Utility and Practices of Routine Post Cardiac Surgery Testing in Adult Patients

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Presenter Disclosures

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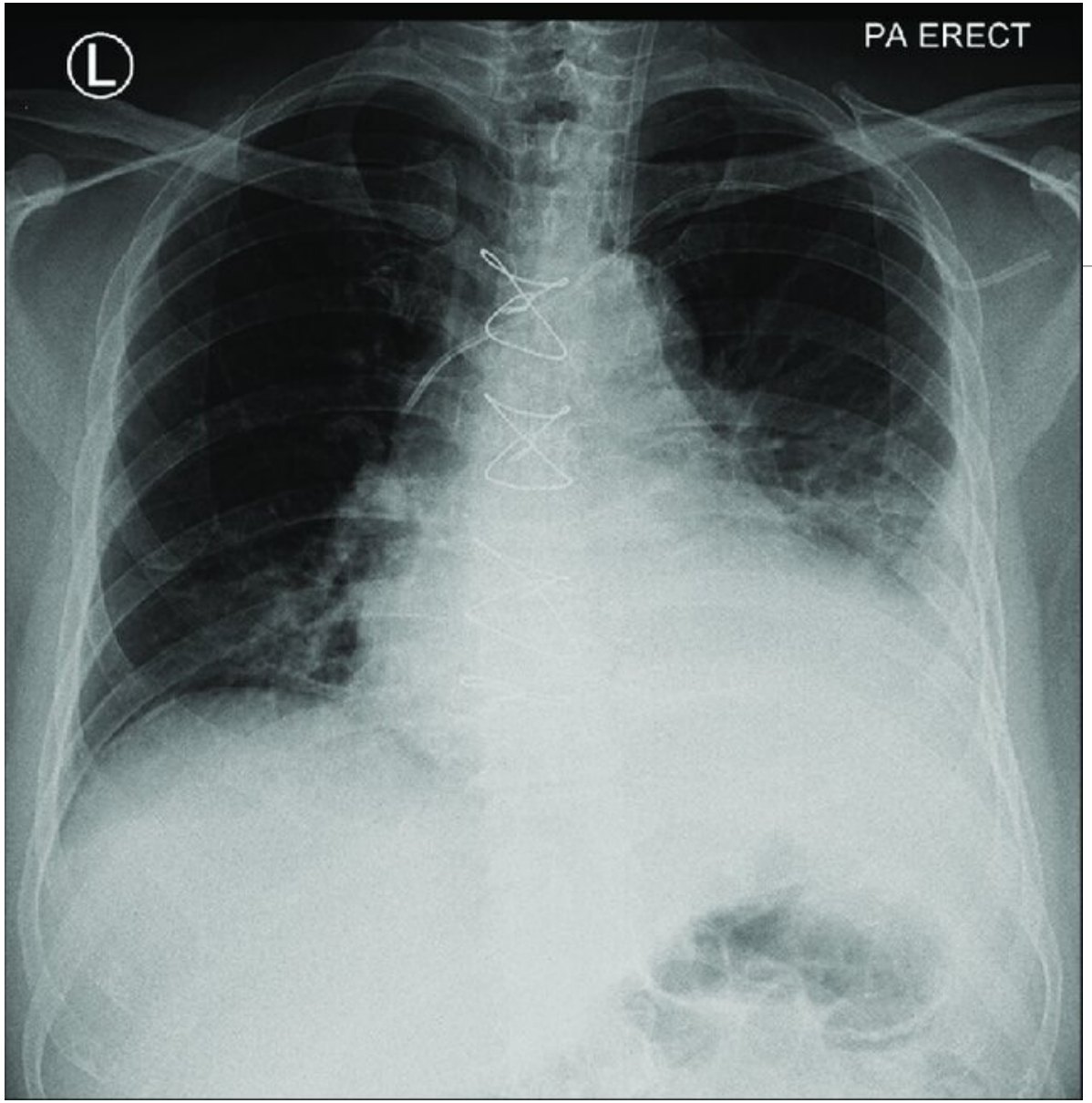


