Society of Thoracic Surgeons
Adult Cardiac Surgery Database

Quality Improvement Series: Decreasing Vent Times

Mark Pridmore, RN
and
Joseph Arcidi, MD

Providence St. Joseph Hospital, Eureka California

November 15, 2023

Agenda

WELCOME AND INTRODUCTIONS

REVIEW H3 REPORTS

Operating Room Extubation: Multiple-Year Experience at a Remote Community Cardiac Surgery Center

Joseph M. Arcidi, Jr., MD FACS FACC

Jeffrey S. Johnston, MD Stephen R. Dieker, MD Thach D. Mai, DO

Barry Steinbock, CCP

Mark E. Pridmore, RN

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PSJH O.R. Heart Team

* Summer Research Fellow funded by Providence St. Joseph Hospital Foundation

Providence
St. Joseph Hospital

4.35% of Isolated CABG pts are extubated in OR

STS National Database Harvest 3, 2023

Responses:

- Why bother?
- Is it safe?
- Who benefits?
- Quantifiable?

Unique features of our program

Our implementation and outcomes

Anesthesiology perspective

Questions/discussion

OR extubation: a progression

Quality ID #164 (NQF 0129): Coronary Artery Bypass Graft (CABG): Prolonged Intubation
– National Quality Strategy Domain: Effective Clinical Care
– Meaningful Measure Area: Preventable Healthcare Harm

2020 COLLECTION TYP
MIPS CLINICAL QUALI

MEASURE TYPE:
Outcome – High Priority

DESCRIPTION:
Percentage of patie
intubation > 24 hour

INSTRUCTIONS:
This measure is to b
is anticipated that M
CABG will submit th
CABG or isolated re

Measure Submissi
Measure data may b
denominator criteria
specification are use
need to be submitte
submissions; howev
claims data. For mo
Payment Program (

DENOMINATOR:
All patients undergo

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AND
Patient pr
33533, 335

Patient pr
33533, 335
AND
Patient proced

NUMERATOR:
Patients undergoing isolated CABG who require intubation > 24 hours following exit from the operating room

Numerator Instructions:
INVERSE MEASURE: A lower calculated performance rate for this measure indicates better clinical care or control. The "Performance Not Met" numerator option for this measure is the representation of the better clinical quality or control. Submitting that numerator option will produce a performance rate that trends closer to 0%, as quality increases. For

Version 4.0
November 2019

Clinical Science | December 1996

Extubating in the operating room after adult cardiac surgery safely improves outcomes and lowers costs

Vinay Badhwar, MD, Stephen Esper, MD, Maria Brooks, PhD, Suresh Mulukutla, MD, Regina Hardison, MS, Demetri Mallios, BS, Danny Chu, MD, Lawrence Wei, MD, and Kathirvel Subramaniam, MD

https://doi.org/10.1097/00000542-199612000-00011

Early tracheal extubation anesthetic management reduces total costs per CABG surgery by 25%, predominantly in nursing and in CVICU costs. Early extubation reduces CVICU and hospital length of stay but does not increase the rate or costs of complications when compared with patients in the late extubation group. It shifts the high CVICU costs to the lower ward costs. Early extubation also improves resource use after cardiac surgery when compared with late extubation.

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Read at the 94th Annual Meeting of The American Association for Thoracic Surgery, Toronto, Ontario Canada, April 26-30, 2014.
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0022-5223/$36.00

http://dx.doi.org/10.1016/j.jtcvs.2014.07.037

gency open cardiac operations.

METHODS

Patient Population

From January 1, 2012, to June 30, 2013, 888 patients underwent adult cardiac surgery at the Presbyterian University Hospital of the University of Pittsburgh Medical Center. Our study cohort of 652 consecutive patients receiving all forms of open cardiac operations who had been extubated within 12 hours was formed after excluding 197 operations defined as

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OPERATING ROOM EXTUBATION AT A REMOTE COMMUNITY PROGRAM

This may have been the first: 2010

The Impact of Immediate Extubation in the Operating Room After Cardiac Surgery on Intensive Care and Hospital Lengths of Stay

Dmitri Chamchad, MD,*‡ Jay C. Horrow, MD, MS,‡ Lev Nakhamchik, MSc,* Francis P. Sutter, DO,†
Louis E. Samuels, MD,†‡ Candace L. Trace, RN, BA,† Francis Ferdinand, MD,† and Scott M. Goldman, MD†

Objective: To determine if lengths of stay in intensive care and the hospital are associated with extubation in the operating room at the conclusion of cardiac surgery.

Design: A nonrandomized, observational study with propensity score–guided case-control matching of prospectively collected data.

Setting: Three interrelated, university-affiliated, community hospitals.

Participants: Three thousand three hundred seventeen patients undergoing elective or urgent coronary artery, valve repair or replacement, or combined surgery between 2000 and 2006.

Interventions: Tracheal extubation occurred, based on history and intraoperative events, either immediately in the operating room or in the intensive care unit.

Measurements and Main Results: Of 3,317 patients in the institutions' Society of Thoracic Surgeons database, 3,089 were extubated within 24 hours, 69% of them in the operating room. Only 0.6% of patients extubated in the operating room required reintubation, compared with 5.9% extubated in the intensive care unit ($p < 0.0001$). By logistic regression, 12 of 25 preoperative and intraoperative factors generated a propensity score for each of the 2,595 patients with complete data, representing the likelihood of immediate extubation (c-statistic = 0.727). A "greedy 5 to 1" propensity score-matching technique created 713 matched pairs of patients by extubation pathway. Those undergoing immediate extubation had reductions in intensive care duration by 23 hours on average (median from 46 to 27 hours, $p < 0.0001$) and in hospital length of stay by 0.8 days on average (median = 6 for each, $p < 0.0001$). Cox regression, using matched pairs as strata, identified the following independent predictors of length of stay in the intensive care unit and hospital: immediate extubation in the operating room, need for reintubation, postoperative renal failure, and postoperative atrial fibrillation.

Conclusions: Selection of patients for immediate extubation in the operating room by experienced clinicians was associated with shorter ICU and hospital stays. Immediate extubation rarely resulted in tracheal re-intubation.

KEY WORDS: tracheal extubation, cardiac surgery, coronary artery bypass graft surgery, length of stay, propensity scores, ICU and hospital length of stay

Not presented at meeting

- n = 2125 (propensity matched 713)
- Multiple operation types: 70% Isol CABG
- 46% elective, 54% urgent
- 8.7% IABP

Reintubation 0.6%

Decreased LOS by 0.8 day ($p<0.0001$)

Journal of Cardiothoracic and Vascular Anesthesia, Vol 24, No 5 (October), 2010: pp 780-784

Limited reports

Extubating in the operating room after adult cardiac surgery safely improves outcomes and lowers costs

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Objective: Prolonged intubation has been implicated in the poor outcomes after adult cardiac surgery. Accelerated postoperative extubation has been a quality focus, but operating room (OR) extubation after cardiopulmonary bypass is rare. We examined the outcomes and direct costs of protocolized OR extubation versus early postoperative intensive care unit (ICU) extubation after nonemergency open cardiac surgery.

Methods: From January 2012 to June 2013, 652 consecutive patients who had undergone various cardiac operations, including redo and multivalve operations, were extubated within 12 hours, 165 in the OR. The OR extubation patients were propensity matched from multivariable logistic regression to derive 106 matched pairs for OR extubation versus extubation < 12 hours (group 1) and 98 independently matched pairs for OR extubation versus extubation < 6 hours (group 2).

Results: OR versus ICU extubation conveyed significant reductions in ICU hours (26.3, interquartile range [IQR], 22.0-31.0; vs 29.0, IQR, 25.0-51.0; $P = .001$, for group 1; 27.0, IQR, 22.0-32.0; vs 29.0, IQR, 25.0-54.0; $P = .0002$, for group 2) and postoperative length of stay (5 days, IQR, 4-6; vs 6 days, IQR, 5-7; $P = .0008$, for group 1; 5 days, IQR, 4-6; vs 6 days, IQR, 4-7; $P = .0002$, for group 2) but did not affect the reintubation rate (1.9% [2 of 106] vs 0.0% [0 of 106], $P = .5$, group 1; 3.1% [3 of 98] vs 2.0% [2 of 98], $P = 1.0$, group 2). OR versus ICU extubation conferred a >20% cost reduction from surgery completion to discharge ($3055, IQR, $2576-$3964; vs $3977, IQR, $3028-$4947; $P = .0007$, group 1; $3025, IQR, $2598-$3965, vs $3877, IQR, $2998-$5458; $P = .007$, group 2).

Conclusions: After cardiac surgery, OR extubation is safe and might provide improvement in length of stay and cost compared with early postoperative ICU extubation. (J Thorac Cardiovasc Surg 2014;148:3101-9)

2014
- n = 165 propensity matched
- Multiple operation types
- 70-80% elective
  20-30% urgent
- 53% EF

Decreased LOS by 1 day
(p=0.0005)
> 20% cost reduction
(p=0.0007)
Reintubation 3% (ns)

Limited reports

Predictors of operating room extubation in adult cardiac surgery

Kathirvel Subramaniam, MD, MPH,[a] Diana S. DeAndrade, MD,[a] Daniel R. Mandell, MD,[a] Andrew D. Althouse, PhD,[b] Rajan Manmohan, BS,[c] Stephen A. Esper, MD, MBA,[a] Jeffrey M. Varga, MD,[a] and Vinay Badhwar, MD[d]

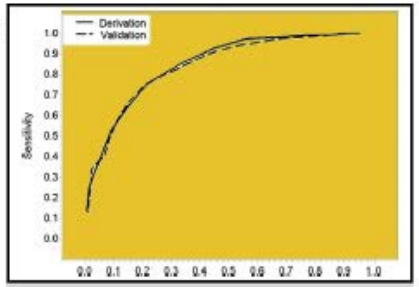
ABSTRACT

Objective: The primary objective of the study was to identify perioperative factors associated with successful immediate extubation in the operating room after adult cardiac surgery. The secondary objective was to derive a simplified predictive scoring system to guide clinicians in operating room extubation.

Methods: All 1518 patients in this retrospective cohort study underwent standardized fast-track cardiac anesthetic protocol during adult cardiac surgery. Perioperative variables between patients who had successful extubation in the operating room versus in the intensive care unit were retrospectively analyzed using both univariate and multivariable logistic regression analyses. A predictive score of successful operating room extubation was constructed from the multivariable results of 800 patients (derivation set), and the scoring system was further tested using a validation set of 398 patients.

Results: Younger age, lower body mass index, higher preoperative serum albumin, absence of chronic lung disease and diabetes, less-invasive surgical approach, isolated coronary bypass surgery, elective surgery, and lower doses of intraoperative intravenous fentanyl were independently associated with higher probability of operating room extubation. The extubation prediction score created in a derivation set of patients performed well in the validation set. Patient scores less than 0 had a minimal probability of successful operating room extubation. Operating room extubation was highly predicted with scores of 5 or greater.

Conclusions: Perioperative factors that are independently associated with successful operating room extubation after adult cardiac operations were identified, and an operating room extubation prediction scoring system was validated. This scoring system may be used to guide safe operating room extubation after cardiac operations. (J Thorac Cardiovasc Surg 2017;154:1656-65)



Percentage of patients successfully extubated in the OR in a validation set.

Central Message

Independent factors associated with successful OR extubation after cardiac operations were identified, and an extubation prediction score is introduced.

Perspective

Extubation in the OR after cardiac surgery is feasible and safe in selected patients. In this study, factors were identified that were independently associated with successful OR extubation after cardiac operations. A prediction score was created and validated to guide safe OR extubation practice in patients undergoing cardiac surgery.

See Editorial Commentary page 1666.

