



Regional Oximetry Monitoring of Cerebral Oxygen FAQs

The Clinical Need: Prevention of Cerebral Oxygen Desaturation Injury during Major Surgery

1. Question: How prevalent is cerebral injury in major surgery?

Answer: Although studies vary, most conclude that stroke results in about 5 percent to 12 percent of all major surgery types (the low-end being general surgery in otherwise healthy patients, and the high-end being major aortic surgery or multiple heart valves). As one major study reports, “Adverse cerebral outcomes after coronary bypass surgery are relatively common and serious; they are associated with substantial increases in mortality, length of hospitalization, and use of intermediate or long-term care facilities.” (Roach GW et al; NEJM 1996)

Cognitive decline, although difficult to assess, results in up to 75 percent to 80 percent of surgery where hypotension is used to control bleeding or cardio-pulmonary bypass is used. One study recently concluded, “Our results demonstrate that intraoperative rSO₂ desaturation is significantly associated with demonstrable neurocognitive decline in a prospectively randomized CABG population.” (Slater JP et al; An Thorac Surg 2009)

2. Question: What is the cost of stroke and cognitive decline?

Answer: Although estimates vary, the cost of stroke is estimated to be at least \$10,000 per patient following coronary artery bypass. One study reported that each peri-operative stroke case costs the hospital \$10,266 — a figure that is likely higher in current dollars. (Roach GW et al; NEJM 1996)

The cost of cognitive decline, although more difficult to assess, is also substantial due to an increased post-operative length of stay. In addition to the immediate costs associated with treating patients with peri-operative cerebral injury, patients frequently suffer effects for weeks, or even months, following surgery — potentially leading to additional financial and scheduling burdens to allow for follow-up appointments.

3. Question: What is the benefit of monitoring oxygen saturation in the cerebral cortex?

Answer: Monitoring cerebral oxygen saturation during surgery tells the clinical team how the brain is metabolizing relative to its pre-operative baseline value. If that level deteriorates by clinically significant levels, it alerts the team and enables them to restore baseline saturation before significant damage is done — relieving the hospital of the increased economic costs associated with cerebral injury described in question #2.

The Clinical Solution: EQUANOX™ Near-infrared Spectroscopy (NIRS) Regional Oximetry Technology

1. Question: How does cerebral rSO₂ monitoring help reduce the incidence of stroke and cognitive decline?

Answer: Monitoring oxygen saturation in the cerebral cortex tells the clinical team that the level of oxygen in the cerebral cortex has declined and may not be at the necessary level for healthy metabolism — allowing early intervention to restore healthy levels prior to damage occurring. In the absence of rSO₂ monitoring, unless S_{jv}O₂ measurements are taken, the clinical team may not know there is a problem until it's too late to make a clinically appropriate decision.



2. Question: Are readings from the 7600 Regional Oximetry System monitor instantaneous and in real-time?

Answer: Yes, the 7600 Regional Oximetry System's sampling rate is the fastest in the industry, so the information you receive is near instant and in real-time. Signal acquisition is almost immediate and sampling rates are less than two seconds apart — making the values on the monitor true to those in the patient's tissue bed at any given moment.

3. Question: How do I know the values on the monitor are true to those in the cerebral cortex?

Answer: **EQUANOX** technology represents a significant advance in NIRS regional oximetry monitoring because its sensor architecture eliminates the surface effects that interfere with optimal readings. Traditional technology has only one emitter and if the light produced by that single emitter is impeded or obscured by the patient's tissue, the resulting accuracy of the measurements is equally reduced. **EQUANOX's** cerebral sensor technology utilizes two emitters that effectively cancel out surface differences — resulting in a more accurate and consistent measurement of cerebral oxygen.

4. Question: How is the Model 7600 Regional Oximetry System with **EQUANOX** rSO₂ technology superior to other regional oximetry products out there?

Answer: The next-generation Model 7600 Regional Oximetry System with **EQUANOX** rSO₂ technology is superior to other products in the following ways:

Superior Sensor Architecture

EQUANOX's improved sensor architecture is engineered with two light emitters as opposed to traditional technologies that only use one. This dual structure enables consistently accurate measurements — even if one emitter is obscured.

Improved Operational Efficiency

For improved efficiency, the Model 7600 Regional Oximetry System's near instant signal acquisition and processing results in almost immediate baseline values — ensuring accurate, real-time measurements from the moment the sensor is placed. Furthermore, for increased operational ease of use, the Model 7600 only requires a single baseline calibration per use — even after the sensor has moved.

Proven Accuracy

The Model 7600 with **EQUANOX** rSO₂ technology proved superior to conventional NIRS cerebral oximetry in validation testing at Duke University with an A_{RMS} of 2.7 along trend lines relative to jugular bulb measurements (SjvO₂).

Unmatched Warranty and Support

The Model 7600 Regional Oximetry System is backed by a 3-year warranty and any service needed is performed by our own expert, in-house technicians. And, with dedicated regional oximetry sales and clinical support teams in your area, we are able to quickly respond to your needs either in person or by phone.



5. Question: Regional NIRS technology is expensive. How can I justify the cost?

Answer: Regional oximetry monitoring is cost-effective at any level of open-heart surgery that meets credentialing standards. Peri-operative stroke rates in open-heart surgery are between 1 percent and 12 percent. In several studies on reducing stroke and cognitive failure by utilizing NIRS regional oximetry, reductions of injury are significant enough to justify the investment in a regional oximetry system.

Benefits include: reducing post-operative length of stay, as well as treatment costs (see the clinical section of Nonin's web site for research in this area). Evidence-based studies show that investment in this technology is more than recovered due to reduced costs resulting from improved patient outcomes.

The Best Choice for a Manufacturer: Nonin Medical

1. Question: Who is Nonin Medical and how can I feel comfortable purchasing equipment from you?

Answer: Nonin is one of the most trusted pulse oximetry technology manufacturers in the world. With over 20 years of NIRS pulse oximetry engineering, design and manufacturing experience, we have the largest installed base of pulse oximetry monitoring solutions worldwide. Some of the markets in which we are most well known include: Sleep, EMS, Cardiopulmonary Rehab and Homecare. Our devices are proven to be highly accurate and durable, and our customer support is second to none. With dedicated regional oximetry sales and clinical support teams in your area, we are able to quickly respond to your needs either in person or by phone.