Original Research Article

Redesigning Hospital Gowns to Improve Comfort, Dignity, and Function: A User-Centered Study of Adolescent Preferences

Aanya Kancherla

Carroll Senior High School, 1501 W. Southlake Blvd, Southlake, TX 76092, United States

ABSTRACT

Hospital gowns are a common part of medical care, but many patients say that traditional designs can reduce comfort, dignity, and confidence during hospital stays. Standard gowns, which usually have an open back and are made from thin, inexpensive fabric, focus on making clinical access easier rather than supporting the patient's experience. This tradeoff may have a greater impact on adolescents, who are at a stage where they often pay more attention to appearance, privacy, and how others perceive them than other groups of patients. This study focused on whether feedback from adolescents could help guide the redesign of a hospital gown that would be seen as more comfortable, secure, and supportive of confidence than the customary design. The study used a sequential exploratory mixed-methods approach, including repeated user-centered prototyping. Adolescents in the Dallas-Fort Worth area first reviewed a standard hospital gown, responding to Likert-scale questions and open-ended prompts. The initial group included 15 hospitalized adolescent patients (ages 10-18) and 15 healthy student volunteers (ages 15-18). Feedback from this first phase was used to create two versions of a new gown, which had a fully secured Velcro back closure and long sleeves with removable Velcro panels for medical access. Since it would not have been ethical to test the new gown on hospitalized patients, only the 14 student volunteers who took part in both phases evaluated the redesigned gown. When compared to ratings for the standard gown, the new gown received much higher scores for comfort (3.40 vs. 4.29), coverage (2.60 vs. 4.07), and confidence (2.30 vs. 4.21; independent-samples t-tests, all $p < .01$). A matched-pairs comparison limited to the 14 students who completed both phases showed the same results (all $p < .01$). These results indicate that design changes based on adolescent feedback were positively received by a healthy peer group. However, since hospitalized patients did not review the redesigned gown, these results should not yet be applied to the experience of patients in the hospital.

Keywords: Adolescent patients; Hospital gowns; Patient-centered care; User-centered design; Patient dignity; Medical apparel; Comfort; Healthcare design

INTRODUCTION

The hospital gown was created with a focus on clinical efficiency, hygiene, and quick medical access, rather than on patient comfort and dignity. Open at the back, loosely secured, and made from thin, inexpensive fabric, the typical gown serves its clinical role but does not do much to protect a patient's privacy or sense of identity during a time when they may feel especially vulnerable. This tension between clinical practicality and

Corresponding author: Aanya Kancherla, E-mail: aanyakancherla990@gmail.com.

Accepted July 30, 2026
https://doi.org/10.70251/HYJR2348.44573585

patient experience has been well described in studies of adult patients. However, adolescents, who are at a stage of development where they are particularly aware of their appearance, privacy, and social encounters compared to other age groups, are almost entirely missing from this research. This lack of attention forms the basis for the current study, which examines whether gathering direct feedback from adolescents can help redesign a hospital gown that finds a better balance between comfort, dignity, and clinical needs.

Two frameworks informed this study. Patient-Centered Care Theory, introduced by Gerteis and colleagues (1), argues that healthcare environments and practices should be shaped around the needs and preferences of patients, not just institutional convenience. In this context, it means that gown design must focus on the adolescent patient's experience rather than only on staff efficiency. User-Centered Design (UCD) theory, proposed by Norman and Draper (2), maintains that products are most effectively developed through repeated cycles of user feedback, prototyping, and testing. Taken together, these frameworks supported an approach where adolescent feedback was gathered before any design changes were made, and then again after a new prototype was created, allowing the gown to be adjusted based on the group it was intended for.

This theoretical grounding is reinforced by a consistent body of research reporting dissatisfaction with the standard hospital gown. Patients often describe it as exposing and uncomfortable (3), and controlled studies have linked wearing the gown to embarrassment, self-consciousness, and a decline in well-being (4). These effects seem to go beyond just surface discomfort: wearing a gown has been tied to a reduced sense of control and increased physiological distress (5), as well as to feelings of dehumanization that can occur regardless of a patient's outward behavior (6). Separately, design-science research on fabric, color, and material has shown that these elements affect perceived calmness, stability, and dignity in medical clothing (7, 8), and that color in particular can have measurable physiological and emotional effects (9, 10). Building on this evidence, design-driven prototypes—including gowns with better coverage and adjustable closures—have been shown to improve dignity, aesthetics, and patient satisfaction compared to the standard gown, although staff have sometimes expressed concerns about their practicality (11, 12). This is important in part because medical clothing has symbolic as well as functional significance: even a garment as utilitarian as a uniform can influence how patients and providers interpret identity, status, and role within a care setting (13). Taken together, this literature suggests that gown design is not just a clinical issue: it shapes patients' emotional experience, sense of control, and identity during medical care, and thoughtfully designed alternatives can measurably improve that experience without necessarily sacrificing clinical function.

