Design for Life Pilot Project

UNIVERSITY HOSPITALS SUSSEX NHS FOUNDATION TRUST

CSH and the Design for Life team, in collaboration with key partners, is working with sites 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.

Team

- Alastair Walters, Clinical Procurement Specialist/Operating Department Practitioner
- Stephen Hill, Clinical Procurement Specialist/Operating Department Practitioner
- Martin Still, Senior Matron Infection Prevention and Control
- Naomi Gibbard, Matron for Theatres RN ODP, St. Richard's Hospital, Worthing Hospital, Southlands DSU
- Brian Jolley, Clinical Engineering and SSD Engineering Services Manager

Background:

Blood pressure cuffs are essential medical devices used to measure a patient's blood pressure, a key indicator of heart health and overall wellbeing. These cuffs consist of an inflatable bladder that wraps around the patient's arm, which is then inflated to temporarily stop blood flow in the artery. The cuff is connected to a manometer, which measures the pressure as it is gradually released. Blood pressure cuffs are used across a wide range of specialties, including general medicine, cardiology, emergency care, and surgical settings, making them high-volume items in healthcare environments.

The single-use nature of many blood pressure cuffs, often seen in clinical settings, contributes to substantial waste and inefficiency. Each time a cuff is used, it is disposed of, leading to unnecessary costs and environmental impact. In addition to the environmental concerns, the frequent disposal of these cuffs adds to the overall operational expenses of healthcare institutions. Given the high usage volume and the need for regular blood pressure monitoring in multiple medical areas, the reliance on disposable cuffs underscores the importance of exploring more sustainable alternatives, such as reusable cuffs, to reduce waste and improve resource efficiency in healthcare.

Single patient use blood pressure cuffs were widely introduced at University Hospital Sussex NHS Foundation Trust in response to the Covid-19 pandemic. There was no clear evidence base for this move. The Trust already recommended them for patients that are severely immunocompromised i.e. Haematology Oncology patients. The Trust supports the sustainability agenda and is motivated to move to reusable products where possible and able. The aim of this report is to understand reasons for variation in current practice and to quantify impacts of a transition to a consistent process using reusable blood pressure cuffs. For the purposes of this report, cuffs used in adult settings only were explored as past work has focussed on this area. When established, the aim would be to transition learning to the paediatric environment.

Process and approach taken to support transition.

Current use of cuffs across the Trust was reviewed. The majority of blood pressure cuffs are ordered through the materials management team through NHS Supply chain. At times, ad hoc orders may be completed by ward clerks. There is variability in products used across the Trust. One historical reason for variation is that the Trust was previously two organisations and a range of different BP machines have been purchased in each and over time given their long lifespan. Clinical engineering estimates that the Trust uses up to 10 manufacturers and 3,000 device models, with many more cuffs required. Cuffs are required in 3 main sizes for adults. Multiple brands are in circulation throughout the Trust, such as GE Dinamap Healthcare, Philips, and Water Medical.

There has been a tendency to purchase Original Equipment Manufacturer (OEM) blood pressure cuff products in the past (though this is not the case 100% of the time). When new equipment is purchased, it typically comes with an accessory kit, which includes the manufacturer's cuffs and accessories. From a medical electronics perspective, changing the cuff is not typically problematic, but manufacturers may not support the accuracy of blood pressure measurements when alternative cuffs are used. This is due to proprietary algorithms embedded in the BP machines, which are certified for use with specific cuffs under Medical Device Regulations (MDR) and UKCA approval. If an alternative cuff is used, the manufacturer cannot guarantee the accuracy of the readings. If an incident relating to poor reading of BP was reported and the OEM cuff not used as per recommendations by machine manufacturer this could affect outcomes. However, this would be an extremely rare occurrence.

In most cases use of a cuff from a different manufacturer will have negligible impacts. However, for clinical trials, pediatric or neonatal cases, or situations requiring higher levels of accuracy, this could present a risk. Verifying the accuracy of alternative cuffs could be undertaken through structured testing with patient simulators. This could be undertaken internally in the Trust however would be a time intensive process. Experience suggests that third-party reusable cuffs are often not as durable or reliable as OEM reusables.

There is a mix of single-patient use and reusable cuffs available through the Trust at present. It has been flagged by a Theatre matron that blood pressure cuffs are not always being used according to the manufacturer's guidance. It has also been expressed that cuffs are typically used until they are worn out, with some units resorting to tape to hold them together when Velcro no longer works. This may lead to underspending on BP cuffs (and impact on financial and carbon projections below).

Possible reasons for reusing single-patient use could include;

- The cuffs look relatively similar and robust for reuse
- Lack of clarity in manufacturer guidance from clinical team
- Cuffs are perceived as a low risk item from a patient safety perspective to reuse
- Staff concern about waste and trying to reduce where seems safe to do so
- Experience of reuse in another service / organisation

Clinical staff commented that single patient use products feel ‘fabricky’ and more absorbent which may be more challenging to clean effectively.