2017

- n = 354
- Multiple operation types
- 76% elective
  24% urgent
- 55% EF
- 0.7% STS pred mortality risk
- 4.9% STS prolong vent risk

Predictors:

Younger age, elective status

Isolated CABG

Lower BMI, higher albumin,

No chronic lung, No DM

Limited reports: only multicenter study

Operating Room Versus Intensive Care Unit Extubation Within 6 Hours After On-Pump Cardiac Surgery: Early Results and Hospital Costs

Andrew D. Hawkins, MD,[*] Raymond J. Strobel, MD, MSc,[*] J. Hunter Mehaffey, MD, MSc,[*] Robert B. Hawkins, MD, MSc,[†] Evan P. Rotar, MD, MS,[*] Andrew M. Young, MD,[*] Leora T. Yarboro, MD,[*] Kenan Yount, MD, MBA,[*] Gorav Ailawadi, MD, MBA,[†] Mark Joseph, MD,[‡] Mohammed Quader, MD,[§] and Nicholas R. Teman, MD[*]

Semin Thoracic Surg ■■:■■–■■

Limited reports: only multicenter study

24,962 patients undergoing CABG and/or valve operations 2011-2021 extubated within 6 hours → 1:n propensity score matching → 487 extubated in OR, 899 extubated within 6 hours

No difference in operative mortality

0.6 days shorter length of stay for OR extubation (p = < 0.001)

$1,964 less for OR extubation (p = < 0.001)

2.5x increased rate of re-intubation after OR extubation (p = 0.008)

2.8x increased rate of re-bleeding requiring reoperation after OR extubation (p = 0.03)

Take-home Message: Improved hospital efficiency with OR extubation must be weighed against increased post-operative reintubation and bleeding

Limited reports

Abstract 3: Intraoperative Extubation after Isolated CABG Improves Postoperative Outcomes

Author List: Les James MD, MPH; Deane Smith, MD; Mike Allison, BS, MBA; Shash Shrivastava, MD; Darien Paone, MD; Mikhail Vaynblat, MD; Daniel Swistel, MD; Didier Loulmet, MD; Eugene Grossi, MD; Mat Williams, MD; Aubrey Galloway, MD; Elias Zias, MD

Abstract 3:

Intraoperative Extubation after Isolated CABG Improves Postoperative Outcomes

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Sex, n (%)			
Male	687 (77.1)	438 (86.4)	*<0.0001*
Female	204 (22.9)	69 (13.6)	
BMI (mean±SD)	28.2 ± 5.2	28.4 ± 8.0	0.4797
STS Risk Score % (mean±SD)	1.5 ± 2.0	1.1 ± 0.9	*<0.0001*
EF% (mean±SD)	54 ± 13	58 ± 10	*<0.0001*
CPB, min (mean± SD)	106 ± 30	112 ± 28	*0.0004*
X-clamp, min (mean± SD)	79 ± 35	91 ± 24	*<0.0001*

Table 2. Outcomes

	Postoperative extubation n=891	Intraoperative extubation n=507	*p-value*
Need for reintubation, n (%)	20 (2.2)	8 (1.6)	0.393
ICU length of stay, hours (mean±SD)	51.1 ± 147.1	19.0 ± 23.2	*<0.0001*
Postoperative length of stay, days (mean±SD)	7.1 ± 7.9	3.4 ± 2.3	*<0.0001*
Discharge to home, n (%)	754 (84.6)	493 (97.2)	*<0.0001*
Postoperative atrial fibrillation, n (%)	171 (19.2)	27 (5.3)	*<0.0001*
Postoperative kidney injury, n (%)	8 (0.9)	1 (0.2)	0.116
30-day readmission, n (%)	44 (4.9)	12 (2.4)	*0.015*
30-day mortality, n (%)	8 (0.9)	1 (0.2)	0.116

2023

- n = 507 (36% of 2017-2022 isolated CABG pts)
- 58% EF
- 1.1% STS pred mortality risk

1.6% reintubation

3.4 days mean postop LOS
(vs 7.1 days, p<0.0001)
97% discharged to home

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Discussion/Editorials

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Discussion

Dr Glenn Whitman *(Baltimore, Md).* Dr Badhwar, as you and I have already spoken this past week, I think this is a tremendous study and extremely provocative.

Your report is extremely provocative, and if in fact patient satisfaction significantly benefits by intraoperative extubation, it might be worth it just for that.

Dr Badhwar. Thank you for your kind comments and for your leadership and contributions in this field.

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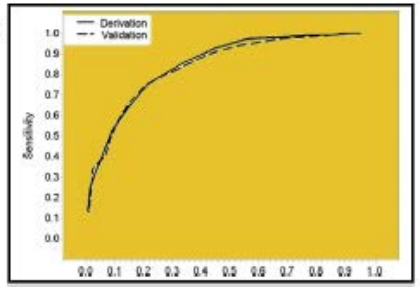

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See Editorial Commentary page 1666.

Early extubation after cardiac surgery: The evolution continues

Hilary P. Grocott, MD, FRCPC, FASE

From the Department of Anesthesia, University of Manitoba, Winnipeg, Manitoba, Canada.

The characteristics are in some respects very obvious (eg, younger age and simpler operation); however, one can easily make the argument that all patients, irrespective of the procedure or the patient characteristics, should be treated right from the start as if they can be extubated in the operating room. The decision to extubate patients should likely be made once the operation is nearing completion, in part informed by the overall success of the operation. The many nuances and complications

Discussion/Editorials

2022;36:1265-1267

Motivation?

Editorial

Early is Good, But is Immediate Better? Considerations in Fast-Track Extubation After Cardiac Surgery

Megan Chacon, MD
Nicholas W. Markin, MD, FASE
University of Nebraska Medical Center, Omaha, NE

As the practice of cardiac anesthesiology continued to mature, it was only natural that the amount of time to awakening, extubation, and mobilization of postsurgical patients would decrease.[12] Although there is a continued pressure to do so, it is not entirely clear that the motivation to further move the extubation goalposts is the result of a desire to improve patient outcomes and more of a desire for the provider to have some personal feeling of accomplishment. Of course, any time one undertakes a course that is of no direct benefit to the patient, there should be questions about the motivation. At this time, the desire to extubate immediately after the procedure may be the result of 3 motivators—shorter ICU length of stay, reduced costs and saved money, or perhaps allowed the physicians to "feel" like they are doing a good job.

Discussion/Editorials

Safety/Logistics?

Editorial

Early is Good, But is Immediate Better? Considerations in Fast-Track Extubation After Cardiac Surgery

Of course, there are non–patient-related factors to consider when making decisions on whether or not to extubate a post-cardiac surgery patient in the OR. Depending on the layout of the perioperative area and the proximity of the OR to the ICU, it may not be considered safe to extubate immediately before a long transport with limited monitoring and airway equipment. If pain is not controlled adequately, or the patient experiences emergence delirium, this also can make for a difficult transport to the ICU. Many centers have developed a multidisciplinary handoff for the OR to ICU transition. It sometimes can be more difficult for the nursing staff to get a patient settled when they are not sedated and intubated, which may make handoff more difficult and the nurse caring for the patient may be distracted and/or unable to listen to pertinent details of the patient's operative course. Although the reported benefits of immediate extubation in the OR have been described, some workflow and institutional barriers may prevent it from being practical or safe.

Discussion/Editorials

Cost savings?

Editorial

Early is Good, But is Immediate Better? Considerations in Fast-Track Extubation After Cardiac Surgery

Given the way that the costs of healthcare continue to increase, cost reduction is a noble goal. However, it is not clear that extubation will change the overall costs.[13] Certainly, in the inpatient Diagnosis-Related Grouping based reimbursement process, there are no changes to patient charges or hospital reimbursement if the patient is extubated before going to the ICU. It is possible that if a hospital system is not taking postcardiotomy patients to the ICU if they are extubated, it could reduce hospital system costs but not patient cost. As well, the hospital is not going to reduce their workforce of respiratory therapists or their ventilator inventory, no cost savings there. As previously mentioned, unless the ICU is skipped all together, there may or may not be a meaningful change in ICU length of stay depending on the practice.[7] Many institutions have issues with moving patients from the ICU to a lower level of care, and shortening the period of intubation will work only if there is capacity for patients to move through at a faster rate.

Discussion/Editorials

To conclude:

Editorial

Early is Good, But is Immediate Better? Considerations in Fast-Track Extubation After Cardiac Surgery

Until the time comes when data for subpopulations show which patients specifically will benefit from earlier extubation, one of the strengths of anesthesia practice is the freedom to do so in a way that is best for the individual patient and within the provider's experience. Although the debate will continue, we argue that there is at this time, there is not adequate evidence to change the current practice of leaving patients intubated for a brief postoperative (<6-hour) period.

What LOE grade?

Gathering evidence

- Is it safe?

  All studies except Virginia show very low reintubation rate.

- Does it decrease LOS?

  To variable amounts: 0.6 - 3.7 days. LOS is multifactorial.

- Patient satisfaction?

  Yes, but not formally evaluated.

Discussion

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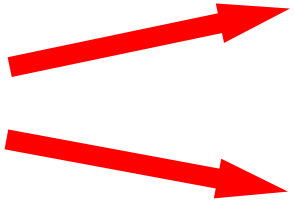
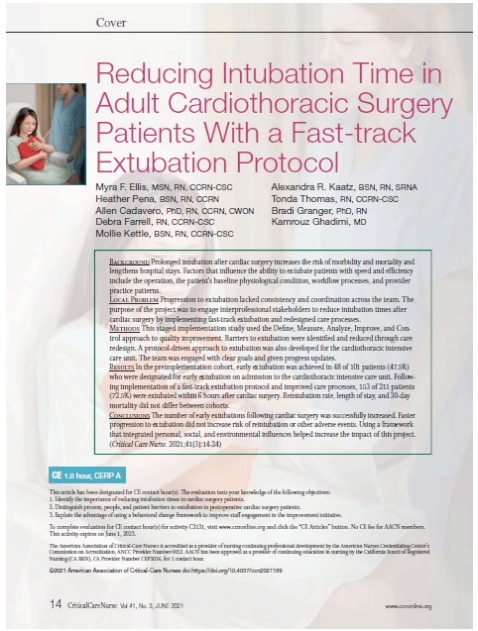
Can logistic barriers be overcome…?

Are these not reminiscent…



Of course, there are non–patient-related factors to consider when making decisions on whether or not to extubate a post-cardiac surgery patient in the OR. Depending on the layout of the perioperative area and the proximity of the OR to the ICU, it may not be considered safe to extubate immediately before a long transport with limited monitoring and airway equipment. If pain is not controlled adequately, or the patient experiences emergence delirium, this also can make for a difficult transport to the ICU. Many centers have developed a multidisciplinary handoff for the OR to ICU transition. It sometimes can be more difficult for the nursing staff to get a patient settled when they are not sedated and intubated, which may make handoff more difficult and the nurse caring for the patient may be distracted and/or unable to listen to pertinent details of the patient's operative course. Although the reported benefits of immediate extubation in the OR have been described, some workflow and institutional barriers may prevent it from being practical or safe.

…like we did to achieve extubation in < 6 hours?



Cover

Reducing Intubation Time in Adult Cardiothoracic Surgery Patients With a Fast-track Extubation Protocol

Myra F. Ellis, MSN, RN, CCRN-CSC
Heather Pena, BSN, RN, CCRN
Allen Cadavero, PhD, RN, CCRN, CWON
Debra Farrell, RN, CCRN-CSC
Mollie Kettle, BSN, RN, CCRN-CSC
Alexandra R. Kaatz, BSN, RN, SRNA
Tonda Thomas, RN, CCRN-CSC
Bradi Granger, PhD, RN
Kamrouz Ghadimi, MD

Background Prolonged intubation after cardiac surgery increases the risk of morbidity and mortality and lengthens hospital stays. Factors that influence the ability to extubate patients with speed and efficiency include the operation, the patient's baseline physiological condition, workflow processes, and provider practice patterns.
Local Problem Progression to extubation lacked consistency and coordination across the team. The purpose of the project was to engage interprofessional stakeholders to reduce intubation times after cardiac surgery by implementing fast-track extubation and redesigned care processes.
Methods This staged implementation study used the Define, Measure, Analyze, Improve, and Control approach to quality improvement. Barriers to extubation were identified and reduced through care redesign. A protocol-driven approach to extubation was also developed for the cardiothoracic intensive care unit. The team was engaged with clear goals and given progress updates.
Results In the preimplementation cohort, early extubation was achieved in 48 of 101 patients (47.5%) who were designated for early extubation on admission to the cardiothoracic intensive care unit. Following implementation of a fast-track extubation protocol and improved care processes, 153 of 213 patients (72.0%) were extubated within 6 hours after cardiac surgery. Reintubation rate, length of stay, and 30-day mortality did not differ between cohorts.
Conclusions The number of early extubations following cardiac surgery was successfully increased. Faster progression to extubation did not increase risk of reintubation or other adverse events. Using a framework that integrated personal, social, and environmental influences helped increase the impact of this project.
(*Critical Care Nurse*. 2021;41(3):14-24)

CE 1.0 hour, CERP A

14 CriticalCareNurse Vol 41, No. 3, JUNE 2021 www.ccnonline.org

… of these?

Table 1 Barriers to extubation with barrier types and resolutions

Type	Barriers	Resolution
Process	Inconsistent weaning practice	Implement standardized weaning protocol for all patients identified as appropriate for the FTE protocol.
	Patients inappropriately labeled as ready to progress to extubation (eg, patients with hemodynamic instability, bleeding, acidosis)	Include considerations for exclusion in protocol; team will indicate clear yes or no for all patients during handoff in CTICU.
	NMB agents not reversed	Decrease NMB use after CPB; check TOF on admission (in protocol).
	RT unavailable for ventilator weaning or changes; no designated person to cover duties during lunch, travels off unit, etc	Designate a person for OR; each RT will let RN know who to call when RT travels off the unit with a patient; RTs will cover duties for each other.
	Workflow issues, handoffs (6 PM for APPs, 7 PM for RTs and RNs)	Try to discuss needs with APP before 6 PM if possible; handoff can be interrupted for extubation order if ABG is WNL and patient is on extubatable settings ready for extubation; the only time patients will not be extubated is 7-7:30 PM during handoff for RNs and RTs.
	Hypertension management with pain and sedation medications	Discuss preferred agent for hypertension management with surgical team at handoff.

