## SOCIETY OF SURGICAL ONCOLOGY
## SUSTAINABILITY TOOLKIT SERIES

# Project 2: Red Bag Waste Reduction Toolkit

A practical guide to improve appropriate sorting of biohazard OR waste

**Model intervention: reducing inappropriate red-bag use one operating room at a time, then scaling through education, workflow redesign, accountability, and measurement.**

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# Overview

Operating rooms generate both biohazard and non-biohazard solid waste. Biohazard waste is material that is contaminated with potentially infectious agents, including OR materials grossly contaminated with blood and/or other body fluids. As such, it is appropriate to dispose of biohazard waste in biohazard red bag containers.

However, when non-biohazard material is placed in red bags, it is routed into a more resource-intensive waste stream.

Mayo Clinic Jacksonville piloted a QI project for reducing inappropriate red bag waste. During a six-month baseline period, red biohazard bags were inappropriately used in 96.5% of 146 cases in one surgeon's OR when little to no biohazardous waste was generated. The project was successful in reducing the amount of red bag waste by over 70%, while protecting against the balancing risk of true biohazard waste entering clear (non-biohazard) bags.

This toolkit translates that QI experience into a stepwise implementation guide. Like the SSO cap-and-gown toolkit, it is designed to help a local champion assess the current state, assemble stakeholders, build a business case, redesign workflow, pilot the change, scale successful practices, and sustain results. Local policies, infection prevention requirements, environmental services procedures, and applicable regulations should be reviewed before implementation.

**Core principle: Do not eliminate red bags. Use them when the waste stream requires them, and avoid opening or using them automatically when they are not needed. OSHA has specific recommendations for red bag waste –**

**OSHA standard 29 CFR 1910.1030(b) explains that regulated red bag waste includes:**

**(1) liquid or semi-liquid blood or other potentially infectious materials**

**(2) contaminated items [e.g., surgical sponges] that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed**

**(3) items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling**

**(4) contaminated sharps**

**(5) pathological and microbiological wastes containing blood or other potentially infectious materials**

During our pilot project, many items were disposed of inside red bag containers, which do not meet OSHA standards. Examples of inappropriately disposed items that went into red bags (but should have been placed into regular clear bag waste containers) included:

- Non-sterile gloves (e.g., nitrile, Latex) that were used as PPE during patient positioning that had no bodily fluids whatsoever
- Plastic or paper packaging materials from opening sterile trays, instruments, and devices (e.g., suture plastic packaging, boxes that contain Ligasure or robotic graspers)
- Lightly stained surgical sponges and drapes that will not release any blood or bodily fluids because of the low volume that has been fully absorbed by these materials
- Foam pads, tape, and ECG leads that had no bodily fluid exposure.

| Assess | Engage | Implement | Sustain |
|---|---|---|---|
| Measure baseline use | Build multidisciplinary team | Pilot in 1 OR | Audit and report |
| Map bag-opening workflow | Align on waste definitions | Huddles + time-out prompt | Refresh education |
| Identify causes | Clarify roles | Make red bag conditional | Scale stepwise |

## Baseline Analysis: Current State Assessment

Start by observing what actually happens before, during, and after cases. Our referenced pilot project found that red bags were routinely opened before cases, were often easier to access, and continued to be used when teams changed during the day. A 5 Whys exercise identified lack of education and training as a key cause.

### Questions to consider:

- What proportion of cases currently use a red bag?
- In what proportion of those cases is the red bag ultimately needed for biohazard waste?
- Who opens red bags, and at what point in room setup are they opened?
- Are red bags automatically opened before every case?
- Where are red and clear bags positioned relative to the point of waste generation?
- Do surgeons, nurses, scrub technicians, trainees, and environmental/custodial staff share the same understanding of what belongs in each waste stream?
- How are new team members, shift changes, and relief staff educated?
- What local policy defines regulated/biohazardous waste?
- What is the local disposal cost for red-bag waste compared with non-biohazard waste?
- What balancing measure will detect biohazard waste incorrectly placed in clear bags?

