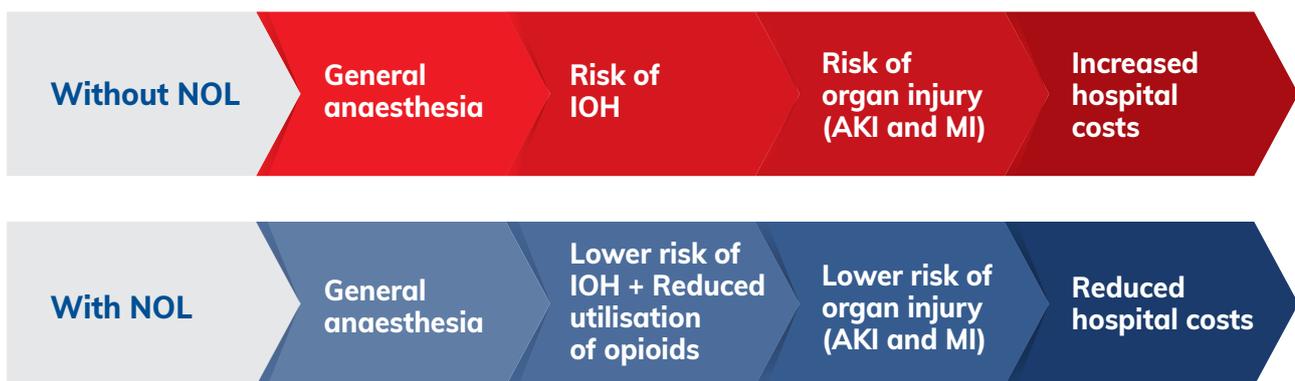


# NOL<sup>®</sup> (Nociception Level) Index ROI Calculator

## Introduction

- NOL monitoring provides an objective assessment of patients' physiological response to surgical stimuli (nociception), enabling clinicians to maintain optimal analgesia during surgery, whilst avoiding over medication and intraoperative hypotension.
- Peer-reviewed studies demonstrate strong correlation between intraoperative hypotension and myocardial injury (MI), acute kidney injury (AKI), and death.<sup>1</sup>
- NOL-guided surgery provides multiple benefits to the provider and patient, including cost savings. Medasense's Return On Investment (ROI) model facilitates calculation of potential economic savings for the hospital and the health system when utilizing NOL.
- This ROI model applies a reliable decision tree methodology, comparing the probability of events and outcomes (occurrence of adverse events and costs, length of stay, drug consumption and care escalation) between standard surgery and NOL-guided surgery.
- The differences and comparisons are based on published evidence linking the rate of intraoperative hypotension to NOL use/ non-use. The calculator also adjusts the risk of postoperative AKI and MI based on whether patients experience intraoperative hypotension or not.
- The default model assumptions for incidence and hospital costs are based on published country-specific\* literature, although the user may freely modify these assumptions and input different data points.

## Which Option Would You Choose?



\* Model has default data from the following countries: Brazil, Canada, France, Germany, Netherlands, Spain, UK, USA. Detailed references are included in the model (from the information button on the top right). When using the tool, it is important to consider the overall hospital perspective and not focus on the economic implications for one particular patient.

1. Perioperative Quality Initiative consensus statement on intraoperative blood pressure, risk and outcomes for elective surgery. D.I. Sessler, J.A. Bloomstone, S. Aronson, et al. *Br J Anaesthesiology*, (2019), 122: 563-574

