What's the optimal anaesthesia for seniors' abdominal cavity surgery?

Sergiy Vorotyntsev, MD, PhD

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Zaporizhzhya State Medical University
Ukraine
Ukraine – east of Europe

Zaporizhzhya – south-east of Ukraine
≈ 781600 people
ZSMU

Hospital “VitaCenter”

City Emergency Hospital
Age definition from prof:

Young girl < 70
Young woman > 70

V.N. Klimenko MD, PhD
Professor
Department of surgery
Zaporizhzhya State Medical University
Ukraine
No conflicts of interest
Currently:

≈ 8% of population > 75
≈ 23% of surgical procedures

Future:

2025 ≈ 10% of population > 75
≈ ?% of surgical procedures
Variations in mortality after emergency laparotomy: the first report of the UK Emergency Laparotomy Network

D. I. Saunders¹, D. Murray²*, A. C. Pichel³, S. Varley³, C. J. Peden⁴, on behalf of the members of the UK Emergency Laparotomy Network

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%)</th>
<th>30 day mortality* (%)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>1845</td>
<td>271 (14.9)</td>
</tr>
<tr>
<td>Age band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total patients with data (n)</td>
<td>1845</td>
<td>1819</td>
</tr>
<tr>
<td>&lt;20</td>
<td>25 (1.4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>20–29</td>
<td>101 (5.5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>30–39</td>
<td>95 (5.1)</td>
<td>4 (4.3)</td>
</tr>
<tr>
<td>40–49</td>
<td>160 (8.7)</td>
<td>14 (9.0)</td>
</tr>
<tr>
<td>50–59</td>
<td>256 (13.9)</td>
<td>24 (9.4)</td>
</tr>
<tr>
<td>60–69</td>
<td>400 (21.7)</td>
<td>56 (14.0)</td>
</tr>
<tr>
<td>70–79</td>
<td>466 (25.3)</td>
<td>92 (20.0)</td>
</tr>
<tr>
<td>80–89</td>
<td>305 (16.5)</td>
<td>70 (23.6)</td>
</tr>
<tr>
<td>90–99</td>
<td>37 (2.0)</td>
<td>11 (31.4)</td>
</tr>
</tbody>
</table>

% of seniors ≈ 44%
% of mortality ≈ 75%
A practical scoring system to predict mortality in patients with perforated peptic ulcer

Ebru Menekse¹*, Belma Kocer², Ramazan Topcu³, Aydemir Olmez⁴, Mesut Tez¹ and Cuneyt Kayaalp⁵

Abstract

Introduction: The mortality rate of perforated peptic ulcer is still high particularly for aged patients and all the existing scoring systems to predict mortality are complicated or based on history taking which is not always reliable for elderly patients. This study’s aim was to develop an easy and applicable scoring system to predict mortality based on hospital admission data.

Methods: Total 227 patients operated for perforated peptic ulcer in two centers were included. All data that may be potential predictors with respect to hospital mortality were retrospectively analyzed.

Results: The mortality and morbidity rates were 10.1% and 24.2%, respectively. Multivariated analysis pointed out three parameters corresponding 1 point for each which were age >65 years, albumin ≤1.5 g/dl and BUN >45 mg/dl. Its prediction rate was high with 0.931 (95% CI, 0.890 to 0.961) value of AUC. The hospital mortality rates for none, one, two and three positive results were zero, 7.1%, 34.4% and 88.9%, respectively.

Conclusion: Because the new system consists only age and routinely measured two simple laboratory tests (albumin and BUN), its application is easy and prediction power is satisfactory. Verification of this new scoring system is required by large scale multicenter studies.

Table 3 Independent predictor of mortality identified by multivariate logistic regression analysis

<table>
<thead>
<tr>
<th>Predictors</th>
<th>P value</th>
<th>SE*</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin</td>
<td>0.0005</td>
<td>0.89</td>
<td>0.0445</td>
<td>0.0077 to 0.2577</td>
</tr>
<tr>
<td>BUN</td>
<td>0.0003</td>
<td>0.009</td>
<td>1.0353</td>
<td>1.0160 to 1.0550</td>
</tr>
<tr>
<td>Age</td>
<td>0.0013</td>
<td>0.03</td>
<td>1.1258</td>
<td>1.0474 – 1.2100</td>
</tr>
</tbody>
</table>

*Standard Error.

