

Cardiothoracic Surgeon Management of Postoperative Cardiac Critical Care

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Objective: To determine whether postoperative cardiac care by cardiothoracic surgeons in a semiclosed intensive care unit model could be distinguished from that given by intensivists who are not board certified in cardiothoracic surgery.

Design: From January 2007 to February 2009, we retrospectively examined data on patients after cardiac operations from 2 consecutive periods during which full-time management of intensive care was changed from noncardiothoracic intensivists (period 1, 168 patients) to cardiothoracic surgeons (period 2, 272 patients).

Main Outcome Measures: Variables measured included Society of Thoracic Surgeons observed and expected mortality, central venous line infections, ventilator-acquired pneumonia, red blood cell exposure, adherence to blood glucose level target at 6 AM on the first and second postoperative days, length of stay, and intensive care unit pharmacy costs. Results were compared using a 2-sample *t* test or 2-tailed Fisher exact test.

Results: In similar populations, as witnessed by equivalent Society of Thoracic Surgeons operative risk, cardiothoracic surgeons providing postoperative critical care led to a mean (SD) decrease in hospital length of stay from 13.4(0.9) to 11.2 (0.4) days ($P = .01$) and decreased drug costs from \$4300 (1000) to \$1800 (200) ($P < .001$). These improvements occurred without losing benefits in other quality measures.

Conclusions: By virtue of their cardiac-specific operative and nonoperative training, cardiothoracic surgeons may be uniquely qualified to provide postoperative cardiac critical care. In a semiclosed unit where care of the patient is codirected, the improvements noted may have been facilitated by the commonalities between surgeons and intensivists associated with similar training and experiences.

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EVIDENCE SUGGESTS THAT CRITICAL care physicians (intensivists) make a significant difference in the care of the critically ill, with reported¹ decreased mortality, time to extubation, infectious complications, and length of stay (LOS), as well as increased use of quality indicators. Furthermore, Leapfrog,² an organization dedicated to ensuring patient safety and evidence-based quality care, considers use of intensivists to be one of their 7 key indicators of hospital quality, reporting that hospitals with intensivist-managed intensive care units (ICUs) have as much as a 40% reduction in ICU mortality. However, not all studies have had similar findings, most noteworthy the report by Levy et al,³ in which the odds of hospital mortality were higher for patients whose care was managed by critical care physicians. Specifically regarding care in the cardiac ICU, board-certified intensivists rarely have formal surgical training; rather, their training is heterogeneous, with

specialty training in pulmonology, internal medicine, emergency medicine, anesthesiology, and trauma. As surgeons of all specialties would attest, postoperative management of a patient's care begins in the operating room, and complications can often be best understood in the context of the specific operation performed. Therefore, it seems reasonable that as intraoperative complexity increases, the importance of surgical training for postoperative care would also increase.

See Invited Critique at end of article

The field of cardiothoracic surgery is notable for its protracted period of surgical training and unparalleled intraoperative complexity. A tenet of the specialty is that this training is necessary to learn preoperative assessment, operative technique, and intricate postoperative management. Furthermore, public reporting

Table 1. Patient Characteristics for Periods 1 and 2

Characteristic	No. (%)		P Value
	Period 1 (n=168)	Period 2 (n=272)	
Male sex	125 (74)	190 (70)	.42
Diabetes mellitus	53 (32)	89 (33)	.68
CABG	102 (61)	188 (69)	.09
Valve	44 (26)	57 (21)	.25
Combined	22 (13)	27 (10)	.30
Ejection fraction, mean	49.8	50.7	.55
BMI, mean	28.7	29.1	.60

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CABG, coronary artery bypass graft. Combined, combined bypass/valve operations; Valve, mitral and aortic valve operation.