## Definitions and Assumptions

<b>IOH: Intra-operative hypotension<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• <b>Definition:</b> Mean arterial pressure (MAP) maintained below a specific threshold for a specific period of time. Different studies have defined different thresholds.</li> <li>• The model focuses on occurrence of hypotension below 55 mmHg, since current available evidence shows NOL's impact on this level of hypotension.<sup>3</sup></li> <li>• Evidence linking IOH with occurrence of adverse events is from the Salmasi<sup>2</sup> and Wan Jie<sup>4</sup> studies: <ul style="list-style-type: none"> <li>- Thresholds of 65mmHg and lower were progressively associated with increased odds of AKI and MI.<sup>2</sup></li> <li>- Without intraoperative hypotension 1.5% and 4.1% of patients experience MI and AKI, respectively.</li> <li>- Patients experiencing intraoperative hypotension are at significantly higher odds of MI (67%) and AKI (39%).<sup>4</sup></li> </ul> </li> </ul>
<b>AKI: Acute Kidney Injury<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• <b>Definition:</b> An abrupt decline in renal function, clinically manifesting as a reversible acute increase in nitrogen waste products, measured by blood urea nitrogen (BUN) and serum creatinine (SCr) levels.</li> <li>• Any patient undergoing surgery could have an AKI event; hypotension is an important risk factor for it.</li> <li>• In general, after major abdominal surgery, incidence of post-operative AKI has been reported at 13.4%.<sup>5</sup></li> </ul>
<b>MI: Myocardial Injury<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• <b>Definition:</b> Myocardial cell death due to prolonged myocardial ischemia. Clinically detected by evidence of at least one postoperative value of cardiac troponin T above the upper normal limit (99th percentile URL) or creatine kinase-MB above the upper limit of normal in the 7 days after operation.</li> <li>• Any patient undergoing surgery could have an MI event; hypotension is an important risk factor for it.</li> <li>• In general, after noncardiac surgery, incidence of postoperative MI has been reported at 8%.<sup>6</sup></li> </ul>
<b>Target patient population</b>	<ul style="list-style-type: none"> <li>• <b>Available Evidence:</b> <ul style="list-style-type: none"> <li>- The Meijer study<sup>3</sup> focused on major abdominal surgeries in adult patients under remifentanyl analgesia for a duration of 2 hours or more.</li> </ul> </li> <li>• For the ROI model, we advise to consider the below population: <ul style="list-style-type: none"> <li>- Patients undergoing longer noncardiac surgeries under general anaesthesia, including visceral, orthopaedic, trauma, vascular, urologic, spinal, and thoracic surgical procedures.</li> <li>- Longer surgeries: 2 hours or more.</li> </ul> </li> </ul>
<b>Impact of NOL on reduction of IOH</b>	<ul style="list-style-type: none"> <li>• The tool is largely based upon the Meijer study<sup>3</sup>, showing that NOL-guided surgery results in 30% less remifentanyl use and an 80% reduction in severe intraoperative hypotension.</li> <li>• The Meijer study<sup>3</sup> used definitions of 60mmHg (moderate hypotension) and 55mmHg (severe hypotension).</li> </ul>

## Economical Benefits for Your Facility

The Medasense NOL ROI model will enable you to estimate the specific impact that NOL will have on your establishment and the time needed until return on investment in NOL monitors and sensors. All you will need to input is data such as:

- PACU time cost
- OR time cost
- Incidence of hypotension
- Incidence of AKI and MI

If hospital data is unavailable the model employs country-specific default data.

2. Relationship between Intraoperative Hypotension, Defined by Either Reduction from Baseline or Absolute Thresholds, and Acute Kidney and Myocardial Injury after Noncardiac Surgery. A Retrospective Cohort Analysis. Vafi Salmasi, M.D., et al.; *Anesthesiology*, (2017) 126:47-653.
3. Nociception-guided versus Standard Care during Remifentanyl-Propofol Anesthesia: A Randomized Controlled Trial. Meijer F et al. *Anesthesiology*, (2019) 130(5):745-755.
4. Association between intraoperative hypotension and 30-day mortality, major adverse cardiac events, and acute kidney injury after non-cardiac surgery: A meta-analysis of cohort studies. Wan-Jie Gu et al. *International Journal of Cardiology*, (2018) 258:68-73.
5. Incidence and associations of acute kidney injury after major abdominal surgery. O'Connor ME, et al; *Intensive Care Med* 2016; 42:521-30. PubMed PMID: 26602784.
6. Botto F, et al. Myocardial injury after noncardiac surgery. *Anesthesiology* 2014;120:564-78.