SUSQI PROJECT REPORT
Stryker Sustainability Initiative

Date Project Started: May 3, 2024
Date of Report: July 19, 2004

Team Members:

- Michelle Shand (Program Manager - Surgical Services)
- Rachel Taylor (Program Manager - ICU/CCU, Respiratory Services, Pulmonary Diagnostics and Bronchoscopy Suite)
- Ermin Sabic (Environmental Services Manager)
- Mark Drescher (Site Services Supervisor - CPSM Support Services)
- Simon Robinson (Clinical Nurse Educator - Surgical Suites & Minor Surgery Clinic).
- Jelena Poprzen (Clinical Quality Improvement Consultant)
- Pedro Reis (Surgery Sustainability Lead)

Background:

The South Health Campus (SHC) has strived to implement initiatives that better support our natural environment fostering a healthier greener planet. Little changes to practice can add up to make a big difference to the ecology of our planet. Health care is a very large industry that unfortunately is also one of the top contributors of waste and carbon emissions, thus negatively impacting the earth. To put it simply we asked, how can we do better?

Single use medical equipment utilized throughout the SHC contributes significantly to costs and carbon emissions right from procurement to waste disposal. These types of items are used in all areas of acute care and in the operating rooms. At the SHC alone we send over 5000 single use compression stockings to the landfill every year. Within Calgary three adult sites have implemented the Sustainability Solutions Program through Stryker. The goal at SHC is to join this initiative to be in alignment with our partner sites and to better support our planet.

The Stryker Medical Equipment Remanufacturing Program, known as the Sustainability Solutions program, focuses on the collection, and reprocessing of medical devices to reduce waste, extend item lifecycle and lower healthcare costs. For organizations who send back used devices, savings can be made in waste disposal costs and carbon emissions. For organizations who buy reprocessed items, they save money and carbon emissions related to manufacturing and procurement of devices.

The SHC has inpatient units and operating theaters that use single-use products which meet the criteria for the Stryker Sustainability Program. All areas were asked to participate and those that had the bandwidth to join this initiative were oriented to the program.

The initiation of the project involved representatives from the Operation Room, ICU, Environmental Services, Quality Improvement and Surgical Sustainability to collaborate on planning, implementation and evaluation of the program.

Specific Aims:

Our hospital is initiating the collection phase of the Stryker Sustainability Program, gathering eligible single-use devices (including SCD Stockings, Trocars, Neonatal Pulse Oximetry Probes, etc.) from various participating departments, such as the Operating Rooms, Post Anesthetic Care Unit (PACU), Day Surgery/Short Stay Unit, in patient units, the Emergency Department, and Intensive Care Unit. These items will then be collected by Stryker to be reprocessed and used by other health authorities.

Methods:

The Stryker recycling program was launched initially at Rockyview General Hospital (RGH). We reached out to the site champion at RGH to learn more about the program, how it was launched, and any recommendations for other sites launching. The Core Project Team went to RGH and met with the site champion and the representative from Stryker. The team toured the collection areas and where supplies for Stryker shipping & receiving were stored.

As there are some site-specific differences, the South Health Campus (SHC) team identified that there would be a need for a slightly different process for collection of recycled items at SHC. We met with the OR supply manager and environmental services to establish a process that would work at SHC.

Once the process was outlined, the team presented at the site managers monthly meeting. At this presentation, we shared the products and quantities that SHC is using that could be collected as part of the Stryker sustainability program. We asked for unit champions to come forward and indicate their willingness to participate in this initiative.

Once we had unit champions interested, we worked with the units to determine what items they used and how many hampers or collection bins they would need. Not every unit using items that could be collected were interested in participating. The reasons provided were that there were competing priorities and concern that this initiative would add workload for front line staff which could contribute to job dissatisfaction and burnout.

