

## CORRESPONDENCE



## Preventing Complications of Central Venous Catheterization

**TO THE EDITOR:** The review by McGee and Gould entitled “Preventing Complications of Central Venous Catheterization” (March 20 issue)<sup>1</sup> convincingly shows that there are substantial data from clinical studies to guide the performance of this important procedure. For example, the authors advocate the use of full sterile-barrier precautions because they have been proven to reduce the incidence of catheter-related infections.<sup>2</sup> A recent consensus statement from the Centers for Disease Control and Prevention and 13 professional medical societies also mandates the use of full sterile-barrier precautions.<sup>3</sup> Unfortunately, in the instructional video that accompanies the review, the physicians do not wear sterile gowns. The prevalence of physicians’ noncompliance with guidelines for the use of full sterile-barrier precautions is unknown, but it may be high, given the frequency of catheter-related infections.<sup>4</sup> The medical community should create incentives for adherence to the best-practice guidelines stated in the review.

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1. McGee DC, Gould MK. Preventing complications of central venous catheterization. *N Engl J Med* 2003;348:1123-33.
2. Raad II, Hohn DC, Gilbreath BJ, et al. Prevention of central venous catheter-related infections by using maximal sterile barrier precautions during insertion. *Infect Control Hosp Epidemiol* 1994; 15:231-8.
3. O’Grady NP, Alexander M, Dellinger EP, et al. Guidelines for the prevention of intravascular catheter-related infections. *MMWR Morb Mortal Wkly Rep* 2002;51(RR-10):1-29.
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**TO THE EDITOR:** In Table 1 of their article, McGee and Gould suggest that the use of maximal sterile-barrier precautions during catheter insertion may decrease the risk of infectious complications. However, the accompanying video shows the operator wearing only gloves. Clearly visible in the video is the operator’s identification badge, which has the potential to contaminate the wire. Our institution requires a surgical scrub, removal of rings and watches, and the use of sterile gowns and gloves. Some institutions now use full-body draping. In addition, a demonstration of ultrasound guidance would have made the video more educational. Although the video may provide a good demonstration of the mechanical aspects of placing a central venous catheter, it fails to show how to minimize the complications that are the subject of the article.

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**TO THE EDITOR:** McGee and Gould state that “subclavian venous catheterization carries the lowest risk of catheter-related thrombosis” and advocate this route rather than the internal jugular vein for central venous access. This recommendation is based on a single study<sup>1</sup> in which bedside Doppler ultrasound

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examination of the accessed vein was performed at the time of catheter removal. Images of central venous outflow (through the innominate vein and superior vena cava) was not imaged. None of the patients with positive findings had symptoms, and none received a diagnosis of pulmonary embolism. However, multiple studies have shown the opposite — that subclavian venous catheterization results in a much higher incidence of venous stenosis and thrombosis than does catheterization with internal jugular venous access.<sup>2-4</sup> These studies used contrast venography, allowing complete evaluation of central venous outflow. Moreover, the incidence of symptomatic lesions has been shown to be significantly higher with subclavian access than with internal jugular access.<sup>2,3</sup> These findings are certainly echoed at our institution, where members of our interventional radiology service insert more than 1500 venous-access devices each year and where we routinely deal with complications of venous access.

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1. Timsit JF, Farkas JC, Boyer JM, et al. Central vein catheter-related thrombosis in intensive care patients: incidence, risk factors, and relationship with catheter-related sepsis. *Chest* 1998;114:207-13.
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3. Macdonald S, Watt AJ, McNally D, Edwards RD, Moss JG. Comparison of technical success and outcome of tunneled catheters inserted via the jugular and subclavian approaches. *J Vasc Interv Radiol* 2000;11:225-31.
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**TO THE EDITOR:** McGee and Gould's article on preventing complications during central venous catheterization is informative and well illustrated. However, the authors do not adequately address the complication of pneumothorax after internal jugular venous cannulation. Instead of inserting the needle between the heads of the sternocleidomastoid muscle low in the neck, as they suggest, a more cranial and lateral approach is advantageous. The puncture site is posterolateral to the sternocleidomastoid muscle, halfway between the mandible and the clavicle. Inadvertent carotid puncture is still possible, but initially aiming superficially and then

"walking" the needle down until venous blood is returned will result in a high rate of successful cannulation and virtually eliminate the risk of inadvertent pleural entry. This point is of great importance in patients receiving positive-pressure ventilation, in whom puncture of the lung may result in the development of a tension pneumothorax.

