SUSQI PROJECT REPORT

Project Title: It's Easy Being Green - A Surgical Incision into Paper Reduction
Start date of Project: April 28, 2025
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Background:

Since December 2023, the Peter Lougheed Center (PLC) Day Surgery Department has participated in a Waste Diversion Project which has seen significant decreases in the number of single-use plastics used (ex. belonging bags, cups, lids and straws) (i.e. ~48% in one year). Building on that sustainability momentum, our focus for this competition was to shift towards paper reduction.

From April 2024-March 2025, the PLC Day Surgery Department saw 7782 Day Surgery Patients. Day Surgery procedures are typically operations of short duration and minimally invasive requiring shorter lengths of stay. For each of these visits, discharge instructions in the form of an After Visit Summary (AVS) are printed from the electronic medical record (EMR) and provided to each patient. The length of the AVS paperwork can vary drastically from patient to patient but was assessed at an average of 9 single-sided pages per patient. This amounts to over 70,000 pieces of paper annually for a single department and therefore was identified as an improvement opportunity.

Paper-reduction and increased reliance on electronic resources in healthcare are well-defined practices across the United States and numerous other countries worldwide. Our team identified two ways to reduce the use of paper in the Day Surgery Unit. First, we could adjust the default printer settings to double-sided printing and immediately cut the paper usage in half. Secondly, by increased education and socialization of the availability of established digital resources, we intend to prevent the need to print the AVS by encouraging and optimizing the use of MyAHS Connect (MAC), the electronic portal to health information in Alberta. MAC is an already established and safe method for patients to access their information and receive documents electronically.

Specific Aims:

1. To reduce the amount of paper used in the PLC Day Surgery Department by at least 50% through adjusting the printer settings from single-sided to double-sided printing.

2. To encourage enrolment in MyAHS Connect before surgery date which would enable patients to receive their After Visit Summary (AVS) electronically. This would contribute to the reduction in the amount of printing required in Day Surgery. We aim to see a 50% increase in the number of patients using MAC.

Methods:

Through process mapping and the ensuing discussion, we arrived at a 3-stage plan to reduce paper usage in Day Surgery (appendix A).

- Stage 1: Default printer settings were changed to print on both sides of the paper.
- Stage 2: Clerical staff in PAC were educated on how to teach the benefits of the online system and encouraged patients to sign up for MyAHS Connect online. Activation emails were sent to all PAC patients during the booking process, unless the patient refused.
- Stage 3 *(Future work):* Decrease the number of AVS printed and provided in Day Surgery at discharge. Complete teaching at the bedside using Workstation on Wheels (WOW) or iPad and ask patients to access MyAHS Connect to view AVS/discharge instructions.

Throughout this process, we encountered a few challenges and developed associated learnings from this.

- Defaulting printer setting affected all printed documents in the department. This did cause some challenges regarding how other documents were viewed and required some changes in workflow for the DS unit clerks. We also saw an increase in the amount of paper jams, but this was remedied by a printer tune-up by IT.
- For our future stage, we have socialized the concept of not printing the AVS with nursing staff and have been met with some resistance and hesitation. Some potential strategies to address this is to introduce shift/role champions, increase training in relation to MyAHS Connect and have engagement sessions to support the staff.

We engaged with management, the clinical leader and clerical team in both Day Surgery (DS) and Pre-admission Clinic (PAC). The clerical team was educated regarding how to approach and coach patients to sign up for MyAHS Connect. We reached out to our site's Patient and Family Centered Care (PFCC) consultant to investigate various ways to engage with patients and explore their thoughts and concerns regarding electronic documents.

No additional resources were required.

Measurement:

Patient outcomes:

- This project will positively impact the standard of care by making the patient's health information more readily accessible through the electronic health record. The uptake will allow patients to play a more active role in their care and create a more patient-centered approach. MyAHS Activation rates can be compared from the baseline at the beginning of the study to the rate at the end of the study.

- Standard of care continues to be met as access to patient information and education has not changed but likely will increase due to enrolment in MyAHS Connect. Access to the electronic health record empowers patients to be partners in care and may lead to increased awareness, compliance and safety (Alomar et al., 2024). (1) To measure this impact, we looked at MAC Activation Rates. This information is obtained from our EMR system and it pulls the data from the previous year, so impact from our project would require more long-term data analysis.
- Potential outcomes post Stage 3 implementation may be seen by improved understanding of pre-op teaching, increased access to trusted evidence-based health information, decreased no-show rates to appointments and greater compliance to pre-op instructions.
    - Possible long term data measurements include: no-show rates to PAC clinic appointments, OR case postponement/cancellation rates due to patient compliance

Environmental sustainability:

Carbon emission reduction anticipated from the first stage of the project (defaulting to double sided printing) are realized through reduction of paper use.