Age > 65 – independent predictor
Frailty – more important than age

Frailty in the older surgical patient: a review

Judith S. L. Partridge, Danielle Harari, Jugdeep K. Dhessi

Age and Ageing 2012; 41: 142–147

Frailty - lack of physiological reserve seen across multiple organ systems

Age - comorbidities and reduction in physiological reserve
Age or Frailty – doesn’t matter

How does the elderly patient look like at home?

How does the elderly patient look like in hospital?

How to improve outcome?
Strategy: ....... anaesthesia & analgesia.......

Challenges in optimising perioperative care in the elderly

Organisation

Logistics

Perioperative physiology
- surgical quality
- anaesthesia & analgesia
- nutrition, delirium
- antibiotics & fluid therapy
- physiotherapy

Timing of surgery, specialised staff, care & rehabilitation plans

Staffing levels, weekend & holidays

Anaesthesia outreach

ERAS protocol

Nikolai Bang Foss
Denmark, 2013
ERAS for Colorectal Surgery

New emergency laparotomy pathway

Admittance papers
OR advised.
Conference between senior surgeon and anaesthetist - triage

CT/preop bypassed
If indicated

Patient taken to specialized ward
MET
Standardized care

Suspected pathology

Abdominal CT < 2 hours

PACU/HDU

Surgery < 6 hours

PACU/HDU

If ASA 3-4 or Apgar < 5:
At least 24 hours stay

Oxygen / sat > 94%
Ringer 1000 ml +
Antibiotics
NG tube

Epidural catheter
Arterial line

GDT: SV + SVV pulsecontour analysis
LIDCO rapid

Nikolai Bang Foss
Denmark, 2013
Multicentre trial of a perioperative protocol to reduce mortality in patients with peptic ulcer perforation

M. H. Møller¹, S. Adamsen², R. W. Thomsen³ and A. M. Møller¹ on behalf of the Peptic Ulcer Perforation (PULP) trial group

Departments of ¹Anaesthesiology and Intensive Care Medicine and ²Gastrointestinal Surgery, Copenhagen University Hospital Herlev, Herlev, and ¹Department of Clinical Epidemiology, Clinical Institute, Aarhus University Hospital, Aarhus, Denmark

Correspondence to: Dr M. H. Møller, Department of Anaesthesiology and Intensive Care Medicine, Copenhagen University Hospital Herlev, Herlev Ringvej 75, DK – 2730 Herlev, Denmark (e-mail: mortenhylander@gmail.com)

Background: Morbidity and mortality rates in patients with perforated peptic ulcer (PPU) remain substantial. The aim of the present study was to evaluate the effect of a multimodal and multidisciplinary perioperative care protocol on mortality in patients with PPU.

Methods: This was an externally controlled multicentre trial set in seven gastrointestinal departments in Denmark. Consecutive patients who underwent surgery for gastric or duodenal PPU between 1 January 2008 and 31 December 2009 were treated according to a multimodal and multidisciplinary evidence-based perioperative care protocol. The 30-day mortality rate in this group was compared with rates in historical and concurrent national controls.

Results: The 30-day mortality rate following PPU was 17.1 per cent in the intervention group, compared with 27.0 per cent in the three control groups (P = 0.005). This corresponded to a relative risk of 0.63 (95 per cent confidence interval 0.41 to 0.97), a relative risk reduction of 37 (5 to 58) per cent and a number needed to treat of 18 (6 to 38).

Conclusion: The 30-day mortality rate in patients with PPU was reduced by more than one-third after the implementation of a multimodal and multidisciplinary perioperative care protocol, compared with conventional treatment. Registration number: NCT00624169 (http://www.clinicaltrials.gov).
Implementing an Enhanced Recovery Program After Pancreaticoduodenectomy in Elderly Patients: Is It Feasible?

Mariëlle M. E. Coolen · Maikel Bakens · Ronald M. van Dam · Steven W. M. Olde Damink · Cornelis H. C. Dejong

Published online: 12 September 2014
© Société Internationale de Chirurgie 2014

Abstract
Background An enhanced recovery after surgery (ERAS) program aims to reduce the stress response to surgery and thereby accelerate recovery. It is unclear whether these programs can be safely implemented for elderly patients, especially in highly complex surgery such as pancreaticoduodenectomy (PD). The objective of this study was to evaluate the feasibility of an ERAS program in elderly patients undergoing PD.