has led to increased scrutiny of individual surgeons' results, and although they cannot realistically control all aspects of care (let alone ensure outcomes), surgeons are held accountable. Cardiac surgeons have traditionally accepted this responsibility, overseeing their patients' entire hospital course. However, with the advent of intensivist-staffed ICUs, much of the minute-to-minute decision making has been taken out of the surgeon's hands. Intensive care units previously under cardiac surgical supervision have been converted to "closed" or "semi-closed" units wherein patient care is either totally directed or codirected by an intensivist. Despite reports¹ of benefits associated with intensivist care, lack of cardiac surgical training may represent an inherent flaw in this patient care model. Intensivists without cardiothoracic training may be at a disadvantage when managing postoperative care for these patients because of the unique pathophysiologic factors resulting from complex operations, hematologic and metabolic perturbations that result from cardiac arrest and cardiopulmonary bypass, and the myriad life-threatening perioperative complications that manifest themselves rapidly.

In 2007, Thomas Jefferson University Hospital changed management of postoperative care from pulmonary/trauma critical intensivists to board-certified cardiac surgery physicians in the surgical cardiac care unit (SCCU). The purpose of this study was to determine whether this change was associated with a measurable effect on postoperative outcomes. The study was presented to the Thomas Jefferson University institutional review board, considered exempt, and approved.

METHODS

We conducted a retrospective analysis of data on patients receiving care after a cardiac operation in 2 consecutive periods during which full-time intensive care management changed from noncardiac surgeons (period 1 [P1], January 2007 to September 2007; 168 patients) to cardiac surgeons (period 2 [P2], October 2007 to February 2009; 272 patients). Analysis included patients' risks stratified by the Society of Thoracic Surgeons database, including all coronary bypass, mitral and aortic valve, and combined bypass/valve operations. Baseline preoperative patient characteristics showed no significant differences (**Table 1**).

Comparisons included mortality; central venous line infection (CVLI) and ventilator-acquired pneumonia (VAP), defined as the number of infections per 1000 device-days; percentage of patients with red blood cell exposure (ie, receipt of packed red blood cells [PRBCs]); 6 AM blood glucose level less than 200 mg/dL (to convert to millimoles per liter, multiply by 0.0555) on postoperative day (POD) 1 and POD2; postoperative and total LOS; and ICU pharmacy cost per patient (drug cost).

Throughout the 26 study months, the SCCU was semi-closed, with care codirected by intensivists and operating surgeons. During P1, SCCU intensivists included 3 pulmonary physicians and 1 surgical critical care physician. During P2, intensivist care changed to 3 board-certified cardiac surgeons (G.J.R.W., M.H., and H.H.); one of these surgeons (M.H.) is also board certified in critical care.

During P1, the patient care team comprised 3 junior residents, which changed to 2 residents and a physician assistant during P2. The residents, the physician assistant, the postgraduate-year-4 resident rotating on the cardiothoracic service, or a research resident provided night coverage. Oversight at night was conducted by telephone or direct supervision, shared between intensivists and operating surgeons.

During P2, with the change in intensivists came a concerted effort to improve the quality of care in the SCCU. Although quality assurance/performance improvement (QA/PI) had been an ongoing hospital process, a specific SCCU QA/PI initiative was spearheaded by the SCCU director (G.J.R.W.) throughout P2. This plan included monthly multidisciplinary meetings with representation from risk management, hospital administration, cardiac surgery, anesthesiology, intensivists, pharmacy, respiratory therapy, physical and occupational therapy, dietary, SCCU nursing, data management (M.L.), and performance improvement (M.A.M.). An agenda was determined and minutes were kept and distributed at each meeting; action items were delegated to specific members of the team (**Figure 1**).

A dashboard (given in the following tabulation) was created by the QA/PI committee to highlight variables related to quality within the SCCU to which metrics could be applied, allowing quantitative assessment of the effect of various initiatives.

Length of stay (intensive care unit and total)

Cost of drugs (albumin, argatroban hydrate, darbepoetin alfa, recombinant human b-type natriuretic peptide)
 Packed red blood cell exposure
 Coagulation factor exposure
 Ventilator-acquired pneumonias^a
 Central venous line-associated bloodstream infections^a
 Checklist adherence
 Hand washing adherence

^a <http://www.cdc.gov/ncidod/dhqp/pdf/NNIS/NosInfDefinitions.pdf>.

