

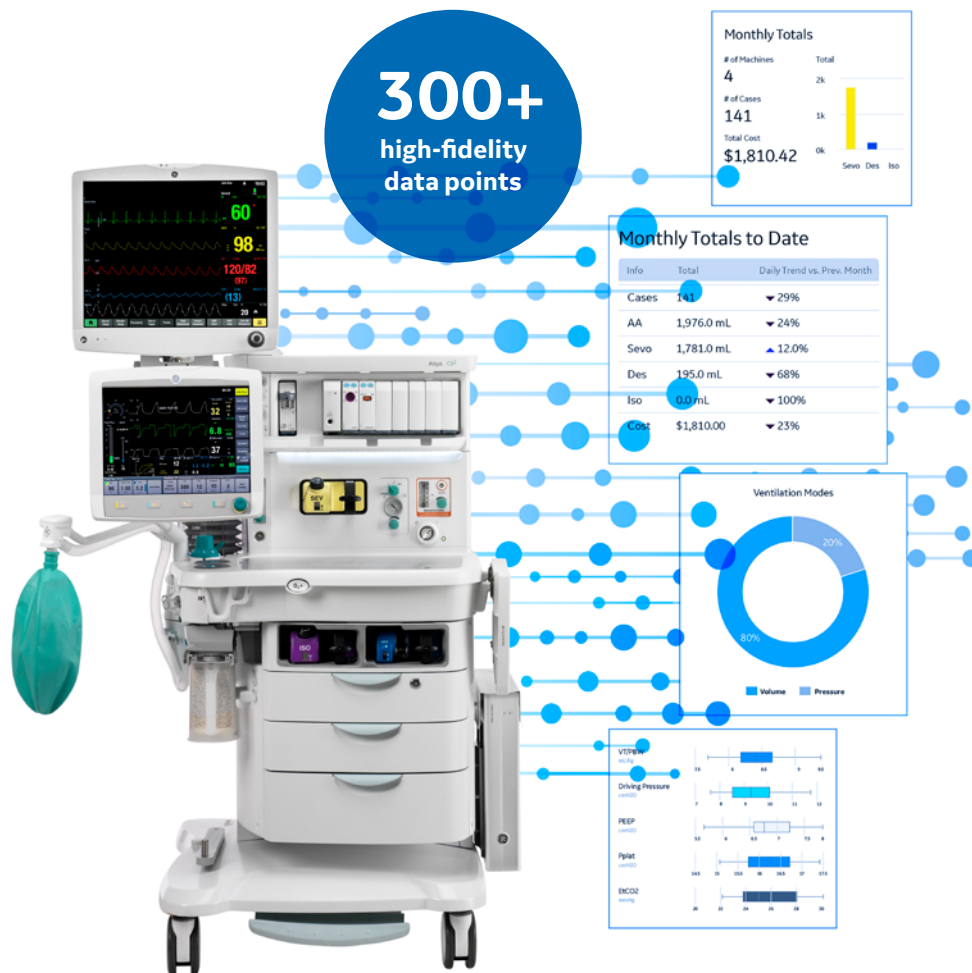


Carestation™ Insights Analytics Applications

We analyze.
You drive change.



Carestation Insights Analytics Applications



Transform complex data into actionable insights

Carestation Insights applications help identify opportunities that can:

- **Improve perioperative productivity**
- **Reduce operating costs and optimize revenue**
- **Standardize best practices across anaesthesiologists**

Together with Aisys™ CS² Anaesthesia Delivery Systems, Carestation Insights applications form an intelligent ecosystem that automatically captures and analyzes high-fidelity case data. Our applications use advanced algorithms to interpret this data and uncover actionable insights that are displayed on your personal devices: desktop, laptop, tablet, smart phone. Use these insights to help improve patient care and support your clinical and financial goals.

The Carestation Insights suite of smart applications includes

- **Checkout App:** Confirm daily anaesthesia machine readiness
- **Lung Protective Ventilation (LPV) App:** Help support lung protection strategies
- **Agent Cost App:** Optimize the benefits of low-flow anaesthesia
- **OR Workflow App:** Data to help improve perioperative productivity
- **LIVE App:** Supervise multiple ORs in real time* while on the move
- **Coming soon! Adequacy of Anaesthesia (AoA) App:** Help support AoA strategies in real time*

*Actual time may vary slightly due to hospital network and processing times.

Checkout Application

Confirm daily anaesthesia machine readiness

Research shows **35%** of patient injuries from anaesthesia gas delivery could have been prevented by a pre-use machine check.¹

Challenge

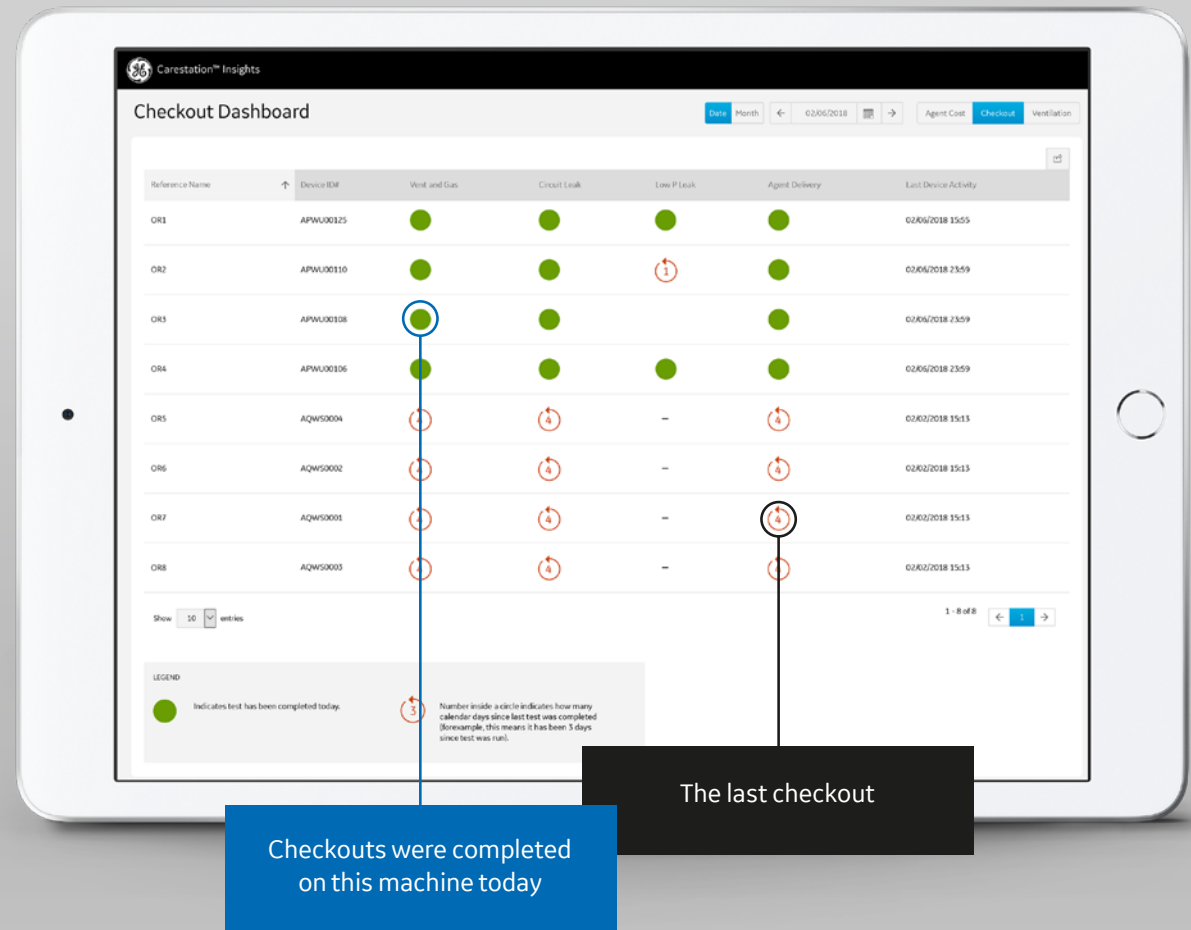
Daily pre-check of anaesthesia equipment is essential, but can be overlooked in busy environments. Failure to perform checkout can lead to patient injuries and near misses.¹

