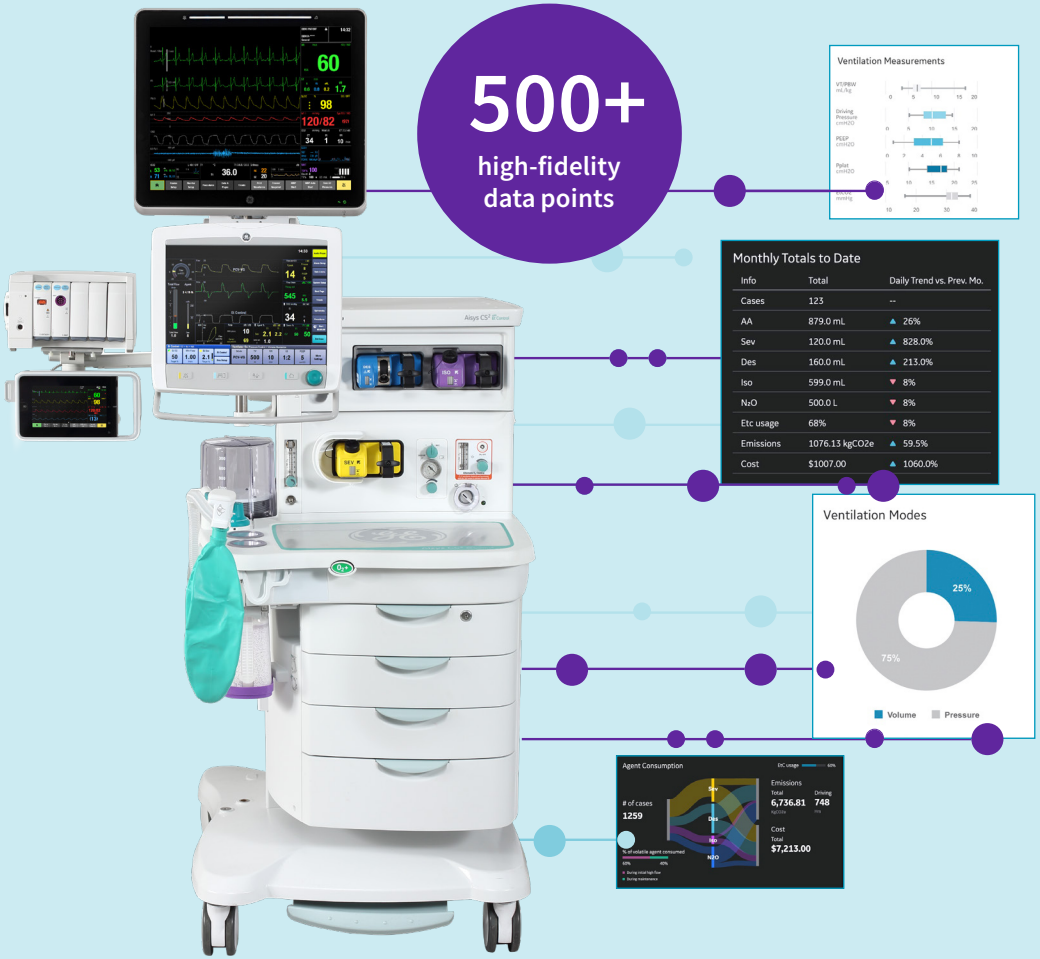
GE HealthCare

Carestation™ Insights Analytics Applications

We analyze. You drive change.

Carestation Insights Analytics Applications



*Actual time may vary slightly due to hospital network and processing times. This app is only compatible with the Aisys™ CS² Anesthesia Delivery System. This product does not generate data or alarms, but transmits data from the OR and displays active alarms in the room for awareness.

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 anesthesiologists**

Together with compatible GE HealthCare anesthesia 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 anesthesia machine readiness
- **Lung Protective Ventilation (LPV) App:** Help support lung protection strategies
- **Agent Cost App:** Optimize the benefits of low-flow anesthesia
- **OR Workflow App:** Data to help improve perioperative productivity
- **Adequacy of Anesthesia (AoA) App:** Provides actionable insights to support your patient stability goals
- **LIVE App:** Supervise multiple ORs in real time* while on the move