None of this research, however, focuses specifically on adolescents. Adolescents list privacy, fairness, and emotional safety among the most important aspects of a positive hospital experience (14), and research on adolescent clothing behavior shows that teenagers use clothing to express identity, establish belonging, and manage social perception in ways that set them apart from adult patients (15). In line with this, studies on hospital room design for adolescent patients have found that this age group has design preferences and priorities that differ from those of younger children or adults (16), which further highlights that solutions created for other populations may not directly apply to adolescents. Since these findings come from both pediatric medicine and apparel-design research, they provide converging evidence that adolescents are likely to be especially affected by gown design, even though no published study has yet directly gathered adolescent feedback and used it to guide a hospital gown redesign.

This gap leads to the central research question for this study: how can feedback and observations from adolescents in the Dallas-Fort Worth area help redesign a hospital gown that more effectively balances comfort, dignity, and function compared to the standard gown? In line with the literature discussed earlier, the hypothesis was that adolescents who assessed a redesigned gown, created through an iterative and user-centered approach, would give higher ratings for comfort, coverage, and confidence than those who evaluated the standard gown.

METHODS AND MATERIALS

Design

This study used a sequential exploratory mixed-methods design, combined with an iterative user-centered prototyping process. In a sequential exploratory design, researchers first collect data to investigate a topic and identify design criteria. These criteria then guide a second phase of data collection, which is used to test them (17). This method is particularly appropriate for problems such as adolescent gown redesign, where there is no existing instrument or design that already matches

the needs of the target population. The study also included an iterative, user-centered prototyping process: user feedback was gathered, applied to build a prototype, and then collected again after users interacted with the prototype (18). Two rounds of redesign were carried out using this cycle. The research was organized into two phases. Phase One gathered baseline data about how adolescents perceive the standard hospital gown. Phase Two assessed a redesigned gown that was developed based on the findings from the first phase.

This combination of methods was selected instead of using only quantitative or only qualitative approaches because the aim was not just to measure adolescent perceptions, but also to turn those perceptions into a tangible design and then test if the new design led to measurable changes in perception. If the study had used only quantitative methods, it would have been limited to collecting numerical preferences without understanding the reasons behind participants' answers. On the other hand, a purely qualitative approach would not have allowed for a direct comparison between the standard and redesigned gowns.

Variables

In Phase One, the independent variable was the standard Baylor Scott & White hospital gown, which is typically used for long-term inpatient stays. The dependent variables included participants' emotional and physical reactions to the gown, such as their sense of comfort, the amount of coverage, their confidence, and how they perceived the fabric. This setup was selected to assess how the design of a physical object might trigger emotional responses. This approach aligns with Bertheaux and colleagues (19), who reported that the material and sensory qualities of a product can affect both user comfort and emotional perception. In Phase Two, the independent variable was the redesigned gown. The same dependent variables from Phase One were measured again, but this time participants were also asked to state their preference between the redesigned and the standard gowns.

Participants

Phase One involved two separate participant groups. The first group was made up of 15 adolescent patients who were hospitalized (8 female, 7 male), and these participants were recruited by a supervising physician at a local children's hospital. The ages in this group ranged from 10 to 18. The second group included 15 healthy student volunteers (8 female, 7 male) from a high school in the Dallas-Fort Worth area, who were recruited through convenience sampling. The ages in this group ranged from 15 to 18. Parents or guardians of the student volunteers were informed ahead of time and given a chance to opt their child out, and all participating students gave written assent.

Phase Two included only the healthy student volunteer group, as it would not have been ethical to test the redesigned gown on hospitalized patients. Out of the 15 student volunteers from Phase One, 14 (7 female, 7 male) completed the evaluation in Phase Two.

The study's original criteria for inclusion specified adolescents between ages 13 and 17. However, the actual ages of participants extended outside this range in both directions, especially among the hospitalized patients (10-18) and, to a lesser extent, among the student volunteers (15-18). This difference between the planned and actual sample makeup is discussed further in the Limitations section.

Inclusion and Exclusion Criteria

Participants were eligible if they lived in the Dallas-Fort Worth area and gave voluntary assent, with parental consent provided as well (or no parental opt-out, in the case of student volunteers). Hospital participants also needed to be current inpatients, wearing a standard hospital gown during the study period. Those were excluded if parental consent was not granted, if voluntary assent was not given, or if any participant chose to withdraw at any stage of the study.

Ethical Considerations

This study received review and approval from the Carroll Independent School District Institutional Review Board. Approval for the participating hospital's use of its regular patient gown in this research was granted by Baylor Scott & White Health, and surveys for hospitalized patients were handed out by a supervising physician at that location. The study also underwent review and approval by the researcher's AP Research faculty advisor as well as the school district before any data was collected. For hospitalized patients, the supervising physician obtained verbal parental permission by phone before distributing the survey, and patients who agreed to participate provided verbal assent directly to the physician. Parents or guardians of student volunteers were given a written notice and an opt-out form that explained the study's purpose and procedures. Students whose parents did not opt them out then gave written assent before taking part.

