



Greatly Reducing Anesthetic Agent Usage

AGC enabled two hospitals in Belfast, UK, to reduce volatile agent consumption by up to 42%.

This document is intended to provide information to an international audience outside of the US.



Improved care that saves costs and time

– and is more climate friendly



AGC greatly reduces anesthetic agent consumption.¹ It also reduces the many adjustments needed to control the gas flows manually.

Over 200 adjustments to stabilize EtAA and FIO₂ in manual gas control could be reduced to zero with an automatic gas control² – valuable time the clinician can dedicate to the patient and other operating room activities. AGC also contributes to patient comfort and safety as well as lower environmental impact.

To evaluate the economic benefits of AGC, two hospitals in Belfast, UK, ran studies to compare anesthetic agent consumption when using the Flow-i with and without AGC. The study at Belfast City Hospital showed a 42% reduction when the AGC functionality was implemented. The Royal Belfast Hospital for Sick Children demonstrated a reduction of 30.5%.

The challenge

Both hospitals are part of Belfast Health and Social Care Trust and are equipped with Flow-i anesthesia machines. As a publicly funded health service, the Trust is always under pressure to further reduce ongoing costs. Belfast City Hospital had heard that anesthetic agent consumption could be substantially reduced using AGC and decided to undertake a study.

On the basis of the positive results achieved, the Royal Belfast Hospital for Sick Children subsequently decided to run its own study.

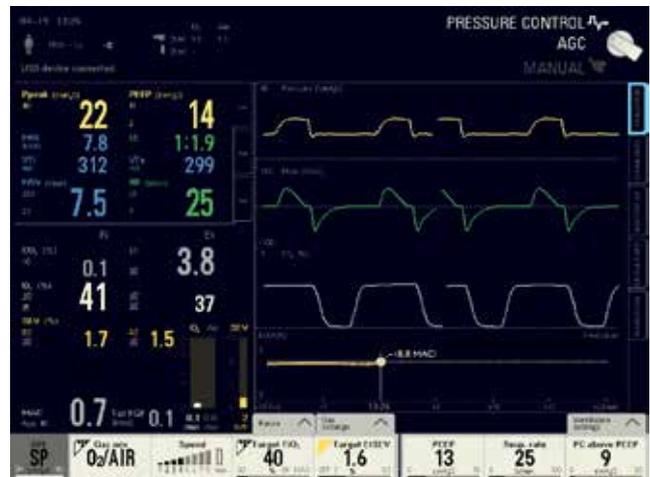


Figure 1: Example case demonstrating flows as low as 0.1 l/min during steady state anesthesia.



Keith Bailie, Royal Belfast Hospital for Sick Children
“AGC could lead to substantial annual savings, which could be further increased by including other volatile agents.”

Case 1: Royal Belfast Hospital for Sick Children

30.5% agent reduction with AGC

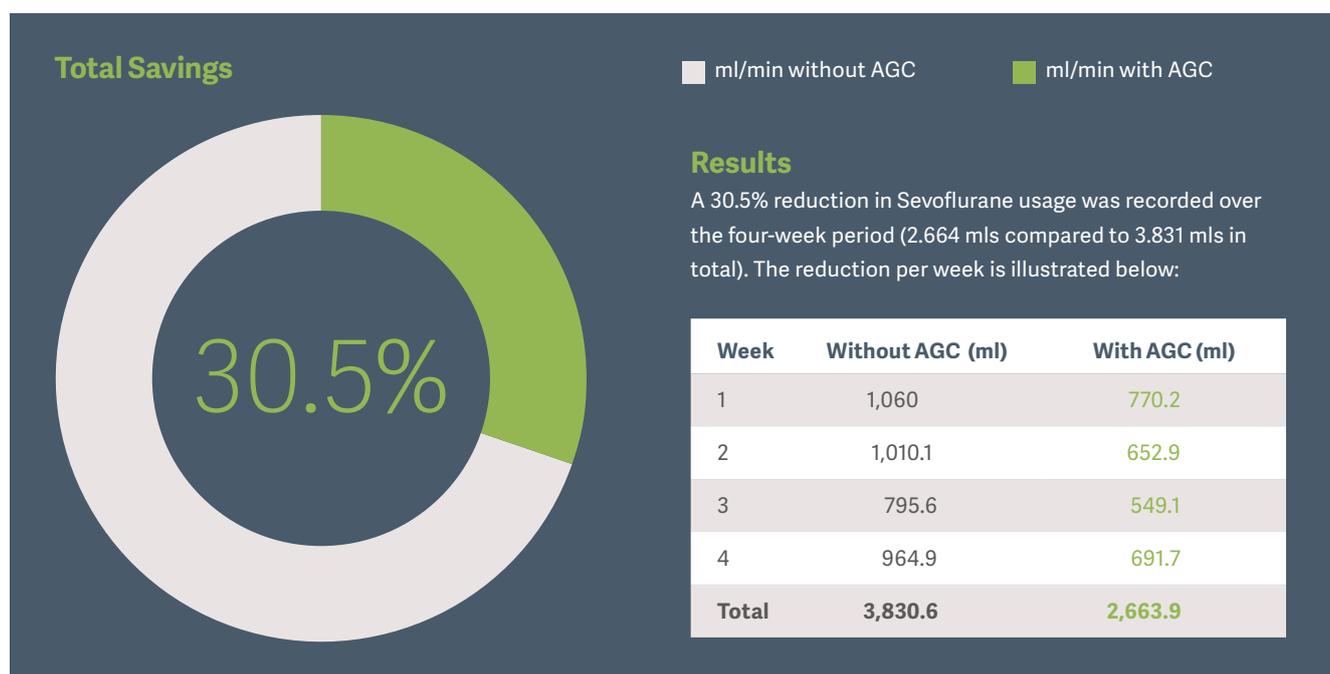
Method

The study³ focused solely on usage of Sevoflurane, which is the anesthetic agent most commonly used with children.

