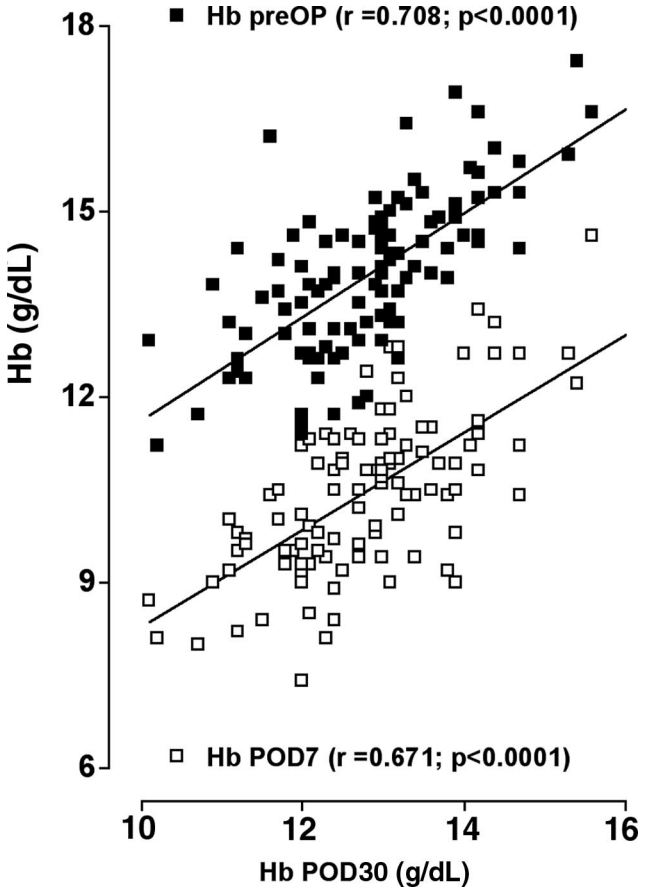


**Figure 1.** The correlations between postoperative day 30 (POD30) hemoglobin and preoperative hemoglobin (preOP) and postoperative day 7 (POD7) hemoglobin.

**Manuel Muñoz, MD, PhD**
*Transfusion Medicine, School of Medicine*
*University of Málaga*
*Málaga, Spain*
*mmunoz@uma.es*

**José A. García-Erce, MD, PhD**
*Department of Hematology*
*University Hospital "Miguel Servet"*
*Zaragoza, Spain*

**Jorge Cuenca, MD, PhD**
*Department of Orthopedic Surgery*
*University Hospital "Miguel Servet"*
*Zaragoza, Spain*

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### In Response:

We agree with Munoz et al.[1] regarding the importance of considering options other than blood transfusion to prevent or treat postoperative anemia in elderly patients after lower limb arthroplasty. This group reports considerable efficacy in maintenance of hemoglobin concentration in patients over 65 yr after primary knee arthroplasty with a regimen of perioperative iron ± erythropoietin.[1]

In our study, we found a positive correlation between hemoglobin levels on hospital discharge and quality of life at 2 mo postoperatively in those older than 65 years after primary hip arthoplasty.[2] Whether the targeted hemoglobin level is achieved by blood transfusion or perioperative iron and erythropoietin, it may result in improved quality of life scores in this patient population.

**Niamh P. Conlon, MBBChBAO, FCARCSI**

**Eilis P. Bale, RGN**

**G. Peter Herbison, MSc**

**Maire McCarroll, FCARCSI**

*Mater Misericordiae University Hospital*
*Newcastle, Australia*
*tallniamh@hotmail.com*

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DOI: 10.1213/ane.0b013e3181934208

# Cardiac Troponin Surveillance After Abdominal Aortic Surgery

### To the Editor:

Mantha et al.'s interesting cost-effectiveness analysis[1] identifies two factors, probability of myocardial infarction and efficacy of interventions, allowing us to focus our attention on what is important in deciding the usefulness of an intervention program.

In the Markov tree (Fig. 2), the authors treated the postcoronary artery bypass graft outcomes of myocardial infarction (MI) and stroke as mutually exclusive complications. Unless their source data did the same, could the tree have been constructed in which a patient suffered both complications? With Monte Carlo simulation, placing those complications at separate and sequential chance nodes and simplifying the tree using cloning, might have obviated the need to know how often patients suffer both complications.

