Anesthesiologist utilization of common anesthetic medications following availability of cost information

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Background

• Currently no direct pharmacy involvement in AHS operating rooms (ORs)

• Anesthesia is a potential area for cost savings within AHS
  – E.g., 7-fold price difference exists between rocuronium and cisatracurium
Background

- Several studies have measured anesthesia expenditures following cost-awareness interventions for anesthesia staff
- Evident variability in results:
  - Majority showed cost savings, some showed no difference, one showed increased expenditures
- All studies on this topic published in the 1990s
- All studies on this topic took place in a single medical centre
  - Our study will be the largest on this topic to date
Study Objectives

- **Primary objective:**
  - Determine if the availability of cost information for anesthetics commonly used within AHS for general and cardiac surgeries will affect utilization patterns of anesthetists

- **Secondary objective:**
  - Determine if overall expenditures of study medications decreased after cost information was released as compared to overall expenditures during the pre-study period
Methods

- Ecological, uncontrolled before-and-after study

- Placed sheets containing cost information for 55 commonly used anesthetics on all OR carts within AHS

  - **Before phase:** July 1, 2013 to December 31, 2013
  
  - **After phase:** January 1, 2014 to March 31, 2014
<table>
<thead>
<tr>
<th>Name</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuromuscular Blockers</td>
<td></td>
</tr>
<tr>
<td>Rocuronium 10 mg/mL, 5mL</td>
<td>$2.95</td>
</tr>
<tr>
<td>Cisatracurium 2 mg/mL, 10mL</td>
<td>$20.71</td>
</tr>
<tr>
<td>Atracurium 10 mg/mL, 10mL</td>
<td>$37.64</td>
</tr>
<tr>
<td>Succinylcholine 20 mg/mL, 10mL</td>
<td>$4.70</td>
</tr>
<tr>
<td>Succinylcholine 20 mg/mL, 20mL</td>
<td>$6.04</td>
</tr>
<tr>
<td>Analgesics (Opioid and Anti-Inflammatory)</td>
<td></td>
</tr>
<tr>
<td>Morphine 10 mg/mL, 1mL</td>
<td>$0.70</td>
</tr>
<tr>
<td>Morphine 15 mg/mL, 1mL</td>
<td>$0.73</td>
</tr>
<tr>
<td>HYDROMorpine 2 mg/mL, 1mL</td>
<td>$0.89</td>
</tr>
<tr>
<td>Fentanyl 50 mcg/mL, 2mL</td>
<td>$0.39</td>
</tr>
<tr>
<td>Fentanyl 50 mcg/mL, 5mL</td>
<td>$1.15</td>
</tr>
<tr>
<td>Ketorolac 30 mg/mL, 1mL</td>
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<tr>
<td>Remifentanil 1 mg injection</td>
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</tr>
<tr>
<td>SUFentanyl 50 mcg/mL, 1mL</td>
<td>$6.83</td>
</tr>
<tr>
<td>SUFentanyl 50 mcg/mL, 5mL</td>
<td>$34.14</td>
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<tr>
<td>Inhalation Anesthetics</td>
<td></td>
</tr>
<tr>
<td>Desflurane bottle, 240mL (prices vary by site)</td>
<td>$115.00 - $122.61</td>
</tr>
<tr>
<td>Sevoflurane bottle, 250mL (prices vary by site)</td>
<td>$165.00 - $180.00</td>
</tr>
<tr>
<td>Intravenous Anesthetics</td>
<td></td>
</tr>
<tr>
<td>Midazolam 5 mg/mL, 1mL</td>
<td>$1.94</td>
</tr>
<tr>
<td>Midazolam 5 mg/mL, 2mL</td>
<td>$2.65</td>
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<tr>
<td>Midazolam 5 mg/mL, 10mL</td>
<td>$8.82</td>
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<tr>
<td>Propofol 10 mg/mL, 20mL</td>
<td>$2.80</td>
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<tr>
<td>Propofol 10 mg/mL, 50mL</td>
<td>$7.00</td>
</tr>
<tr>
<td>Propofol 10 mg/mL, 100mL</td>
<td>$10.50</td>
</tr>
<tr>
<td>Ketamine 10 mg/mL, 2mL</td>
<td>$2.90</td>
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<tr>
<td>Ketamine 50 mg/mL, 2mL</td>
<td>$9.48</td>
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<td>Ketamine 10 mg/mL, 20mL</td>
<td>$21.42</td>
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<tr>
<td>Ketamine 50 mg/mL, 10mL</td>
<td>$38.00</td>
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<tr>
<td>Etomidate 2 mg/mL, 10mL</td>
<td>$22.81</td>
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<tr>
<td>Dexmedetomidine 100 mcg/mL, 2mL</td>
<td>$41.67</td>
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<tr>
<td>Local Anesthetics</td>
<td></td>
</tr>
<tr>
<td>Lidocaine 1%, 20mL</td>
<td>$1.95</td>
</tr>
</tbody>
</table>
Methods

• Utilization and expenditures reported as averages per month
  – Divided by number of surgical procedures per month
  – Calculations included standard deviations
  – Plotted on a line graph to display average utilization per month
• All calculations were stratified by zone
Results

- 227,080 surgical procedures took place during study timeframe
  - Calgary and Edmonton Zones consistently had the highest number of surgical procedures per month
- Slight increase in utilization
  - 4.7 units of drug per surgery pre-intervention vs. 5.1 units post-intervention
- Overall increase in expenditures
  - $22.21 pre-intervention vs. $23.29 post-intervention
Figure 1: Average Medication Utilization per Surgery per Month
Figure 2: Average Medication Expenditure per Surgery per Month

Cost/Surgery by Month: All Zones

- Calgary
- Edmonton
- North
- Central
- South

Month: July, Aug, Sept, Oct, Nov, Dec, Jan, Feb, Mar

Cost: $0.00, $5.00, $10.00, $15.00, $20.00, $25.00, $30.00
Results

- 5 drugs which contributed the greatest proportion of expenditures each month:
  - Desflurane (inhalation anesthetic)
  - Sevoflurane (inhalation anesthetic)
  - Propofol (IV anesthetic)
  - Rocuronium (neuromuscular blocker)
  - Glycopyrrolate (antimuscarinic)

- Next highest expenditures:
  - Lidocaine (local anesthetic)
  - Ketorolac (NSAID)
Discussion

- Results add to knowledge base on this topic, as some studies have shown cost savings, whereas others have not
- The greatest utilization and expenditures were seen in Edmonton and Calgary Zones
  - Likely due to longer, more complex surgical procedures
Discussion

• Increased expenditures driven by overall increase in utilization
• Decrease in utilization and expenditures in South Zone may be due to more engaged physician group
• May be potential to promote more cost-effective alternatives within pharmacologic classes, e.g.:
  – Glycopyrrolate → atropine
  – Ketorolac → opioid analgesics, alternative dosage form
Limitations

• Cost sheets received by different zones at different times
  – As a result, data analyzed by zone
• No direct observation of physicians
  – Unable to assess if physicians actually viewed cost sheets
• Unable to link drug utilization to specific patient/procedure-related factors
  – Assumed relatively constant over time
Conclusions

- Placing cost sheets within ORs did not reduce overall anesthetic utilization or expenditures after a period of 3 months
  - Further study planned to include 6 months of data post-intervention
Conclusions

- Further area for study may include more active, as opposed to passive, cost-minimization initiatives:
  - Selecting highly utilized, expensive agents for discussion with anesthesiologists
  - Audit and feedback: providing utilization/expenditure information to anesthesiologists on a monthly basis
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• Dr. Sheri Koshman


