Climate, Health & Sustainable Care

Inaugural Symposium

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COLLABORATIVE CENTRE FOR Climate, Health + Sustainable Care

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Quality Improvement to Reduce the Environmental Impact of Health Care: *Exploring Clinician-Led Efforts in Ontario*

Thomas Bodley, Christine McDonald, Melissa Ho, Sarah Bunston

Moderator: Brian Wong

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Climate, Health & Sustainable Care

Inaugural Symposium

Using QI to Drive Sustainability

Climate, Health and Sustainable Care Symposium 2024

Thomas Bodley, MD MSc FRCPC

Adult Critical Care and General Internal Medicine

Medical Quality Lead Critical Care, Scarborough Health Network

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UNIVERSITY OF TORONTO | Interdepartmental Division of Critical Care Medicine

SHN SCARBOROUGH HEALTH NETWORK

Disclosure

Co-director of the Using Labs Wisely program at Choosing Wisely Canada

Objectives

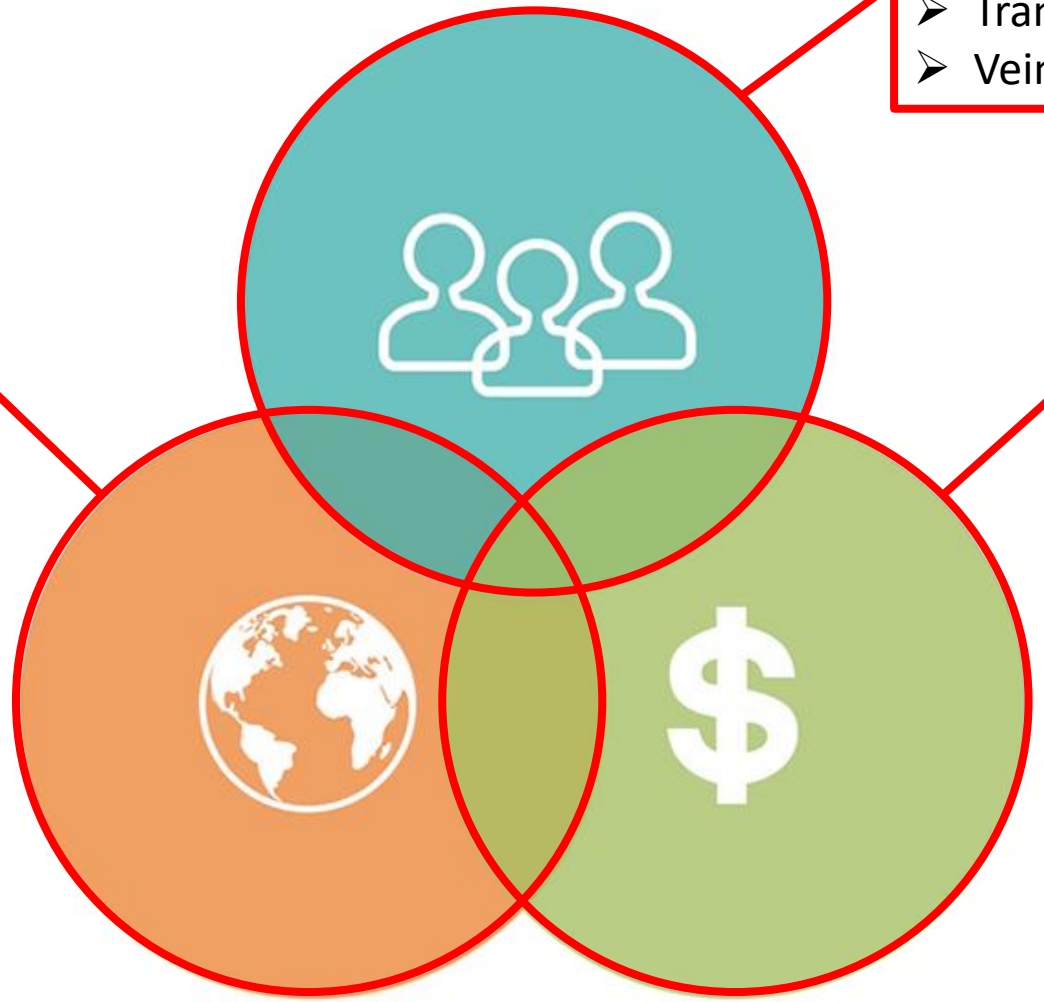
1. Introduce the *Triple Bottom Line* of unnecessary blood testing
2. Directly link *QI and Planetary Health* using a *Case Example*

Unnecessary Blood Testing

1. Avoid Harm To Patients
- Anemia
- Transfusion
- Vein Puncture

2. Lab Cost Savings
- Equipment
- Lab Processing
- Blood Bank

3. Reduce Environmental Waste
- Plastic Waste
- Carbon Emissions



ST. MICHAEL'S
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PLOS ONE

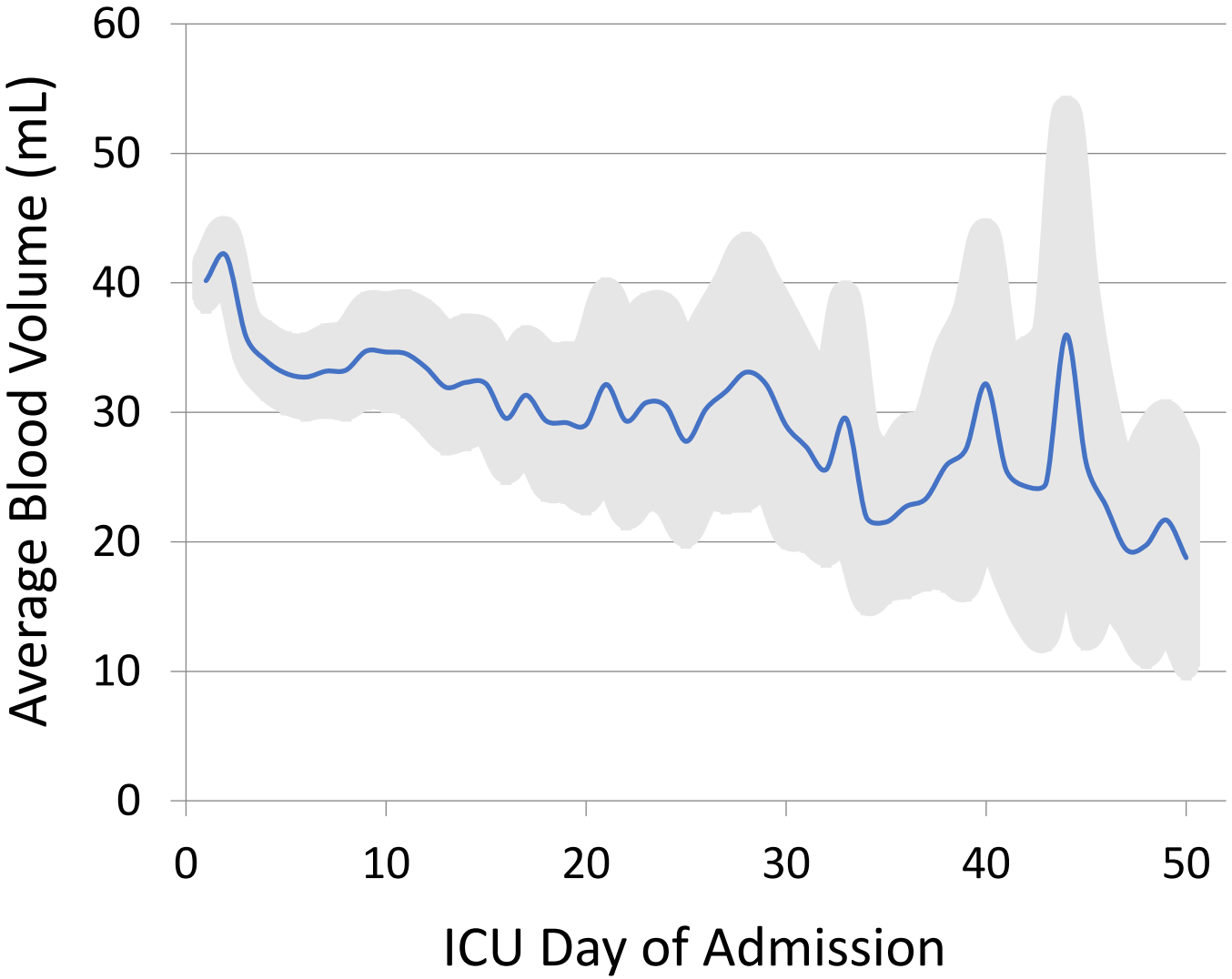
OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Patient harm associated with serial phlebotomy and blood waste in the intensive care unit: A retrospective cohort study

Thomas Bodley, Maverick Chan, Olga Levi, Lauren Clarfield, Drake Yip, Orla Smith, Jan O. Friedrich, Lisa K. Hicks

Published: January 13, 2021 • https://doi.org/10.1371/journal.pone.0243782



Logistic Regression Model

	Nadir Hb < 80 g/L	RBC Transfusion
	OR (95% CI)	OR (95% CI)
Avg Daily Phleb, mL	**1.03 (1.01 – 1.06)**	**1.03 (1.01 – 1.05)**
Age, yr	1.01	1.02
Sex (male)	0.71	1.05
Admit Hb, g/L	0.91	0.93
Admit SOFA	1.17	1.16
ICU LOS, d	1.21	1.03

Bodley et al. 2021

QUALITY IMPROVEMENT REPORT

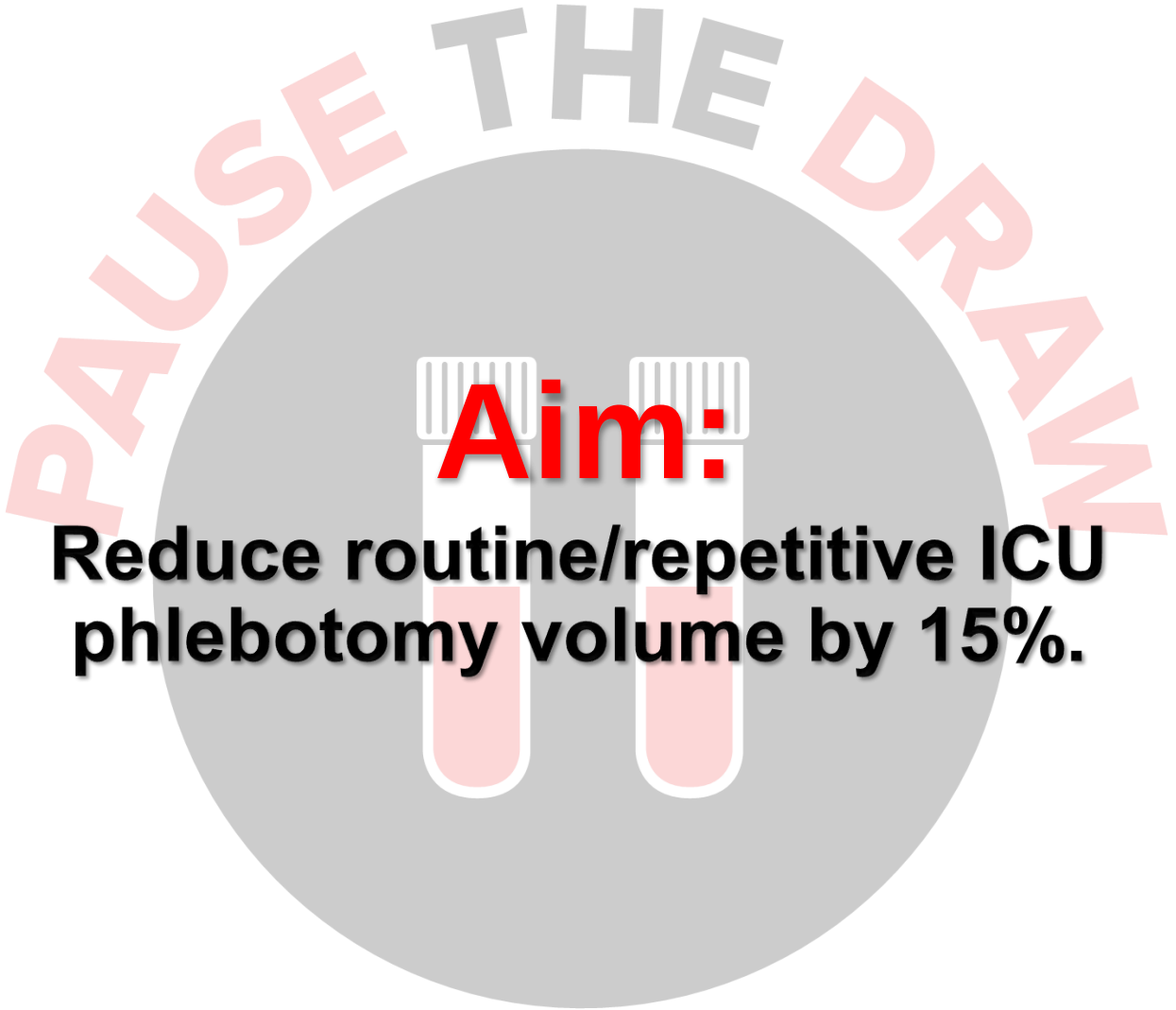
Reducing unnecessary diagnostic phlebotomy in intensive care: a prospective quality improvement intervention

Thomas Bodley ,[1,2] Olga Levi,[3,4] Maverick Chan,[3,5] Jan O Friedrich,[6,7] Lisa K Hicks[1,3,5]

BMJ

Bodley T, *et al*. *BMJ Qual Saf* 2023;**0**:1–10. doi:10.1136/bmjqs-2022-015358

The Health Foundation



Aim:

Reduce routine/repetitive ICU phlebotomy volume by 15%.

