GE HealthCare

White paper

Carestation™ Insights helps to continuously reduce anaesthetic agent costs and carbon dioxide emissions

Long term reduction of carbon emissions in the operating room through data analytics

The anaesthesiology clinic at the Evangelisches Diakoniekrankenhaus Freiburg – a teaching hospital of the Albert-Ludwigs-Universität Freiburg – has been using GE HealthCare's high-fidelity digital ecosystem Carestation™ Insights since the beginning of 2018. Chief physician Professor Wiesenack reports on his experiences with the agent and emissions application and actions undertaken to reduce carbon footprint.

"Our anaesthesiology department performs the most up-to-date procedures available for pain-free and safe operations and diagnostic interventions. We have a wealth of experience, conducting out over 7,500 anaesthetic procedures per year."

Looking to a greener, more cost-effective future

Clinics and healthcare facilities must prove their CO_2 (carbon dioxide) emissions. In order to realize savings here, the institutions began to identify and implement projects and measures for environmental and climate protection. Even or especially when purchasing products and consumables, which is difficult for institutions to control, emissions must be identifiable and reduced if possible. This area, defined as scope 3, is a key factor in the CO_2 emissions of healthcare facilities.

Anaesthetic agents are known to be potent greenhouse gases, and their release into the atmosphere can contribute emissions equivalent to up to 350 cars driving hours per year.[1,2] Cutting the amount of anaesthetic agents used could, therefore, have a direct effect on the reduction of CO_2 emissions.

Back in 2013, a working group from an English hospital published data on using End-tidal Control technology. Using EtControl* in the Aisys™ CS^2, they were able to document a **53% reduction in consumption of the anaesthetic agent sevoflurane.**[3]

In the same year, another working group from an Australian hospital was able to show that with this EtControl technology of the Aisys CS^2 anaesthesia system, the emissions caused by sevoflurane were reduced by 80 tons of CO_2 equivalents per year.[4]

Carestation™ Insights, confident patient care with an intelligent Operating Room ecosystem

The Carestation Insights Agent Cost App helps you implement a low-flow anaesthesia strategy by providing visibility to fresh gas flows (FGF) across all connected Aisys™ CS^2 Anaesthesia Delivery Systems. It analyzes flow data to deliver insights on your personal devices about inhalational anaesthetic agent use, costs and greenhouse gas emissions to help you adopt low- and minimal-flow anaesthesia practices and support your green sustainability initiatives.

The Carestation Insights Agent Cost App

https://www.gehealthcare.co.uk/products/perioperative-care/carestation-insights/carestation-insights-agent-cost-application

Strong baseline anaesthesia practice

Since the beginning of 2018, Diakoniekrankenhaus Freiburg has been using Aisys CS^2 Anaesthesia Delivery Systems with EtControl combined with the high-fidelity ecosystem Carestation™ Insights.

"Using Carestation Insights Agent dashboard we could monitor the FGF during the induction and maintenance phase of anaesthesia and the adoption of EtC use".

"In 2015 already we stopped using Desflurane as anaesthetic Agent when more information became available about the high carbon footprint of this anaesthetic agent. Sevoflurane was the only available anaesthetic agent. We can see in the CSI agent dashboard that we achieved a remarkably adoption of 98%-99% and consistent use of EtControl across all our procedures (Figure 1). EtControl was activated soon after intubation, allowing for the lowest configured FGF 0,5L/minute to be achieved in 42 seconds. The average maintenance flowrate is 0,7 L/min across all procedures as shown in the example below. This is directly resulting into a low use of anaesthetic agents and CO_2 emissions".

It is important to state that the costs and CO_2 emissions from anaesthetic agents in Diakoniekrankenhaus Freiburg were already low and used as the best practices benchmark in Europe.

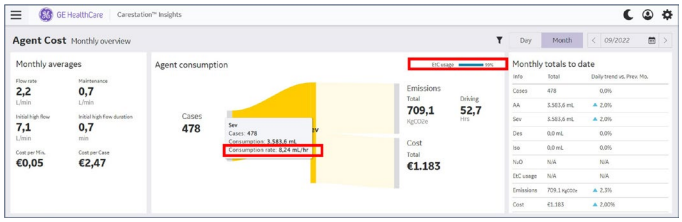

Figure 1: Agent dashboard showing the baseline with an average Maintenance fresh gas flow of 0,7 L/min and initial high flow duration of 0,7 Minutes, resulting in an average agent consumption rate of 8,24ml/ Hour.

