Cost-effective Analysis for Flexible Optical Scope for Tracheal Intubation: A Descriptive Comparative Study of Reusable versus Single-use Scopes

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INTRODUCTION:
• Flexible fiberoptic intubation is an integral part of American Society of Anesthesiologists’ Difficult Airway Algorithms 2003.
• However, its use has been limited to the non-emergent difficult airway scenarios because
  • Advanced training required
  • High costs of purchase and maintenance
  • The decontamination processes worrisome and tedious
• Ambu® aScope™ is a new addition to the intubation scopes
  • A single use apparatus
  • No need for tedious decontamination
  • However needs cost-effectiveness evaluation
• The present study was designed
  • To calculate the costs-per-intubation of reusable fiberscope at our institute
  • To deduce a practical and justifiable cost for single-use intubation scope.

METHODS:
• The study was co-sponsored by
  • Ambu Inc., Maryland, United States
  • Department of Anesthesiology, Detroit Medical Center, Detroit, Michigan
• Designed as an open-label retrospective study for cost-effectiveness analysis
• The calculations for cost per intubation for reusable scope were derived from
  • One-year intubation records of the reusable intubation scope-aided intubations
  • Three-year repairs costs records of the reusable intubation scopes
  • One-year maintenance costs of the reusable intubation scopes
• The fiberoptic scope manual washing and sterilizing at our institute is as follows:
  • Step 1: The wire brush is run through the scope; subsequently the scope is hooked up to the air machine to see for any bubbles indicating a leak.
  • Step 2: The scope is washed off in the Enzy Clean solution.
  • Step 3: The scope is placed in Cidex solution, and then with the help of new 10 cc syringe at the suction port, enough Cidex solution is drawn back in through the scope. This procedure is repeated three times.
  • Step 4: The scope is now placed in the plain water, and then with the help of new 10 cc syringe at the suction port. This procedure is repeated three times.
  • Step 5: A new syringe is filled with alcohol that is then pushed through the scope, followed by blowing the air through the scope.

RESULTS:
• Per financial year 2009 records of Department of Anesthesiology, Harper University Hospital, regarding the fiberoptic intubations and reusable intubation scope (Table 1)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Cost per intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The total cost of purchasing</td>
<td>$32.18 (5192.00/166)</td>
</tr>
<tr>
<td>2</td>
<td>The annual interest cost of investing $50,192.00</td>
<td>$32.18</td>
</tr>
<tr>
<td>3</td>
<td>The total cost per fiberoptic intubution was $151.03</td>
<td>$151.03</td>
</tr>
<tr>
<td>4</td>
<td>The repair costs per intubation were $53.48</td>
<td>$53.48</td>
</tr>
<tr>
<td>5</td>
<td>The maintenance costs per intubation were $33.16</td>
<td>$33.16</td>
</tr>
<tr>
<td>6</td>
<td>The personnel cost for each intubation was $12.96</td>
<td>$12.96</td>
</tr>
</tbody>
</table>

TABLE 1:

<table>
<thead>
<tr>
<th>Materials that incurred costs</th>
<th>Annual Amounts (in USD)</th>
<th>Cost per intubation (in USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope Purchase</td>
<td>3346.14</td>
<td>20.15</td>
</tr>
<tr>
<td>Interest</td>
<td>5192.00</td>
<td>31.28</td>
</tr>
<tr>
<td>Repairs</td>
<td>8878.33</td>
<td>53.48</td>
</tr>
<tr>
<td>Maintenance</td>
<td>5505.60</td>
<td>33.16</td>
</tr>
<tr>
<td>Labor</td>
<td>2150.63</td>
<td>12.96</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25072.70</td>
<td>151.03</td>
</tr>
</tbody>
</table>

DISCUSSION:
• The deterrent for single use fiberoptic intubation scope
  • High cost of purchase (approx. 300 USD)
• The previous studies in reusable scope
  • Repairs to procedures ratios as 1.392 to 1:142
  • Repair costs varied 5.25EUR to 51 USD per procedure
  • Repair costs 743.61EUR to 2726.13 USD per damage
  • The major costs incurred are the repair costs
• In our study
  • The repair to intubation ratio was 1.55
  • The repair costs were 53.48 USD per intubation
  • Repair costs were 2959.44 USD per instance of repair
• The present study’s null hypothesis was
  • Both the reusable scope and the single use intubation scope will incur similar intubation costs
• However, based on our calculations, our null hypothesis can be rejected if
  • The price range for the single use intubation scope is within 10% of our intubation costs (150 to 165 USD per single use intubating scope)
• Limitations in our study
  • 15-year estimate can be a cause of cost under-estimation
  • Reusable cleaning brush BW-7B used as disposable single use brush can be cause of cost over-estimation

CONCLUSION:
• The market price range within 10% of our intubation cost (150 to 165 USD per single use intubating scope) will be more practical and justified cost to replace the reusable scope with the single use intubating scope.

REFERENCES:
3. Ozcan S, Yilmaz Y. Analysis of fiberoptic bronchoscopy damage and repair costs in a large tertiary care teaching institution. Respir Care 2006;51(9):1278-81.