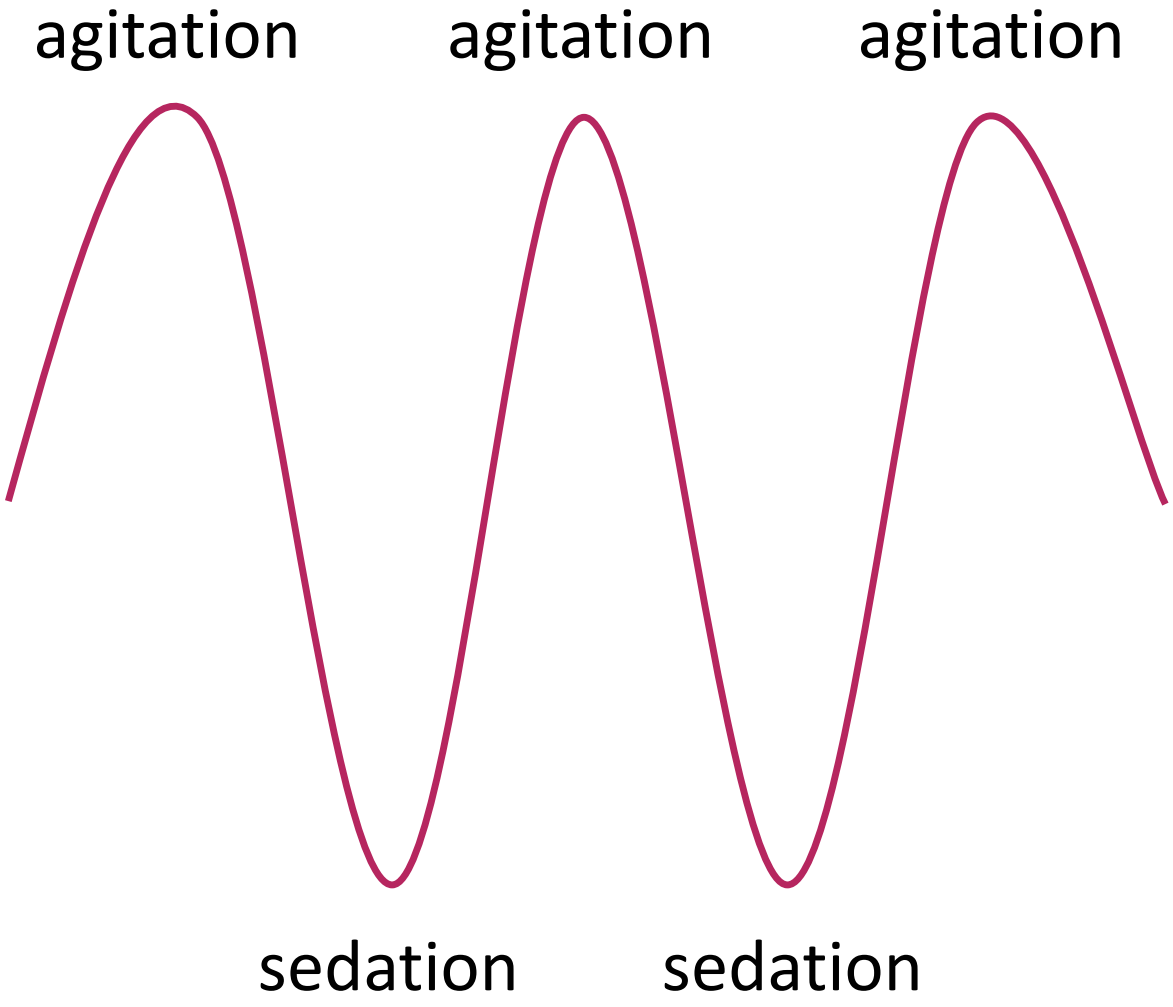
Critical Care Nurse 2021; 41:14-24.

Providence St. Joseph Hospital

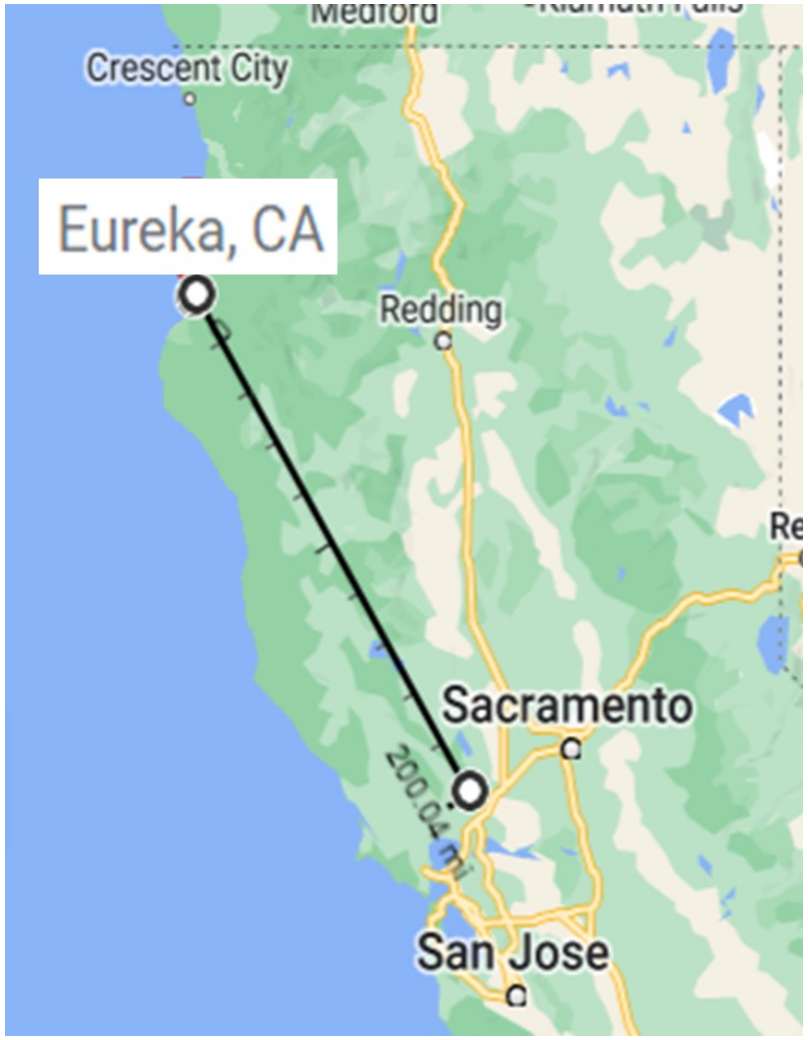
OPERATING ROOM EXTUBATION AT A REMOTE COMMUNITY PROGRAM

Spoiler: Our post-ORE handoff has been smoother

We no longer see this - but it's very hard to quantify



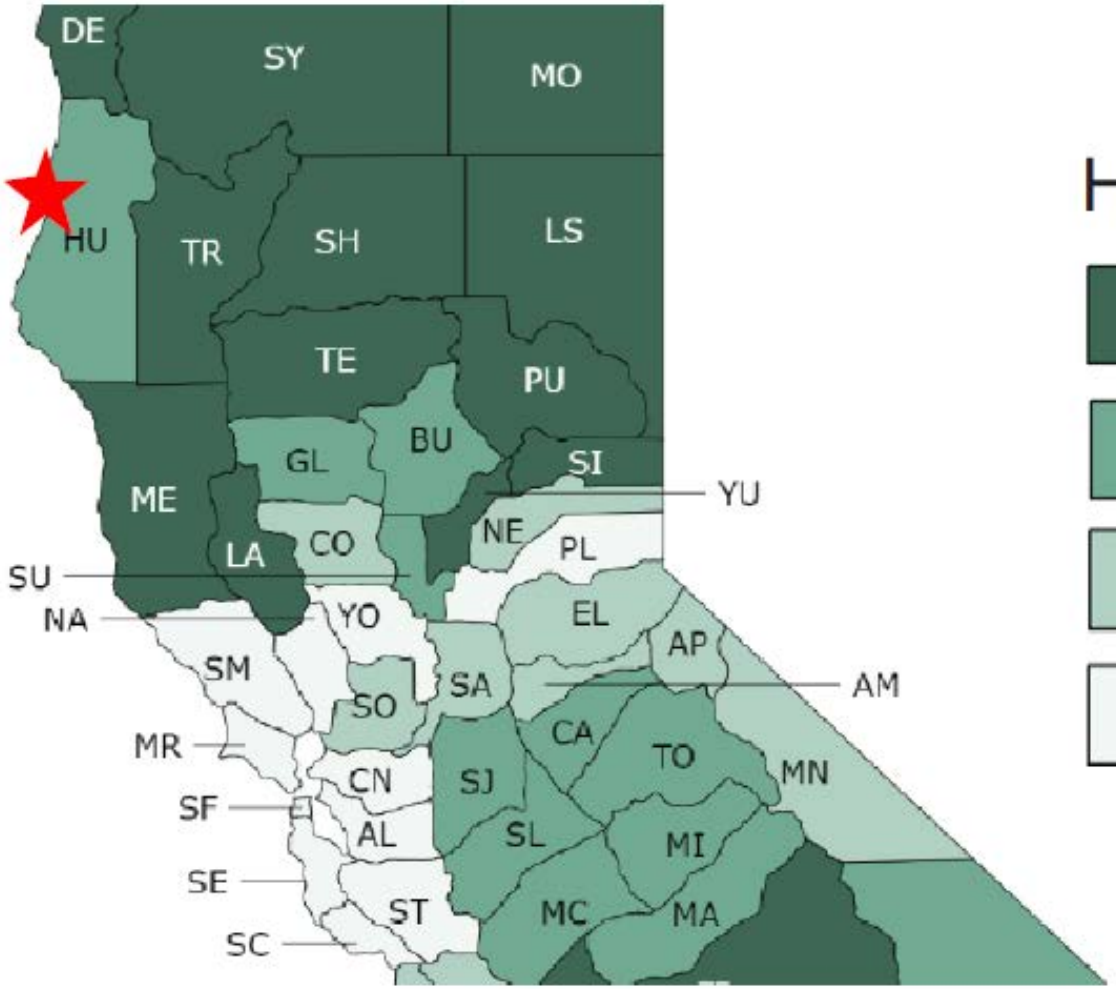
Unique features of our program

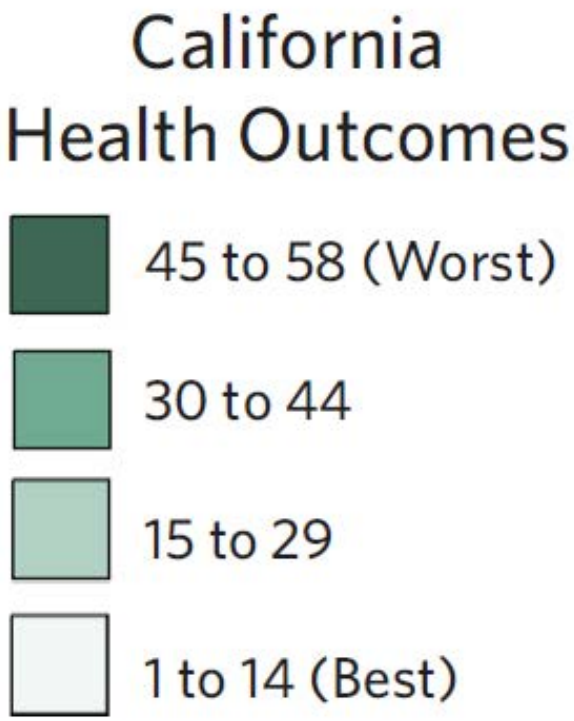


Providence
St. Joseph Hospital

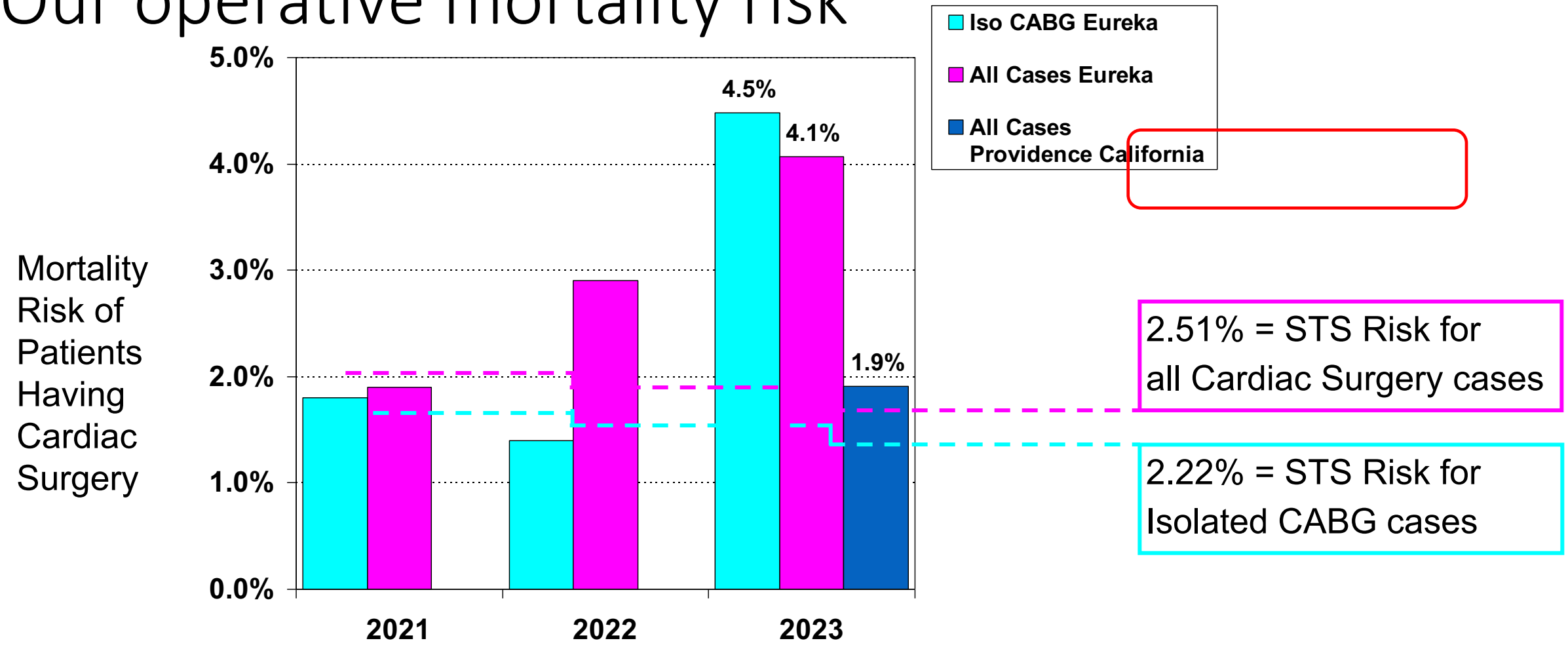
OPERATING ROOM EXTUBATION AT A REMOTE COMMUNITY PROGRAM

Unique features of our program





Our operative mortality risk



Our mortality

Risk Adjusted Report 10/18/2023

The Society of Thoracic Surgeons

All Procedure Risk-Adjusted Data Summary
Participant: 31137
STS Period Ending Jun 2023

