

# A cost-consequence analysis of AnaConDa versus propofol and midazolam in the long-term sedation of critically-ill surgical patients from the UK NHS perspective

Sackey P<sup>1,2</sup>, Mumby-Croft J<sup>3</sup>, Last V<sup>4</sup>, Hickey D<sup>5</sup>

<sup>1</sup>Sedana Medical AB, Danderyd, Sweden; <sup>2</sup>Karolinska Institutet, Stockholm, Sweden <sup>3</sup>Source HEOR, London, UK; <sup>4</sup>OPEN Access Consulting, Marlow, Buckinghamshire, UK; <sup>5</sup>OPEN Access Consulting, London, UK

Poster ID: PMD68

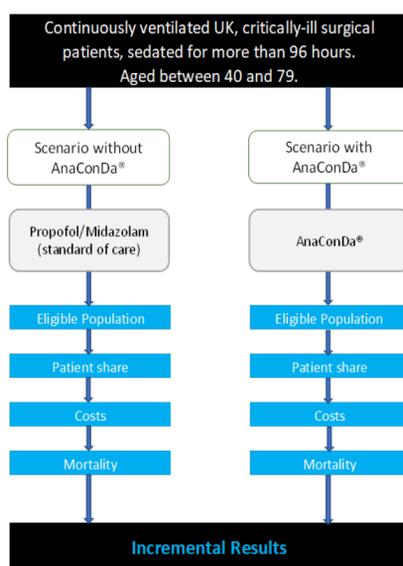
## Background

- Intensive care unit (ICU) patients often require sedation to attenuate anxiety, agitation and to improve the effectiveness of mechanical ventilation.<sup>1</sup> Commonly administered sedatives include intravenous propofol and midazolam.
- Inhaled anaesthetics, such as isoflurane offer a method of sedation that selectively suppresses consciousness but leaves many autonomic functions intact.<sup>2</sup> In studies, waking after inhalational sedation has been shown to be quick and predictable with fewer side effects compared to intravenous sedation.<sup>2</sup>
- Widespread use of inhaled anaesthetics in the ICU has been limited due to the lack of a standardised method of delivery.<sup>1</sup> The commercial availability of the AnaConDa<sup>®</sup> technology offers a viable alternative to intravenous sedation that is well-tolerated,<sup>3</sup> effective and has a relatively short awakening period.<sup>2</sup>
- Patient outcomes may improve with inhaled anaesthetic sedation compared to intravenous sedation. There is evidence to suggest that patients sedated with isoflurane may be at a lower risk of death than with propofol/midazolam, both during their hospital stay and up to 365 days after.<sup>3</sup>

## Objective

- To compare five-year costs and outcomes associated with inhaled isoflurane sedation via the AnaConDa<sup>®</sup> technology with propofol or midazolam in long-term sedated, surgical patients from the perspective of the UK National Health Service.

FIGURE 1: Model schematic



## Methods

- A decision-analytic model was developed to estimate comparative costs and outcomes in 100 sedated patients.

### Clinical Outcomes

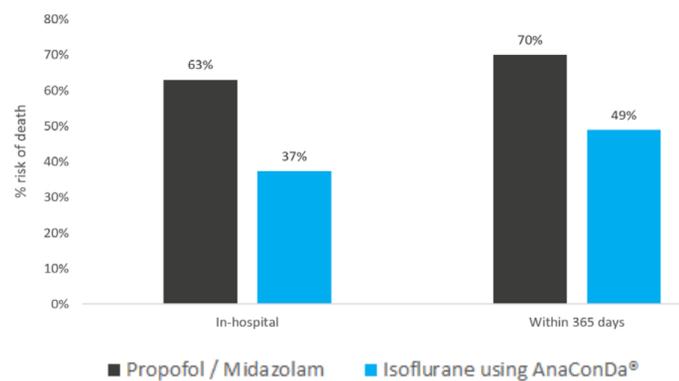
- Clinical data were taken from Bellgardt et al 2016<sup>3</sup>. This study reported in-hospital mortality and 365-day mortality for long-term ventilated, surgical patients receiving either isoflurane (using AnaConDa<sup>®</sup>) or propofol/midazolam.