All participant information remained confidential. No identifying details were collected from hospitalized participants, and survey answers were not tied to participant names. Participation was voluntary; participants were told they could leave the study at any time without penalty. The study involved minimal risk, as it only required non-invasive activities such as filling out a survey and briefly wearing a hospital gown over their own clothes.

Instruments

The instruments for Phase One included a survey and a Baylor Scott & White hospital gown. In Phase Two, the instruments were used to help construct the redesigned gown. According to Interweave Healthcare (20), hospital-textile fabric should be soft, breathable, and able to wick away moisture to improve patient comfort. This recommendation, along with the same source's note that polycotton blends are durable and keep their shape after washing, guided the choice to use a polycotton blend for the new gown. The construction process also involved a sewing machine, fabric cutters, fabric chalk, thread, and pattern paper. The basic sewing pattern was taken from a publicly available pattern for a standard hospital gown (21), then changed to fit the design needs found in Phase One. A research notebook was used for sketches and measurements, and paper surveys collected responses for Phase Two.

Procedure – Phase One

Phase One gathered both qualitative and quantitative baseline data to inform the gown redesign. A physician at a local children's hospital distributed the survey to 15 hospitalized patients who were wearing hospital gowns at that moment. Gathering data from adolescents in the hospital setting was seen as important because it reflects the experiences of those actually wearing gowns in a clinical environment, which earlier studies indicate has a strong effect on how comfort, dignity, and vulnerability are perceived (4). At the same time, 15 student volunteers from a North Texas high school were recruited using a convenience sample and took part in a controlled wear trial. Each student tried on a standard hospital gown over their own T-shirt and shorts, which allowed the gown itself to be the main variable of interest, following established guidelines for apparel-perception research (6). Photos were taken from both the front and back to record how the gown fit and what areas it covered (Figure 1). After trying on the gown, participants filled out a post-wear survey right away, in line with best practices for gathering reactions soon after the experience being studied (22). The responses were then reviewed to find the most frequently mentioned requests for design changes. This thematic approach matches earlier findings that fabric and structural details have a direct impact on emotional reactions to medical clothing (23). Basing redesign decisions on participant feedback, rather than on researcher assumptions, fits with an evidence-based method for apparel design (11).

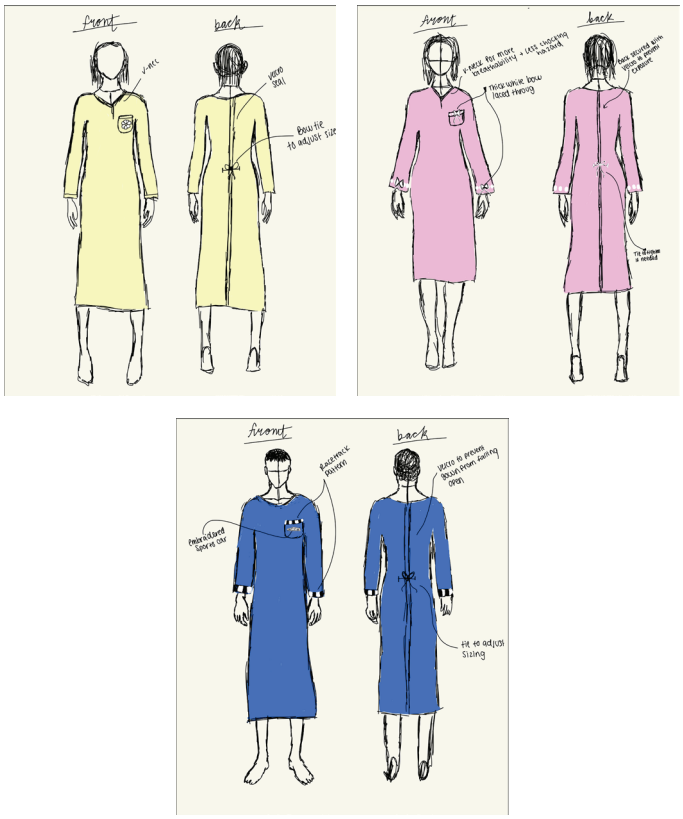

Figure 1. *The typical Baylor Scott & White hospital gown shown on a student volunteer during Phase One wear trials, photographed from both the front and back to capture fit, closure, and coverage. The open-back style and the loose tie closure seen here were the aspects most often mentioned by participants as issues in the post-wear survey.*

Procedure – Phase Two

Phase Two took the feedback from Phase One and used it to create a new version of the hospital gown, then tested how well it worked by comparing it directly with the standard gown. The updated design included the changes that were most often requested, such as better

coverage, different color, new pattern, and improved fit. This approach aligns with research that finds user feedback at the design stage leads to better results for apparel (11). These suggestions led to specific changes in the gown's structure, like adding a Velcro closure at the back, an adjustable tie for fit, and new color and pattern choices. Sewing patterns were made in three sizes—small, medium, and large—to allow for a more inclusive evaluation. The most noticeable feature of the new gown was a sleeve panel with Velcro that could be removed or opened along the arm when medical access was needed, such as for an IV or taking blood pressure.

