HYPOTHERMIA AND POSTOPERATIVE OUTCOMES: ASSOCIATION OR CAUSATION? To the Editor:

We read with interest the thought-provoking contribution from Hannan and associates¹ regarding surgical outcomes as they relate to temperature. It is our opinion that the conclusions of this retrospective observational study may not be supported by the data presented.

The authors attempted to evaluate the impact of temperature on arrival in the intensive care unit on the outcomes for patients undergoing off-pump coronary artery bypass grafting. However, the design (a retrospective observational study) has a serious limitation: the association between temperature recorded in the intensive care unit and subsequent in-hospital morbidity and mortality does not establish causality. Thus, the conclusions of this particular study are unfounded given the information provided.

It remains plausible that both the impaired temperature regulatory mechanisms and the subsequent postoperative complications have common causes. For example, both hypothermia and postoperative morbidity may stem from intraoperative hypoperfusion, low cardiac output syndrome, hypotension, and under-resuscitation, among other possible factors.²⁻⁵ In the absence of data regarding perfusion indices (pH, bicarbonate and lactate levels, blood pressure, and

cardiac index), both intraoperatively and in the intensive care unit, to correlate with the recorded temperatures, hypoperfusion and under-resuscitation cannot be eliminated as a potential reason underlying both the hypothermia and a complicated postoperative course.

To further confound the issue, data are missing regarding the management of intraoperative temperatures. Were any attempts made to rewarm hypothermic patients intraoperatively? It is easy to speculate that such attempts were probably made (ie, it is implausible that the patients were left hypothermic without any intervention), but were effective only to a degree commensurate with the preservation of peripheral perfusion, accounting for a correlation between the severity of hypothermia and postoperative morbidity. In such circumstances, immediate intensive rewarming may be of dubious value, if not actually harmful.⁶

Patients at risk for intraoperative hypoperfusion and hypotension during off-pump coronary revascularization (such as those who are elderly, anemic, or have congestive heart failure) were also found postoperatively to be more often hypothermic and had higher in-house morbidity and mortality rates. That observation could hardly be attributed to hypothermia per se; at best, that indicates a significant etiologic heterogeneity in the hypothermia group. The final answer may only come from a randomized prospective clinical trial.

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Reply to the Editor:

We thank Drs Gologorsky and Salerno for their comments regarding our recent study that identified higher adverse outcome rates for patients undergoing off-pump coronary artery bypass graft surgery with higher and lower than normal temperatures on transfer from the operating room.¹

We agree with Drs Gologorsky and Salerno that the results of our study do not imply causation, but we do believe the results establish a strong association. The purpose of studies like ours that examine large observational databases is to generate testable hypotheses that can be used to ultimately improve quality of care and outcomes. Our study demonstrates that patients who are cold (or very warm) in the operating room experience worse results even if the mechanism (eg, low cardiac output, hypoperfusion, or just low temperature) is not known.

We are hopeful that these findings will establish a hypothesis-generating foundation for future studies that will shed more light on the causes of inferior outcomes for hypo- and hyperthermic patients. However, it is not clear that a randomized prospective clinical trial is a panacea because the other possible explanations posed by Drs Gologorsky and Salerno (low

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