Post-op cardiac surgery…

Indication: POD1 CABG

Findings:

- Interval removal of endotracheal tube
- central venous catheter and chest tubes in place
- “Patient has had cardiac surgery”
- Left basal atelectasis/collapse

Soetisna, Tri & Buana, Andhika & Tirta, Edward & Ardiyan, Ardiyan & Aligheri, Dicky & Herlambang, Bagus & Tjubandi, Amin & Hanafy, Dudy & Sugisman, Sugisman. (2020). A 48-Year-Old Man at Low Risk for SARS-CoV-2 Infection Who Underwent Planned Elective Triple-Vessel Coronary Artery Bypass Graft Surgery at a National Heart Center in Indonesia Followed by a Fatal Case of COVID-19. American Journal of Case Reports. 22. 10.12659/AJCR.928900.

Routine post-op CXR costs and benefits

COSTS

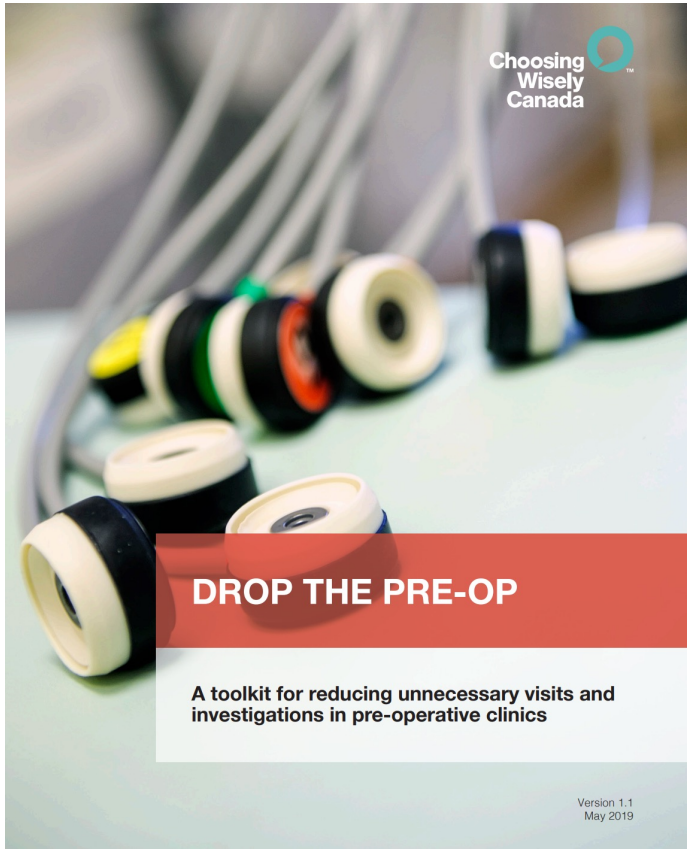
- Risk of device removal/dislodgment
- Discomfort for patients
- Risk to healthcare personnel to positioning patients (workplace injury)
- Equipment, personnel, testing costs
- Radiation exposure to patients and staff
- Environmental footprint of CXRs (0.5kg/scan, McAllister et al., 2022)
- “abnormal” findings may lead to further downstream testing

BENEFITS

- Earlier identification of relevant pathology?
- Assurance of correct device placement?
- Assurance to clinicians trained with routine testing?

McAlister S, McGain F, Petersen M, Story D, Charlesworth K, Ison G, Barratt A. The carbon footprint of hospital diagnostic imaging in Australia. Lancet Reg Health West Pac. 2022 May 3;24:100459. doi: 10.1016/j.lanwpc.2022.100459. PMID: 35538935; PMCID: PMC9079346.