Once we had determined how many collection hampers and bins were required, the team met with the Stryker representative. We toured the different levels and identified where the collection bins would be transported to by the environmental services team for the Stryker team to collect. We identified that additional bins and hampers were required.

A process map was developed to show the stakeholders what to collect, where to place the collected item, and where the environmental service team would transport the collected items to a holding area on each floor for the Stryker team to collect on a bi-weekly basis (Appendix 1). Education materials were sent to the unit managers to distribute to their teams.

The hampers and collection bins were ordered by Stryker and once they arrived on site, the vendor met with the team to deliver the hampers and collection bins. Each unit received their requested collection container and/or hamper along with a poster as to what was being collected (Appendix 2 and 3). On each level, there were additional hampers, collection bags, and a collection bin for the environmental services team to access. This was completed the first week of May 2024. Stryker determined the frequency of pickup which was scheduled for every two weeks. The first collection was on May 16, 2024.

The process for the OR collection was unique to the other units. The process for the OR identified that rigid collection containers would be placed in each OR, once filled, our health care aids would take the filled container to the soiled utility area and replace it with a new container. The environmental services team would transport the collection containers to the lower level to be picked up by the Stryker team. A process map was created and distributed to the stakeholders (Appendix 1).

The representative came to an OR in-service to provide education on what items would be collected as part of the program and how to place the items in the container to decrease the risk of damage. Education was provided to not cut cords and what not to place in the container.

Investment

All the materials required to launch the Stryker sustainability program were provided by the vendor at no cost to our site or organization. The vendor provided the shipping materials, the hampers, collection bins, liners, posters, and tape to affix the posters.

Items collected

Stryker determines what items are eligible for collection. There are a number of items that we do not use at our site, however all eligible items used by the South Health Campus were included in this site wide initiative.

Risk

The risk of items being placed in the collection bins that should not be discarded is minimal as the items are currently going into a waste stream, either general waste or waste for incineration. The collection bins are labeled with posters, and for the non operating room areas, it would be easy to identify any items that are supposed to be kept, for example an SCD machine.

Since launching in May 2024, we have received expressions of interest from other units to join the sustainability initiative. Three units will be joining later in July.

Measurement:

Patient outcomes:
This project will have no impact on patient/clinical outcomes as the change is implemented after direct patient care is provided when items are being disposed of. Therefore, no patient/clinical outcomes have been measured.

Environmental sustainability:
Currently AHS are not purchasing reprocessed devices, therefore GHG emission savings to AHS will come from removing used instruments from landfill and entering the reprocessing pathway. By participating in the Stryker recycling program, SHC is providing new items for reprocessing, therefore indirectly contributing to the carbon savings realized in this program.

GHG emission changes presented in this report are direct GHG changes from diverting items from landfill and incineration as well as projected model GHG savings if AHS were to purchase reprocessed items.

Items currently included in the program are compression devices, pulse oximeters (non-surgical items), trocars, harmonic scalpels, LigaSures, hysteroscopic tissue removal devices - MyoSure (surgical devices).

A process-based life cycle assessment was used to estimate the carbon footprint of the new and re-processed compression stockings. For the new (single-use) stockings, the analysis included GHG emissions associated with raw material extraction, packaging raw materials, transport and disposal. Item and packaging materials were weighed by the teams and converted into GHG emissions using emission factors taken from the ICE, BEIS 2023 and Ecoinvent v3 database. Supply chain and transportation distances were projected based on manufacturing location, and it was assumed items were transported by truck to the hospital. Transport emission factors taken from the USA EPA 2024 database were used. Carbon conversion factors for waste disposal were provided by the AHS Office of Sustainability.

