SUSQI PROJECT REPORT

Rationalising drugs in the operating theatre

Start/End date of Project: Sept-Dec 2023

Team Members:

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Background:

Medicines use is a major contributor to the carbon footprint of the NHS, accounting for 20% of all emissions[1]. Although more difficult to measure, it also has a widespread harmful impact on the environment including through air pollution, water pollution and land use pressures.

It is difficult to quantify medicines wastage, however it is well recognised that medicines wastage is very high due to poor inventory management and stock expiration or medication being dispensed or drawn up and then not given to or taken by the patient. A 2015 study suggested a region of £300 million a year is wasted in the UK[2]. This is roughly equivalent to 38,304 tonnes CO2e.

Although generally very safe, anaesthesia is a specialty with a high risk of adverse events which need to be managed rapidly to prevent patient harm. For this reason, many medications are immediately available in case their use becomes necessary. Good medicines handling practice prohibits the splitting of boxes to individual ampoules/doses and so whole boxes of medications that are rarely used are stocked in multiple areas in case their use becomes necessary and sometimes to accommodate clinician preference. Many of these boxes expire unopened and require disposal and replacement.

There is a limited storage space for medications in operating theatres, the visual appearance of products may change from week to week due to manufacturer preferences or supply chain problems necessitating alternative sourcing arrangements and different medications often look similar. The risk of medication errors in this setting is high with significant potential harm to patients and there are multiple examples in the literature and locally of this[3]. In addition to patient harm, the impact of medication errors on the staff involved is significant and also harmful.

Reducing the medication burden in theatres whilst maintaining adequate availability of emergency medications has the potential to bring safety, financial, social and environmental benefits.

Specific Aims:

To safely streamline medication stock and storage in the anaesthetic rooms in our operating

theatres for social, clinical, environmental and financial benefit.

Methods:

Studying the system:

- Identify what medications are stocked in the anaesthetic rooms in our operating theatres.
- Identify a candidate list of low-use drugs that could be safely removed from the anaesthetic rooms with a supply maintained in an accessible centralised location.
- Estimate the potential cost and carbon savings from reducing and centralising these medications to share with relevant staff and support decision making.

Engaging stakeholders and Implementing change:

- Conduct an inventory of a representative selection of anaesthetic rooms across the central campus.
- Identify potential locations to centralise and gain local stakeholder support in these locations.
- Survey impacted groups to gauge support and consensus on which medications could be safely centralised. In the Jessop Wing, this will be the obstetric anaesthesia consultants.

Measurement:

Patient outcomes:

Although this is not possible to measure in this study, potential impact is detailed in the results section.

Population outcomes:

Measurement of the impact of this proposed intervention on population health is beyond the scope of this study however potential wider impact is detailed in the results section.

Environmental sustainability:

We will calculate the potential carbon footprint of reducing our low-use medication stock. There are myriad other environmental impacts that are beyond the scope of our study but the impact of a reduction is anticipated to be universally positive across a life cycle analysis.

Saved waste emissions from disposing of unused/expired stock as pharmaceutical waste will not be calculated as the total weight of wasted medication is considered to be low as a proportion of total carbon footprint.

We used an Environmentally Extended Input Output Analysis (EEIOA) approach and used an industry-wide pharmaceutical emissions factor of 0.621 kgCO2e/£ spent to estimate the carbon footprint saving of centralising these medications[4].

Economic sustainability:

We will calculate the potential cost saving from modelling a reduction in our turnover of low-use medication.

Social sustainability:

We will survey affected staff groups to gauge their attitudes to a proposed overhaul of low-use

medication availability.

Results:

Patient outcomes:

We anticipate any reduction in the number of medications stocked within anaesthetic rooms and theatres, whilst maintaining an accessible central supply, reduces the chaos and variation in the drug cupboards. This reduces the risk of medication error with consequent benefits to patient safety provided rapid and reliable access is maintained for relevant emergency medications.

As part of the audit, several examples of poor drug management practices such as local anaesthetics stored with other drugs and expired drugs were identified and rectified. Feedback to the relevant staff groups provided an opportunity to improve medicines management with a consequent reduction in risk to patient safety.

Population outcomes:

A reduction in medication wastage has the potential to improve the availability of critical medicines many of which currently have pressured supply chains. Reducing the environmental impact of medications and transportation will have a positive but unmeasured impact on public health. Improved population health is well correlated with environmental benefits through improved air, water and land quality and reduced congestion resulting from a reduction in manufacturing, transport and waste emissions.

Environmental sustainability:

The modelled carbon saving for 12 elective theatres (excluding theatre 2/emergencies) on A floor is 4,404.5 kgCO2e. The modelled carbon savings for Jessops theatres (3 obstetric theatres on a remote but connected site) 2,612.8 kgCO2e.

Total potential CO2e saving for these theatres is 7,017.3 kgCO2e, equivalent to driving 20,724 miles in an average car.

Data was not collected for our theatre complexes on B floor or Q floor at RHH or at NGH due to time and resource limitations within the timescales of this project. Extrapolating from our data, counting our elective theatres on E floor at NGH as similar to A floor, and our smaller complexes in Bev Stokes, Q floor and B floor as smaller, self-contained and more remote-site environments similar to Jessops, the potential calculated savings are detailed below. Confidence in this derived data however is low.

14 elective theatres (excluding theatres 9, 11 and 18/trauma & emergencies) on E floor NGH, 5,138.5 kgCO2e.