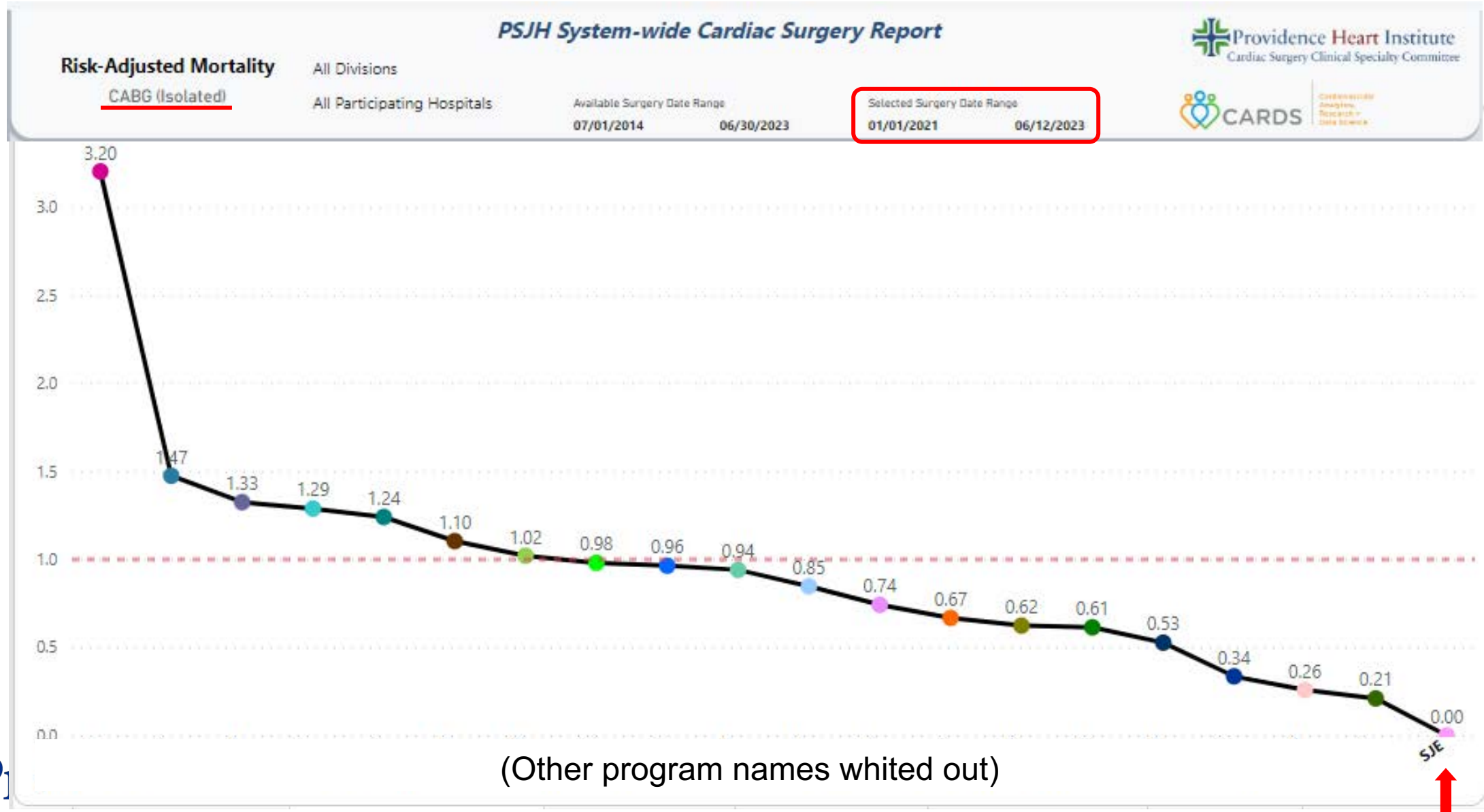
Mortality Risk-Adjustment

Outcome		My Site 2021	My Site 2022	My Site 2023*	Like Group 2023	Region 2023	STS 2023
In-hospital Mortality	OR (95% CI)	0.90 (0.36-2.28)	0.84 (0.33-2.15)	0.91 (0.38-2.18)	1.52 (1.37-1.68)	-	1.00
	O/E (95% CI)	0.00 (0.00-7.32)	0.00 (0.00-5.20)	0.00 (0.00-6.29)	1.22 (1.16-1.30)	-	1.00
	Risk-adjusted Rate	0.00%	0.00%	0.00%	2.33%	-	1.90%
Operative Mortality	OR (95% CI)	0.89 (0.38-2.08)	0.83 (0.35-1.94)	0.90 (0.39-2.08)	1.51 (1.38-1.66)	-	1.00
	O/E (95% CI)	0.00 (0.00-5.69)	0.00 (0.00-4.08)	0.00 (0.00-4.80)	1.20 (1.15-1.28)	-	1.00
	Risk-adjusted Rate	0.00%	0.00%	0.00%	2.99%	-	2.47%

OR = Odds Ratio; O/E = Observed-to-Expected Ratio; CI = Confidence interval; ** represents a partial year*

Providence St. Joseph Hospital

Our system ranking

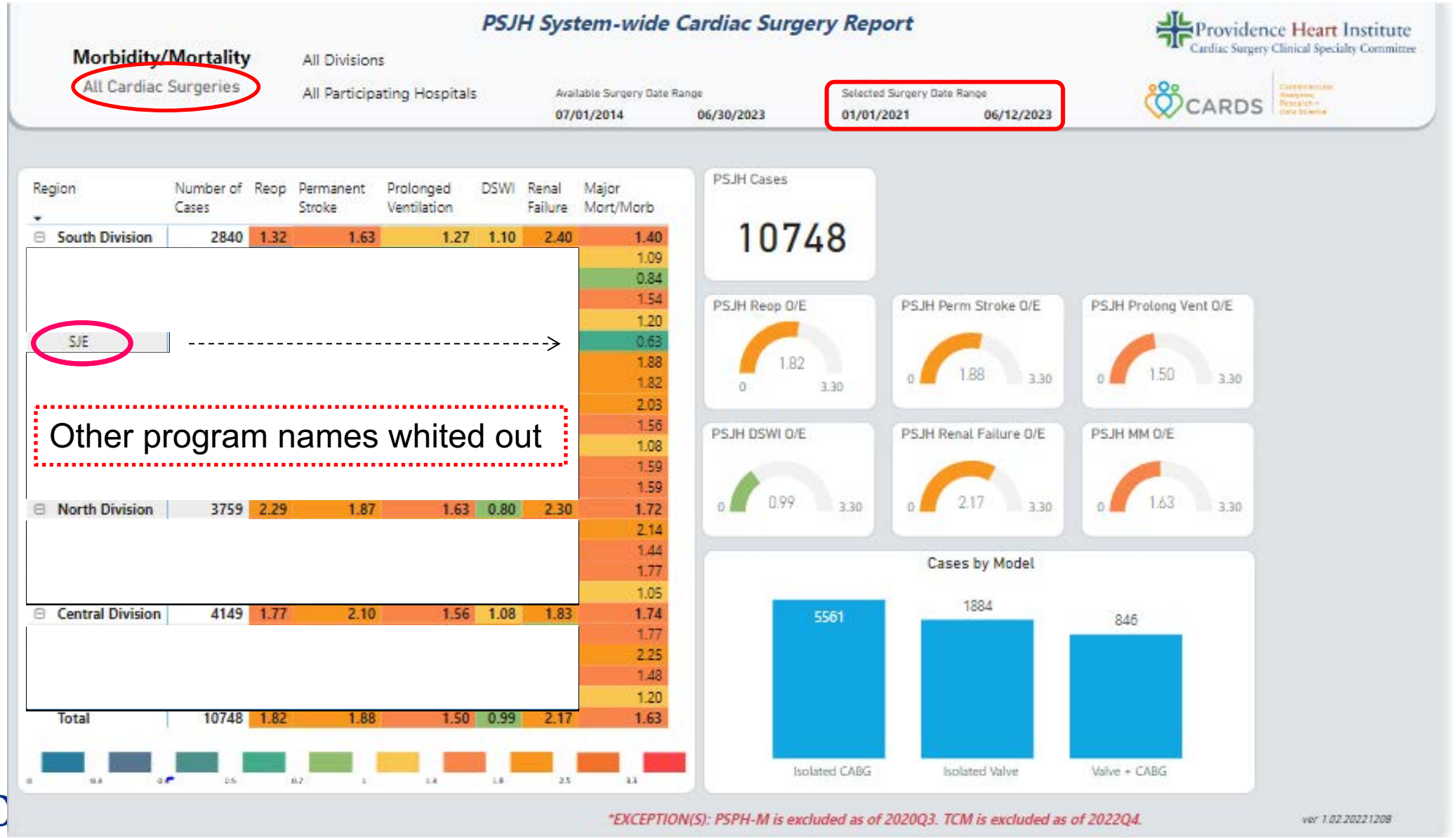


(Other program names whited out)

St. Joseph Hospital

OPERATING ROOM EXTUBATION AT A REMOTE COMMUNITY PROGRAM

Our system ranking



Unique features: multiarterial grafting with CABG

Risk Adjusted Report 10/18/2023

	My Site 2020*	My Site 2021	My Site 2022	My Site 2023*	Like Group 2023	STS 2023
% of patients with multiple arterial grafts	-	52.38%	43.75%	40%	13.35%	15.68%
IMA Used	-	100%	100%	100%	99.53%	99.61%
Left	-	90.47%	87.50%	60%	90.76%	90.60%
Right	-	-	-	-	0.42%	0.36%
Both	-	9.52%	12.50%	40%	6.91%	7.09%
Missing	-	-	-	-	0.02%	0.02%
Radial Artery Used	-	42.85%	37.50%	-	7.95%	10.16%

Unique features: multiarterial grafting with CABG

LETTER TO EDITOR | ARTICLES IN PRESS

BRIDGING THE GAP BETWEEN VOLUME AND QUALITY IN MULTIARTERIAL GRAFTING

north of the San Francisco Bay Area, within a region with the worst health outcomes in the state.

Over the past 3 calendar years, our program, which performs fewer than 100 cardiac cases annually, has utilized multiple arterial grafts in 20 patients (47.6%; 40%-52% yearly), with bilateral internal mammary artery grafts in 6 (14.3%) and radial artery grafts in 15 (35.7%). We attribute our consistent 0:2.1 coronary artery bypass grafting observed vs expected mortality ratio and 0:15.6 STS observed vs expected morbidity ratio to our cohesive team. Indeed, we suggest that our team's familiarity with multiarterial grafting in the urgent/elective setting has facilitated a successful outcome in at least 1 emergent patient,[3] compared with centers that might utilize a second arterial graft only when facing a venous conduit shortage.[4]

Fellowship funds Dominic C. Regli.

DISCLOSURES

The authors have no conflicts of interest to disclose.

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REFERENCES

1. Saadat S, Habib R, Engoren M, et al. Multiarterial coronary artery bypass

ARTICLE IN PRESS

Bridging the Gap Between Volume and Quality in Multiarterial Grafting

TO THE EDITOR: We welcomed the detailed analysis in *The Annals* of multiarterial coronary bypass grafting in the United States,[1] appearing 7 years after publication of The Society of Thoracic Surgeons Clinical Guidelines.[2] The authors' conclusions regarding outcomes at low-volume institutions, however, were resoundingly con-

"little correlation between total institutional coronary artery bypass grafting case volumes and multiarterial cases (R^2 – 0.282) [Figure 2]". With larger proportions of multiarterial grafting procedures apparently performed at lower volume centers, we propose to the authors that another objective would be the enhanced adoption of multiarterial grafting at higher volume centers.

FUNDING
The Providence St. Joseph Hospital Foundation Summer Research Fellowship funds Dominic C. Regli.

DISCLOSURES
The authors have no conflicts of interest to disclose.