The GHG emissions associated with paper use were estimated using a process-based carbon footprint analysis. This assessment includes emissions from raw material production and transportation.

Emissions from disposal of printed paper were excluded, as the printed AVS is provided to the patient and disposal method is unknown.

Observation from one week indicates that 7.8% of AVS were reprinted and the original AVS disposed at the hospital and not given to patients. The team considered emissions from disposal of paper at the hospital. For disposal, paper waste generated at the hospital is shredded and then recycled at a facility located 12 km away. Since the shredded paper is reprocessed into a new product, emissions from the shredding process are excluded in line with UK GHG emission allocation principles. Only the emissions from transporting the paper to the shredding facility were considered and it was determined that emissions from paper disposal have minimal impact compared to emissions from raw material production and transportation. Therefore, emissions from disposal of extra AVS printed were excluded.

It was assumed that the paper was made from 100% recycled content, and the emission factor for recycled paper was sourced from the Department for Energy Security and Net Zero (DESNZ) 2025 database.(3)

Due to limited information about the paper manufacturing origin, only that it was produced in the United States, the transport distance was conservatively estimated as the shortest route from Calgary to the U.S. border (approximately 200 miles). This likely underestimates the actual transport distance. The 2025 U.S. EPA emission factor for a "medium heavy-duty truck" was applied to convert this distance into carbon emissions.

The carbon emission factor for a single piece of paper was calculated at 0.00653 kgCO2e.

We multiplied this value by the number of sheets reduced to calculate the total carbon admissions saved from switching from single-sided to double-sided printing.

Total CO2e savings have been translated into the equivalent of kilometres driven using an emission factor of 0.259 kgCO2e/km for an average passenger vehicle calculated from the 2024 Canadian vehicles database, Natural Resource Canada.(2)

For stage 3 of the project - With increased use of MyAHS Connect, we understand there will be associated carbon emissions related to smart phone usage, electricity usage and networks/data centres that will have to be subtracted from the carbon savings resulting from decreased use of paper.

For emissions associated with app usage, we included the embodied emissions of a smartphone, sourced from a Greener NHS database, as well as average smartphone electricity consumption and network/data centre usage per minute, based on figures from *How Bad Are Bananas?* by Mike Berners-Lee. Electricity-related emissions were adjusted to reflect the Canadian context.

This was calculated to be 0.000477kgCO2e per minute of smart phone use.

Since we also anticipate the number of OR cancellation would decrease with easy access to pre-op instructions and associated health information we will consider reduction of carbon footprint of procedure cancellation in the calculations. The carbon footprint for each procedure cancellation was estimated at 24.54 kgCO2e. The impact of our interventions would require long term analysis on OR cancellation/postponement rates.

See appendix B for carbon emissions methodology.

Economic sustainability:

- An estimated value of $0.014* per sheet of paper was applied, in line with market rates. We used this cost/sheet to calculate total savings.
- No investment costs were incurred.

** = Market rates*

Social sustainability:

Discussion amongst staff leading up to the project indicated that nurses and unit clerks recognized the large amount of paper used in the department. We anticipate that by adjusting the default settings we will improve staff satisfaction. Previous leader rounding sessions showed that patients do want access to their information electronically, especially from their Pre-Admission Clinic appointment. Notably, increased MAC engagement would help with the information gap for telephone only PAC appointments where AVS printing is not possible. We conducted staff interviews to gain feedback on Phase 1 & 2. Phase 3 impacts could be measured through additional staff/patient interviews or leader rounding sessions after implementation.

Results:

Patient outcomes:

These measures requires long-term data analysis and are not available for this report.

- Ex. MyAHS Connect Activation Rate, PAC no-show rates, OR cancellation rates (with patient compliance as the reason).

Environmental sustainability:

The printer settings were adjusted on June 5th. From June 5th – July 18th, there were approximately 820 Day Surgery patients that came through the department, which equals approximately 7380 pages of AVS. Due to the double-sided printing, we decreased paper usage by 3280 pieces of paper or 21.4184 kgCO2e. This number is likely an underestimation of total impact since double-sided settings were applied to all printed documents in the department, not just the AVS. This equates to an estimated 203.26 kgCO2e/year, based on last year's total patient volume, equivalent to 785 km driven in a standard vehicle.

