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Staff Perspectives of Single-use versus Reusable Sterile Textiles: A Qualitative Analysis



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ABSTRACT

Introduction: Operating theaters contribute significantly to healthcare-related carbon emissions, with single-use surgical textiles being a key contributor. Reusable sterile surgical textiles are available, yet their adoption is not widespread. This study explored the views of hospital staff, including surgeons and those working in procurement, of single-use and reusable sterile textiles.

Method: This qualitative analysis was conducted in one National Health Service trust in England. Fourteen hospital staff were recruited either via self-selection or purposive sampling to ensure representation of key stakeholders. The semistructured one-to-one interviews were imported into NVivo software and analyzed using thematic analysis.

Results: Six themes were developed: (1) current practice, (2) practical considerations, (3) infection prevention concerns, (4) social norms, (5) levers for change, and (6) navigating complex systems. Continued use of single-use surgical textiles was driven by complex procurement systems, convenience, perceived cost, and embedded practices. The transition to reusable sterile textiles was hindered by existing surgical culture, personal preferences and by those in “green” roles experiencing a lack of time, agency, and resource to enact change. A key barrier was a perception that reusable textiles increased infection risk, especially in the orthopedic specialty.

Conclusions: Despite no evidence that single-use surgical textiles offer superior patient protection, the adoption of reusable textiles is constrained by engrained practices and misconceptions. Broader dissemination of lifecycle analysis evidence, coupled with messaging cascaded via national guidance, royal colleges, and local leadership could support both individual and system-wide acceptance of reusable surgical textiles.

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Introduction

Surgical textiles such as patient drapes and the gowns used in the operating theater play a crucial role in maintaining sterility and ensuring patient safety. In the United Kingdom (UK), historical infection risks such as the emergence of human immunodeficiency virus in the 1980s and the variant Creutzfeldt-Jakob disease in the 1990s highlighted the importance of protecting both the patient and the healthcare team.¹ These events led to concerns about decontamination and a move away from reusable medical devices toward single-use.² Concerns about infection risk also drove the move toward nonwoven single-use gowns and drapes as these materials were perceived to be more impermeable to blood and body fluids than the woven reusable fabrics available at the time.³ These nonwoven fabrics were perceived to be sterile and were also cheap and fast to manufacture.¹

Modern developments in the materials used to make reusable surgical textiles, with the inclusion of polyethylene terephthalate and additional barriers in the critical zones, ensures that fluid penetration is prevented. They can be reprocessed and sterilized approximately 75-100 times without any impairment in impermeability.⁴ In the United Kingdom, surgical drapes and gowns are reprocessed in accordance with health technical memorandum HTM0104,⁵ which provides assurance of sterility and material integrity. Performance testing has found that reusable gowns provide greater protection than disposable ones.⁶ There is no evidence to suggest any differences between disposables and reusables in terms of surgical site infection rates.⁷ Additionally, the literature demonstrates that compared to disposable surgical textiles, reusables have a lower carbon footprint and energy consumption.⁸

The UK National Health Service (NHS) implemented a strategy to achieve net zero carbon emissions by 2040 for direct emissions, and by 2045 for those under their influence, such as supply chain emissions.⁹ Within hospitals the operating theater has a significant contribution to NHS carbon emissions. Evidence from two recent systematic reviews identified medical devices and consumables as the highest contributors to the carbon footprint of surgical operations.^{10,11} In addition, an analysis of five common operations found single-use drapes for patients and instrument tables contributed 14% to overall carbon emissions.¹² The operating theater is a key location to focus a drive on environmental sustainability due to the potentially substantial impact of reducing carbon emissions in this setting.

There is a paucity of literature focused on how those working within healthcare organizations perceive the benefits and drawbacks of single-use and reusable sterile surgical textiles. A recent study reported barriers and enablers within the categories of finance, infection prevention and control (IPC), custom and practice, system complexity, and laundering and sterilization.¹³ Key organizational barriers to sustainable practices also exist such as inadequate strategic planning, cost, lack of information, and a lack of supportive atmosphere.¹⁴ The aim of this evaluation was to understand perceived and actual barriers to adopting reusable sterile

surgical textiles among staff working at an NHS trust in England.