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Unique features: Operating room extubation

When: January 2021

Why: Program revamping under new surgical leadership

How: Our first patient was an isolated 2-vessel CABG with good LV function. Collaboration with our 3 cardiac anesthesiologists* (* we're recruiting!) and our world-class perfusionist.

I am struck by 3 themes within this opinion piece that I find of particular importance. First, OR extubation in the appropriate patient is safe, and possibly beneficial. Second, the authors' emphasis on the multidisciplinary effort to accomplish the task should be lost on no one. The necessity to work together as a team of surgeons, anesthesiologists, perfusionists, and other, is appropriately highlighted. Finally, as the evidence continues to build that OR extubation in the right patient is an improvement in care, the authors challenge all of us to do more of it and lay out the tenets required to do so, safely. They should be commended. As we have done in the past (eg, with mitral valve repair), multiarterial grafting, transcatheter aortic valve replacements, and now, as trumpeted in this article, OR extubations, cardiac surgery should embrace every effort to improve what we do, regardless of its "inconvenience."

Glenn J. R. Whitman, MD

Implementing operating room extubation (ORE)

How: Collaboration with our 3 cardiac anesthesiologists* (* we're recruiting!) and our world-class perfusionist.

Perfusion fluid management:

- Short pump circuit length
- Retrograde autologous priming
- Hemoconcentration
- Rewarming

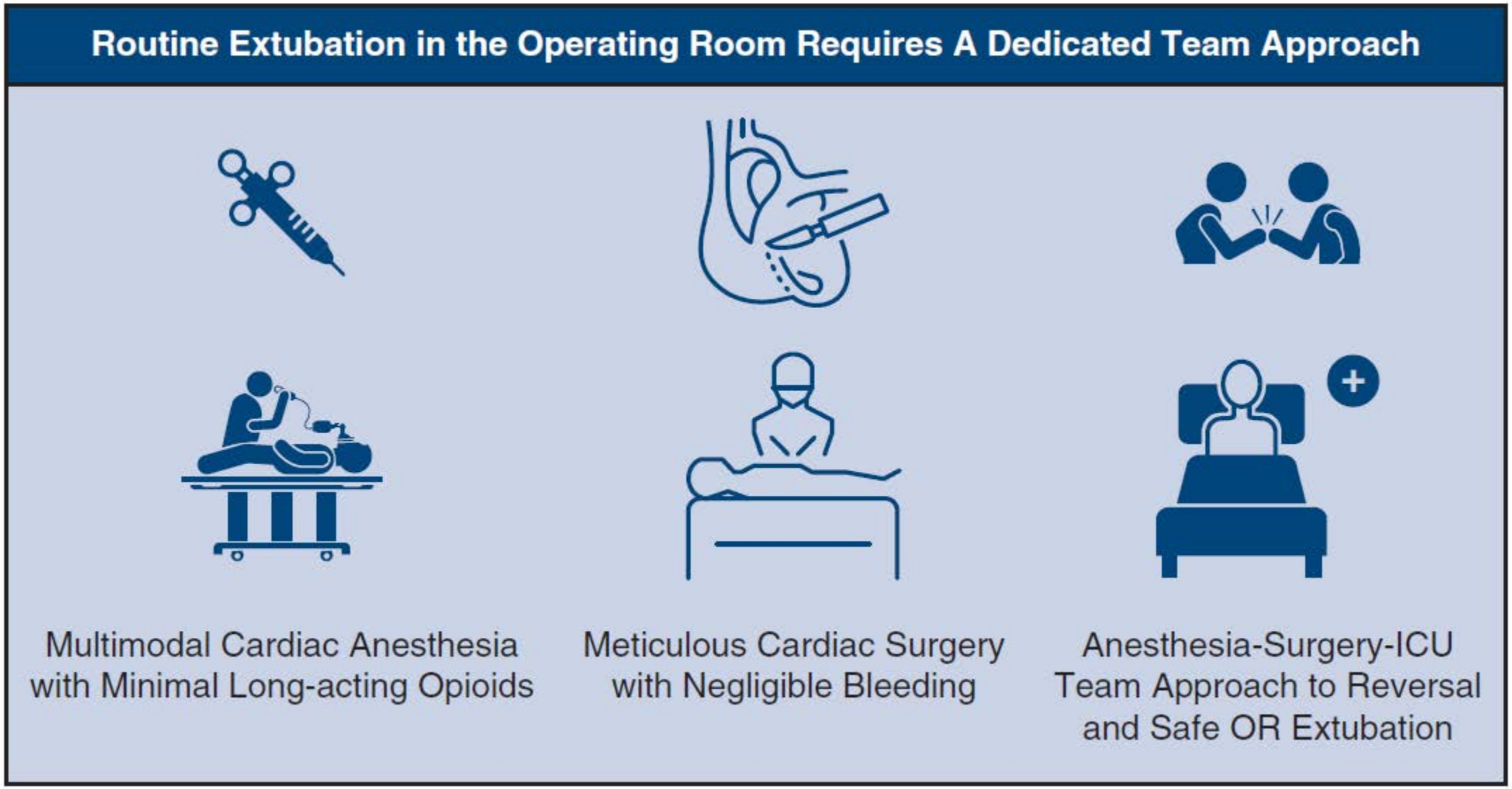
I am struck by 3 themes within this opinion piece that I find of particular importance. First, OR extubation in the appropriate patient is safe, and possibly beneficial. Second, the authors' emphasis on the multidisciplinary effort to accomplish the task should be lost on no one. The necessity to work together as a team of surgeons, anesthesiologists, perfusionists, and other, is appropriately highlighted. Finally, as the evidence continues to build that OR extubation in the right patient is an improvement in care, the authors challenge all of us to do more of it and lay out the tenets required to do so, safely. They should be commended. As we have done in the past (eg, with mitral valve repair), multiarterial grafting, transcatheter aortic valve replacements, and now, as trumpeted in this article, OR extubations, cardiac surgery should embrace every effort to improve what we do, regardless of its "inconvenience."

Glenn J. R. Whitman, MD

Patients should be extubated in the operating room after routine cardiac surgery: An inconvenient truth

Heather K. Hayanga, MD, MPH,[a] Matthew B. Ellison, MD,[a] and Vinay Badhwar, MD[b]

JTCVS Techniques 2021;8:95-9



Implementing operating room extubation (ORE)

Perfusion fluid management:

- Short pump circuit length
- Retrograde autologous priming
- Hemoconcentration
- Rewarming

More from Dr. Jeffrey Johnston

Nursing & RT coordination:

- Communication is everything

> Once OR extubation has been established as a routine, the intubated patient arriving to the ICU will become a rarity. Nursing, allied health, respiratory therapy, and intensivists will all become aligned with OR extubation expectations and management protocols (Figure 1). Finally, and to the program's benefit, patients, their families, and their referring providers will come to expect this growing standard of quality care in cardiac surgery.

Rapid ORE generalization beyond isolated CABG

Our approach quickly became:
All cardiac surgical patients are treated as candidates for operating room extubation.

Early extubation after cardiac surgery: The evolution continues

Hilary P. Grocott, MD, FRCPC, FASE

From the Department of Anesthesia, University of Manitoba, Winnipeg, Manitoba, Canada.

The characteristics are in some respects very obvious (eg, younger age and simpler operation); however, one can easily make the argument that all patients, irrespective of the procedure or the patient characteristics, should be treated right from the start as if they can be extubated in the operating room. The decision to extubate patients should likely be made once the operation is nearing completion, in part informed by the overall success of the operation. The many nuances and complications

Evaluating our ORE experience

We reviewed all 66 patients from 1/2021 – 3/2023 with:

- STS Predicted Risk of Mortality scores
- No exclusions for emergent or preoperative IABP patients
- Compared Isolated CABG vs Valve/Valve+CABG pts
- Univariate predictors of successful operating room extubation

Results: ORE successful in 88% of patients (58/66)

- No reintubations
- 0% Operative mortality
- 0.56 Observed/Expected STS morbidity

Results: Isolated CABG vs Valve/

Group Comparison	Isolated CABG (n=43, 65%)	Valve/Valve+CABG (n=23, 35%)
Age (mean; %≥75 yrs)	67.7; 24%	63.9; 26%
Sex (% female)	22.2%	43.5%
Surgical Timing (% urgent/emergent)	80.0%	52.2%
Ejection Fraction (EF) (mean; % ≤40%)	49.9; 24.4%	56.3; 17.4%
STS Predicted Operative Mortality Risk (PROM)	2.1%	3.6%
STS Predicted Prolonged Ventilation Risk	11.7%	15.9%
Operating Room Extubation	90.7%	82.6%

2017

- n = 354
- Multiple operation types
- 76% elective
  24% urgent
- 55% EF
- 0.7% STS pred mortality risk
- 4.9% STS prolong vent risk

Predictors:
Younger age, elective status
Isolated CABG
Lower BMI, higher albumin,
No chronic lung, No DM

Results: Univariate predictors of ORE success

Paradoxical:

- Higher age
- Lower ejection fraction
- Higher STS predicted risk of mortality

Our explanation: Extubation in the operating room was based primarily on ability to oxygenate and ventilate, irrespective of age, ejection fraction, STS PROM, etc.

Conclusions

1) Our operating room extubation experience:
   - First reported from a remote community program
   - Demonstrated that ORE can be successfully and safely undertaken in centers with smaller case volumes
   - Higher proportions of challenging risk patients than any reported ORE series
2) ORE anesthesia management for isolated CABG was readily transferable to Valve/Valve+CABG patients
3) Success with ORE accompanied program achievements in mortality and morbidity

PreOp Considerations

- OSA History
  - Assessment- STOP BANG score
  - Sleep Study
  - CPAP Compliance
- COPD, Pulmonary Dz, or Previous Thoracic Surgery
  - Optimized by Pulmonologist
  - Home O2 vs bronchodilators
  - PFTs helpful
  - Room air ABG

	Analyzed variable	Question to be asked/examination findings
S	Snoring	Do you Snore Loudly? Louder than talking or loud enough to be heard through a closed door?
T	Tiredness	Do you often feel Tired? Do you sleep during the daytime?
O	Observed apnea	Has anyone observed you stop breathing during sleep?
P	Pressure	Do you have high blood pressure?
B	BMI	BMI > 35 kg m^{-2}
A	Age	Over 50 years
N	Neck	Circumference >40 cm
G	Gender	Male

High risk for OSAS: ≥3 positive responses.
Low risk for OSAS: <3 positive responses.

Providence

PreOp Considerations

- Obesity
  - Anticipated Difficult Airway
  - Diminished FRC, will desaturate quickly
  - Likely require BiPAP in ICU
- ESRD
  - Recent Dialysis
  - Strict Fluid management

IntraOp Considerations

- Opiate Management
  - Controversial in our group (3 anesthesiologists have 4 different opinions)
  - Conversative opiate management
    - Maximum Fentanyl 500-600mcg during the case
    - Small doses of long acting opiates during closure
      - Dilaudid 0.4mg IV
      - Morphine 0.1mg/kg IV
- Non-Opiate Management
  - IV Acetaminophen during closure
  - Precedex gtt
  - +/- Local anesthesia (parasternal and intercostal ropivacaine by surgeon)

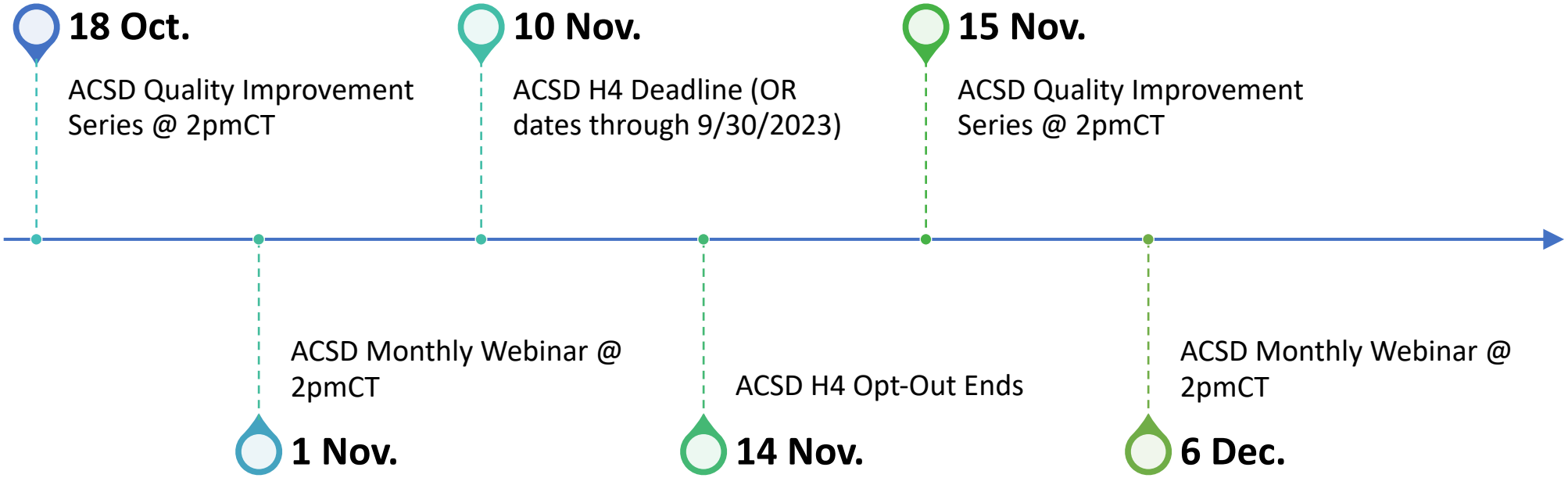
Planned Extubation

- Sugammadex for complete reversal
- Start SBT/Pressure Support once chest is closed
- Titrate additional opiates for tachypnea
- Tidal Volumes acceptable with low pressure support
- Low pressor requirement
- Normothermic
- No evidence of pulmonary congestion in ETT
- Gastric contents suctioned with OG

Extubation

- Small Precedex gtt (0.5mcg/kg/hr) allows patients to follow simple commands (“deep breaths” or “arms down”), but avoids agitation during transfers to ICU
- RT and BiPAP on standby in ICU
- Nasal airways helpful
  - RT and Nurses are afraid of oral airways with BiPAP
- ICU nurses (like those in PACU) should be comfortable with patient extubated deeply
  - i.e. Jaw thrust or mask ventilation skills if needed.

