Intraoperative cerebral oxygen desaturation is associated with adverse postoperative outcome.\textsuperscript{1,2} Cerebral oximetry guided identification of cerebral desaturation coupled with an interventional algorithm targeting common causes of inadequate tissue oxygenation may decrease the burden of cerebral oxygen desaturation.\textsuperscript{3}
The Denault Algorithm

In 2007, Denault and Murkin et al. published an interventional algorithm to assist clinicians in reversing cerebral desaturation events.\textsuperscript{1,4} Since its initial publication, the algorithm has been repeatedly demonstrated to be effective in high-risk surgical patients.\textsuperscript{3,5} The interventions in the algorithm target factors that regularly influence cerebral oxygen supply and demand such as perfusion pressure, cardiac output, arterial oxygen content, partial pressure of carbon dioxide (PaCO2), and cerebral metabolic rate.
Cerebral desaturation is common and can be reversed in high-risk surgery patients


Reversal of decreases in cerebral saturation in high-risk cardiac surgery.


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**Figure.** Desaturation load in control patients and patient treated with cerebral oximetry guided implementation of an interventional algorithm

**Study Design: Randomized, controlled trial**

<table>
<thead>
<tr>
<th>Control Arm</th>
<th>Cerebral oximetry guided care</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 25 high risk surgery patients</td>
<td>• 23 high risk surgery patients</td>
</tr>
<tr>
<td>• Clinicians were blinded to cerebral oximetry values</td>
<td>• Clinicians reversed cerebral desaturation via interventional algorithm coupled with cerebral oximetry monitoring</td>
</tr>
</tbody>
</table>

**Results:**

• 76% and 69.6% of patients in the control group and cerebral oximetry guided care group suffered cerebral desaturations

• 92.5% of cerebral desaturation events in the cerebral oximetry guided care technology group were reversed
Reduction of cerebral desaturation via an a cerebral oximetry guided interventional algorithm reduces postoperative cognitive decline


Influence of intraoperative cerebral oximetry monitoring on neurocognitive function after coronary artery bypass surgery: a randomized, prospective study.
Colak Z, Borojevic M, Bogovic A, Ivancan V, Biocina B, Majeric-Kogler V.

Figure. Incidence of cognitive decline among 200 coronary artery bypass graft patients randomized to receive either care guided by cerebral oximetry partnered with an interventional algorithm or standard practice

Study Design: Randomized, controlled trial

<table>
<thead>
<tr>
<th>Control Arm</th>
<th>Cerebral oximetry guided care</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 96 CABG patients</td>
<td>• 94 CABG</td>
</tr>
<tr>
<td>• No cerebral oximetry monitoring</td>
<td>• Clinicians reversed cerebral desaturation via interventional algorithm coupled with cerebral oximetry monitoring</td>
</tr>
</tbody>
</table>

Results:

• Multivariate analysis revealed that cerebral oximetry monitoring coupled with an interventional algorithm was associated with reduced likelihood of postoperative cognitive decline
• Patients with prolonged cerebral desaturation were 12 times more likely to postoperative cognitive decline.(P = 0.003)
Cerebral desaturation occurs frequently and requires a variety of interventions for resolution.

*Anesth Analg.* 2016 Jun;122(6):1786-93

A Multicenter Pilot Study Assessing Regional Cerebral Oxygen Desaturation Frequency During Cardiopulmonary Bypass and Responsiveness to an Intervention Algorithm.


**Figure.** Intervention that corrected desaturation in 225 cerebral desaturation events

**Study Design:** Prospective, cohort trial

**Methods:**
- 235 coronary artery bypass graft patients were monitored with cerebral oximetry
- Upon identification of a cerebral desaturation event (>20% from preanesthesia baseline), providers addressed the desaturation via interventional algorithm

**Results:**
- 61% of patients suffered cerebral desaturations
- Of 340 total cerebral desaturation events, 115 resolved spontaneously
- Cerebral desaturation was resolved via the interventional algorithm in 92% of the remaining 225 events
- The number of interventions required to address cerebral desaturation were:
  - 1 intervention: 32%
  - 2 interventions: 26%
  - 3 interventions: 12%
  - >3 interventions: 30%


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