### Suggested baseline data set

| Measure | Definition | Suggested frequency |
|---|---|---|
| Red bag opened | Yes/No for each case | Every observed case |
| Red bag was appropriate | Whether case generated waste requiring red-bag disposal under local policy | Every case with red bag |
| Inappropriate red-bag use | Red bag used when no qualifying biohazard waste was generated | Weekly/monthly rate |
| Balancing event | Qualifying biohazard waste placed in clear/non-biohazard bag | Every observed case |

| | | |
|---|---|---|
| Team/shift change | Whether new personnel entered after initial education | Optional process measure |

# Stakeholder Engagement

Red-bag reduction is a behavior and workflow change. The pilot project engaged surgeons, OR nurses, scrub technicians, environmental workers/custodians, and OR administrators. Frequent communication increased awareness, encouraged questions, and supported psychological safety around correcting waste-sorting decisions.

## Hospital internal stakeholders

- Surgeons, residents, fellows, advanced practice clinicians
- Circulating nurses and scrub technicians
- OR nursing and perioperative leadership
- Environmental services / custodial staff
- Infection Prevention & Control
- Safety, regulatory, and compliance teams
- Waste management / facilities / sustainability teams
- Supply chain and finance
- Clinical educators and quality improvement staff

## Align the message to stakeholder priorities

| Stakeholder priority | How to frame the project |
|---|---|
| Patient and staff safety | Correct waste sorting, clear local standards, balancing-measure monitoring (i.e., placement of biohazard waste incorrectly into clear, non-biohazard waste containers) |
| Workflow efficiency | Do not create unnecessary setup steps; make the correct bag easiest to use |
| Financial stewardship | Avoid routing ordinary waste through a higher-cost disposal stream, which can translate into cost savings for the hospital |
| Sustainability | Reduce unnecessary resource use associated with biohazard-waste processing |
| Quality improvement | Use baseline data, a defined aim, tested interventions, and feedback |

# Financial and Business Case Development

The business rationale is based on avoiding unnecessary biohazard-waste processing, which can cost up to 10 times more to process than non-biohazard waste. For example, at Mayo Clinic Jacksonville, routine clear bag waste disposal costs $0.024/lb and biomedical red bag waste disposal costs $0.22/lb, a differential of $0.196/lb. Local finance and waste-management data should be used for any formal savings estimate.

## Data to collect locally

- Cost per pound, container, pickup, or other contracted unit for biohazard waste.
- Cost per equivalent unit for non-biohazard waste.
- Average or measured weight/volume of red-bag waste from the target OR or service.
- Number of cases and percentage with inappropriate red-bag use.
- Any supply cost difference associated with red versus clear bags.
- Staff time or operational costs created by current waste-handling practices.

## Simple business-case formula

**Estimated avoidable disposal cost = avoidable red-bag waste volume × (biohazard disposal unit cost - non-biohazard disposal unit cost).**

Keep environmental claims separate from financial claims unless your institution has validated local data. For leadership, pair a simple cost estimate with the QI aim, safety balancing measure, and an implementation plan that requires minimal capital.

# Waste Stream Standards and Workflow Design

Before changing workflow processes, confirm your institution's current definitions and handling requirements. Lessons learned from our pilot project included examples of different waste materials staff were taught to recognize, including items visibly saturated with blood, visibly contaminated used PPE, soaked gauze or drapes, IV tubing and blood bags, containers with unfixed human tissue, and sharps. Your local policy should be the controlling standard.

> **Design target: the red bag should be available when needed, but not opened by default for every case.**

## Some suggested workflow changes

1. Morning huddle: remind the team not to open red bags automatically.
2. Case-by-case decision: include red-bag need in the surgical time-out or another reliable pre-case checkpoint.
3. Point-of-care education: post a sustainability reminder about proper red-bag use.
4. Accountability: address lapses promptly and include physician champions in the same expectations.
5. Re-education: orient new and relief team members, especially when teams change during the day.
6. Positive reinforcement: recognize the team for correct segregation and sustained improvement.

Implementation

The pilot deliberately started with a single surgeon's OR. This small-scale approach made it possible to test communication, observe balancing events, and refine the workflow before considering broader spread.