Methods

Data collection and sample

Hospital staff were recruited from one trust in England. The trust spans multiple sites within the region, providing secondary and tertiary care. Recruitment was via self-selection or purposive sampling paired with snowball sampling. Purposive sampling was undertaken in addition to self-selection to ensure representation of a range of key hospital staff whose roles were central to the topic of single-use and reusable sterile surgical textiles. Staff were recruited in a variety of ways via emails to surgical department administrators for dissemination, direct emails to groups or individual staff members as recommended by other participants (i.e., snowball sampling) and via posters displayed in theaters and general staff spaces throughout hospital sites. Interested staff members contacted the research team directly if they were interested in taking part. Interviews were arranged either via Microsoft Teams or in-person depending on participant preference. Before the interview, written informed consent was received in line with Good Clinical Practice guidelines, and a demographic questionnaire was completed by participants to aid ongoing sampling.

Semistructured interviews were conducted by researchers PK or CG in one-to-one interviews lasting approximately 45 min. Interviewers and participants were not previously known to each other, and interviewers had previous experience of interviewing research study participants. Both interviewers were interested in the topic of environmental sustainability, however no personal opinions were shared in interviews and participants knew that the research was being undertaken as part of an externally funded project. An initial interview topic guide, informed by existing literature and the experience of the research team, was piloted and used to guide interviews ([Supplementary Methods 1](#)). Participants were interviewed one time and questions focused on quality, cost, procurement, and barriers and enablers to change including IPC. The topic guide was refined iteratively to allow emerging factors to be explored with subsequent participants. Interviewers documented field notes following the completion of interviews to capture reflections and identify any novel topics for exploration with future participants. Participant recruitment ceased when data saturation occurred, this was defined as the stage when no new insights or novel topics were identified that required further exploration.

Ethical approvals

Ethical approval was obtained from the Brighton and Sussex Medical School Research Governance Ethics Committee (ref: ER/BSMS7742/1) and the project was registered with the local trust clinical audit department.

Data analysis

For interviews conducted online, visual and audio recordings were captured. Transcripts generated by Microsoft Teams were used and checked against the audio for accuracy. For interviews conducted in person, audio was recorded and manually transcribed verbatim. Member checking of transcripts and findings was not performed due to time constraints. During transcription, any identifying information such as names or locations was redacted. A pragmatic critical realist approach was used. Transcripts were analyzed using Braun and Clarke's six phases for thematic analysis, analysis was data-driven and therefore no specific theoretical framework was used.^{15,16} Briefly this included: (1) familiarization with the data through rereading transcripts and listening to audio files, (2) development of initial codes in NVivo 12 software, (3) initial codes were combined into broader overarching themes and subthemes, (4) initial subthemes were iteratively refined to ensure that they fit coherently within each theme, (5) themes were further defined and refined, and (6) a written report was produced. Data analysis was led by the first author (CG) who consulted a second reviewer (EY) to agree coding and interpretation at all stages. Themes did not have to be universal to all participants to qualify as a theme or subtheme. This study is reported in accordance with the COnsolidated criteria for REporting Qualitative research checklist.¹⁷

Results

Fourteen interviews were conducted (five in-person and nine online via Microsoft Teams). No participants refused to take part or withdrew. Participants reflected a range of departments and roles within the hospital including the surgical and procurement teams (Table 1). Two participants held

“green” roles alongside their main job, “green” in this context refers to environmental sustainability and the role involves implementing and supporting changes to make services more environmentally sustainable at ward, department or organizational levels.

Thematic analysis identified six overarching themes: (1) current practice, (2) practical considerations, (3) infection prevention concerns, (4) social norms, (5) levers for change, and (6) navigating complex systems (Supplementary Table 2). Each theme is discussed below and illustrated with participant quotes.

Theme 1: current practice

Personal preferences and the move to single-use

Most participants indicated a personal preference for reusable textiles and equipment over single-use. However, many noted that their organizations currently used single-use items or a combination of both. Participants predominantly viewed the shift in the sector from reusable to disposable items as being driven by historical infection-related incidents, such as variant Creutzfeldt-Jakob disease:

“I think initially 20 y ago when I started we were under a lot of pressure, we’d just come out of the CJD crisis, so we were being pressured by the sterilization department to move over to single use...” [O10_THEAT]

Gaps in knowledge and individual reactions to waste

Participants identified knowledge gaps in the workforce around environmental awareness, carbon literacy, alternatives to single-use items, labor rights in the manufacture of healthcare equipment, and IPC. There was an awareness of the levels of waste generated in healthcare, with sometimes

Table 1 – Participant job roles.