Dashboard maintenance was the responsibility of one person (M.A.M.), who was given access to hospital databases and appropriate personnel to ensure timely collection and reporting. Data on CVLI and VAP rates came from the hospital's Infection Control Department, PRBC exposure from the Society of Thoracic Surgeons database, blood glucose levels from the hospital report for the Surgical Care Improvement Project, and pharmaceutical costs from the pharmacy data system.

At the beginning of P2, a bedside checklist was introduced, based on a postoperative pathway that described nursing care, laboratory and other testing, medications, documentation, and quality metrics (**Figure 2**). The checklist was completed by the intensivist team with the bedside nurse on admission of any patient postoperatively and the morning and evening of each POD. This checklist was designed by the QA/PI team to ensure uniform, high-quality care and was reviewed twice daily (AM and PM). For example, the checklist was used to deal with

the problem of infections, addressing VAP by including “HOB [head of the bed] up 30°” and antacid therapy as checklist items, having respiratory therapy develop a standard rapid weaning protocol to decrease ventilator time, and instituting routine mouth care and “sedation vacations.”⁴ Our method to diminish CVLs was to place on the checklist removal of the CVL introducer on POD1.

Commercial software (SAS, version 9.1; SAS Institute, Inc, Cary, North Carolina) was used for statistical analysis. The 2-sample *t* test was used for comparing continuous variables, and χ^2 analysis and the 2-tailed Fisher exact test were used for categorical variables, as appropriate.

RESULTS

MORTALITY

Mortality rates did not change significantly from P1 to P2, with a mean (SD) of 3.1% (4.5%) vs 2.5% (2.8%) ($P=.15$). Furthermore, the Society of Thoracic Surgeons observed to expected mortality ratio remained constant at 1.17 ($P=.80$) between the 2 periods.

THE QA/PI COMMITTEE MEETINGS

A typical agenda (Figure 1) addressed issues for which responsible parties had been identified. Meetings occurred biweekly until the group felt comfortable that progress would continue with monthly meetings. The initiatives of P1 invariably had an associated metric. For example, **Figure 3** shows our success with using the checklists during rounds. Consistently collecting checklists proved to be impossible, but the data showed that, although recovery of checklists was variable, their use appeared to be immediate between 80% and 100% of the time.

VAP AND CVLI

Although the difference was not significant, VAP rates dropped from 7.6 per 1000 device-days to 4.2 per 1000 device-days ($P=.19$). The incidence of CVLIs (incidence per 1000 device-days) also did not change significantly between P1 and P2 (1.3 vs 1.6; $P=.83$) (**Figure 4**).

PRBC EXPOSURE

We attempted to create a guideline whereby postoperative administration of PRBCs would occur only if the hematocrit was less than or equal to 24% (to change to a proportion of 1.0, multiply by 0.01). We recognized that a better metric existed, eg, adherence to our protocol, as measured by the incidence of PRBC transfusions when the hematocrit was higher than 24%. However, resources prevented that type of data capture. The postoperative exposure to PRBCs between P1 and P2 was 32% vs 37% ($P=.28$).

BLOOD GLUCOSE TARGET ADHERENCE

Our hospital’s Insulin Infusion Protocol was implemented in the SCCU in June 2006, targeting a blood glucose level between 100 and 140 mg/dL. Our improve-

SCCU QA/PI Committee Typical agenda	
	Party responsible
Review of the minutes	
1. CABG/valve checklist:	G.J.R.W./M.A.M.
(a) Combine	
(b) Collection	
(c) Collate the data	
2. Implementation of new order sets in Last Word	J.R./B.B./G.J.R.W.
3. Fentanyl drips after OHS	S.G.
4. Argatroban use: changing concentration to decrease waste	S.G.
No. of patients and treatment days	E.M.
5. Extubation protocol	B.G.
6. Postoperative transport and line management	D.C.
7. Aspirin/clopidogrel bisulfate and Afib protocols	M.D./G.J.R.W.
8. Nutrition initiation	G.J.R.W.
9. Dashboard:	M.A.M./E.M.
CLV infections	
VAP	
SCIP data	
Blood utilization	
Time from transfer order to transfer of patient	
Metrics from the pathway	
SCD utilization	
Time to extubation	

