Economical Aspects of Regional Anesthesia

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Disclosure
Agenda

• Do we have a money problem?
• Impact of regional anesthesia on major health cost drivers:
  – postoperative acute / chronic pain
  – operating room time / PACU bypass
  – anesthesia-related side-effects
  – postoperative cognitive dysfunction
  – ultrasound vs neurostimulator: impact on costs
• Conclusions
Do we have a money problem?

Expenditure on Health per Capita (US Dollars)

by jameyer@jameyer.com
HEALTH CARE COSTS AROUND THE WORLD

(Reuters) - "The United States spends more on healthcare than any other country in the world but has higher rates of infant mortality, diabetes and other ills than many other developed countries."
The PIIGS states and their debts

Debt levels, as a percentage of gross domestic product

<table>
<thead>
<tr>
<th></th>
<th>Greece</th>
<th>Italy</th>
<th>Ireland</th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>157.7</td>
<td>120.3</td>
<td>119.8</td>
<td>112.0</td>
<td>101.7</td>
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<tr>
<td>2012</td>
<td>166.1%</td>
<td>119.8</td>
<td>117.9</td>
<td>107.4</td>
<td>68.1</td>
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Source: European Commission Spring Forecast
To many Doctors
To many Hospitals
= Higher Health Costs
→
Reduce Doctors & Hospitals!

Willy Oggier, Dr. oec. HSG, 48J
Jesús J. Aguirre, 2nd primary school, 7J

If you think health is expensive, then try disease! Dr. Ch. Jones

If you think education is expensive, then try ignorance! D. Bok
Yes, yes, we **could**...
Current surgical opinion

- The current enthusiasm for ultrasound-guided nerve blocks needs to be tempered by realisation of the costs of this procedure to the health system...

- In orthopedics this procedure adds at least 15-30min to the anesthetic time increasing theatre costs....

Fredrickson MJ et al. NZMJ 2010; 123:9-11
Horne G. NZMJ 2010; 123:105
Current surgical opinion

• …significant increase in rehabilitation time due to delay in mobilisation.

• Patients require at least one extra day in hospital, often two…

• Like everything in medicine this current enthusiasm for regional blocks will wain. If you work in the finance department you will be praying it ends soon.

Fredrickson MJ et al. NZMJ 2010; 123:9-11
Horne G. NZMJ 2010; 123:105
Has RA economical advantages over GA?

Perhaps you might want to update your Facebook status to “unconscious” before we start?
Has RA economical advantages over GA?

- 50 - 70% of in hospital patients suffer from moderate to severe pain after surgery.
- 40% of ambulatory surgical patients have moderate/severe pain during the first 24–48h.
- Chronic pain after hip arthroplasty: 28%
- Chronic pain after knee arthroplasty: 33%

→ relation to intensity of early post operative pain

Power I et al. BJA 2005; 95:43-51
Pavlin DJ et al. Anesthesia and Analgesia 2002; 95: 627-34
Wu CL et al. Anesthesiology 2002; 96:994-1003
Puolakka P et al. EJA 2010; 27:455-460
Has RA economical advantages over GA?

Most striking predictive factor for CPSP:

Severity of acute postoperative pain

CPSP: chronic postsurgical pain

Perkins FM et al. Anesthesiology 2000; 93:1123-33
Grosu I et al. Anesthesiology Clinics 2001; 29:311-327
Has RA economical advantages over GA?

- Not one single published study showing that postoperative acute pain treatment with regional anesthesia has a negative impact on direct or indirect costs:
  - with RA better analgesia, less side effects  
  - with RA positive impact on CPSP  
  - with RA earlier discharge due to better analgesia  
    Ilfeld BM et al. RAPM 2011; 36:116-120
  - with RA better early joint mobilization  
    Ilfeld et al. Anesthesiology 2006; 105:999-1007

RA: regional anesthesia
CPSP: chronic postsurgical pain
Anesthesia and impact on costs
Anesthesia and impact on costs

86y, male, ASA 3, hypertension, CAD (4xACBP, EF 35%, COPD, Diabetes mellitus Type 2.....) Aspirin, Clopidogrel, Beta-blocker etc.

