Cardiac Surgery OR Efficiency

Standardization, Communication &
Evidence-Based Perioperative Practice

Baystate Medical Center | Cardiac Surgery

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Disclosures

In the past 24 months, I have not had any financial relationships with an ineligible company.

Defining the Foundation

What Is OR Efficiency?

OR efficiency is whether the right patient, the right team, and the right supplies arrive aligned — prepared, on time, and ready. When the system holds, outcomes improve and costs fall. When it breaks down, both suffer.

The Right Team

Every member arrives prepared, informed, and with clearly defined responsibilities for each phase of the case.

The Right Supplies

Every instrument, implant, and consumable is confirmed in stock and verified before incision — not discovered missing at the field.

The Right Systems

Communication protocols, pre-operative workflows, and inventory processes are intentionally designed so the team knows in time to respond.

The Problem We Are Addressing

Common Efficiency Challenges in Cardiac Surgery ORs

Communication Failures

Communication breakdowns are identified in 43% of OR adverse events.[1] Structured preoperative briefings in cardiac surgery significantly reduce flow disruptions, miscommunication events, and circulating nurse trips to retrieve supplies.[2]

Supply Awareness Gaps

Critical implant unavailability is among the most common nonclinical reasons for same-day cardiac surgery cancellation.[3] Enhanced supply awareness protocols and proactive team communication minimize avoidable last-minute disruptions.

Unoptimized Perioperative Status

Preoperative anemia affects approximately 1 in 4 cardiac surgery patients and independently predicts transfusion, renal injury, and mortality.[4] Uncontrolled glucose and nutritional deficits are similarly modifiable yet frequently unaddressed before surgery.

Preventable Non-Operative Time

Non-procedural OR time intervals such as post-closure workflow and inter-case turnover are the most compressible component of total OR time.[5] Standardizing role assignments and parallel task execution consistently recovers 15–25% of that time.

The Financial Reality of Cardiac OR Inefficiency

$36–37/min[6,7]

All-in OR cost
(staff, supplies, overhead)

3–5%[8]

Cardiac case
cancellation rate

15–30 min[9]

Avoidable non-operative
OR time per case

- Economic analyses estimate all-in OR time at $36–$37/min, making the cardiac OR one of the most expensive clinical environments in the hospital.[6,7]
- A 3–5% cancellation rate and 15–30 minutes of avoidable non-operative time per case represent preventable inefficiencies with measurable financial solutions.[8,9]
- Every efficiency failure carries a downstream cost: delayed OR access, staff overtime, rescheduling burden, and increased patient risk.[10]
- Each initiative in this program targets a documented, preventable inefficiency supported by peer-reviewed evidence and a realistic implementation plan.

Four Quality Initiatives

A Cardiac Surgery Program Built for Precision

01

Communication Enhancement

Team notification
Pre-incision briefing
Supply confirmation

Goal: Eliminate information gaps before they become OR problems

02

Supply Chain Integrity

Par-level awareness
Defined roles & accountability
Proactive team communication

Goal: Ensure critical implants are confirmed available before the case is scheduled

03

Perioperative Optimization

Glycemic control
Anemia protocol
Nutrition & frailty screening

Goal: Arrive at surgery with the best possible patient foundation

04

Non-Operative Time Reduction

Post-closure workflow
Inter-case turnover
Role standardization

Goal: Recover 15-25% of non-procedural OR time within 6 months

Initiative 1: Communication Enhancement

One Principle. Three Applications.