Checkout Application

Confirm daily anesthesia machine readiness

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

Challenge

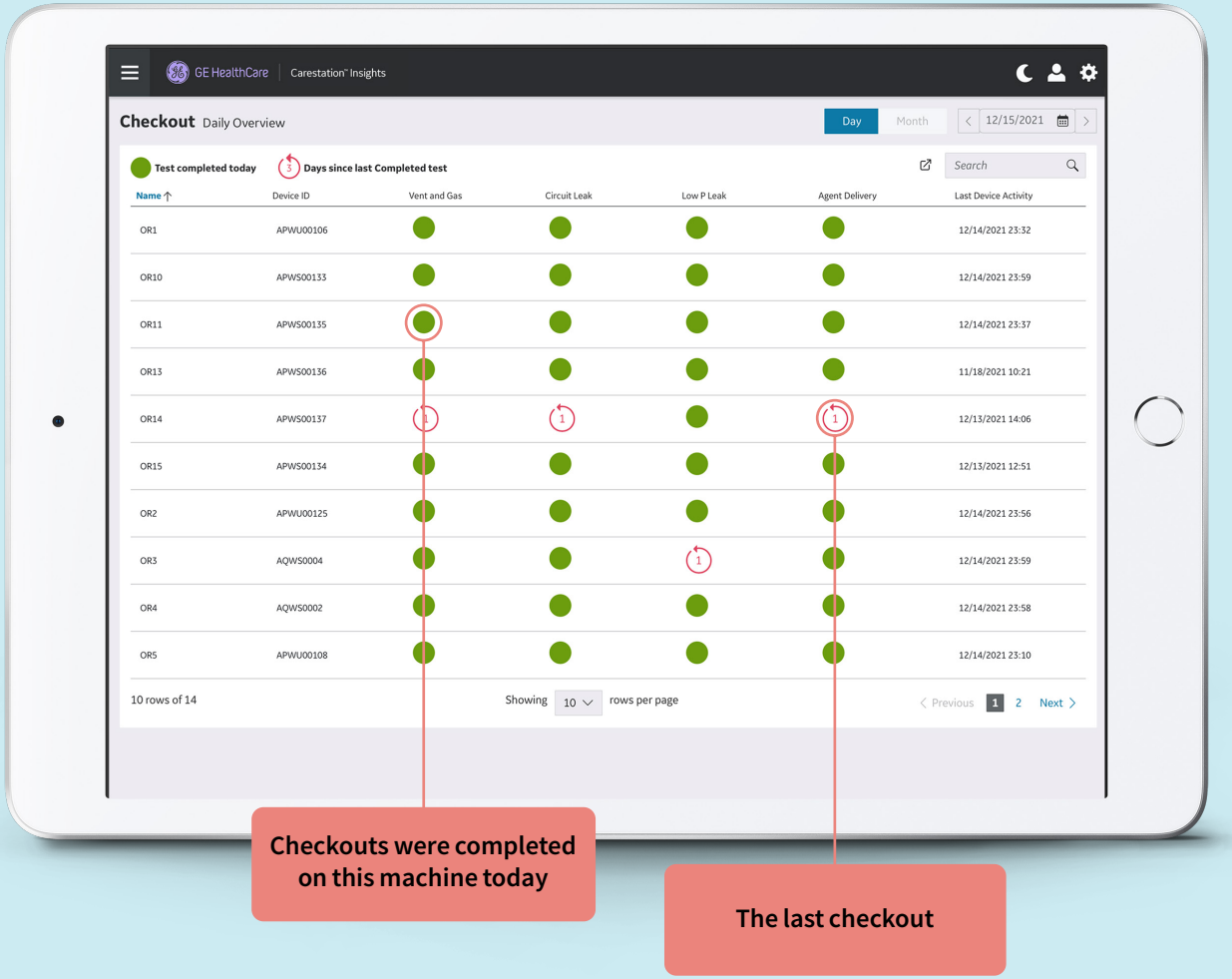
Daily pre-check of anesthesia equipment is essential, but can be overlooked in busy environments. Failure to perform checkout can lead to patient injuries and near misses.[1]

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.

Target 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 anesthesia 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 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.

