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Exposing the gown: A patient-oriented pan-stakeholder needs assessment of hospital gowns

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	person-centred care. Our needs assessment provides suggested design elements to inform gown redesigns. Redesigns require partnership across the stakeholder groups involved in the gown lifecycle to minimize implementation barriers while placing patients' needs at the forefront.

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Interpretation: The standard hospital gown continues to fail to meet the needs of those involved in providing and receiving high-quality healthcare. Redesigning the gown would be a step towards increased person-centred care. Our needs assessment provides suggested design elements to inform gown redesigns. Redesigns require partnership across the stakeholder groups involved in the gown lifecycle to minimize implementation barriers while placing patients' needs at the forefront.

Background

The design of the standard hospital gown is not patient-centred. Hospital gowns have been associated with an increased sense of exposure, discomfort, disempowerment, embarrassment, reduced self-esteem, and compromised dignity (1–3). As a result, governments, researchers, celebrity designers, and private healthcare systems have made efforts to redesign the standard gown to improve patients' experiences (4–6). However, design innovations have not been met with significant market uptake. Historically, redesigns have been patient-centred; yet, without consideration of all the stakeholders involved, new designs have resulted in costly products with limited utility in everyday clinical practices.

Hospital gowns reside in a complex healthcare ecosystem. Through its lifecycle, the standard gown goes through four discrete stages: manufacturing, transport, patient utilization, and sterilization or disposal (7). An effective patient gown must meet the unique functional challenges presented by stakeholders in each stage of this lifecycle with consideration of impacts to patients' experiences and outcomes. For example, fabric type may impact patients' pressure ulcer risk (8). Therefore, while maintaining a patient-centred focus, the purpose of this study was to conduct a needs assessment for hospital gowns to understand the experiences, desires, processes, and requirements of patients, clinicians, and system stakeholders involved in the product lifecycle. We aimed to contribute to the evidence base that is needed to develop a patient gown that optimizes its impact on patient, provider, and system outcomes.

Methods

Design

We conducted a needs assessment (9) using a constructivist, patient-oriented lens to describe the gap or discrepancy between "what is" (i.e., the present state) and "what should be" (i.e., desired state) (10). A constructivist framework (11) appreciates each individual's unique experiences and perspectives; it recognizes that findings are co-constructed between researchers and participants. Within our constructivist approach, a patient-oriented strategy was used as defined by Canada's Strategy for Patient-Oriented Research (12). The Consolidated Criteria for Reporting Qualitative Research (COREQ) (13) was used; see supplemental COREQ 32-item checklist for further reporting and methodological details.

Data Sourcing and Setting

Many stakeholders are involved in the hospital gown from production to disposal. To identify the breadth of needs, maximum variation sampling (14) was used to capture a diverse number of stakeholders' experiences and perspectives (e.g., different professions, religions, cultures, sexes and genders, Canadian immigrants). A workshop at the Nova Scotia College of Arts and Design (NSCAD) identified stakeholder groupings. Workshop participants included medical students, clinicians, patient representatives, design and textile students, and professional designers. We consulted with patients and their family members, clinicians, and a wide range of systems stakeholders (Table 1). The *a priori* sample size estimate was 30-60 interviews (15,16). Stakeholders were identified through the research team's volunteer and professional networks at Michael Garron Hospital and the Nova Scotia Health Authority. Additional system stakeholders were identified through web searches. A snowball sampling strategy was also used with all stakeholder groups; participants were asked to recommend others based on our recruitment gaps at that point in time. Participants were recruited by email and only adults (18 years and older) were eligible to participate in the study. CA, SS, and JC conducted individual, semi-structured telephone interviews that were recorded and transcribed *verbatim*. Interview guides are appended to the COREQ supplemental document.

Analysis

Analysis was ongoing throughout sampling and data collection, using NVivo 12 software for Mac (QSR International). Thematic analysis was conducted to identify, analyze, and report patterns (themes) within the data. Specifically, we used a hybrid deductive-inductive approach (17); we provide further analysis details in the supplemental COREQ document.

Patient Engagement

We integrated a patient advocate (CA) into the research team, who helped design and conduct the study. The GRIPP2 Short Form Checklist (Guidance for Reporting Involvement of Patients and the Public) is provided as a supplemental document.

Ethics

This study received ethics approval from the Nova Scotia Health Authority and from Michael Garron Hospital. Verbal consent was obtained from all participants prior to their interviews.

Results

Across the three stakeholder groups, 40 individuals (males $n = 15$, females $n = 25$) were interviewed and saturation was reached (i.e., interviews conducted and analyzed towards the end, across the three stakeholder groups, did not result in the development of new codes or themes). Age was collected from 29 participants with a mean of 48.2 years (SD 15.2). No participants retracted their data or requested alterations after receiving an email with a summary of the findings and the opportunity to provide feedback. Interviewed participants often spoke to their experiences with hospital gowns in a variety of domains. As an example, we interviewed an individual who spoke about their perspective on gowns as a healthcare administrator, patient, and family member. All reported experiences were integrated into the analysis. Table 1 reflects the domains discussed in relation to the three stakeholder groups.