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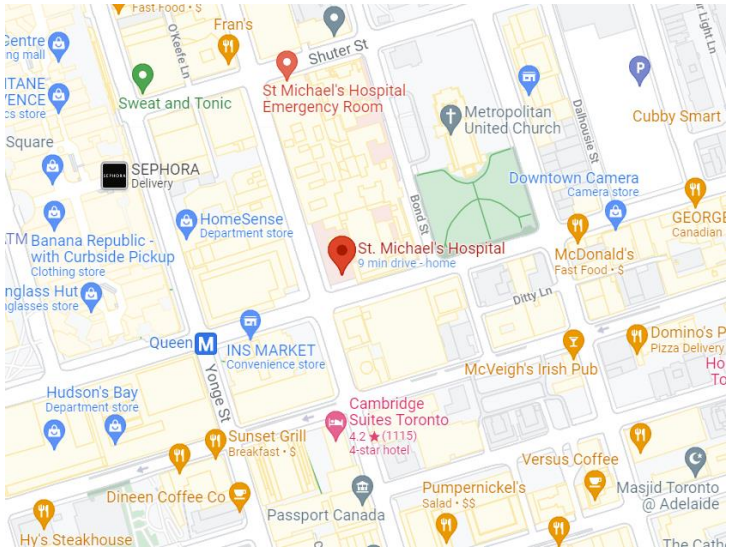
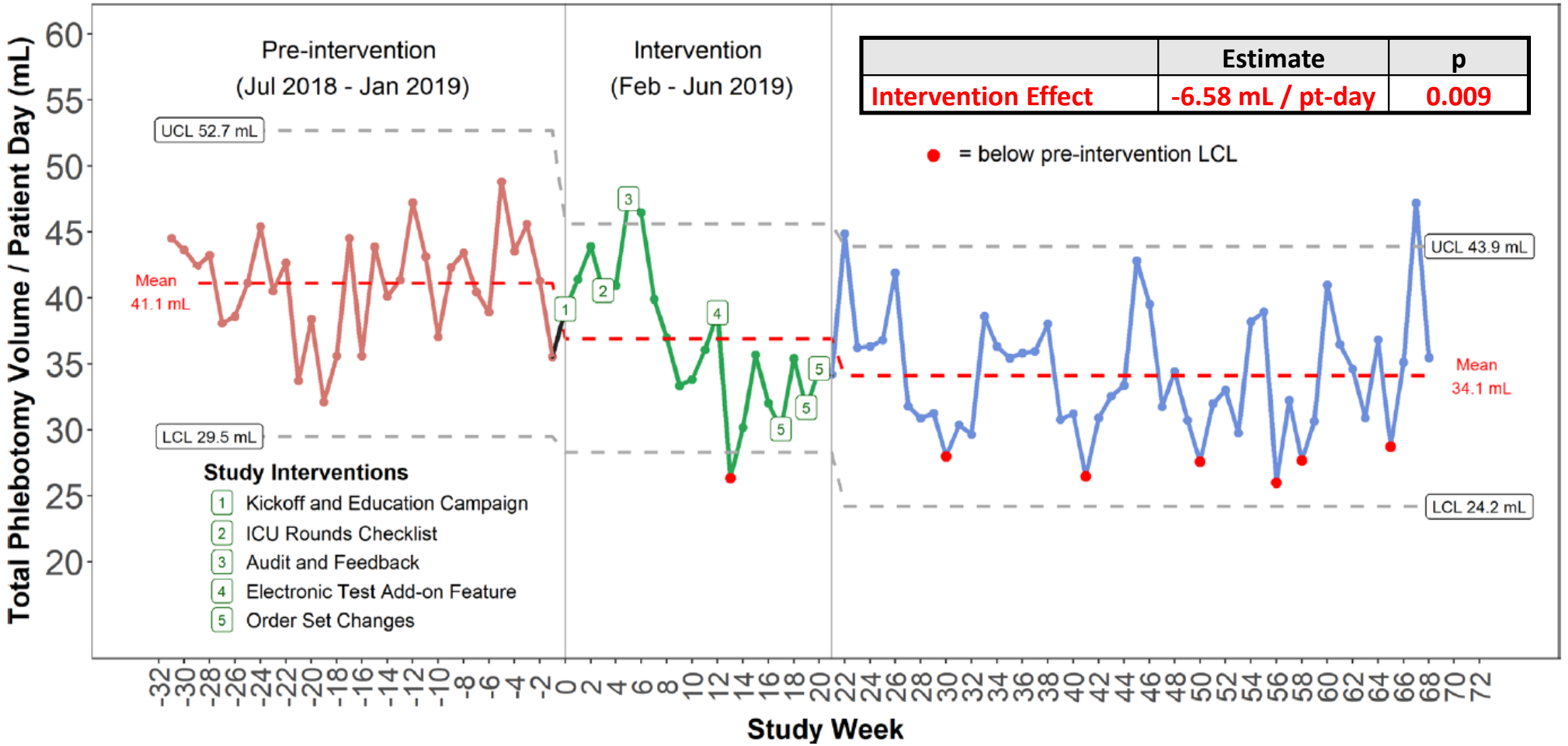
St. Michael's Hospital

- Toronto, Ontario
- 460 bed (30 bed MSICU)
- University affiliated
- Inner city



Phlebotomy Volume



Bodley 2023 - https://pubmed.ncbi.nlm.nih.gov/36657786/

	Standardized ratio
Tubes by Type	**Post/Pre (95% CI)**
Blood Culture	1.03 (0.92 – 1.15)
Urine Chemistry	1.00 (0.86 – 1.17)
Red (Tox/Drug Lvl)	0.90 (0.79 – 1.01)
Venous Blood Gas	1.09 (0.97 – 1.20)
Pink (G&S)	0.89 (0.79 – 1.00)
Gold (Chemistry)	0.84 (0.81 – 0.87)
Calcium-Ionized	0.84 (0.76 – 0.92)
Lavender (Hematology)	0.78 (0.75 – 0.80)
Arterial Blood Gas	0.76 (0.72 – 0.80)
Blue (Coagulation)	0.55 (0.52 – 0.57)

