Society of Thoracic Surgeons
Adult Cardiac Surgery Database

Quality Improvement Series:
Decreasing Vent Times

NorthShore University HealthSystem
Evanston Hospital

September 20, 2023
Agenda

Welcome and Introductions

STS Updates

NorthShore University HealthSystem
Important Dates for Adult Cardiac

- **20 Sep.**  
  ACSD Quality Improvement Series - NorthShore University HealthSystem - Evanston

- **28 Sep.**  
  AQO ACSD ALL DAY!!!

- **26–29 Sep.**  
  AQO Starts!!

- **28 Sep.**  
  ACSD Monthly Weinbar @ 2pmCT  
  Beta Blocker Project

- **4 Oct.**  
  ACSD Monthly Webinar @ 2pmCT  
  Preparing for Harvest Close

- **18 Oct.**  
  ACSD Quality Improvement Series @ 2pmCT  
  Current Status of STS ACSD Vent Times H3 2023

- **10 Nov.**  
  ACSD H4 Harvest Close  
  OR Dates through September 30, 2023

- **15 Nov.**  
  ACSD Quality Improvement Series @ 2pmCT  
  Topic TBD

- **14 Nov.**  
  ACSD H4 Opt-Out Ends
STS Updates

AQO Platform is Now OPEN!

H3 data is in Analysis

Still In-Hospital Patients
STS ACSD Data Drives Quality Improvement and Furthers Research
Decreasing Intubation Time for Cardiovascular Surgery

Hyde M. Russell, MD Chief, Division of Cardiac Surgery

Hannah Whitney RN AACC CV Surgery Quality Manager

Valerie Reed, MSN, AG ACNP-BC, CCRN

Steven Greenberg, MD, FCCP, FCCM Chair of Anesthesiology
Research and Education

Noah Ben-Isvy BS Research Assistant, Department of Anesthesia
STS Adult Cardiac Surgery Database Drives Quality Improvement Valuable Source of Validated Data

Hyde M. Russell, MD, FCCP, FCCM
Chief, Division of Cardiac Surgery
NorthShore University HealthSystem
Clinical Professor, Department of Surgery University of Chicago
Cardiovascular Institute NorthShore University HealthSystem

Cardiac Surgery performed at both Evanston Hospital & Highland Park Hospital

Team covers both hospitals

4 Cardiac Surgeons 2 APNs 5 PAs 6 Perfusionists

Evanston Hospital

17 Operating Rooms 2 Heart Rooms 1 Hybrid Room
165 Annual Case Volume 2022
60 isoCAB 20 MVRR 15 isoAVR 20 isoValve+Valve/CAB+Valve
50 Other In 2022: 22 Aortic Procedures (includes 9 dissections) 13 AVRs+other
Does NOT include TVT procedures, LVAD or ECMO
STS Adult Cardiac Surgery Database Drives Quality Improvement

1. CV Surgery STS Iso CAB Quarterly Summary
2. CV Surgery M&M Review Report qtr
3. CV Surgery STS ACSD RA Dashboard qtr
4. CV Surgery Quality Initiatives
   - MVRR Appropriateness Audit annually
   - Monitoring Aortic Dissections
   - Identify EMR and documentation issues
5. Research
CV Surgery ICU Handoff &
ICU Nurse-Driven Spontaneous Awakening Trial (SAT) and Spontaneous Breathing Trial (SBT)

Valerie Reed, MSN, AG ACNP-BC, CCRN
CV Surgery
Participants: CV Surgery, Anesthesia, Critical Care, ICU RN, Perfusion, Respiratory

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- Patient Name / Height / Weight
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RN to clarify any questions/concerns prior to termination of huddle

* Plan A: “Fast track”
  Plan B: “Delayed” or “Other”

02/2023
ICU Nurse-Driven Spontaneous Awakening Trial (SAT) and Spontaneous Breathing Trial (SBT)

Guideline SAT safety screen must be performed daily between 0500 and 0800am

**SAT Safety Screen**
- Sedation for active seizures or ET/IOH withdrawal
- Patient is requiring escalating doses of sedation d/t RASS ≥ +2
- Patient is on neuromuscular blockers
- If monitoring ICP, ICP ≥ 30mm/Hg
- Patient is on FiO2 > 60% and/or PEEP ≥ 10
- Patient is on target temperature management
- Patient is requiring high and/or escalating doses of vasopressors
- Patient is on ECMO
- There is evidence of acute cardiac ischemia without revascularization within past 24 hours
- Patient has planned surgical or other invasive procedures today requiring continuation of mechanical ventilation

**SAT Trial**
- STOP ALL sedation (propofol, lorazepam, midazolam)
  - RASS < +2
  - RR > 35 and < 15, and/or no signs of respiratory distress (defined as two or more of the following: use of accessory muscles, abdominal paradoxus, diaphoresis, marked subjective dyspnea)
  - SpO2 ≥ 90%
  - No evidence of acute cardiac arrhythmia
  - Heart rate 50-120
  - If remains sedated after 30min of SAT, discuss opioid dose adjustment with provider

**SBT Safety Screen**
- Patient is on FiO2 ≤ 60%, and PEEP < 10
- There is evidence of spontaneous inspiratory effort

- Restart sedation at 50% of the previous dose
- Titrate to meet ordered RASS goal
- Document reason for failed SAT
- Discuss alternatives for sedation
ICU Nurse-Driven Spontaneous Awakening Trial (SAT) and Spontaneous Breathing Trial (SBT) cont.