COMMUNICATION FRAMEWORK

One unifying principle

1A Team Mobilization

- HVCC-wide email group — IT configured and active
- TigerText secure cardiac call team group
- Surgeon triggers both channels simultaneously
- Already live and in active use

1B Supply Confirmation

- Confirmed-open protocol at pre-incision brief
- Perfusionist + nurse verify with surgeon before opening
- High-cost items: cannulas, cor-knots, sternal wires, etc.
- Actively advocating

1C Inventory Communication

- Daily low-stock log: item name + catalog number
- Submitted to supply team for restock
- Backorder alerts routed at scheduling — not at incision
- Prevents mid-case room exits for missing items

1A: Team Mobilization — Keeping the Service Connected

HVCC-Wide Email Group

Configured in partnership with IT

- A single email reaches the entire cardiac surgery service simultaneously
- Used for STAT cases, same-day add-ons, and case cancellations
- Ensures surgeons, PAs, anesthesia, and OR nurses receive updates in parallel rather than sequentially
- Eliminates the phone tree and eliminates the risk that someone is notified last
- Reduces case start delays caused by a team member learning about a case change too late to respond in time

TigerText Call Team Group

Secure, HIPAA-compliant messaging

- Dedicated group for the cardiac surgery call team
- Team members can opt in and out based on their call schedule
- Enables real-time parallel communication across the entire on-call team
- Used for: case timing updates, inventory requests, add-on coordination, and team-wide needs during on-call hours
- Everyone is on the same page simultaneously — no delayed handoffs, no missed messages

What This Supports: The surgeon still contacts the main OR as typically done to book the case. Instilling these measures minimizes the chances that someone is not contacted at all and also allows for the ICU, floor, and other teams to be notified ASAP and allow them to take any measures necessary for appropriate throughput.

1B: Supply Confirmation — The Pre-Incision Briefing

Why It Matters

- When circulating nurses leave the OR to retrieve instruments mid-case, it represents a workflow disruption and increases the potential for airborne pathogens entering the sterile field.[11]
- A study of 60 cardiac surgical teams found that teams with a more positive perception of the timeout had significantly lower rates of circulating nurse OR exits to retrieve instruments ($p < 0.001$).[11]
- Preoperative briefings in cardiac surgery significantly reduced circulating nurse trips to the sterile core, time spent there, and supply waste compared to un-briefed cases.[2]

The Confirmed-Open Protocol

- Pre-incision briefing: perfusionist + OR nurse verify supplies with surgeon before anything is opened
- Cannulas (EOPA, venous, retrograde, LV vent): confirmed before opening
- Cor-Knot devices: opened only on explicit request with quantity confirmed
- Sternal wires (6 vs 7, single vs myo): confirmed before closure preparation begins

Financial Impact: 1 room exit/case × 400 cases × 4 min avg × $36/min = **~$57,600/year** in avoidable OR time BEFORE accounting for discarded supplies.

Metrics: Track circulating nurse room exits per case (monthly) · Track cases with complete pre-incision supply confirmation · Track OR overtime attributable to supply delays

Initiative 1: Communication Enhancement

1C: Inventory Communication + Initiative Outcomes

1C: Inventory Communication System

- Daily low-stock log completed by OR staff: item, catalog number, quantity
- Routed to supply team and OR manager for reorder action
- Backorder status communicated daily, not discovered at incision
- Prevents mid-case room exits caused by missing stock
- Closes communication loop between OR, supply team, and device reps

~$144K

Team mobilization time savings

Macario 2010[6]

~$58K

Room exit reduction

Estimated from site data

↓ Events

Communication-related adverse events

Joint Commission 2023[1]

~$200K+

Combined annual savings (conservative)

Annual estimate

Key Insight

These savings all stem from one root cause: information arriving too late to prevent disruption. The dual-channel notification system, confirmed-open protocol, and inventory communication log are three applications of the same principle: communicate earlier.

Metrics: Time from decision to OR notification (min) · Percentage of cases with complete parallel notification · Number of low-stock items flagged per month · Backorder discovery timing (scheduling vs. day-of)

Initiative 2: Supply Chain Integrity

1C: When the System Does Not Communicate, the OR Pays the Price

In cardiac surgery, a missing critical implant discovered on the day of surgery is not a supply inconvenience; it is an OR efficiency failure, a potential patient safety event, and a financial loss. All at once.