Figure 2. *First redesigned prototype, with long sleeves included in response to participants' concerns about cold and the thinness of the fabric. This version provided better warmth, but follow-up feedback indicated it restricted medical accessibility, which led to the development of the second prototype shown in Figure 3.*

The redesigned gowns were made in three colors: pastel yellow, pastel pink, and a brighter blue. This choice was guided by research indicating that certain colors are linked to more positive emotional responses, such as relaxation and comfort (10). After the gowns were made, the 14 student volunteers took part in a post-test wear trial. They tried on the redesigned gown just as they had with the standard gown and filled out a survey using the same measures. One extra question was added, asking which gown they liked better. Having the same participants in both phases made it possible to compare results within each person. This within-subject approach is supported by methodological research, which shows that such designs are useful for identifying the effect of a specific change while also controlling for differences between participants (24).

Figure 3. *Second redesigned prototype, with the removable Velcro sleeve panel opened to reveal the upper arm. This change was introduced after the first prototype (Figure 2) was found to limit medical access, and aimed to maintain warmth while still allowing clinical accessibility.*

Statistical Analysis

In addition to descriptive statistics (means and standard deviations) for each measure, independent-samples t-tests were used to compare Phase One (standard-gown) ratings with Phase Two (redesigned-gown) ratings for comfort, coverage, and confidence, using the full Phase One sample (hospitalized patients and student volunteers combined, n = 30) as the baseline. Because the Phase Two sample consisted of the 14 student volunteers who also completed Phase One, a second, matched-pairs analysis (paired-samples t-tests) was conducted using only those 14 students, to provide a within-subject test of change that holds the participant sample constant across phases. Effect sizes are reported as Cohen's d (independent-samples comparison) and Cohen's dz (matched-pairs comparison). Analyses were run in Python with SciPy, and all tests used an alpha level of .05.

RESULTS

Overview

This study investigated if feedback from adolescents in the Dallas-Fort Worth area might help redesign a hospital gown to better balance comfort, dignity, and function. Participants reviewed either a standard hospital gown, a redesigned gown, or both. They responded to Likert-scale items (1 = strongly disagree, 5 = strongly agree) that measured coverage, comfort, and confidence, and also answered open-ended questions. Table 1 presents participant demographics, while Tables 2 and 3 show the quantitative results.

Table 2 presents a comparison between the complete Phase One baseline sample (n = 30, which includes both hospitalized patients and student volunteers) and the Phase Two redesigned-gown sample (n = 14, consisting of student volunteers). Independent-samples t-tests indicate that all three measures were significantly higher for the redesigned gown, with large effect sizes.

Because the Phase Two sample consisted of a subset of the Phase One participants, Table 3 shows a matched-pairs comparison limited to the 14 student volunteers who took part in both phases. This allows for a direct comparison between each participant's standard-gown rating and their own redesigned-gown rating.

Coverage

Coverage emerged as the most consistent qualitative concern during Phase One. Many participants described the open-back design of the standard gown as causing feelings of exposure and embarrassment, especially when they were moving or sitting in shared areas. To address this, the first redesigned prototype featured a fully secured Velcro back closure, which was meant to prevent open-back exposure while still allowing for medical access. As indicated in Table 2 and Table 3, ratings for coverage with the redesigned gown were much higher

Table 1. *Participant demographics by group. Hospitalized patients were recruited from a local children's hospital and took part only in Phase One, as the redesigned gown was not available for inpatients. Student volunteers were selected from a North Texas high school using a convenience sample; out of the 15 student volunteers in Phase One, 14 also participated in Phase Two.*

Group	n	Female	Male	Age range	Phase(s) completed
Hospitalized patients	15	8	7	10–18	Phase 1 only
Student volunteers	15	8	7	15–18	Phase 1 (n=15); Phase 2 (n=14)

Table 2. *Descriptive statistics and results from independent-samples t-tests comparing ratings for the standard gown (Phase 1, all participants, n=30) with those for the redesigned gown (Phase 2, student volunteers, n=14). Ratings were given on a 1-5 Likert scale (1 = strongly disagree, 5 = strongly agree). M = mean; SD = standard deviation. Cohen's d represents the standardized mean difference for independent samples.*

Measure	Standard gownM (SD), n=30	Redesigned gownM (SD), n=14	t	p	Cohen's d
Comfort	3.40 (1.10)	4.29 (0.61)	3.42	.001	0.91
Coverage	2.60 (1.38)	4.07 (0.73)	4.62	<.001	1.21
Confidence	2.30 (1.32)	4.21 (0.70)	6.29	<.001	1.65

Table 3. *Matched-pairs (paired-samples t-test) comparison limited to the 14 student volunteers who completed both Phase 1 and Phase 2. Since these are the same individuals rating both gowns, this comparison accounts for between-person differences that could otherwise affect the Table 2 comparison. Cohen's dz represents the standardized mean difference for paired samples.*

Measure	Standard gownM (SD), n=14	Redesigned gownM (SD), n=14	t(13)	p	Cohen's dz
Comfort	3.29 (1.14)	4.29 (0.61)	3.37	.005	0.90
Coverage	2.21 (1.37)	4.07 (0.73)	3.88	.002	1.04
Confidence	2.21 (1.25)	4.21 (0.70)	4.77	<.001	1.27

than those for the standard gown, with a large effect size in both the full-sample and matched-pairs analyses. This result aligns with participants' qualitative feedback that a secure back closure resolved one of their main concerns about the standard gown.