Figure 1. Typical agenda of the SCCU QA/PI Committee with delegation of projects to specific committee members. Afib indicates atrial fibrillation; CABG, coronary artery bypass graft; CVL, central venous line; OHS, open heart surgery; QA/PI, quality assurance/performance improvement; SCCU, surgical cardiac care unit; SCD, sequential compression device; SCIP, Surgical Care Improvement Project; and VAP, ventilator-acquired pneumonia.

ment between P1 (83%) and P2 (88%) was nonsignificant ($P=.19$). We were troubled by our inability to better control hyperglycemia, as it was the only Surgical Care Improvement Project metric that did not improve to the top 10% of hospitals in the United States. This poor performance was evaluated during P2 and resulted in an Insulin Infusion Protocol modification to account for certain patient risk factors and to require its continuation through POD2 if patients still required intravenous insulin to maintain glucose control rather than transition to subcutaneous insulin as a sliding scale, as determined by the caring intensivist on POD1.^{5,6}

PHARMACEUTICAL COSTS

At the commencement of P2, the QA/PI committee determined that cost of care should be a quality measure. With use of the hospital pharmacy database, we identified the following drugs as representing the greatest cost with the greatest opportunity to minimize expenditures without jeopardizing high-quality care:

1. albumin: routinely used for volume resuscitation;
2. recombinant human b-type natriuretic peptide: treatment initiated occasionally as therapy for postoperative advanced heart failure;
3. argatroban hydrate: prescribed for postoperative anticoagulation to avoid heparin-induced thrombocytopenia or to treat postoperative thrombocytopenia; and
4. darbepoetin alfa: used to decrease postoperative transfusion rates.

Not a permanent part of the patient record

OPERATIVE DAY		Patient plate		
Date:	CABG CLINICAL PRACTICE GUIDELINE	RN INITIALS		
		7a-7p	7p-7a	N/A
Assessment	Cardiac & hemodynamic monitoring			
	Epicardial pacing wires to pacer & tested in OR.			
	Head of bed elevated 30 degrees			
	VS every 15 minutes till stable then every 1 hour and as needed			
	Hemodynamic profile upon arrival and then every hour until stable. (If PAD outside parameters, MAP <60 or >90, or CI <2.2 call surgeon)			
	Correlate manual BP to A-line every shift, and document.			
	Urine output >0.5cc/kg/hour. Notify surgeon if urine output less than this amount times 2 hours.			
	Nasogastric/Oralgastric tube to suction			
	Notify house officer if temp > 101.5			
	Warming blanket for temp <96 degrees F			
	SICU CT weaning/extubation protocol			
	Pulse check upon arrival and every 4 hours			
	CT output every 15 minutes x4 then every hour			
	Notify surgeon if CT drainage >150cc/hr			
	If restrained, is physician order written?			
	Sequential compression device in place			
	Defibrillator pads removed			
Pacer, Swan, A-line & chest tubes checked and proper working order				
Dressings dry and intact (change dressings if saturated)				
Goals:	Normal thermic, No evidence of excessive bleeding, hemodynamically stable, CT drainage within limits & adequate respiratory parameters.			
Tests	Chest x-ray upon arrival			
	EKG upon arrival			
	CBC, platelets, basic met, CK, PT, PTT, post-op			
	ABG and mixed venous gas upon arrival to the SICU			
	Glucose monitoring every 4 hours if on Epi. or PMH DM			
	H&H, PLT, PT, PTT PRN if bleeding			
	Continuous pulse oximetry			
ABG 2 hours post-op and with any changes in minute ventilation				
Goals:	Labs, EKG, X-rays within expected limits. Diabetics: glucose controlled			
Medications	ASA 6 hours post-op as ordered			
	Nitroglycerin drip infusing			
	Vasopressor drips as ordered			
	Insulin drip as ordered glucose check every hour till stable			
	Prophylactic antibiotic given immediately post-op			
	250cc Normal saline IV bolus if MAP <60, while notifying MD			
	D5W @ 10cc/hr via cordis			
	Analgesics as ordered			
H2 blocker as ordered				
Goals:	Maintain hemodynamic stability with meds as needed, afebrile, & pain free.			
Teaching	Review clinical practice guide with family			
	Daily contact made with family			
	Explain all procedures to patient/family			
RN Signatures				
RN Signatures				
RN Signatures				
RN Signatures				
RN Signatures				

