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REFERENCES

1. Cooper JB, Newbower RS, Long CD, McPeck B: Preventable anesthesia mishaps: A study of human factors. *ANESTHESIOLOGY* 49:399-406, 1978
2. Hyndman BH: Failure to monitor: The equipment element. *Essential Noninvasive Monitoring in Anesthesia*. Edited by Gravenstein JS, et al. New York, Grune and Stratton, 1980, pp 283-298

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Manufacturer's Comment

I do not agree with the statement that this "incident involving a Dupaco Model 75000® anesthesia machine . . . suggests a potential hazard specific to that model." As reported in the letter, aging and hardening of the lubricant and the two seals around the spool increased the resistance to its travel. After this problem was discovered by the hospital, an authorized Dupaco dealer was called in to evaluate the situation, and it was determined (as was indicated in the letter) that the problem could have been avoided by implementing a more extensive preventive maintenance program. Simple cleaning and re-lubrication of the components corrected the problem.

ECRI has developed a preoperative machine check-out procedure that is available from ECRI in the form of a card which can be attached to each anesthesia machine. It is important that when servicing these machines it is not only necessary to insure that the flush feature is activated properly, but that the valve returns freely, restoring the pre-set flows through the flow tubes.

On apparatus manufactured prior to 1975, the flush

valve incorporated a "twist-to-lock-on" feature. This feature was removed to comply with the ANSI Z79.8, 1979 standards. We recommend that the small cross pin in the shaft be removed to eliminate this feature. This is best accomplished at the time of servicing the valve. (It should be mentioned that the ANSI standard does permit a locking type flush valve, "if specially requested by the users." The Dupaco flush valve does comply with this standard.)

We find it difficult to agree with the inference of this letter that the Dupaco Model 75000 anesthesia machine's design contains this potential hazard. What we do agree with is the suggestion that following more specific service recommendations is in order: 1) A routine preventive maintenance program be initiated and followed for every anesthesia machine in use. 2) A preoperative machine check must be performed before every anesthetic administration.

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Technique is the Critical Variable

To the Editor:—Dr. Naulty and colleagues reported an incidence of air embolism of 47% during insertion of epidural catheters in 17 healthy women for analgesia for labor and delivery.¹ Although they did not evaluate

methods for decreasing this incidence, they proposed several actions that might be taken to avoid the possibility of air embolism, including hydration, performance of the epidural in the lateral position, and per-

forming the loss of resistance test with saline or local anesthetic rather than air.

There are two aspects of their epidural technique that may have contributed to the high incidence of air embolism. First, they used the "hanging drop" sign to identify the epidural space. I would propose that if carefully investigated, this method for identifying the epidural space would be associated with a higher incidence of entry of the epidural needle tip into an epidural vein than if the space is identified by "loss of resistance" in which continuous pressure is applied to the plunger of a small syringe filled exclusively with fluid, either saline or local anesthetic. Second, it has been shown that the incidence of insertion of an epidural catheter into an epidural vein is greater when the epidural space is not first expanded by the injection of fluid, than when it is.² I believe that the incidence of air embolism from epidural anesthesia reported by Naulty *et al.* would have been far lower if greater care had been taken to push

the epidural venous plexus out of the way by the use of continuous pressure with fluid as the needle was being inserted and by expansion of the space with 7 to 10 ml of fluid before inserting the catheter. Further, I suggest that these simple precautions are more important than hydration or posture for minimizing this complication.

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REFERENCES

1. Naulty JS, Ostheimer GW, Datta S, et al: Incidence of venous air embolism during epidural catheter insertion. *ANESTHESIOLOGY* 57:410-412, 1982
2. Verniquet AJW: Vessel puncture with epidural catheters. *Anaesthesia* 35:660-662, 1980

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In reply:—The "hanging drop" sign is used at our institution as a training device for residents, and since this is our standard technique, this is what we evaluated in the study. We noted in the paper that the possibility of air embolism would be reduced by using the loss of resistance technique "with saline or local anesthetic rather than air." However, I feel that if 7 to 10 ml of "fluid" are used to distend the epidural space prior to insertion of the epidural catheter, the fluid should *not* be local anesthetic, since this large volume given intrathecally or intravenously could cause obvious diffi-

culties. All aspects of technique in epidural anesthesia are critical.

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Pulmonary Artery Catheters in Eisenmenger's Syndrome: Many Risks, Few Benefits

To the Editor:—I read with both interest and chagrin the case report by Devitt *et al.*¹ recounting the fatal outcome of pulmonary artery monitoring in a parturient with Eisenmenger's syndrome. Although their discussion of the risks was entirely reasonable, the discussion of the benefits of a PA line in this disease demands further consideration.

A number of potential benefits for pulmonary artery catheterization in this patient could be postulated:

1) Pulmonary artery catheterization allows measurement of PA occluded pressure to evaluate left ventric-

ular volume status. Eisenmenger's syndrome is characterized by obliterative pulmonary vascular disease in which PAOP may not truly reflect LVEDP or LVEDV. In this syndrome, the right ventricle, not the left, is at highest risk for dysfunction. Right atrial pressure should provide an adequate assessment of vascular volume.

2) The authors' discussion of PA catheterization for evaluation of shunting should be reevaluated. In the patient with pulmonary hypertension and a right-to-left shunt, the degree of shunting is easily evaluated by serial analysis of arterial blood gases and by observing the clinical signs of increasing tachypnea, cardiac rhythm