Next steps for further reduction of emissions and costs of anaesthetic agents

In close collaboration with GE HealthCare, the Diakoniekrankenhaus Freiburg has made another step in reducing anaesthetic agent-related CO_2 emissions. In March 2023, the Aisys™ CS^2 Anaesthesia Delivery Systems software was upgraded to further reduce the minimal FGF under EtControl from 500 ml/min to 300 ml/min. All anesthesiologists were made aware of this upgrade and advised to use EtControl with a 300 ml/min FGF immediately after switching to mechanical ventilation.

* Et Control is indicated for patients 18 years of age and older in the United States.

Results improved anaesthesia practice

To evaluate the impact of the reduced FGF option in EtControl we used the Carestation Insights Agent dashboard data from September 2022 to December 2022 as our baseline. Changes in practice take time and attention before these become a new standard way of working. We therefore decided to compare our baseline September-December 2022 data with September-December 2023 and with data from February-May 2024.

When comparing the data from September-December 2023 with our 2022 baseline we already achieved an additional $KgCO_2e$ (kilograms of carbon dioxide equivalent) and agent cost reduction of 11%. During a team meeting we reiterated the need to further reduce the FGF using the EtControl and added signs on the Aisys CS^2 to help the staff to remember.

A few months later, in February-May 2024 we achieved an **additional reduction of 15% $KgCO_2e$ and agent cost** compared to our 2022 baseline (Table 1). The calculated reduction of emission for the full year of 2024 is - **1106,70 $KgCO_2e$** (Table 2).

This reduction represents close to two months agent consumption (Figure 2)

Comparison Febr-May 2024 versus Sept-Dec 2022				
TOTAL # cases	Avg. Cost/ Minute	Avg. Cost/ Case	TOTAL Agent Cost	Total Emission $KgCO_2e$
2096	-€ 0,01	-€ 0,21 €	-€ 615,00	-368,90
102%	-13%	-10%	-15%	-15%

Table 1: Comparison of September-December 2022 baseline with the February-May 2024, Costs and KgCO2e Emissions

Calculation Full year 2024 versus Full year 2022		
TOTAL # cases	TOTAL Agent Cost	Total Emiss $KgCO_2e$
6288	-€ 1.845,00	-1106,70
	-15%	-15%

Table 2: Total calculated additional costs and emission reduction in a full year.

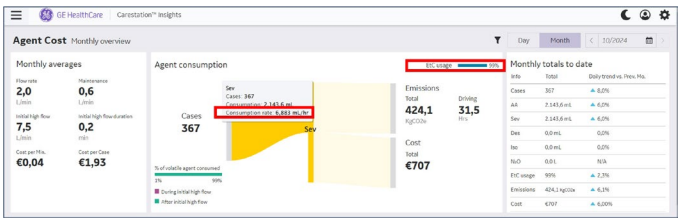

Figure 2: Showing an average maintenance fresh gas flow of 0,6 L/min, a high flow duration of 0,4 min and agent consumption rate of 6,88 ml/hr versus baseline of 0,7 l/min, 0,7 min and agent consumption rate of 8,24 ml/hr respectively.

Conclusion

Although the anaesthesiologists in Diakoniekrankenhaus Freiburg had a high adoption of the EtControl during all the general anaesthesia cases (as seen in the agent dashboard) resulting into a high % reduction in agent costs and emissions already in 2018, the team has achieved an additional 15% reduction in CO_2 emissions and agent cost. This has been the effect of activating the 300 ml/min FGF option in the Aisys CS^2 and a trackable increased use of EtControl with 300 ml/min FGF. Without Carestation Insights agent dashboard we would not have been able to track and stimulate the adoption of lower fresh gas flow combined with EtControl and coach our staff where appropriate.

Prof. Wiesenack Head of department Ev. Diakoniekrankenhaus Freiburg.

"For me, the long-standing and trusted collaboration with GE HealthCare in anaesthesia represents a symbiosis between the industry and the user that we never experienced before and is rarely seen in the healthcare sector. We pursue a common goal: develop and use innovative technologies to unite patient safety in anesthesia with economical, ecological and sustainability outcomes, protecting our valued environment."

Mr. Decker CEO Ev. Diakoniekrankenhaus Freiburg.

"Sustainability is a question of perspective. We are very happy every time we find a practical way to make something fundamentally better and more sustainable. If this results into additional positive effects such as cost-savings, that's even better."

References

1. Environmental Protection Agency. Emissions facts: greenhouse gas emissions from a typical passenger vehicle. http://www.epa.gov/oms/climate/420f05004.htm#key
2. 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
3. British Journal of Anaesthesia 2013; 110: 561–6
4. Anaesth Intensive Care 2013; 41: 95-101

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