Routine Peri-Operative Testing



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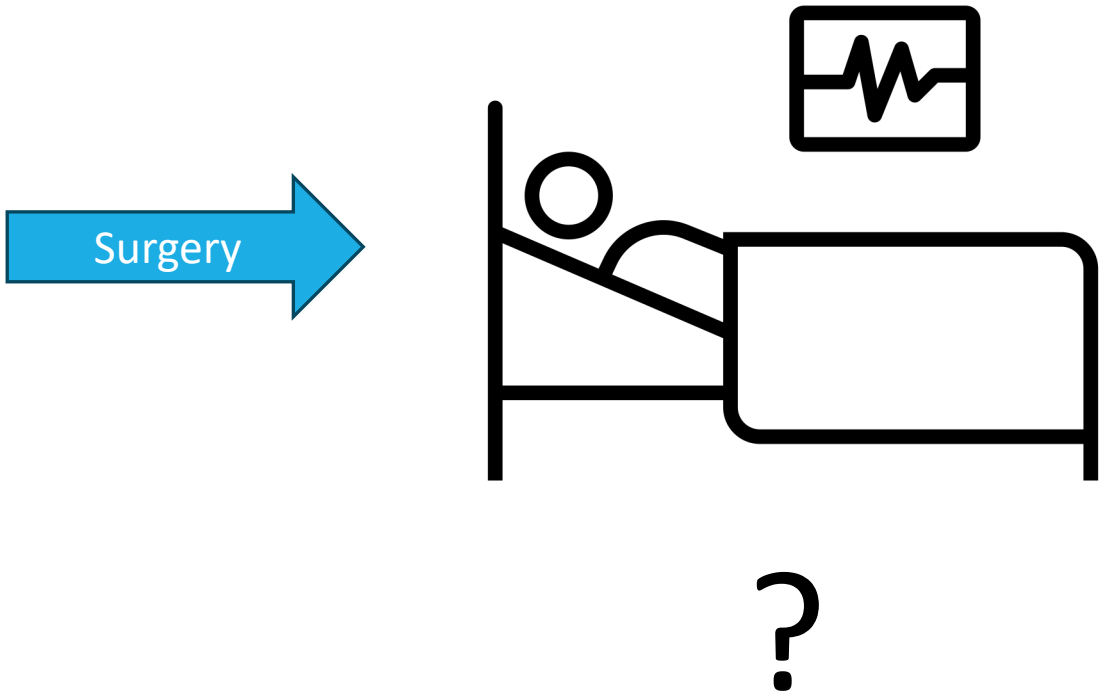
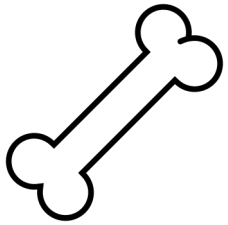
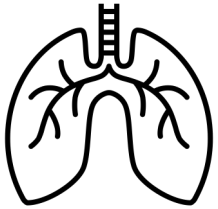


Not a new idea…



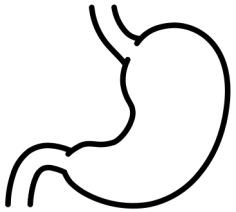
Total hip and knee arthroplasty
(Gilde et al., 2021; Halawi et al., 2019; Howell et al., 2019; Mostello et al., 2020; Zhuang et al., 2021)

hysterectomy & reconstruction
(Aldrich & Pauls, 2022; Chamsy et al., 2014)
caesarian section
(*Khaikin, 2023, CWC meeting)

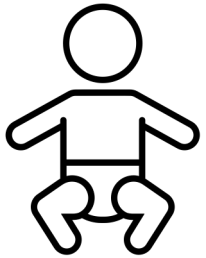


Thoracic surgery
(Galata et al., 2022; Thet et al., 2022)

?



lap cholecystectomy
(Ben-Ishay et al., 2017; Strohäker et al., 2021)



PICU post-op
(Dewan et al., 2017)

Tracheostomy
(Yeo et al., 2014)

Evidence: Systematic Review

What is the diagnostic efficacy and therapeutic efficacy of routine chest radiographs in adult patients in the first 7 days after cardiac surgery?