Target outcomes

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

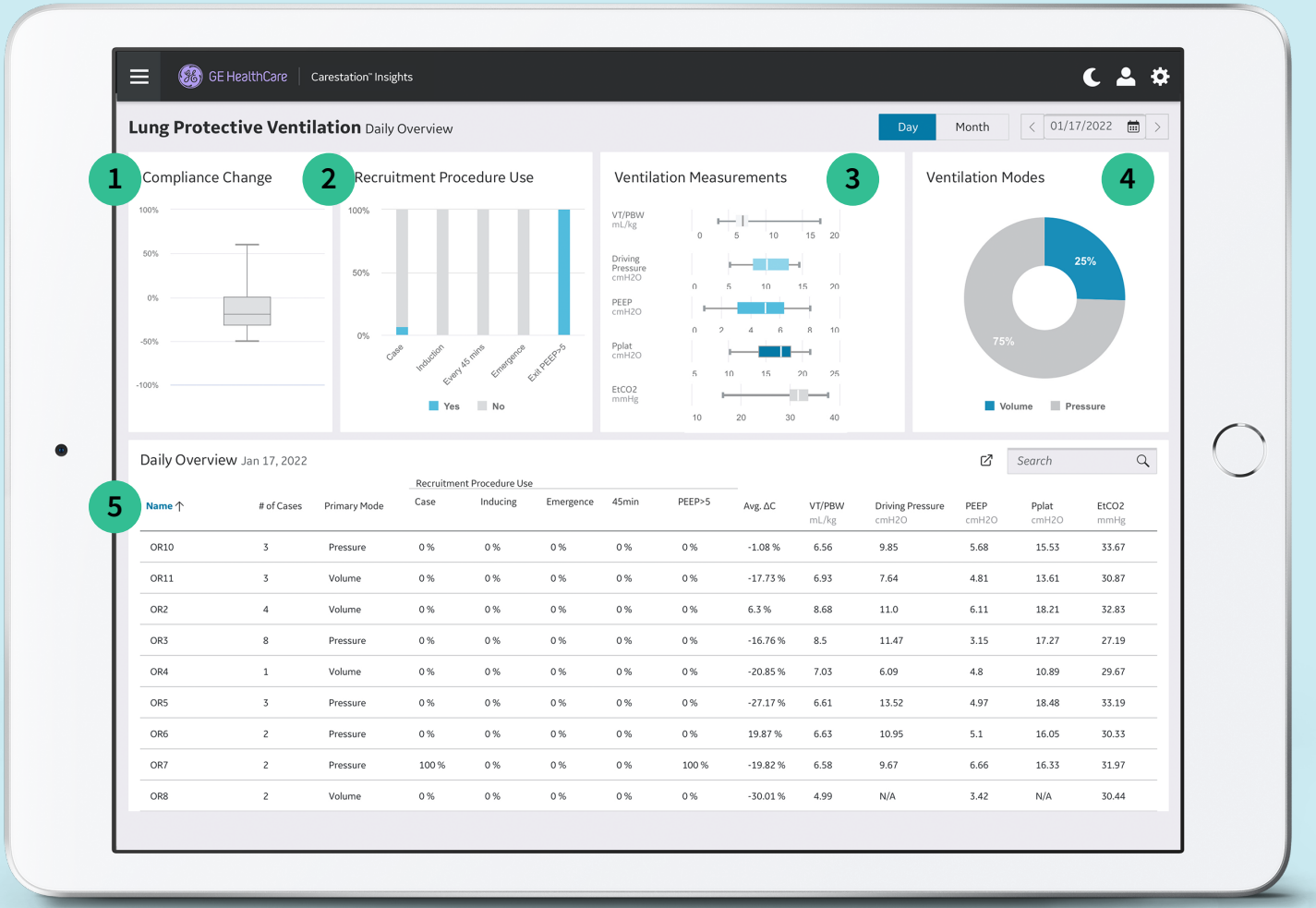
Outcomes achieved using LPV in the Futier et al study[2]

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., PhD., 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 $EtCO_2$.