Methods Implementation of the ERAS protocol was studied prospectively in a consecutive series of patients undergoing PD between January 2009 and August 2013. Patients were divided into two groups: ≤65 years and ≥70 years. Endpoints were length of stay (LOS), readmissions, morbidity, mortality, and compliance with ERAS targets.

Results Of a total of 110 patients, 55 were ≤65 years (median 57) and 55 ≥70 years (median 77). Median LOS was 14 days in both groups. In patients without complications median LOS was 9 days. Both mortality and readmissions did not differ between groups (mortality n = 3 (5.5 %) in younger versus n = 6 (10.9 %) in older patients, p = 0.49, readmissions: n = 11 (20 %) versus n = 7 (12.7 %), p = 0.44). CT-drainage and relaparotomy-rates were not different between groups, nor was overall morbidity (n = 31 (56.3 %) in the older versus n = 35 (63.3 %) in the younger group, p = 0.44). There were no differences in compliance with elements of the ERAS protocol between groups.

Conclusion An ERAS program seems feasible and safe for patients ≥70 years of age undergoing PD.
Why TEA?

Protective Effects of Epidural Analgesia on Pulmonary Complications After Abdominal and Thoracic Surgery

A Meta-Analysis

Daniel M. Pöpping, MD; Nadia Elia, MD; Emmanuel Marret, MD; Camille Remy, MD; Martin R. Tramer, MD, DPhil

Objective: To review the impact of epidural vs systemic analgesia on postoperative pulmonary complications.

Data Sources: Search of databases (1966 to March 2006) and bibliographies.

Study Selection: Inclusion criteria were randomized comparison of epidural vs systemic analgesia lasting 24 hours or longer postoperatively and reporting of pulmonary complications, lung function, or gas exchange. Fifty-eight trials (5904 patients) were included.

Data Extraction: Articles were reviewed and data extracted. Data were combined using fixed-effect and random-effects models.

Data Synthesis: The odds of pneumonia were decreased with epidural analgesia (odds ratio [OR], 0.54; 95% confidence interval [CI], 0.43-0.68), independent of site of surgery or catheter insertion, duration of analgesia, or regimen. The effect was weaker in trials that used patient-controlled analgesia in controls (OR, 0.64; 95% CI, 0.49-0.83) compared with trials that did not (OR, 0.30; 95% CI, 0.18-0.49) and in larger studies (OR, 0.62; 95% CI, 0.47-0.81) compared with smaller studies (OR, 0.37; 95% CI, 0.23-0.58). From 1971-2006, the incidence of pneumonia with epidural analgesia remained about 8% but decreased from 34% to 12% with systemic analgesia (P < .001); consequently, the relative benefit of epidural analgesia decreased also. Epidural analgesia reduced the need for prolonged ventilation or reintubation, improved lung function and blood oxygenation, and increased the risk of hypotension, urinary retention, and pruritus. Technical failures occurred in 7%.

Conclusion: Epidural analgesia protects against pneumonia following abdominal or thoracic surgery, although this beneficial effect has lessened over the last 35 years because of a decrease in the baseline risk.

Arch Surg. 2008;143(10):990-999
Prospective, randomized, controlled trial of thoracic epidural or patient-controlled opiate analgesia on perioperative quality of life

M. Ali¹, D. C. Winter¹*, A. M. Hanly¹, C. O’Hagan², J. Keaveny² and P. Broe¹

¹Department of Surgery and ²Department of Anaesthesia, Beaumont Hospital, Institute for Clinical Outcomes and Education (iCORE), St Vincent’s University Hospital, Elm Park, Dublin 9, Ireland
*Corresponding author. E-mail: winterd@indigo.ie

**Fig 2** Mean pain scores for the epidural and PCA groups. Values

**Fig 3** Mean physical and mental QOL scores for the epidural and PCA groups.

**Conclusions.** Epidural analgesia with local anaesthetic and opioid improves QOL and delivers better analgesia compared with PCA in patients undergoing major thoraco-abdominal surgery.
Epidural Analgesia Is Associated with Improved Health Outcomes of Surgical Patients with Chronic Obstructive Pulmonary Disease