Participant code	Role	Specialty	Length of time at trust
001_SUR	Surgical trainee	Orthopedics and trauma	1-2 y
002_SUR	Consultant surgeon	Hand	11-20 y
003_HCA	Healthcare assistant	Theaters	Missing data
004_SUR	Consultant surgeon	ENT	Missing data
005_IPC	Senior IPC nurse	IPC	21 + y
006_PROC	Clinical procurement	Procurement	6-10 y
007_IPC	Senior IPC nurse/theater nurse	IPC/urology	11-20 y
008_SUR	Consultant surgeon	Urology	11-20 y
009_CONS	Consultant medic/“green” lead [†]	Data withheld [†]	11-20 y
010_THEAT	Theater team leader	Urology	21 + y
011_THEAT	Senior theater nurse lead	Urology	11-20 y
012_SUR	Consultant surgeon	Orthopedics and trauma	11-20 y
013_SUR	Consultant surgeon	Orthopedics	11-20 y
014_PROC	Clinical procurement	Procurement	21 + y

ENT = otorhinolaryngology; IPC = infection prevention and control.

[†] A “green” role is taken on by staff alongside their main job to support services make environmentally sustainable changes at ward, department or organizational levels.

[†] Specialty withheld due to protection of anonymity.

visceral reactions about the amount of waste, described by participants working surgical roles as “obscene” [01_SUR], “terrible” [08_SUR], and the numbers of single-use items used as “frightening” [04_SUR]. Single-use products were seen as a particular issue in the operating theater:

“There’s a huge single-use, throw-away culture and then the very worst place in the world, the black hole of all this, is the operating theatres.” [013_SUR]

Despite an awareness of the waste generated in operating theaters, participants expressed uncertainty about how to implement changes in practice:

“Patients have full body draping and they’re all disposable and it’s probably a good kilo of plastic that goes in the bin to drape an entire patient when you’re doing a 15-minute carpal tunnel. It’s obscene. You need like reusable drapes, and probably just a small little hole drape. Do we have them? I don’t know. Where do we get them from? Who knows? You know, like, it’s just all very difficult.” [001_SUR]

Theme 2: practical considerations

Ease of use

Participants suggested that the persistent use of disposable textiles was largely due to their ease of use. In some cases, convenience, both in terms of the use and disposal of single-use products, outweighed personal feelings toward their environmental impact of single-use products:

“It’s single use, it goes in the bin, so there’s no cleaning or prepping for the next patient. It’s literally use, and put in the bin next to the patient, so it does make life very convenient I must say, although I think it’s completely wrong, it’s convenient.” [006_PROC]

Customizable procedure packs for theater, containing disposable drapes and other single-use equipment for specific procedures, were seen as particularly convenient. One participant noted these packs sped up the preparation and performance of surgical procedures, enabling staff to reach performance targets for surgical procedures:

“But for productivity reasons, I have a single-use procedure pack which has a disposable drape in it. Everything in it is disposable; however, it allows me to achieve the productivity figures that I have been told I have to.” [010_THEAT]

Design, size, and comfort

Although reusable gowns were seen by some as more comfortable than disposables, some participants reported that disposable gowns tended to be available in larger sizes which allowed for better fit and temperature regulation. It was also noted by some surgical staff that disposable drapes and gowns could be adapted for certain procedures leading to the inclusion of additional protective features which added a sense of reliability:

“Some of the single-use ones [gowns] will have a container built into them that keeps my feet dry because we use a lot of irrigating

fluid as we’re operating and with a reusable system that doesn’t necessarily exist...” [008_SUR]

Perceptions of quality

Participants reported that they perceived single-use textiles and equipment to be lower quality than reusables:

“In some ways [reusables are] probably more reliable than a lot of the disposable gowns we have and things now which some of them are very fragile and seem to rip very easily so you do worry that they might be the odd time when you haven’t noticed that something’s got a gap in it.” [002_SUR]

However, it was acknowledged that since single-use items do not need to withstand repeated use, they do not need to be robust. Despite this, there were some concerns that due to their repeated use the longevity of reusable textiles may have an impact on patient safety after multiple uses:

“So, you might say, ‘Well, I can test it in the laboratory on day one, and it’s just as good as a disposable’, but how good is it after 1000 cycles or whatever? Those are the sort of things I think we need to get a bit more evidence on. I don’t know whether there is evidence there from mult cycles and uses, and how often you can do it, and how safe it is after that many times of washing.” [002_SUR]