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 anesthesia

Challenge

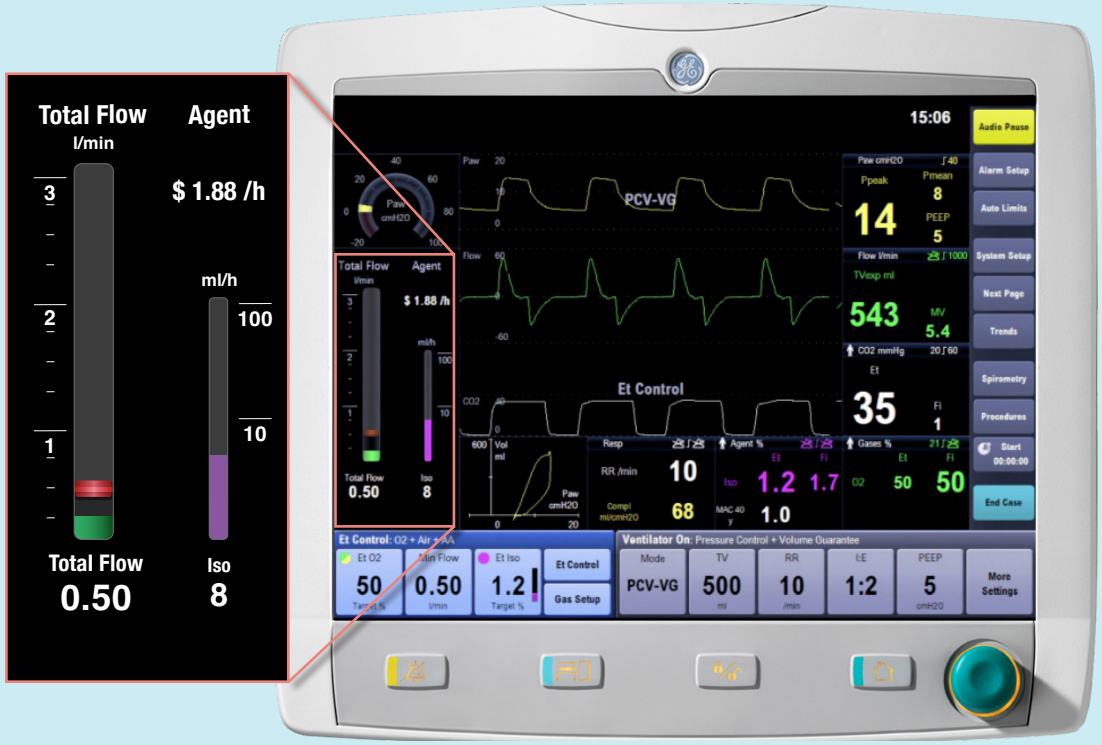
Anesthetic agents are the biggest ongoing expense in your anesthesia unit. Hospitals can spend an extra 15–30% on anesthetic agents due to high fresh gas flow rates.[5] The agent release into the atmosphere can also contribute extra greenhouse gases equivalent up to 350 cars/year.[6,7]

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 anesthesia practices.

Target outcomes

- **Reduce anesthetic agent costs**[8]
- **Savings can be used by hospitals for other critical needs**
- **Support positive environmental impact**



Low-flow anesthesia 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]

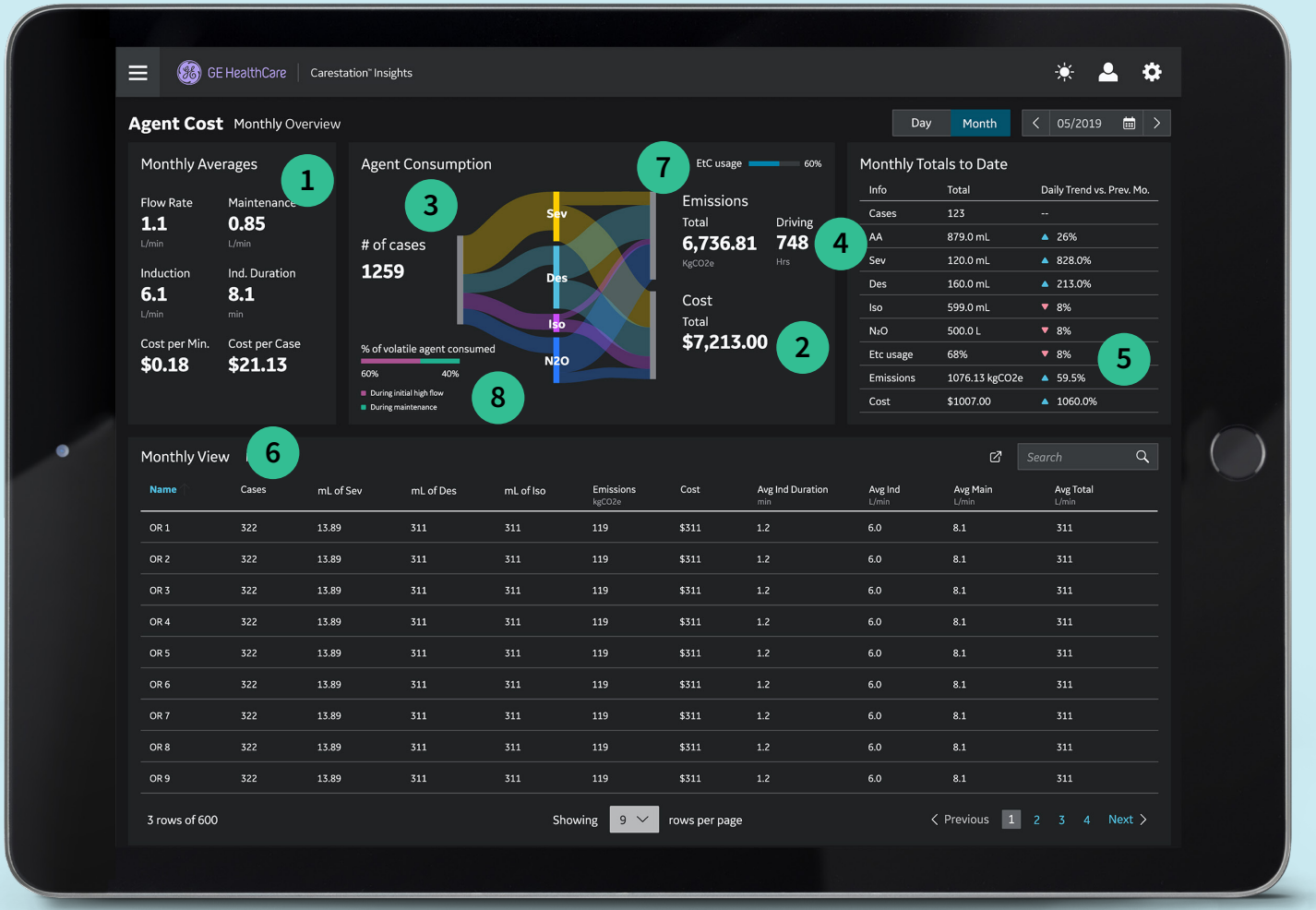
5. Hospitals can be spending an extra 15–30% for anesthetic agents in an OR due to high flow estimates derived from the GE HealthCare ecoFLOW Calculator. https://gehealthcareamer.my.salesforce.com/sfc/#version?selectedDocumentId=069a0000004eOn7
6. Environmental Protection Agency. Emissions facts: greenhouse gas emissions from a typical passenger vehicle. Available at: http://www.epa.gov/oms/climate/420f05004.htm#key
7. Global 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-anelgesia.org July 2010; v111 #1.
8. The 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
9. Tay 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 013;41(1):95-101.