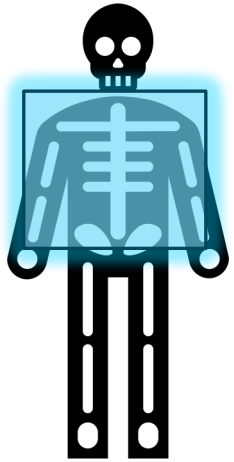
Inclusion/Exclusion Criteria

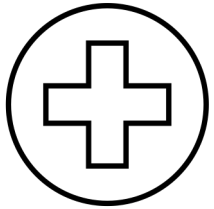
Inclusion criteria	Exclusion criteria
post-operative cardiac surgery	duplicates
adults (age ≥18)	wrong outcomes (i.e. no complications or relevant chest radiography findings)
routine indication chest radiograph (within 7d post-op)	pediatric patients
diagnostic efficacy and/or therapeutic efficacy of routine CXRs	non-English papers
	articles without full text available
	case report or case series or review article
	evaluating a treatment/intervention other than CXR
	percutaneous/interventional radiology cardiac procedure alone
	animal studies

Systematic Review Results

18709 screened

26 included for full-text review





Diagnostic efficacy:

- Atelectasis: ~30-50% (range 4-91%)
- Pleural effusion: ~40% (range 3-94%)
- Pneumothorax: ~2% (range 1-6.5%)
- **Significant/major findings only: 2-3%**

Therapeutic efficacy

- **All interventions 2-3% (range 0-10%*)**

*one study excluded due to unclear calculation of therapeutic efficacy

Randomized/interventional trials

2 randomized trials, 546 patients (Forouzannia et al., 2014; Mandegar et al., 2007)

- No difference: signs/symptoms, therapeutic interventions, hospital LoS, readmission rate
- 0% therapeutic efficacy in routine group (vs. 100% in clinically-indicated)

4 interventional (pre/post) trials (Mets et al., 2007; Parker et al., 2016; Rao et al., 1997; Salehi et al., 2017)

- ↓ clinical value

- safe
- ↓ resources

Routine Post-op Labs: Cardiac Surgery

Very little data exist

Expert opinion suggests we should (DiMarco, 2010; Stephens & Whitman, 2015)

- Which tests?
- How frequently?
- In which patients?

Guidelines on Routine Post-op Testing

ERAS Guidelines (Engelman et al., 2019)

- ***Early detection of kidney stress and interventions to avoid acute kidney injury after surgery (IIa, B-R)***

