PROJECT CHARTER

Reusable Laryngeal Mask Airways (LMAs)

Developed in collaboration with the Ontario's Anesthesiologists Environmental Sustainability Working Group, including: Dr. Amanda Jasudavisius, Dr. Anita Rao, Dr. Connor Brenna, Dr. David Ohrling, Dr. Elaine Ng, Dr. Martin Van Der Vyver, Dr. Melissa Ho, Mike Apostol, Dr. Syed Ali Akbar Abbass

Team members: : Anesthesiologists, MDRD staff, Operating Room educators, perioperative nurses, Operating Room attendants, Procurement staff, Infection Prevention and Control (IPAC)

Executive Sponsor:

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Please contact CASCADES@utoronto.ca if you have any questions.

NAVIGATION

Goal & Scope

1 What do you want to achieve?

Transition from single-use laryngeal mask airways (LMAs) to reusable LMAs in order to reduce environmental impacts, costs and potential supply chain interruptions.

2 Define the limits of what you want to be included in the project and consider the environmental impacts you are targeting for change.

Project Scope: Replace single-use LMAs within the organization with reusable LMAs, prioritizing operating rooms (OR).

Emission scope: Scope 3; these emissions arise from activities or products that are related to health sector activities, but not owned or controlled by the organization, such as pharmaceuticals and other medical products and devices

Problem/Opportunity Statement

3 Briefly state the problem you want to solve or the opportunity you want to realize.

LMAs are used to facilitate airway management during general anesthesia. These essential, commonly used medical devices are a source of operating room waste. Reusable LMAs can be reprocessed and reused multiple times, thereby reducing the negative environmental impacts as compared to single-use LMAs.

There is growing consensus on the environmental benefits of reusable LMAs. A life cycle assessment (LCA) found that a reusable LMA, which is commonly recommended for 40 use cycles, produces 7.4 kg CO_2e, while the equivalent 40 single-use LMAs produce 11.3 kg CO_2e (1), and a Swedish study found disposable LMAs had higher impacts across all three major environmental impact categories: human health, ecosystems, and resources. (2) The environmental impacts associated with the reusable LMA stem from washing and sterilization, but these are outweighed by the environmental impacts associated with the single-use LMAs, which derive from the production of polymers, packaging, and waste management. Moreover, the LCA cited above considered the autoclaving of a single reusable LMA; sterilizing multiple LMAs at once would result in further environmental savings (1), as would optimizing the washing and sterilization process itself (3).

In addition to the environmental savings associated with a switch from single-use to reusable LMAs, the latter can also make hospitals less vulnerable to supply chain shortages. (3) Moreover, although there is an initial cost outlay, this investment will be recouped as the per unit cost of resusable LMAs is smaller than that of single-use LMAs. Cost savings can be maximized by ensuring that reusable LMAs are used to the full extent of their functional life span. (1,4)

Current State of the System/Process

4 What do things look like today?

Disposable LMAs

- Contract established between buying group and vendor(s) for purchasing of disposable LMAs
- Manager of OR inventory and delegates determine the number of disposable LMAs required, then liaise with hospital procurement to place order
- Single-use LMAs arrive at an institution wrapped in plastic peel packs and used for one case
- LMAs are disposed of in the general waste stream (not sharps or biohazard) at the end of the case
- Waste bins in OR are removed by custodial staff for disposal by waste haulers, who send them to landfill

Reusable LMAs

- Contract established between buying group and vendor(s) for purchasing of reusable LMAs
- Manager of OR inventory and delegates determine the number of reusable LMAs required, then liaise with hospital procurement to place order
- LMA is used during the surgical procedure
- Used LMA is sent to Medical Device Reprocessing Departament (MDRD) for reprocessing
- MDRD tracks the number of times a LMA is used (generally via serial number, code, or RFID); Most reusable LMAs can be reprocessed and used 40 times before disposal according to manufacturers (1)
- After reprocessing, the LMA is returned to the OR inventory for use
- After its final predetermined use, or if the LMA is no longer fit for use, it is disposed of in the garbage and sent to the landfill

Root Cause Analysis

5 What gets in your way?

Education & Awareness
- Infection prevention and control concerns exist from the misbelief that disposable LMAs provide higher quality and sterility assurance

Clinical Workflow
- Staff mistakenly dispose of reusable LMAs they believe to be single-use because:
  - Where there is a mix of single-use and reusable LMAs, the items look similar (the difference is sometimes only color)
  - Single-use LMAs are more prevalent; new staff or trainees may not have been informed that the LMAs on hand are reusable
- There are concerns about limited MDRD capacity
  - Without a robust process, reusable LMAs may not be put back into clinical rotation in a timely fashion

Finances & Procurement
- Contracts may be with vendors who do not have reusable LMAs
- Vendor representatives often promote single-use products
- The upfront cost of reusable LMAs is higher than single-use LMAs

Design the Improvement & Define Change Ideas

6 What are your ideas to achieve your goals, address your root causes and close the gap from your problem statement?

Education & Awareness

- Create an educational campaign and materials with data supporting the safe use of reusable LMAs, ensuring that avoiding inadvertent disposal is prioritized. **(Resources: Reusable LMAs: Background and presentation (Ontario's Anesthesiologists Environmental Sustainability Working Group); CASCADES presentation: Melissa Ho)**
- Identify champions to promote the change to reusable LMAs, and to seek buy–in from the anesthesia department and staff