Initials denote completion of intervention, Circled initials indicates intervention not completed.
Please return completed pathway to Abhi Rastogi in the Care Management Department

Privileged and confidential information

Figure 2. The checklist: a tool to be used on rounds as a guideline for patient care, to standardize and maintain quality. ABG, arterial blood gases; ASA, aspirin; BP, blood pressure; CABG, coronary artery bypass graft; CBC, complete blood cell count; CI, cardiac index; CK, creatine kinase; cordis, side port of the central venous cannula; CT, chest tube; D5W, 5% dextrose and water; DM, diabetes mellitus; EKG, electrocardiogram; Epi, epinephrine; H&H, hemoglobin and hematocrit; IV, intravenous; MAP, mean arterial pressure; MD, physician; met, metabolic panel; N/A, not applicable; OR, operating room; PAD, pulmonary artery diastolic pressure; PLT, platelet; PMH, past medical history; post-op, postoperative; PRN, as occasion requires; PT, prothrombin time; PTT, partial thromboplastin time; RN, registered nurse; SICU, surgical intensive care unit; VS, vital signs.

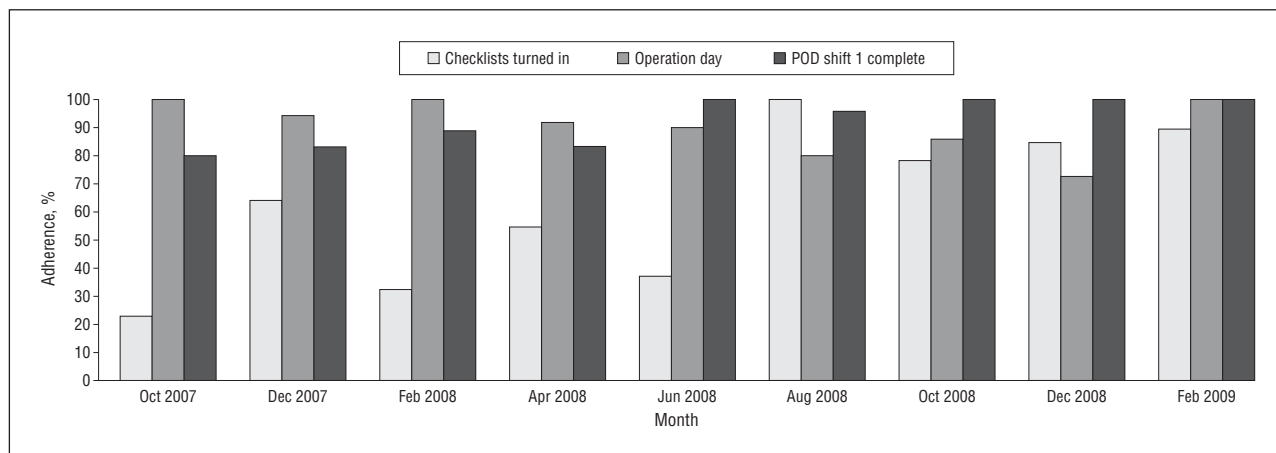


Figure 3. Surgical cardiac care unit checklist adherence. POD indicates postoperative day.

During P2, the savings that resulted from targeting these drugs was approximately \$1600 per patient and represented 64% of the \$2500 per patient in pharmacy savings (**Table 2**). Although we did not break down costs beyond the 4 drugs listed, it is remarkable that during P2 an additional decrease of \$892 in other pharmaceutical expenses occurred.