Felix van Lier, M.D., Ph.D.,* Patrick J. van der Geest, M.D.,† Sanne E. Hoeks, Ph.D.,‡ Yvette R. B. M. van Gestel, Ph.D.,‡ Jaap W. Hol, M.D.,‡ Don D. Sin, M.D., F.C.C.P.,§ Robert Jan Stolker, M.D., Ph.D.,‖ Don Poldermans, M.D., Ph.D.‖

ABSTRACT

Background: Patients with chronic obstructive pulmonary disease (COPD) have increased postoperative morbidity and mortality. Epidural analgesia (EDA) improves postoperative outcome but may worsen postoperative lung function. It is unknown whether patients with COPD benefit from EDA. The objective of this study was to determine whether patients with COPD undergoing major abdominal surgery benefit from EDA in addition to general anesthesia.

Methods: This cohort study included 541 consecutive patients with COPD who underwent major abdominal surgery between 1995 and 2007 at a university medical center. Propensity scores estimating the probability of receiving EDA were used in multivariable correction. The primary outcome was postoperative pneumonia and 30-day mortality.

Results: There were 324 patients (60%) who received EDA in addition to general anesthesia. The incidence of postoperative pneumonia (16% vs. 11%; P = 0.08) and 30-day mortality (9% vs. 5%; P = 0.03) was lower in patients who received EDA. After correction EDA was associated with improved outcome for postoperative pneumonia (OR 0.5; 95% CI: 0.3–0.9; P = 0.03). The strongest preventive effect was seen in patients with the most severe type of COPD.

Conclusion: This study provides evidence that in patients with COPD who are scheduled for major abdominal surgery, epidural analgesia decreases postoperative pulmonary complications.

A Comparison of Epidural Analgesia and Traditional Pain Management Effects on Survival and Cancer Recurrence after Colectomy

Kenneth C. Cummings, III, M.D., M.S.,* Fang Xu, Ph.D., M.S.,† Linda C. Cummings, M.D., M.S.,‡ Gregory S. Cooper, M.D.§

ABSTRACT

Background: Cancer recurrence after surgery may be affected by immunosuppressive factors such as surgical stress, anesthetic drugs, and opioids. By limiting exposure to these, epidural analgesia may enhance tumor surveillance. This study compared survival and cancer recurrence rates for resection of colorectal cancer between patients who received perioperative epidurals and those who did not.

Methods: The linked Medicare-Surveillance, Epidemiology, and End Results database was used to identify patients ages 66 yr or older with nonmetastatic colorectal cancer diagnosed between 1996 and 2005 who underwent open colectomy. Recurrence was defined as chemotherapy 16 months or more after surgery and/or radiation 12 months or more after surgery. Patients were followed for at least 4 yr. To account for hospital effects, overall survival was estimated via marginal Cox regression. Recurrence was estimated by conditional logistic regression.

Results: A cohort of 42,151 patients, of whom 22.9% (n = 9,670) had epidurals at the time of resection, was identified. 5-yr survival was 61% in the epidural group and 55% in the nonepidural group. There was a significant association between epidural use and improved survival (adjusted Cox model hazard ratio = 0.91, 95% CI = [0.87, 0.94]). Adjusting for covariates, there was no significant reduction of recurrence in the epidural group (odds ratio = 1.05, 95% CI = [0.95, 1.15]). Several covariates, including blood transfusion, were predictive of mortality and cancer recurrence.

Conclusion: This large cohort study found that epidural use is associated with improved survival in patients with nonmetastatic colorectal cancer undergoing resection but does not support an association between epidural use and decreased cancer recurrence.