Table 1. Participating hospital gown stakeholder groups. For reporting purposes, we categorized each participant into one of the three stakeholder groupings (patients/family, clinicians, or system stakeholders) to reflect the context in which they primarily interacted with gowns. However, many clinicians and system stakeholders also spoke of their experiences as a patient or family member of a patient; this is not reflected in the "patient/family" sample size. Further, many participants discussed the gown in the context of multiple domains due to diverse and multiple experiences within and/or across the three stakeholder groupings.

Gown Users		**Gown-Related Processes**
Patients/Family ($n = 8$)	**Clinicians ($n = 12$)**	**System Stakeholders ($n = 20$)**
Healthcare Domains: • Bariatric • Burn Care • Diagnostic Imaging • Emergency Care • Intensive Care • Obstetric • Other (general use / domain not declared) • Palliative • Physical Rehabilitation • Psychiatry	Healthcare Domains: • Diagnostic Imaging • Emergency Care • Infection Control • Inpatient & Outpatient Care • Long-term Care • Obstetric & Pediatrics • Physical & Neurological Rehabilitation • Psychiatry • Surgery	Healthcare Domains: • Fashion & Design (Healthcare-based) • Healthcare Leadership (Executives, Purchasers, Safety & Quality Control) • Hospital Insurance • Infection Control (Research/Industry) • Laundering, Repair, & Disposal • Manufacturers

• Surgery	Professions Represented: Medicine, nursing, occupational therapy, physiotherapy, midwifery, & diagnostic imaging.	• Supply Chain • Textile Experts • Wearable Technology

Themes

Four main themes were generated from the data (1) Utility, (2) Economics, (3) Comfort and Dignity, and (4) Aesthetics. Although we present the themes separately, they are interconnected and there is overlap.

Gown Utility

Participants described the standard hospital gown as primarily a utility garment to facilitate healthcare processes and procedures. The focus on gown functionality and its impact on patient outcomes was discussed by all stakeholder groups; however, clinicians tended to focus on this aspect of the gown. Functional benefits noted by clinicians included: easy stain identification (e.g., bleeding); easy donning due to large arm openings and open back; easy access for certain procedures (e.g., back opening for epidurals); and observation (e.g., can monitor for bruises/tissue injury on legs by just watching patients get out of bed).

Many functional limitations of gowns were also outlined. Participants discussed how gowns complicate aspects of clinical exams (e.g., cardiorespiratory exam) and interfere with equipment (e.g., intravenous lines). The standard back opening was frustrating to several clinicians as it did not have functional utility. Participants emphasized how gown-related factors can have a negative impact on recovery. Gowns were reported to restrict mobility and contribute to increased bedrest due to a range of factors, such as inability to fasten/close the gown and fear of exposure. The standard gown has two ties at the back of the garment that can accommodate a variety of patients' shapes and sizes. However, participants reported challenges for patients with limited range of motion in their shoulders or issues with hand dexterity and fine motor skills. Participants also commented on issues when rolling over in bed; ties and loose gown material were reported as uncomfortable and can get stuck under one's body. The gown was also reported to be confusing to navigate with patients not knowing if the opening should be in the front or back and how the ties are supposed to work.

From a laundering and gown processing perspective, ties were noted to be the number one reason gowns get thrown away; people rip the ties off or tie knots in them that cannot be untied so they are cut off with scissors. Participants suggested fastening alternatives such as buttons, snaps, zippers, magnets, and Velcro®. Others opposed these alternatives citing issues with snaps (difficult to replace, short life span, choking hazard), zippers/magnets (technical difficulty with hospital imaging, e.g., X-ray), and Velcro® (poor life span, skin irritation, and infection control issues). Overall, the current hospital gown was reported to have both benefits and limitations regarding utility. Suggestions for improvements were conflicting, reflecting the different needs and perspectives of the interviewed stakeholders. Supporting quotes for this theme are provided in Table 2.

Table 2. Sample quotes supporting the theme "Gown Utility", reflecting the functionality of the gown and impacts on healthcare processes/procedures and patient outcomes.

Gown Users
"The problem is how can you do it by yourself. You have to tie these things up at the back and have your butt hang out, it's like why they have to tie up at the back and expect you to do it yourself, it's impossible." **- Patient (multiple experiences, including diagnostic imaging and surgical experiences)** *"I have to look for the ties and you can't tie it. It is awful … make sure your butt is covered …"* **- Patient (emergency department and surgical) and family member**

"It's difficult to tie. I wouldn't be able to do it myself … and there is always the fear that It would open up, right?" **- Patient (bariatric)**

"A lot of people don't know if it should go on with the ties in the front or the ties in the back. There is not a day that goes by where I am in a clinical environment that someone hasn't got it on backwards or falling off of them or doesn't cover them or are too long or short." **- Physician (emergency department)**