Cost considerations and reprocessing concerns

The upfront cost of implementing reusable textiles was seen as a potential barrier to use among participants. There was a perception that Trust management prioritized cost and would therefore be unwilling to agree to an initial increase in spending to set up reusable systems and services, especially if adoption may not offer any significant cost savings in the short-term:

“There may well be some initial capital costs, you see, that’s the problem. Oftentimes, if it looks like something is going to be expensive, the Trust aren’t that interested in doing it or is not as interested as something that’s going to immediately save loads of money.” [002_SUR]

Some participants reported concern over reprocessing capacity within their organization due to their experience of seeing the NHS outsource or underinvest in sterile services and laundry departments. This posed another barrier to the adoption of reusable textiles as a need to transport offsite for processing could have potential implications on turnaround time and environmental impact:

“[Hospitals] outsource all their laundry services, or a lot of them do and so, I guess the question is how the drapes are going to be processed, whether that’s going to be outsourced or whether it’s going to be on site will be, I guess, a local decision to some extent, but I suspect nearly every hospital trust has essentially got rid of its laundry department.” [013_SUR]

In some cases, questions were raised regarding the environmental impact of reprocessing reusable textiles. Some participants were unsure whether reprocessing would be any

more environmentally beneficial compared to using single-use textiles:

“It’s quite a tough one because with regards to gowns and drapes, then if you’re using reusable then you’ve got to factor in all the reprocessing and resterilizing of things, whereas obviously the single-use items once they’re contaminated then they’re thrown away.” [011_THEAT]

Engagement of staff

Practical issues were raised around the engagement of staff in the process of change. Staff identified that it is likely that those working on the frontline do not have time to engage in research or to implement changes regarding environmental sustainability. Suggestions were made as to how staff might be better engaged which included: mandatory training on sustainability in healthcare; embedding sustainability into theater debriefs; adding sustainability to clinical governance meeting agendas; introducing incentives for individuals or teams; and discussing sustainability at team huddles. Understanding and acknowledging how change might impact individuals, teams, and departments was seen as an important step in enacting change:

“It has to be from the ground up, you’ve got to address what the concerns are of the people, which are quite valid, in order to influence ... there’s no reason that you couldn’t do a focus group with theatre staff and just process map how they’re using equipment, and then at each stage just challenge and say ‘If you were to reuse it, how would that affect you? Would you do it? Would you not do it?’” [005_IPC]

Roles focused on promoting environmental sustainability, so called “green” roles within the NHS, which focus on developing, planning, and implementing sustainability initiatives were seen as lacking the resources, time, and power to achieve tangible change. Staff reported that there was an over-reliance on passionate individuals pushing for change and taking on these “green” roles alongside their main job role. Those who held these roles, or were interested in taking them on, expressed a sense of frustration in terms of being unable to maintain momentum and achieve change:

“It was expected on top of nonclinical work. So, there was absolutely no time given for this, this was just an extra role that you take on to add on top of your normal job...there’s just no funding, and there’s no resource for anyone to do these jobs justice.” [001_SUR]

Theme 3: infection prevention concerns

Perceptions of infection risk

All participants mentioned that perceptions around risk of patient infection were a barrier to adoption of reusable textiles; this was either seen in their colleagues or expressed themselves. There were concerns about the certainty of cleanliness of reusable drapes and gowns after reprocessing:

“I guess the fear is does the washing process and the steaming process of a reusable drape get it as clean as a sort of manmade fiber drape that’s never been contaminated in the first place?” [013_SUR]

Fears and concerns around a perceived infection risk due to the use of reusable textiles meant that it could be seen as a case of “better to be safe than sorry” by using single-use textiles [01 surgeon]. Such feelings of fear could be perceived as compounding resistance to change:

“People are very fearful of getting it wrong and I get that, certainly I’ve worked in the operating theatre for a number of years and the fear of doing it wrong is very high. So yeah, we want something that’s pretty consistent, I suppose, and I think generally people aren’t very good with change.” [006_PROC]

The perception that single-use items are sterile, and that the move to reusable textiles could increase infection risk was seen as a major barrier by participants to their adoption within the orthopedic department. Staff from across the trust were aware that as infections within orthopedics can have a significant impact on patient outcomes, due to the potential for deep infections around metal implants, they noted that reusable textiles were not used in this setting:

“Orthopedic surgery requires disposable drapes and that’s because obviously the risk of an infection to any joint surgery would be really detrimental to a patient’s health and their outcome.” [007_IPC]

Therefore, expanding the evidence base for reusable items was identified as a particular need within the orthopedic specialty:

“I think it would be better if we could get everyone on board and agree that it’s safe even for the joint replacements, but I think they’re going to need a bit more evidence before they’re going to be convinced that it’s as safe as the disposable ones.” [002_SUR]

Theme 4: social norms

Departmental subcultures

Potential differences in uptake of reusable textiles between hospital departments are further complicated by departmental culture, which is often engrained. The actions of others across the specialty, working in different departments or locations, may serve as a catalyst for change and offer reassurance in terms of changing practices:

“Mainly it’s peer pressure, we like to generally conform or feel that we’re doing the right thing, and we don’t want to be the 1 sinner when there’s 25 people beside us who are all doing the right thing. So, the more that we know, the better we can behave. And there is that that sort of crowd behavior that encourages people.” [004_SUR]

Adjusting social norms

Others mentioned that changing to reusables may be hampered by individual preferences and refusals by some to

change their practice. Small numbers of participants felt optimistic that younger or newer staff maybe be able to introduce change and sustain changes in practice. Though conversely some felt younger staff were uninterested in driving change if it was outside of their normal role. Some participants thought that the most effective way of changing practice would be to take a top-down approach and “go all or nothing” [013_SUR] which gives no alternative but to enact change in the system:

“Otherwise we’ll be fiddling around with this for years, trying to convince people it’s the right thing to do and we’d make gains but it would be small rather than saying ‘We’re removing all of these single-use products and going back to reusables’ and it’d be a pain initially but people would get used to it.” [006_PROC]

Role of clinicians and other trust staff

It was highlighted that to successfully change existing practice, particularly within orthopedics, this would require the identification and involvement of key individuals to challenge and lead change:

“I think basically infection control will say ‘it’s not justified’, but then you’ve got very strong consultants saying ‘sorry, I’ll continue using that’, and that’s what happens, the strength of the consultant, not necessarily based on any research or information either. So, ‘no, not doing it’, it would then take a strong lead consultant and chief executive to try to change those surgeons that won’t change.” [010_THEAT]

Theme 5: levers for change

The role of governance and guidance via professional bodies and experts

Organizations such as NHS trusts, NHS supply chain, and the government were seen as having the position to enforce sustainability from the top-down to achieve change across the system. This links to staff views that top-down approaches within their working environments would help enact change (Theme 4: social norms). Professional organizations, societies, and Royal Colleges were also seen as potential drivers for enabling environmentally sustainable practices, especially by those working in surgical roles. This was particularly highlighted by 1 surgeon who emphasized the importance of guidance upon which the profession follows:

“So, surgeons are kind of conditioned a bit to follow, that kind of, ‘we’ll follow the guidance, we’ll follow the rule’, and if you deviate from that you’d better have pretty good ‘why?’, ‘why are you not following the herd?’.” [012_SUR]

Evidence to support change

It was recognized that enacting change requires a body of evidence to provide a framework to underpin practice. Some felt that a move to reusable products would not happen without robust evidence to indicate that the switch would not increase infection risk. This also tied into the theme of social

norms, as changes in practice were perceived as more acceptable when implemented at a broader level rather than on an individual basis:

“If there was a big unit somewhere that had already swapped over to reusable gowns and they’d found it was safe, and they had shown scientifically in a large number ... you’d have to have a huge study to definitively show that there was no increased rate of infection, you know, thousands and thousands of patients. So, it would take a very long time to actually show that scientifically there is the scientific evidence of the testing regimes of the different products and that helps reassure to some extent, and I don’t think you’d get it over the line at all unless you’ve got that.” [002_SUR]

In addition to the provision of evidence regarding infection risks, participants expressed uncertainty as to whether reusable items were the most environmentally sustainable option when considering all aspects of their supply chain and reprocessing. One participant who felt reusables were more sustainable than single-use commented that: “you have to prove it to people before they listen” [001_SUR]. It was suggested that calculating and providing the carbon footprint of single-use and reusables would be of benefit as it would provide an evidence-base to support change:

“I suppose what might make things easier is having a bit more information out there about carbon footprinting of certain things that we use so that people can access it and sort of demonstrate things.” [001_SUR]

Theme 6: navigating complex systems

Decision-making in procurement

Procurement departments were identified as key gatekeepers to enacting change. Participants working outside of the procurement department felt that procurement decisions were largely influenced by cost rather than environmental sustainability. Those working on the frontline were unsure of how procurement worked or how they could work with them to achieve change:

“I suppose procurement ... you know the items that they send us have to be fit for purpose and cost effective, but whether they actually think about sustainability as well, I don’t, I don’t know. There are a lot of links in the chain, really and it’s just knowing where to sort of try and get in and make changes I suppose.” [011_THEAT]

Participants from the procurement department noted that they were working within specific frameworks and policies, and that the current NHS supply chain is based on a consumable goods model. They reported a shift in procurement requirements which means they now consider suppliers’ carbon reduction plans when ordering supplies or contracts. One participant thought this may push suppliers toward environmental sustainability as it may benefit their business:

“Either suppliers who don’t yet have a carbon reduction plan either have to do it or they’re going to go out of business. So, it starts to drive commercially those desirable environmental sustainability performance aspects.” [014_PROC]

Similarly, one consultant felt that enacting additional requirements around sustainability for those supplying the NHS may help to move companies toward greener practices:

“If a trust has a policy, which is something that we’re trying to develop, that any newly procured item has got to go through not just the financial check but sustainability check then that could be really powerful.” [009_CONS]

Suppliers’ role in the persistence of single-use items

Participants noted that suppliers should provide more clarity around the environmental sustainability credentials of their products and services, such as through life cycle analyses which would provide information which could be harnessed to drive change:

“I know as a supplier you’re going to tell me it’s a green product because you know it makes it more sellable, but give me the information, plug it into my calculator compared to what I currently do, ‘actually, yeah, you’re right, it is greener or actually no it’s not’, so for me that’s one of those key enablers cause I think that will open up the conversation more widely” [014_PROC]

Complex systems lead to inertia

The complexities of the procurement systems and the way in which the frontline interacted, or did not interact, with procurement meant that it could be perceived as too complex to unpick to encourage or implement use of reusable textiles or equipment:

“I think a lot of the problem with implementing any of these things is inertia really, in the system, so it’s easier to carry on doing things the way we are doing it than change it and pull it to pieces and start again and do something different.” [002_SUR]

Discussion

This analysis has used in-depth interviews to capture a breadth of perspectives from professionals working within surgery, IPC, procurement, and the operating theater regarding the use of reusable surgical gowns and drapes. The findings highlight a range of interconnected factors which influence the adoption of sustainable surgical textiles including individual knowledge and beliefs, departmental culture and norms, procurement systems, and national guidance.

Despite recognizing the substantial volume of waste generated by operating theaters, participants were uncertain how to effect change at both an individual and organizational level. Frontline staff viewed existing procurement routes for environmentally sustainable alternatives as largely beyond

their understanding, control, or influence. Additionally, participants viewed procurement decisions as primarily driven by cost and not environmental sustainability. Those working in procurement noted that purchasing frameworks do consider suppliers’ carbon reduction plans, though stated this was not the main driver in decision-making when placing orders. These findings are consistent with barriers to the adoption of reusable surgical textiles identified by van der Klink and Demirel¹³ who reported stakeholders working in healthcare found procurement processes fragmented and perceived lower costs were favored over the sustainable credentials of procured items. Improving transparency around purchasing decisions and the environmental impact of procured items may enhance frontline engagement and support procurement as a lever for change.

The upfront costs and logistics associated with reusable drapes and gowns were raised as a barrier to change. However, these concerns are unfounded since reusable sterile textiles are supplied through service contracts with external providers, with no investment or ownership of such textiles required from the purchaser. Other practical issues such as matching the range of sizes available, comfort, and designs adapted for different surgical procedures of single-use drapes and gowns would be a simple fix to foster the wider acceptance of reusables. Collaboration between textiles manufacturers and surgical staff would further ensure they meet the needs of those on the frontline across different specialities.

Another key lever for change is addressing the knowledge gap identified by participants around life cycle assessments which measures the environmental impact of items from production through to disposal, including reprocessing for reusable items. Existing evidence from exploration of carbon footprints favors reusable surgical textiles.⁸ A key driver of single-use textiles was convenience which was perceived to support the fast-paced workflow of operating theaters. Wider dissemination of life cycle assessment evidence may challenge these perceptions and highlight the environmental harms associated with single-use textiles.