Important Dates for Adult Cardiac



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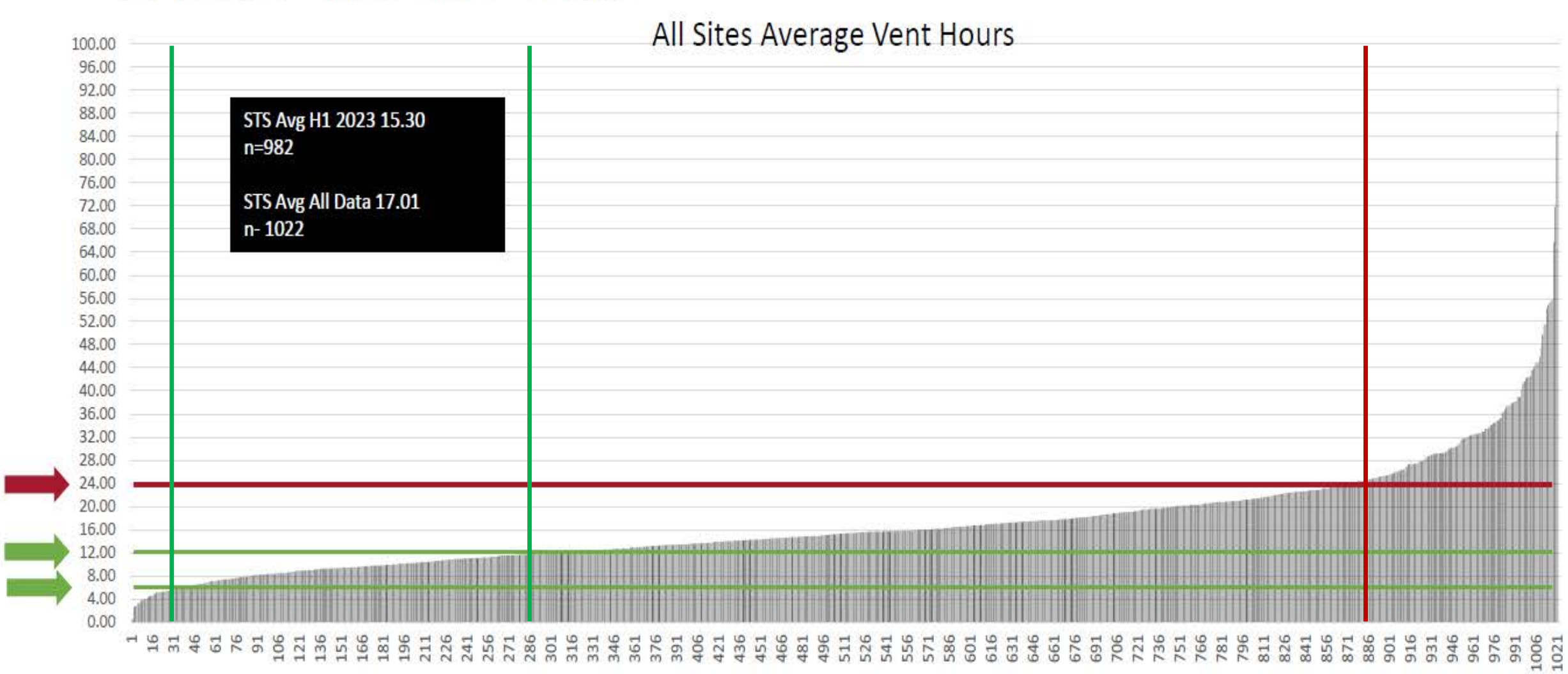
Where we WERE at… Harvest 1 2023

Isolated CABG – ProcID 1



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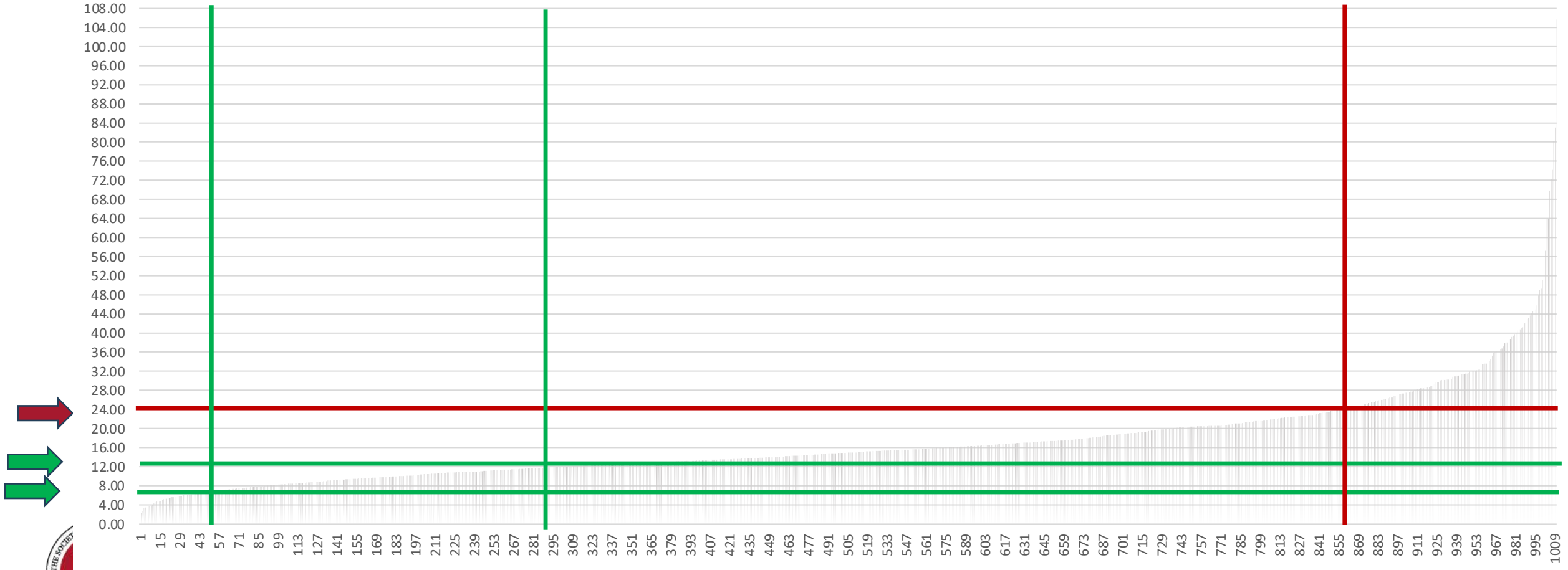
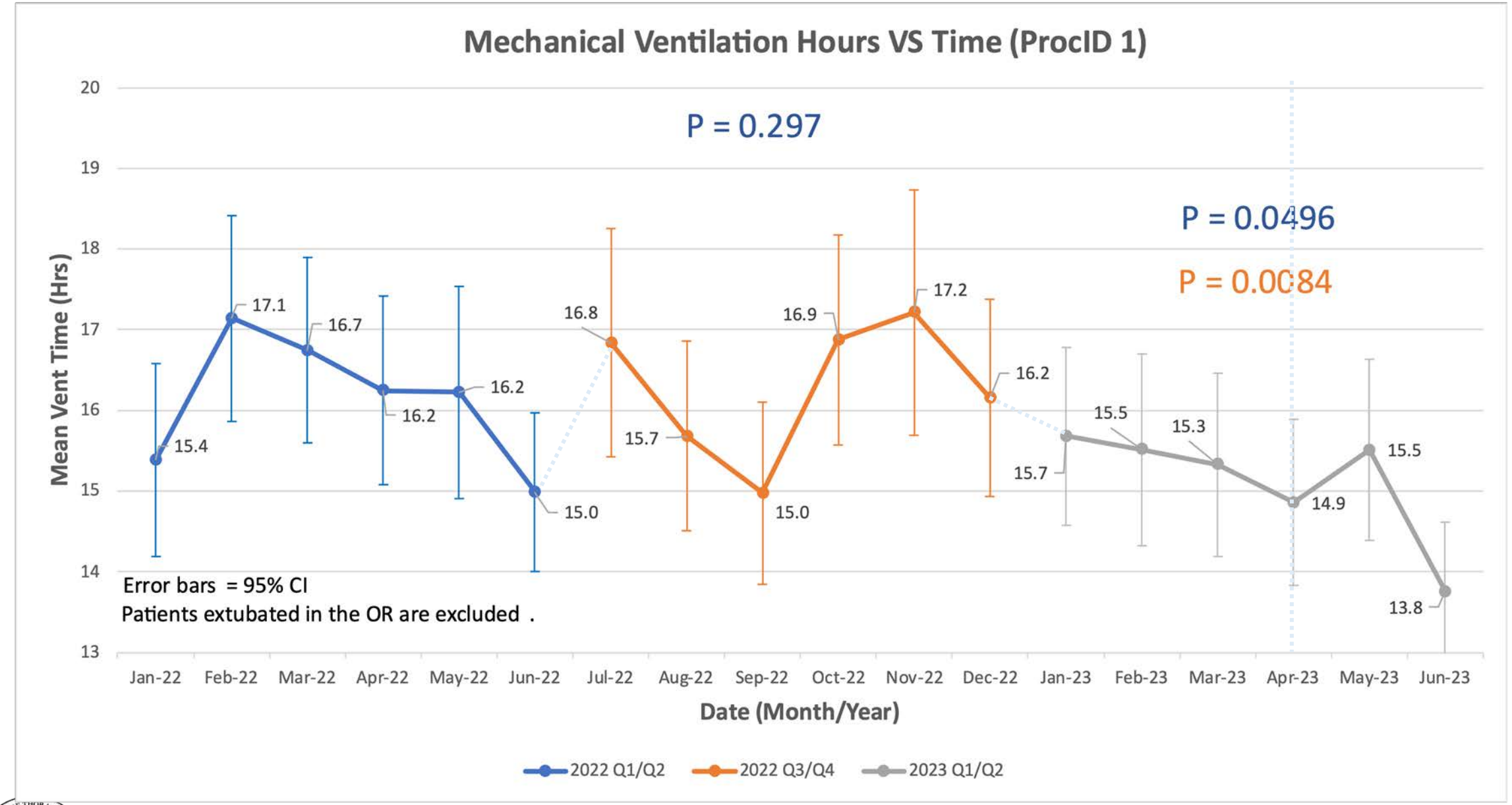
ProcID 1
STS Avg H3 – 14.42 (15.30 H1)
927 sites
n = 449053

All Avg STS Data =
17.11
1011 sites
n = 459061

Where we are at for H3 2023

Avg Vent Time

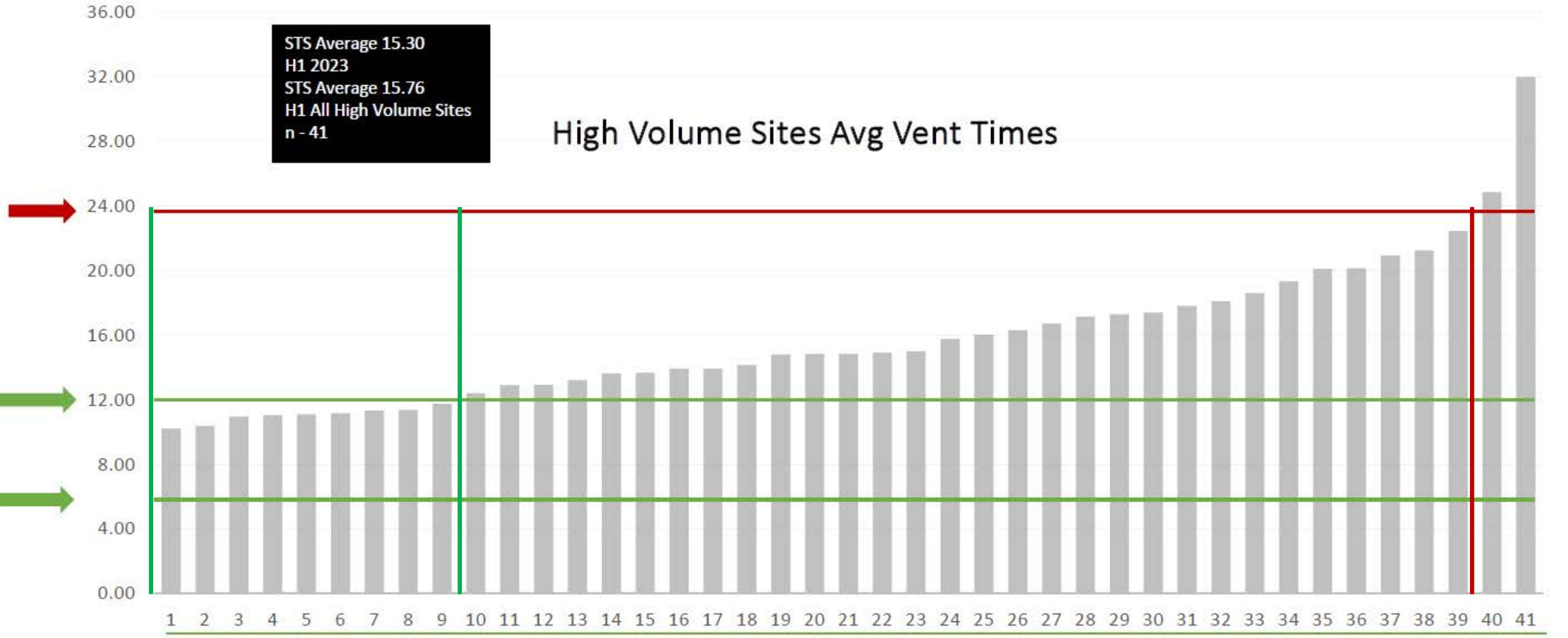




P values shown on the graphs reflect results of difference in difference analysis comparing slopes across the three six month time frames (2022 Q1/Q2, 2022 Q3/Q4, and 2023 Q1/Q2)

