

Aisys™ CS² Anesthesia Delivery System with Et Control Software

Literature Summary



Journal articles*

Utilization and Impact of Automated End-Tidal Control at an Ambulatory Surgical Center: A Preliminary Single-Center Cohort Analysis.

McBride J, Yuan Y, Mentz G, Hovord DG, Colquhoun DA. *Anesthesia & Analgesia*. August 29, 2025. doi:10.1213/ANE.0000000000007723

- ▶ Et Control was used in 28.4% of 1,004 anesthetics, increasing from 13.9% in month 1 to 43.5% by month 6. When utilized, Et Control reduced fresh gas flow by 1.00 L/min and CO₂e emissions by 1.14 kg/hour, with no clinically meaningful difference in MAC.

Automated Volatile Anesthetics Delivery with End-tidal Control: Early Results from Adoption at Missouri University Hospital.

Mraovic B, Cardonell B, Johnson Q, Luchetti M, Beard JW. *Anesthesiology*. 143(2):464-467, August 2025. doi:10.1097/ALN.0000000000005498

- ▶ Early adoption demonstrated that in 238 sevoflurane cases, End-tidal Control was used in 49% and reduced FGF and anesthetic consumption by 45.6% compared to manual control. Et Control also lowered agent costs and CO₂e emissions, reducing volatile anesthetic cost per OR from \$351.20 to \$186.26 and emissions from 274.39 to 145.53 kgCO₂e.

The Effects of End-Tidal Controlled Low-Flow Anesthesia on Anesthetic Agent Consumption in Elective Surgeries: Randomized Controlled Trial.

Elzem Sen, Suleyman Ganidagli, Ayse Mizrak, Berna Kaya Ugur, Mehmet Cesur, Fahrettin Yildiz & Lutfiye Pirbudak. *BMC Anesthesiology*. 25, Article 176 (2025). doi:10.1186/s12871-025-03051-9

- ▶ In 132 elective surgery patients receiving End-tidal Controlled low-flow anesthesia, Et Control reduced manual adjustments, improving workflow efficiency and supporting cost-effectiveness and environmental sustainability.

Environmental and Economic Impacts of End-tidal Control of Volatile Anesthetics: A Scoping Review and Analysis.

Beard JW, Kennedy RR, Philip JH, Erslon M, Jiao W, Hyatt HW, Yapici HO. *The Open Anesthesia Journal*. February 13, 2025. doi:10.2174/0125896458355905241230090118

- ▶ This scoping review found that End-tidal Control reduced anesthetic agent usage in 8 of 10 studies, with mean decreases of 32.2% for desflurane, 30.1% for isoflurane, and 4.1% for sevoflurane. For a 592-bed academic medical center, Et Control utilization could potentially save \$95,536 annually and cut greenhouse gas emissions by 434,345 kg CO₂e, which is equivalent to eliminating emissions from ~100 motor vehicles.

Journal articles

End-Tidal Control Versus Manual Control of Inhalational Anesthesia Delivery: A Randomized Controlled Noninferiority Trial.

McCabe MD, Dear GdL, Klopman MA, Garg K, Seering MS. *Anesthesia & Analgesia*. 139(4):812-820, October 2024. doi:10.1213/ANE.0000000000007132

- ▶ In 210 randomized patients, End-tidal Control maintained target anesthetic and oxygen concentrations within 5% of desired values for 98% of the time versus 45.7% with manual control. Et Control also achieved targets twice as fast with less overshoot and exhibited a median overshoot of only 6.64%, whereas manual control often failed to reach clinician's desired value. Et Control also demonstrated a 15.7% lower deviation from desired concentrations.

Anesthesia Delivery via Manual Control Versus End-Tidal Control: A Scoping Review.

Beard JW, Yacoubian S, Luchetti M, Yapici HO, Kennedy RR. *Trends in Anaesthesia and Critical Care*. Volume 58, October 2024, Article 101501. doi:10.1016/j.tacc.2024.101501

- ▶ This scoping review found that End-tidal Control required less than half as many provider interventions than manual control in 66.7% of usability studies, maintained concentrations within 10% of targets for at least 90% of the duration of delivery in four out of five studies. Clinicians consistently favored Et Control over manual adjustments in studies evaluating clinician feedback.

Desflurane consumption with automated vapour control systems in two different anaesthesia machines. A randomized controlled study.

Mostad D, Klepstad P, Follestad T, Pleym H. *Acta Anaesthesiologica Scandinavica*. 2021;65(7):895-901. doi:10.1111/aas.13825

- ▶ Under clinical conditions, the authors found a reduction in desflurane consumption when using automated gas delivery devices compared to low-flow anaesthesia. Both devices were reliable in use.

Comparative Study of Automated End Tidal Control Versus Manual Fresh Gas Flow Adjustment with Respect to Gas Usage and Delivery during Low Flow Anesthesia.