Dr. Keith Bailie and Dr. Leanne Laverty initially audited Sevoflurane usage on one machine in the emergency operating room over a four-week period. The AGC software was then installed on the machine and it was used for a two-week period to allow familiarization with the updated software. Sevoflurane usage for this machine was then reaudited over a further four-week period.

» We are confident that as our anesthetists become more familiar with this software, savings will increase further. «

Dr. Keith Bailie, Anesthetist, Royal Belfast Hospital for Sick Children



Case 2: Belfast City Hospital

42% agent reduction with AGC

Method

Prior to undertaking the study, Dr. John Strange and Dr. Megan Lennox examined anesthetic agent consumption for the previous years. (Table 1)

The comparison study was carried out on one machine equipped with AGC (Group 1) and four machines without AGC (Group 2) over a period of three weeks. A total of 111 general anesthesia cases were treated, and agent usage data was retrieved after each case (Table 2).

»42% volatile agent reduction with AGC! This enables a significant cost saving in addition to several clinical benefits.«

Dr. John Strange, Belfast City Hospital

Table 1

Timeframe	Cost for agents
2013–2014 (12 months)	€67,291
2014–2015 (12 months)	€72,369*

*(increase mainly due to higher usage of Desflurane)

Table 2: There was no significant difference between the average length of cases.

Group 1 (with AGC)	Group 2 (without AGC)
18 cases	93 cases
127 minutes	110 minutes

John Strange

"Flow-i has performed well in all areas of specification, with particular interest raised in a more rapid turnover of patients due to gas efficiency and a reduction of anaesthetic agent usage."



Results

Lower average agent usage



A 42% saving in both Sevoflurane and Desflurane was recorded. The average usage for both groups was calculated in ml/min. Price per ml: 28 cents for Sevoflurane and 24 cents for Desflurane. The results are illustrated below:

Difference in agent usage with and without AGC

■ ml/min without AGC
■ ml/min with AGC



"I find AGC extremely useful as a 'hands-free' device, enabling our staff to perform other interventions for the patient that would normally require either another doctor or an assistant. I was able to let the Flow-i perform uninterrupted while I carried out CVC insertion, arterial line insertion and regional nerve blockade," says Dr. John Strange, Consultant in Intensive Care Medicine and Anesthesia, Belfast City Hospital

Conclusions

Improved cost-efficiency, safety & convenience



Substantial cost savings enabled

Anesthetic agent consumption can be greatly reduced when the anesthesia machine runs in AGC (Automatic Gas Control) mode. Belfast City Hospital's study demonstrated a reduction of 42% for both Sevoflurane and Desflurane. The Royal Belfast Hospital for Sick Children demonstrated a reduction of 30.5% for Sevoflurane.

These are major reductions that would result in significant cost savings. Based on the study, Belfast City Hospital projected combined annual savings of €30,394 for its seven anesthesia machines. Return on investment for the software upgrade would be achieved in less than one year.

Hands-free control

In addition to reducing consumption of anesthetic agents, AGC also eliminates the complex and time-consuming manual adjustments needed for low-flow anesthesia. This frees clinicians' time for other tasks and reduces the risk of error.

An additional benefit is reduced environmental impact. Sevoflurane and Desflurane are greenhouse gases and reducing output helps hospitals in meeting their environmental targets.

Proven performance

Based on the results achieved, Belfast City Hospital has decided to upgrade its entire fleet of Flow-i machines with AGC functionality, and to include the software as standard in future purchases. AGC will be implemented as standard intraoperative practice.

The Royal Belfast Hospital for Sick Children is currently in the process of submitting a business proposal to upgrade all of its Flow-i machines with AGC.

The other hospitals within the Trust have expressed an intention to follow these examples and upgrade with AGC.



Agent usage per case can easily be read on the Flow-i's screen.



What is AGC?

Automatic Gas Control (AGC) is a software feature that adjusts the fresh gas flow and the anesthesia gas concentrations in order to reach the set target values for inspired O₂ (FIO₂) and end-tidal anesthetic agent concentration (EtAA). Once the target is reached, AGC automatically reduces the fresh gas flow and agent delivery to minimal levels.



The built-in speed and prediction tool supports the user with information on the expected course of anesthesia, enabling safe low-flow anesthesia.

About the hospitals

Belfast City Hospital Trust

A 900-bed modern university teaching hospital providing local acute services and key regional specialties, including renal medicine and transplantation and a comprehensive range of cancer services. A number of research projects are being undertaken within the hospital, including IOS wean (weaning practices) and RADAR (deresuscitation and fluid management).

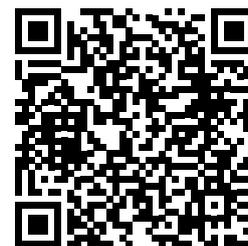
Royal Belfast Hospital for Sick Children

The only hospital in Northern Ireland dedicated specifically to the care of children. It has 107 beds and provides general hospital care for children living in Belfast, as well as providing most of the pediatric regional specialties for children throughout Northern Ireland.

References

1. Carette R, De Wolf AM, Hendrickx JF. Automated gas control with the Maquet Flow-i. Journal of Clinical Monitoring and Computing 2016;30(3):341-6
2. Lucangelo, U., Garufi, G., Marras, E. et al. J Clin Monit Comput (2014) 28: 117. <https://doi.org/10.1007/s10877-013-9516-8>
3. Laverty L, Bailie K, An audit on the introduction of Automated Gas Control to the anaesthetic machine in a tertiary paediatric hospital, Royal Belfast Hospital for Sick Children, UK

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Automatic Gas Control (AGC)
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