For the reprocessed stockings, the analysis included GHG emissions associated with transportation to the Stryker reprocessing facility and back to the hospital, reprocessing cycle, additional raw materials, reprocessed packaging and disposal. Packaging materials were weighed by the team and converted into GHG emissions using emission factors taken from the ICE and BEIS 2023 database. Transportation distances were determined based on reprocessing and sterilization locations provided by Stryker and transport emission factors taken from the USA EPA 2024 database were used. GHG emissions associated with reprocessing was determined using available data from the Stryker study, and was based on an average of reprocessing emissions for the 5 items included in the study. The results obtained using outlined approach were validated by comparing to the results from the Comparative LCA study for IPC sleeves (3). Results from project calculation using average of reprocessing emissions for the 5 items from the Stryker study were within 10% error margin of the LCA IPC study.

For the harmonic scalpels (HARH36), LigaSures (bipolar surgical instrument)(LF2019), Myosure (hysteroscopic tissue removal device), and pulse oximeters (Max-A), the carbon footprints were taken from the Anthesis Stryker report (4). However, to make the data more specific to AHS, transport data to AHS was used instead of the transport data in the Stryker report. Although the Stryker study calculator of GHG emissions are for the specific items SKU number (manufacturer) the data was applied to the same type of equipment regardless of the manufacturer or model.

The maximum number of reprocessing cycles were determined by Stryker and included in the calculations as detailed in the Results section.

Trocars are included in the program however, they have been excluded from the environmental impact calculations as the complexity of calculations and assumptions that would have to be made.

Table 1: GHG emissions associated with original and reprocessed items (excluding trocars) along with number of approved reprocessing cycles.

Item	**GHG emissions per item (kgCO2e)**		**Number of reprocessing cycles**
	Original item	**Reprocessed item**	
HARH36	3.8	2.1	2
LF2019	1.5	1.1	1
MyoSure	5.3	4.4	1
Max-A	0.15	0.09	1
Stockings	1.5	0.9685 (LCA IPC study data) 1.055 (Stryker study data)	4 (LCA IPC study data) 5 (Stryker study data)

Limitations of methodology:

- Processing yield of 100% is assumed.
- Rejection rate (the percentage of the accepted unit that is rejected in a phase of reprocessing (stains, cords cut, damaged, etc.) not taken into consideration with calculations.

Since the instruments included in the Stryker LCA study are more complex and require more reprocessing steps than the compressions stockings this approach most likely results in overestimation of the carbon footprinting of reprocessed stockings and underestimates carbon footprint savings achieved from using reprocessed items.

Economic sustainability:

There is no cost to AHS to join the program – collection bins placed in the hospital, used items packaging material and transport cost are covered by Stryker. Direct cost savings were realized from diverting used items from landfill and incineration waste stream.

Social sustainability:
In June a staff survey was sent to the Managers of participating units for dissemination to staff. The survey asked the respondents about their participation in the program, changes to their workload and if the participation in the program enables them to make a difference in protecting the environment.

Patients were not engaged as part of this project as the change will not have an impact on their care experience.

Results:

Patient outcomes:
No patient outcomes as detailed in the methods.

Environmental sustainability:
GHG emission changes presented in this report are direct GHG changes from diverting items from landfill and incineration as well as indirect GHG emissions savings to the wider community, realized from providing items for the recycling program. We have also projected potential savings if reprocessed items were purchased back.

1. Direct GHG changes by recycling items

Projection shows the GHG emission changes associated with sending the items to Stryker rather than landfill or incineration. These are the current changes and exclude any wider community savings. Because landfill emissions are very low compared to sending items to Stryker reprocessing facilities in the US, there is a slight increase of emissions primarily attributed to the non-surgical items. However, savings are made with the surgical items being diverted from high temperature incineration.

Table 2. Direct GHG changes by recycling all qualifying items

Item category	**GHG emissions changes (kgCO2e) - first month collection**	**Projected annual GHG emission changes**
Surgical Items	44.28	530.16
Total for Non-Surgical Items	-45.28	-543.33
Total for ALL items	-1.10	**-13.17**

Although the projected annual GHG changes are not favorable, the project will result in 28,140kg of waste diverted annually from the landfill/incineration. Diverting waste from landfill or incineration is environmentally beneficial because it conserves natural resources and supports the reuse and

recycling of materials, contributing to a more sustainable product life cycle. While this is an increase in emissions to SHC, savings are reflected in the purchasing of remanufactured items from other hospitals (below) which could not happen without SHC/AHS and others engaging in the return scheme.