**SBT Safety Screen**
- Patient is on FiO2 < 60% and PEEP < 10
- There is evidence of spontaneous inspiratory effort

**YES**

**SBT Trial**
- Ask RT to place patient on ordered SBT trial settings (recommended SBT is PS 5-8). Plan trial for 30-120 minutes.
  - Respiratory Rate: 10-30/min, SpO2 ≥ 90%
  - No acute cardiac arrhythmia
  - No signs of respiratory distress
  - No abrupt mental status changes
  - No cough, gag
  - No excessive secretions
- RT to obtain weaning parameters & document. If within normal range, proceed.

**NO**
- Discuss with provider if SBT trial should be performed and when to re-screen
- Place patient on previous vent settings (or comfortable level of pressure support determined by provider)
- Document failed SBT
- Discuss with provider when to re-screen

**Restart sedation at 50% of the previous dose**
- Titrate to meet ordered RASS goal
- Document reason for failed SAT
- Discuss alternatives for sedation
Residual Neuromuscular Blockade
& Cardiac Surgery

Steven Greenberg, MD, FCCP, FCCM
Jeffery Vender Anesthesiology Chair of Research and Education
NorthShore University HealthSystem
Clinical Professor, Department of Anesthesia & Critical Care,
University of Chicago
Mechanism/Types of Neuromuscular Blockers
Why Use Muscle Relaxants

Intraoperative: Cardiac Surgery

- Facilitates smooth endotracheal intubation
- Optimizes surgical operating conditions
- Prevent movement during high stimulation periods of surgery and upon transport to ICU

Typical Management of Neuromuscular Blockade at End of Surgery

• Most Surgeries:
  – Reverse NMB

  RISK: Lower
  Residual NMB

• Cardiac Surgery:
  – No reversal of NMB
  – Allow body to metabolize NMB on own

  RISK: Higher
  Residual NMB
Residual Neuromuscular Blockade: Current Definition

- Train of Four Ratio < 0.9

TOF ratio: The amplitude of the fourth twitch divided by that of the first. A decreasing train-of-four ratio indicates greater degrees of paralysis!
Residual Neuromuscular Weakness

- **Incidence: Up to 65%**
  - Depends on study design
  - Depends on definition of RNMB (0.7 vs. 0.9)
  - Method of measurement
  - Time of measurement
  - Type and dose of NMBD
  - Use of NM monitoring intraoperative
  - Degree of NM blockade
  - Type/Duration of anesthesia
  - Type/Dose of NMB reversal
  - Time interval between reversal & measurement of train of four.
  - Patient factors
  - Drug therapy perioperative period

Thilen S. *Anesthesiology* 2023; 138:13–41
Residual Neuromuscular Blockade: Clinical Studies

- **TOF < 0.9**
  - Increased risk of postoperative hypoxemia
  - Increased airway obstruction during PACU transport
  - Higher risk of critical respiratory events in PACU
  - Symptoms/signs of profound muscle weakness (w/longer acting NMB)
  - Delays in meeting PACU discharge criteria
  - Prolonged postop vent weaning/increased intubation time
  - Increased postoperative pulmonary complications:
    - **Cardiac Surgery Patient (VENICE)**

Methods To Reduce The Risk Of Residual Neuromuscular Blockade

• Use of short-acting NMBDs

• Quantitative neuromonitoring vs. Qualitative and Clinical tests

• Administration of NMB reversal drugs:
  – Sugammadex more effective with moderate or deep block in clinical studies vs. neostigmine (anticholinesterases) with less potential side effects!

Thilen S. Anesthesiology 2023; 138:13–41
Neuromuscular Reversal Agents

Two Primary Choices:

**Sugammadex:**
- Modified y-cyclodextrin that reverses NMB by encapsulating steroidal muscle relaxant
- **Advantages:** shorter time to reversal, more effective w/ mod-dense block, possible less tachycardia/HTN
- **Disadvantages:** cost, use only w/ aminosteroids, possible anaphylaxis/bronchospasm

**Neostigmine:** acetylcholinesterase inhibitor:
- Increase acetylcholine at NMJ to reduce prevalence of residual neuromuscular blockade
- Use quantitative NM monitoring to confirm recovery from NMB.

- Sugammadex is recommended for deep, moderate, and shallow levels of NMB induced by aminosteroids.

- Neostigmine is reasonable alternative for minimal blockade.

- Patients with adequate spontaneous recovery to TOF >0.9 with quantitative monitoring, do not require pharmacological antagonism.
Why The Retrospective Study?