COPD + TEA - ↓ PPCs

Anaesthesiology, 2011

↑ Suv
= TEA
≠ ↑ Met

Anaesthesiology, 2012
Effect of epidural analgesia on bowel function in laparoscopic colorectal surgery: a systematic review and meta-analysis

Suhail A. Khan et al. Sur Endosc, 2013

**Results**
Six trials published between 1999 and 2011 were included in the final analysis. **TEA significantly improves return of bowel function** assessed by time to first bowel motion [WMD $-0.62$ ($-1.11$, $-0.12$) with $Z = 2.43$; $P = 0.02$, 95% confidence interval (CI)], and pain scores [WMD $-1.23$ ($-2.4$, $-0.07$)] with $Z = 2.07$; $P = 0.04$, 95% CI]. **TEA did not influence duration of hospital stay** [WMD $-0.47$ ($-1.55$, $0.61$)] with $Z = 0.85$ ($P = 0.39$, 95% CI). No significant increase in operative time or side effects was associated with TEA.
A national survey of epidural use and management in elderly patients undergoing elective and emergency laparotomy

B. Walton,¹ C. Farrow² and T. M. Cook³

¹ Specialist registrar, 2 Senior House Officer, 3 Consultant, Royal United Hospital, Bath BA1 3NG, UK

Summary
A postal questionnaire was sent to anaesthetic clinical tutors in the United Kingdom describing two hypothetical 75-year-old patients requiring abdominal surgery. Patient 1 (ASA 2) required elective anterior resection and patient 2 (ASA 3–4) required emergency laparotomy. There was a 65% response rate. For patient 1, 98.5% of respondents would insert an epidural, 93% inserting this awake and 50% placing it in the high-mid thoracic region. All respondents would use local anaesthesia (concentration varied four-fold) and 62% would use opioids. All respondents would place the epidural pre-operatively; although 36% would administer the epidural block pre-operatively and 3% postoperatively. For patient 2, 70% of respondents would insert an epidural (p < 0.0001), drug administration would be more frequently delayed until postoperatively (13%; p = 0.0005) and epidural opioid use decreased (57%); p = n/s. Epidural insertion influenced the postoperative destination in 42% of departments. Use of a critical care facility was anticipated for more than half of these patients; 60% reported difficulty accessing critical care beds.
Regional anaesthesia appears to be safe in the elderly patients because it reduces stress response, the incidence of thromboembolic complications and provides good postoperative analgesia.
Enhanced recovery can allow early discharge
Outcome may be improved
Special attention to frailty
Min opioids
No ↑ FiO2
NSAID contraindicated
Fluids as little as possible
Type of anaesthesia doesn't influence on outcome
Why multimodal?
Conclusions: Understanding perioperative pathophysiology and implementation of care regimes to reduce the stress of an operation, will continue to accelerate rehabilitation associated with decreased hospitalization and increased satisfaction and safety after discharge....
He described a technique for using opioids, regional anaesthesia and general anaesthesia which is a concept known as balanced anaesthesia.

(Crile G.W. // Lancet, 1913)
What we use in our daily practice?

• CEGA (combined epidural-general anaesthesia)

“The combination of thoracic epidural analgesia (TEA) and general anesthesia (GA) has become a widespread anesthetic technique for the perioperative treatment of patients undergoing major abdominal surgery”.

Case report 1

- Woman, 72 years old
- Stomach cancer
- Comorbidities - ischemic heart disease, partial bowel obstruction
- Planned surgery - Gastrectomy
Gastrectomy, Resection of the transverse colon
Results

No lung complications
No cardiac complications
No anastomosis leakage
No wound inflammation
Per os feeding on 5 day

Discharge from the hospital on 10 day
Case report 2

- Man, 91 years old
- Colon cancer
- Comorbidities - ischemic heart disease, partial bowel obstruction
- Planned surgery - Colonectomy
<table>
<thead>
<tr>
<th>Показатель</th>
<th>Результат Ед.изм.</th>
<th>Реф. зел.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Лейкоциты (WBC)</td>
<td>5,5 г/л</td>
<td>4,0-9,0</td>
</tr>
<tr>
<td>Эритроциты (RBC)</td>
<td>2,24 мл/л</td>
<td>4,0-5,7, 3,7-4,7</td>
</tr>
<tr>
<td>Гемоглобин (HGB)</td>
<td>54 г/л</td>
<td>130-160, 120-140</td>
</tr>
<tr>
<td>Гематокрит (HCT)</td>
<td>0,170 н/л</td>
<td>0,35-0,50</td>
</tr>
<tr>
<td>Тромбоциты (PLT)</td>
<td>287 г/л</td>
<td>150-350</td>
</tr>
<tr>
<td>Средний объем эритроцита (MCV)</td>
<td>75 фл</td>
<td>60-100</td>
</tr>
<tr>
<td>Среднее содержание Hb в эритроците (MCH)</td>
<td>23,9 г/л</td>
<td>27-31</td>
</tr>
<tr>
<td>Среднее концентрация Hb в эритроците (MCHC)</td>
<td>316 г/л</td>
<td>330-370</td>
</tr>
<tr>
<td>Распределение эритроцитов по объему (RDW)</td>
<td>14,8 %</td>
<td>11,5-14,5</td>
</tr>
<tr>
<td>Лимфоциты (LYM)</td>
<td>22,2 %</td>
<td>17,0-42,0</td>
</tr>
<tr>
<td>Мonoциты (MON)</td>
<td>5,7 %</td>
<td>3,0-11,0</td>
</tr>
<tr>
<td>Гранулоциты (GRA)</td>
<td>72,1 %</td>
<td>43,0-76,0</td>
</tr>
</tbody>
</table>