* Et Control in the United States is indicated for patients 18 years of age and older. Et Control is only available on the Aisys CS^2 anesthesia machine. ecoFLOW software is also available on GE HealthCare anesthesia machines to assist providers practicing manual control of low-flow anesthesia.

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 CO_2 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.

7.
End-tidal Control (EtC) usage shows percent of cases using EtC software* to automate fresh gas flow delivery.

8.
View % agent consumed during high flow and maintenance phase of each case and as an aggregate.

* Et Control in the United States is indicated for patients 18 years of age and older. Et Control is only available on the Aisys CS² anesthesia machine.

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.

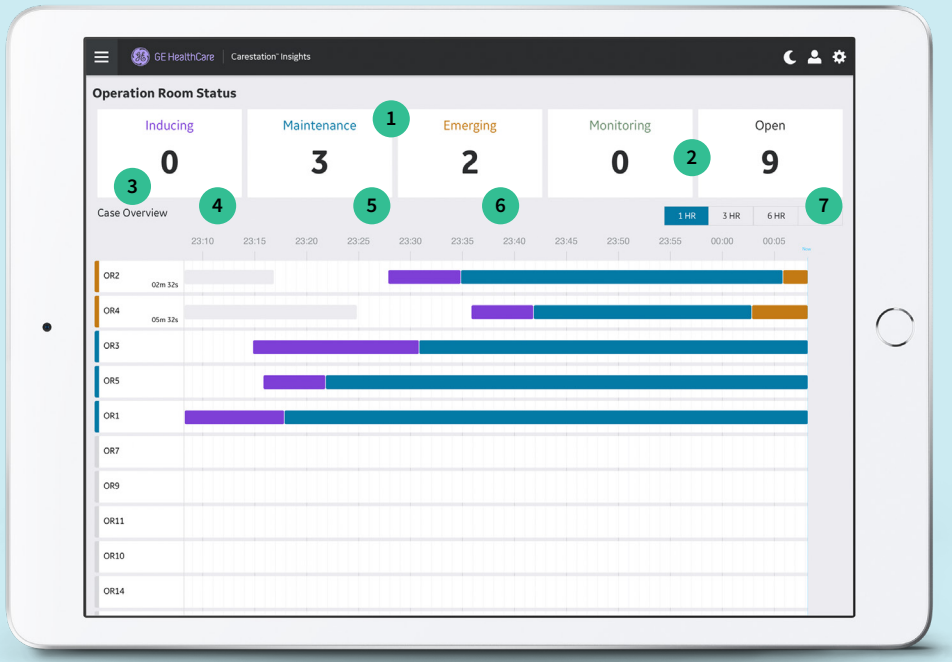
Target outcomes

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

Visibility to prioritize OR turnover

Visibility to prepare for next PACU patient

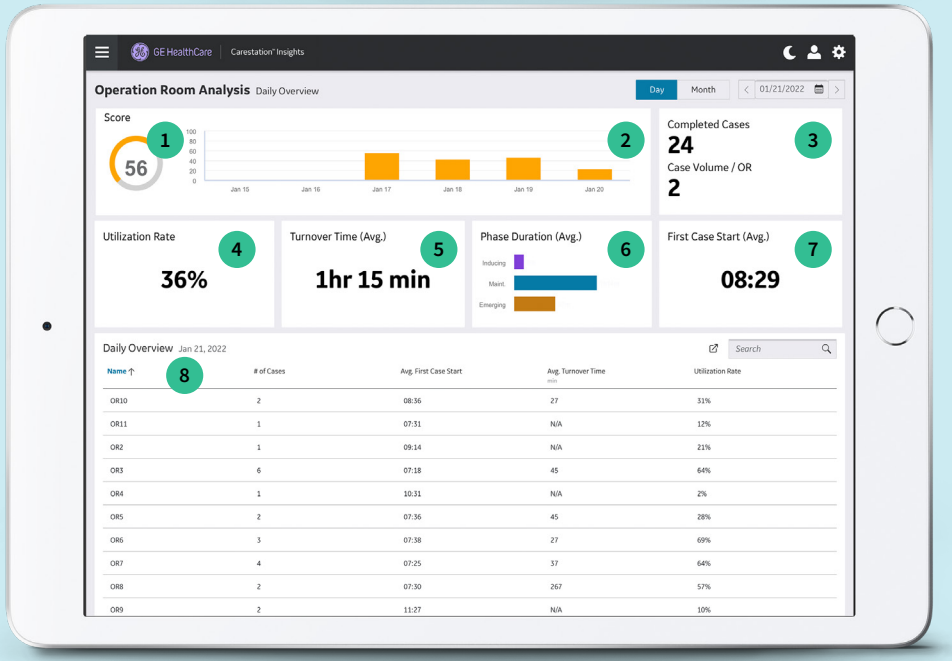
10. NHS Institute for Innovation and Improvement. The Productive Operating Theatre. http://www.institute.nhs.uk/images//documents/Quality_and_alue/Productive%20Operating%20Theatre/Finance%20leaflet.pdf