TABLE 1: Mortality rates between treatments

	Propofol/midazolam	Isoflurane using AnaConDa <sup>®</sup> adjusted odds ratio	Isoflurane using AnaConDa <sup>®</sup>
In-hospital	63%	0.35**	37%
Within 365 days	70%	0.41**	49%

\*\*p=0.002

FIGURE 2: Percentage risk of mortality



### The Cost of Sedation

- The percentage of patients currently sedated with propofol and midazolam was taken from a published survey of UK adult general critical care units.<sup>4</sup> The average daily dose was based on the median recommended dose for propofol and midazolam.<sup>4</sup>
- In clinical practice, long-term sedated patients receiving propofol are likely to be switched to midazolam, therefore the average timing of this switch was included, based on expert opinion.
- Costs for the AnaConDa<sup>®</sup> technology included; isoflurane, syringes, FlurAbsorb, adapters, measuring lines, nafion tubing and gas analysers\*. These costs were provided by the manufacturer.
- The cost per patient per day is shown in Table 2.

TABLE 2: AnaConDa<sup>®</sup> costs

AnaConDa costs	
Total cost per sedated patient	£2,053.03
Total cost per patient per day	£97.38

\* Days of gas analyser use assumed to be 180 days' per annum and replacement every five years

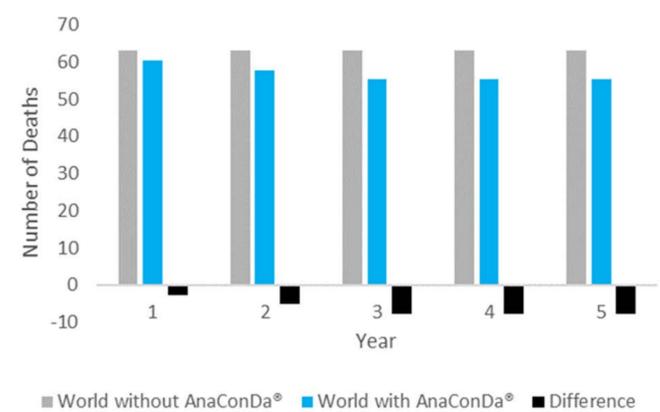
TABLE 3: Sedation costs per day

	Propofol/midazolam	AnaConDa <sup>®</sup> Technology
Total cost per patient per day	£20.96	£97.38
Incremental cost per sedated patient versus current standard of care		
Per day	-	£76.42
Per mean duration of sedation	-	£1,677

## Results

- Over 5 years an estimated 31 in-hospital deaths and 25 deaths at 365 days could be avoided per 100 patients sedated with isoflurane versus propofol/midazolam.
- The estimated incremental cost between treatments for the mean duration of sedation is £1,677 per patient.
  - Over 5 years the incremental cost between treatments is estimated to be £201,192 per 100 patients.
- The overall cost per death avoided is estimated to be £7,943.
- A cost utility analysis suggests that the use of AnaConDa<sup>®</sup> would be considered cost-effective at a threshold of £20,000 per QALY provided that surviving patients continue to survive for a further six months at a threshold utility of 0.26.

FIGURE 3: Hospital mortality



## Discussion

- The model shows that the uptake of inhaled sedation yields an incremental cost per saved life of £7,943. With a conservative assumption of 6 months further survival and a utility of 0.26, the cost will meet the QALY threshold of £20,000.
- Although hospital stay is shortest in the propofol/midazolam group, this may be explained by the higher mortality rates in that group reducing the length of stay. The model did not consider the impact of sedation regimen on hospital resource use.
- The Bellgardt 2016 study was performed in a small group of adult patients ventilated for over 96 hours. Therefore, the results may not be directly generalisable to all ICU patient populations.

## Conclusions

- Over five years, the usage of the AnaConDa<sup>®</sup> technology could significantly reduce mortality.
- These reductions in mortality are associated with an incremental cost per patient of £1,677.
- The total cost per death avoided is £7,943.

## References

(1) Rohm K., Intensive Care Med 2008, 34:1683–1689; (2) L'Her E. Respiratory Care 2008, 53:10 (3) Bellgardt M., Eur J Anaesthesiol 2016, 33:6–13 (4) Richards-Belle A., Critical Care 2016, 20:355.