



Improving Minimal Flow Anaesthesia with Aisys CS²[™] and End-tidal Control.



Klinikum am Gesundbrunnen, SLK-Kliniken Heilbronn, Germany

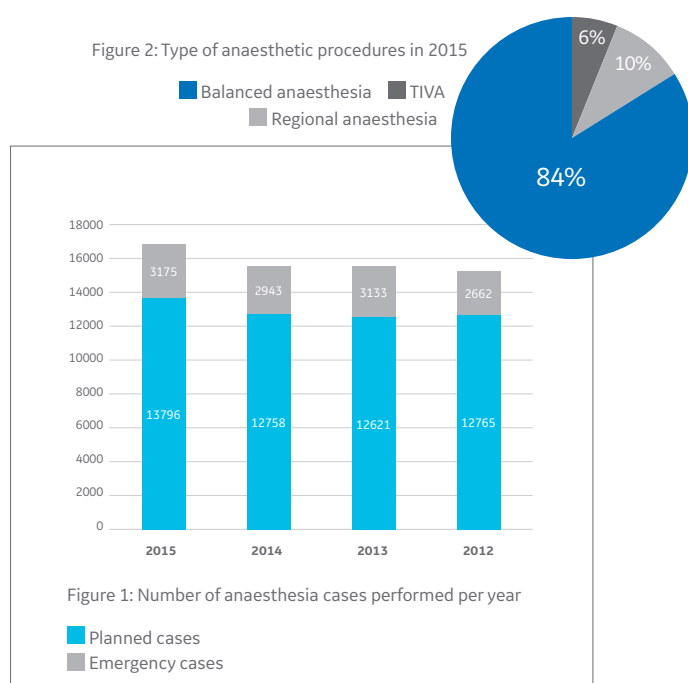
About the hospital

SLK-Kliniken Heilbronn has 874 beds. In 19 operating rooms and 2 centralized induction areas with 5 anaesthesia workstations each, 17,000 anaesthesia cases are performed annually (Fig. 1).

A high number of those are on children and premature neonates as SLK-Kliniken Heilbronn is a level 1 perinatal centre.

In 2015, 84 % of anaesthesia cases were performed as balanced anaesthesia, 10% as TIVA and 6% as regional anaesthesia (Fig. 2)

The same year, the hospital decided to invest in new anaesthesia equipment and conducted a clinical evaluation of different anaesthesia machines, including the Aisys CS² with End-tidal Control.



End-tidal Control (Et Control) for a safe Minimal Flow Anaesthesia

Et Control is a target control mode on the Aisys CS² Carestation, that maintains patient end-tidal agent and oxygen independently of changes in haemodynamic and metabolic status.

Et Control automates the delivery of anaesthetic agent, fresh gas mix and total flow to deliver consistent anaesthetic agent levels and maintain EtO₂ at 25% or higher.



Interview with Prof Dr. med. Henry Weigt. Head of anaesthesia and intensive care department.

"During the extensive clinical evaluation and testing of different anaesthesia machines, it was noted that after instructions based on the medical product law (Medizin Produkte Gesetz - MPG), the automatic End-tidal Control functionality was used consistently and very well accepted by the medical staff.

For us, this was in some way surprising since full acceptance of "innovations" in clinical practice is usually over a longer period of time and requires intensive trainings and persuading efforts.

The medical staff found the activation and use of Et Control intuitive, achieving each level of oxygen and anaesthetic gas concentration in minimum flow, quickly, precisely and above all in a very reliable way."

What criteria were decisive for the selection of the Aisys CS² device?

"Automatic anaesthetic agent adjustment was an important aspect for the choice. Since the desired anaesthetic gas concentration is set once by the anaesthesiologist and is adjusted automatically and securely by the device. This creates for the anaesthesiologist capacity to care more for the patient. We see this as an additional positive safety aspect for the patient and the clinician."

In clinical tests², a majority of clinicians reported that Et Control is easier to use compared with the conventional practice of using fresh gas flow and vaporizer settings. Another study observed that even for longer cases, Et Control required 52% fewer keystrokes per case than manual control.¹

Which changes have you observed after the introduction of Aisys CS² with Et Control?

"The introduction of the new Aisys CS² in the operating department started at the beginning of 2015. Therefore, it was possible for us to monitor the changes in the anaesthetic gas consumption.

One year after introduction of the new fleet of Aisys CS² the consumption of anaesthetic gases decreased significantly by about 30% compared to 2014. Of further note in 2015, the average anaesthesia case time in minutes increased by 5% following the increase in the number of operations in 2015 (Fig. 1).

The gas savings calculation was based on purchase data of the pharmacy department and it has been adapted to the change in the duration of minutes of anaesthesia cases."

Tay *et al.* have reported that the use of Et-Control has helped reduce anaesthetic agent costs by 27% and greenhouse gas emissions decreased by 44%³.

How do you explain the notable gas savings?

"The main reason is that Et Control is used by the anaesthesiologist in "minimum flow" and that minimum flow is consistent throughout the case. Furthermore, we have noticed that "minimum flow" is reached at a much earlier stage compared to manual low flow delivery."

In a clinical study, Et Control maintained end-tidal concentration within 10% of the set target for 98% of the total steady state time.¹

Considering that low flow and minimal-flow methods are already a 'given' in the German clinical community of anaesthesiologists, do you consider any way of improving such practice?

"Among the German anaesthesiologist community prevails the belief that the optimal level has been achieved even with the manual control of fresh gas during low-flow anaesthesia. In reality low-flow anaesthesia depends on how far the gas supply can be reduced manually and it is very much user dependent. In addition, low flow delivery is mainly applied in the maintenance phase.

The current practice of low-flow-anaesthesia is to reduce fresh gas flow after an initial phase of high fresh gas flow (induction). Unfortunately, large quantities of gases are wasted in this initial (induction) phase and within the first five to ten minutes. By automatically regulating the anaesthesia supply and starting the low-flow delivery at earlier stage we could definitely reduce further gas consumption and consequently costs."

Publications have shown that the consumption of inhalational anaesthetics is markedly reduced if low flow or metabolic flow is used from the first minute of anaesthesia and that during the first 10 minutes as much anaesthetic is consumed as in the following hour.⁴

Singaravelu *et al* demonstrated that Et Control helped decrease significantly FGF and volatile usage versus manual control in the first 10 min and with increased duration of anaesthesia. In cases of the same duration, Et Control used 40 – 55% less agent than manual control.¹

"In autumn 2016, we will move to our new hospital which will have a centralized induction area. For the centralized induction area and operating area, we plan to use the Aisys CS² Et Control. We plan to introduce more complex cases. Especially in this situation of working focused on the patient, it is important that the selected settings of anaesthetic gas and O₂ concentration are controlled automatically and reliably by the device."

Conclusion

In summary, automated delivery with End-tidal Control not only brings workflow benefits, but also leads to significant anaesthetic agent savings for the hospital.

References

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4. Meissner *et al.*, *Anesthesiology* 2004; 101: A485





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