Solution

A central source for daily machine checkout status enables you to measure and manage compliance to machine checkout procedures, helping support OR readiness and quality programs. This application tracks checkout status across your department, for every machine and OR, each day and over time.

Outcomes

- **Ensure pre-use check compliance to help protect patients against injury**
- **Eliminate machine readiness as a factor in OR delays**
- **Support efficient operations and quality of care**



¹ Mehta SP, Eisenkraft JB, Posner KL, Domino KB. Patient injuries from anesthesia gas delivery equipment. Anesthesiology 2013; 119: 788-95.

Lung Protective Ventilation Application

Support lung protection strategies

Challenge

Improper ventilation during anaesthesia can increase post-operative pulmonary complications (PPC) by up to 60%.² Mechanical ventilation can contribute to lung injury by delivering too much or too little pressure and volume, leading to over-distension or collapse. Consequently, these PPCs are linked to higher post-operative mortality and longer ICU and hospital stays.³

Solution

Lung protective ventilation (LPV) strategies take into consideration the roles of tidal volumes, positive end-expiratory pressure, and recruitment maneuvers.⁴ This Insights LPV application provides visibility into the use of LPV strategies in the operating room. This visibility and oversight can help support your goals of improving post-operative clinical outcomes associated with LPV.

Outcomes

- **Identify opportunities to support lung protection initiatives**
- **Measure results that support LPV strategies**
- **Help anesthesiologists comply with lung protection guidelines**

Research shows improper ventilation during anaesthesia can cost more than **\$25,000 per case** in post-operative lung complications.³

Lung Protective Ventilation (LPV) Outcomes²

POST-OP COMPLICATIONS	WITHOUT	WITH LPV
Pneumonia	8.0%	1.56%
Need for invasive ventilation	3.5%	1%
Sepsis	14.5%	6.5%
Overall length of stay	13 days	11 days

² Futier, E., M.D., Constantin, J., M.D., Ph.D., et al. (2013). A Trial of Intraoperative Low-Tidal-Volume Ventilation in Abdominal Surgery. The New England Journal of Medicine, 369(5). doi:10.341/f.718056191.793482037.
³ Fleisher, L. A., & Linde-Zwirble, W. T. (2014). Incidence, outcome, and attributable resource use associated with pulmonary and cardiac complications after major small and large bowel procedures. Perioperative Medicine, 3(7). doi:10.1186/2047-0525-3-7.

⁴ Güldner A, Kiss T, Serpa Neto A, et al. Intraoperative Protective Mechanical Ventilation for Prevention of Postoperative Pulmonary Complications: A Comprehensive Review of the Role of Tidal Volume, Positive End-expiratory Pressure, and Lung Recruitment Maneuvers. Anesthesiology 2015;123(3):692-713. doi: 10.1097/ALN.0000000000000754.

Lung Protective Ventilation (LPV) Application

Use this data to show adherence to LPV protocols

1.

Change in patient lung compliance during the maintenance phase.

2.

Use of recruitment maneuvers during the case and during specific case phases. Use of PEEP directly after the maneuver.

3.

