THE INVOS™ CEREBRAL/SOMATIC OXIMETER
The full physiologic perspective, when it absolutely matters
A Clear Choice Supported by Clinical Data

When it comes to clinical evidence, the INVOS™ cerebral/somatic oximeter stands alone. Clinicians around the world have come to rely on the INVOS™ system to guide their decisions in critical situations. Trust has been earned through both clinical performance and by extensive published research. For those reasons, the INVOS™ system is the clinical standard in regional oximetry.

- The only cerebral oximeter (at date of publication) on the market to be tested and validated under varying levels of CO₂ to ensure measurement sensitivity during changing levels of blood volume under the sensor. Refer to figure 1
- Provides real-time data (what some manufacturers call “absolute”) in patients > 2.5 kg.
- The only cerebral/somatic oximeter (at date of publication) with rigorous, peer-reviewed clinical investigations demonstrating ability to improve patient outcomes. Refer to figure 2
- More than 1,000 clinical studies (more than 600 which are peer-reviewed) show the INVOS™ system as the clinical standard.
- Three published, randomised, controlled trials have established the clinical value of the INVOS™ system to aid clinicians in improving patient outcomes.
- The only device with a claim for improved outcomes after surgery.

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**Figure 1:** The INVOS™ system’s validation is extensive

<table>
<thead>
<tr>
<th>Validation: FiO₂ normoxia and hypoxia</th>
<th>Validation: CO₂ normocarbia and hypercarbia</th>
<th>Validation: Published emitter sensor spacing</th>
<th>Validation: Published sensitivity to changes in oxygenation</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVOS™ 5100C Monitor</td>
<td>Yes¹</td>
<td>Yes¹</td>
<td>Yes¹</td>
</tr>
</tbody>
</table>

**Figure 2:** Documented clinical performance¹

<table>
<thead>
<tr>
<th>All articles, abstracts, and posters</th>
<th>Published and peer-reviewed articles</th>
<th>Outcome correlation (peer-reviewed)</th>
<th>Outcome improvement (peer-reviewed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVOS™ System</td>
<td>1,000+</td>
<td>600+</td>
<td>3</td>
</tr>
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</table>

June 2013
Before you decide which NIRS technology to use, consider this: All NIRS technology is not the same.

Clinical evidence for one technology does not necessarily apply to another. Each cerebral oximeter uses unique methodologies, algorithms and sensor design to analyse the oxy-haemoglobin saturation in tissue. The clinical evidence supporting the INVOS™ system is specific to INVOS™ technology and does not reflect the performance of competitive products.

**THE INVOS™ SYSTEM OFFERS A MEASURE OF rSO₂ NOT AVAILABLE WITH OTHER OXIMETERS**

Only the INVOS™ system has been proven to be clinically effective in providing clinicians with physiologic insights into a patient’s status to make care management decisions that contribute to improving patient outcomes.

- It is the ONLY cerebral oximeter on the market that is validated via a published hypoxia study under different levels of PaCO₂.

- Using an optimised emitter spacing configuration, the INVOS™ system demonstrates sensitivity to subtle changes in saturation and cerebral blood flow.

**ANOTHER MANUFACTURER’S DISCLAIMER – ACCURATE WHEN PATIENTS ARE “NORMAL”**

Another manufacturer states that their device is designed to determine regional haemoglobin oxygen saturation of blood underneath the sensor. They also state that the performance and accuracy of the device can be degraded or impacted if the patient’s CO₂ levels are non-normocapnic (non-normal) or if there are other conditions that affect blood volume. Do your patients always have “normal” CO₂ levels?
Other companies promote the “absolute intervention threshold” or what is sometimes called “absolute accuracy” capability of their oximeters. There’s more to the picture.

- Exactly what does “absolute intervention threshold” or “absolute accuracy” mean? At this time, there are no regulations or standards that define the parameters for these marketing terms.
- Current cerebral oximeter technology does not allow for “absolute” measurements. The only real way to measure “absolute” cerebral oxygenation levels is to sample blood from a patient’s brain, which oximeters don’t do.
- “Absolute intervention thresholds” or “absolute accuracy” alone are not definitive of a patient’s full physiologic condition. Each patient is unique and there is a wide range of “normal” values for cerebral venous oxygenation, which is contrary to an absolute measurement threshold for intervention.