Without a Proactive System

- Critical implants are assumed to be in stock until proven otherwise at the field
- Stock gaps discovered day-of-surgery, after the patient arrives and the room is set
- Emergency sourcing delays or cancels the case at full OR cost per minute
- No clear accountability: unclear who checks, who communicates, and by when

The Clinical & Financial Consequence

- Same-day cancellation with full team assembled and OR time running at $36/min
- Nonclinical reasons, including supply unavailability, are among the most common causes of same-day cardiac surgery cancellations
- Patient distress, repeat pre-operative preparation, and extended hospital stay
- Emergency procurement costs and potential for suboptimal implant substitution

Evidence: A study of cardiac surgery programs found nonclinical cancellation reasons, including blood unavailability and supply issues, accounted for 39% of same-day cancellations.[3] A delayed surgery due to an unavailable implant results in revenue losses exceeding $10,000 per case.[12]

The goal is not to eliminate all shortages, but to build a system where the team knows before the patient does.

Initiative 2: Supply Chain Integrity

1C: Defined Roles. Daily Communication. System-Wide Awareness.

Every role in this chain has one job: ensure the right information reaches the right person daily, consistently, before it becomes an OR problem.

OR Staff / Charge Nurse

Document Daily

- Log low-stock items after each case or during daily room check
- Record: item name, catalog number, quantity on hand
- Flag any item at or below par level
- Submit log to Cardiac OR Manager same day → Rounds

Cardiac OR Manager

Review & Act

- Review log daily; cross-reference upcoming case schedule
- Confirm critical implants in-house before cases are posted
- If gap identified: contact Supply team immediately
- Escalate to device rep when backorder is confirmed

Central Supply / Inventory

Respond & Reorder

- Acknowledge OR Manager alert same business day
- Confirm stock status; initiate reorder if needed
- Communicate backorder timeline or alternate options
- Close the loop with OR Manager in writing

Device Company Rep

Source & Communicate

- Contacted when backorder is confirmed or timeline unclear
- Responsible for alternate sourcing or emergency delivery
- Proactively notify OR Manager of anticipated supply disruptions
- Provide written confirmation of resolution

Metrics: Number of stockout events per quarter · Percentage of cases with implants confirmed in advance · Backorder discovery timing (scheduling vs. day-of surgery)

Initiative 3: Perioperative Optimization

APP-Led Preoperative Consult — What We Have Already Initiated

Initial Consult

PA-led intake within 24 hrs of referral

Pre-op Testing

Labs, echo, cath, med review

Lab Review

Results reviewed, interventions placed

Optimization

Glucose, anemia, nutrition addressed

OR-Ready

Clearance documented and communicated

How This Program Has Evolved

- Evolved to include PA-performed conduit evaluation: bedside ultrasound vein mapping of the greater saphenous veins and radial arteries before CABG
- Bedside mapping identifies conduit suitability, diameter, and anatomic course prior to OR entry, reducing intraoperative surprises and unnecessary dissection
- Ultrasound-assisted vein assessment is superior to clinical examination for discerning path and suitability for use as conduit

Financial & Operational Value

- Billable consult and procedure: PA consult charges + conduit mapping procedure generate documented revenue per case
- Conduit quality documented before OR arrival and the surgeon knows what to expect before incision
- Reduces intraoperative decision delays from unexpected conduit findings; supports informed case planning

Initiative 3: Perioperative Optimization

Three Domains of Preoperative Preparation

Each domain targets a modifiable risk factor that independently predicts adverse outcomes when unaddressed before surgery.

Glycemic Control

Uncontrolled glucose is independently associated with sternal wound infection, prolonged ventilation, and mortality in cardiac surgery.[13]

- HbA1c at every consult
- ≥8.0%: endocrinology referral
- 7.5–8.0%: intensified monitoring + PCP coordination
- Perioperative target: 140–180 mg/dL per STS guideline
- Standardized insulin protocol: every case

Anemia Protocol

Preoperative anemia affects ~1 in 4 cardiac surgery patients and is independently associated with transfusion, renal injury, stroke, and death.[14,15]