11. Improving the economy of surgical services, Part 4. Strate, Cody. The Cost of a Lost Minute in the OR. Jun 22, 2018. https://www.accessefm.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.

Adequacy of Anesthesia (AoA) Application

Providing actionable insights to support your patient stability goals

Challenge

Effective AoA strategies may reduce adverse events[12] during and after general anesthesia and help minimize emergence times[13] 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 the compatible GE HealthCare 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's analysis view provides the ability to see the outcome information associated with the use of AoA, including emergence times, agent costs, and certain unwanted events. It also includes the capability to track anesthetic agent costs and provide visualization of greenhouse gas emissions of anesthetic drugs, helping you meet your financial and environmental goals.

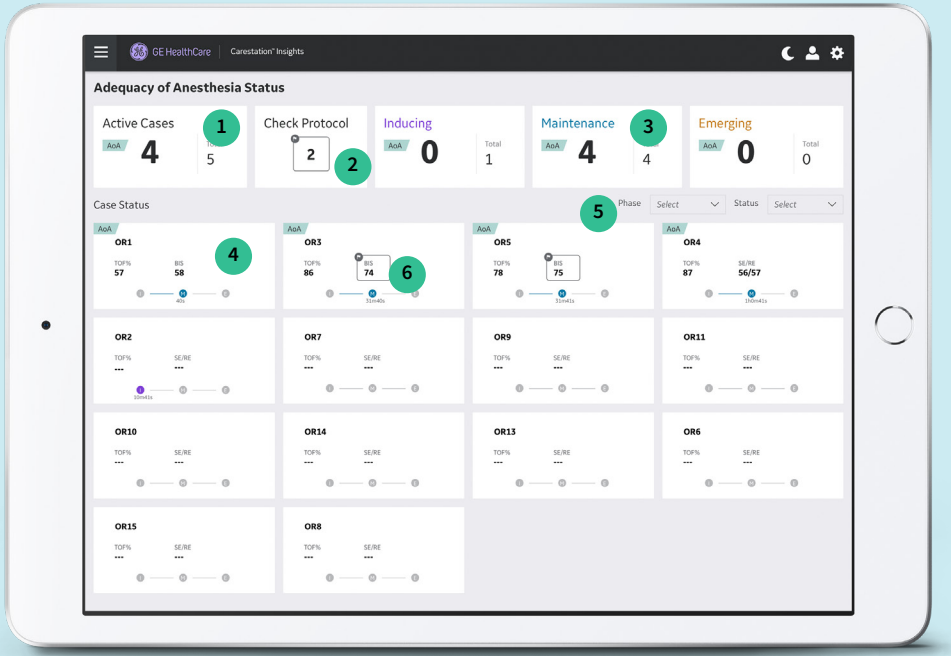
Target outcomes

- **Gain clinical insights from patient outcome information associated with AoA protocol adherence**
- **Optimize AoA practices to help reduce variability across multiple ORs**
- **Analyze anesthetic agent use, cost and environmental impact**

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

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.