2. GHG emission savings to other hospitals/wider community

The project will bring CO2e savings to other hospitals who purchase the items SHC have sent to Stryker after items are reprocessed. The number of re-processing cycles are not included in the calculator as SHC currently sends a new item back to Stryker which should be able to be reprocessed. The results don't include savings from trocars.

Table 3 - GHG emissions savings to wider community (excluding trocars)

Item	**GHG emissions savings (kgCO2e) - First month collection**	**Projected annual GHG emission savings (kgCO2e)**
HARH36	49.4	592.4
LF2019	15.0	180.1
MyoSure	5.7	68.8
Max-A	81.0	971.8
Stockings	134.9	1,618.3
Total	285.9	**3,431.3**

3. Projected GHG savings

While it is not currently possible for SHC/AHS to purchase remanufactured items below are modeled savings if SHC were to purchase reprocessed items. The number of re-processing cycles have been taken into consideration. Projected savings are based on 2023 usage of items that are now included in the Stryker program. The projection excludes trocars.

Table 4 - Projected GHG savings (excluding trocars)

Item	**Projected Annual GHG emissions savings (kgCO2e)**
HARH36	123
LF2019	143
MyoSure	65
Max-A	466
Stocking	1,996

Total	**2,792**

Economic sustainability:
The projected annual savings from diversion from the waste streams: general (landfill) waste and incineration are $2,502 CAD based on the first month's waste diversion data provided by Stryker. These savings will increase as additional units join the initiative.

Social sustainability:
Preliminary staff survey results after two weeks, identified that the program has been positively received. All respondents (15) are participating in the program. Respondents have reported no change or minimal increase in their workload (which was expected due to the nature of the change).

80% of respondents agreed that participation in the program enables them to make a difference in protecting the environment. Staff have asked that more items be added to the program and suggested additional environmentally focused changes they would like to see in their workplace. It is interesting to note that two respondents strongly disagreed that reducing the impact of healthcare on the environment is important to them.

The survey will remain active and a reminder for survey completion will be sent to the participating units. Since the launch, the program has expanded to three additional units and the staff survey will be distributed to the added areas.

Discussion:

The goal of this project was to implement the Stryker recycling program at South Health Campus initially in OR and in other clinical areas where there was interest. By joining the program**,** the units are diverting single use items from the landfill and providing new items for reprocessing, contributing to the environmental benefits realized in this program.

There is no cost to join and participate in the program. The changes to the workload are minimal and the initiative has been well received. Initially, six clinical areas (in addition to OR) joined the program. During the first weeks of collections, it was identified that additional collection bins were required which were provided by Stryker. The hesitancy from other units to join the program initially was attributed to competing priorities but after launch, there was interest and an additional three areas joined the program in July.

The carbon emission impact of non-organic items in the landfills is relatively low, and there are no carbon emissions savings resulting from removal of items from the waste stream, however, landfill sites are the potential causes of contamination of the soil and groundwater. Removing items from landfill can reduce the amount of heavy metals and other environmentally harmful substances that may spread from the landfill sites bringing other positive environmental benefits.

The biggest financial and environmental savings from the program can be achieved by participating in the buyback programs, which might warrant further exploration by the AHS. Projected annual GHG emissions savings, if SHC/AHS were to send and buy back re-processed items, are 2,792 kgCO2e which is equivalent to 10,779km driven in an average car. (5)

The results of the program will be shared with the site to promote further engagement across other areas at SHC (e.g. outpatient services) and potential expansion of the program to other items that can be collected by Stryker.