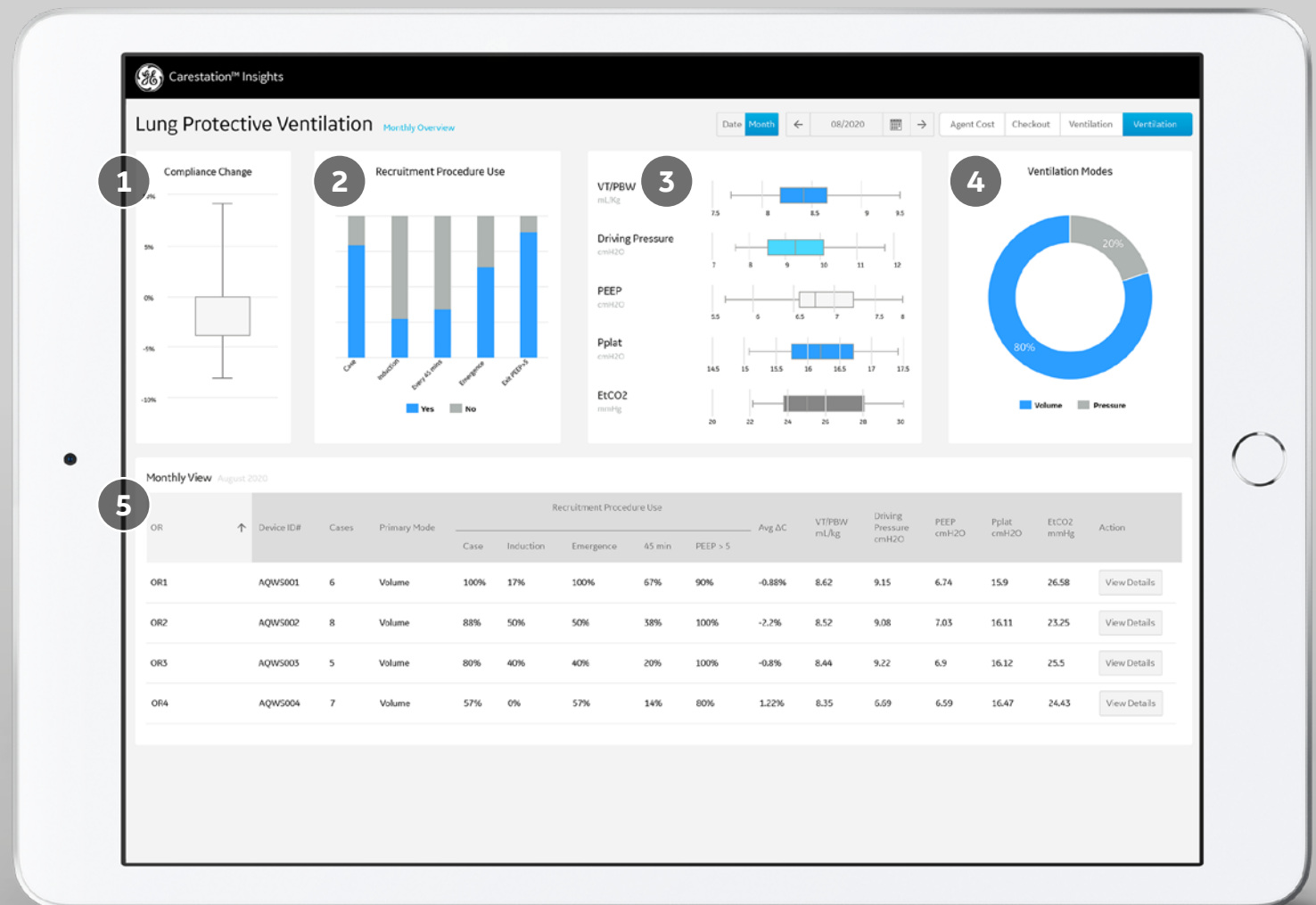
Ventilation settings used throughout the cases and the resulting patient measurements, including VT/PBW, driving pressure, PEEP, Pplat, and EtCO₂.

4.

Percentage of case time spent in volume vs. pressure or other supportive ventilation modes.

5.

Ventilation setting and measurement averages shown by OR. Case level detail is available by sorting or drill-down.



Agent Cost Application

Optimize the benefits of low-flow anaesthesia

Challenge

Anesthetic agents are the biggest ongoing expense in your anaesthesia unit. Hospitals can spend an extra 15–30% on anesthetic agents due to high fresh gas flow rates.⁵ The agent release into the atmosphere can also contribute extra greenhouse gases equivalent up to 350 cars/year.^{6,7}

Solution

This Insights application analyzes flow data at the induction and maintenance case phases and translates it into anesthetic agent utilization, costs, and equivalent greenhouse gas emissions across your operating rooms to help drive low-flow anaesthesia practices.

Outcomes

- **Reduce anesthetic agent costs⁸**
- **Savings can be used by hospitals for other critical needs**
- **Support positive environmental impact**

⁵Hospitals can be spending an extra 15–30% for anesthetic agents in an OR due to high flow estimates derived from the GE Healthcare ecoFLOW Calculator. <https://gehealthcareamer.my.salesforce.com/sfc/#version?selectedDocumentId=069a0000004eOn7>

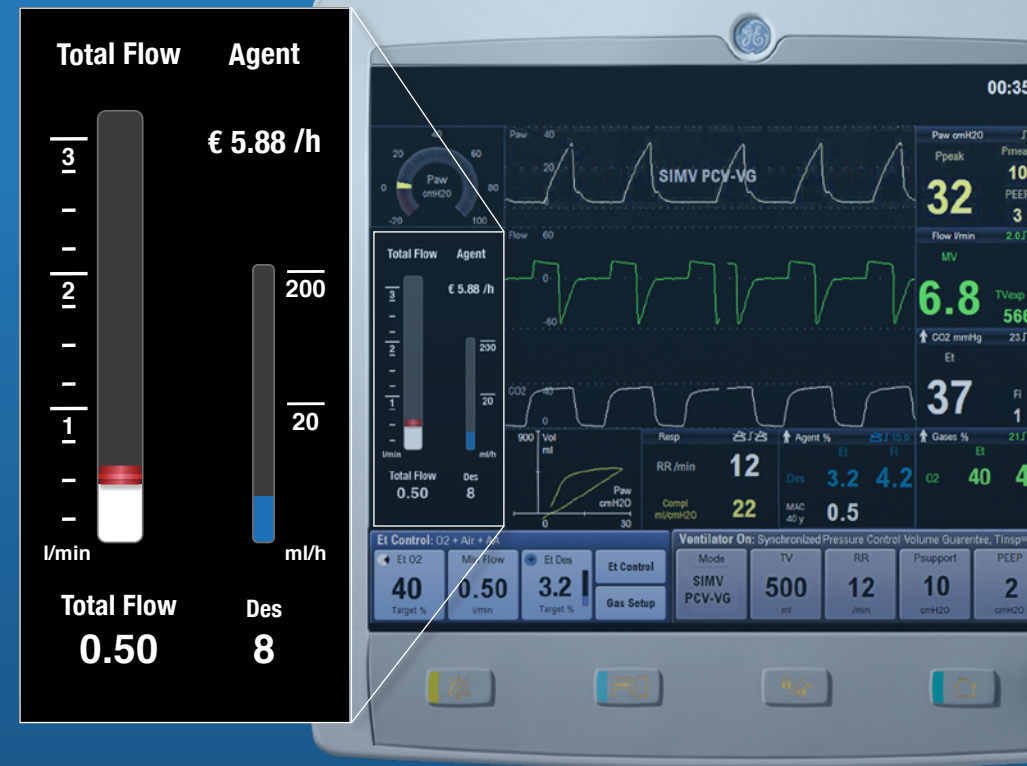
⁶Environmental Protection Agency. Emissions facts: greenhouse gas emissions from a typical passenger vehicle. Available at: <http://www.epa.gov/oms/climate/420f05004.htm#key>

⁷Global Warming Potential of Inhaled Anesthetics: Application to Clinical Use, Susan M. Ryan, MD, PhD, and Claus J. Nielsen, CSC International Society for Anaesthetic Pharmacology www.anesthesia-analgia.org July 2010; v111 #1.