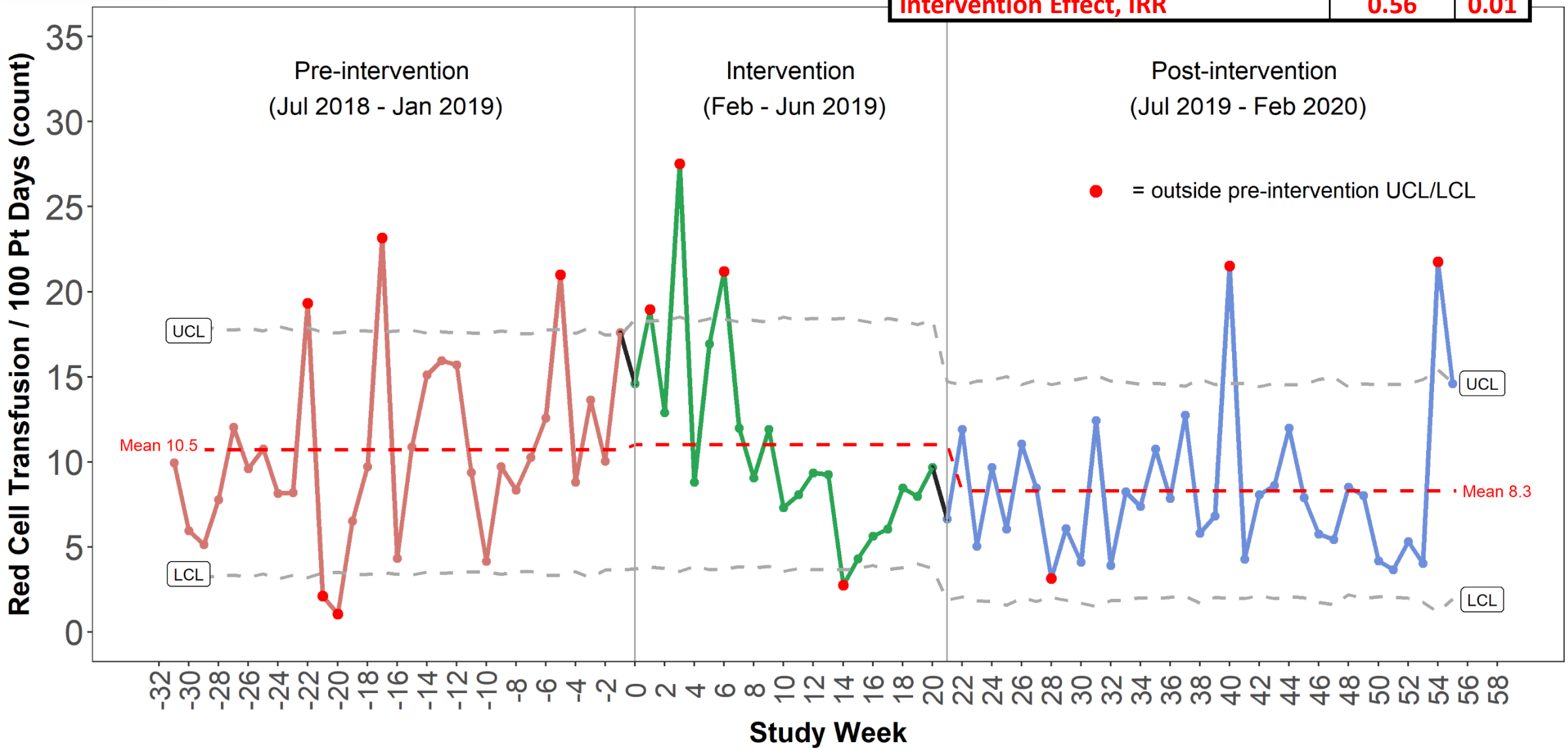
Least Reduced

Most Reduced

Triple Bottom Line

Red cell transfusion

Phlebotomy ITS (AR1)	Estimate	p
Intervention Effect, IRR	0.56	0.01

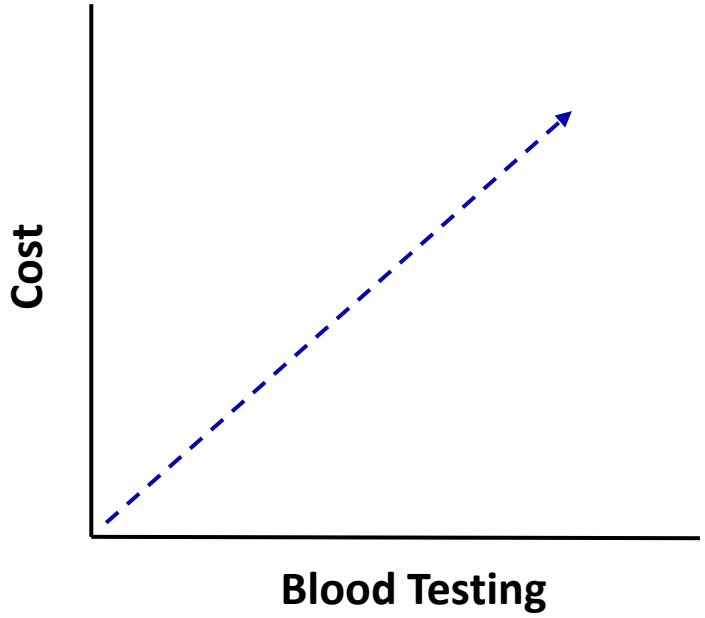


Triple Bottom Line

Costing Lab Tests

Material-related Costs

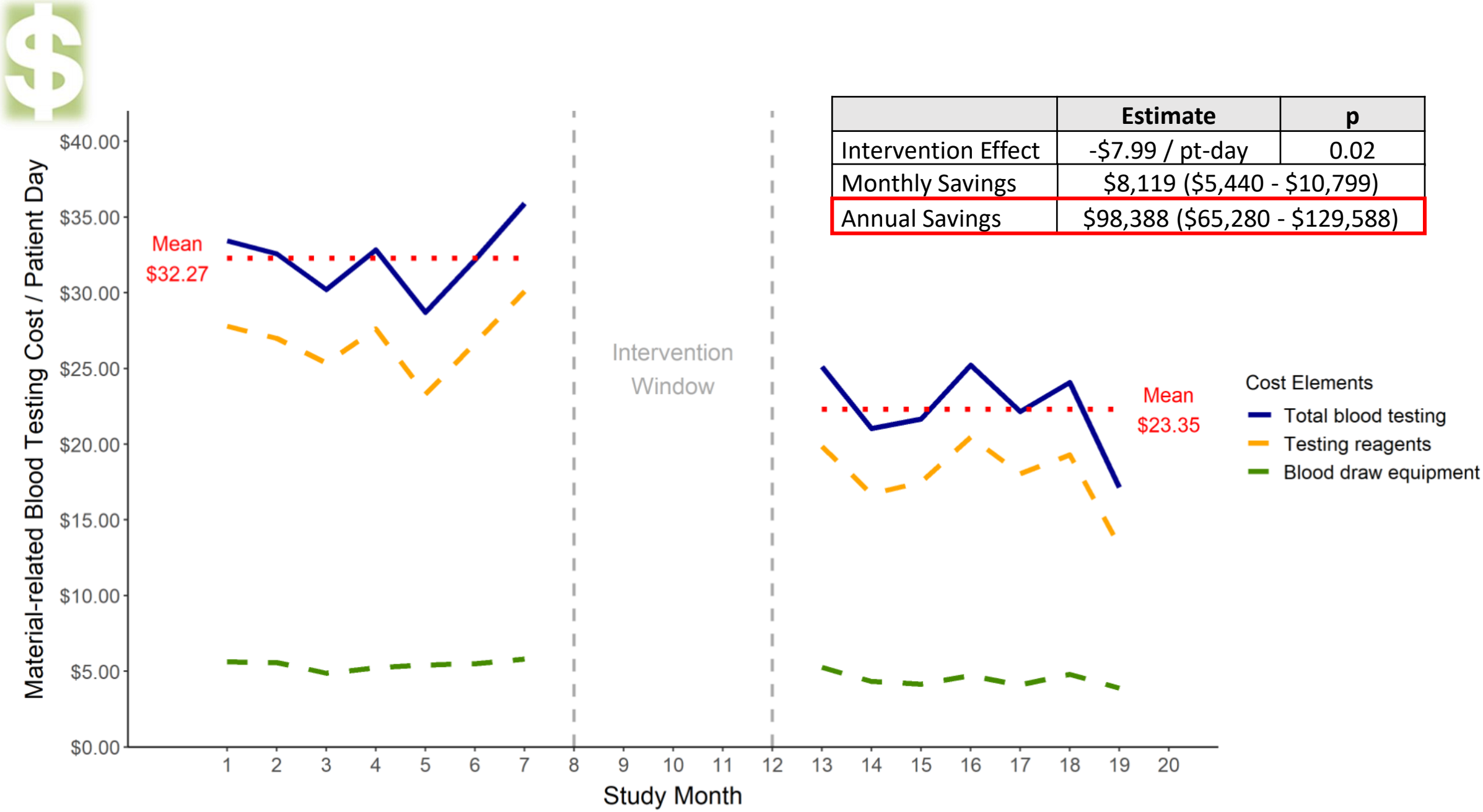
1. Blood testing reagents
2. Phlebotomy and laboratory disposable equipment
   - Sterile syringe (waste sample)
   - Vacutainer adapter
   - Blood sample tubes



Costing Lab Tests

Fixed Costs (somewhat)

1. Lab infrastructure investments
2. Phlebotomy and Laboratory Labour
3. Electrical and other utilities
4. EMR maintenance and result reporting



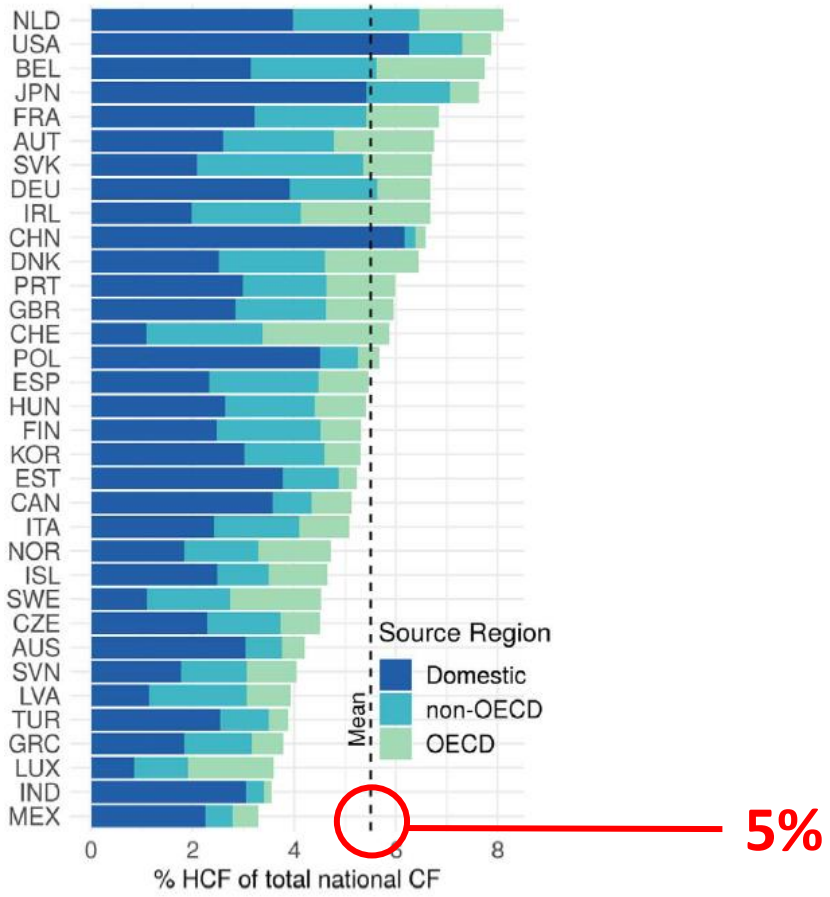
	Estimate	p
Intervention Effect	-$7.99 / pt-day	0.02
Monthly Savings	$8,119 ($5,440 - $10,799)	
Annual Savings	$98,388 ($65,280 - $129,588)	

Triple Bottom Line

Environmental Impact

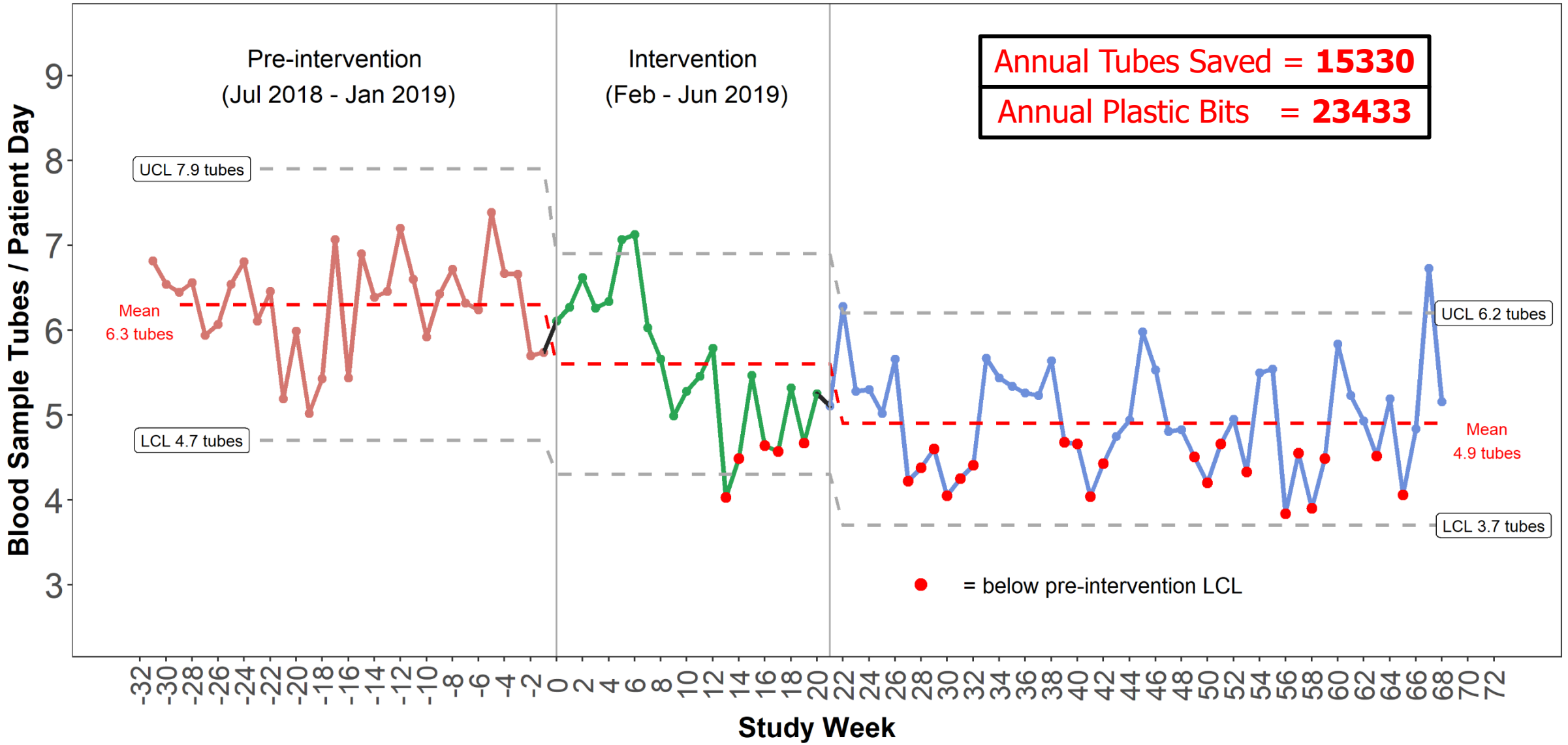
1) Material Waste

2) Carbon Emissions



Plitcher 2019

Material Waste – Tubes and Plastic Bits



23433 Plastic Bits?

One Day:

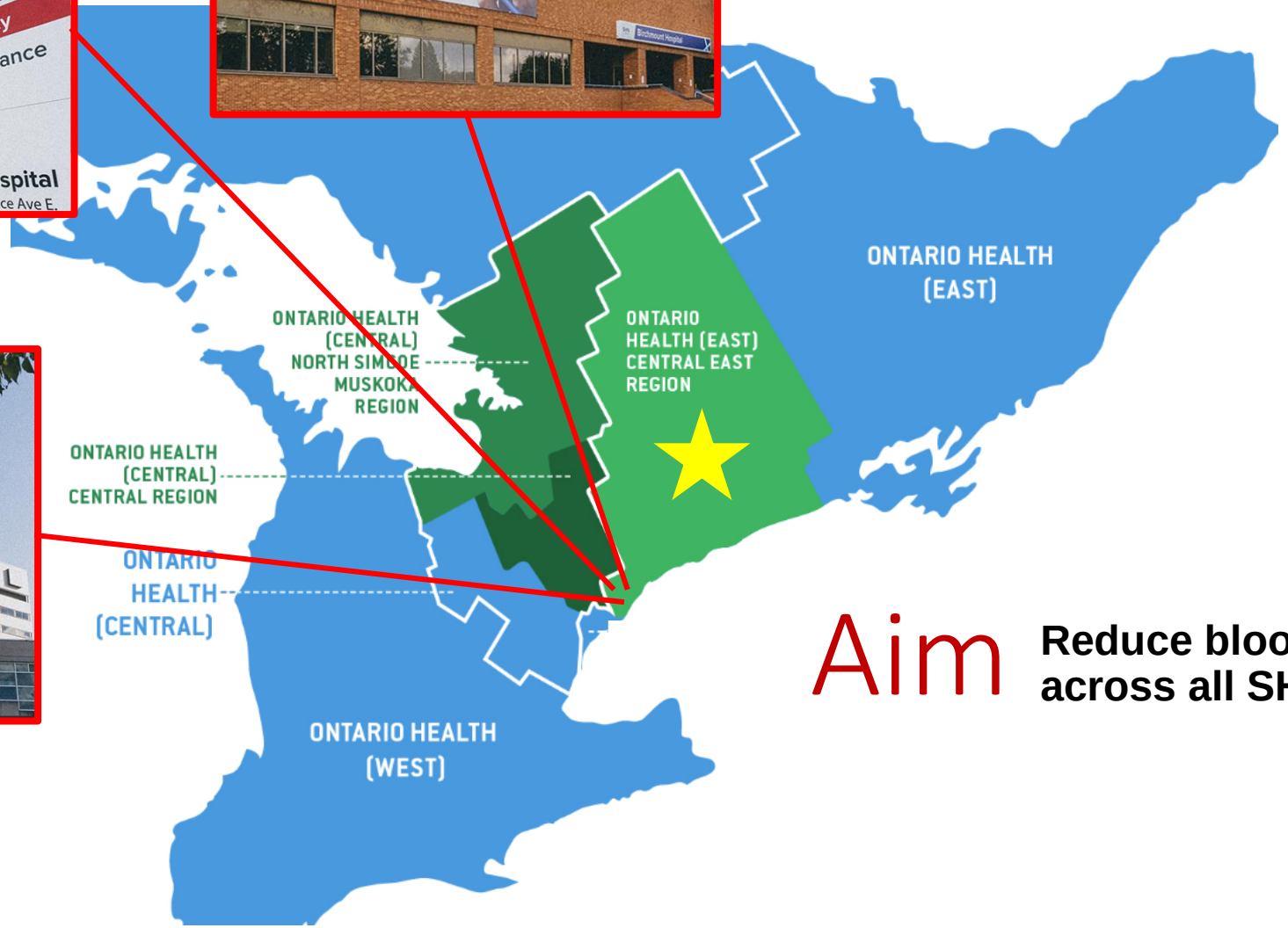
- 180 Tubes
- 90 Waste Syringes
- 90 Phlebotomy Adapters
- +/- some vein puncture equipment

19% Reduction in Testing →

Carbon Footprint

Annual gCO2e Reduced = **2,547,736**

Spoyalo et al. 2023



SHN
SCARBOROUGH HEALTH NETWORK

Aim

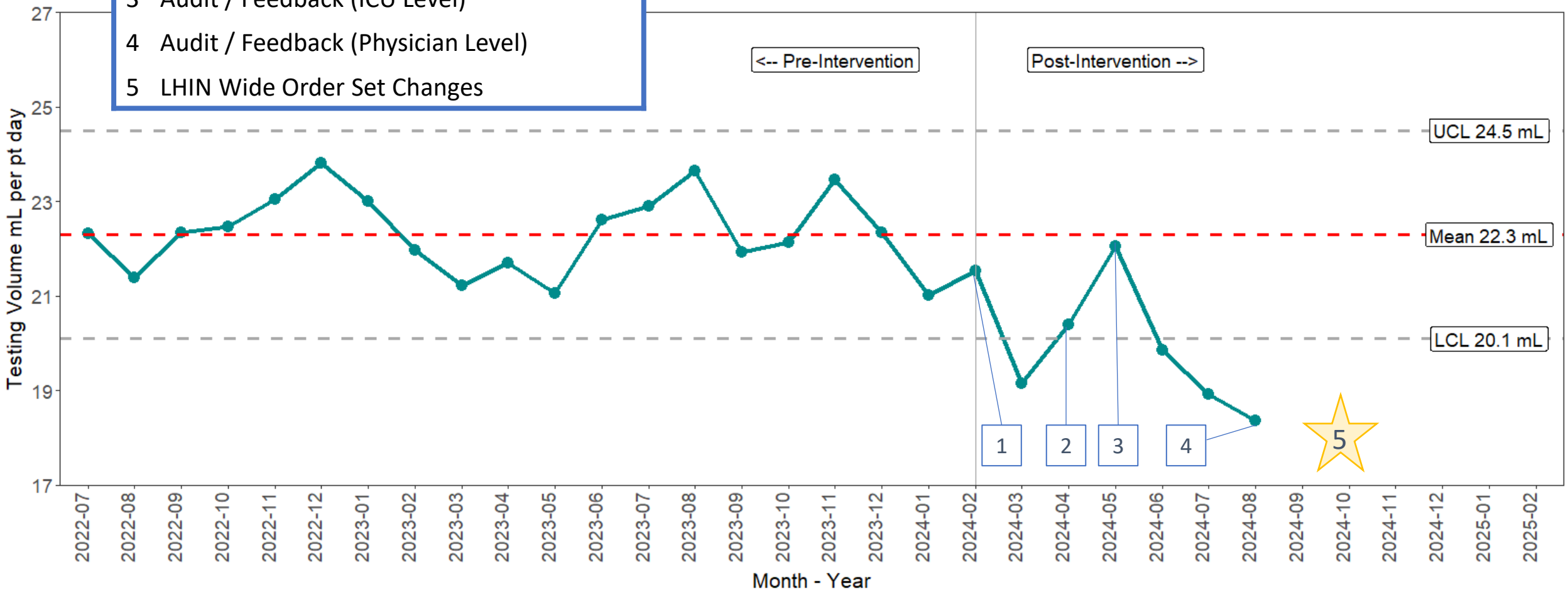
Reduce blood testing by 15% across all SHN ICUs by Oct 2024

4.0 Project Deliverables

Objectives	Deliverables	Performance Measures (if applicable)
1: Quantify baseline ICU blood testing volume at SHN in mL of blood per patient-day and assess the impact of the hospital site and critical care physician on variation in total routine testing volumes.	Statistical Process Control (SPC) chart for baseline blood testing level (mL blood per patient-day) stratified by ICU (SHN-G, SHN-B, SHN-C).	Primary Outcome: 1. mL of blood per patient-day
2: Develop and implement a series of change strategies to reduce unnecessary blood testing volume (mL per patient-day) by 20% by October 31, 2024.	Multimodal continuous QI intervention using staged PDSA cycles to implement blood testing reduction strategies identified during project development. Strategy categories include 1) education and awareness, 2) audit and feedback, 3) electronic order set modification.	Primary Outcome: 1. mL of blood per patient-day Secondary Outcomes: 2. unique blood draws per patient-day 3. blood tubes per patient-day 4. red cell transfusions per 100 patient-days 5. incidence of ICU acquired anemia (new nadir Hb < 80 g/L) per ICU admission 6. estimate of carbon footprint for ICU lab testing and plastic waste volume using previously published methods Balancing Measures: 6. STAT:Routine test ratio 7. Add-on tests 8. ?Others
3: Identify any patient-safety events related to the blood testing reduction program and obtain clinician perspectives on the blood testing program.	SPC chart demonstrating the rate of patient-safety events related to blood testing in the ICU per 100 patient-days. Formal and informal clinician feedback regarding the blood testing program	9. Patient-safety events related to blood testing in the ICU per 100 patient-days

SHN ICU "Pause the Draw"

1 Education / Awareness
2 User Smart-set Order Sets
3 Audit / Feedback (ICU Level)
4 Audit / Feedback (Physician Level)
5 LHIN Wide Order Set Changes




SHN
Deepa & Narinder Lal
← Emergency
← Main Entrance
General Hospital
3030, 3050 Lawrence Ave E.
Love, Scarborough
Donate at LoveScarborough.ca
SHN
PRHC
ONTARIO HEALTH (EAST)
ONTARIO HEALTH (CENTRAL) NORTH SIMCOE MUSKOKA REGION
ONTARIO HEALTH (EAST) CENTRAL EAST REGION
ONTARIO HEALTH (CENTRAL) CENTRAL REGION
ONTARIO HEALTH (CENTRAL)
ONTARIO HE (WEST
Centenary Hospital
Lakeridge Health
NORTHUMBERLAND HILLS HOSPITAL
Lakeridge Health
1 Hospital Court
Ambulance Entrance

Future Directions for QI and Sustainability

Expanding De-implementation Scope:

- Other Choosing Wisely targets
- CW sustainability recommendations

Build Sustainability into Analysis Plan:

- Pre-specify the outcome measures
- Partner with experts in LCA / MFA

Achieve Scale:

- 1 Site SMH → 3 Site SHN → 9 Sites CE LHIN
- Moving beyond the ICU

Thank You!

Email: tbodley@shn.ca

SHN Project Team

Praby Singh, MD MSc

Susan John, MD

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Martin Betts, MD MBA

UofT Mentors

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Lisa Hicks, MD MSc

SMH Project Team

Olga Levi, RN MSc

Maverick Chan

Orla Smith, RN PhD

SHN Laboratory and EA Team

Petra Sheldrake

Wol Chung

+ SMH ICU Leadership and Clinical Team

+ SHN ICU Leadership and Clinical Team

+ CQUIPS Program

Chest Procedures & Planetary Health

Dr. Christine McDonald, MD MSc FRCPC

Interventional Pulmonology & General Respirology

Clinician in Quality and Innovation

Sunnybrook Health Sciences Centre

Medicine
UNIVERSITY OF TORONTO

Sunnybrook
HEALTH SCIENCES CENTRE

RESPIROLOGY
50
YEARS OF EXCELLENCE

Disclosures

- I have no conflict of interest

Background

Sunnybrook/Odette Cancer Centre Effusion Procedure Interprofessional Clinic (EPIC) is the largest ambulatory malignant effusions clinic in the Greater Toronto Area

1070 patient visits in the last fiscal year

520 thoracentesis/paracentesis performed in 2023

Our clinic mandate is to manage effusions in the ambulatory setting and community, avoiding resource-intensive hospital admissions and ED visits

Reduced Low-Value Testing

- Discontinued routine CBC and INR/aPTT testing for new patients in 2020
- Discontinued routine testing of fluid for fungal culture and AFB/TB culture in 2021, given low pre-test probability population
- Standardized lab requisitions with evidence-based tests

Indications for CBC and INR prior to procedure

- **High bleeding risk procedure**
- **Known liver disease**

Indications for CBC prior to procedure

- **Chemotherapy known to cause cytopenia within the last 14 days**
- **Known thrombocytopenia (history of platelets < 50)**

