Q Is it safe for patients with pulmonary artery catheters inserted via the jugular or subclavian vein to stand up?

Do you have any information on ambulating patients with femoral arterial catheters? Some of our patients have femoral arterial catheters after open heart surgery, and the surgeon says to ambulate them with the catheters in place. Although this makes me uncomfortable, I cannot find literature to support or not support this.

I do not see any available standards or articles related to safety of ambulation with small-gauge (20 gauge) “soft” femoral catheters. It seems that most institutions have no policy. I refuse to get my patient out of bed with a femoral arterial catheter but often have patients with orders to do so. My concern is related to fibrin clots that may form around the catheter, especially because of its length (usually 20 cm). Valid or not?

Chris Winkelman, RN, PhD, replies:

Data are currently insufficient to build a standard or policy for strategies related to safe, effective ambulation of patients with pulmonary artery or femoral catheters. Generally, reports of complications from cannulation of the internal jugular, subclavian, and femoral veins as well as the femoral artery focus on events during insertion of catheters, not on subsequent events associated with catheter manipulation or with patients’ movement or activity. Although some reports describe increased risk of infection with femorally inserted catheters as opposed to catheters inserted via the subclavian or jugular vein, none of these reports detail whether catheters are manipulated via patients’ activity.

Certainly, the best option is to remove central catheters when they are no longer required for therapy. However, some data and clinical expertise suggest that the risks for out-of-bed activity in patients with either femoral or pulmonary artery catheters are minimal. The data and experiences are described here. Avoiding the hazards of bed rest provides a compelling reason to mobilize our intensive care unit (ICU) patients.

Pulmonary Artery Catheters

Potential complications from manipulating the pulmonary artery catheter while sitting or standing include catheter fracture, migration both forward and backward into the pulmonary artery, injury of the vessel, and accidental dislodgment with potential for life-threatening dysrhythmias. The most serious potential complications are advancement of the tip, occluding the pulmonary artery with potential lung tissue damage/necrosis, and dysrhythmias from movement of the catheter in the right atrium. It is essential to assess the catheter for its secure placement before the patient begins moving around. Be sure to check out the safety of moving the patient in bed; if dysrhythmias occur while the patient is turning from side to side or the catheter shows significant forward/backward movement, then...
the patient is an unlikely candidate for out-of-bed activity.

Indirect evidence from 7 studies designed to evaluate values derived from pulmonary artery catheters suggest that sitting in a chair, standing, and walking occur in practice and research settings, and no adverse outcomes specific to mobilizing patients who have a pulmonary artery catheter were reported in any of those studies. Although it is not clear from these reports whether pulmonary artery catheters were inserted into subclavian or jugular veins, it seems reasonable that the risks for complications are similar regardless of insertion site as far as mobility activity is considered.

A study recently published in the American Journal of Critical Care described a series of 27 patients who sat in a bedside chair while a pulmonary artery catheter was in place, and no complications from either standing or sitting were reported. The authors included a picture of a patient sitting in a bedside chair with a pulmonary artery catheter placed via the internal jugular vein! A similar report of no complications occurred with a sample size of 55 patients after coronary bypass graft surgery who assumed a sitting position at the edge of the bed (also called “dangling”).

In 3 reports from 1 site that included a total of 61 patients with a pulmonary artery catheter after open heart surgery, the effects of standing, sitting, and even operating a standing bicycle were reported; no complications related to use of a pulmonary artery catheter during these activities were detailed. In another report of monitoring pulmonary artery pressure during exercise and activities of daily living in a series of 9 men with chronic heart failure, researchers reported no complications from invasive monitoring over a series of days. Although the study was not ICU-based, 1 report described use of a pulmonary artery catheter during walking and exercise in 9 pregnant women. When reported, the duration of activity in those studies ranged from 10 to 60 minutes.

The absence of reported complications is not conclusive evidence of no adverse outcomes. Nonetheless, I suspect that the studies could not have occurred unless the principal investigators were able to document that sitting in a chair or dangling with pulmonary artery catheters was safe or common practice when applying to get permission to study human subjects from an institutional review board. So although no specific report has been published about the safety of sitting or walking ICU patients who have pulmonary artery catheters, the literature does appear to support both feasibility and safety in practice.

**Femoral Catheters**

Information about the safety and feasibility of assisting patients with a femoral catheter out of bed is supported by findings from a retrospective, single-center chart review. This report specifically details no documented complications among 30 cardiovascular surgery patients with either arterial, venous, or both femoral and venous catheters who had at least 1 episode of out-of-bed activity (mean duration, 30 minutes) while in the ICU after cardiovascular surgery (total number of activity events = 47).

