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In Reply:—I appreciate the comments made by Drs. Dexter and Macario regarding our prospective, randomized, controlled trial on the economics of "fast-tracking CABG surgery."¹ They agreed with our conclusion that early extubation reduces cardiovascular intensive care unit (CVICU) and hospital length of stay and does not increase the rate or cost of complications when compared with patients in the late extubation population. High CVICU costs can be shifted to the lower surgical ward costs, and early extubation improves resource utilization after cardiac surgery. However, they questioned the methodology used for our findings that early extubation reduces overall hospital costs of CABG patients by 25%, mostly in nursing and CVICU costs.

As stated in our methodology, we included discharge criteria costs to show the potential for further cost savings in patients having cardiac surgery when postoperative management is maximized. We calculated direct variable costs as the product of the hourly salary of overtime and part-time nurses. The cost of full-time nurses and respiratory therapists were added as direct fixed costs. Our conclusion that early tracheal extubation reduces overall hospital costs by 25%, mostly in nursing and CVICU costs, was referred to in table 2. In this table, we included all of the actual CABG costs adjusted for all complications from preoperation to hospital discharge. Our findings confirmed that the time savings equate with our budgetary savings in a decrease in the number of scheduled staff.

Drs. Dexter and Macario correctly indicate that having enough nurses "on average" is insufficient when scheduling CVICU nurses and respiratory therapists for cardiac surgery. Nurses should be present to care for patients at all times. Our cost savings in the CVICU came from reduction in the number of afternoon and evening shifts of nurses and respiratory therapists working in the CVICU. As indicated in our discussion, to maximize the cost savings in early tracheal extubation, early tracheal extubation should be instituted as part of a fast-track cardiac program. A comprehensive or coordinated preoperative, intraoperative, and postoperative management or clinical pathway will minimize variation and maximize patient discharge from the CVICU and hospital.

Regarding the comments about the source of variation in our analyses: First, at our institution, we do not have much variation in the number of patients having CABG surgery. Each day, we have five cardiac operating rooms with 10–12 patients processed through our system for admission to the CVICU and step-down unit. Second, the variation in patient discharge time from the CVICU also is kept at a minimum. At our institution, we have two transfer times for patients

out of the CVICU at 10:00 AM and 2:00 PM, so that we have the flexibility of reducing the nursing:patient ratio in the PM hours by not having to call in part-time or shift nurses to the CVICU. These cost savings are made possible with early extubated patients.

There is no easy answer for what is the necessary minimal daily volume of CABG patients for a CVICU to gain from a decrease in time to discharge by using early tracheal extubation. This depends on the flexibility of the CVICU to adjust their nursing shift work, e.g., three 8-h shifts per day or two 12-h shifts per day. Early tracheal extubation will allow the reduction or shifting of nursing staff costs to other cost centers in the PM hours, according to the ratio of nurses-to-patients after extubation. There should not be any excuse, even from smaller centers with a fixed number of CVICU nurses, to not practice early extubation because we also have demonstrated that early extubation after cardiac surgery does not increase perioperative morbidity.² Nonetheless, to give an example from our own institution, we did 2,303 cardiac cases this past year with a pool of 40 full-time equivalent (FTE) nurses, plus 11 FTE part-time nurses for a total of 51 FTE. This equates to an average of 45 cardiac cases per 1 FTE. Holiday time and flexible time schedules for the nursing staff also were considered. With early extubation and lowered clinical acuity of the patients in the CVICU, further savings can be achieved by teaming nursing staff with nursing assistants.

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