- Hemoglobin + HbA1c at every consult (POQI-8/ERAS-Cardiac: Strong A recommendation)
- If Hgb <13: ferritin + transferrin saturation
- Oral iron if ≥6 weeks to surgery; IV iron (ferric carboxymaltose) if <6 weeks or intolerant
- Goal: best hematocrit at time of surgery; opens the door to ANH as the program matures

Nutrition & Frailty

Albumin <3.5 g/dL and prealbumin ≤20 mg/dL predict surgical site infection, prolonged ventilation, and morbidity. Gait speed independently predicts operative mortality in ambulatory patients, regardless of STS risk score.[16,17]

- Albumin + prealbumin drawn with routine preoperative labs at every consult
- Low albumin or prealbumin: prompt referral to nutrition services
- Gait speed assessment for ambulatory patients ≥70 years (not applicable to patients with mobility limitations or mechanical circulatory support)
- Nutrition consult initiated before surgery when labs indicate deficit

Initiative 3: Perioperative Optimization

Expected Clinical Outcomes & Financial Projections

↓ 66%[13]

Sternal wound infection rate

Glucose <200
Lazar et al. 2009

↓ 75%[18]

Operative mortality in CABG

Continuous insulin
Furnary et al. 1999

↓ Transfusions

Preoperative anemia identified and treated

POQI-8 / ERAS-Cardiac 2022 Consensus[15]

↓ 1–2 days[10]

ICU LOS with glycemic optimization

Engelman et al.
JAMA Surg 2019

Financial Impact of Perioperative Optimization

Cancellation prevention: 10–20/yr × $15–25K = $150K–$500K. **ICU LOS reduction:** 400 pts × 1 day × $2,500–$4,000/day = **$1M–$1.6M annually.**

Metrics: HbA1c + hemoglobin completion rate · Cancellation rate by cause · Intraop glucose excursion rate · Units pRBC per case · Iron supplementation initiation rate

Initiative 4: Non-Operative Time Reduction

Preventable Time Lost Outside the Procedure

Skin Closure → Patient Exit

- A complex parallel workflow follows every closure: dressing, lines, warming, ventilator disconnect, transport prep, documentation
- Without defined roles, these steps run sequentially, adding unplanned time to an already long case
- Role ambiguity between nursing, anesthesia, and perfusion is the most common contributor to delays in this phase

Inter-Case Turnover

- Room cleaning, restocking, equipment reset, and circuit priming are highly variable and rarely standardized in cardiac programs
- Variability in turnover makes scheduling unpredictable and compounds delays across the operative day
- High-performing programs standardize turnover through role assignment and parallel task checklists

Why This Deserves Attention

- Among 29,206 CABG patients, longer non-surgical OR time was significantly associated with adverse outcomes, including complications, prolonged LOS, and mortality. Each additional 15 minutes in the OR increased the odds of complications, mortality, and cost.[19]
- A standardized parallel-task OR turnover protocol reduced median turnover time from 37 to 14 minutes, a 62% reduction, with an estimated return on investment of $19,500 per day. Lean methodology and role assignment, not added resources, drove the improvement.[20]
- Non-procedural OR time intervals are the most compressible component of total case time and the most responsive to standardization. The opportunity is structural, not clinical.[9]

Initiative 4: Non-Operative Time Reduction

Four-Phase Implementation Approach

Phase 1

Baseline Measurement

- Measure skin closure to patient exit for every case
- Record inter-case turnover time
- Document role assignments or absence of them
- Identify variability: best, worst, and average

Phase 2

Workflow Mapping

- Map post-closure tasks and identify parallel opportunities
- Pinpoint role ambiguity and communication gaps
- Benchmark against published OR turnover data

Phase 3

Standardize & Train

- Define explicit role assignments post-closure
- Standardize turnover checklist with parallel task execution
- Incorporate into pre-case briefing; train all team members

Phase 4

Monitor & Iterate

- Track non-operative OR time per case as primary metric
- Monthly review; quarterly leadership dashboard
- Goal: 15–25% reduction within 6 months

Metrics: Skin closure to exit (min) · Turnover time (min) · Staff overtime hours/month · Schedule overrun rate