LENGTH OF STAY

Our mean (SD) total hospital LOS for P2 decreased by 2.2 days, from 13.4 (0.9) to 11.2 (0.4) days ($P = .01$). Our postoperative LOS, which dropped from 9.8 (0.7) to 8.3 (0.3) days ($P = .04$), contributed 1.5 of these 2.2 days.

COMMENT

This study examined a variety of quality indicators comparing care between 2 consecutive cohorts of patients who underwent open heart surgery when noncardiothoracic intensivists vs intensivists board certified in cardiothoracic surgery provided attending supervision. The hypothesis questioned the impact of the specialty training of intensivists caring for patients in SCCUs, with all 3 intensivists being board certified in cardiothoracic surgery during P2. Overall, the care provided did not differ significantly with respect to mortality, CVLI, VAP, PRBC transfusions, or blood glucose control. Significant differences were found in postoperative LOS, as well as the cost of drugs. However, there were confounding differences in the focus of care delivered between the 2 periods.

The SCCU QA/PI committee was instituted simultaneously with the change in intensivist leadership. Although the hospital collected outcome measurements during both periods, only during P2 was a concerted effort made to present these data formally as part of the SCCU dashboard. The committee involved a variety of hospital departments and was diligent regarding its agenda and the assignment of specific individuals to their action items. Most important, all areas of focus had associated metrics allowing assessment of performance improvement. The committee recognized that continuous review of the data was the sine qua non of performance improve-

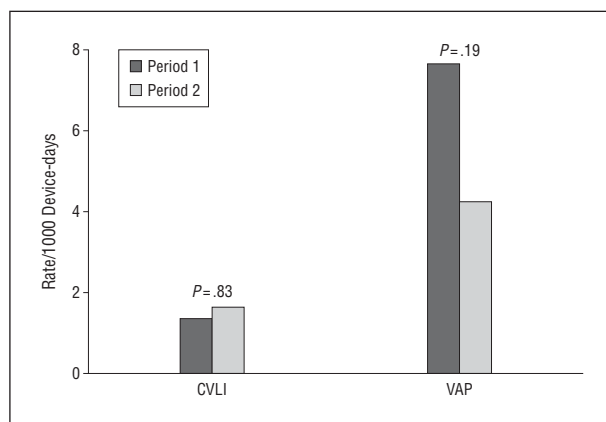


Figure 4. Incidence of central venous line infection (CVLI) and ventilator-acquired pneumonia (VAP) in period 1 vs period 2. Prevention of CVLI and VAP was a process improvement specifically addressed by the checklist.

ment⁷⁻¹² and that presentation of quantified outcomes is a powerful tool in manipulating behavior.^{8,13-16}

A checklist used during rounds has been shown to be a simple but effective tool in standardizing high-quality care.¹⁶⁻¹⁹ To improve the quality of care, the use of such a checklist was instituted during P2. The dashboard metrics dealt with outcomes and the checklist addressed specific care issues (eg, keeping the head of the bed elevated $\geq 30^\circ$, twice-daily oral care while receiving mechanical ventilation, early elimination of CVLs, or use of the Insulin Infusion Protocol.²⁰ Nevertheless, as demonstrated in Figure 3, simply making the checklist available at the bedside did not guarantee its use. However, over time, with consistent presentation of quality metrics, the relevance of the checklist became apparent and its use became routine. Although adherence to use of the checklist was 100% on POD1, it did not reach that level at ICU admission. This was almost certainly the result of late night or weekend admissions, when upper level residents, not fully oriented to its use, staffed the unit.

Unfortunately, the checklist did not lead to significant benefit regarding VAP, CVLIs, transfusions, or adherence to Surgical Care Improvement Project guidelines for blood glucose control, although performance with VAP and blood glucose control did improve. This lack

Table 2. Pharmaceutical Costs for Period 1 and Period 2

Period	Cost, Mean (SD), \$					
	Albumin	Argatroban Hydrate	Darbepoetin Alfa	Recombinant Human b-Type Natriuretic Peptide	Other	Overall ^a
1	153	2800	54	180	1113	4300 (1000)
2	34	1450	39	56	221	1800 (200)

^a $P < .001$ (period 1 vs period 2).

of significance was likely the result of the relatively small sample size during each period, leading to insufficient power to identify statistical significance. However, the relative decrease of 50% in VAP rates between the 2 periods was notable.