⁸The role of the induction period in determining overall gas and vapour consumption. Ross Kennedy, MB ChB PhD FANZCA, Richard French2 MB BS FANZCA, Christchurch Hospital & University of Otago Christchurch, NEW ZEALAND. James Hanrahan BS MBA, and Guy Vesto BSc, GE HealthCare, Madison WI, USA. JB48535XX. Kennedy RR, French RA, Vesto G, Hanrahan J and Page J. The effect of fresh gas flow during induction of anaesthesia on sevoflurane usage: a quality improvement study. Anaesthesia. 2019; doi:10.1111/anae.14669

⁹Tay S, Weinberg L, Peyton P, Story D, Briedis J. Financial and environmental costs of manual versus automated control of end-tidal gas concentrations. Anaesth Intens Care. Jan 2013;41(1):95-101.

*Et Control software is not cleared or approved by the US FDA. Not for sale in the United States. Not available in all markets.



Low-flow anaesthesia supported by Et Control software*

Et Control software automatically adjusts fresh gas concentrations to quickly and efficiently achieve and maintain end tidal oxygen and end tidal agent targets. Automated control of end tidal gases has been shown to reduce the rate of greenhouse gases by 44% and reduce agent costs by 27%.⁹

Agent Cost Application

Using this data, hospitals can support initiatives to help drive improved financial outcomes

1.

Time weighted average fresh gas flow shown for the total case, and for induction and maintenance phases.

Average Induction Duration shown (length of the initial high flow period).

Agent cost per case and per minute computed for the time period.

2.

Total anesthetic agent and total agent cost shown for the time period.

3.

Average agent consumption by drug per case and agent cost/min by drug computed.

4.

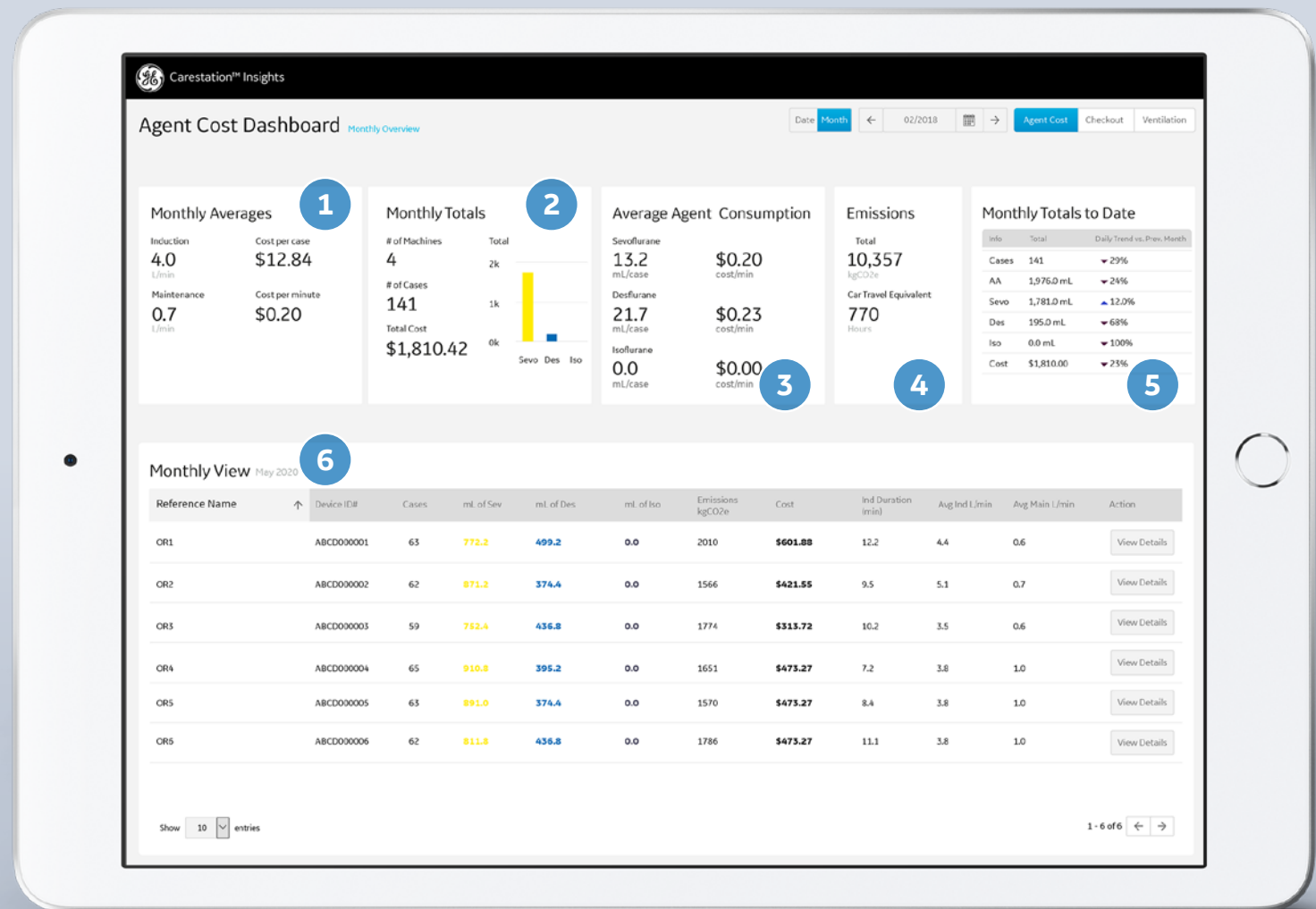
Environmental cost of agent usage translated to CO₂ equivalency and number of hours driven in a car.

5.

Trends of agent usage and costs shown for the time period.

6.

Fresh gas flows and agent costs shown by OR. Case level detail is available by drill-down.



OR Workflow Application

Improve perioperative productivity

Challenge

Workflow and scheduling issues can reduce OR utilization by 10% per year.¹⁰ Even the most advanced systems, if reliant on manual data entry or manual communication, can leave room for errors and slow down workflow. And with operating room delays costing more than \$60 per minute,¹¹ inefficiency can become a burden.

Solution

This Insights application algorithmically determines case phase and OR status in near real time without the need for manual data entry. An OR efficiency score card is also calculated based on your goals to help track improvements over time.