Researchers in several studies have examined healthy adults with femoral venous and arterial catheters participating in sitting, standing, and repetitive, resistance exercise in laboratory settings. In 1 report about healthy adults, no major complications (ie, no thrombosis, no loss of pulse, and no fistula or pseudoaneurysm) occurred with femoral catheters during 346 arteriovenous cannulations in a 10-year period. Catheters had to be repositioned or replaced in 41 of 346 separate instances (11.8% of arteriovenous cannulations) and were removed because of loss of patency in 6 instances (1.7% of cannulations). Bruising at the insertion site was documented 29 times (8.4% of cannulations) with no additional complications after hemostasis was achieved with pressure. Subjects in this report underwent vigorous and repeated activities such as walking on a treadmill or bicycling for 60 minutes and engaging in resistance exercises with repeated hip flexion for 30 to 60 minutes.

Clinicians in Johns Hopkins Hospital ICUs do not restrict out-of-bed activities based solely on the presence of femoral catheters (Dale Needham, written communication, July 20, 2011; www.hopkinsmedicine.org/OACIS). Anecdotal evidence from physiotherapists in Australia indicate that in that country it is common to have patients with femoral catheters sit, stand, and walk while they are in the ICU (Elizabeth Skinner, written communication, May 15, 2010). These data appear to support the safety of having patients with femoral catheters ambulate.
Although evidence shows that a fibrin sheath forms around venous catheters that have been in place for more than 7 days (typically dialysis catheters and peripherally placed central catheters), little or no information is available about fibrin formation around the catheters commonly used in ICUs. Most cases of fibrin dislodgment occur during removal of venous catheters.21 A fibrin sheath does not commonly contribute to thrombus formation.19 An older study20 indicated that as many as 8.5% of critically ill adults experienced femoral vein thrombosis when the catheter had been in place 8 days or longer. However, these findings may not apply to patients receiving venothromboembolism prophylaxis or patients with newer silicon catheters.

Further support that thrombus/embolic risk is not a consideration when determining the type or duration of out-of-bed activity comes from guidelines for care of the patient with a deep vein thrombosis when the catheter had been in place 8 days or longer. However, these findings may not apply to patients receiving venothromboembolism prophylaxis or patients with newer silicon catheters.

The guidelines include data indicating that the incidence of pulmonary emboli is not reduced with bed rest and that patients experience less swelling and pain with deep vein thrombosis when mobilized early.21 No reports of complications from manipulation of a femoral catheter associated with hip flexion were found in my search of published reports. Potential complications reported in texts and listservs were the risk of catheter fracture and migration, venous or arterial injury, loss of catheter patency (kinking, thrombosis formation), and accidental dislodgment (with possible significant blood loss if arterially placed). Catheters and dressings may become unsealed and contaminated. Some of the risk for complications can be reduced by avoiding hip flexion greater than 45° in the affected leg (ie, the same degree of flexion for in-bed positioning to reduce aspiration risk) and inspecting the catheter and dressing for secure connections.

As with pulmonary artery catheters, risks and benefits for individual patients with femoral catheters should be assessed before mobility activities are started. When the risk to the patient would be high if a complication were to occur, consider modifying or delaying the activity. For example, a high-risk situation may be when the femoral catheter is the only access for the patient and dislodgment could cause major problems with the delivery of essential intravenous therapy. If the patient has a marked coagulopathy or a very low platelet count, be extra cautious about vigorous levels of activity. Finally, if the catheter presents challenges of kinking, reduced flow, or dampened waveforms in bed or the catheter is not very secure, these conditions must be addressed before activity is started.

While researching the answer to these questions, I learned that 2 clinicians and their team are in the process of submitting manuscripts about prospective studies that describe the results of mobilizing patients with both rigid and flexible femoral catheters in veins and flexible catheters in femoral arteries (Christiane Perme, written communication, May 10, 2011; Nathalie Cote, written communication, May 13, 2011). Both of these acute care physical therapy experts are seasoned in ICU practice. In a series of observations numbering more than 100 (Perme) and 500 (Cote) mobility activities, preliminary data indicate no incidents or complications from sitting, standing, or walking. In general, femoral catheters were sutured and inspected for potential safety hazards before a physical therapy session. Cote further reported that femoral catheters included both soft and rigid (dialysis-style) catheters. Both clinicians emphasize that the teams providing activity are ICU-based and experienced in delivery of rehabilitation therapy. Some adjustments were made to specific mobility activities such as avoiding multiple repetitions of hip flexion (as with range of motion or exercises for strengthening). Both clinicians reported that femoral catheters do not routinely limit progression to out-of-bed activity in their settings.

Conclusion

The presence of a pulmonary artery or femoral catheter should not be considered an absolute or routine contraindication for mobilization in the ICU. Several investigators have reported successful implementation of mobility activities while pulmonary artery and femoral catheters were in place. Other considerations, such as hypotension or combative agitation, provide more compelling reasons to limit activity than do tubes and catheters. A Web site that may be helpful to clinicians who are implementing mobility as part of
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Ambulating With Pulmonary Artery or Femoral Catheters in Place
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