Initiative 4: Non-Operative Time Reduction

Financial Projections

Example Scenario

Annual cardiac surgery cases	400
Average non-operative time reduction per case	10 minutes
Total minutes saved annually	4,000 minutes
OR cost per minute	$35–$40
Estimated annual savings	$140,000–$160,000

Secondary Benefits

15–25%

Non-operative OR time reduction within 6 months

↓ Overtime

Reduced staff overtime from late cases

↑ Throughput

Potential for additional cases per operative day

Metrics: Non-op OR time/case · Turnover variability · Overtime hrs/mo · Schedule overrun rate

Consolidated Financial Projections — Four Initiatives, 400 Cases/Year

Initiative	Basis	Est. Annual Savings	Ref.
Initiative 1: Communication protocol	10 min delay × 400 cases × $36/min	**~$144,000**	6
Initiative 1: Supply confirmation savings	400 cases × 4 min avg room exit × $36/min	**~$58,000**	Site est.
Initiative 2: Implant stockout prevention	Cancelled/delayed cases × $10K–25K each	**$150K–$500K+**	3,12
Initiative 3: Glucose optimization (ICU LOS)	400 pts × 1 day × $2,500–$4,000/ICU day	**$1.0M–$1.6M**	6,10
Initiative 3: Cancellation prevention (periop)	10–20/yr × $15–25K per cancellation	**$150K–$500K**	6
Initiative 3: Transfusion reduction	400 cases × 1 unit × $252.80 (institutional)	**~$101,000**	Inst.
Initiative 4: Non-operative time reduction	4,000 min/yr × $35–40/min	**$140K–$160K**	6,9

ESTIMATED COMBINED ANNUAL IMPACT — 4 Initiatives

$1.9M – $3.2M+ in avoidable costs across all four initiatives at a 400-case program

Transfusion cost reflects institutional pricing ($252.80/PRBC unit). All other estimates derived from peer-reviewed economic literature cited above.

Culture Is the Foundation

The Evidence Behind the Human Element

Teamwork Predicts Patient Outcomes[1]

Mazzocco et al. (Am J Surg 2009): When surgical teams exhibited infrequent team behaviors, patients were nearly five times more likely to experience death or major complication after adjusting for ASA score. Culture is not peripheral to outcomes. It is causal.

Psychological Safety Drives Performance[2]

Edmondson, Harvard Business School (Admin Sci Q 1999): Teams with psychological safety show higher performance, better problem-solving, and greater adaptability. Over 1,000 peer-reviewed studies link psychological safety to better team outcomes.

Safety Culture Varies at the Team Level[3]

Pronovost & Sexton (Qual Saf Health Care 2005): Safety culture variation is considerably greater at the work unit level than at the hospital level. The culture of your specific OR team matters more than your institution's overall scores.

Protocols Work When People Believe in Them

Every initiative here depends on a person: the nurse who completes the low-stock log, the PA who screens HbA1c, the perfusionist who confirms cannulas before incision. Protocols do not execute themselves. Engaged, accountable teams do.

Key Takeaways

1 OR time costs $36–$37/min. Ten minutes of preventable delay per case is $144,000 a year. Efficiency is a clinical priority, not just an administrative one. 6,7

2 Communication failures drive 43% of OR adverse events. A pre-incision briefing, confirmed-open protocol, and inventory log address the same root cause: information arriving too late. 1,2

3 Critical implant unavailability is a leading nonclinical cause of same-day cardiac surgery cancellation. A proactive inventory system with defined roles prevents day-of discovery. 3,12

4 Preoperative anemia affects 1 in 4 cardiac surgery patients. An APP-led protocol anchored to POQI-8/ERAS-Cardiac recommendations identifies and treats it before surgery. 15

5 Glucose standardization reduces sternal wound infections by 66% and operative mortality by 75% in CABG. One protocol. Every team. Every case. 13,18

6 Culture is not separate from outcomes. Psychological safety, team trust, and shared purpose are what make any of this last.

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