2 theatres in Bev Stokes NGH, 1,741.7 kgCO2e.

4 theatres on Q floor RHH, 3,483.9 kgCO2e.

B floor was not calculated as low-use medication is less consistently stocked and often obtained from A floor.

Total potential CO2e saving including the extrapolated areas is 17,382.9 kgCO2e.

Corresponding water and air quality savings are not modelled.

Economic sustainability:
The modelled cost savings for A floor are £7,092.52.
The modelled cost savings for Jessops theatres are £4,207.21.
Total potential savings for A floor and Jessops theatres are £11,299.73.

Using the methodology above, the modelled cost savings for E floor NGH are £8,274.61.
The modelled savings for Bev Stokes NGH are £2,804.81.
The modelled savings for Q floor RHH are £5,609.61.
Total potential savings extrapolated across E floor and Bev Stokes NGH and A floor, Q floor and Jessops at RHH are £27,988.76.

Social sustainability:
A survey was sent to all obstetric anaesthesia consultants. 11/14 responded (79%).

- 10/11 (91%) were supportive of the principle of centralising low-use medications.
- 9/11 (82%) had no concerns about the proposal. 2/11 (18%) were concerned it could delay emergency treatment or that they would "forget where they are".
- 10/11 respondents could see benefits in centralising stock and thought there were sustainability savings, 8/11 (73%) cost savings and 7/11 (64%) reduction in risk from simplifying the cupboards.

We also sent a survey to our pharmacy technician who strongly thought this intervention would make their job easier, save them time, save money and reduce wastage.

Discussion:

We have identified a clear opportunity to rationalise our medications management across our operating suites. We have proved the concept for estimating the potential financial and carbon impact using accepted methodology for making these changes and estimated the opportunity potential in areas we have not yet audited.

We have demonstrated that the proposed changes are universally acceptable to theatre staff working in Jessops and can apply this methodology to A floor and other areas where medicines rationalisation may be undertaken in future. We have provided evidence and staff opinion to support a purported patient safety benefit from making this change. There are 140 consultant anaesthetists working within our Trust and we are aware that gaining consensus for more widespread change will be more challenging than in a small discrete group like obstetric anaesthesia. We have consulted with pharmacy and governance and plan to present this at a directorate-wide meeting, inviting expressions of interest to join a working group of interested individuals who will develop a generic list of medications to be present in every theatre. We will then approach the lead anaesthetist for each specialty area to determine which, if any, medications need to be available within that specialty's theatres in addition to the generic list. There will then be an agreed template to work to, ending the current situation where medications are added adhoc or for preference and then replaced with no scrutiny.

Undertaking a medicines audit in the theatre environment is challenging and time-consuming, requiring access to theatres when they are not operational to avoid interrupting clinical care. We did not intend to and have not managed to survey all our elective theatres across the Trust.

Extrapolating conclusions from the audited areas will miss specialty-specific requirements for certain low-use medications which are not widespread across unselected theatres and may miss geographical quirks where centralised storage may be more challenging than on A floor or at Jessops. As a result, confidence in the conclusions for the extrapolated areas is low and the audit and stakeholder consultation would need to be repeated in these areas prior to implementation of any changes.

Calculating the potential saving in drug spend using spot prices for each medication is accurate at a point in time. However prices change frequently, stability of supply is increasingly volatile and consequently suppliers and formulations often change also. Therefore the proposed financial and savings are variable.

There is very limited carbon footprinting data related to pharmaceuticals. We have used the accepted practice of applying a top-down industry-wide emissions factor based on financial spend. However, this is a crude measure which poorly reflects the carbon footprint of individual medications. Medications used in anaesthesia are predominantly IV preparations which tend to have a higher carbon footprint than oral medications but this is not reflected in their calculated carbon footprint. It is likely methodology will improve in the future but there is currently no better way of estimating carbon savings. Calculating other environmental benefits of reducing medications waste would require a complete cradle to grave life-cycle assessment over all 19 environmental domains for each of the medications involved. This would be impractical. However, although the scale of the benefits is debatable, the proposed intervention is a reduction in product use and so all impacts will be positive or neutral with no negative environmental impacts. We have consulted with Yewmaker who have created software that uses chemistry principles to more accurately estimate the carbon footprint associated with medications than by cost alone. We hope to work further with them on this project in the new year when their capacity allows.

Conclusions:

Centralising low-use drugs within our operating complexes is achievable, clinically acceptable and will result in financial savings as well as environmental, workplace and potentially safety improvements. We have consulted with governance, pharmacy and anaesthetic colleagues to develop a process to implement this change across the trust.

References and Resources

1) Delivering a “Net Zero” National Health Service. NHS England & NHS Improvement 2022. https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2022/07/B1728-delivering-a-net-zero-nhs-july-2022.pdf (accessed 20/11/23).
2) Pharmaceutical waste reduction in the NHS. NHS England 2015(1). https://www.england.nhs.uk/wp-content/uploads/2015/06/pharmaceutical-waste-reduction.pdf (accessed 20/11/23).
3) F Kelly et al. Implementing human factors in anaesthesia: guidance for clinicians, departments and hospitals. Anaesthesia 2023:78(4):458-478.
4) UK and England’s carbon footprint to 2020. Department for Food, Environment and Rural Affairs. https://www.gov.uk/government/statistics/uks-carbon-footprint#full-publication-update-histor (accessed 17/12/23).

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 x MDT / Cross-department communication ☐ Skills and capability of staff ☐ 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 ☐ 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	x 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.