Indications for INR prior to procedure

- **Patient on warfarin**

Microbiology

Specimen Type: SEE BELOW FOR TYPE

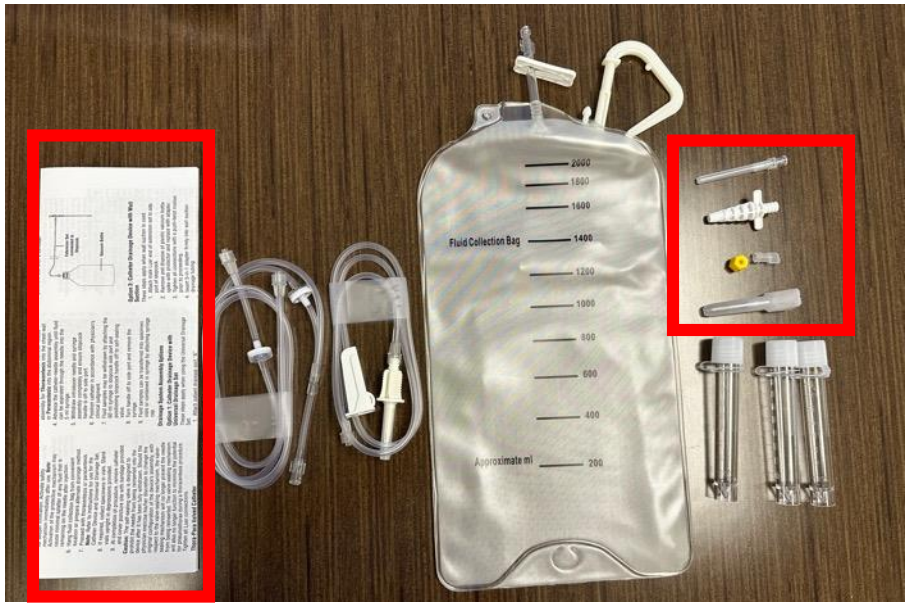
Specimen Site: SEE BELOW FOR SITE

- ☐ AFB/TB
- ☐ ARO Screen:
- ☑ C&S
- ☐ Fungus
- ☐ Ova and Parasites

Supply Chain

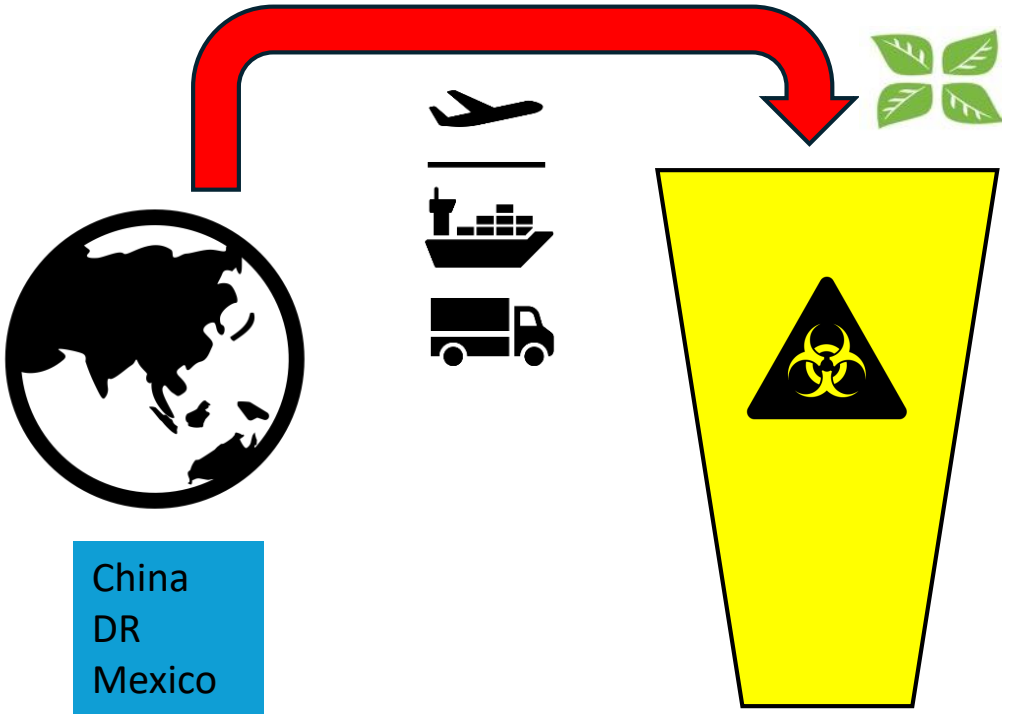
26 unique items

Current state



12 items usually discarded without use

6 items always discarded without use (>3100/yr)

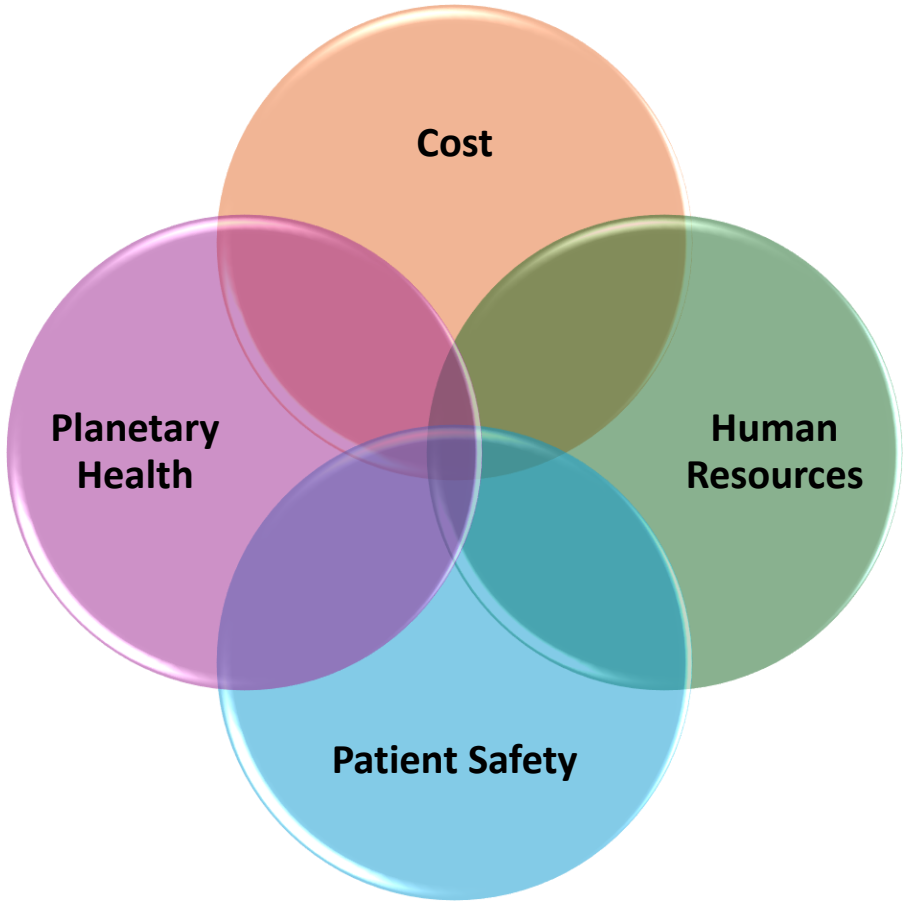


China
DR
Mexico
India
Italy
Israel

Project Goals

- Eliminate zero-use items
- Reduce single-use items (where feasible and appropriate)
- Create an environment that enables appropriate waste sorting

By March 2025.



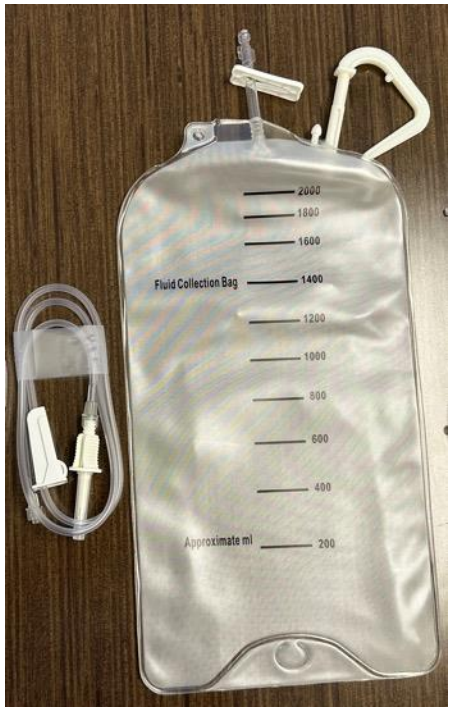
Industry Engagement

Hospital-wide kit – 27 items

EPIC clinic kit – 15 items

If sample collection required:

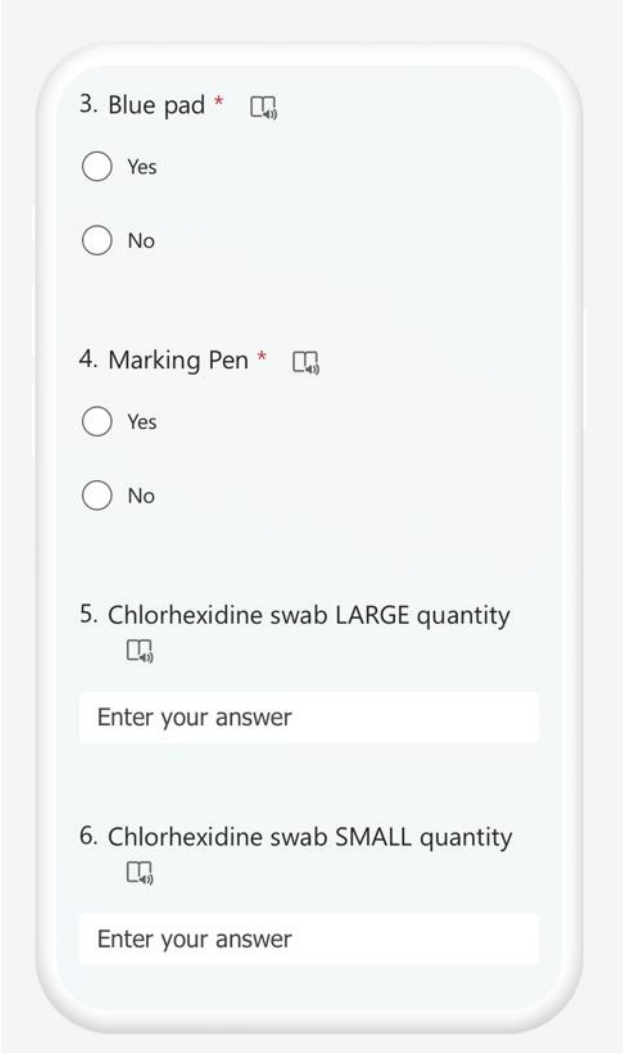
Thoracentesis



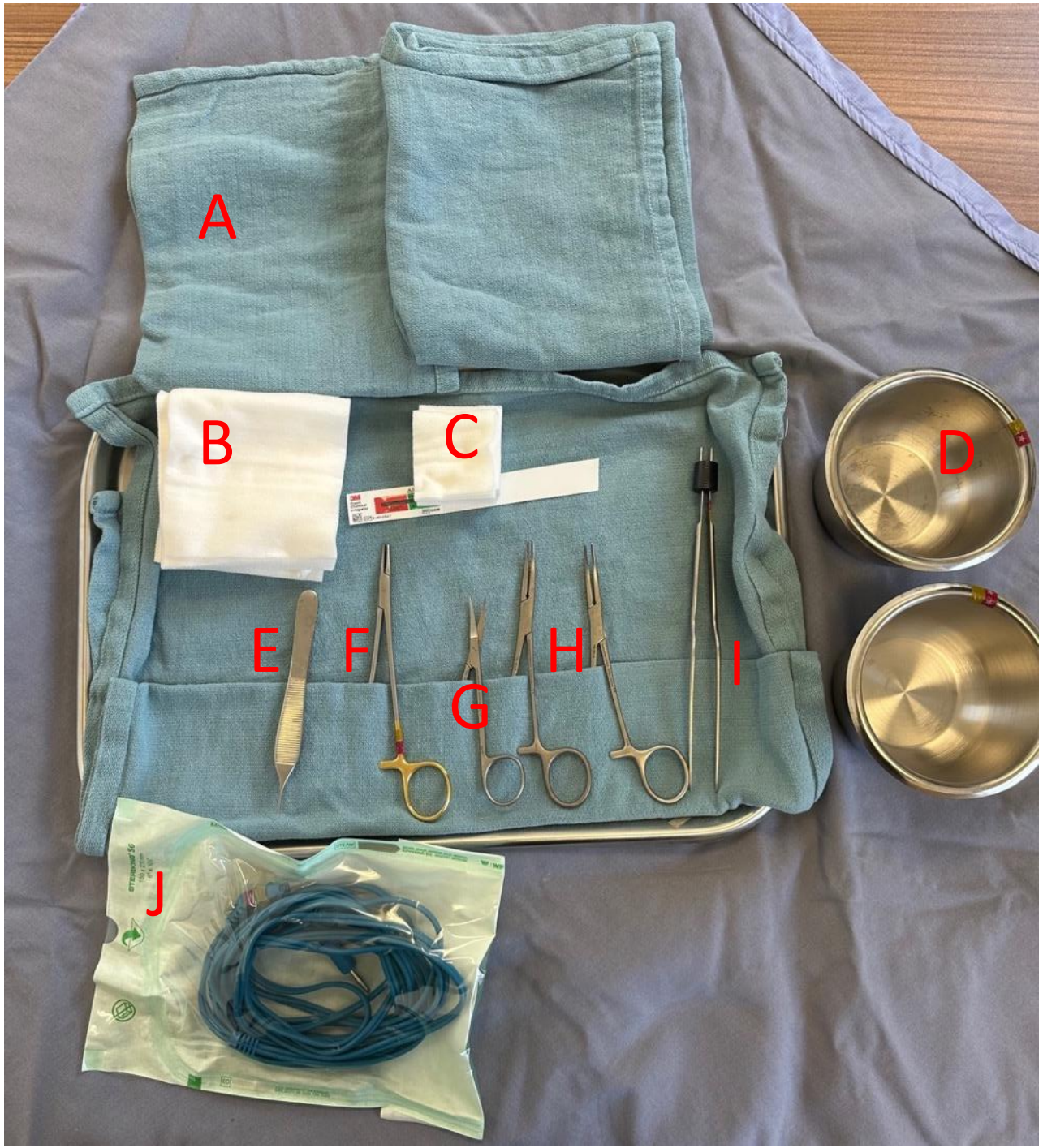
Paracentesis

EPIC – 21 items

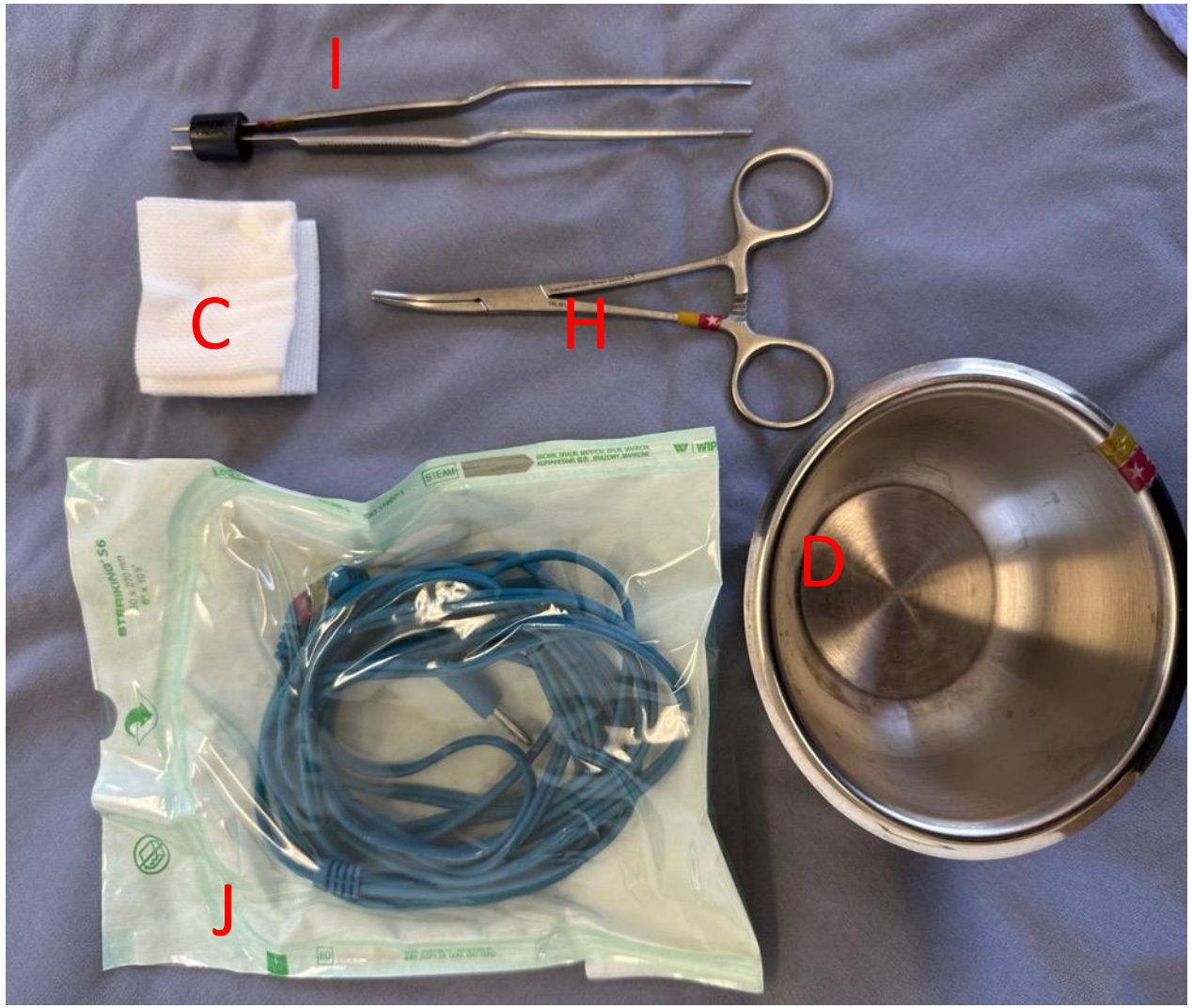
Supply Audit



Materials Used Thoracentesis
Disposable blue pad (100%)
Marking pen 20/22 (91%)
Chlorhexidine swab (large) 7/22 (32%) Quantity 1-3
Chlorhexidine swab (small) 13/22 (59%) Quantity 2-3
Chlorhexidine applicator 2/22 (9%) Quantity 1
Lidocaine (100%)
Sterile gloves (100%) Quantity 1-3
Non-sterile gloves 15/22 (68%)
Kit (100%)
Drainage bottle large (100%)
Drainage bottle small 4/22 (18%)
50 mL syringe 9/22 (41%)
Orange-top container 1/22 (5%)
Specimen bag small 9/22 (41%) Quantity 2-3
Specimen bag large 8/22 (36%)



Proposed items to remove



Explore strategies to reduce processed waste

Challenges

- Supply chain vulnerability
- Communication chains
- Unsatisfactory needle substitution
- Visual appearance of custom kit causing stocking challenges
- Resources/support for robust procedure database/tracking of clinic-specific materials

Quality Improvement to Reduce the Environmental Impact of Health Care

Stories from the NYGH Perioperative Green Team

Dr. Melissa Ho, MD FRCPC
Staff Anesthesiologist, North York General Hospital
Lecturer, Department of Anesthesia
University of Toronto

October 22, 2024

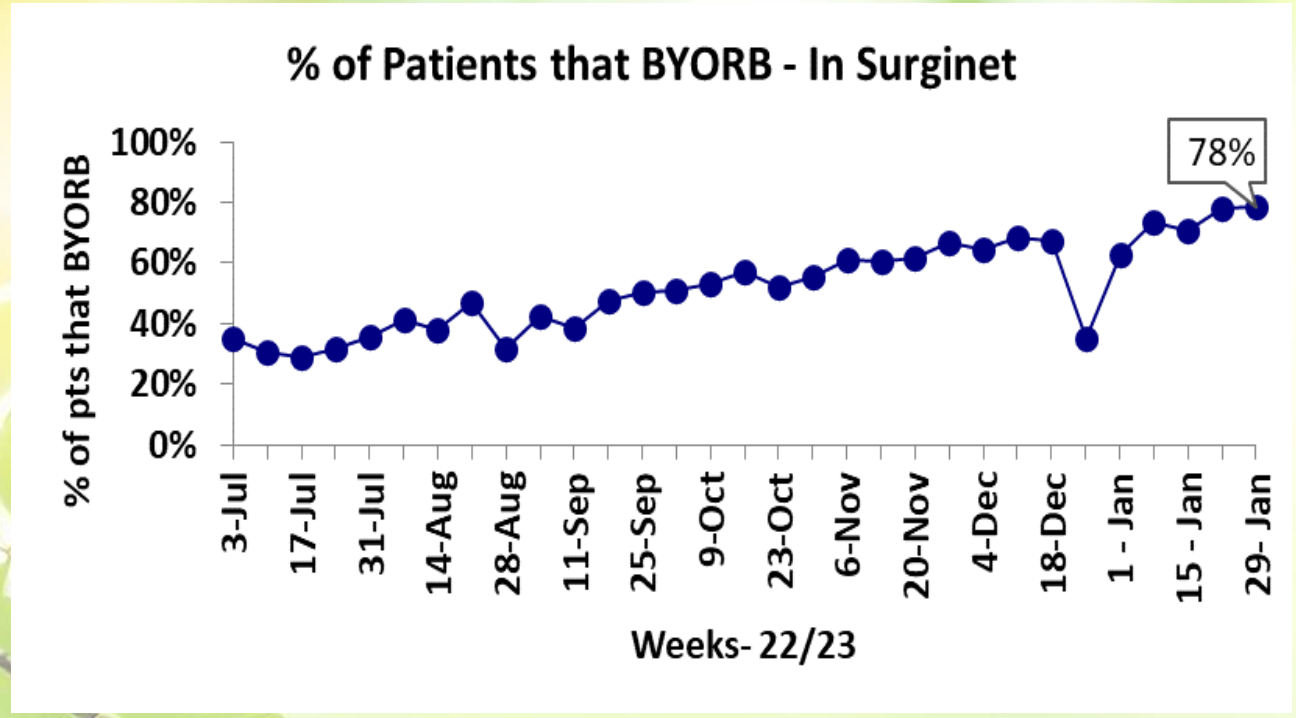
Outline

- Bring Your Own Reusable Bag
- Removal of desflurane from pharmacy formulary and anesthesia delivery units (ADUs)
- Reusable anesthesia equipment implementation

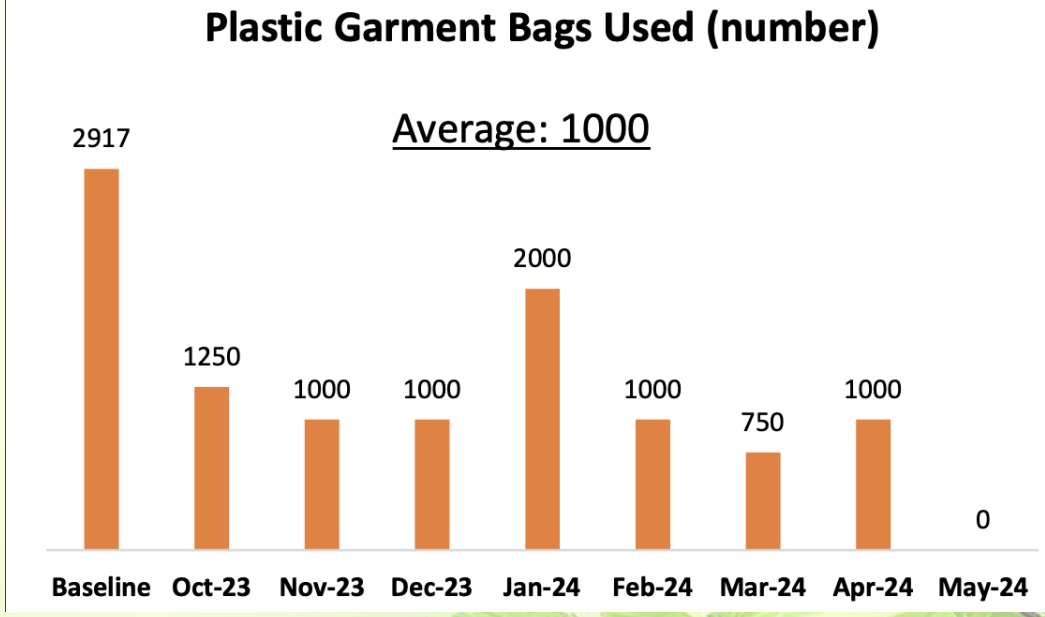
Bring Your Own Reusable Bag

- Root cause analysis and fish bone diagrams to refine strategies to relay message to patients
- Multidisciplinary input
  - Patient Experience Partner (PXP) – make the message simple and clear
  - Administrative assistants - relayed message to surgical and endoscopy patients succinctly
- Run chart following SurgiNet compliance data, individual surgeon/endoscopist office compliance rates