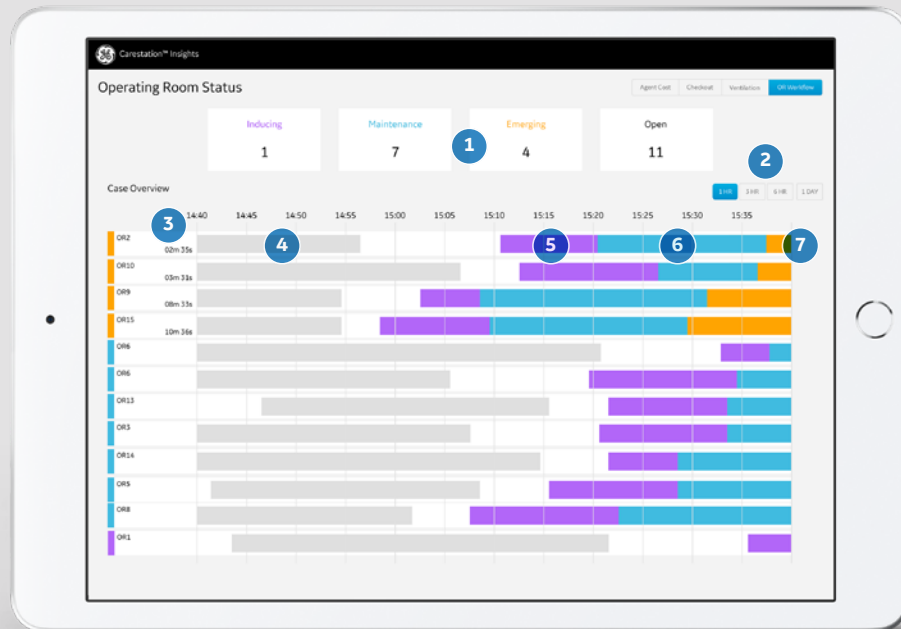
Outcomes

- **Increase OR utilization and case revenue**
- **Effectively prioritize OR turnover**
- **Make sure PACU beds are ready when needed**
- **Easily visualize case phase**



¹⁰ NHS Institute for Innovation and Improvement. The Productive Operating Theatre. http://www.institute.nhs.uk/images/documents/Quality_and_value/Productive%20Operating%20Theatre/Finance%20leaflet.pdf

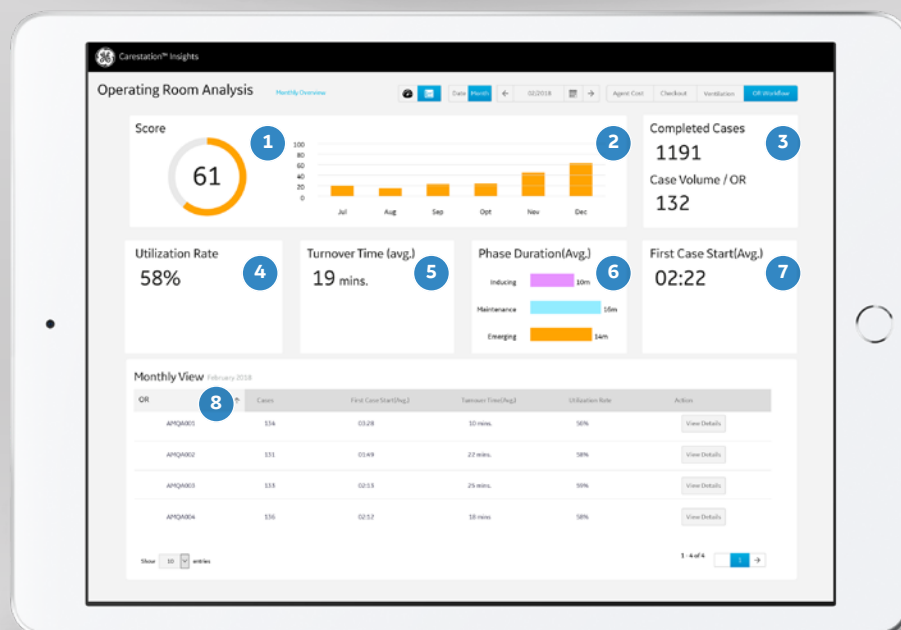
¹¹ Improving the economy of surgical services, Part 4. Strate, Cody. The Cost of a Lost Minute in the OR. Jun 22, 2018. <https://www.accessfem.com/blog/the-cost-of-a-lost-minute-in-the-or>



OR Workflow Application

Operating Room Status: Live view into OR case phase

1. Current phase and status summary of connected operating rooms.
2. Timeframe to view current operating room status in graphical form.
3. Emerging rooms sorted automatically to the top of the list with a timer showing current length of the emergence phase.
4. Timeframe for completed cases shown in grey.
5. Timeframe for current case in induction phase shown in purple.
6. Timeframe for current case in maintenance phase shown in blue.
7. Timeframe for current case in emergence phase shown in orange.



Operating Room Analysis: OR efficiency scorecard

1. Single efficiency score customized for the sites targets and goals.
2. Efficiency score tracked over time.
3. Total number of completed cases and cases per OR.
4. Utilization rate of machines.
5. Average turnover time between cases.
6. Duration of phases for all the cases.
7. Average first case start time.
8. Individual operating room characteristics.

LIVE Application

Supervise multiple ORs
in real time*

Challenge

Supervising multiple operating rooms, prioritizing activities and delivering medical direction, while outside the OR and constantly on the move, is demanding for one clinician. There is no simple way to quickly access the relevant patient and anaesthesia data when not in the OR.

Solution

The LIVE application captures high-fidelity data from the anaesthesia machine and patient monitor and organizes it into a simplified display on a mobile device. Clinicians receive real-time*, breath-by-breath data from multiple ORs, so they can review patient status and how anaesthesia therapy is being delivered. They can then determine if an OR needs additional support. The user interface provides customizable notifications and access to detailed patient data.