## Pilot

- Choose one engaged surgeon, OR, or procedure group.
- Collect a baseline period long enough to establish current practice.
- Define the aim and balancing measure before launch.
- Brief environmental/custodial staff before room setup so red bags are not automatically opened.
- At the start of each case, state whether a red bag is expected to be needed based on the procedure and local waste criteria.
- Keep a red bag readily available so it can be opened promptly if the case generates qualifying waste.
- Use a huddle and/or time-out prompt to reinforce the decision.
- Audit every pilot case initially and correct unsafe sorting immediately.
- Celebrate correct practice and discuss misses without delay.

## Example aim statement

> **Decrease inappropriate red-bag use by at least 50% from baseline by [DATE], without increasing the number of cases in which qualifying biohazard waste is placed in clear/non-biohazard bags.**

## Full-Scale Roll-out

After a stable pilot, expand stepwise rather than enterprise-wide all at once. A potentially successful progression could start with surgeons who perform a particular procedure (e.g., breast lumpectomy and mastectomy), then proceed to a Division (e.g., Surgical Oncology), then to the Department of Surgery, the broader surgical practice (e.g., House of Surgery), the enterprise at large, and ultimately other hospitals. At each stage, repeat baseline assessment, stakeholder education, workflow adaptation, and balancing-measure review.

# Measurement, Reporting, and Sustainability

Evaluation should begin with implementation. In the pilot experience, inappropriate red-bag use improved from 96.5% at baseline to 17.5% over six months after intervention. Three balancing events occurred in which biohazard waste entered non-biohazard bags; these were detected and corrected, and the project attributed them to a communication misunderstanding.

## Recommended measures

| Type | Measure | Numerator / denominator | Goal |
|---|---|---|---|
| Outcome | Inappropriate red-bag use | Cases with unnecessary red-bag use / eligible observed cases | Decrease |
| Balancing | Biohazard waste in clear bag | Cases with qualifying waste incorrectly placed in clear bag / observed cases | Zero or near-zero; investigate every event |
| Process | Red bag opened by default | Cases where red bag is opened before need is assessed / observed cases | Decrease |
| Process | Pre-case discussion completed | Cases with huddle/time-out waste discussion / observed cases | Increase |
| Financial | Avoided disposal cost | Locally calculated | Increase |

## Reporting cadence

- Give frontline teams rapid feedback during the pilot.
- Share monthly run-chart or rate data with OR leadership and the pilot service.
- Review every balancing event for cause and corrective action.
- Report financial estimates only with locally validated disposal data.
- Refresh education when new staff, shift changes, or drift in practice are identified.

# Let's Go! - Ready-to-Use Tools

## 1. Pre-case huddle script

> **"For this case, do we expect waste that requires red-bag disposal under our local policy? If not, please leave the red bag unopened but available. If qualifying waste is generated, we will open and use it."**

## 2. Time-out prompt

> **Waste stream check: Red bag needed now? YES / NO / REASSESS IF CASE CHANGES**

## 3. Quick audit form

| Field | Entry |
|---|---|
| Date / OR / service | |
| Procedure category | |
| Red bag opened? Y/N | |
| Qualifying biohazard waste generated? Y/N | |
| Was red-bag use appropriate? Y/N | |
| Any biohazard waste placed in clear bag? Y/N | |
| Huddle/time-out prompt completed? Y/N | |
| Team change during case? Y/N | |
| Comments / corrective action | |

## 4. Education checklist

- Review local definition of biohazard/regulated medical waste.
- Show examples of what belongs in red versus clear waste under local policy.
- Explain why automatic red-bag opening creates unnecessary waste processing.
- Teach the new setup workflow and who makes/revisits the decision.
- Emphasize that safety takes priority: open a red bag whenever qualifying waste is generated.
- Explain the balancing measure and how to report a sorting error.
- Include environmental/custodial staff and relief/new team members.

# Project Summary

## Key lessons for replication

- Automatic room setup can hard-wire unnecessary red-bag use.
- Education must include the entire perioperative team, not only clinicians.
- Shift changes and new team members are predictable points of failure.
- A simple, repeated communication cue can change behavior without new funding.
- Balancing-measure surveillance is essential because overcorrection can create improper disposal in the opposite direction.
- Scaling should be deliberate and supported by visible local champions.