With the potential increased enrolment in MAC and instructing patients to review discharge instructions and information in their patient portal, our stage 3 goal is to avoid printing the AVS in Day Surgery. This would save 0.03265kgCO2e per AVS (based on the now 5 double-sided pages). The increased cell phone app use would decrease our savings by 0.00477kgCO2e, based on an estimated 10 minutes of AVS review. With these factors, we estimate an additional savings of 0.02788kgCO2e/patient for Stage 3.

In addition, we hypothesize having access to pre-op instructions via MAC would lead to increased pre-op instruction compliance (ex. NPO status, medication instructions, arrival time). This could lead to a decrease in OR cancellation rates. Each procedure cancellation has an estimated carbon footprint of 24.54 kgCO2e. The impact of our interventions would require long term analysis on OR cancellation/postponement rates post Stage 3 implementation.

Economic sustainability:

Savings resulting from AVS printing reduction.

For Stage 1, there was approximately $45.92* in savings during the project period (June 5th-July 18th). That would equate to $435* per year (based on last year's patient volume).

For stage 3, based on the last year year's patient volume and elimination of remaining 5 pages of printed AVS, the anticipated yearly savings are an additional $544.39*.

Additional financial savings could be realized at Stage 3 if OR cancellation rates are decreased, which requires a more detailed financial analysis that will be completed closer to Stage 3 implementation.

** = Market rates*

Social sustainability:

As anticipated, the double-sided printing has been a positive change for both staff and patients, as evidenced through staff interviews. Staff feel good about the switch to double-sided printing.

- "It's a simple change and it just makes sense. Less paper used and wasted is a good thing."
- "Patients seem to be less overwhelmed by the AVS now. Even though it is the same information, seeing and holding less pages makes it easier to consume."

The clerical PAC staff drastically increased number of MyAHS Connect Activation attempts during the project. Before education and project launch, there were 3 activation attempt emails sent in the month of May by the PAC team. This increased to 180 activation emails sent between June 5 – July 18.

Discussion:

The PLC Day Surgery Project aimed to reduce the use of paper in the department with a specific focus on discharge information in the After Visit Summary (AVS). Two key strategies were implemented: adjusting default printer settings and increasing uptake of digital access to information via MyAHS Connect.

One challenge we encountered was identifying our baseline paper usage. From reports in the EMR, we were able to pull the documents' byte sizes but not the number of pages. To find our average sheet count per AVS, we relied on nurse reporting which was compared with the document's byte size to make an estimation. Furthermore, paper is usually ordered quarterly for the unit. Due to the short timeline of the project, we were unable to see any impact of paper orders that we could use for data collection.

The shift to double-sided printing has already shown positive outcomes. This includes an immediate reduction in paper usage, totaling approximately 3280 pieces of paper or 21.4184 kgCO2e and the supply cost savings of $45.92* during the project timeline. Adjusting the printer settings did impact all printing that occurs on the unit which did require some unanticipated workflow changes for the unit clerks. Furthermore, the double-sided printing initially caused paper jams, but this was easily fixed with an IT service ticket. This change was widely accepted by the staff and positive feedback was received from both staff and patients.

Our second aim was to prevent the need to print the AVS. We planned to tackle this goal in two stages. We would first attempt to increase enrolment in MyAHS Connect. We have a unique opportunity to engage with patients upstream prior to their surgical date since all pre-op patients are booked for a Pre-Admission Clinic appointment. We educated the PAC unit clerks on how to promote MyAHS Connect and how to send activation emails. This was quickly adopted by the team, and we saw a drastic increase in the number of activation emails sent. The progress we've made so far provides a strong foundation for the next stage of the project. To continue building on this momentum we will need to prioritize staff engagement and education to ensure AVS access from MyAHS Connect is a success. Once this is realized, we anticipate seeing another significant decrease in paper usage within the department.

This project could be duplicated in many areas of healthcare with relative ease and no upfront cost. Default printer setting adjustments can be applied to all printers, therefore reducing resource use, costs and carbon emissions. MyAHS Connect is readily available within Alberta and therefore these techniques have the potential to be applied in a variety of departments and care areas. The beauty of this sustainability initiative is that everyone can participate. Patients and staff can be made aware, be engaged, and mindfully contribute to sustainable initiatives with simple

everyday actions.

Longer term initiative adoption of this sustainability culture would be greatly supported by the creation of a communication strategy with an executive sponsor. From a scale and spread lens, the collection of similar data to encourage, nurture, and showcase sustainability initiatives between units, portfolios, sites and zones would be an actionable step forward. Setting up competitions between sites as a means to increase uptake and encourage paper reduction could be a realistic next step to support a global reduction in paper resource consumption in clinical and non-clinical areas.