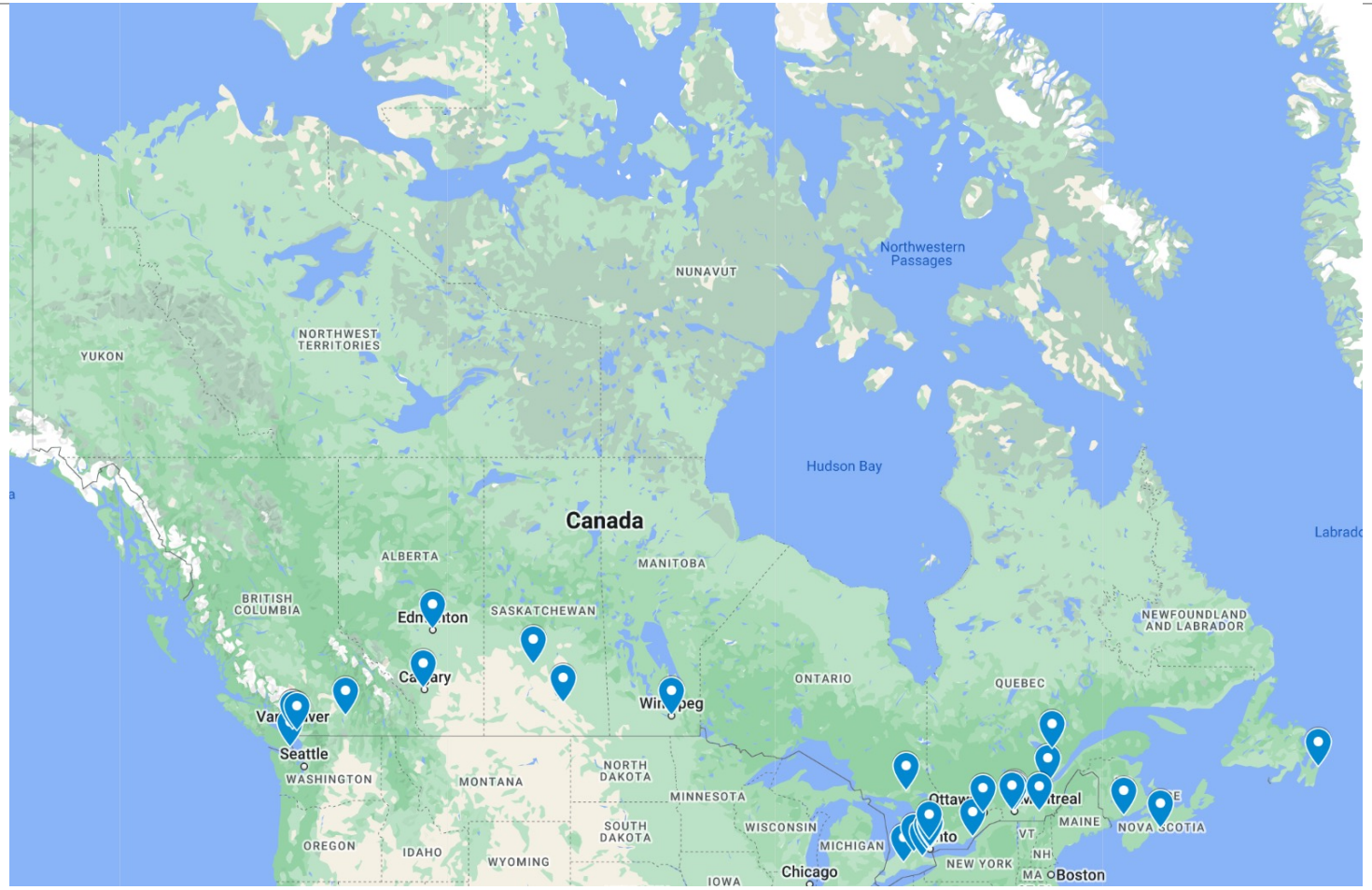
ERAS Cardiac Society, ERAS International Society, STS (Grant et al., 2024)

- ***Routine screening for and, where appropriate, the use of a comprehensive treatment care bundle can reduce the incidence and severity of postoperative acute kidney injury. (Quality of Evidence: Moderate)***

SFAR/SFCTCV (Mertes et al., 2022)