Existing cultures and knowledge gaps within surgical departments also drove the use of single-use textiles and created inertia in moving toward the use of reusables. There is a misconception that reusable surgical drapes and gowns are associated with an increased risk of infection as there is no evidence to support superiority of single-use textiles in preventing surgical site infections.^{3,7} Concern about infection risk was especially apparent in orthopedics, where participants described a culture of caution, both expressed by those working within the specialty and perceived by others outside of it, due to fears about implant infection. These concerns were seen by participants as a crucial barrier to the adoption of reusable textiles. This adds further evidence to support recent literature which reports IPC concerns or misconceptions around infection risk to be a key barrier to the adoption of reusable surgical textiles in healthcare.^{13,18}

The demands of clinicians for research evidence to support the introduction of reusables are unjustified as there is no equivalent evidence to support the superiority of single-use textiles.^{3,7} However, the expressed need for reusable textiles to demonstrate their safety and effectiveness is a factor in holding back their widespread adoption. Therefore,

encouraging professional organizations and surgical teams to question the rationale for the use of disposable textiles may be one way to drive change. The involvement of IPC practitioners and experts at both a national and local level will be a key in supporting this. They have a key role to tackle misconceptions, promote change via professional societies, and build staff and patient confidence in reusable textiles and the standards to which they are reprocessed.

Participants at all levels noted a lack of time and influence to drive change. Those acting in, or interested in taking on, “green” roles felt they lacked dedicated time to enact real change, with the role often being an addition to their existing workload. Although “green” roles may be viewed as a facilitator to change within organizations, this finding further supports literature reporting that these roles are not provided with meaningful funding, time, support, or the authority to successfully create and maintain change across complex healthcare systems at the speed necessary.^{19–21}

Participants identified levers for change and noted the importance of national and organizational policy, professional guidance, and research data in driving change in environmental sustainability as these sources provide the evidence on which practice is based. This suggests that there is a lack of awareness of guidance that already exists such as the Green Theatre Checklist²² and the Green Surgery Report²³ that are both badged by UK Surgical Colleges and encourage use of reusable surgical textiles. Information delivered by these trusted and credible sources can be effective in influencing behavioral change in clinical practice.²⁴

Incorporating such guidance into national policy would provide a valid foundation on which to base change in practice and support healthcare professionals to challenge engrained practices, or to feel more comfortable adopting reusable textiles by knowing they are accepted within policy or guidelines. This may also go some way to create an environment more conducive to change in which individuals in “green” roles can operate more effectively. The involvement of clinical leaders and clinicians to support decision-making is also important if “green” procurement is to be embedded into practice.²⁵ To drive change at the speed and scale demanded by the climate crisis more assertive directives from NHS England and the Department of Health and Social Care on the requirement to move toward reusable surgical textiles are necessary to overcome local barriers of inertia, misconceptions about patient safety and cost, and fear of doing the wrong thing.

Limitations

Participants who agreed to be interviewed, particularly self-selecting ones, are more likely to have a preexisting interest in environmental sustainability. This introduces the possibility of self-selection bias, meaning those with less interest in the topic may present differing views to those presented here. Most interviews were arranged via purposive sampling which goes some way to reduce this potential bias, though not eliminate it. Additionally, organizational issues at a national and local level may be specific to those systems, other locations or countries may face differing barriers to adoption of reusable textiles within their organizations.

Conclusions

These findings highlight the complexity of adopting reusable surgical textiles. Although many staff seem to be aware of the environmental impact of single-use textiles, that is not enough to overcome embedded cultural norms and practices, which are complicated by procurement processes and financial concerns, alongside perceptions of convenience of disposables and the unfounded concern around infection risk from adopting reusables. Change may be better achieved via a top-down approach, ensuring reusable surgical textiles are procured and promoted through national processes and structures. This could relieve the burden from frontline staff who often lack the individual knowledge or power to initiate change.

Supplementary Materials

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jss.2026.05.019>.