The tree probability variable effrs [= efficacy of risk reducing strategies] seems not to be mathematically defined. Is it the same as Efficacy defined on page 1349? If so, then is the probability "MI"/"Test Positive"/"Troponin Surveillance" in the decision tree (Fig. 1) equal to (1 − effrs) × the probability of MI without intervention?

The analysis was based on a cohort consisting of 65-yr-old patients. Is there evidence that it would be cost-effective in, say, an 85-yr-old with a higher risk of complications but a much shorter life-expectancy? If not, then the declaration that the strategy is cost-effective for patients "65 yr and older" would be premature.

Peter W. Dion, MD, PhD, FRCPC
*Department of Anaesthesia*
*St. Catharines General Hospital*
*St. Catharines, Ontario, Canada*
*sleepdoc.awning@sympatico.ca*

**Table 1.** Results of the Model with Start Age Assumed as 85 yr

| Strategy | Direct medical costs | QALYs | ICER (cost/QALY) |
|---|---|---|---|
| Standard care | $24,837 | 4.8003 | |
| cTnI surveillance | $26,489 | 4.8512 | $32,456 |

ICER = incremental cost-effectiveness ratio; QALY = quality adjusted life-year.

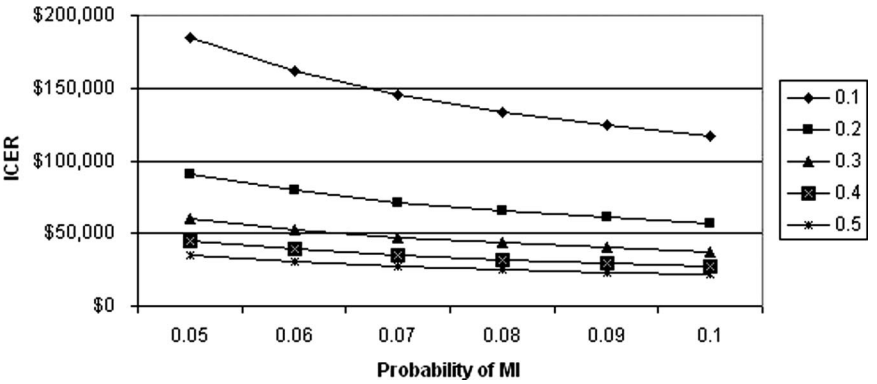


**Figure 1.** Two-sensitivity analysis on efficacy of MI risk-reducing strategies and different values of prior probability of MI assuming a start age of 85 yr. The *x*-axis represents the prior probability of MI and five values for efficacy i.e., 0.1, 0.2, 0.3, 0.4, and 0.5 were examined. ICER = incremental cost-effectiveness ratio; MI = myocardial infarction.

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### In Response:

Theoretically, although postcoronary artery bypass graft outcomes, i.e., myocardial infarction (MI) and stroke can occur in the same patient, such occurrence seems to be rare in actual clinical scenarios. In the source data for those outcomes used in our model[1,2], no patient suffered both complications.

Conceptually, Dr. Dion[3] is correct in his interpretation of the mathematical formula related to the MI rate after risk-reducing interventions. In the limb of the decision tree that Dr. Dion is referring to, i.e., probability of "MI"/"Test Positive"/"Troponin Surveillance," the probability of MI, the probability is equal to (1 − effrs) × probability of MI without intervention only when the sensitivity of troponin surveillance is 1. But in situations in which sensitivity is <1, the probability will be equal to (1 − effrs) × probability of MI without intervention × sensitivity of troponin surveillance. For example, with the baseline values, that probability would be 0.45 × 0.049 × 0.8 = 0.01764. In other words, that limb refers to true positive cases among those tested positive. Patients with false negative test results, i.e., P(D + |T-), would not get the benefit of risk reducing interventions.[4] Such a scenario is depicted in the last limb of the decision tree of our original paper.[5]