LENGTH OF STAY

During the entire study, LOS was a crucial focus for the hospital. During P2, LOS decreased by 2.2 days. The effect of the intensivist on LOS would have been more convincing had we shown that SCCU LOS decreased, but it did not. However, it became apparent during P2 that our inability to transfer patients to the step-down unit or ward at the time of the actual transfer order was contributing to the problem. This wait-to-transfer time averaged up to 22 hours per patient. Consequently, in early 2008, we modified our 9 SCCU beds to allow telemetry. This enabled patients to be mobile, allowing the unit to rehabilitate patients through assisted or independent ambulation. Second, in concert with the operating surgeon, the intensivists began to inform patients of their expected hospital discharge dates at the time of SCCU discharge. By setting an expected date of discharge with patients and families, we attempted to manage expectations. In this way, we hoped that the decision to discharge would not be a surprise. Although we did not measure the effectiveness of this specifically, we believe that, when forewarned, patients are more accepting of discharge timing.

The dollar value that one can ascribe to the decrease in LOS is derived from 2 considerations. First, discharging patients earlier leads to an absolute decrease in hospital resource units expended per patient. Second, a reliable decrease in LOS across a large hospital-based population, such as patients who have undergone cardiac operations, increases bed availability. If these days can be “back filled” with new admissions, they represent added revenue to the hospital. When applied to a population of approximately 300 patients per year who undergo open heart surgery, a 2.2-day decrease in LOS translates into as many as 660 new inpatient-days. With an average hospital LOS of 6 days, as seen at our institution, this represents approximately 110 new admissions per year. At current reimbursement levels, this would increase the hospital’s contribution margin by approximately \$800 000.

PHARMACEUTICAL COSTS

Targeting pharmaceutical costs of care has recently become a focus²¹⁻²³ and is generally not included in routine performance improvement. Notably, the cost of simi-

lar care delivered by different physicians has been shown to vary significantly.²⁴ During P2, the intensivists took it upon themselves to control costs as a group. They determined which drugs led to the greatest expenditures, focusing on possible alternatives to decrease overall costs. If one takes a data-driven approach to determine acceptable interventions, many costly therapies can be eliminated. For example, there is no benefit of albumin vs crystalloid for the resuscitation of hypovolemia,^{25,26} and there are no data supporting the short-term use of darbepoetin alfa to improve reticulocytosis and diminish the need for PRBC transfusions.^{27,28} Although costly at \$800 per day, recombinant human b-type natriuretic peptide is a recognized, effective pulmonary and systemic vasodilator that improves ventricular stroke volume and diuresis; however, there is no evidence to support its use in postoperative decompensated heart failure.^{29,30} Similarly, use of a direct thrombin inhibitor for postoperative anticoagulation to avoid the possibility of heparin-induced thrombocytopenia, although theoretically reasonable, is an extremely expensive solution to an uncommon problem (argatroban costs \$800-\$1000 per day). The 60% reduction in pharmaceutical costs seen between the 2 periods represented a savings of more than \$2500 per patient.

ORGANIZATIONAL STRUCTURE

The crux of the issue regarding the improvement in LOS and cost savings is whether they are attributable to the insight and teamwork resulting from similarly trained surgeons working together or simply because of the efficiency measures that were concurrently implemented at the commencement of P2. This study simply documented improvement to care that resulted from a change in ICU staffing to intensivists trained in cardiothoracic surgery while simultaneously implementing a formal, metric-driven performance improvement initiative. Could similar results have been achieved if the noncardiothoracic intensivists from P1 attempted to manage the quality improvement program? Specifically, would cardiac surgeons easily accept a perceived “outside” specialty identifying patient care efficiency opportunities and changing the delivery of care to address those opportunities?