"When they are not mobilizing or moving as much as they could – it actually produces much worse outcome." - **Physiotherapist (multiple units)**

"The most important for our unit would be the ability to remove the gown without impacting the IVs and to be able to selectively expose body parts on the front of a patient … For our purposes, they (current gowns) are terrible, everything about them is wrong. For a labouring mother and a new mother with a baby … if we could just unbutton one side of the gown or one area of the gown as if it was designed in an intuitive way that allowed us to expose certain areas of the body, I think that would be great." **- Nurse (labour and delivery)**

"One of the obstacles is that people are busy, and they don't want to go through the whole thing of taking the IV tubing out of a pump, pulling it through the gown and everything is twisted up and then you've got all these other wires and an epidural tube is taped to the gown and all this other stuff. So, I find that patients a lot of the time if I am covering somebody for break, I will come to the room and they are wearing a dirty gown and I wonder how long it has been like that and many people say it is a pain to change so leave it. It is annoying to have to thread everything through the arm so that could be something (to consider regarding redesign)." **- Nurse (labour and delivery) and patient**

"I do like the fact (that gowns) are just cotton or a cotton blend that is really thin – the cotton absorbs any liquid and shows it as a stain and typically it doesn't hide any issues that are going on where it's covering. So, if they are fresh from surgery and the wound is bleeding or their wound packing isn't doing what it is supposed to, you can see that really well. If they are having incontinence issue, you can usually see that pretty easily. So, from material thickness perspective, I like that because you can tell right away if there is any sort of other problems going on from a fluid perspective." **- Physiotherapist (multiple units), patient, and family member**

"*The things that I liked were that they were really easy to remove … I found that they were really fast to get on and off … really easy to help with people who had limited arm range of motion. … often times the gowns get dirty and I found that the current gowns are really easy to tell if they are dirty … It's really to tell if they are wet and I think that's part of the blue colour too*." And: *"… if somebody had bruise on their thigh, just from going in and glancing when they got out of bed, I could tell if it was better or worse rather than having somebody take down their pants to see those changes. So, in terms of physio assessment and measuring range of motion, I found the gown to be really easy that way and easy to move over to cover what needs to be covered*." **- Physiotherapist (multiple units), patient, and family member**

"… doing an epidural… it is good to have that open, but I am not sure in general why the hospital gowns open at the back." **- Nurse (birthing) and patient**

"*I think the big thing for our department that makes the gown hard as well is the breastfeeding moms. After they deliver, their gowns are tied up at the back, they have to get someone to untie it and they have to pull it down, so they can breastfeed. It isn't accessible, it doesn't work."* **- Nurse (maternal/pediatrics)**

Gown Processes/System Stakeholders

"From a mobility perspective, I think the gown, the way they are, are limiting mobility … Patients don't feel as nice wearing the gowns. They don't feel as nice getting outside the room and walking if they are half exposed." - **Researcher (geriatric medicine) and patient**

"*Through the design process, I imagine the fastener was given a lot of thought, what led to holding onto this design of the fastener as opposed to a button or a clasp or anything else along those lines?"* **- Healthcare laundering and linens.**

"I am not a big fan of Velcro because the pinch grasp that you need to open and close Velcro is usually not present in the group of patients I observed in rehab, that is a very difficult fastener to manipulate. There is that hook side of the Velcro, if it comes in contact with skin or other clothing in the laundry, if you don't fasten it shut before you launder the garments is also problematic because it sticks to other garments in the laundry and lint builds up in there, so I am not a big fan of Velcro either. The challenge is what other fastener to use … using a magnetic fastener? But again, doing a loop over top of the fastener, so you can put your two fingers under the loop and lift rather than pinching and grasping to get the fastener open." - **Professor and fashion designer**

"They're confusing pieces of clothing and it's not always clear if the opening is in the front of the opening is in the back and maybe that varies." **- Hospital administrator, patient, and family member**

Gown Economics

The economic challenges that shape the lifecycle of the hospital gown were discussed by all stakeholder groups, especially system stakeholders. Participants discussed the challenge of balancing healthcare expenses, industry profits, and the needs of clinicians and patients. Although manufacturers and launderers appreciated the needs of clinicians and patients, changes to the current gown have potential to disrupt well-established gown processes (e.g., washing, ironing, folding, and storage). Therefore, it was reported that any gown alterations need *buy-in* from those involved in gown processing for any gown innovations to be implemented on a large scale.

Some participants discussed gown innovations that may enhance patients' experiences while also providing cost savings, such as a change in fabric (e.g., from cotton to polyester) or design changes that would mitigate "double gowning" that increases purchasing and laundering costs. Double gowning is the practice of wearing one gown with the opening in the back and a second gown worn with the opening in the front to increase coverage and/or provide warmth. System stakeholders commented that designs that provide coverage, yet with fewer gown parts (i.e., fewer seams), can result in decreased costs and increased durability. They also noted to be considerate of heavier fabric as cost is often a function of weight and that heavier materials can negatively impact laundering (e.g., fewer gowns per load). Overall, participants emphasized that gown redesigns must benefit as many stakeholders as possible and that implementation will be easier when compromise among the various stakeholder groups is maximized. Many noted that it is unfortunate that cost is a significant barrier to patient-centred gown implementation and that gown redesign is not a healthcare priority. Supporting quotes for this theme are provided in Table 3.