Результат исследования не является диагнозом и требует консультации лечащего врача.
Подпись: 25.02.2013 в 8.42.17
Results

No lung complications
No cardiac complications
No anastomosis leakage
No wound inflammation
Per os feeding on 5 day

Discharge from the hospital on 12 day
Case report 3

- Man, 79 years old
- Aortic aneurysm
- Comorbidities - ischemic heart disease, AF
- Planned surgery – aortobifemoral bypass grafting
Aortobifemoral bypass grafting
CVP – 5, 8, 8, ....
CO – 2,7; 2,5; 2,67, 2,61, 2,77
SI – 37, 35, 35, 35, 35
Results

No lung complications
No cardiac complications
No vascular complications
No wound inflammation
Per os feeding on 1 day

Discharge from the hospital on 10 day
Our data

Elective surgery (private hospital)
- 120 surgical beds
- > 300 major laparotomy/year
- Types of surgery:
  - stomach resection, gastrectomy
  - pancreas resection
  - colon resection
  - hernioplasty
  - resection of retroperitoneal tumors
  - aorta surgery

Emergency surgery (public hospital)
- 180 surgical beds
- > 600 major laparotomy/year
- Courses for surgery:
  - Perforate ulcer
  - Acute bowel obstruction
  - Peritonitis
  - Abdominal ischemic syndrome
  - Pancreonecrosis
• CEGA using:
  - urgent surgery – 35-40% (start 2013)
  - elective surgery – 85-90% (start 1996)

• CEGA protocol:
  - TEA (T6 – T10)
    Intraop. L (1.0%) + F (50 mcg) bolus 6-8 ml
    L (1.0%) 5-7 ml/h
  Postop. B (0.175%) + F (2 mcg/ml) 5-7 ml/h
  - GA: SEV, F, Atracurium, K
Main Results

- Combined anesthesia during surgery with excessive blood loss
  С.Воротынцев. Збірник наукових праць ЗМАПО. - 2007. - Т.2. - С. 31-35

- Multimodal combined anesthesia in pancreas surgery
  С.Воротынцев. Медицина неотложных состояний. - 2009.- №2 (21).-С.95-98

- Fast-track anaesthesia during the abdominal cavity surgery in patients with obesity
  С.Воротынцев. Клінічна анестезіологія та інтенсивна терапія. - 2013.- №2.-С.53-58
Main Results

• Fast-track anaesthesia during the abdominal cavity surgery in seniors (2015)

According to our data CEGA during major abdominal cavity surgery in seniors contributes to early extubation, provides adequate post-operative analgesia with possibilities of mobilization and rehabilitation even at the first postoperative day, and reduces the number of pulmonary complications.

No published data
It is not the epidural that is dangerous, but the person who gives it

D.M. Popping
H.K. Van Aken
G. Brodner
M. Wenk

Neuraxial anaesthesia (alone) can therefore be considered as the anaesthetic technique of choice following careful assessment of the risk/benefit ratio for each patient.

Neuraxial analgesia is also associated with better post-operative outcome and should therefore be considered as the technique of first choice (following careful assessment of individual risk / benefit profile).
Major Abdominal Surgery in Nursing Home Residents: A National Study

Conclusions:

Nursing home residents experience substantially higher rates of mortality and invasive interventions after major surgery than other Medicare beneficiaries that are independent of age and measured comorbidities.

Thanks for your attention