- No recommendations on routine post-operative testing

Canadian CVICU Routine Post-op Practices Survey



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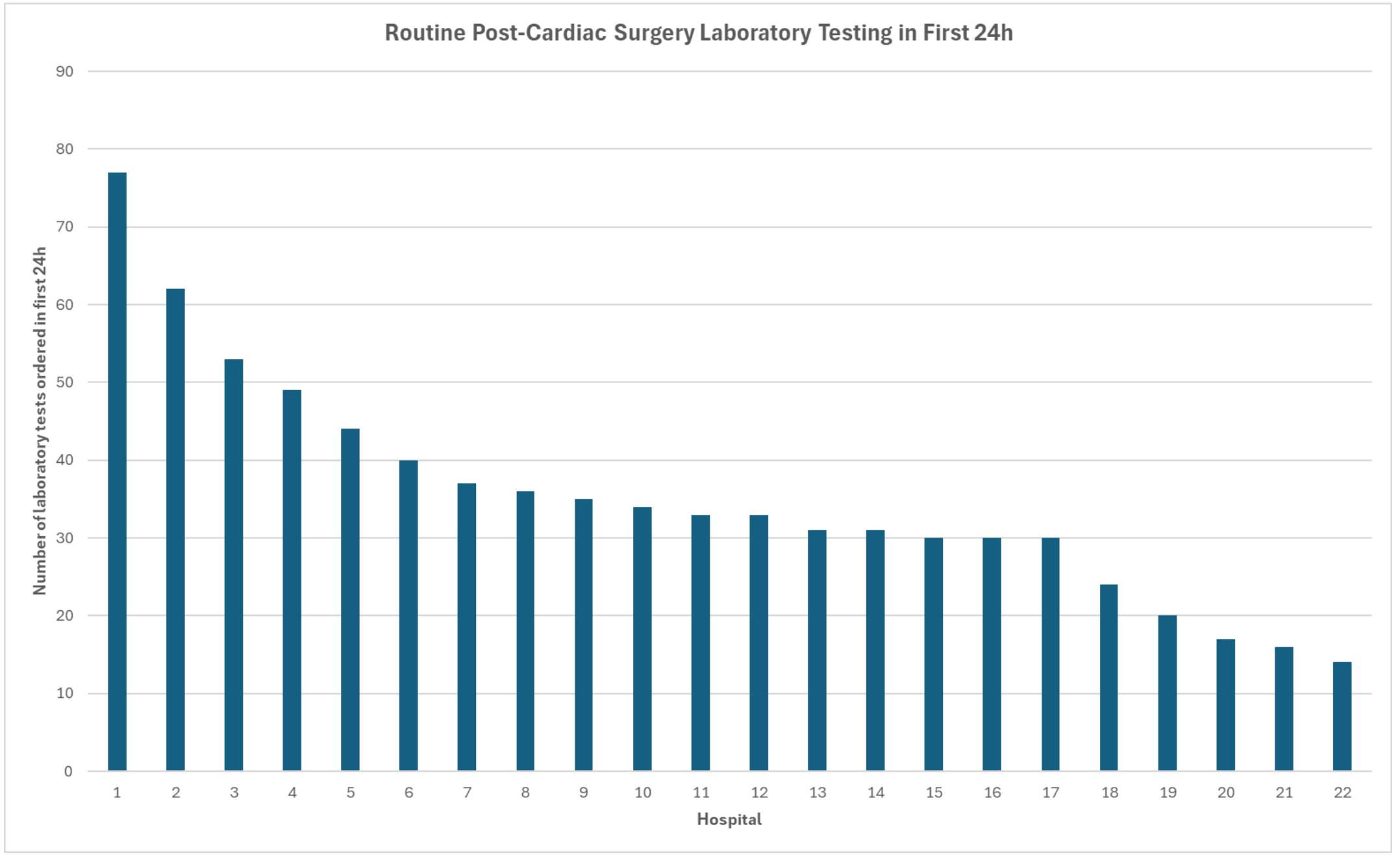
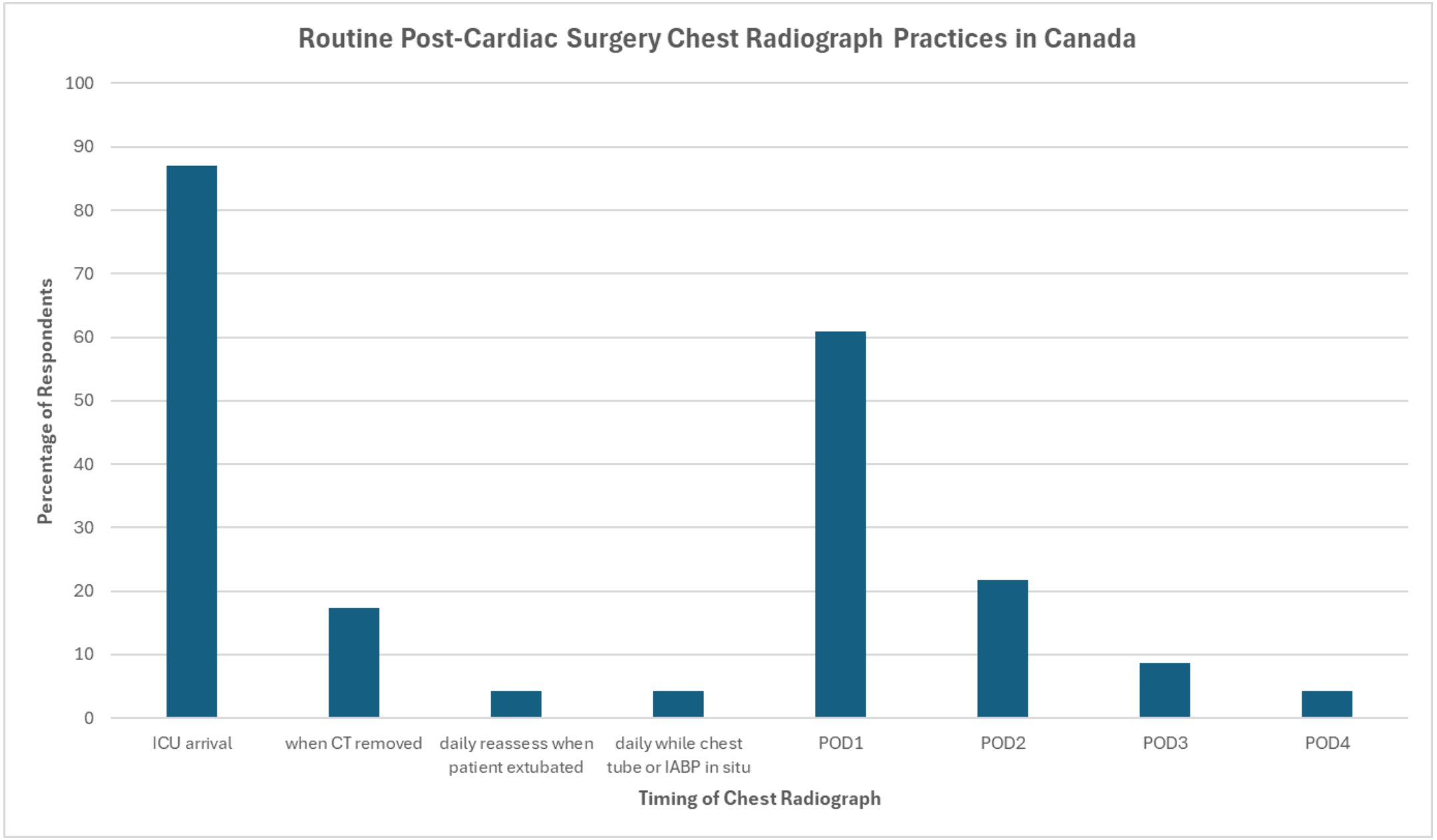