Baselines matter – customise care for each patient’s “normal”

What is “normal”? When it comes to an individual patient’s measurement, “normal” can cover a wide range. That’s why establishing an individualised baseline is so critical. It shows you where each patient’s physiologic “normal” range begins and ends so that you can customise care for that individual. The INVOS™ cerebral/somatic oximeter features a baseline setting that provides additional dimension and value to the rSO$_2$ measurement. Combine this baseline with continuous monitoring and the result is critical, early warnings of developing pathology and deteriorating patient condition. This is the kind of timely information you need – and can rely on – during surgery.

Unlike pulse oximetry, which measures arterial oxygen, the INVOS™ system measures rSO$_2$, a reflection of cerebral venous saturation. This is an important distinction, because cerebral saturation has a much wider range of normal values (45% to 75%) than arterial saturation, which has a very narrow range. With this wider range of cerebral saturation, clinicians will make more informed decisions about intervention during surgery, based on the most individualised “normal” for each patient. The end result? Studies have demonstrated that intervening based upon a relative drop of rSO$_2$ from baseline improved patient outcomes.

The INVOS™ system provides clinicians with vital physiological data, based on each patient’s “normal”, to allow the clinician to customise care for that individual.
Reduce complications, improve outcomes

The INVOS™ system is the only regional oximeter with improved patient outcomes labeling. It stands alone as the best (tested) choice to improve patient outcomes after cardiac surgery – and for patients, that’s big news.

REDUCED MAJOR ORGAN MORBIDITY OR MORTALITY (MOMM)³

A randomised, controlled clinical study demonstrated that monitoring cerebral rSO₂ in coronary artery bypass patients avoids profound cerebral desaturation and is associated with significantly fewer incidences of major organ dysfunction.³

- Only 3% of the INVOS™ system group experienced MOMM compared to 11% in the control group and compared to 13.4% from the Society of Thoracic Surgeons database.

REDUCED LENGTH OF ICU STAY³

Also clinically demonstrated, ICU length of stay for the INVOS™ system group was significantly shorter.³

- Mean 0.62 day reduction in length of stay, p<0.029.

REDUCED STROKE AND NEED FOR PROLONGED VENTILATION⁶

INVOS™ system use on cardiac surgery patients reduced permanent stroke and reduced total time needed for mechanical ventilation.⁶

- The study group had greater comorbidities than those in the control group
- Rated using New York Heart Association (NYHA) classifications

- Median ventilator time of four hours vs. five hours in the control group, p<0.0016. A significantly greater proportion of the patients in the control group required prolonged ventilation, 10.6% vs. 6.8%, p<0.0014.⁶

INVOS™ system use on cardiac surgery patients reduced permanent stroke and reduced total time needed for mechanical ventilation.⁶

- Incidence of permanent stroke <1% in the INVOS™ system group compared with 2% in the control group, p<0.044.⁶
EVERYTHING IN PERSPECTIVE, WHEN IT ABSOLUTELY MATTERS

The INVOS™ system is the clinical standard in regional oximetry monitoring. It’s also the most widely used regional oximeter in the world12 – for a reason. The INVOS™ system has been proven by extensive clinical investigations to improve patient outcomes.3-4 INVOS™ technology enables clinicians to detect subtle, physiologic changes in saturation and cerebral perfusion in order to make timely, critical life-saving decisions for improved patient outcomes.
The Medtronic INVOS™ system has long been the clinical benchmark and market leader in NIRS technology. It’s no coincidence. Getting essential physiologic data about the patient’s well-being, with actionable insights and trends, into your hands at the right moment helps you make life-saving decisions.

INVOS™ SYSTEM BENEFITS:

- Continuous rSO₂ monitoring in multiple patient types
- Timely rSO₂ data to trigger interventions
- Improved patient outcomes
- Reduced hospital resource requirements

REFERENCES
12. Market share based on data provided by Millennium Research Group.