The team involved in carbon footprinting the items that were not covered by the Stryker study learned the complexities of bottom-up approach to carbon footprinting, including selection of carbon conversion factors to be used given the differences between UK and North American supply chains and energy sources, as well as the lack of Canadian specific carbon conversion factors for specific categories.

The calculations were based on collection quantities and the weights of collected items from Stryker. We want to acknowledge the assistance and engagement of the Stryker representative who readily provided Stryker related information needed for carbon footprinting of stockings.
It is also worth noting that through the Stryker tree planting program with partnership with VeriTree, hospitals are able to contribute to the restoration of national forests and ecosystems. (2) As per the Stryker representative, the number of trees donated are based on year over year collection growth per hospital/site i.e. for 25% growth in collection total 25 trees will be planted. Upon joining the program, the initial year donation is 100 trees.

Conclusions:

The main driver for success of the program is staff motivation to do their part and make sustainable choices at workplace settings. The program also sparked an interest in suggesting further sustainability ideas. The comments in the survey indicated that there is an appetite from staff to include more items in the recycling program. Further increasing staff awareness of the impact that healthcare delivery has on the environment and providing opportunities to staff to “do something” about it is the first step in creating more sustainable processes.

With the additional inpatient unit areas joining the program since its initial roll-out, all inpatient units at SHC are now participating in the program. SHC now joins other sites within AHS in the Stryker recycling program. We will report our results to the provincial Waste management team to be shared with the rest of AHS to further increase the awareness of staff about the program and its impact to the environment.

While we have measured the potential impact, it was not possible to implement the use of reprocessed devices for this project which is a decision managed at the provincial level. AHS's Contracting, Procurement, & Supply Management (CPSM) is working with the Infection Prevention and Control (IP&C) and Evidence Decision Support Group teams to determine the safety and applicability of reprocessed single use devices in the Alberta context. The group is also assessing and comparing "greener" manufacturers of new single-use devices compared to reprocessed ones, while investigating the total carbon footprint and all other aspects of the triple bottom line such as patients' safety, clinician training and cost. For example, some of the new device suppliers have a 90%+ green manufacturing facility. Further, CPSM must also consider current contracts in place as decreasing the amount of purchased products may lead to increase in prices and impact supply. Lastly, AHS must ensure there is a system in place to track which devices have been reprocessed and how many times to ensure patient safety requirements are being met.

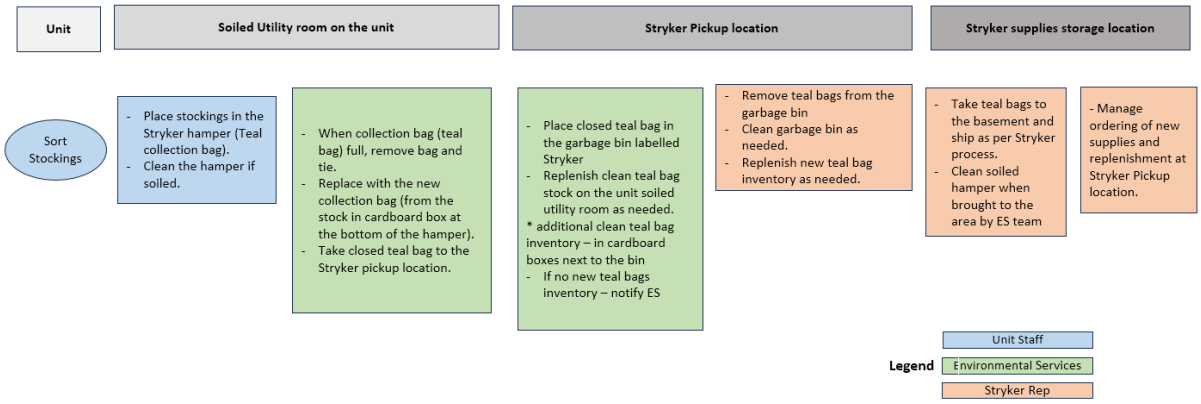
References:

1. 2024 GHG Emission Factors Hub published by US EPA available at GHG Emission Factors Hub | US EPA
2. Sustainability Solutions | Stryker
3. Lichtnegger S, Meissner M, Paolini F, Veloz A, Saunders R. Comparative Life Cycle Assessment Between Single-Use and Reprocessed IPC Sleeves. Risk Manag Healthc Policy. 2023 Dec 13;16:2715-2726. doi: 10.2147/RMHP.S439982. PMID: 38107437; PMCID: PMC10725682.
   Comparative Life Cycle Assessment Between Single-Use and Reprocessed IPC Sleeves - PMC (nih.gov)
4. Comparative Carbon Footprint of Reprocessed Single Use Medical Devices, Stryker Sustainability Solutions, May 26, 2023
   Comparative Carbon Footprint for LCA.pdf (stryker.com)
5. Fuel consumption ratings search tool (nrcan-rncan.gc.ca)

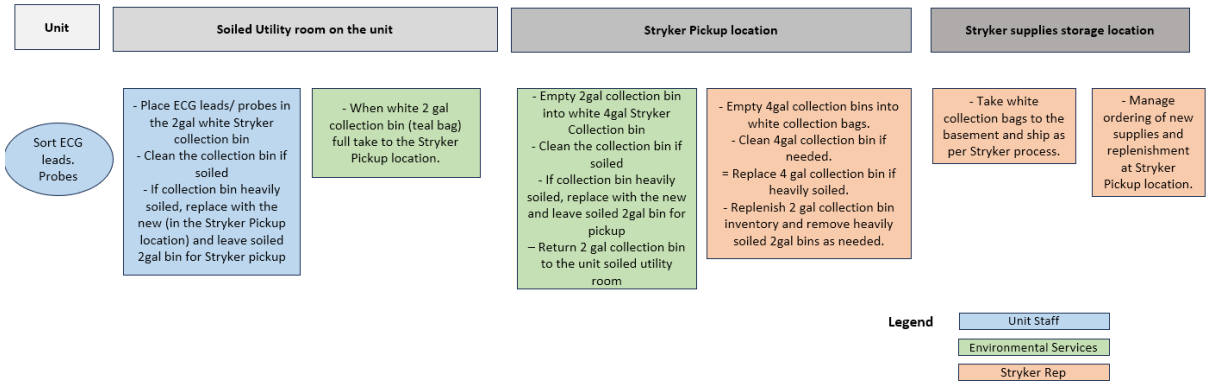
Appendices

Appendix 1: Stryker collection process maps

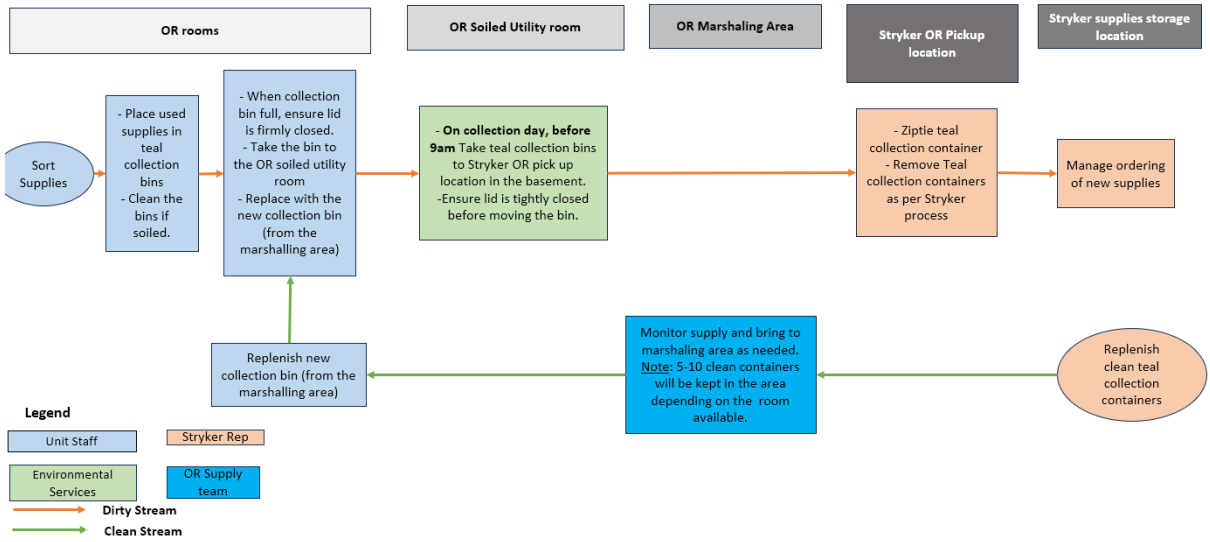
SHC Stryker Recycling program – SCD Stockings