The Infection prevention and control (IPC) team are aware that blood pressure cuffs are labeled as "single patient use," and are at times reused across multiple patients. This practice is due to staff perception that these cuffs are robust enough for multiple uses. If observed, IPC advises the cuffs must be used as per manufacturer guidance as this aligns with Regulatory and Legal Framework. Infection control professionals (IPC) have previously issued alerts (e.g., a DB alert related to Legionella and masks) cautioning against practices that increase infection risks. If reusable products are used improperly and something goes wrong, the organization could be held liable.

The IPC team at UHS have considered the change and agreed to proceed with reusable cuffs following manufacturer instructions for cleaning given cuffs are low risk and just require cleaning. As the Trust already uses reusable cuffs in some locations (Worthing and St Richards) the change is further supported. The change has been raised at a senior IPC meeting with IPC able to authorise across the Trust. IPC will inform relevant teams and senior leads through Governance meetings and committees, however the transition would not need to go through any specific processes as decontamination instruction is clear from manufacturer. Implementation would come under the medical devices group. Finance would need to sign off and then IPC would ask procurement to switch out product codes (this may not be necessary given some sites already have access to the reusable options). Materials management would manage the change and equipment moving forward with all areas ordering via them.

As the Trust has 4 hospital sites plus satellite sites with various challenges and usage levels, different fittings suited to a variety of monitors etc. It may be more feasible to roll out the change one site at a time to evaluate and address any challenges, etc, before scaling to the others. This process would require:

- Consideration of how many items are needed at each site/department
- Procurement to communicate with and inform (via emails and spreadsheet with data) each department or division including all stakeholders and budget holders.
- Departments order reusable equipment for their service.
- Ensuring that cuffs are compatible with machines in the Trust
- Procurement also needs to communicate with materials management and service.
- Training and clear communication would be required to all clinical staff to ensure proper cleaning procedures are followed and items aren't accidentally thrown away.
- Procurement would need to monitor procurement data and usage moving forward to identify and address any issues (e.g. over ordering of reusables which may come from reusables being thrown away, or unexpected wear and tear sooner than manufacture guidance, etc).

Perceived barriers to the transition.

There was a query from IPC as to whether a product with velcro would be appropriate for reuse between patients as velcro may be harder to clean. Velcro could trap dirt, sweat, and bodily fluids, potentially making it difficult to properly disinfect the item between uses. The concern is that such residues could harbor bacteria or viruses, presenting an infection risk. Perceptions from the patient perspective also need to be considered, e.g., cuff could get fluffy and look less clean. Concerns may arise with specific patients (e.g., those with open wounds where blood may be left on cuff, autoimmune disorders, or edema) where infection risks are heightened.

While it was not deemed necessary in this instance, a formal risk assessment could be undertaken to explore if there is a true risk of transmission of infection from intact skin to intact skin. Perceptions on this may change between staff and patients depending on how risk averse they are. This risk assessment would include a detailed evaluation of the likelihood of cross-contamination, especially in a clinical setting with varied patient types. Consideration of a wider environment linked to usage would be considered. For example, in an outpatient setting, patients wear the same clothes they have worn elsewhere in their day, they have sat in waiting room chairs, possibly public transport etc. The waiting room is not cleaned between patients, and the BP cuff on intact skin therefore risk is low. Specific patient needs would need to be considered (e.g., for immunocompromised patients it may be agreed that cuffs will not be shared, etc). The risk assessment process would need governance sign-off. This would first go through several groups, including the decontamination committee, IPC operational group, the Trust infection committee, and ultimately the board for final approval. If approved, implementation of any reusable (with or without velcro) would involve several considerations.

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

There is no clinical impact or increased risk to patients with the use of reusable BP cuffs. Patients are unlikely to notice a difference to their care. Any potential risks of not using an OEM cuff, as described above, are minimal, however would be considered. As use of non-OEM cuffs is already taking place across the Trust, there is unlikely to be any change to current practice. Testing of reusable cuffs could be undertaken for assurance if required, especially in the case of a transition in paediatric, neonatal settings or for clinical trials.

Any potential infection risks would have been thoroughly assessed during the governance process. Infection control measures for BP cuffs are not required beyond the routine monitoring of infection rates, which is already part of standard practice. Given that BP cuffs are considered a low-risk item, applied to in-tact, clean skin. It is very difficult to directly link them to infections, and the likelihood of any such occurrence is minimal.