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**TO THE EDITOR:** McGee and Gould recommend the use of chlorhexidine-based rather than povidone-iodine solutions for skin preparation. However, the occurrence of immediate, life-threatening hypersensitivity reactions has been described after the insertion of central venous catheters impregnated with chlorhexidine, after the intraurethral use of chlorhexidine, and after the topical application of chlorhexidine.<sup>1-3</sup> Indeed, in more than 60 published cases the diagnosis of anaphylaxis due to chlorhexidine was confirmed. The severity of these cases prompted the Food and Drug Administration (FDA), in 1998, to issue an alert to the medical community about the potential for serious hypersensitivity reactions to chlorhexidine-impregnated medical devices.<sup>4</sup>

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4. Center for Devices and Radiological Health. FDA public health notice: potential hypersensitivity reactions to chlorhexidine-impregnated medical devices. Rockville, Md.: Food and Drug Administration, March 1998. (Accessed June 6, 2003, at <http://www.fda.gov/cdrh/chlorhex.html>.)

**TO THE EDITOR:** McGee and Gould do not mention the routine use of chest films to identify malpositioning of catheters. When blind-access procedures are used, catheter malpositioning is frequently an unavoidable but correctable error, and complica-

tions are therefore usually preventable by immediate repositioning.

It is essential to ensure that the catheter tip is in the distal portion of the superior vena cava, just above the right atrium, in the longitudinal plane. Preventable complications include tachyarrhythmias or delayed pericardial tamponade, delayed contralateral hydrothorax, ipsilateral internal jugular or contralateral subclavian intubation with early thrombosis, and late progression of small pneumothoraxes.<sup>1</sup>

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1. Bowdle TA. Central line complications from the ASA Closed Claims Project: an update. Vol. 66. No. 6. ASA Newsletter. June 2002: 11-2, 25. (Washington, D.C.: American Society of Anesthesiology.)

**TO THE EDITOR:** In their excellent review, McGee and Gould correctly emphasize knowledge of the venous anatomy of the neck. I suggest that similar knowledge of thoracic venous anatomy and its variations is also essential for anyone who inserts these catheters.<sup>1</sup> Radiologists occasionally see the tips of central venous catheters in azygos veins, internal thoracic veins, and anomalies such as a left superior vena cava. Few residents who insert catheters recognize these venous structures.

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**THE AUTHORS REPLY:** We thank Drs. Berlin and Perrin for reemphasizing that full sterile-barrier precautions should be used when inserting a central venous catheter. Because it is difficult to change physicians' behavior, we agree with Dr. Berlin that appropriate incentives should be devised to encourage this practice.

Dr. Soltes and colleagues argue that the rate of catheter-related thrombosis or stenosis is higher with catheters that are placed at the subclavian site than with those placed at the internal jugular site, in contrast to the findings of Timsit et al.<sup>1</sup> To support their argument, they cite studies of variable quality that enrolled patients with dialysis catheters or tunneled infusion catheters, which were not the focus of our review. If Dr. Soltes and his group

have collected data on the risk of thrombosis associated with the use of standard, nontunneled catheters that contradict the findings of Timsit et al., we encourage them to publish their findings.

Dr. Ouriel is concerned that we did not address the risk of pneumothorax after internal jugular catheterization. However, in Table 2 of our article, we cite data showing that pneumothorax occurs infrequently during catheterization at this site. To our knowledge, no one has shown that the risk of pneumothorax is lower when internal jugular catheterization is performed through the posterior approach, although this seems plausible on the basis of anatomical considerations. We agree that it is useful to be familiar with multiple approaches for placing central venous catheters, and we thank Dr. Ouriel for describing the technique of posterolateral insertion.

Dr. Dewachter and colleagues warn that cases of anaphylaxis have been linked to the use of chlorhexidine-impregnated catheters. For reasons that are not known, most cases have occurred in Japan, prompting voluntary withdrawal of these catheters from the Japanese market in August 1997.<sup>2</sup> Fortunately, since the FDA issued its public health notice on this matter in March 1998, only one additional case of immediate hypersensitivity to a chlorhexidine-impregnated catheter has been reported in the United States (Yoder DL, FDA: personal communication). The risk of this very rare but potentially life-threatening complication must be weighed against the much greater risk of catheter-related bloodstream infection, which is also potentially life-threatening.

Finally, we agree with Drs. Beer and Towers that radiographs of the chest should be obtained and knowledge of thoracic venous anatomy should be applied to confirm that a newly placed catheter is positioned correctly.

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