Outcomes

- **Supervise multiple ORs with confidence**
- **Enable clinicians to prioritize medical direction**
- **Help clinicians support adherence to protocols in real time***

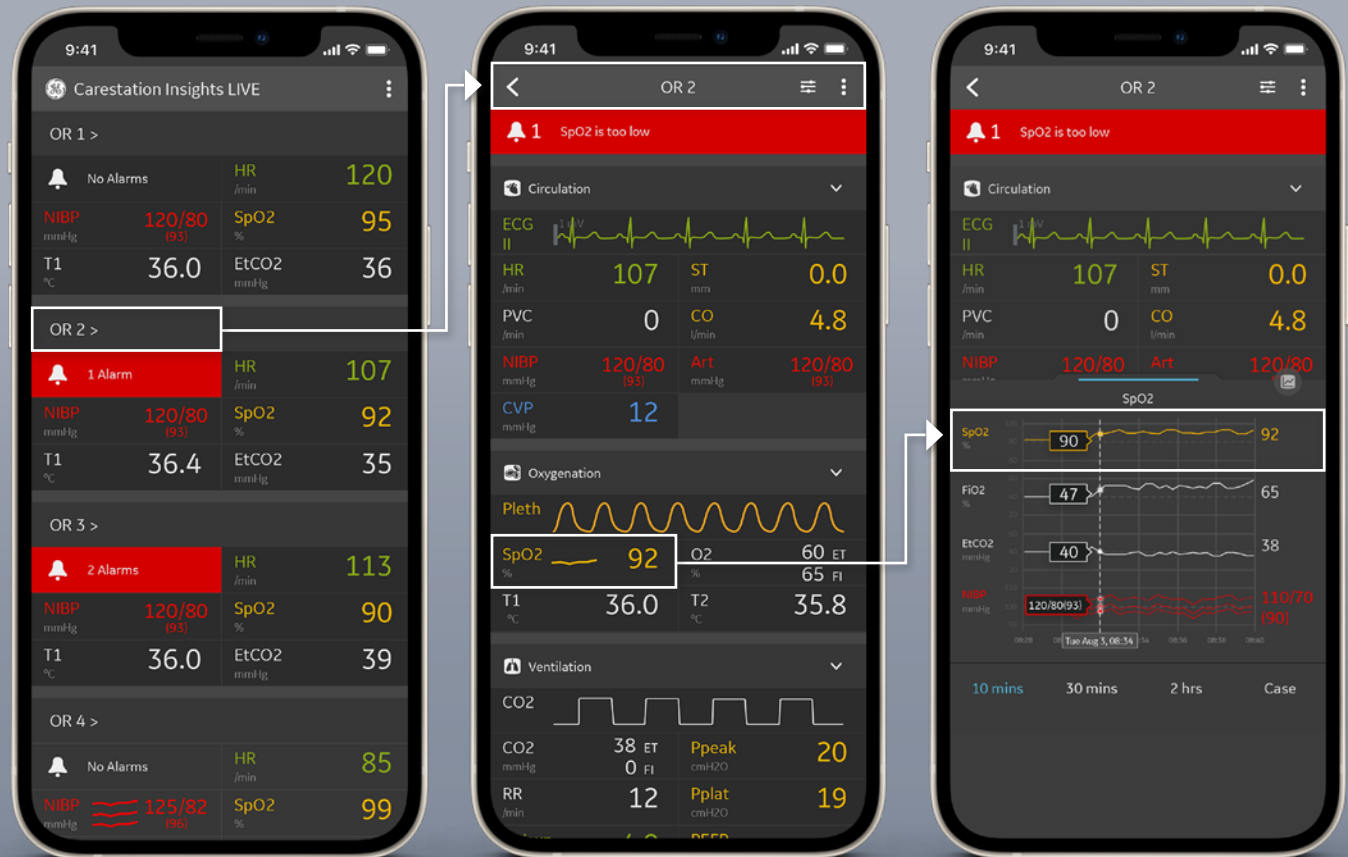


*Actual time may vary slightly due to hospital network and processing times.

LIVE Application

Stay connected to your ORs while on the move

View Aisys CS² anaesthesia workstation and CARESCAPE™ Patient Monitor data combined on your mobile device to help you supervise multiple ORs and respond to real-time* events.



Multiple OR View

Single OR View

Patient Trends Details

Coming soon!

Adequacy of Anaesthesia (AoA) Application

Providing insights to AoA protocol adherence

Challenge

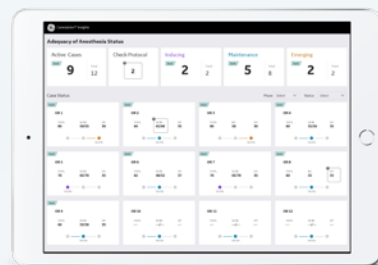
The Adequacy of Anaesthesia (AoA) concept uses a combination of unique clinical parameters to provide a holistic view of the patient response to anaesthesia therapy. Effective AoA strategies can greatly reduce adverse events¹² during and after general anaesthesia and help minimize emergence times¹³ for patients in the PACU. However, clinicians lack an efficient tool for reviewing adoption of AoA practices and associating those practices to measurable outcomes.

Solution

The Carestation Insights AoA application combines data from patient monitors and anesthesia machines[†] to present the data in an intuitive way, showing real time* and historical data measured against customized performance targets. The application shows the impact of AoA practices on patient recovery times by analyzing emergence time trends. This application includes the capability to track anaesthetic agent costs and agent release into the atmosphere, helping you meet your financial and environmental goals.

Outcomes

- **Gain visibility into patient responses to inhaled and intravenous drugs**
- **Optimize AoA practices to help reduce variability across multiple ORs**
- **Analyze anaesthetic agent use, cost and environmental impact**



AoA Clinical Parameter Tools

Gain the intelligence you need from the Carestation Insights AoA application with parameter data collected from these unique CARESCAPE monitor AoA measurements.

Entropy™ Parameter

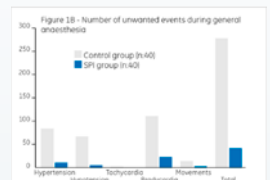
Utilizing GE Healthcare's proprietary Entropy algorithm and technologies, the patient's electroencephalograph (EEG) and frontal electromyograph (FEMG) data is captured during general anaesthesia. Entropy monitoring provides two indexes:

- **State Entropy (SE)** is an estimation of the hypnotic effect of anaesthetic drugs on the brain during general anaesthesia may be based on SE value.
- **Response Entropy (RE)** is sensitive to the activation of facial muscles, (i.e., FEMG). Facial muscles may also give an early indication of emergence seen as a quick rise in RE value.



SPI™ Parameter**

By observing the SPI value and trend, clinicians can monitor real-time* adult patient responses to surgical stimuli and analgesic medications, therefore, saving valuable time for optimizing analgesia delivery and possibly avoiding unwanted events.¹⁴ The SPI parameter is derived from hemodynamic information in the photoplethysmographic waveform obtained from a patient's finger using GE Healthcare's proprietary TruSignal™ SpO₂ technologies.



NMT Parameter

Quantitative NMT monitoring of muscle relaxation/recovery gives a clear picture of the individual dosage needs and facilitates optimal administration of neuromuscular blockade medications (NMBAs) and antagonists. Both electromyography (EMG) and kinemyography (KMG) sensors are used to assess nerve and muscle responses to therapy. Studies have shown that implementing quantitative EMG neuromuscular monitoring resulted in a significant reduction in the incidence of incompletely reversed patients in the PACU¹⁵.



