SUSQI PROJECT REPORT

A paradigm change: from disposable to reusable instruments usage in the Ophthalmology Department

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Team Members:

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Background:

The Ophthalmology Department is a very busy service. It mainly works as an outpatient department, with a patient turnaround of approx. 100-200 patients per day, seeing over 25.000 patients per year. At present, for many procedures in our department we are using a high volume of single-use items, because they are convenient and 'on the shelf' which produces a significant amount of waste.

This project has been chosen by our team because we feel strongly that we need to reduce the disposable item usage in our Department by replacing disposable items with reusable ones wherever possible. Many procedures actually performed using disposable tools could be performed equally well using reusable instruments. While there have been attempts to replaced single use with reusable items in the past, this hasn't been successful. Our Oculoplastic surgery sets contain reusable scissors, however the scissors are blunt and so the majority of staff will request a single use pair for each procedure.

We have also investigated the possibility of switching from single dose drops to multi package drops for pupil dilation (mydriasis). In ophthalmology, we routinely administer/prescribe dilating eye drops (tropicamide). This is administered via single dose minims. There are more sustainable alternatives to minims. By administering drops from multidose bottles that can be used safely with multiple patients we will significantly reduce packaging. Rahemtulla et al 2021 compared annual financial costs between multidose bottles and single-use minims finding use of multidose bottles was $22,481 CAD (approximately £13,250) cheaper than minims in their Department. This is a cost saving but also avoids a huge amount of plastic waste.

Specific Aims:

1. To replace high volume single use items (forceps, scissors and sponge holders) with reusable items in clinic and theatre
2. To switch from single use eye drop minims to multidose bottles

Methods:

Studying the system

We reviewed our current clinic and surgical needs and identified three items to target which are used in a high volume of procedures, where the benedict in switching to reusable would be the greatest

1) Sponge holder:

3 sponge holders are used in every ophthalmic operation performed in our department - approximately 50 operations per week, Roughly 2,500 operations a year. This means roughly 7,500 plastic sponge holders are used every year as 3 are included in all packs despite only needing to use one. As we have a total of 20 operator sets in the whole department, a total of 20 reusable sponge holders need to be ordered. These would be replaced with 20 reusable sponge holders (for 2,500 operations/uses per year). The sponge holders will be added to our surgical sets. 1 sponge holder is required in any set (used to hold gauze to first disinfect the skin and then dry it with a different gauze).

2) Disposable forceps:

Disposable Forceps are used for suture removal in clinic: Around 20 forceps are used every week in the clinic (total per year 500). We will buy 6 new reusable forceps to replace the single use option.

3) Disposable Westcott scissors.

We currently have reusable Westcott Scissors in theatre for Oculoplastic surgery. However, these scissors are blunt and thus not fit for purpose. We estimate that because of this, we use approximately 500 pairs of disposable scissors. These are also not ideal for practice, as they are sharper and smaller than most staff would prefer. Disposable Wescott scissors are also used in clinic for suture removal. Around 20 scissors are used every week in the clinic (total per year 500).

As a solution, the existing blunt scissors could be sent to the clinic to be used for suture removal as that task is much less demanding than a surgical operation. Cutting sutures is less dependent on top quality scissors than cutting delicate tissues in the operating theatre. We plan to purchase 6 new scissors for our Oculoplastic set that better meet clinical needs and move the current blunt pairs of scissors to our clinics. Combined, this would eliminate use of approximately 1000 single use scissors per year.

We identified a further common used item that could be changed from single use to multi use:

4) Dilating eyedrops

Eyedrops are used in many patients in the outpatient department to perform fundus examination. We are awaiting pharmacy approval to switch to multi dose dilating drops, ideally a combination of tropicamide and phenylephrine in the same bottle, to make the application more comfortable for the patient, having to instil just a single drop instead of 2 different ones.

Implementing change

We engaged the ophthalmology team by explaining the importance of the change to reduce clinical waste, raw material usage and cost for the hospital. At first, we had to explain why the proposed changes were important because, as expected, there was some resistance in changing common working patterns that have been stable for a long time.

We explained that the changes would have a minimal impact on our working routine. It was also helpful to highlight that some changes could make procedures slightly easier, as we could select the most suitable reusable scissors that will be more effective than our blunt reusable and the single use options we have been using.

Reusable instruments in clinic will be sent to the sterilisation room at the end of the day, where they can be made ready for use the following day. As the sterilisation room is inside our Department, and other reusable tools are already brought to be sterilised at the end of the day, this would not cause any significant impact on the Staff.

We gained infection prevention and control (IPC) approval for the changes, including eye drops.

Measurement:

Patient outcomes:

We don't anticipate any changes to clinical outcomes for patients.

Environmental sustainability:

A bottom up, process based methodology was used to estimate the carbon footprint of both single use and reusable items.