Table 3. Sample quotes supporting the theme "Gown Economics", reflecting the tensions between gown costs/design and gown users' needs.

Gown Users
"I know it sounds terrible, but they (hospitals) want to spend their money on the machine (that) helps save lives versus a gown that is going to fit an overweight patient." **- Patient (bariatric)**
"You have to wear two (gowns) and I always give people two when they are walking around the halls because no one wants to have their back exposed." **- Nurse (birthing) and patient**
"*When they are walking - back, buttocks, legs, all of that can be exposed. It's tough with the gowns because a lot of patients really don't - what we did to get around it was to just double gown, right? So, one in the front and one on the back in reverse but a lot of patients really don't like that because they feel confined*." **- Physiotherapist (multiple units), patient, and family member**
Gown Processes/System Stakeholders
"I know everybody hates them (current gowns) but my conclusion after supplying them for so many years and seeing that the basic design hasn't changed … it is designed not for the convenience or for the comfort of the patient. It's

designed for the efficiency of the laundry processing." **- Textile company employee**

"If you're providing two gowns for dignity and the hospitals are billed on a per kilogram basis or per pound basis … come up with a solution that you have one gown that weighs more than an individual (but) that is a lot less than two. You are going to give them some cost savings" **- Healthcare laundering/linens**

"That (laundering) is the most expensive. That is the biggest cost in the lifecycle of these products … Some companies here in Canada are putting a major push on converting everything to 100% polyester because it's so much cheaper to process (dries faster)" **- Textile company employee**

"*We have seen a surge in request - polyester in itself has come a long way in the last few years. So, it can be brushed, it can be heavier weight, it feels nice, it's nice against the skin and it's still breathable but the great thing about polyester is that it holds its colour and very durable…"* **- Healthcare leadership - product manager**

"I would say cost is probably by far the number one (factor to consider) and you know you are probably the eighth or ninth person I have engaged with over the years, who has attempted to do this…" **- Healthcare product manufacturing employee**

Gown Comfort and Patient Dignity

Participants across stakeholder groups discussed that the current gown is humiliating, invades privacy, and is culturally insensitive. This was noted to be especially prominent in patients when walking, those who are semi-conscious, or those who do not have the mobility or capacity to fasten the standard gown with a back opening and ties. Family members and clinicians discussed the vulnerability of patients while in the hospital and adding gown-related issues on top of this is worrisome as it can be prevented.

Many discussed potential innovations to overcome gown issues related to comfort and dignity. The idea of a front or side opening robe-like gown, with fabric overlap, was frequently mentioned (all stakeholder groups) as an alternative to the open back, which can easily result in patients being exposed. Participants across stakeholder groups discussed the current lack of control patients have over the hospital gown and the need to give patients gown-related options and control. The desire for appropriate sizes, comfortable materials, and easy fastening was frequently mentioned. Further, there was discussion around the choice of sleeve length, material thickness, colour, size, and options related to skin coverage to align with patients' religious beliefs and gender identities (e.g., Muslim women not covered enough, and some men feel that the gown is like a "dress" and are hesitant to wear it or when they do, they may interact differently with family). One patient mentioned the possibility of vending machines like the ones that clinicians use for their scrubs. With this, patients could select their own gown. The desire for pants also came up multiple times as well as garments that are *"more like clothes"* as described by a researcher and patient.

The idea of enhancing gown options for patients presents challenges as highlighted by system stakeholders, especially those in healthcare leadership and purchasing roles. Overlapping with the theme "Gown Economics", the primary issue is that increasing gown options comes with increased costs as the order volumes change. Universal gowns (i.e., one size fits all) in bulk orders are the cheapest option. Further, it was reported that having multiple types of gowns can create issues from a laundering perspective, as established processes are in place to accommodate the current gown and to minimize labour (i.e., reduced number of manual folds before using a folding machine). Overall, tensions across stakeholder groups were apparent; introducing new gowns may be met with process-related behaviour change/implementation problems despite the potential to increase patient comfort and dignity. The current gown was reported to not fulfill patients' needs and negatively impacted patients' and families' healthcare experiences. Supporting quotes for this theme are provided in Table 4.

Table 4. Sample quotes supporting the theme "Gown Comfort and Patient Dignity".

