Cost Effectiveness of Anesthesia Providers

Juan F. Quintana DNP

Purpose

• Assess the cost effectiveness of CRNAs and Anesthesiologists with regard to Cost of Education, Quality of Care, Cost Effectiveness of Anesthesia Practice Models and Access to Care.

Outline

• Education
  Cost Effectiveness of Educating CRNAs
• Quality
  Claims Information
• Anesthesia Practice Models
  Cost Effective Anesthesia Delivery Models
• Access
  The Value Added Component

Educational Cost - Literature Review
(all estimates converted to 2008 dollars)

CRNA Education
$52,076 (Direct Cost) Gunn (1996)
$287,382 (Social Cost) Fagerlund (1998)

MD (PGY 2-4)
$321,000 (Direct Cost) Dodoo, Phillips (2008)
$301,178 (Direct Cost) Franzini, Berry (1997)
$-114,031 (Direct + productivity) Franzini, Berry (1997)
$245,969 (+ opportunity cost) Franzini, Berry (1997) modified by Hogan to include opportunity cost
$146,940 Pisetsky, et al (1998) w/ productivity offset with opportunity cost (Hogan)
Educational Cost
Lewin Group

• Three types of cost included:
  – Direct education costs
  – Opportunity cost of student/resident’s time
  – Value of student/resident services while training

Educational Cost Assessment

<table>
<thead>
<tr>
<th>CRNA</th>
<th>Anesthesiologist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct:</td>
<td></td>
</tr>
<tr>
<td>Pre-Anesthesia:</td>
<td>$53,696</td>
</tr>
<tr>
<td>Anesthesia:</td>
<td>$68,465</td>
</tr>
<tr>
<td>Opportunity:</td>
<td>$291,353</td>
</tr>
<tr>
<td>Productivity:</td>
<td>-$251,704</td>
</tr>
<tr>
<td>Total:</td>
<td>$161,809</td>
</tr>
<tr>
<td>Direct:</td>
<td></td>
</tr>
<tr>
<td>Pre-Anesthesia:</td>
<td>$623,818</td>
</tr>
<tr>
<td>Anesthesia:</td>
<td>$494,420</td>
</tr>
<tr>
<td>Opportunity:</td>
<td>$897,793</td>
</tr>
<tr>
<td>Productivity:</td>
<td>-$775,073*</td>
</tr>
<tr>
<td>Total:</td>
<td>$1,083,795</td>
</tr>
</tbody>
</table>

Anesthesia Providers Produced

<table>
<thead>
<tr>
<th>CRNA</th>
<th>MDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>670</td>
<td>100</td>
</tr>
</tbody>
</table>

Conclusions: Educational Cost

• Direct costs and Economic cost of educating CRNAs are significantly lower than the cost of anesthesiologists
  – Economic costs of graduate education for CRNAs are 1/4th the cost of anesthesiologists
  – Total education costs of CRNAs are about 15% of the cost of anesthesiologists
• Key cost drivers:
  – Faculty cost and student-faculty ratio
  – Program length
  – Student opportunity cost
  – Productivity of students in clinical portion of graduate education

Quality: Literature

Majority: no statistically significant difference between anesthesiologists and CRNAs after controlling for other relevant factors
  – Minnesota Department of Health, 1995
  – Cromwell, 1999, Posner & Freund, 1999
  – Hoffman, Thompson, Burke, & Derkay, 2002
  – Pine, Holt, & Lou, 2003; Smith, Kane, & Milne, 2004
  – Simonson, Ahern, & Hendryx, 2007
  – Needleman & Minnick, 2008
  – RTI & Cromwell, 2010
• Exceptions: Silber et al 2000
• Anesthesia Complications for Analyses: Donnelly & Buechner, 2001
Quality: Records Review

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>%</th>
<th>Weighted N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>8,034,162</td>
<td>99.88%</td>
<td>39,496,584</td>
<td>99.89%</td>
</tr>
<tr>
<td>Yes</td>
<td>9,253</td>
<td>0.12%</td>
<td>45,364</td>
<td>0.11%</td>
</tr>
</tbody>
</table>

Ingenix National Database

N = 52,636 claims; No complications

National Survey of Ambulatory Surgery (NSAS)

N = 52,233*, Weighted N = 34,738,440

Conclusions: Quality

- Incidence of complications due to anesthesia, regardless of delivery model, is low and declining
- With some exceptions, literature suggests no statistically significant difference in complication rates or mortality rates between CRNA and anesthesiologists
- Analysis of claims data is consistent with very low incidence of complications, and no differences between provider type

Anesthesia Practice Models

Cost Effectiveness:

- Literature Review
- Simulation Analyses

  - Medical direction model is more cost effective with respect to QALY’s than a model in which CRNAs act independently
  - Data is NOT based on mortality due to anesthesia (Silber Study)
  - Variation in delivery models may be correlated with variation in other factors affecting quality of care or patient risk.