Bring Your Own Reusable Bag

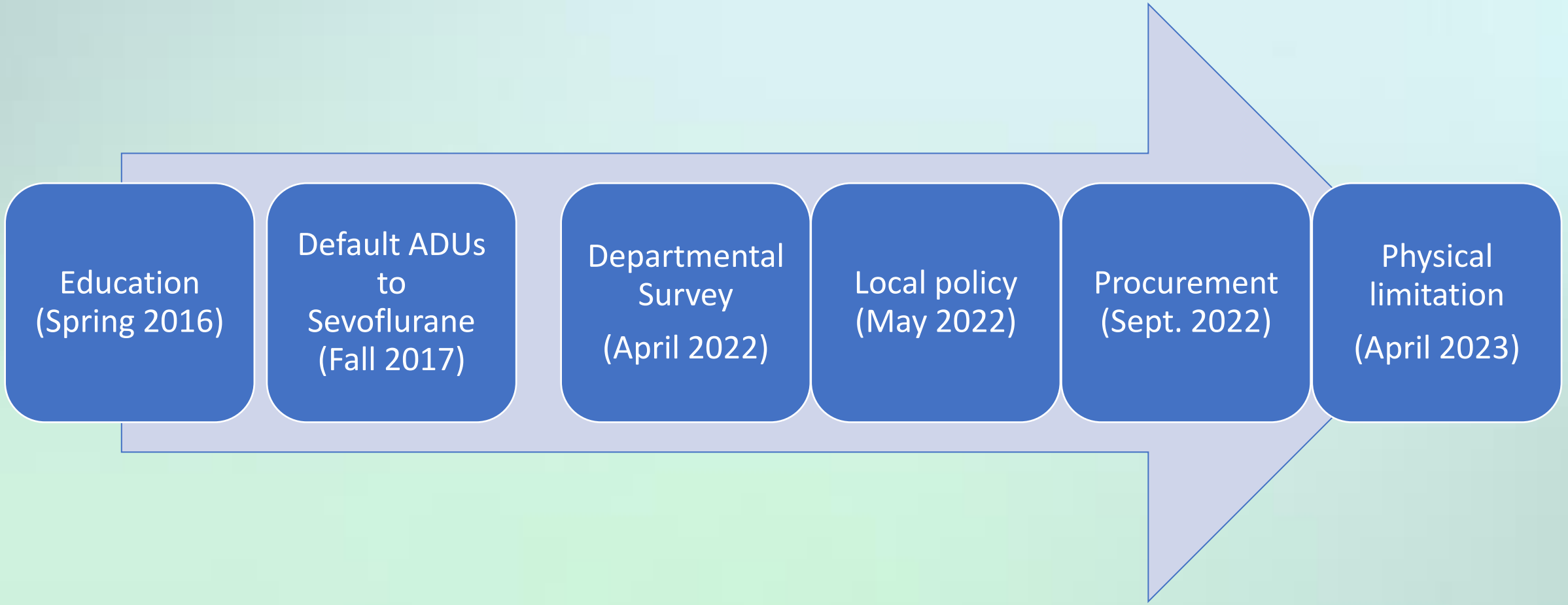


Patients that brought their own Reusable Bag **85%**

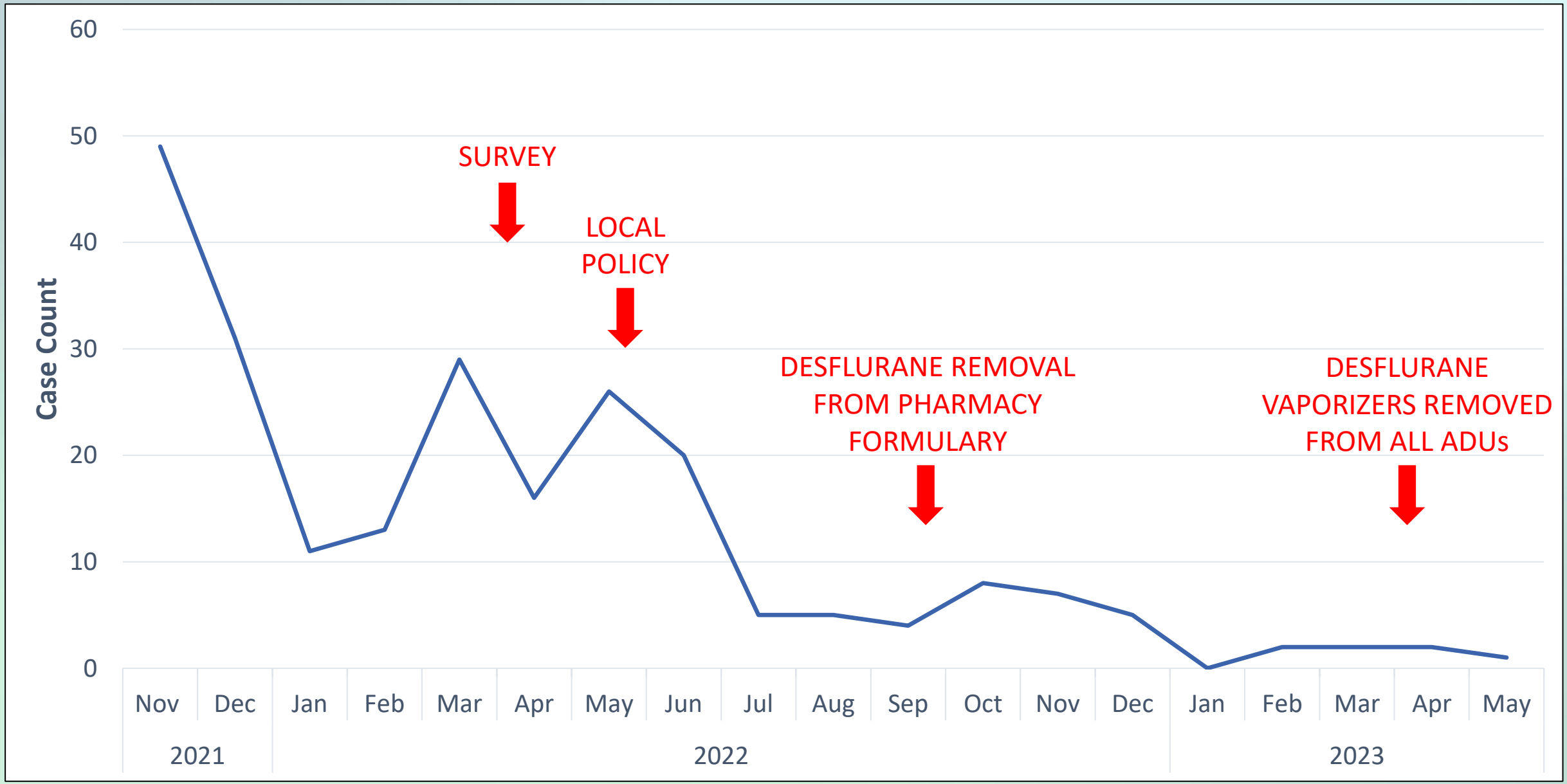


- OR and endoscopy alone on track to save $4000 and prevent landfill waste of 20000 plastic bags annually
- Front line engagement on sustainability initiatives

Change Management Steps on the Removal of Desflurane from NYGH

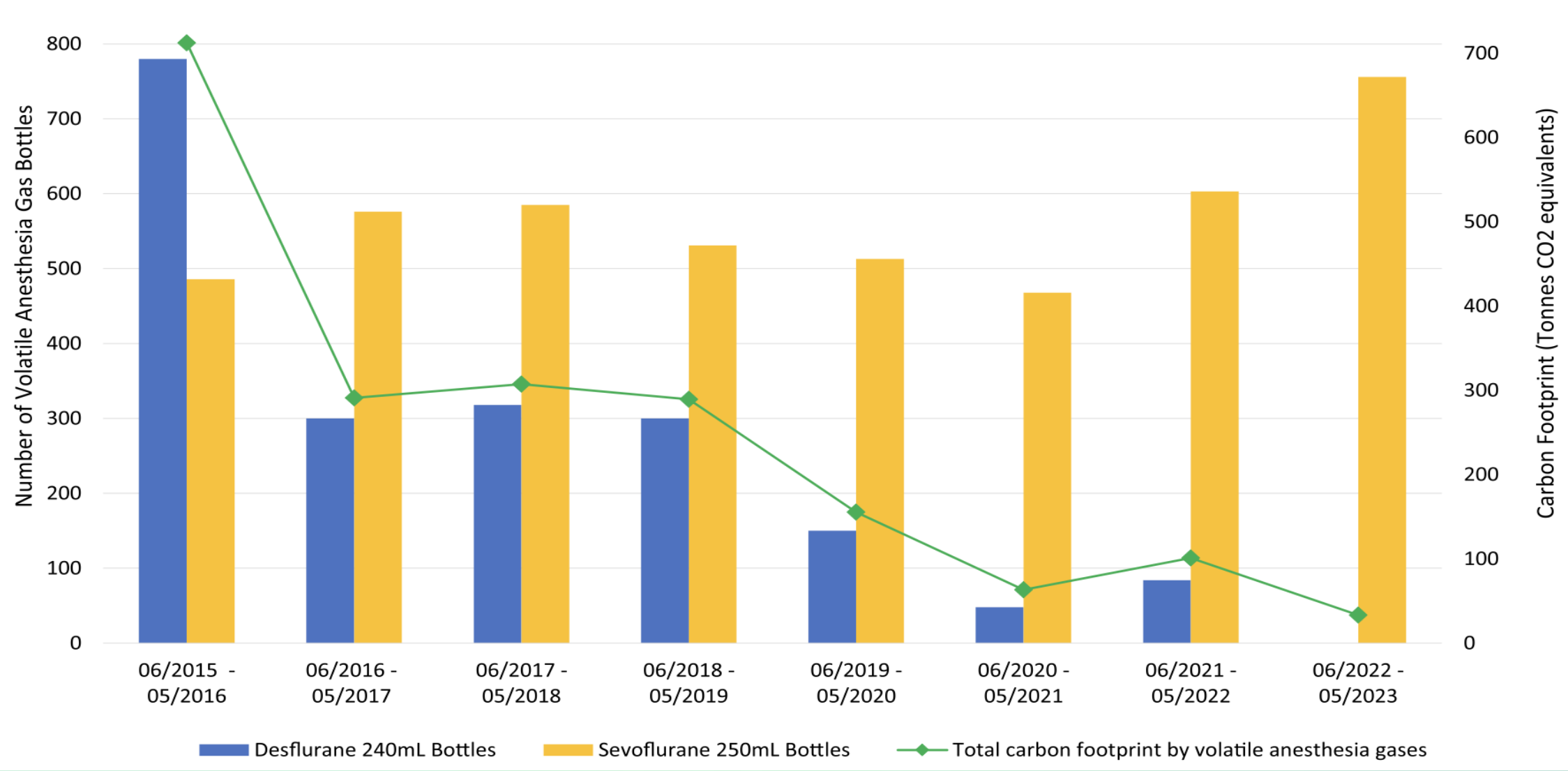


Monthly Count of Anesthesia Cases Utilizing Desflurane at NYGH



Source: NYGH Anesthesia Cerner EMR case data

Elimination of Desflurane Reduces the Anesthetic Gas Carbon Footprint at NYGH



Reusable Anesthesia Equipment at NYGH

Breathing circuits

Laryngeal Mask Airways (LMAs)