Comfort

Comfort ratings for the standard gown (M = 3.40, Table 2) were higher than the ratings for coverage or confidence. Still, open-ended comments, especially from hospitalized participants, often described the gown as thin and cold. Many asked for thicker fabric or more warmth. Since making the fabric thicker overall was not possible due to the need for hospital gowns to stay lightweight and easy to tear in emergencies—a quality that is well documented in reviews of healthcare gown fabric performance (25)—warmth was addressed in a different way. Long sleeves were added to the first prototype (Figure 2). Feedback on this version showed that while the sleeves helped with warmth, they made it harder to access the patient for medical procedures. The second prototype (Figure 3) solved this by making the sleeves fully openable with a Velcro panel running down the arm, so both warmth and clinical access were maintained. Comfort ratings for this final redesigned gown were much higher than for the standard gown in both the full-sample and matched-pairs comparisons (Tables 2-3).

Confidence

Confidence ratings for the standard gown were the lowest among the three measures (M = 2.30 combined; M = 2.21 among student volunteers), and open-ended responses often mentioned feeling exposed, self-conscious, or embarrassed, especially regarding coverage and fit.

After the redesigned gown, which included both the Velcro back closure and openable sleeves, was assessed, confidence ratings rose significantly compared to the standard gown (Tables 2-3). This was a large effect and appeared in both comparisons. This result matches the qualitative theme mentioned earlier: coverage and fit were closely connected to participants' sense of confidence when wearing the gown.

Impact of Iterative Prototyping

The study's two-prototype approach demonstrates a particular benefit of iterative, user-centered design. The first prototype included a sleeve, which addressed the warmth issue but created a new problem by limiting medical access. This tradeoff became apparent only because participants interacted with the prototype themselves. The second prototype, featuring an openable sleeve panel, managed to solve this new problem while still maintaining the warmth advantage. This example shows that if there had been only one round of design changes without a cycle of feedback and revision, the tradeoff might not have been recognized or addressed.

Figure 4. *The final redesigned gown is shown from the back (left) with the Velcro closure fastened, and from the front (right) to show the overall fit and coverage. These photos correspond to the prototype that student volunteers evaluated in the Phase Two survey reported in Tables 2 and 3.*

DISCUSSION

Interpretation of Findings

This study examined whether feedback from adolescents could help redesign a hospital gown that more effectively balances comfort, dignity, and function. In a small pilot sample from a single district, the findings are encouraging: a gown created through an iterative design process involving adolescents received notably higher ratings than the standard gown in all three measured areas among the healthy adolescent volunteers who reviewed it. These results indicate that even modest, relatively inexpensive design adjustments, such as a secured back closure and sleeves that can be opened or adjusted, can make a measurable difference in how adolescents view a hospital gown.

However, since the redesigned gown was not tested by hospitalized patients, this study shows that the

redesign was well received by healthy peers; it does not, by itself, demonstrate improvements in comfort, dignity, or confidence for hospitalized adolescent patients. The use of two prototypes also highlights a broader aspect of iterative design: the compromise between the first prototype's increased warmth and its decreased medical accessibility was discovered only because participants evaluated the prototype directly, and was addressed only after a second round of feedback and revision.

Limitations

Several limitations should be kept in mind when interpreting these findings. First, the sample size was small (n = 30 in Phase One; n = 14 in Phase Two) and came from just one school district and one children's hospital in the Dallas-Fort Worth area. This restricts how much these results can be applied to other adolescent groups or different regions. Second, participants were chosen through convenience sampling instead of random sampling, which could introduce selection bias that is not addressed by the statistical analysis.

Third, and perhaps most significantly, only healthy student volunteers evaluated the redesigned gown, rather than hospitalized patients. A patient who is ill, in pain, or anxious in a clinical environment might react to gown design in a different way than a healthy peer trying on a gown in a low-stress school environment. Because of this, the study shows that design changes informed by adolescents were well received by healthy peers, but it does not directly show improved comfort, dignity, or confidence among hospitalized adolescent patients. The findings should not be extended to the clinical patient experience without further research. Fourth, the actual ages of participants ranged more widely (10-18) than the study's intended adolescent range of 13-17, especially among hospitalized patients. This may have introduced developmental differences among participants that the analysis does not separately address.