A recent series spanning a 14-yr period evaluated 30-day perioperative outcomes in patients aged >80 ($n$ = 490) and compared with those in patients aged <80 ($n$ = 2823). Perioperative all-cause mortality rates were higher in elderly than in younger patients (1.4% vs 0.2%, $P$ = 0.014), especially after abdominal aortic aneurysm repair (2.8% vs 0%, $P$ = 0.035). However, age *per se* was not an independent factor of a higher perioperative mortality risk or fatal and nonfatal complications.[6] We agree that, as the age of the cohort increases, the life expectancy decreases and incremental cost-effectiveness ratio may not be the same. For example, if we assume a start age of 85 instead of 65 yr, as in our original model, we would get the values as shown in Table 1. The incremental cost-effectiveness ratio value $32,460/quality-adjusted life year (QALY) is greater than the value we obtained in our original analysis i.e., $12,641/QALY, but it is still less than the threshold value, i.e., $50,000/QALY defined for cost-effectiveness. To further address the question raised by Dr. Dion, we conducted two-way sensitivity analysis with higher values for probability of MI and lower values for efficacy of risk reducing interventions than those we assumed in our original analysis (Fig. 1). These were the two key variables identified in our original analysis that determined the cost-effectiveness. We note that the troponin surveillance still remains cost-effective, provided the efficacy of the interventions is at least 0.3.

Srinivas Mantha, MD
*Department of Anesthesiology*
*Nizam's Institute of Medical Sciences*
*Hyderabad, India*

smantha@satyam.net.in
Michael F. Roizen, MD
Joseph Foss, MD
*The Cleveland Clinic Foundation*
*Cleveland, Ohio*
John E. Ellis, MD
*Chicago, Illinois*

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# Non-Opioid Anesthesia with Esmolol Avoids Opioid-Induced Hyperalgesia and Reduces Fentanyl Requirement After Laparoscopy

**To the Editor:**

Collard et al.[1] demonstrated that substituting an esmolol infusion for intraoperative fentanyl or remifentanil reduced postoperative fentanyl demand, diminished nausea, and accelerated discharge after laparoscopic cholecystectomy. The study design with two interventions in the same group (eliminating opioids and adding esmolol infusion) does not establish the definite cause-effect relationship.

Opioids provide an initial analgesic effect, but then reduce the pain threshold to less than baseline (opioid-induced hyperalgesia [OIH]) and increase the amount of drug required to achieve the same analgesia (tolerance).[2,3] Remifentanil has been shown to increase pain and induce mechanical hyperalgesia after 30 min infusion at the dose 0.05–0.1 $\mu g \cdot kg^{-1} \cdot min^{-1}$ in volunteers.[4–6] An alternative explanation for the decreased postoperative fentanyl requirement originally attributed to esmolol infusion[1] is that non-opioid anesthetic technique does not cause OIH and tolerance.

Both $\beta$-blockers and opioids blunt the sympathetic response to nociception during the surgery, whereas a subanesthetic dose of inhalational anesthetics exacerbates this response.[7] However, deepening inhaled anesthesia can achieve similar hemodynamic stability in most patients with additional benefit of anesthetic-induced preconditioning.[8]

OIH is modulated by anesthesia technique (e.g., use of *N*-methyl-D-aspartate antagonists), and some clinical studies have failed to demonstrate increased pain scores after remifentanil infusion.[9] Whether postoperative opioid sparing is caused by the intraoperative opioid avoidance or an intrinsic $\beta$-blocker opioid sparing effect remains to be answered in additional studies. Study groups should be matched for intraoperative opioid usage (receive either none or the same dose).

Collard's group finding that esmolol in the absence of opioids decreases the postoperative fentanyl requirement is clinically significant and relevant for ambulatory surgery. The question as to whether the diminished postoperative analgesic requirement after minimally invasive surgery is a result of presence of esmolol, absence of opioids or combination of these interventions remains to be answered.

Mindaugas Pranevicius, MD
*Department of Anesthesiology*
*Albert Einstein College of Medicine*
*Jacobi Medical Center*
*Bronx, New York*
*pranevicius@gmail.com*
Osvaldas Pranevicius, MD, PhD
*Department of Anesthesiology*
*New York Hospital Queens*
*Flushing, New York*

Dr. Carli does not wish to respond.

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# Proper Diagnosis and Treatment of Transurethral Resection of the Prostate Syndrome Requires More than Transesophageal Doppler

**To the Editor:**

Schober et al.[1] presented an interesting and noninvasive approach to the early detection of hypervolemia during transurethral resection of the prostate (TURP). However, the authors' conclusion that the patient suffered from "hypotonic hypervolemia" and the subsequent discussion and recommendations