A public-private collaboration to objectively measure the value of capnography monitoring

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**Background**

- Respiratory compromise is a known patient safety concern during sedation\(^2\), but early detection is possible\(^2\) and may minimize patient harm
- Waveform capnography is one such method of early detection and although included in guidelines\(^3\) is not always used during procedural sedation
- Via objective measurement of outcomes data, value-based healthcare allows interventions to be introduced at low financial risk to hospitals
- Quality improvement initiatives (QII) provide an excellent opportunity to trial new medical technologies and begin a value-based healthcare project

**Methods**

- As part of a hospital-led QII, capnography monitoring was introduced to the standard of care (SoC) for procedural sedation
- A de-novo, digital solution was developed to collect outcomes data and was adapted to meet the requirements of each hospital
- An initial Excel\(^\circledast\) data collection tool is being turned into an app (Fig.1).
- Common to all QII's was the collection of SIVA-defined\(^4\), sedation-related adverse events and interventions, and patient risk classification
- 20% reduction in combined incidence of oxygen desaturation (mild and severe), tachycardia, and bradycardia (primary outcome) was targeted
- At each hospital, a baseline reading for current care was established
- After this, capnography was introduced and comprehensive training on the use of capnography and safe sedation was provided by Medtronic

**Ethics and data protection**

- Each hospital received ethics approval, or a waiver was granted
- Privacy by design was implemented to prevent any patient being identified

**Results**

- This public-private collaboration is currently complete or underway in 8 hospitals in Europe and North America (Fig.2).
- Of three completed sites, all surpassed the targeted 20% decrease
  - The primary outcome was reduced by 41.9% (RR, 0.58, CI: 0.48-0.7, p<0.05, Fig.3 A)
  - Matching patients by procedure and risk classification gave a RR of 0.61 (CI:0.45-0.84, p<0.05, Fig.3 B)
  - Capnography was associated with reduced need for escalations of care, including admission to the intensive care unit
- Adverse events reduced mainly after providers became familiar with and trusted capnography (learning curve effects)
- Training was imperative and often >1 training was needed
- Tracking outcomes data added burden to departmental staff
- Successful implementation required that the QII was supported by senior management and the department staff
- Objective data collection was required. This increased staff burden initially,
- Tracking of continued benefit may need to be optimized

**Discussion**

- Value-based healthcare implies payment for patient outcomes and QII results could drive pay-for-value contracting
- By improving safety and reducing rare but expensive inpatient admissions, initial indications are that capnography is cost effective
- The program focuses on outcomes not captured in medical records so objective data collection was required. This increased staff burden initially, testing of continued benefit may need to be optimized
- QII worked because sites had a commitment to guidelines, education, and process optimization – technology was one part of the solution
- We hope that this program can be a template applied in more hospitals and for more devices

**Conclusion**

- Results of this value-based healthcare program are positive and the perceived value of capnography was high
- Capnography was a benefit in real-world procedural sedation
- The program demonstrated the importance of partnership in understanding each hospital's needs and finding solutions

**References**


**Disclosure**

RS is the owner and RTT is an employee of Coreva Scientific, which received consultancy fees for this work, FJ is an employee of Medtronic.