Fifth, all outcome measures were based on self-reported Likert-scale ratings using a survey created specifically for this study, rather than a previously validated scale. This limits how well the results can be compared to other research on patient-reported gown experience, and it leaves open the chance that the instrument does not fully measure what it was intended to. Sixth, responses could be influenced by social desirability bias: participants may have rated the redesigned gown more positively because they guessed it was the "preferred" answer, a novelty effect that cannot be ruled out given the study's unblinded design. Since the same participants completed both phases one after the other and knew the study's purpose, demand characteristics may have played a role in the reported improvements as well as actual design effects. The study also did not include a blinded or randomized evaluation component. Replications that address these limitations, such as using larger and more diverse samples, validated instruments, blinded evaluation, and direct testing with hospitalized patients, would help strengthen confidence in these findings.

Future Directions

Future research should repeat this design process using larger and more demographically varied samples. Most importantly, redesigned gowns should be tested directly with hospitalized adolescent patients instead of healthy volunteers, because the experience of patients in a clinical, high-stress environment can differ in important ways from that of healthy peers in a low-stress setting. Using validated survey tools, when possible, would also make comparisons across future studies stronger. If these findings are confirmed with hospitalized patients, healthcare administrators and procurement teams might consider trying out design features like secured back closures and adjustable sleeve access in pediatric units. Still, this study by itself is an early step and does not provide enough evidence to recommend broader adoption.

CONCLUSION

This study aimed to investigate how input from adolescents could guide the redesign of a hospital gown to better address their needs. By placing adolescent feedback at the center of each stage of the design process, the resulting gown received significantly higher ratings than the standard gown in terms of coverage, comfort, and confidence from the healthy adolescent volunteers who assessed it. This outcome suggests that meaningful improvement might not depend on a radical redesign, but rather on steady, repeated attention to user feedback. However, this conclusion is limited by the study's small sample size from a single district and, more importantly, by the fact that hospitalized patients did not take part in evaluating the redesigned gown. As such, the study should be seen as an initial, evidence-based step toward prioritizing adolescent perspectives in hospital gown design, rather than as proof of enhanced patient experience in clinical settings. Additional research that repeats this process with larger groups and

includes hospitalized patients would be necessary before these findings could influence clinical practice. With that limitation in mind, the results provide a modest yet tangible starting point for future research into how patient comfort, dignity, and function could play a larger role in designing a garment that shapes the experiences of many young patients during an already vulnerable period.

ACKNOWLEDGEMENTS

The author would like to thank the participating students, hospital staff, faculty advisor, and expert advisor for their support and guidance throughout this project.

FUNDING SOURCES

No external funding was received for this study.

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest related to this work.

REFERENCES

1. Gerteis M, Edgman-Levitan S, Daley J, Delbanco TL, eds. Through the Patient's Eyes: Understanding and Promoting Patient-Centered Care. San Francisco, CA: Jossey-Bass; 1993.
2. Norman DA, Draper SW, eds. User Centered System Design: New Perspectives on Human-Computer Interaction. Hillsdale, NJ: Lawrence Erlbaum Associates; 1986. https://doi.org/10.1201/b15703
3. Lucas CM, Dellasega C. Finding common threads: How patients, physicians and nurses perceive the patient gown. *Patient Exp J*. 2020; 7 (1): 51-64. https://doi.org/10.35680/2372-0247.1387
4. Morton L, Cogan N, Kornfält S, Porter Z, Georgiadis E. Baring all: The impact of the hospital gown on patient well-being. *Br J Health Psychol*. 2020; 25 (3): 452-473. https://doi.org/10.1111/bjhp.12416
5. Gabay G, Ornoy H. Revisiting the hospital-issued gown in hospitalizations from a locus of control and patient-centered care perspectives: a call for design thinking. *Front Public Health*. 2024; 12. https://doi.org/10.3389/fpubh.2024.1420919
6. Punchihewa GC, Broadbent E. Patient gowns and dehumanization during hospital admission. *JAMA Netw Open*. 2024; 7 (12). https://doi.org/10.1001/jamanetworkopen.2024.49936
7. Kam S, Yoo Y. Patient clothing as a healing environment: a qualitative interview study. *Int J Environ Res Public Health*. 2021; 18 (10): 5357. https://doi.org/10.3390/ijerph18105357
8. Gökluberk Özlü P, Dengin Sevinir S. Aesthetical and emotional effects of material on clothing design. *TOJDAC*. 2019; 9 (1): 42-51. https://doi.org/10.7456/10901100/006
9. Jacobs KW, Hustmyer FE Jr. Effects of four psychological primary colors on GSR, heart rate and respiration rate. *Percept Mot Skills*. 1974; 38 (3): 763-766. https://doi.org/10.2466/pms.1974.38.3.763
10. Kaya N, Epps HH. Relationship between color and emotion: a study of college students. *Coll Stud J*. 2004; 38 (3): 396-405.
11. Desselle MR, Ibanez-Arricivita IN, Blackler AL, Woodruff MA. Transform the uniform: designing fashion for the hospital of the future. *Int J Fashion Des Technol Educ*. 2021; 14 (2): 232-242. https://doi.org/10.1080/17543266.2021.1915393
12. Rabin JM, Farner KC, Brody AH, Peyser A, Kline M. Compassionate coverage: a patient access linen system. *J Patient Exp*. 2019; 6 (3): 185-193. https://doi.org/10.1177/2374373518793411
13. Richardson M. The symbolism and myth surrounding nurses' uniform. *Br J Nurs*. 1999; 8 (3): 169-175. https://doi.org/10.12968/bjon.1999.8.3.6704
14. De Rosa R, Siano MA, Colucci A, et al. Perceptions and expectations of youth regarding the respect for their rights in the hospital. *Children (Basel)*. 2024; 11 (2): 222. https://doi.org/10.3390/children11020222
15. Ceballos LM, Bejarano M. Value segmentation of adolescents: a performance of appearance. *Int J Fashion Des Technol Educ*. 2018; 11 (2): 148-159. https://doi.org/10.1080/17543266.2017.1352039
16. Kim EY. Exploring healing design elements for patient room design: preferences of adolescent patients from surgical units. *Glob J Health Sci*. 2022; 14 (8): 9. https://doi.org/10.35500/jghs.2022.4.e9, https://doi.org/10.5539/gjhs.v14n8p9
17. Grech P, Grech R. Stroke knowledge: developing a framework for data integration in a sequential exploratory mixed method study. *Res Methods Med Health Sci*. 2020; 2 (2): 68-81. https://doi.org/10.1177/2632084320978040
18. Akbari RA, Kurniawan D. Perancangan user experience aplikasi Android konsultasi skripsi dengan metode user-centered design. *JTEKSIS*. 2023; 5 (3): 183-189. https://doi.org/10.47233/jteksis.v5i3.834
19. Bertheaux C, Zimmermann E, Gazel M, Delanoy J, Raimbaud P, Lavoué G. Effect of material properties on emotion: a virtual reality study. *Front Hum*