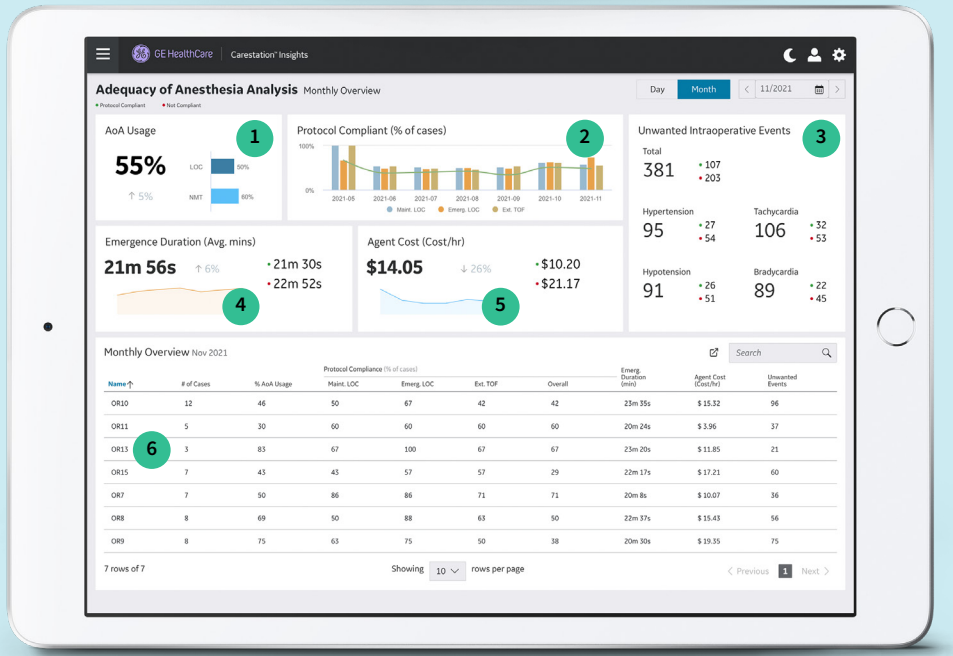
13. Vakkuri, A., et al, Spectral Entropy Monitoring Is Associated with Reduced Propofol Use and Faster Emergence in Propofol–Nitrous Oxide–Alfentanil Anesthesia. Anesthesiology 2005, Vol. 103, 274–279.



AoA Application

AoA Status View: Real-time data for active cases

1. Displays the number of ongoing cases where AoA parameters are being used and the total number of ongoing cases.
2. Displays the number of ongoing cases where AoA parameters are outside of the set protocol ranges during the Maintenance phase.
3. Displays the number of ongoing cases in the Inducing, Maintenance and Emerging phases where AoA parameters are being used and the total number of cases in each phase.
4. Displays the individual room AoA parameter status which includes TOF%, Entropy™ or BIS.
5. Filter cases by phase or status.
6. A parameter with a box around it indicates it is outside of the set protocol range.



AoA Analysis View: Retrospective case data and analytics

1. Displays the percent of cases where AoA parameters are used with trend value.
2. Displays the percent of cases that adhere to the set of protocols when AoA is used.
3. Displays the total number of Unwanted Intraoperative Events based on the criteria set by the facility.
4. Displays the average Emergence Duration for all cases.
5. Displays anesthetic agent cost (cost/hr) total for all cases.
6. The daily or monthly view table shows case data by operating room. Aggregated data can be viewed by selecting a row.

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 anesthesia data when not in the OR.

Solution

The LIVE application captures high-fidelity data from the anesthesia 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 anesthesia 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.