Clinical Workflow

- Create processes to prevent the incorrect disposal of reusable LMAs, such as:
  - adding reusable LMAs to the Surgical Safety Checklist or Sustainability Momement (until a habit is formed where they are not incorrectly disposed of)
  - implementing a self–monitoring system to ensure LMAs are not being incorrectly disposed of (using counts or waste audits)
  - Consider eliminating all LMA disposal in the OR such that MDRD determines post0use pathway
- If needed, transition using a hybrid model during a short training period (i.e., 3 months) to ensure LMAs are available

Design the Improvement & Define Change Ideas

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Infrastructure

- Establish standardized pathway in collaboration with MDRD to ensure successful transportation, reprocessing, and instrument tracking **(Resource: LMA processing and documentation pathway)**
- Audit inventory and operating procedures on a regular basis to ensure that devices are reused to the greatest possible extent (1)
- Have a dedicated receptacle for reusable LMAs post use

Finances & Procurement

- Purchase reusable LMAs instead of disposable LMAs, ensuring adequate inventory to meet clinical needs
  - New contracts may not be needed: check with existing vendors to see if they also sell reusable LMAs
- Create a business case to show the cost savings of purchasing reusable LMAs compared to disposable.
  - *Note: In one US study, the cost per use of a $200 reusable LMA was cited as $8 (including $5 per use and $3 per cleaning, including labour). The unit cost of a single-use LMA was cited at $9.60 – a 20% increase over the cost of the reusable. The authors note that if the reusable LMA is able to be used 80 times, its unit cost would decrease to $5.50, further enhancing the savings. (1).*
  - *Note:* Toronto-area hospital figures for a business case estimates a disposable LMA costs $7.83 and a reusable LMA costs $350. Reusable LMA manufacturers suggests 40 uses but studies show no decrease in performance or material integrity after 100 uses (4). Assuming sterilization is $2.50 per LMA, each reusable LMA has an estimated cost between $6.00 and $11.25 per use.
- Consider switching other devices to reusables as well to reduce per-unit processing expenses

Measure & Test Impact

7 How will you estimate the environmental impact of your changes?

Activity/Outcome Metric

1A. # of single use LMAs disposed of per month
1B. # of reusable LMAs disposed of per month

Source(s):
- Procurement data
- MDRD
- Self–audit

Considerations:
- Monthly counts are recommended to observe progress, but data can be processed for any given time frame.

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Related Environmental Metric

2A. 0.28 kg CO2e (kg CO2e for 1 disposable LMA)
2B. 7.4 kg CO2e (kg CO2e for 1 reusable LMA)

Source(s):
- Eckleman, et al. 2012. Comparative Life Cycle Assessment of Disposable and Reusable Laryngeal Mask Airways (1)

Considerations:
- While *individual* single use LMAs have a much smaller footprint than reusable LMAs, this is not a one–to–one comparison, as each reusable LMAs can generally be used a minimum of 40 times. The "functional unit" would therefore be 40 uses. 40 disposable LMAs have a carbon footprint of 11.3 kg CO2e (0.28 kg CO2e*40), which is larger than the footprint of a reusable LMA.
- This data comes from an academic health facility (Yale New Haven Hospital) in Connecticut USA. It may have limited applicability in the Canadian context.

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Environmental impact

Considerations:
- Tally the kg CO2e for both types of LMAs (1A*2A)+(1B*2B)
- There should be a REDUCTION in this number over time if you are increasing the proportion of reusable LMAs, and using them a minimum of 40 times.
- Reusable LMAs can often be used more than 40 times, increasing their environmental benefits (1)
- Use the Natural Resources Canada Greenhouse Gas Equivalencies Calculator to translate your results to stakeholders.
- **Calculations will yield ESTIMATES only**

Embed & Spread

8 What steps have been taken to ensure lasting change? How could it be spread to other contexts?

Micro (What can you do?)
- Familiarize yourself with the benefits of reusable LMAs and support co-workers in their efforts to utilize this resource appropriately
- Document your learnings to share with others (e.g., process steps that could be improved, what you learned from your failures, how you course correct, etc.).

Meso (What can you do within your organization?)
- Build training for handling reusable LMAS into anesthesiologist and nursing orientation for all new hires, residents, fellows, and staff.
- Create an organization wide policy to ensure all new supplies purchased for the hospital meet specific environmental sustainability standards.
- Reinvest any funds saved into other sustainability initiatives.

Macro (What can your organization do?)
- Advocate that suppliers to make it easier to acquire reusable LMAs, including for children.
- Consider liaising with other hospitals to form coalitions with combined contracts; include environmental sustainability as a consideration in group procurement contracts.

References

(1) Eckelman M, Mosher M, Gonzalez A, Sherman J. Comparative Life Cycle Assessment of Disposable and Reusable Laryngeal Mask Airways. Anesthesia & Analgesia. 2012 May; 114(5):1067–72.

(2) Liang G. Life Cycle Assessment of Disposable and Reusable Laryngeal Mask Airway in Skånevård Sund. Lund University. 2019. https://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8986326&fileOId=8989501

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(4) Goodman EJ, Christenson E, Douglas AM, Ziegler EJ, Lewis BR. Reusable Laryngeal Mask Airways can be used more than 40 times. J Clin Anesth. 2008 Mar;20(2):109–15.