According to the *Medical Devices Regulation* and the *Health and Social Care Act 2008*, IPC guidelines must be adhered to, especially when it comes to the safe and proper use of medical devices. The *CQC* (Care Quality Commission) also enforces these standards during inspections, and any failure to comply can lead to penalties. The UK's *Medicines and Healthcare Products Regulatory Agency* (MHRA) has explicitly stated that reusing single-use medical devices is not permissible. Therefore, any switch to reusable cuffs needs to meet the regulatory standards for decontamination and infection control.

Perceived change to staff experience or safety.

The transition to reusable BP cuffs is unlikely to result in noticeable differences in clinical practice. The change is considered low-risk and would not impact patient care or staff workflow. As above, the process of reuse is already benign undertaken bny many staff.

Clinical staff have generally embraced the idea, appreciating the potential to reduce waste, and there are minimal concerns about added time, especially if cleaning is already part of the process. While

storage space savings are minimal, as the cuffs do not take up much room, staff are reassured that measures for cleaning and hygiene can be effectively implemented.

It has been reported that some cuffs are used until they are very worn, even using tape to hold the cuff together at times. A switch to a product intended for multi-patient use may be more durable and prevent usage of items that are so worn. This may have some perceived benefit to staff and patient experience.

Carbon emission cost/saving of the proposed change.

A cradle-to-grave process-based carbon footprint analysis was used to estimate the GHG emissions associated with the disposable and reusable blood pressure (BP) cuffs. The analysis included GHG emissions associated with raw materials, transport, disposal and for the reusable items, sterilisation. The Mindray disposable adult blood pressure cuff and the Mindray reusable NIBP adult cuff (25-35 cm) were selected for evaluation based on availability. It was assumed that their carbon footprints would be representative of the other blood pressure cuffs procured by the Trust.

Item and packaging materials of the disposable and reusable blood pressure cuffs were weighed by the BSMS Research Fellow and CSH converted material data into GHG emissions using carbon conversion factors taken from the 2024 UK Government Greenhouse Gas Conversion Factors Database. The composition of each BP cuff was determined through a combination of manufacture specifications and expert opinion. Both disposable and reusable cuffs were manufactured in the same location, China. It was assumed they would be transported from the manufacturing site to the nearest port by HGV, then shipped from the port in China to Felixstowe Port in the UK. From there, it was assumed the BP cuffs would be transported by road to the hospital. As no information was provided regarding the retailer, distribution locations, or specific routes, these factors were excluded from the assessment. For disposal, it was assumed that they would be disposed of in non offensive waste, emission factors for clinical waste were taken from Rizan et al., 2020.

For the single use BP cuffs, total number of all brand Adult 25-35 cuffs was provided by UHS, approximately 19,936 are procured per year.

For reusable blood pressure (BP) cuffs, it was assumed that they would be disinfected between patients using a Clinell wipe. In the absence of specific data on product lifespan, a conservative estimate of 1,000 uses per cuff before disposal was applied.

It was not possible to determine the exact number of reusable cuffs required to replace single-use versions, so the analysis was instead based on the number of uses. However, this approach has limitations due to variability in how single-use cuffs are currently used—some are used as single-use, while others are reused for the same or even different patients.

Procurement data for adult 25–35 cm single-use cuffs was provided by UHS. Based on average length of stay, it was estimated that each single-use cuff is reused approximately 4.8 times, resulting in a total of 95,693 uses per year. However, this figure may represent an overestimation.

	GHG emissions per use (kgCO2e)	GHG emissions per year
Disposable BP cuff	0.41 (per item)	8,155

	GHG emissions per use (kgCO2e)	Number of uses per year	GHG emissions per year (kgCO2e)
Reusable BP cuff	0.00066	95,692	64
Additional 20% purchased to account for losses			13
Clinell wipe	0.0206	95,692	1,971
Total			2,048

It is estimated that switching from single use adult 25-35 cm cuffs to reusable cuffs will save 6,108 kgCO2e per year.

Financial cost/saving of the proposed change.

In terms of financial impact, the same assumptions applied as in the carbon footprinting above. Total cost of all branded adult 25-35 cm single use BP cuffs was provided by UHS.

In terms of reusable BP cuffs, two costs for the BP cuffs were modelled. £27 per cuff (cost of cuff already being used in the hospital), and £7 per cuff, cost of trial. Costs were divided by 1,000 to determine a cost per use. Cost of a clinell wipe was taken from a previous CSH project and is not specific to UHS.

	Single use cuff	Reusable cuff (trial price)	Reusable cuff (higher price)
Cost per year	£32,836	Cuffs (including a 20% loss/re-order): £804 Clinell wipes: £1,225	Cuffs (including a 20% loss/re-order): £3,100 Clinell wipes: £1,225
Total	£32,836	£2,029	£4,325

It is estimated that switching from single use adult 25-35 cm cuffs to reusable cuffs could save an estimated £30,808 per year based on trial price or an estimated £28,512 based on the higher price.