Forefoot amputation right foot due to chronic osteomyelitis
Anesthesia and impact on costs

• RA
  – 18G IV line
  – (Cont) popliteal block
  – Propofol / remifentanil sedation
  – 1h PACU (if at all)

ACT: 20min
Material: 50.05 CHF
PACU: 0 – 100 CHF

• GA
  – 18G IV line
  – Radial artery
  – TCI/TCI GA (propofol/remifentanil)
  – 2 lum. central venous catheter
  – 24-??h PACU

ACT: 60min
Material: 147.21 CHF
PACU: 400 - ?? CHF
Swing room model for RA

RA: regional anesthesia

Head SJ et al. Can J Anesth 2011; 58:725-32
RA: Impact on costs

• Regional anesthesia cost benefits:
  – reduction of operating room time without increase in turnover time:
  • reduction of the ACT

ACT: anesthesia controlled time: patient enters OR until readiness for positioning + end of surgery until patient leaves the OR

Williams BA et al. Anesthesiology 2004; 100:697-706
Williams BA et al. Anesthesiology 2003; 98:1206-13
Hadzic A et al. Anesthesiology 2004; 101:127-32
Hadzic A et al. A&A 2005; 100; 976-81
Williams BA et al. Anesthesiology 2000; 93:529-38
The most important cost factors
Anesthesia: impact on costs

- Anesthesiology costs are estimated to be 5.6% for common procedures. But:
  - Anesthesia medications comprise 10-13% of hospital pharmacy budgets.
  - 20-50% of drugs drawn up are never used and discarded.
  - Cost reduction of US$ 13-30/case possible
  - → 25 million anesthetics/year in the USA = annual wastage US$ 350-750 millions

PONV: post anesthesia nausea and vomiting

Williams BA et al. Anesthesiology 2004; 100:697-706
RA and PACU

• Regional anesthesia cost benefits:
  – reduction or even elimination of PACU length of stay leading to:
    • reduced postoperative nursing interventions
    • faster discharge times
    • Cost savings of 420 US$ / patient

PACU: post anesthesia care unit

Williams BA et al. Anesthesiology 2006; 100:697-706
Williams BA et al. Anesthesiology 2003; 98:1206-13
Hadzic A et al. Anesthesiology 2004; 101:127-32
Hadzic A et al. A&A 2005; 100; 976-81
Williams BA et al. Anesthesiology 2000; 93:529-38
RA and PACU

Shoulder: RA: 95-100%
Shoulder: RA: 95-100%
Hip: RA: 80-90%
Tumor: RA: <10%
Hand: RA: 95-100%

PACU: 8 Places
IMC: 2 Places

PACU: post anesthesia care unit
IMC: intermediate care unit
Regional anesthesia cost benefits:

- reduction of PONV
- reduced length of stay (LOS)
  - successful same day discharge
  - reduction of unplanned admission or readmission
  - reduction of multiple-day hospitalizations to single days
- earlier discharge

PONV: post anesthesia nausea and vomiting

References:
- Williams BA et al. Anesthesiology 2004; 100:697-706
Anesthesia and ambulatory surgery

Anesthesia and ambulatory surgery

• Problems of ambulatory surgery
  – Unplanned hospital visits due to pain and PONV
  – Readmission rate after general anesthesia: 7-27%
  – Readmission rate after regional anesthesia: 4-13%
Impact of anesthesia on postoperative cognitive dysfunction / delirium
No significant correlation between anesthetic technique and incidence of POCD / delirium has been found. Short-term POCD, diagnosed approximately one week after surgery, appears to be more common after general anesthesia. 

Impact of sedation depth?

POCD: postoperative cognitive dysfunction

Jankowski Ch et al. A&A 2011; 112:1186-93
Rasmussen LS. Best Pract Res Clin Anaesthesiol 2006; 20:315–30
Cognitive decline in the elderly: Is anaesthesia implicated?