A recent article by Hewett et al³¹ highlights the difficulties associated with communication between different caregivers within the health care profession and illustrates the obstacles to care facing patients who require attention from multiple specialties. As anyone who has

cared for patients in a large university health care system can attest, orchestration of patient care via communication between house officers, referring physicians, and consultants can be overwhelmingly difficult.^{32,33} Many inefficiencies, waste, and preventable errors stem from difficulties with intergroup communications. This is quite problematic in the SCCU when one considers that intergroup dynamics are constantly at play, with difficulties increasing in concert with the complexity of the patient's condition. Furthermore, in postoperative care, the surgeon-patient bond that results from the preoperative consent process may not be fully appreciated by physicians from other specialties.^{34,35} No one feels the commitment to his or her patient more poignantly than the cardiac surgeon who routinely obtains consent for operations that pose a substantial risk to life.

In a semiclosed unit where care is codirected, an appreciation of this commitment by the cardiothoracic surgeon intensivist may have provided a sense of trust and comfort that allowed the performance improvement process to proceed successfully. Although its contribution to ICU care may be difficult to assess, the bond between cardiothoracic surgeons as a result of their arduous training, the intensity of the operations they perform, and their common experience with critically ill postoperative patients cannot be denied. It is possible that this sense of belonging to the same group felt by the surgeons and intensivists present during P2 enabled the intensivists to address apparent opportunities for improvement and institute new plans for patient care. The improvement in performance seen during P2 may be as much an outcome of group identification resulting from similar training, education, experiences, and sense of patient "ownership" as from the specific medical knowledge that came from the years of training that are required to become a cardiac surgeon.

In conclusion, a change in cardiac ICU staffing to the use of intensivists specialized in cardiothoracic surgery was associated with significant efficiencies in postoperative care relating to a decrease in LOS and the cost of drugs used postoperatively. Should even a portion of these savings be generalizable to the 500 000 patients who undergo open heart surgery each year in the United States, the money saved could be on the order of hundreds of millions of dollars. The change in group dynamics, wherein both surgeons and intensivists were similarly trained and board certified, may have been responsible for the success of the performance improvement initiatives that was associated with increased efficiency of care delivered.

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INVITED CRITIQUE

Critical Care Competence

Whether or not intensivists improve outcomes is debatable. Lost in this debate, however, is the fact that many surgical subspecialists are, in fact, well-trained critical care physicians. Obvious examples include trauma surgeons, burn surgeons, and cardiothoracic surgeons. The educational paradigms of these subspecialties, the inherent nature of the diseases, and the high acuity of the patients these surgical subspecialists treat demand that they be critical care physicians.

Critical care is intrinsic to cardiothoracic surgery. As defined by the American Board of Medical Specialties, a cardiothoracic surgeon “provides the operative, perioperative care and critical care of patients with acquired and congenital pathologic conditions within the chest.”¹ The program requirements and curricula of thoracic surgery residencies accredited by the Accreditation Council for Graduate Medical Education demand an immersion into the critical care of cardiothoracic surgical patients; completion of these programs requires an attestation of resident competence by the program directors. The 2 largest professional societies of cardiothoracic surgery, the Society of Thoracic Surgery and the American Association for Thoracic Surgery, dedicate large portions of their annual meetings to critical care. The American Board of Thoracic Surgery specifically examines candidates on critical care as part of its determination of board certification. Cardiothoracic surgeons are, in fact, specialized critical care physicians.

Therefore, Whitman and colleagues² are to be congratulated for this study. Their data clearly demonstrate that the critical care provided by cardiothoracic surgeons contributed to excellent surgical outcomes. One must conclude that the professional backgrounds in cardiothoracic surgery of these critical care physicians allowed them to improve the processes of care of cardiac surgical patients. In turn, this led to greater efficiency in the care provided and substantial financial savings. As Whitman and colleagues continue their research in this area, I am confident that these investigators will continue to affirm the competence of cardiothoracic surgeons as critical care physicians.

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