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Carolynn Greene: Writing – review & editing, Writing – original draft, Project administration, Investigation, Formal analysis, Data curation. **Elaney Youssef:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jennie Wilson:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Data curation, Conceptualization. **Pinky Kotecha:** Writing – review & editing, Project administration, Investigation, Data curation. **Mahmood F. Bhutta:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

REFERENCES

1. Karim N, Afroj S, Lloyd K, et al. Sustainable personal protective clothing for healthcare applications: a review. *ACS Nano*. 2020;14:12312–12340.
2. Bhutta MF. Our over-reliance on single-use equipment in the operating theatre is misguided, irrational and harming our planet. *Ann R Coll Surg Engl*. 2021;103:709–712.
3. Nour HM, Javid S, Gwyn R, Johnson R. Reusable surgical gowns and drapes. Should we be adopting them? *J Trauma Orthop*. 2023;11:56.
4. Overcash M. A comparison of reusable and disposable perioperative textiles. *Anesth Analg*. 2012;114:1055–1066.
5. NHS England. Health Technical Memorandum 01-04: decontamination of linen for health and social care. 2013. Available at: <https://www.england.nhs.uk/publication/decontamination-of-linen-for-health-and-social-care-htm-01-04/>. Accessed June 16, 2023.
6. McQuerry M, Easter E, Cao A. Disposable versus reusable medical gowns: a performance comparison. *Am J Infect Control*. 2021;49:563–570.
7. World Health Organization. *Global Guidelines for the Prevention of Surgical Site Infection*. 2nd ed. Geneva: World Health Organization; 2018.
8. Bolten A, Kringos DS, Spijkerman IJB, et al. The carbon footprint of the operating room related to infection prevention measures: a scoping review. *J Hosp Infect*. 2022;128:64–73.
9. NHS England. Delivering a “net zero” national health service. 2020. Available at: <https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf>. Accessed June 16, 2023.
10. Robinson PN, Surendran K, Lim SJ, et al. The carbon footprint of surgical operations: a systematic review update. *Ann R Coll Surg Engl*. 2023;105:692–708.
11. Rizan C, Steinbach I, Nicholson R, et al. The carbon footprint of surgical operations: a systematic review. *Ann Surg*. 2020;272:986–995.
12. Rizan C, Lillywhite R, Reed M, et al. The carbon footprint of products used in five common surgical operations: identifying contributing products and processes. *J R Soc Med*. 2023;116:199–213.
13. van der Klink M, Demirel P. Implementing reusable medical textiles in NHS operating theatres: barriers and enablers. *J Clean Prod*. 2025;491.
14. Thomas A, Suresh M. Barriers affecting the green transformation process in healthcare organizations. *Int J Healthc Manag*. 2024;17:245–260.
15. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health*. 2019;11:589–597.
16. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.
17. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19:349–357.
18. Eussen MMM, Bluiminck S, Chambon M, et al. Perspectives on disposable and reusable surgical materials in laparoscopic surgery: a global survey amongst surgeons. *Int J Surg*. 2025;111:4354–4361.
19. Kallio H, Pietilä A, Kangasniemi M. Environmental responsibility in nursing in hospitals: a modified Delphi study of nurses’ views. *J Clin Nurs*. 2020;29:4045–4056.
20. Luo OD, Razvi Y, Kaur G, et al. A qualitative study of what motivates and enables climate-engaged physicians in Canada to engage in health-care sustainability, advocacy, and action. *Lancet Planet Health*. 2023;7:e164–e171.
21. Petre M, Bahrey L, Levine M, et al. A national survey on attitudes and barriers on recycling and environmental sustainability efforts among Canadian anesthesiologists: an opportunity for knowledge translation. *Can J Anaesth*. 2019;66:272–286.
22. Robb HD, Pegna V. The intercollegiate green theatre checklist. *Bull R Coll Surg Engl*. 2023;105:64–67.
23. Brighton & Sussex Medical School. Centre for sustainable healthcare and UK health alliance on climate change. Green surgery: reducing the environmental impact of surgical care (v1.1). London: UKHACC. 2023. Available at: <https://ukhealthalliance.org/sustainable-healthcare/green-surgery-report/>. Accessed June 30, 2025.
24. Tang MY, Rhodes S, Powell R, et al. How effective are social norms interventions in changing the clinical behaviours of healthcare workers? A systematic review and meta-analysis. *Implement Sci*. 2021;16:8.
25. Al-Hadithy N, Knight K, Gopfert A, et al. Vital role of clinicians in reducing the NHS carbon footprint through smarter procurement decisions. *BMJ Lead*. 2024;8:43–48.