Gown Users
"The side (opening) might actually might be ideal because; a) it's easier to tie and b) I probably rather have some of my side exposed rather than my entire back … they are kind of bleak looking to be honest - maybe if the material was nicer and they had a little more dignity in terms of coverage, it might be a bit better." **- Nurse (ED) and patient**
"A side opening. One piece, but with the side opening. I came to the conclusion that would be the best for me, personally." **- Patient (surgical)**
"They weren't fitting me, and they were uncomfortable because of my size … I am a large fellow … I am covered with a sheet most of the time … Majority of the time is spent in the buff … gowns don't do anything … one size fits all is not a good headset." **- Patient (bariatric)**
"The hospital gowns are not physically comfortable. They are uneasy and awkward. They take away your esteem. Do you know what I mean? Like you go in there and you know how you feel, you are worried and anxious, and then you put this gown on and it's dreadful and terrible … I have to look for the ties and you can't tie it. It is awful … make sure your butt is covered, and it is all twisted and it is extremely uncomfortable." **- Patient (emergency department and surgical) and family member**
"… especially men will request pants, maybe because they don't feel comfortable (in) something like a dress and most floors don't have the hospital pants available." **- Occupational Therapist (multiple units)**
"They are ill designed because they don't look comfortable, they don't look cozy, they are open – you have to wear two …." **- Nurse (birthing) and patient**
"People can be comfortable and more human and less like here we are all like prisoners wearing the same orange jumpsuit. I know that sounds extreme but is a real big thing for me. I have been a patient in a gown before, so I can speak to that, you feel exposed. It is flimsy, it's not comfortable, there is not a lot of security in it and I think a lot of the time when people are in hospitals, they want to feel comfortable." **- Nurse (birthing) and patient**
Gown Processes/System Stakeholders
"I think generally the most significant concerns of people are the modesty concern, how uncomfortable the fabric is, the fact that it is not attractive, it doesn't keep you warm and those ties are uncomfortable when you are laying on them or are trying to do them up. It's flawed in multiple ways." **- Fashion designer**
"There are a lot of negative things associated with the gowns - definitely from the patient's and family's perspective around dignity, it's limited, it has created a stigma" **- Researcher (geriatrics) and patient**
"Feeling vulnerable and they are already in a position where they're in pain or uncomfortable or frightened and this adds to that power imbalance with healthcare providers and patients." **- Hospital administrator, patient, and family member**
"It says one size fit all but it doesn't fit obese patients." **- Manager and nurse (maternal/pediatrics).**
"With all communities, modesty is coming up more often. People want more coverage. Mostly females or males speaking on behalf of Muslim females regarding coverage. May cost more, but trade off, if right thing for patients." **-Healthcare leadership (quality and safety)**

Gown Aesthetics

Participants frequently commented on the look and feel of the current gown and how it could be improved. In particular, the colour and institutional aesthetic of the gown were discussed. Regarding colour, some participants commented that the light colours of current gowns are optimal, as they have calming effects, promote a perception of a clean or sterile environment, are gender-neutral and easily allow for stain identification as noted in the theme "Gown Utility". However, most of the participants suggested that the colour could be improved upon or that patients should be given options as the gown can shape the way patients and family members feel about their care and hospital stay. Participants also commented on the psychosocial impact of wearing the gown in public, noting that one does not normally wear pajama-like clothes around strangers and that it may be embarrassing. Overlapping with the quotes in Table 4, participants commented that the current gown is "ugly" and like a "prison jumpsuit" or "pajamas". Gown colour suggestions are found in Table 5 and supporting quotes for this theme are provided in Table 6.

Table 5. Gown colour suggestions and rationale discussed by participants across stakeholder groups.

- Brighter, "cheery", or fun colours to improve psychosocial impact.
- Hospital colours (i.e., colour of hospital logo/branding); others suggested something "less hospital" like.
- Darker grey or blue, white, or cream to get away from institutionalized colour and to facilitate a cozy, clean, and comfortable experience.
- No busy colours or patterns, and no blacks (considered too depressing) and no reds (cannot see blood).
- Gender-neutral colours, such as yellow, green, or grey.
- Ties to be a darker colour than the gown so they can be better visualized. (Overlaps with theme "Gown Utility").

Table 6. Sample quotes supporting the theme "Gown Aesthetics".

Gown Users
"Well, they are ugly. I didn't feel attractive at all in the gown, I didn't feel dressed up – like when I wear my t shirt and my flannel, I feel dressed up compared to the gown. The gown is slump and long, like it went down to your knees and it looked very old fashioned. I just think they're ugly." **- Patient (mental health)** *"I think the blue with the pattern on is just like a bummer. I know it sounds silly … You look like a bedsheet."* **- Nurse (birthing) and patient** *"I just feel like as soon as you put one of those things on people, suddenly, it is like this illness behaviour that goes with it, this stereotype that goes with the Johnny shirt hospital gown and all of a sudden it looks like you are sick."* **- Physician (emergency department)** *"A lot of people say it's ugly and there's a lot of negative comments usually."* **- Nurse (emergency services)**
Gown Processes/System Stakeholders
"I think that we can do quite a bit in terms of improving the looks of them … the ones we have here … blue and white pattern or they're completely blue and they're ugly. They just look institutional." **- Healthcare leadership role** *"Feeling vulnerable and they are already in a position where they're in pain or uncomfortable or frightened and this adds to that power imbalance with healthcare providers and patients."* **- Hospital administrator, patient, and family member**