Some risks were identified in scaling and spreading this initiative. Low risks include a lack of interest in initiative at an organizational level and effort required for unit adoption with current workflows and capacity. Medium risks could include change fatigue and initiative prioritization at the Unit/Site level resulting in lack of adoption.

** = Market rates*

Conclusions:

This project successfully reduced paper usage in the PLC Day Surgery Department. Our results demonstrate that small changes can lead to lasting impact and using the established technology and resources effectively can have great potential.

A reassuring note is AHS's pursuit of supporting sustainability initiatives in health care. The viability of the Office of Sustainability, specialty positions in sustainability have emerged (Provincial Waste and Sustainability lead, Surgical sustainability lead), the success of the Sustainability Community of Practice, South Health Campus as a Beacon site for Sus QI and support of this Green Team competition, embedding sustainability in policy, and the movement towards sustainable practices at the unit, site and Zonal levels. In addition, sustainability has also been incorporated as a Quality Dimension of Health (Health Quality Alberta). (4)

References and Resources

1. Alomar, D., Almashmoum, M., Eleftheriou, I., Whelan, P., & Ainsworth, J. (2024). *The impact of patient access to electronic health records on health care engagement: Systematic review*. Journal of Medical Internet Research, 26, Article e56473. https://doi.org/10.2196/56473
2. Fuel consumtion ratings search tool (nrcan-rncan.gc.ca)
3. Government conversion factors for company reporting of greenhouse gas emissions - GOV.UKGovernment conversion factors for company reporting of greenhouse gas emissions - GOV.UK
4. Health Quality Alberta. (2025). *The Alberta Quality Dimensions for Health.* https://hqa.ca/about-us/our-mandate/the-alberta-quality-dimensions-for-health/

Critical success factors

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

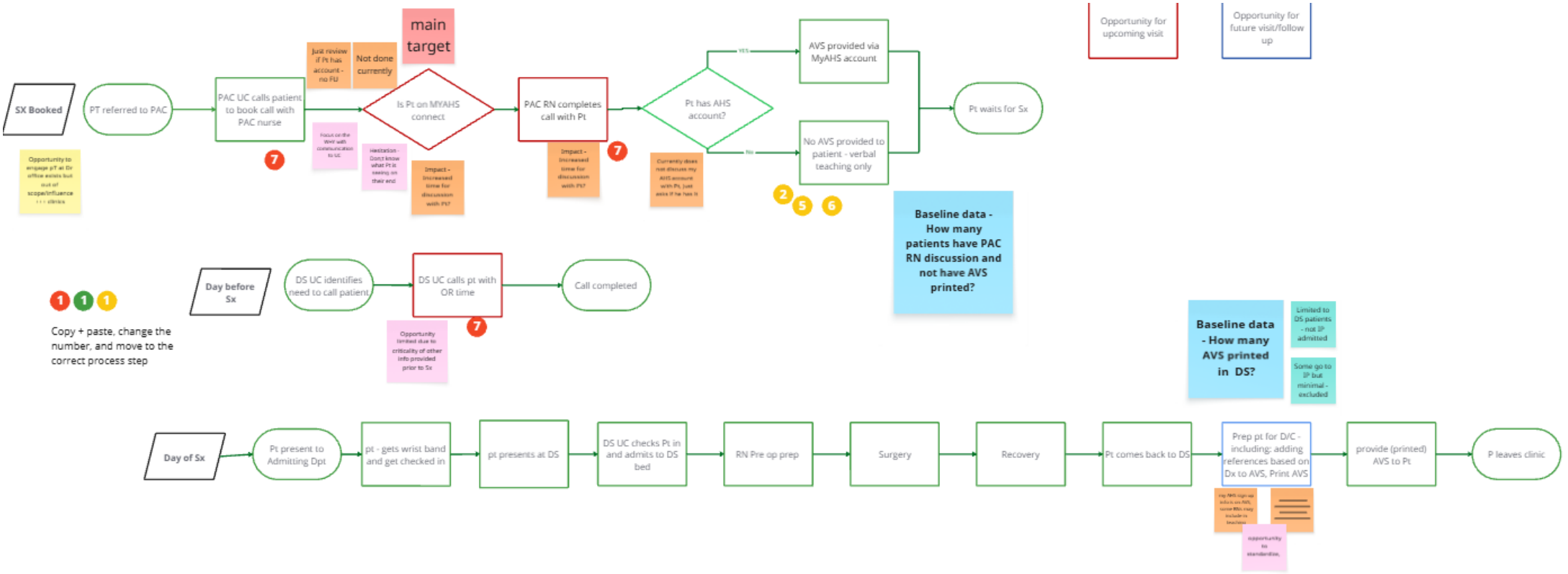
People	Process	Resources	Context
✓ Patient involvement and/or appropriate information for patients - to raise awareness and understanding of intervention ✓ Staff engagement ☐ MDT / Cross-department communication ☐ Skills and capability of staff ☐ Team/service agreement that there is a problem and changes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

This template is adapted from SQUIRE 2.0 reporting guidelines.