Neurosci. 2024; 17. https://doi.org/10.3389/fnhum.2023.1301891

20. Interweave Healthcare. Why children's textiles matter in hospital wards. Available from: https://www.interweavetextiles.com/why-do-textiles-matter-in-childrens-wards/ (accessed on 2026-1-22).
21. Cruz S. Free hospital gown sewing pattern. Available from: https://blog.moodfabrics.com/free-hospital-gown-sewing-pattern/ (published on 2020-3-29; accessed on 2026-1-22).
22. Frankel R, Peyser A, Farner K, Rabin JM. Healing by leaps and gowns: a novel patient gowning system to the rescue. *J Patient Exp*. 2021; 8. https://doi.org/10.1177/23743735211033152
23. Syed S, Stilwell P, Chevrier J, Adair C, Markle G, Rockwood K. Comprehensive design considerations for a new hospital gown: a patient-oriented qualitative study. *CMAJ Open*. 2022; 10 (4). https://doi.org/10.9778/cmajo.20210271
24. Greenwald AG. Within-subjects designs: to use or not to use? *Psychol Bull*. 1976; 83 (2): 314-320. https://doi.org/10.1037/0033-2909.83.2.314
25. Kilinc FS. A review of isolation gowns in healthcare: fabric and gown properties. *J Eng Fibers Fabr*. 2015; 10 (3): 180-190. https://doi.org/10.1177/155892501501000313

APPENDICES

Appendix A: Survey recruitment message sent to personal contacts and pediatricians

Dear [Dr. Last Name],

My name is Aanya Kancherla, and I am currently an AP Research student at Carroll Senior High School in the Dallas–Fort Worth area. I am conducting a research study focused on redesigning hospital gowns specifically for adolescents to better support comfort, dignity, and functionality during medical care.

My project uses a sequential mixed-methods approach, combining survey data and observed behavioral responses from adolescents interacting with both standard and redesigned hospital gowns to better understand patient needs and design a more functional gown. I am reaching out to ask if you would be willing to serve as an expert advisor for my project. Your expertise would provide valuable insight while I refine my design and interpret my findings. Your involvement would be minimal and flexible (primarily offering guidance or feedback via email).

Thank you for considering my request. I truly value your time and expertise!

Appendix B: Child Assent Form

I am doing a study to learn more about how teenagers feel about hospital gowns and how they could be made more comfortable, private, and functional. I am asking you to help because I want to hear what people your age think about hospital gowns and how they can be improved.

If you agree to be in my study, you will fill out a short survey about how you feel when wearing or looking at a hospital gown. You may also be asked to look at or try on a redesigned gown and tell us what you think about it. The survey will take about 10–15 minutes, and the whole study will take about 20–30 minutes total.

You can ask questions about this study at any time. If you decide you don't want to continue, you can ask me to stop, and no one will be upset.

There are no right or wrong answers. I just want to know your honest opinions. Your answers will stay private, and your name will not be shared with anyone.