Interpretation

To our knowledge, this is the first study assessing the hospital gown along its entire lifecycle by conducting in-depth interviews with a wide range of patients, clinicians, and system stakeholders. Our thematic analysis of 40 interviews generated four main themes: utility, economics, comfort and dignity, and aesthetics. Although different stakeholder groups emphasized different priorities for gown redesign, in general, all stakeholder groups emphasized that there is much room for improvement. Similarly, of 1200 inter-professional caregivers, 63% felt that it was important to change the design of the current patient gown (18). A recent interview study of patients, physicians, and nurses echoed this finding; a common theme across the groups was negative impressions of the gown and the need for improvements (2).

The design of the patient hospital gown is inherently complex as it must address multiple competing interests within a healthcare setting. When a design alteration is made, it may benefit one stakeholder group, but hinder another group's needs. For instance, while patients prioritize dignity, many clinicians value access and utility. Similarly, while hospital leadership may value low costs of gown laundering, patients may value a fabric associated with greater laundering costs. There exists an inherent power imbalance in the relationship between decision-makers and gown users; the patient perspective is not prioritized.

Here, patient participants strongly emphasized that the current gown is confusing and lacks comfort and dignity. Clinicians commented that the gown can impact patient outcomes and impede care. Similarly, a recent mixed-methods study found that the hospital gown can contribute to patients' experience of discomfort, disempowerment, exposure and embarrassment (1) and there have been strong calls for gown changes as they lack dignity (19). However, gown redesigns face barriers, especially those related to gown laundering and processing. As emphasized by interviewed system stakeholders, patient-centred gown innovations must involve economic considerations in order to compete with or improve on the operating costs for the current gowns.

Limitations

Although a strength of our study was that we included three stakeholder groups and each group represented a variety of domains, further analysis of stakeholder sub-categories may allow for more nuanced themes related to specific participant groups and clinical settings.

Lessons Learned from Patient Engagement

Our patient advocate (CA) was an integral component of every step of this study including shaping the interview guides, recruitment, interviewing, and interpreting data. Her insights and perspectives were central when exploring patients' needs and competing priorities across stakeholder groups.

Conclusions and Future Directions

The current patient gown fails to meet the needs of those involved in providing and receiving high-quality healthcare. Ultimately, a feasible yet person-centred redesign of the hospital gown will require alignment between user and system interests. Our needs assessment provides suggested elements that can inform redesigns. Further research is required to develop fabrics, fasteners, and technologies that can improve patient outcomes, user experiences, and the overall economics of the garment's lifecycle. This will require partnership across the stakeholder groups involved in the gown lifecycle to minimize implementation barriers while placing patients' needs at the forefront.

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Supplemental File
COREQ 32-item checklist with additional study details and sample interview questions.

Adapted from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. International Journal for Quality in Health Care. 2007;19(6):349-357.

No. Item	Questions/Description	Reported Section and/or Additional Details (if applicable)
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	See Methods
2. Credentials	What were the researcher's credentials? E.g., PhD, MD	Author 1: BSc, MBA, MD. Author 2: BKin, DC, MSc, PhD. Author 3: BSc, MSc. Author 4: Patient Lead. Author 5: MFA. Author 6: MD, MPA, FRCPC.
3. Occupation	What was their occupation at the time of the study?	Author 1: Medical Student. Author 2: PhD Student. Author 3: Surgical Quality Analyst. Author 4: Hospital volunteer, including involvement in patient experience panel and working groups. Author 5: Associate Professor of Craft: Fashion Design. Author 6: Professor (Medicine) and Physician.
4. Gender	Was the researcher male or female?	Author 1: Male Author 2: Male Author 3: Male Author 4: Female Author 5: Male

		Author 6: Male
5. Experience and training	What experience or training did the researcher have?	Author 1: Experience and training in quality improvement and innovation. Undergraduate experience with research. Medical student. Author 2: Graduate-level (MSc, PhD) trained qualitative researcher. Author 3: Graduate-level (MSc) trained researcher in biological sciences. Hospital-based quality improvement experience. Author 4: Patient partner and freelance writer with extensive hospital experience, including: Patient Experience Panel; Research and Innovation Council; Emergency Department Patient Experience Panel; Infection Prevention and Control Committee; COVID-19 Steering Committee; Vaccine Hesitancy Working Committee. Author 5: Received a BFA in Fashion Design and a Masters in Fine Art: Textiles. Experience with collaborative design in research. Author 6: More than 400 peer-reviewed publications and nine books to his credit. Leading authority on frailty.
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Some participants were in the same professional circles as the researchers.
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Before participating in the interviews, all participants were provided with a summary of the project, including the objective of using the needs assessment to re-design the hospital gown.
8. Interviewer characteristics	What characteristics were reported about the	SS, JC, and CA interviewed participants and all came in with the

	interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	assumption that the current gown design was suboptimal and were interested in ways it could be redesigned. Prior to recruitment, PS led a qualitative interviewing training session with CA, SS, and JC. Focused on using the semi-structured interview guide and open-ended questions with prompts.
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	See Methods.
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	See Methods.
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	See Methods
12. Sample size	How many participants were in the study?	See Results
13. Non-participation	How many people refused to participate or dropped out? Reasons?	See Results
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	See Methods (telephone interviews)
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	See Methods/Results
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	See Results
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Pilot/mock interviews were tested among CA, SS, JC, and PS. Sample interview questions are provided below.
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or	See Methods

	visual recording to collect the data?	
20. Field notes	Were field notes made during and/or after the interview or focus group?	See Methods
21. Duration	What was the duration of the interviews or focus group?	See Results
22. Data saturation	Was data saturation discussed?	See Methods/Results
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	No
Domain 3: analysis and findings		
Data analysis		See Methods. Additional details: Our thematic analysis incorporated a deductive and inductive approach. Before any coding was done, NVivo was set up with deductive *a priori* "nodes" representing the basic concepts covered in the interview guide (e.g., colour, safety, etc.).
24. Number of data coders	How many data coders coded the data?	The interview transcripts were coded by PS, assigning segments of text to corresponding nodes. During this process, new nodes were inductively created and modified. During regular teleconference calls, preliminary findings were discussed and triangulated with field notes generated by CA, SS, and JC. Thematic consensus was reached between PS, CA, SS, and JC. Due to sporadic technical errors (audio-recordings cut short), in some cases, the interviewer's field notes were imported into NVivo in lieu of transcribed data.
25. Description of the coding tree	Did authors provide a description of the coding tree?	N/A
26. Derivation of themes	Were themes identified in advance or derived from the data?	See Methods: derived from data
27. Software	What software, if applicable, was used to manage the data?	See Methods
28. Participant checking	Did participants provide feedback on the findings?	See Results
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the	See Results

	themes/findings? Was each quotation identified? e.g. participant number	
30. Data and findings consistent	Was there consistency between the data presented and the findings?	
31. Clarity of major themes	Were major themes clearly presented in the findings?	
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	See Results/Discussion

Sample Interview Questions:

Patient and Patient Family Members:

1) Can you tell me a bit about yourself in the context of a healthcare setting?

Probe: What is your occupation? How long was your hospital stay as a patient? What unit in the hospital did you stay in?

2) How does the current hospital patient gown make you feel?

Probes: Why does the gown make you feel this way? What about the gown that makes you feel this way? Can you talk about any social/ psychological impacts of the gown? Can you give me an example of why and when that was an issue? Can you think of a time when the patient gown made you feel good or bad?

3) Tell me about your experiences and or the experiences of a loved one with the hospital patient gown during a hospital stay?

Probes: If a bad experience, what was negative about it? If positive what was great about it? How important of a concern or benefit is this for you?

4) What works about the current gown?

Probes: How would you feel if this was changed about the gown?

5) What are some of your complaints about current hospital gown?

Probes: Why are these concerns?

6) Do you have any safety concerns about the hospital gown?

Probes: elderly patients, mental health patients using gown for self- harm?

7) What do you think about the current hospital gown design?

Probes: Are there any features of the current gown that can be improved? Neck opening? Fasteners? Ties? Coverage? Colours? Size? Material? Mobility? Sleeve length? Access? Safety concerns? Aesthetics? The ease of putting the gown on and taking it off? Sanitation?

8) If a new gown was created, what are the most important features of a hospital gown for you? (e.g., material, access, coverage, cost).

Probes: why are these features important to you?

Multi-disciplinary Clinicians:

1) Can you tell me a bit about yourself in the context of healthcare?

Probe: What do you do for work? How long have you been working at the hospital for? How much of your work entails interacting with patients?

2) How does the current hospital patient gown make you feel?

Probes: Why does the gown make you feel this way? What about the gown that makes you feel this way? Can you talk about any social/ psychological impacts of the gown on your patients? And how does that make you feel? Can you give me an example of why and when that was an issue?

3) How do you interact with the current hospital gown?

What parts of the gown are important to you in the context of your work? How does the current gown impact your line of work? Does the current gown pose any challenges?

4) Tell me about your experiences with the hospital gown in the context of your line of work?

Probes: If bad experience, what was negative about it? If positive what was great about it? How important was this experience to you? Is there anything you would change about the event? How has the current gown impacted the health outcomes of your patients?

5) What works about the current gown in the context of work?

Probes: How would you feel if these features were changed? How would this impact your line of work? Will this make it easier or harder?

6) What are some of the complaints you hear about the current hospital gown from patients/ colleagues/ employees?

Probes: Why do you think these are concerns? What do you think about these complaints? How have these concerns impacted your patients? Impacted patient satisfaction? Impacted recovery? Impacted rehabilitation? Impacted safety?

7) What do you think about the hospital gown design specifically?

