Toward Safer Spine Surgery
Proper planning and a systematic approach optimize outcomes

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As surgical techniques for patients with scoliosis and other spinal deformities become more complex, the potential for complications looms ever larger, making a systematic approach to patient safety during and after surgery essential.

Adverse events will occur in 70,000 children undergoing surgery per year, said Suken A. Shah, MD, a faculty member for the “Techniques for Optimizing Safety and Outcomes in Spinal Deformity Surgery” course at the 2011 Annual Meeting of the Scoliosis Research Society. In pediatric spine surgery, adverse events occur in about 14 percent of procedures, although most do not incur sequelae. The positive news, said Dr. Shah, is that 60 percent of adverse events are preventable when a system is in place to optimize safety and outcomes intra- and postoperatively.

Preoperative safety measures
The safety effort should begin before the patient enters the operating room, with a preoperative check of equipment, including implants, sterilization, and graft material. The surgery team should also confirm the patient’s identification, site markings, and appropriate blood products.

“What is needed is a simple, systematic way to make sure that no items, even small ones, are forgotten,” Dr. Shah said. He recommends a preoperative huddle and the use of a simple checklist, such as a modified version of the World Health Organization (WHO) Surgical Safety Checklist. Before surgery, all members in the team should introduce themselves. “It’s been demonstrated in the airline industry and other complicated systems processes that when people don’t know each other, they don’t communicate, and they don’t speak up,” Dr. Shah said. Other checklist items should include the following:

- Patient position and surgical site, and levels for surgery
- Verification of signed consent and understanding of the procedure
- Antibiotic administration within 30 minutes of incision
- Availability of blood products
- Discussion of anticipated critical events
- Disposition of the patient after surgery (eg, to the intensive care unit, the recovery room, or home)

Confirmation of the surgical level(s) is crucial. “This might be the most common complication or lawsuit trigger in spine surgery,” Dr. Shah said.

Infection prevention measures, when implemented consistently, can significantly lower infection rates (Fig. 1). These include proper timing of antibiotic administration, preparation of skin and draping, limiting traffic in the operating room, efficient use of operating room time, and fluoroscopy.

For anesthesia, a dedicated team following a known routine is optimal, with full communication among the anesthesiologist, surgeon, and monitoring personnel. Because anesthetics agents can facilitate or interfere with monitoring, Dr. Shah advised limited use of paralytic agents. Strict control of blood pressure can limit bleeding, as can antifibrinolytics and cautery techniques.

Intraoperative safety
Neuromonitoring has made spinal deformity surgery safer, according to Dr. Shah. Monitoring of transcranial motor-evoked potentials (tcMEP) “can be protective or reduce the rate of neurologic injury because it provides real-time information about the health of the spinal cord.” Personnel should be qualified and have proper certification, Dr. Shah said, and multimodality, onsite interpretation should be employed.

“Newer techniques do pose a risk of neurologic deficit and can increase the complication rate by inducing more blood loss and destabilizing the spine,” Dr. Shah said. “Surgeons must understand the biomechanics of the implants; implants that are too strong for a patient’s bone density can cause injury.”

He added that once the correction is achieved and the implants inserted, “surgeons must use meticulous technique to achieve fusion and proper closure and must document that the procedure was done properly before leaving the operating room.”

Postoperative safety steps
After surgery, the recovery room and intensive care unit personnel should have a face-to-face signoff and exchange of information. According to Dr. Shah, pain should not be viewed as a complication and “proper pain management may increase satisfaction.” At his hospital, for example, a multimodal pain management program is used that involves epidurals, judicious use of Toradol and gabapentin, and early rehabilitation to decrease narcotic use and its related complications.

The use of hospitalists, said Dr. Shah, can reduce both length of stay and costs. “They understand the need for nutritional support, pulmonary supplementation, and weaning from ventilators,” he said. Postoperative care pathways should establish benchmarks for each day, which the patient needs to meet before leaving the hospital. This will help decrease length of stay, complication rate, and variability.

Complications
“Surgeons have multiple educational opportunities to teach patients and their families about these procedures and the inherent risks. Informed patients may be more accepting if a complication does occur,” noted Dr. Shah.

According to Dr. Shah, the “five big things to watch out for” in spine deformity surgery include infections (early and late); implant problems; pseudoarthrosis; imbal-

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