Brendan Silbert, MBBS., FANZCA, Senior Staff Anaesthetist a,b,*
Lisbeth Evered, BSc., MBiostat, Senior Scientist a,c
David A. Scott, MBBS., PhD., FANZCA, Director a,b,d

Proportion of population over 65 and anaesthetics administered

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<th>Year</th>
<th>% population aged over 65</th>
<th>% anaesthetics in over 65s</th>
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<tbody>
<tr>
<td>2001</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>2002</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>2003</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>2051</td>
<td>50%</td>
<td>50%</td>
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POCD incidence at week 1: heart surgery (43%) vs. hip surgery (17%)

At 3 months incidence of POCD independent from type of surgery and anesthesia regimen
The noncardiac surgery patients underwent elective first-time THJR surgery. Anesthesia comprised temazepam premedication, spinal anesthesia with midazolam sedation up to 5 mg, and then a light general anesthetic using propofol and/or a volatile anesthetic with the aim of maintaining a bispectral index <60 (BIS Monitor; Aspect Medical Systems, Norwood, MA). After surgery, analgesia was provided by morphine patient-controlled analgesia for 48 hours, then oxycodone.

At 3 months incidence of POCD independent from type of surgery and anesthesia regimen.
Impact of postoperative cognitive dysfunction on costs

- In hypertensive patients there seems to be a correlation between minimum intraoperative MAP and decline in cognitive function 1d and 1m after surgery.
- POCD at 3m but not at 1w was associated with increased mortality.
- Risk to leave labor market prematurely due to disability or voluntary was higher in patients with 1w POCD. More social transfer payments for 1w POCD patients were observed.

MAP. Mean arterial pressure
d: Day; w: Week; m: Month

Aguirre J et al. Accepted by Rev Esp Anes Rea 2013
# Comparison of cost: US vs NS

Material costs for 1,000 anesthesias (excl. print paper, ink for printer, cleaning towels…)

- Visible needles for US: 12,462 €
- Sterile protective cover: 6,646 €
- Sterile gel: 1,661 €

**Total for US:** 20,769 €

- US Machine: 41,541 €
- Annual maintenance: 664 €
- Replacement of a transducer: 6,646 €

**Total for Ultrasound in 5 years:** 155,695 €

**Neurostimulation incl. neurostimulator in 5 years**

- Material cost: 50,000 €
- Neurostimulator: 1,000 €

**Total for Neurostimulation:** 51,000 €

*With US 305 % more direct cost!!!*
Cost-effectiveness analysis alongside a RCT (100 pat: 50US, 50NS, continuous popliteal sciatic nerve block)

- US is a dominating technology providing both higher quality and lower costs

Model for cost per patient of US vs NS for 4 different clinical scenarios:

- Depending on clinical scenario, US is either a cost or profit center

- ambulatory setting: US competitive and cheaper if success rate of NS < 96%
The influence of RA technique on costs

• Big CH hospitals (A): 17‘000 anesthesias/year
  – 1‘600 peripheral nerve blocks / year
  – 35-40 anesthesiologists
  – 40 blocks / year = 3 blocks/month/anes.
  – 4 important peripheral nerve blocks = each is performed 10x / year / anes.

➔ Will US with this low block numbers / anesthesiologist positively influence costs? Reduce complications? Increase patient flow?...
The influence of RA technique on costs

• Balgrist University Hospital (B):
  7‘000 anesthesias / year
  – 4‘000 peripheral nerve blocks / year
  – 12 anesthesiologists
  – 333 blocks / year = 30 blocks / month / anes.
  – 4 important peripheral nerve blocks = each is performed 85x / year / anes.

→ Will US with this high block numbers / anesthesiologist and high success rate (>95%) using NS positively influence costs? Reduce complications? Increase patient flow?
Conclusions
Conclusions

• Health system has too many players with different interests

• Anesthesia has an important impact in health costs

• Be aware of what you read and what you believe, consider your particular situation
Conclusions

• RA has clear advantages compared to GA and positively influences costs at different levels

• (Continuous) RA for outpatients is a cost-saving management

• However, further good quality studies are needed...