Issues such as this in practice would often be managed by the Decontamination lead. However at present, this post is vacant across HHFT and therefore could be raised with IPC. Generally, while IPC sign-off is needed for instigating the change, IPC wouldn't need to regularly input unless there is an issue.

Perceived change to staff experience or safety.

The reusable wraps are packaged in a very similar way to the currently used disposable ones and the department would be able to store these without an increase in storage requirements. A change to the delivery location would be required and so communication and logistic organising would be required with the store co-ordinator and porters.

As there is an existing contract with Elis for laundering other items (e.g. gowns), the infrastructure for this change is already in place. The wraps can be put in the same laundry bags as the gowns, so there will be no requirement to purchase any more bins for the theatres. The existing cages can also be used, and apart from an increase in usage, there will be no need for additional storage and segregation of a separate laundry stream. With the increase in the laundry produced there could be the requirement for more regular collections or increased storage space in the laundry department for the full cages. Space in the laundry department is very limited, so this could be a potential logistics problem to overcome.

If surgery is required on a known infectious patient then an alginate bag is required to line the green plastic laundry bag. This will protect the person handling the bags at the laundry site. The alginate bag can be placed into the washing machine and will dissolve. This is currently already the practice for the reusable gowns in the trust and therefore no change to working requirements would be needed.

The process for TSSU technicians of delivering, wrapping and sterilising the the trays with the reusable wraps is very similar to the current process. The switch to reusable tray wraps should not cause a change in their working habits unless there becomes an increase in work load due to failed wraps such and retained moisture or holes.

Carbon emission cost/saving of the proposed change.

Due to its requirement for sterility of all surgical instruments, tray wrap is a high volume item. In one Year (01/01/2024-31/01/2025) RHCH sterile services department (TSSD) processed 30,345 sets and 29,653 supplementary items. There was a failure rate of 0.13% from 78 occurrences of holes/damage or blown packs which leads to use of a second tray wrap and re-sterilisation of items. Basingstoke processed 64,751 trays in the same period with 450 failures.

A cradle-to-grave process-based carbon footprint analysis was used to estimate the GHG emissions associated with the single use tray wrap and the reusable tray wrap. The analysis included GHG emissions associated with raw materials, transport, disposal and for the reusable wrap, sterilisation and transport to the offsite sterilisation facility.

For this project, only one size of single use trap wrap was carbon footprinted, the 120 m2 wrap. Item and packaging materials were weighed by the HHFT team and CSH converted material data into GHG emissions using carbon conversion factors taken from the 2024 UK Government Greenhouse Gas Conversion Factors database. Based on manufacturing specification, it was assumed that the single use wraps were made from 100% Polypropylene. The wraps were manufactured in Thailand and it was assumed they would travel via container ship to the UK. For all trays, 2 tray wraps are required per tray sterilised.

For the reusable wraps, the weight of each size was provided by the supplier. The wraps are composed of 99% microfibre, and for the purpose of this analysis, it was assumed they consist of a 50:50 blend

of nylon and non-woven polyester. Greenhouse gas (GHG) emissions were calculated using conversion factors from the 2024 UK Government emissions database.

The wraps are manufactured in Cambodia and are assumed to be transported to the UK via container ship. Upon arrival, they are delivered to the supplier in London, and subsequently distributed to the Trust.

Regarding their usage cycle, after each use the wraps are sent to a laundering facility in Camberwell (London), then returned to the Trust for reuse. According to supplier data, each wrap can be reused approximately 55 times before disposal. Two wraps are required for each tray that is sterilised.

Due to time constraints, no specific data on the laundry process at Camberwell was available. Instead, GHG emissions associated with laundering were estimated using factors from Rizan et al. (2023), which provide emissions per kilogram of laundry washed. These figures were updated to reflect 2024 emission factors, and transport emissions to and from Camberwell were also included in the calculation.

	Single use	Reusable
Number of trays processed per year (across Hampshire & Basingstoke)	95,096	95,096
Occurrences of damaged tray wrap (assuming an additional 2 wraps will be needed per occurrence)	528	n/a
GHG emissions per year (kgCO2e)	63,288	31,723.9

It is estimated that the Trust could save 31,564 kgCO2e per year by switching from single use to reusable sterilisation tray wrap.

Financial cost/saving of the proposed change.

All sterilisation wraps (for sets) and sterilisation reels/bags (for supplementaries) come from the TSSU budget. The annual amount spent on single use tray wraps at HHFT exceeds £90,000.

Based on the quotes provided by Ellis, cost of reusable will be approximately 10% higher (at least £10,000) per year than the single use wraps currently procured. Given the projected spend this falls within the threshold that mandates a competitive procurement process under public sector contract regulations and the Trust's financial governance policy. This would require the trust to engage either via an established framework route or conduct a local competitive tender involving a minimum of three suppliers.

To ensure the Trust preserve's transparency, auditability, and value-for-money assurance throughout, the appropriate next step would be to complete a technical specification document, which can then be issued to the wider market prior to any supplier engagement or trials.

Discussion:

This project has highlighted that there is an attempt by manufacturers to produce a reusable alternative to the single use disposable surgical tray wraps currently used. This area of the market has the potential to produce a product that would save the NHS money and reduce its carbon footprint.

An increased learning of the sterilisation process was obtained during these projects as well as a better understanding of the different products currently on the market. Understanding the process better has helped to identify some barriers that would need to be overcome before this project could progress. For this project to move forward a better understanding of the reusable tray wrap would need to be made. This could be achieved through completing a trial as well as gathering a more indepth literature review of the current published evidence. If the published evidence didn't cover the required elements for TSSU and IPC satisfaction then more research and testing would need to be done on the efficiency of wraps by testing the moisture levels inside the wraps as well as the sterilisation rate achieved.

From the research carried out during this project it appears one limitation to the implementation of this switch could be dated infrastructure currently in place in some trusts. Dated equipment can cause the sterilisation process to have reduced efficiency and on occasion require the reprocessing of trays. With concerns regarding the permeability of the reusable wraps alongside the potential use of dated equipment it could result in more trays requiring reprocessing. This has the potential for time delays on the sets, increase in staff workload and time, as well as the cost and carbon footprint of running extra sterilisation cycles. Depending on the set this implication could also cause delays to operations or even operations having to be cancelled. The larger and heavier the set the more likely for condensation to form and not dry during the process resulting in the failure of that set. This would need to be assessed further during a trial period.

The short time frame for the project resulted in a limitation in the data and research material we were able to obtain. Engaging with stakeholders can be a lengthy process and can require large amounts of communication. With more time, increased financial data could be obtained to better understand the financial benefits/implications of making the switch to reusable tray wraps. Although infection control was able to provide us with an understanding of the areas they would need to cover, specific requirements for these projects were not obtained. The short project deadline also meant there was not enough time to present the idea to governance for review or carry out a trial.

In order for this project to move forward the next steps would be to gather some more evidence and data from literature reviews and experiences of other trusts that are using the product already. A meeting with Elis, IPC, TSSU, theatre managers and any other stakeholders will be arranged to ensure everyone understands the process and any concerns can be discussed. The project will then be presented to governance for review and if agreed a trial period will be arranged. With staff feedback from the trail alongside IPC, TSSU, governance and procurement agreement a decision can be made to make the switch from disposable to reusable gowns.