Where we were at…

Isolated CABG Case Volume for 36-month analytic window
High Volume – 1200 or more
Moderate Volume – 600-1199
Low Volume – 0-599

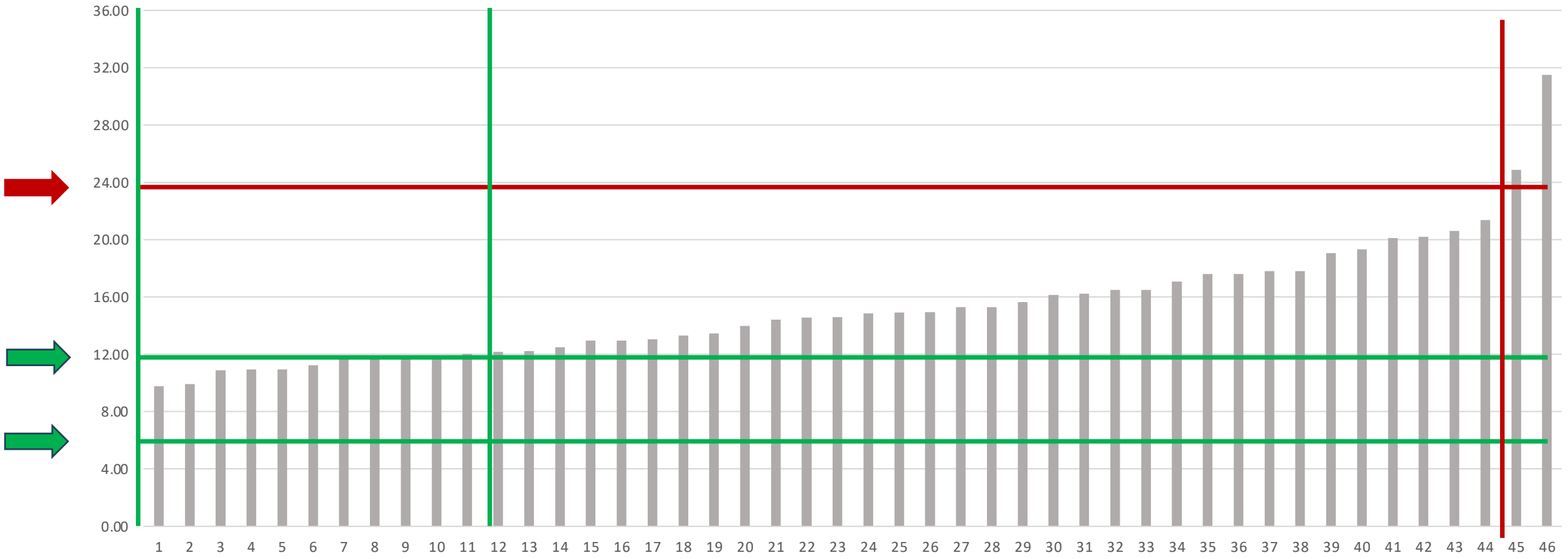


High Volume Sites Avg Vent Time

n = 77688
Participants: 46

Isolated CABG Case Volume for 36-month analytic window
High Volume – 1200 or more
Moderate Volume – 600-1199
Low Volume – 0-599

Where we are at…



Where we were at…

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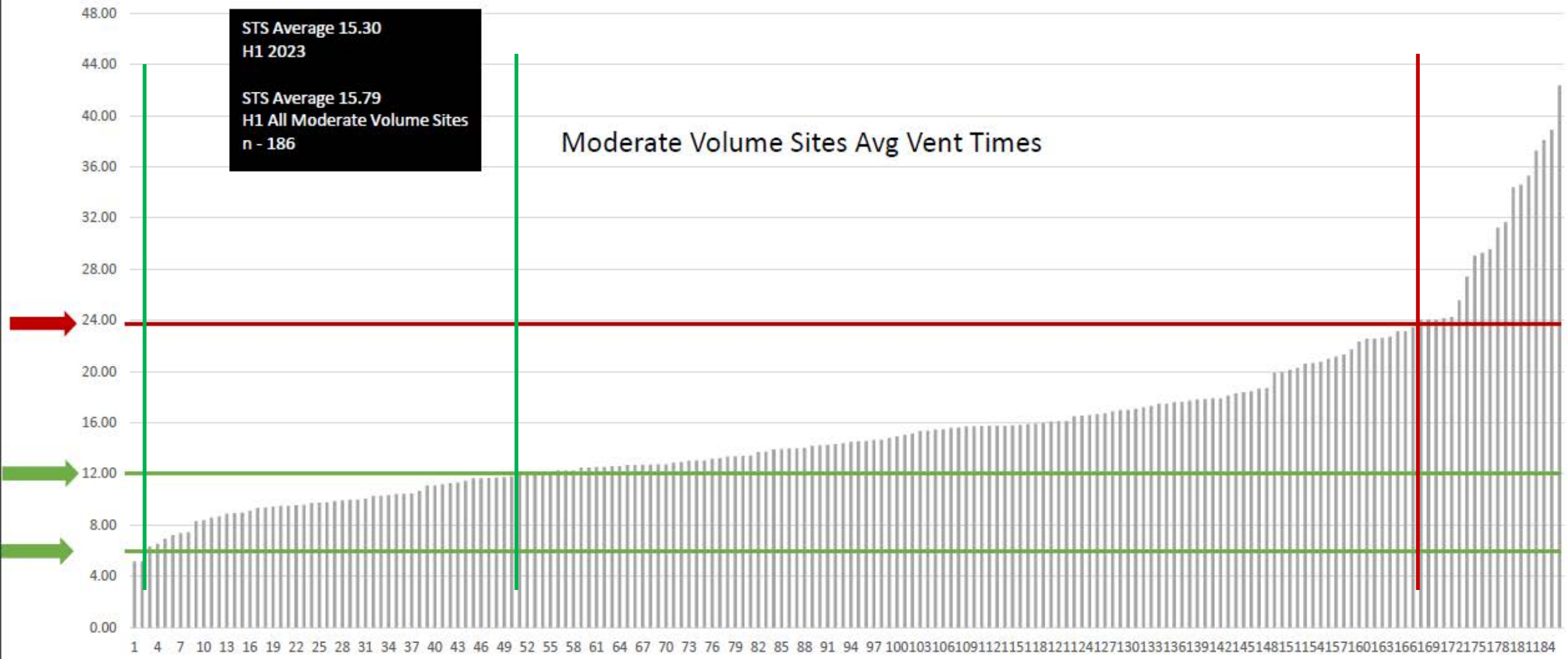
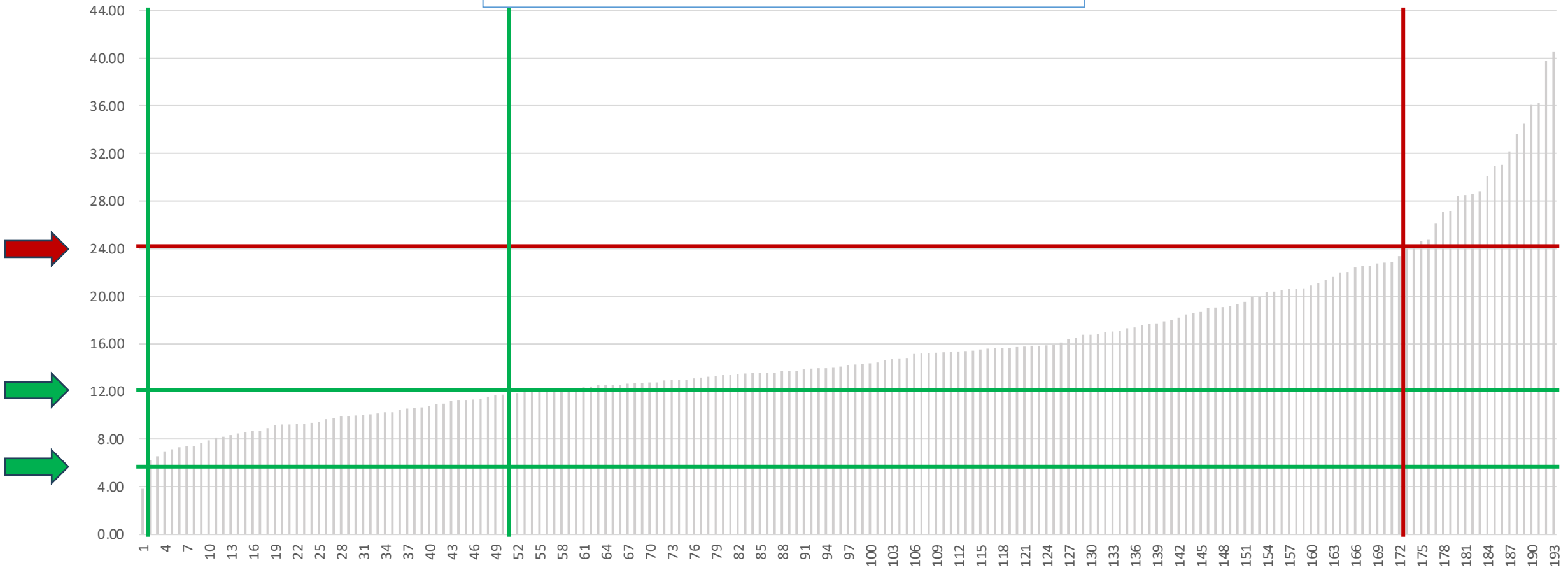


Moderate Volume Sites Avg Vent Times

n = 155625
Participants: 193

Isolated CABG Case Volume for 36-month analytic window
High Volume – 1200 or more
Moderate Volume – 600-1199
Low Volume – 0-599