Routine Post-Cardiac Surgery Laboratory Testing in First 24h
Number of laboratory tests ordered in first 24h
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Hospital


Routine Post-Cardiac Surgery Chest Radiograph Practices in Canada
100
90
80
70
60
50
40
30
20
10
0
Percentage of Respondents
ICU arrival
when CT removed
daily reassess when patient extubated
daily while chest tube or IABP in situ
POD1
POD2
POD3
POD4
Timing of Chest Radiograph

Next Steps

- Opportunities for evaluating value of routine post-op cardiac surgery laboratory testing
  - Role for machine learning?
- Evaluation of potential cost savings and carbon footprint reduction in reducing non-essential post-operative testing
- Dissemination in published literature and engagement of clinicians in Canadian CVICUs on (de-)implementation studies

Summary

1. In many situations, routine post-operative testing has low clinical value.

2. Post-cardiac surgery chest radiography has low clinical value and opportunity exists for reducing this testing in Canada.

3. Optimal post-op lab testing strategy following cardiac surgery is unknown but existing variability offers an opportunity for study and perhaps identification of unnecessary testing.

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Thank you!

Questions/Collaboration?

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Outline

1. Routine post-operative testing literature and guideline review
2. Post-cardiac surgery routine chest radiograph systematic review
3. Survey results of Canadian post-cardiac surgery routine testing practices
4. Next steps