SHC Stryker Recycling program - pulse oximeters



SHC Stryker Recycling program – OR



Appendix 2: Collection poster

stryker

Conservation starts with collections

Remember to collect

Compression sleeves

Safeguarding the planet, **together**

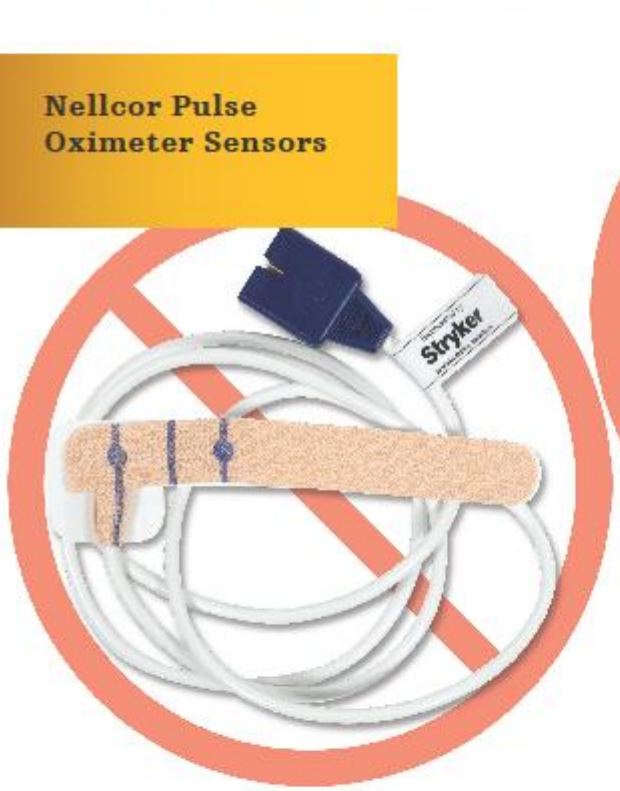
Sustainability Solutions **1 888 888 3433** **sustainability.stryker.com**

Appendix 3: Reminder poster

stryker

Do not discard

Nellcor Pulse Oximeter Sensors



Masimo Pulse Oximeter Sensors

Sustainability Solutions **1 888 888 3433** **sustainability.stryker.com**

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 X **Staff engagement** X **MDT / Cross-department communication** ☐ Skills and capability of staff ☐ Team/service agreement that there is a problem and changes are suitable to trial (Knowledge and understanding of the issue) ☐ Support from senior organisational or system leaders	☐ clear guidance / evidence / policy to support the intervention. ☐ Incentivisation of the strategy – e.g., QOF in general practice ☐ systematic and coordinated approach ☐ clear, measurable targets ☐ long-term strategy for sustaining and embedding change developed in planning phase X **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 X **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 X **'Permission' given through the organisational context, capacity and positive change culture.**