Probes: Are there any features of the current gown that can be improved? Neck opening? Fasteners, ties? Coverage? Colours? Size? Material? Mobility? Sleeve length? Access? Safety concerns? Aesthetics? The ease of putting the gown on and taking it off? Comfort?

8) If a new gown was created, what do you think are the most important characteristics or features you would like the new gown to include?

Probes: Why are these features important to you? How will this impact your work? Will this increase efficiency? What do you think about disposable gowns?

Secondary Stakeholders & Tertiary Stakeholders:

1) Can you tell me a bit about yourself in the context of healthcare?

Probes: What is your occupation? What company do you work for? How many years of experience do you have? How much of your work entails interacting with patients?

2) How does the current hospital patient gown make you feel? What do you think about the current hospital gown?

Probes: Why does the gown make you feel this way? What about the gown that makes you feel this way? Can you talk about any social/ psychological impacts of the gown on your patients? And how does that make you feel? Can you give me an example of why and when that was an issue?

3) Can you explain your occupation's involvement with the gown from beginning to end?

What parts of the gown are important to you in the context of your work? How does the current gown impact your line of work? What are the processes that the gown undergoes in your line of work? Does the current gown pose any challenges?

4) Tell me about your experiences with the hospital gown in the context of your line of work?

Probes: If bad experience, what was negative about it? If positive what was great about it? How important was this experience to you? Is there anything you would change about the event? How has the current gown impacted the health outcomes of patients?

5) What works about the current gown in the context of your line of work?

Probes: How would you feel if this was changed about the gown? How would this impact your line of work? Will this make it easier or harder?

6) What are some of your or your colleague's complaints of the current hospital gown?

Probes: Why do you think these are concerns? What do you think about these complaints? How have these concerns impacted your patients? Impacted patient satisfaction? Impacted recovery? Impacted rehabilitation? Impact on safety?

7) What do you think about the hospital gown design specifically?

Probes: Are there any features of the current gown that can be improved? Neck opening? Fasteners, ties? Coverage? Colours? Size? Material? Mobility? Sleeve length? Access? Safety concerns? Aesthetics? The ease of putting the gown on and taking it off? Comfort?

8) If a new gown was created, what are the most important characteristics or features you would like the new gown to include?

Probes: Why are these features important to you? How will this impact your work? Will this increase efficiency?

9) What do you think a new gown would do to patient satisfaction at the hospital? (leadership question)

Probes: Health outcomes? Rehabilitation? Empowerment?

10) Can you tell me more about the cost of the current gown?

Probes: Environmental costs? Economic costs? Laundering costs?

11) What can be done to reduce costs?

Probes: Change in fabric? Change in features such as fasteners, ties?

Completed GRIPP2 Form Short Checklist

1) Aim: Report the aim of PPI (patient and public involvement) in the study
Using a constructivist framework in conducting the study, the research team included stakeholders from several different groups, including a patient partner. The primary aim of PPI in this study was to have the perspectives of a patient partner on our team during interview design, data acquisition, and thematic interpretation. This allowed for an extra level of assurance that the patient-oriented perspective was being captured throughout the study. Further, the patient partner was able to effectively engage with specific stakeholders by recruiting and interviewing participants through established connections within the hospital community.

2) Methods: Provide a clear description of the methods used for PPI in the study
PPI was integrated in the study design as a patient partner was part of the multi-disciplinary research team and lead stakeholder recruitment and telephone interviews. The patient partner was trained in research ethics prior to working with personal health information and conducting interviews with participants.

3) Study results: Outcomes—Report the results of PPI in the study, including both positive and negative outcomes
As a result of PPI in the study, targeted recruitment of a wide variety of stakeholders was made possible, ensuring that patient, clinician, hospital, and industry needs were captured. Specifically, through hospital connections already established by the patient partner, unique patient populations were engaged and interviewed. A caveat of including PPI in the study was the challenge of coordinating interviews to avoid interviewing individuals who they knew or had close relationships with prior to the study.

4) Discussion and conclusions: Outcomes—Comment on the extent to which PPI influenced the study overall. Describe positive and negative effects
As a result of the study focusing on the needs of a variety of stakeholders, primarily patients, it was influenced by PPI. Additionally, the influence of the patient partner at every stage of the study, from semi-structured interview question drafts to reviewing and affirming thematic analyses, ensured that all aspects of the study reasonably represented the patient perspective.

5) Reflections/critical perspective: Comment critically on the study, reflecting on the things that went well and those that did not, so others can learn from this experience
On the whole, PPI in this study was found to be mutually beneficial. The study results benefited tremendously from ongoing patient advocacy and ensuring a variety of patient voices were heard during data acquisition. Conversely, the patient partner was given a unique opportunity to be involved in academic research that focuses on their community. Of note, the connection to the patient partner was made through patient engagement channels and clinicians who had been previously working with patients in an advocacy setting. Engaging patients as proactive partners allows for research projects to be directed in an authentic manner that ensures results are relevant to patient safety and prioritize patients.