- Glance (2000)
  - Anesthesiologist model not cost-effective
  - Direction-models are cost effective, with ratios varying optimally based on risk class of case.
  - Subjective estimates of risk
  - Not clear how a given setting could adjust quickly to different models depending on risk

Cost Effectiveness: Literature Review

Quintana (2009) estimated costs associated with a number of different delivery models

- Quality outcomes are held constant
- Anesthesiologist intensive forms of delivery are less efficient, and more likely to require subsidization by the hospital

Anesthesia Practice Models

Cost Effective

12 ORs High / Low Demand

CRNA  MDA  ACT  Collaborative (Supervision)

H - ✓✓  H -  H - ✓  H - ✓✓  H - ✓✓
**Cost Effectiveness Conclusions: Simulation Analyses**

- CRNAs acting independently is the MOST cost efficient model and MOST attractive financially.
- Where demand is high, supervisory model (1:4+) and direction model (1:4) become relatively more attractive financially. Supervisory (Collaborative) model is the second least costly model.
- When demand is constrained, models which require larger demand become less cost effective.
- There are no circumstances examined in which a 1:1 direction model is cost effective or financially viable.
- When demand is highly uncertain, CRNAs acting independently becomes relatively more attractive financially.

### Claims Analysis Average Billed

<table>
<thead>
<tr>
<th>Delivery Model</th>
<th>N</th>
<th>Average Billed Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesiologist only</td>
<td>33,249</td>
<td>$1,087.15</td>
</tr>
<tr>
<td>Direction 1:2-4</td>
<td>11,022</td>
<td>$1,434.19</td>
</tr>
<tr>
<td>Direction 1:1</td>
<td>2,021</td>
<td>$1,544.36</td>
</tr>
<tr>
<td>CRNA only</td>
<td>6,344</td>
<td>$1,059.34</td>
</tr>
</tbody>
</table>

### Claims Analysis Allowed Amounts

<table>
<thead>
<tr>
<th>Delivery Model</th>
<th>N</th>
<th>Allowed Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesiologist only</td>
<td>33,249</td>
<td>$470.54</td>
</tr>
<tr>
<td>Direction 1:2-4</td>
<td>11,022</td>
<td>$438.13</td>
</tr>
<tr>
<td>Direction 1:1</td>
<td>2,021</td>
<td>$477.57</td>
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<tr>
<td>CRNA only</td>
<td>6,344</td>
<td>$307.23</td>
</tr>
</tbody>
</table>

### Conclusions: Claims Analysis

- **Access**
- **Cost Effective**
- **Reimbursed Amount**
  - CRNA < all other models
  - Lowest to highest cost:
    - CRNA only
    - Anesthesiologist only
    - Direction 1:2-4
    - Direction 1:1

### Claims Analysis Caveat

<table>
<thead>
<tr>
<th>Delivery Model</th>
<th>N</th>
<th>% Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesiologist only</td>
<td>33,249</td>
<td>63%</td>
</tr>
<tr>
<td>Direction 1:2-4</td>
<td>11,022</td>
<td>21%</td>
</tr>
<tr>
<td>Direction 1:1</td>
<td>2,021</td>
<td>4%</td>
</tr>
<tr>
<td>CRNA only</td>
<td>6,344</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52,636</td>
<td>100%</td>
</tr>
</tbody>
</table>
CRNAs as the primary anesthesia providers in the rural United States provide a Value Added Component.

All things being equal (which they are not) we bring more to the table.

**Access to Care: Anesthesiologists per Population**

Concentrated in Urban Areas

**Percentage of Urban Counties by Anesthesia Provider Type**

- No anesthesiologists/CRNAs: 9%
- CRNAs Only: 16%
- Anesthesiologists Only: 4%
- Anesthesiologists and CRNAs: 71%

**Percentage of Rural Counties by Anesthesia Provider Type**

- No anesthesiologists/CRNAs: 34%
- CRNAs Only: 35%
- Anesthesiologists Only: 27%
- Anesthesiologists and CRNAs: 4%

**Conclusions: Access**

- CRNAs significantly expand access to anesthesia services across the county
  - Lower cost
  - Greater physical access
- Particularly expand care to rural areas
  - Value Added Component
Summary

CRNAs are 6x more Cost Effective to Educate than Anesthesiologists
Quality of Anesthesia services is better than it ever has been without significant differences between CRNA and Anesthesiologists
Increased CRNA autonomy and more precisely Independence improves the Practice Models: Cost and Efficiency
CRNAs provide the Healthcare system the Value Added Component of increased Access to anesthesia services in Rural America

Cost Effectiveness Technical Advisory Panel

- Nancy Bruton-Maree, CRNA, MS
- Larry G. Hornsby, CRNA, BS
- Betty J. Horton, CRNA, PhD
- Kenneth C. Plitt, CRNA, MBA
- Juan F. Quintana, CRNA, DNP
- Paul Santoro, CRNA, MS
- Jim Scarsella, CRNA, MSF
- Bruce A. Schoneboom, CRNA, PhD, FAAN
- James Walker, CRNA, DNP
- Lorraine M. Jordan, CRNA, PhD (Staff)