Target outcomes

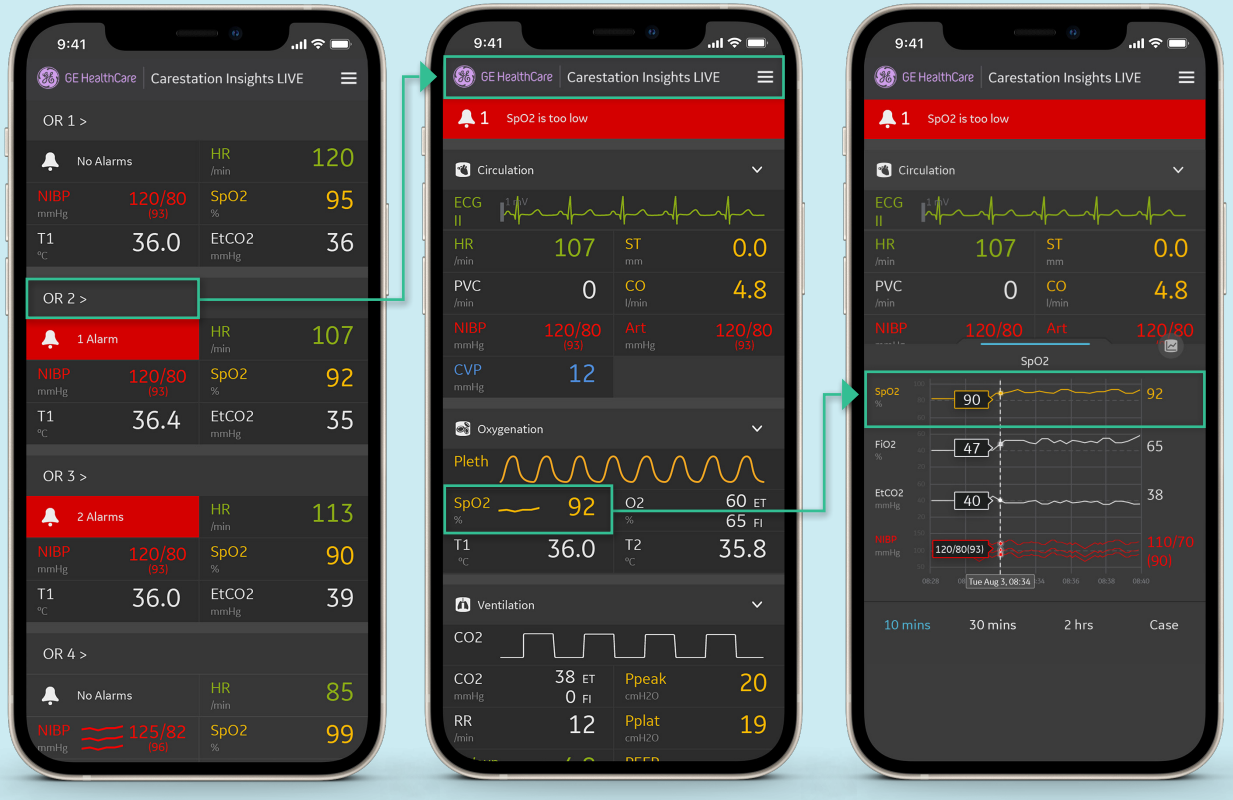
- **Supervise multiple ORs with confidence**
- **Enable clinicians to prioritize medical direction**
- **Help clinicians support adherence to protocols in real time***

* Actual time may vary slightly due to hospital network and processing times. This product does not generate data or alarms, but transmits data from the OR and displays active alarms in the room for awareness. This app is only compatible with the Aisys CS² anesthesia machine.

LIVE Application

Stay connected to your ORs while on the move

View Aisys CS² anesthesia 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**

*Actual time may vary slightly due to hospital network and processing times. This product does not generate data or alarms, but transmits data from the OR and displays active alarms in the room for awareness.

Carestation Insights Family of Analytics Applications

Insights app	Challenge	Solution	Target outcomes
Checkout	Ensure that anesthesia 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 anesthesia	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 anesthesia strategies	Near real-time data on agent usage, cost and greenhouse gas emissions, supporting low-flow initiatives	• Save on anesthetic agents • Reduce greenhouse gas emissions
OR Workflow	Minimize costly OR delays and ensure PACU readiness	Near real-time visibility to case phases without manual data entry	• Increase OR utilization • Prioritize OR turnover • Easily visualize case phase
Adequacy of Anesthesia (AoA)	Unable to review AoA practices across ORs and associate with outcomes	Analyze AoA parameter data from patient monitor and anesthesia machine data in real time* and view historical trends	• View patient responses to drugs • Support adherence to AoA protocols • Analyze anesthetic agent use, cost and environmental impact
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; available with Aisys CS^2	• Supervise multiple ORs with confidence • Assist clinicians to prioritize medical direction • Help support adherence to protocols in real time*

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NOTE: Screen images are representative of the products for the Aisys CS^2 anesthesia machine, but may change in future product software updates. Not all products or features are available in all markets. Contact a GE HealthCare representative for more information. Please visit www.gehealthcare.com. Data subject to change.

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