Parting ways with routine postoperative chest radiographs: Are we ready to cut the cord?

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Should a chest radiograph (CXR) be performed on every patient after heart surgery? The question of whether to perform CXRs routinely or selectively in various intensive care unit patient populations, including postoperative cardiac surgical patients, has been scrutinized for more than 2 decades.^{1,2} In a simple yet elegant study in the current issue of the *Journal*, Tolsma and colleagues³ shed additional light on this question by prospectively testing a selective protocol for postoperative CXR use during the first 24 hours after cardiac surgery with sternotomy at a single center in The Netherlands. Indications for selective (on-demand) CXRs were carefully defined in the article and included difficult central venous access, intra-aortic balloon pump placement, and hemodynamic, ventilatory, or physical examination abnormalities. Tolsma and colleagues³ then verified the sensitivity of their selection protocol by performing CXRs on all remaining patients the next morning to screen for any missed findings among the patients who had failed to meet criteria for an on-demand CXR. According to their selection protocol, only 301 of 1102 patients (27%) met indications for an on-demand CXR after surgery; of these, 12 patients (4%) required intervention. Among the remaining 801 patients who did not receive an on-demand CXR on the day of surgery, screening CXRs the next morning identified only 5 patients (0.6%) who had missed findings requiring intervention (4 chest tubes for pneumothorax or effusion and 1 transthoracic echocardiogram for widened mediastinum), and none of these patients were harmed as a result of the delay in diagnosis. Thus the selective CXR protocol achieved a 73% reduction in immediate postoperative CXR use, leading to reduced radiation exposure to patients, a predicted cost saving of \$40,000/year, and no apparent increase in adverse events.

The rationale for compulsory chest imaging after cardiac surgery is to detect and address potentially harmful problems before any clinical manifestations. Similar to other screening tools, for routine CXRs to have value they must pose minimal risk to the patient, identify important pathology before the onset of signs or symptoms, allow for improved outcomes through early intervention, minimize overtreatment of false-positive findings, and be cost-effective. By most accounts, CXRs fulfill these criteria because they are safe and inexpensive, and the benefits of identifying major problems before acute decompensation (tamponade, tension pneumothorax, etc) are potentially large. As a result, most cardiac surgical centers are willing to accept the costs and small risks of performing routine CXRs on all postoperative cardiac surgical patients. The study by Tolsma and colleagues,³ however, effectively challenges this practice and suggests that important life-threatening problems are not missed when routine CXRs are abolished and replaced with on-demand CXRs obtained only for defined clinical indications. The goals of minimizing patient exposure to unnecessary imaging and laboratory tests⁴ and of reducing the costs of surgical intervention are clearly laudable, and Tolsma and colleagues³ are to be congratulated for their effort.

Despite these convincing findings, certain study limitations may render some centers reluctant to abandon routine postoperative CXRs without further evidence of safety and cost-effectiveness. First, the study by Tolsma and colleagues³ does not contain a control group or report objective clinical end points. As a result, although the number of clinically significant missed findings as a consequence of the selective CXR protocol was low, it is unclear whether there was any survival or outcomes benefit or hazard to this protocol relative to patients subjected to a routine CXR protocol. Second, although Tolsma and colleagues³ demonstrated in an 1100-patient single-center series that the selective CXR protocol was safe, extrapolating their experience to the general population without a greater sample size may be premature. At present, Tolsma and colleagues³ have shown only that the major error rate of their selective CXR protocol is less than 1 in 1100, but how many serious adverse events might be detected if the sample size were to be increased

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to 10,000, to 20,000 or to the more than 200,000 patients undergoing cardiac surgery yearly in the United States? Even if a serious adverse event occurred only once per 10,000 patients as a result of the selective CXR protocol, the modest cost saving of \$40,000/year per center (or \$36/patient) could easily be erased by a single major patient complication resulting in reoperation, organ failure, or prolonged hospitalization. In the era of fervent attention to quality, safety, and process improvements; public reporting; never events; and the national pursuit of 1% coronary artery bypass grafting mortality,⁵ many centers may understandably remain hesitant to part ways with the time-honored practice of routine

postoperative CXR until proved safe in a larger, multi-institutional population of cardiac surgical patients.

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