* Actual time may vary slightly due to hospital network and processing times.

** SPI is not cleared in all markets and is not approved for use in the US.

[†] AoA App collects data from CARESCAPE™ Patient Monitors and Aisys CS² Anaesthesia Delivery System.

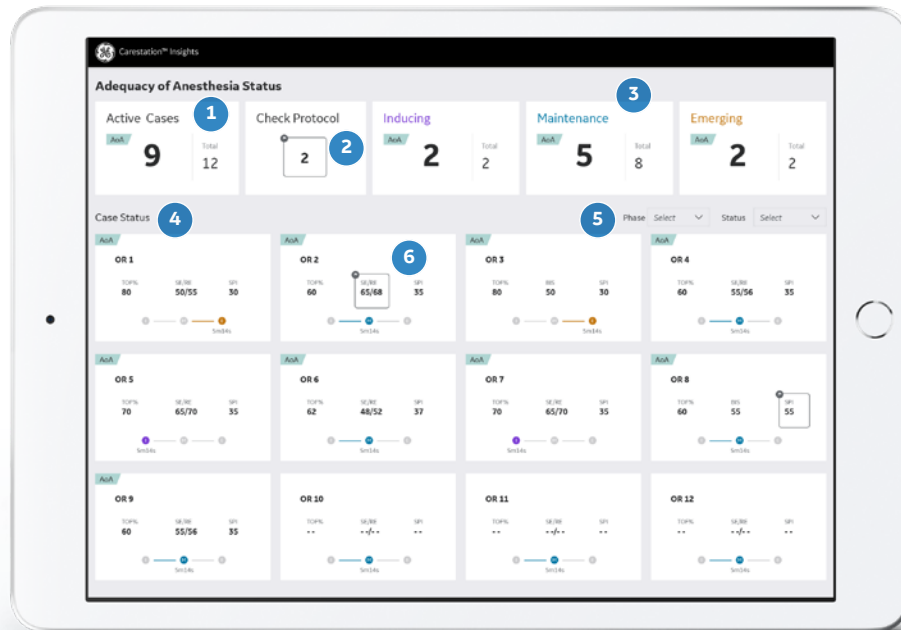
¹² Murphy, GS and Brull, SJ. Residual neuromuscular block: Lessons unlearned. Part 1: Definitions, incidence, adverse psychological effects of residual neuromuscular block. *Anesth Analg* 2010;111:120-128.

¹³ Vakkuri, A., et al. Spectral Entropy Monitoring Is Associated with Reduced Propofol Use and Faster Emergence in Propofol-Nitrous Oxide-Alfentanil Anesthesia. *Anesthesiology* 2005, Vol. 103, 274-279.

¹⁴ Chen X, et al. Comparison of Surgical Stress Index-guided Analgesia with Standard Clinical Practice during Routine General Anaesthesia. *Anesthesiology* 2010; 112:1175- 83.

¹⁵ Todd, MM, et al. The implementation of quantitative electromyographic neuromuscular monitoring in an academic anaesthesia department. *Anesth Analg*. 2014; 119(2):323-31.

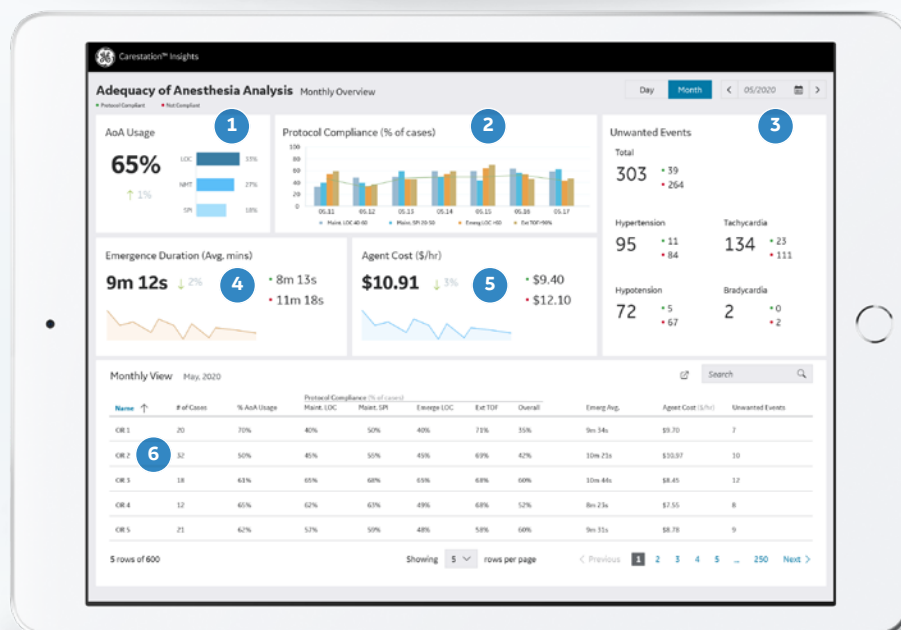
NOTE: This product is in development. Depictions of the AoA application are illustrative, subject to change, and may not be representative of the final product. Please contact your GE healthcare representative for updates.



AoA Application – Coming soon!

Operating Room Status: Live view into OR case phase

1. Total active cases and number of cases using AoA protocols.
2. Number of protocols currently out of compliance.
3. Dashboard of total cases by anaesthesia phase, and cases using AoA protocols.
4. Dashboard of all active cases using AoA.
5. Filter cases by phase or status.
6. Specific OR details at a glance. Out of compliance protocols will be denoted with a box.



Operating Room Analysis: OR AoA practice and events overview

1. % of cases using AoA protocols by monitoring parameter.
2. % of cases using AoA parameters in graphical form.
3. Number of adverse events by type.
4. Average emergence time across all cases for the timeframe.
5. Average cost of anaesthetic agents used across all cases.
6. Specific OR details by date – click to drill down to OR level details.