Where we are at…



Where we were at…

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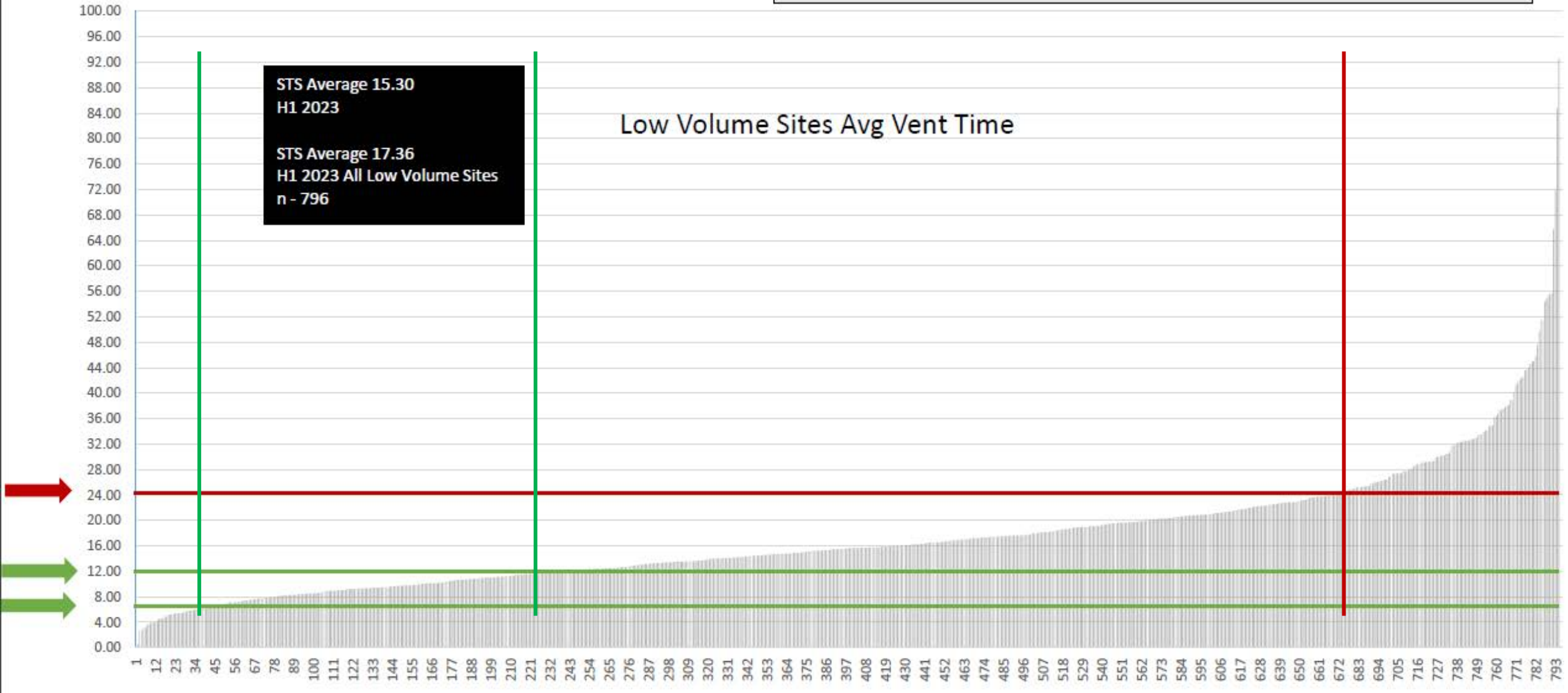
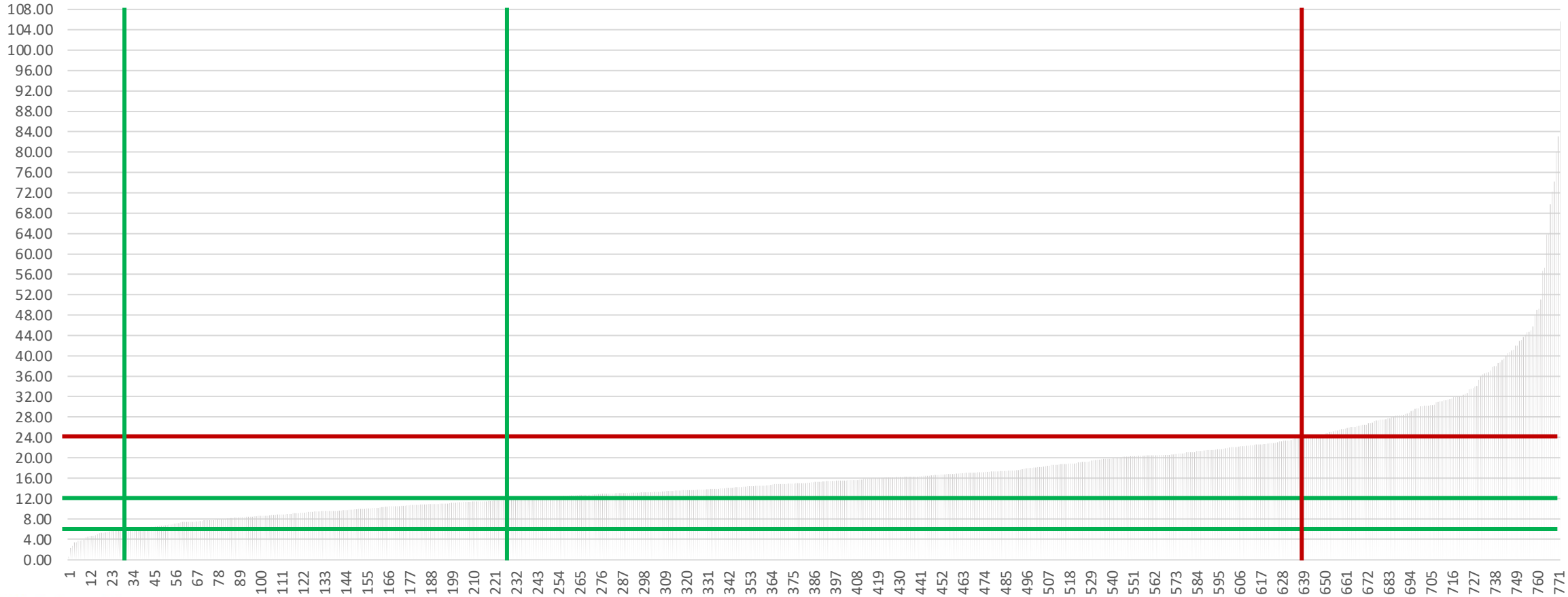


Low Volume Site Avg Vent Times

Isolated CABG Case Volume for 36-month analytic window
High Volume – 1200 or more
Moderate Volume – 600-1199
Low Volume – 0-599

n = 225724
Participants = 772

Where we are at…



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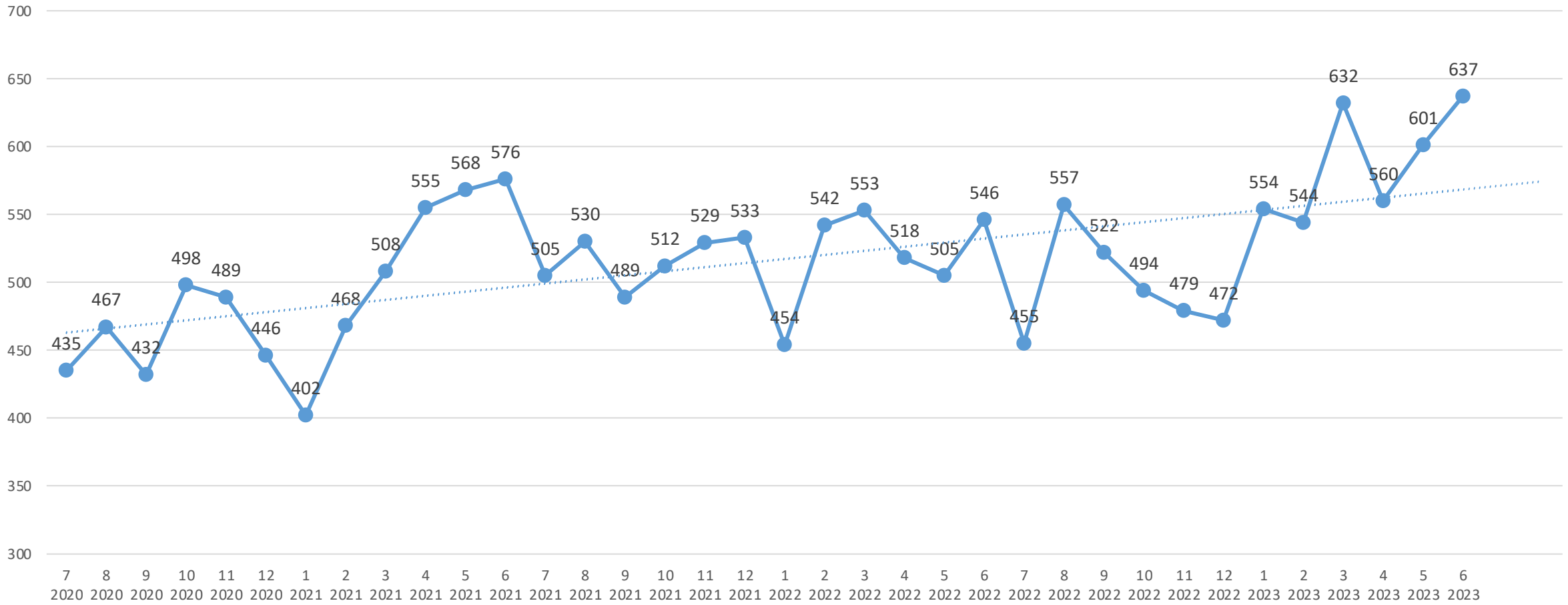
Extubated in OR Case Counts – ProcID 1



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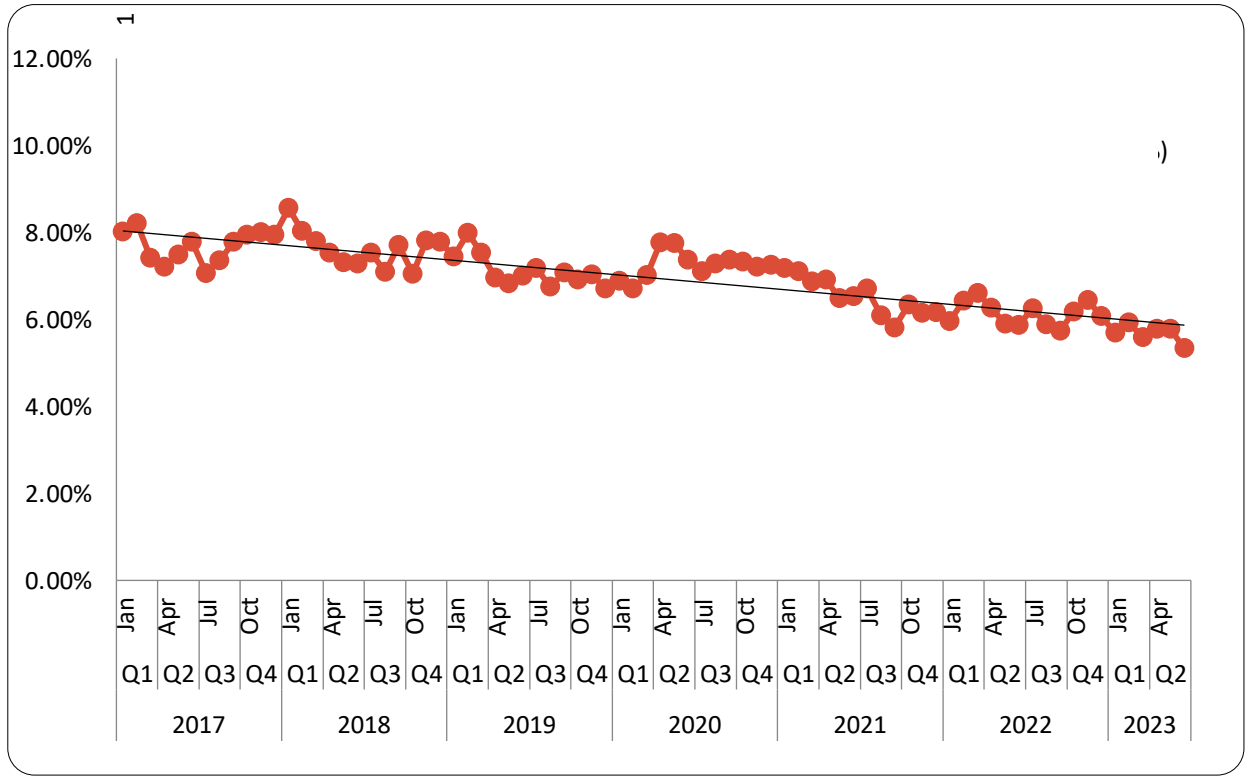
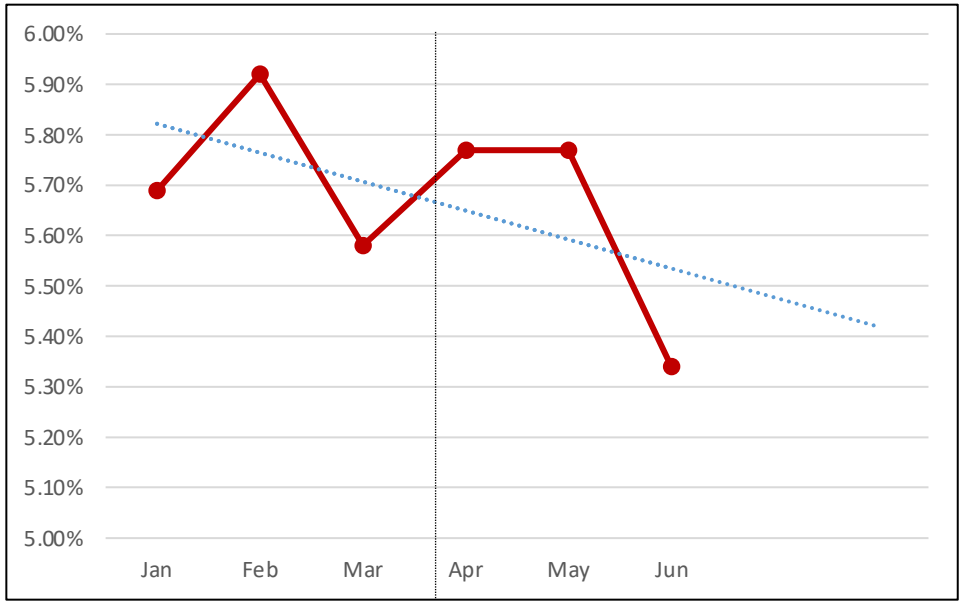
Prolonged Vent – STS AVG ProcID 1



2023					
Q1			Q2		
Jan	Feb	Mar	Apr	May	Jun
5.69%	5.92%	5.58%	5.77%	5.77%	5.34%



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  - IQVIA/Database Platform Questions (Uploader, DQR, Missing Variable, Dashboard, Password and Login)

Open Discussion

Please use the raise-hand function.

Please use the Q&A Function.

We will answer as many questions as possible.

We encourage your feedback and want to hear from you!