Circuit face masks

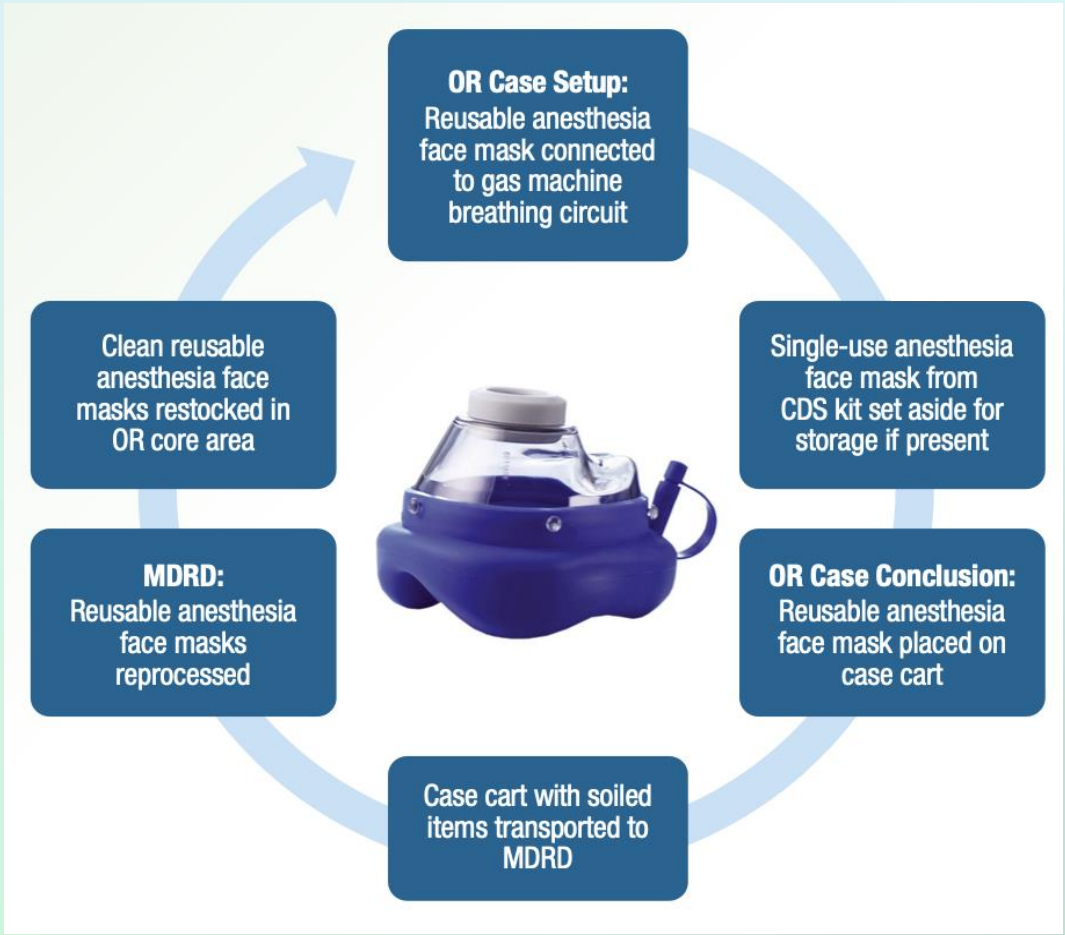
Airway adjuncts

- Inadvertent loss of LMAs during transition to different brand/model
- Root cause analysis to identify sources of accidental loss
- Multidisciplinary input to revise workflow of LMAs

Conversion to Reusable Circuit Face Masks

- Workflow analysis to devise pathway for reusable anesthesia equipment with high turnover
- ”Go Live” date set
- Ongoing multidisciplinary input and feedback
- Monthly inventory analysis

- >700kg plastic waste diverted per year with $15000 savings annually



Key Lessons

- Perioperative sustainability work is a team effort

- Quality improvement tools are instrumental in perioperative sustainability efforts
  - Follow uptake of initiatives
  - Provide information to direct efforts for further uptake and success
  - Reporting tool to share effectiveness of interventions with front line teams

Thank You!

melissa.ho@nygh.on.ca

Sustainability and QI in the Perioperative Sphere:

A Pilot Project in Custom Pack Waste Reduction

Climate, Health & Sustainable Care Inaugural Symposium

Dr. Sarah Bunston

Oct 22, 2024

NORTH YORK GENERAL

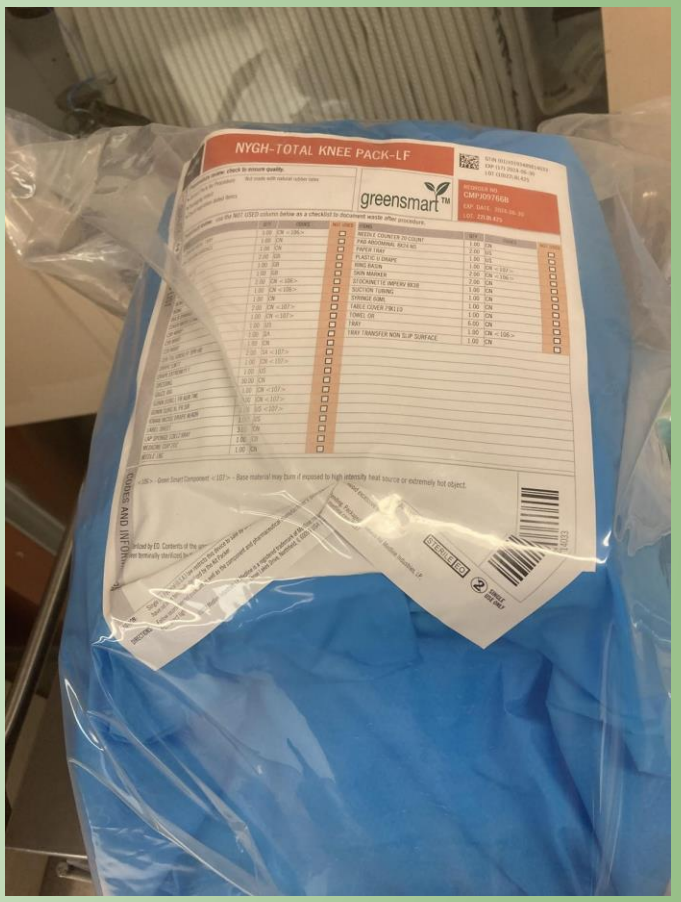
Context: NYGH Perioperative Green Team

- Volunteer based
- Alternate week meetings
- Diverse representation
- Using CASCADES scorecard as guide
- Observations of wasteful practices
- An array of projects:(anesthetic gases, reuseables in anesthesia, linen reduction, BYO(R)B, recycling pilot, custom pack review, educational and engagement)

NORTH YORK GENERAL

The Custom Pack Story

- A sterile package of disposable single use items opened together for a given procedure
- NYGH custom pack program expanded approx 7 years ago
- Purpose: increase speed and decrease cost
- Created secondary problem of increased waste/resource inefficiency

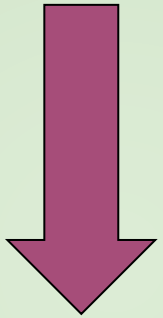


CUSTOM PACK OVERAGE!

NORTH YORK GENERAL

Project Inception

Project began with observations of waste by front line staff



Pre-Action Information Gathering Stage

NORTH YORK GENERAL

Understanding Stakeholders and Process

- Uncovering process of custom pack? (design, contract…)
- Key players and relationships?
- Need for buy in and consultations?(OR management, surgeons, resource nurses…)
- What would need to happen in order to effect a change/decrease waste?
- Cost implications?

Developing a plan to execute on small scale

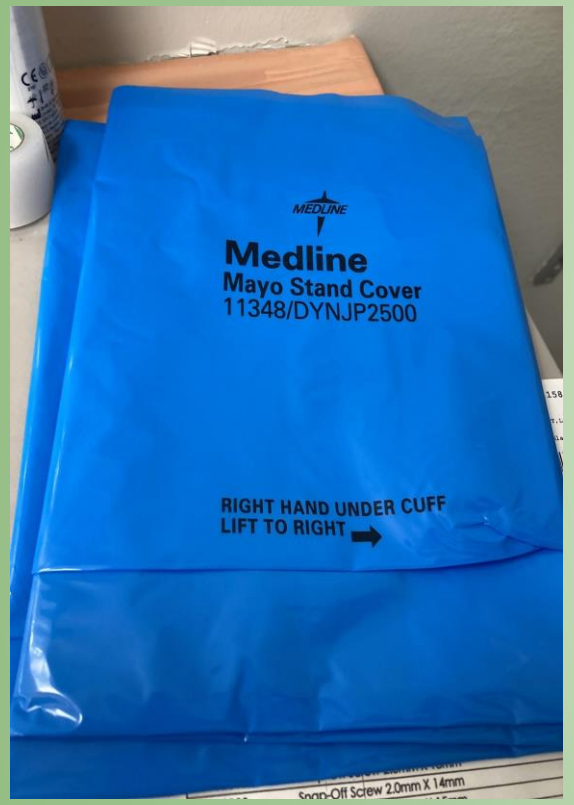
NORTH YORK GENERAL

From Information to Action

- Keep on small scale: three ortho packs only (TKA, bilat TKA, THA)
- Working Group established: targeted engagement
- Communicated with dedicated procurement specialist
- Obtained pack contents list for review
- Identified wasteful items for removal
- Start with easy wins/ low hanging fruit
- Communication with surgeons
- Experimented with “audit” by vendor

NORTH YORK GENERAL

Items identified for removal



NORTH YORK GENERAL

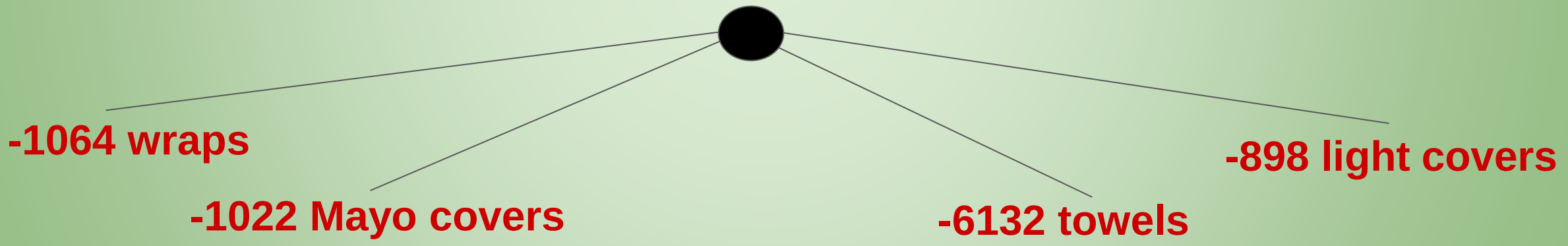
Waste Reduction

Typical Yearly Use (2023):

Bilateral knee packs: 42 (-2 wraps, -1 Mayo cover, -6 disposable towels)

Total knee packs: 980 (-1 wraps, -1 Mayo cover, -6 disposable towels)

Total hip packs: 449 (-2 disposable light covers)



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Challenges

- **Lack of formal resources (time, financial)**
- Need to engage many stakeholders and identify decision/action points
- Engaging with industry
- Difficulty with measurement (environmental impact and cost)

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Challenges with Vendor Communication

- Dealing with a private sector entity
- Diverging agendas
- Intermediaries
- Opaque communication
- Delay between change request made in Fall 2023 and new pack arrival Spring 2024
- Unable to formally quantify cost impact (no major impact at this point)

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Opportunities for Scalability and Iteration

- More waste to be identified for removal (including adjunct pack)
- Further Ortho Packs for review
- Expand to other services (engage resource nurses and surgeons)
- Present to Green Team for feedback
- Extend to pick lists and instrument trays?

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Thank you for your attention!

Climate, Health & Sustainable Care
Inaugural Symposium

Dr. Sarah Bunston

Oct 22, 2024

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Please provide feedback to inform future events

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