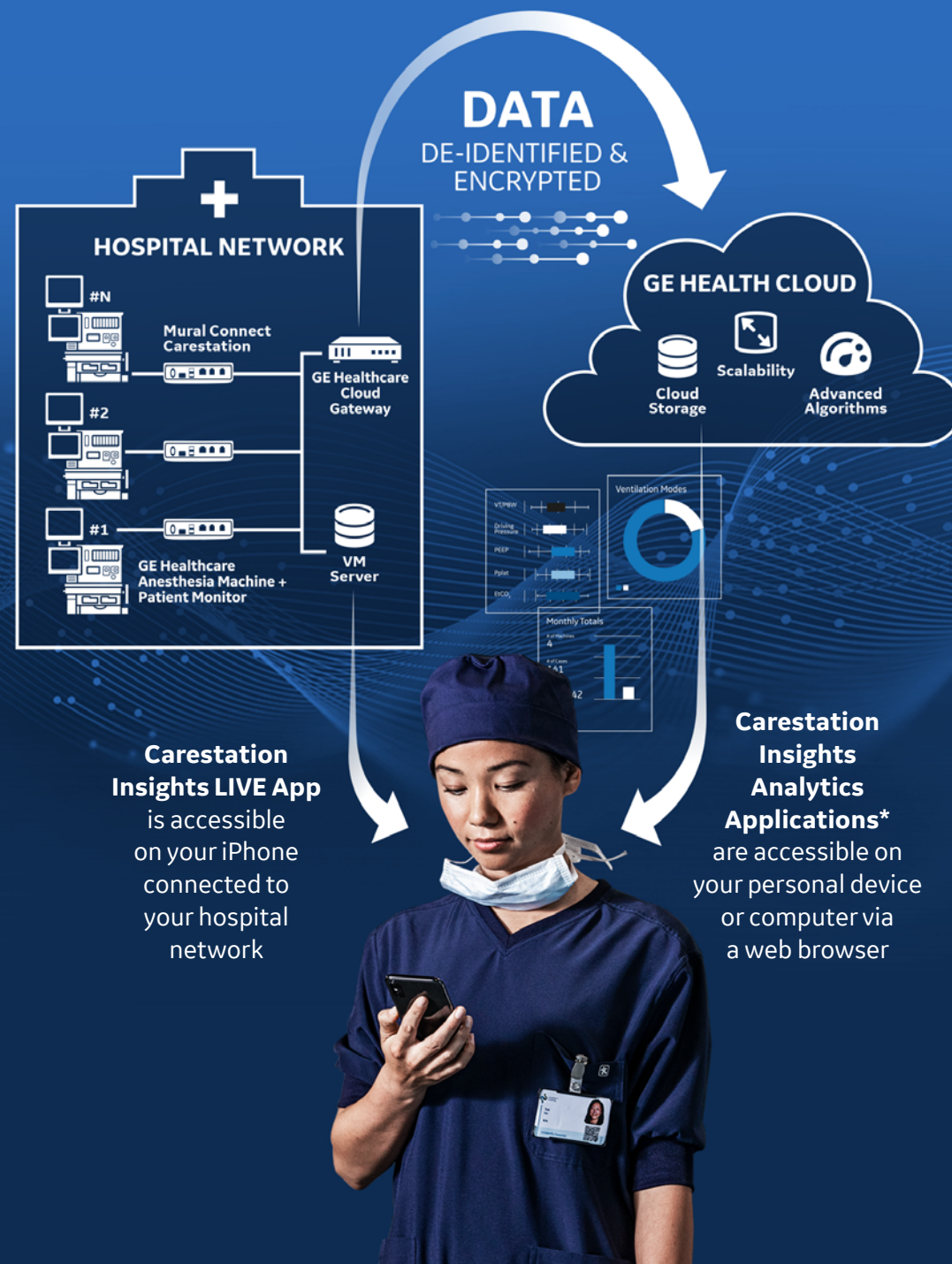
NOTE: This product is in development. Depictions of the AoA application are illustrative, subject to change, and may not be representative of the final product. Please contact your GE healthcare representative for updates.

Simple & Secure IT Infrastructure

Carestation Insights cloud-based applications are designed to have limited impact to hospital IT infrastructure. On-site install and maintenance requirements are minimized by leveraging cloud technology with the flexibility to use the hospitals existing network, or segregated VLAN, without interfering with any existing machine connectivity. Data from connected GE Healthcare machines are captured by a small cloud gateway appliance that de-identifies and encrypts the data before sending it to the GE Health Cloud where storage, analysis, and visualization occurs. Users access the cloud-based applications on their personal device via a web browser.

Carestation Insights LIVE Application is similar in that it will not interfere with existing machine connectivity, but this solution is deployed as a virtual machine (VM) on the hospital network and uses the Mural™ Connect Carestation™ Connectivity Appliance to obtain data from the GE Healthcare anaesthesia machine and patient monitor. Users access this application on their mobile device while connected to the hospital network.

Both Carestation Insights cloud-based applications and Carestation Insights LIVE application can be used together. In this case, (see diagram) the machines provide data simultaneously to both the VM and the cloud gateway using the Mural Connect Carestation appliance.



* Not applicable for Carestation Insights LIVE App.

Carestation Insights Family of Analytics Applications

INSIGHTS APP	CHALLENGE	SOLUTION	OUTCOMES
Checkout	Ensure that anaesthesia machines are ready for use	Central source for daily machine checkout status to enhance OR scheduling workflow	• Help ensure pre-use checkout compliance • Help protect patients from injury • Support efficiency and quality of care
Lung Protective Ventilation	Risk of costly post-op lung complications due to improper ventilation during anaesthesia	Insights to criteria related to LPV strategies and how they affect patient outcomes	• Identify opportunities to support lung protection initiatives • Measure results that support LPV strategies • Help anesthesiologists comply with lung protection guidelines
Agent Cost	Effectively manage low-flow anaesthesia strategies	Real-time* data on agent usage, cost and greenhouse gas emissions, supporting low-flow initiatives	• Save on anaesthetic agents⁸ • Reduce greenhouse gas emissions^{7,8}
OR Workflow	Minimize costly OR delays and ensure PACU readiness	Real-time* visibility to case phases without manual data entry	• Increase OR utilization • Prioritize OR turnover • Easily visualize case phase
LIVE	Supervising multiple ORs and prioritizing medical direction	Simple, real-time* access to data on patient and machine status and how therapy is delivered all while on the move	• Supervise multiple ORs with confidence • Assist clinicians to prioritize medical direction • Help support adherence to protocols in real time*
Coming soon! AoA	Unable to review AoA practices across ORs and associate with outcomes	Analyze AoA parameter data from patient monitor and anaesthesia machine data in real time* and view historical trends [†]	• View patient responses to drugs • Support adherence to AoA protocols • Analyze anaesthetic agent use, cost and environmental impact

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* Actual time may vary slightly due to hospital network and processing times.

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Products may not be available in all countries and regions. Contact a GE Healthcare Representative for more information. Please visit www.gehealthcare.com. Data subject to change.

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