Template References

- SQUIRE | SQUIRE 2.0 Guidelines (squire-statement.org)
- Home | Sustainable Quality Improvement (susqi.org)

Appendix A – Process map



Appendix B

Carbon footprinting methodology Surgery

Project 1: paper reduction

The GHG emissions associated with paper use were estimated using a process-based carbon footprint analysis. This assessment includes emissions from raw material production, transportation, and, for paper disposed of at the hospital, end-of-life disposal.

It was assumed that the paper was made from 100% recycled content, and the emission factor for recycled paper was sourced from the Department for Energy Security and Net Zero (DESNZ) 2025 database.

Due to limited information about the paper bag's manufacturing origin, only that it was produced in the United States, the transport distance was conservatively estimated as the shortest route from Calgary to the U.S. border (approximately 200 miles). This likely underestimates the actual transport distance. The 2025 U.S. EPA emission factor for a "medium heavy-duty truck" was applied to convert this distance into carbon emissions.

For disposal, paper waste generated at the hospital is shredded and then recycled at a facility located 12 km away. Since the shredded paper is reprocessed into a new product, emissions from the shredding process are excluded in line with UK GHG emission allocation principles. Only the emissions from transporting the paper to the shredding facility are included in the final calculation.

For emissions associated with app usage, we included the embodied emissions of a smartphone, sourced from a Greener NHS database, as well as average smartphone electricity consumption and network/data centre usage per minute, based on figures from *How Bad Are Bananas?* by Mike Berners-Lee. Electricity-related emissions were adjusted to reflect the Canadian context.

Project 2: procedure cancellation

The GHG emissions associated with resource use of a cancelled procedure has been estimated using a hybrid approach.

The GHG emissions associated with medication use were estimated using an Environmentally Extended Input-Output Analysis (EEIOA). The financial cost of each medication was adjusted to 2022 values using the Bank of Canada's inflation rate and then converted into GHG emissions using the 2022 UK Government Standard Industrial Classification (SIC) emission factor for *'pharmaceuticals'*. As the SIC factor is based on British pounds, it was converted to Canadian dollars using the average 2025 exchange rate of £1 = 1.8299 CAD. The calculation reflects cradle-to-gate emissions only, encompassing the emissions from raw material extraction through to the point of manufacture. Emissions associated with the disposal of pharmaceuticals were excluded from this estimate, as they are considered minimal compared to those generated during manufacturing.

For reusable linen, including laundering, the carbon footprint of the items themselves was based on a previous CSH Green Team Competition study, which undertook a process based bottom-up approach. This included emissions from raw material production, and disposal. Emissions associated with transporting gown from country of manufacture to hospital were excluded. Whilst most emissions data was taken directly from the original study, disposal emissions were adapted using AHS' landfill

emission factors to reflect local waste practices and additionally, emissions from transporting the linen to landfill were estimated separately using the 2025 U.S. EPA emission factor for a "medium heavy-duty truck and a distance of 11.5 km. It was assumed, each piece of linen could be used 75 times before disposal.

Laundering emissions were calculated by assuming that linen is transported to and from a laundering facility located 22.3 km from the hospital. Transport emissions were estimated using the 2025 U.S. EPA emission factor for a “medium heavy-duty truck.” Emissions from energy, water, and detergent use during laundering were based on raw data from Rizan et al. (2022) on hospital laundry utilities. Due to the lack of Alberta-specific data, it was assumed that laundering resource use in the UK was comparable to that in Alberta. The UK-based utility data were converted into GHG emissions using 2025 Canadian emission factors, allowing for adjustment to the local context.

For the cannula, IV tubing, and gauze the carbon emissions were taken directly from a CSH project where they had been estimated using a bottom-up process based approach. However, as with the linen, disposal emission were adapted using AHS’s landfill emission factor to reflect local waste practices. For the dressing and alcohol swab, emission factors were taken directly from a CSH project, no adjustments were made for the Canadian context.

No site-specific data was available for an average patient distance to the hospital, instead it was assumed an average return distance of 64 km taken from a previous AHS Green Team Competition was used. It was assumed all patients would be driven to the hospital, the factor of 0.259 kgCO2e/km was applied.