Swami A, Arora K, Puppala P. *Anesthesia and Critical Care*. 2020;02(02). doi:10.26502/acc.014

- ▶ The authors concluded automatic implementation of low-flow anesthesia using End-tidal Control is a good system for conserving the consumption of gases and reducing the number of adjustments needed to maintain depth of anesthesia.

Target-controlled inhalation anaesthesia: A cost-benefit analysis based on the cost per minute of anaesthesia by inhalation.

Ponsonnard S, Galy A, Cros J, Daragon AM, Nathan N. *Anaesthesia Critical Care & Pain Medicine*. 2017;36(1):33-37. doi:10.1016/j.accpm.2016.02.005

- ▶ TCIA appears to have a favourable cost-benefit ratio. Despite a number of factors, which would tend to minimise the saving and increase costs, the authors still managed to observe a 13% savings. Shorter duration of surgery, type of induction, as well as the way HA concentration is targeted, may influence the savings results obtained.

End-tidal Control vs. manually controlled minimal-flow anesthesia: a prospective comparative trial.

Wetz AJ, Mueller MM, Walliser K, et al. *Acta Anaesthesiologica Scandinavica*. 2017;61(10):1262-1269. doi:10.1111/aas.12961

- ▶ End-tidal control is a superior technique for setting and maintaining oxygen and anesthetic gas concentrations in a stable and rapid manner compared with manual control. Consequently, End-tidal Control can effectively support the anesthetist.

Automated control of end-tidal sevoflurane in living donor hepatectomy, a prospective, randomized, controlled study.

Kandeel A, Elmorshedi M, Abdalla U, et al. *Egyptian Journal of Anaesthesia*. 2017;33(3):233-237. doi:10.1016/j.egja.2017.05.007

- ▶ Automated control of EtSev during anesthesia of living donor hepatectomy significantly lowers sevoflurane consumption and decreases required user interventions without deleterious effect on patient safety.

Journal articles

A Ten-Year Audit of Fresh Gas Flows in a New Zealand Hospital: The Influence of the Introduction of Automated Agent Delivery and Comparisons with Other Hospitals.

Kennedy RR, French RA. *Anaesthesia and Intensive Care*. 2014;42(1):65-72. doi:10.1177/0310057x1404200112

- ▶ The authors' findings suggest that time spent in the Et Control automated delivery mode increased from 35% to 63% and the users valued the workload reduction. In daily practice, with a wide range of practitioners at different levels of training and a broad patient mix, mean flow rates of around 1.3 l/minute with median flows in the range 0.5 to 1.0 l/minute are achievable targets.

Cost efficiency of target-controlled inhalational anesthesia.

Potdar M, Kamat L, Save M. *Journal of Anaesthesiology Clinical Pharmacology*. 2014;30(2):222. doi:10.4103/0970-9185.130026

- ▶ Both methods are equally stable and safe for patients. The consumption of volatile agents was significantly increased in the AUTO-ET group. EtC considerably reduces the number of key presses.

End-tidal versus manually-controlled low-flow anaesthesia.

Lucangelo U, Garufi G, Marras E, et al. *Journal of Clinical Monitoring and Computing*. 2013;28(2):117-121. doi:10.1007/s10877-013-9516-8

- ▶ Low-flow anaesthesia delivered with an anaesthetic machine able to automatically control EtAA and EtO₂ provided the same clinical stability and avoided the continuous manual adjustment of delivered sevoflurane and oxygen concentrations. Hence, the anaesthetist could dedicate more time to the patient and operating room activities.

Financial and Environmental Costs of Manual versus Automated Control of End-Tidal Gas Concentrations.

Tay S, Weinberg L, Peyton P, Story D, Briedis J. *Anaesthesia and Intensive Care*. 2013;41(1):95-101. doi:10.1177/0310057x1304100116

- ▶ The authors conclude that anaesthesia machines with the option of automated control of end-tidal gases can significantly decrease volatile agent consumption with financial and environmental benefits by increasing participation in low-flow anaesthesia.

Automated control of end-tidal inhalation anaesthetic concentration using the GE Aisys Carestation™

Singaravelu S, Barclay P. *British Journal of Anaesthesia*. 2013;110(4):561-566. doi:10.1093/bja/aes464

- ▶ Automatic implementation of low-flow anaesthesia using Et Control allows the user to set and maintain a desired end-tidal volatile concentration while using less volatile agent.

Disclaimers:

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

* This summary offers a representative overview of studies involving the Aisys CS² Delivery System with End-tidal Control software. It is not intended to serve as an exhaustive compilation of all published research. The referenced articles reflect the prevailing consensus observed across similar studies.

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Refer to the anesthetic agent labeling for information regarding indications for use, warnings, and other relevant clinical information specific to that anesthetic agent. For example, labeling for sevoflurane includes specific warnings related to the potential risk associated with use at a low flow rate and under certain clinical conditions. Any decisions regarding selection of anesthetic agent and flow rate should be made at the discretion of the clinician and in their medical judgment based on available information.

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