If you sign this paper, it means that you understand what the study is about and that you want to take part. If you don't want to be in the study, don't sign this paper. It's completely your choice, and no one will be upset if you say no or change your mind later.

Your signature: _____
Date: _____

Your printed name: _____
Date: _____

Signature of person obtaining assent: _____
Date: _____

Printed name of person obtaining assent: _____
Date: _____

Appendix C: Parental Opt-Out Form

Parental Notification Form

Principal Investigator: Aanya Kancherla
Faculty Advisor: Mrs. Erin Burkamp
Expert Advisor: [Dr. Last Name]
Study Title: Redesigning Hospital Gowns to Improve Comfort, Dignity, and Function: A User-Centered Study of Adolescent Preferences

Dear Parents and Guardians,

I am an AP Research student at Carroll Senior High School, conducting a study about how adolescents feel about hospital gowns and how their feedback can help improve gown design. Carroll ISD and my AP Research teacher, Mrs. Burkamp, have permitted me to conduct this study with student volunteers, and this form is to inform you of the study and allow you to opt your child out if you do not wish for them to participate.

If you allow your child to participate, they will complete a short 10–15-minute survey and brief observation activity about the comfort, coverage, and mobility of a standard hospital gown. Later, they may be asked to view or test a redesigned prototype and fill out another 10–15 minute feedback survey comparing the two gowns. Participation will take no more than 30 minutes total and will take place at school under supervision.

There are no known risks to your child from participating in this study. Participation will not affect grades, attendance, or school standing in any way.

Your child will not directly benefit from participating,

but their feedback may help improve future hospital gown designs for adolescent patients and contribute to research focused on patient comfort and dignity.

This research is anonymous. No names or identifying information will be collected. Only group results will be reported in my final AP Research paper and presentation.

If you have any questions about this study, please contact Aanya Kancherla at [Email]. For hospital-related questions, you may contact my expert advisor, [Dr. Last Name], MD, at [Hospital].

If you would like your child to participate, no further action is required.

If you do not wish for your child to participate, please fill out and sign the form below and return it to Mrs. Burkamp or your child's teacher, or email [Email] with the subject line "Opt Out" and include your name and your child's name in the message.

Please return the form by November 30, 2025.

Notification of Refusal

Study Title: Redesigning Hospital Gowns to Improve Comfort, Dignity, and Function: A User-Centered Study of Adolescent Preferences

Principal Investigator: Aanya Kancherla

Faculty Advisor: Mrs. Erin Burkamp

Expert Advisor: [Dr. Last Name]

I DO NOT permit my child to participate in the study described above.

Print Child's Name: _____

Parent/Guardian

Signature: _____

Date: _____

Appendix D: Phase 1 Standard Gown Post-Wear Trial Survey

Study Title: Redesigning the Hospital Gown: Using Adolescent Feedback to Improve Comfort, Dignity, and Function

Researcher: Aanya Kancherla, Carroll Senior High School Faculty Advisor: Mrs. Erin Burkamp

Instructions: You'll briefly observe or try on a standard hospital gown. Then answer the following questions based on how it felt or looked. There are no right or wrong answers. Please answer honestly!

AGE: _____ GENDER: _____

Perceptions of the Standard Gown (Rate 1 = Strongly Disagree to 5 = Strongly Agree):

1. The gown was comfortable.
2. The gown seemed to cover the body well.
3. I would feel confident wearing this gown.
4. The fabric felt soft and non-irritating.
5. I would prefer a gown that looked more like everyday clothing.
6. The design seemed practical for hospital use.

Open-Ended Questions:

7. What's the first thing you notice about the hospital gown?
8. How do you think you would feel wearing it (emotionally and physically)?
9. What changes or improvements would make it better for someone your age?

Appendix E: Phase 2 Redesigned Gown Post-Wear Trial Survey

Study Title: Redesigning the Hospital Gown: Using Adolescent Feedback to Improve Comfort, Dignity, and Function

Researcher: Aanya Kancherla, Carroll Senior High School Faculty Advisor: Mrs. Erin Burkamp

Instructions: You'll briefly observe or try on the redesigned hospital gown prototype. Then answer the following questions based on how it felt or looked. There are no right or wrong answers. Please answer honestly!

Perceptions of the Redesigned Gown (Rate 1 = Strongly Disagree to 5 = Strongly Agree):

1. The redesigned gown feels more comfortable than the standard gown.
2. I feel less self-conscious or embarrassed wearing the redesigned gown.
3. The redesigned gown looks more modern or stylish.
4. The redesigned gown provides enough coverage and freedom to move.
5. I would prefer this redesigned gown if I had to stay in a hospital.

Open-Ended Questions:

6. What do you like most about the redesigned gown?
7. What would you still change or improve?
8. Do you think the redesign balances comfort, dignity, and function better? Why or why not?

Appendix F: Photographs of the standard gown

Additional reference photographs of the standard hospital gown collected during Phase One, used to document fit and inform the redesign.