For the single use scissors, forceps and single dose minims, the carbon footprinting analysis included raw material extraction, packaging raw materials, transport and disposal. For the single use plastic sponge holders, the analysis included raw material extraction and transport but excluded packaging due to the item already being contained within a pack with other surgical instruments. Weights and materials type of the items and packaging were weighed by the team and converted into carbon using emission factors taken from the 2023 UK Government BEIS carbon conversion factors database. Location of the manufacturer was taken from the packaging of the surgical instruments.

For the reusable forceps and the scissors, the carbon footprinting analysis included raw material extraction, packaging raw materials, transport, sterilisation and repairs (scissors only). Weights and material type of each reusable item were supplied by the manufacturer and converted into carbon using emission factors taken from the 2023 UK Government BEIS carbon conversion factors database. Due to some data unavailability it was assumed that the reusables were manufactured in the same location as the single use items. For the forceps it was assumed they would last for 600 uses (600 surgeries) before being disposed of, this was based on data taken from Rizan et al (2023). For the scissors, the carbon footprint associated with repairing off site was taken from Rizan et al (2022), based on this paper it was assumed that each pair would require repair after 40 uses and would last a total of 400 uses (400 surgeries) before being disposed of. For GHG emissions

associated with sterilisation for items used in clinic, emission factors have been taken from Rizan et al 2022. It was assumed that the instruments are sterilised in an instrument tray along with other instruments. The items used in theatre have not had sterilisation included.

For the reusable sponge holder, the carbon footprint per use was taken from Rizan et al (2023). Due to data unavailability of weight and packaging type, it was assumed that the sponge holder in the study would be similar to the one purchased by NGH. Transport GHG emissions from supplier to NGH were added into the calculation.

Economic sustainability:
The costs of items have been obtained from the procurement team.

Single use items

- Single use scissors: box of 10 - £130 (n100 = £13,000 per year)
- Single use forceps: box of 10 - £81 (n50 = £4,050 per year)
- Single use sponge holder: Costs for the sponge holders are not available individually as they are provided within a kit. We have made an assumption each costs approximately 50p. (n7,500 = £3,750 per year).
- Tropicamide single dose Drops: box of 20 - £11.21 (0.56p per patient as with 1 minims both eyes can be dilated) £10,080 per year

Reusable items

- Reusable scissors 0103173 Westcott, Haag-Streit Uk Ltd: £130.00 each (n6 = £780 total)
- Reusable forceps St. Martins 0101043 ST Martin 0.3mm, Haag-Streit Uk Ltd: £75 each (n6 = £450 total)
- Reusable sponge holder PH161482 Rampley Sponge holder, Steris Ltd: £11.90 each (n20 total: £238 total)
- Tropicamide drops (300 drops per bottle): Tropicamide Ophthalmic Solution USP, 0.5%, 15mL 14,36 £ (0,095p per patient considering 150 patients per bottle - 1 drops per eye = 2 drops in each patient) £1,710 per year

A cost for sterilisation of 0.92p per instrument per use has been included, taken from Rizan et al 2022.

Social sustainability:
Staff were engaged and gave feedback on the project via informal conversation.

Results:

Patient outcomes:
We don't anticipate any changes to clinical outcomes for patients.

Environmental sustainability:

The table below shows the potential annual carbon savings for each item. Forceps is based on an assumption of 500 uses per year, scissors on 1000 uses per year (500 each in clinic and theatres) and sponge holders on 2,500 uses per year.

Item	Single use kgCO2e per item	Reusable kgCO2e per use	Saving (kgCO2e) per year
Scissors (clinic use)	0.126	0.12494	62.47
Scissors (theatre use)	0.126	0.067	29.4
Forceps	0.078	0.066	6.2
Sponge holders	0.129 (3 per procedure pack = 0.387 per procedure)	0.000382705	966.54
Eye drops*	0.01	NA	NA
TOTAL			1,064.61

*We have assumed drops are given to 50% (75) patients seen per day.

Across a year, we will save **1,065 kgCO2e** from a switch to reusable scissors, forceps and sponge holders. This carbon saving is equivalent to driving 3,144 miles in an average car.

While a switch to multi use drops would bring further carbon savings, we are still collating data to estimate the carbon footprint of a multi-use bottle.

Economic sustainability:
Financially, we have been spending £20,800 on single use scissors, forceps and sponge holders each year. The reusable replacements cost £1,468. Accounting for sterilisation costs of the forceps and scissors (£920), this is an annual saving of **£18,412** As the reusable items are expected to last for 4.8 years, the savings will increase in subsequent years.

Our savings will increase by a further **£8,370** with a switch to multi use drops.

Social sustainability:
We will submit a questionnaire to the team members once the reusable instruments have been trialled to evaluate: if there is any potential negative impact, acceptance of the change, understanding of the reasons behind the proposed changes.

Replacing the scissors in theatre will make operating more pleasant as staff wont need ot request a single use pair be added to the set. The reusable scissors will be easier for the team to use as the

disposable ones are very sharp and small, therefore not ideal for the kind of procedures that we commonly perform.