• Recent data shows advantages to use of NMB reversal:
  – Shorter time to extubation
  – Reduction in ICU/Hospital length of stay

• No current studies to address association between NMB reversal use (sugammadex) and meeting STS extubation criteria of < 6 hours from end of surgery

• **Hypothesis:** Those STS defined urgent/elective cardiac surgical patients who received sugammadex vs. those that did not were more likely to be extubated w/in 6 hrs. of end of surgery

Bardia, A, Critical Care Explorations. 2022; 4:1-12
Original Article

A Retrospective Pilot Comparison Trial Investigating Clinical Outcomes in Cardiac Surgical Patients Who Received Sugammadex Reversal During 2018 to 2021

Steven B. Greenberg, MD,1,4†, Noah Ben-Izvy, BS,1,4†, Hyde Russell, MD,1 Hannah Whitney, RN,1 Chi Wang, PhD,1 Mohammed Minhaj, MD, MBA,1,3

1NorthShore University, HealthSystem, Evanston, IL, 2University of Chicago, Pritzker School of Medicine, Chicago, IL, 3University of Illinois at Urbana-Champaign, Urbana-Champaign, IL

Objective: To compare the number of eligible urgent and elective cardiac surgical patients who could be extubated successfully within 6 hours of surgery and who received sugammadex versus those who did not.

Design: This retrospective pilot study compared outcomes in cardiac surgical patients undergoing cardiopulmonary bypass between 2018 to 2021 who received sugammadex versus those who did not.

Setting: A tertiary-care hospital in the Northshore of Chicago.

Participants: A total of 358 elective or urgent cardiac surgical patients who underwent cardiopulmonary bypass (by 1 cardiac surgeon) and were extubated within 24 hours of the end of surgery at Evanston Hospital in Evanston, IL, were included.

Interventions: Data were examined in the following 2 groups of patients: those who were administered sugammadex and those who were not.

Measurements and Main Results: After performing propensity matching for age, sex, body mass index, kidney or liver disease, the number of preoperative conditions (defined as the sum of the presence of the following medical conditions: diabetes, immunosuppressive disease, on home oxygen, on intubated bronchodilator, or sleep apnea), number of patients who underwent elective or urgent surgery in each group, surgery time, cardiopulmonary bypass duration, number of intraoperative blood products, use of intraoperative midazolam and propofol, a statistically significant increase in the percentage of patients in the sugammadex group were extubated within 6 hours of the end of surgery versus those who did not receive sugammadex (96.67% vs 81.33%, p = 0.0028). In addition, there was a statistically significant reduction in time to extubation (hours) (4.72 ± 2.92) vs (3.57 ± 1.96 p = 0.0008) in the sugammadex group. All other outcomes did not meet statistical significance.

Conclusion: This retrospective study suggested that using sugammadex reversal in cardiac surgical patients undergoing cardiopulmonary bypass may result in more patients meeting the Society of Thoracic Surgery benchmark extubation criteria within 6 hours of the end of surgery.
A Retrospective Pilot Trial
Investigating Clinical Outcomes in Cardiac Surgical Patients Receiving Sugammadex During 2018-2021

**Research Problem:** Only some cardiac surgery patients receive sugammadex reversal following surgery

**Main Objective:** To understand whether there was a difference in clinical outcomes between sugammadex and no reversal groups

**Research Approach:** Conducted a retrospective analysis to answer the question regarding sugammadex reversal in cardiac surgical patients
A Retrospective Pilot Trial
Investigating Clinical Outcomes in Cardiac Surgical Patients Receiving Sugammadex During 2018-2021

Utilized STS database to identify patients, collect patient demographic information, extubation times, and surgery information

Defined extubation time by ACSD STS data definitions

Filled in other data points through manual EPIC chart review

Compared percentage of patients receiving sugammadex vs. no reversal meeting extubation ≤6 hours on fast-track extubation
A Retrospective Pilot Trial
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Increase in percentage of patients extubated ≤6 hours: 81% in no reversal group to 96% in the sugammadex group (p=0.0428)

All other outcomes were not statistically significant
A Prospective Randomized Controlled Trial Comparing Clinical Outcomes in Cardiac Surgical Patients: Sugammadex vs. Placebo

**Primary Endpoint:** Number of patients meeting STS 6-hour extubation endpoint in sugammadex vs. placebo groups

**Study Status:** Currently underway and enrolling patients

**Study Details:** Sugammadex/Placebo administered 15 minutes after ICU arrival, neuromuscular blockade assessed through quantitative monitoring, TOF $\geq 0.9$ before extubation
Questions?
Questions?
Quantitative Neuromuscular Monitoring

Contact Information

• Carole Krohn, Director, STS National Database
  • CKrohn@sts.org
  • 312-202-5847

• STSDB@sts.org
  • Database Operational Questions (Billing, Contracts, Contacts)

• STSDB_Helpdesk@sts.org
  • 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!
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