For patients, eye drops will be more comfortable if combined, as this reduces the drops administered for the patient from 2 drops per eye to 1 single drop per eye.

Discussion:

With the proposed changes we plan to improve practice in our department by reducing raw material usage and waste production, by increasing comfort for patients with the combined drops and for clinical staff by buying new and more efficient surgical scissors.

A limitation to this work is that the number of procedures performed per year, as the number of scissors and forceps used in the clinic, is an estimation. Nevertheless, despite not having the exact number of procedures performed, we believe that the proposed changes will have a positive impact on our clinical practice by making it more efficient and environmentally friendly at the same time.

Challenges: we will need to convince other members of the team to switch from disposable items to reusable items in the clinic, by bringing the sterilised instruments in the clinical area at the start of the morning and taking the dirty ones to be sterilised at the end of the day. This should not be a problem as, as explained before, the clinical area and the sterilisation room are just one floor apart and the procedure is already undertaken for other reusable tools.

No risks are anticipated regarding the change in the surgical items. Theoretically there is an increased chance of infection spread using a multi dose bottle on eyedrops for different patients. Considering that the drops would be given by expert members of the staff, and that the bottle doesn't touch the eye, this risk is considered extremely low, as long as the proper contactless administration technique will be used.

The next steps to extend our project further could include:

1) replacing more disposable items with reusable ones: e.g. the sterile drapes used in theatre for every procedure
2) try to spread the positive change from disposable items to reusable items to other surgical services and Department/Wards.
3) try to involve the Management to change the Trust policies regarding disposable items usage, to speed-up the change in other departments/surgical services.

Conclusions:

In the current scenario where climate change is becoming more and more concerning, every action that can lead to a reduction in raw material usage, pollution and waste generation should be encouraged.

The key elements that contributed to successes and learning in this project was the critical evaluation of our practice to understand how we do things and how we can do them in a more environmentally friendly way, maintaining patient safety all the while.

We learned that we need to be proactive in order to start a change that will then become common and accepted practice, although there can be some resistance initially. Encouraging staff to see this as a common goal rather than a veiled criticism of their current practice is key.

We plan to review the result and the impact of our project and then involve the managers on a higher level to help widespread the positive changes to other departments/ the whole trust. We want to expand in the future the changes by including other disposable items commonly used like the sterile drapes used for the surgical procedures by replacing them with reusable ones.

References and Resources

1. Rizan C, Lillywhite R, Reed M, Bhutta MF. The carbon footprint of products used in five common surgical operations: identifying contributing products and processes. *Journal of the Royal Society of Medicine*. 2023;116(6):199-213. doi:10.1177/01410768231166135
2. Rizan, C., Brophy, T., Lillywhite, R. *et al.* Life cycle assessment and life cycle cost of repairing surgical scissors. *Int J Life Cycle Assess* 27, 780–795 (2022). https://doi.org/10.1007/s11367-022-02064-7
3. Nast K, Swords KA. Decreasing operating room costs via reduction of surgical instruments. J Pediatr Urol. 2019 Apr;15(2):153.e1-153.e6. doi: 10.1016/j.jpurol.2019.01.013. Epub 2019 Jan 28. PMID: 30846251. **DOI: 10.1016/j.jpurol.2019.01.013**
4. Rizan C, Lillywhite R, Reed M, Bhutta MF. Minimising carbon and financial costs of steam sterilisation and packaging of reusable surgical instruments. Br J Surg. 2022 Feb 1;109(2):200-210. doi: 10.1093/bjs/znab406. PMID: 34849606; PMCID: PMC10364739.

Critical success factors

Please select one or two of the below factors that you believe were most essential to ensure the success of your project changes.

People	Process	Resources	Context
☐ Patient involvement and/or appropriate information for patients - to raise awareness and understanding of intervention ☐ Staff engagement ☐ MDT / Cross-department communication ☐ Skills and capability of staff X Team/service agreement that there is a problem and changes are suitable to trial (Knowledge and understanding of the issue) ☐ Support from senior organisational or system leaders	☐ clear guidance / evidence / policy to support the intervention. ☐ Incentivisation of the strategy – e.g., QOF in general practice ☐ systematic and coordinated approach ☐ clear, measurable targets ☐ long-term strategy for sustaining and embedding change developed in planning phase X integrating the intervention into the natural workflow, team functions, technology systems, and incentive structures of the team/service/organisation	☐ Dedicated time ☐ QI training / information resources and organisation process / support ☐ Infrastructure capable of providing teams with information, data and equipment needed ☐ Research / evidence of change successfully implemented elsewhere ☐ Financial investment	☐ aims aligned with wider service, organisational or system goals. ☐ Links to patient benefits / clinical outcomes ☐ Links to staff benefits ☐ 'Permission' given through the organisational context, capacity and positive change culture.