

Appendix Table 1. Abstracted Data for Eligible Randomized Trials\*

Author, Year (Reference)	Intervention	Intervention Description	Control Description	Type of Surgery	Inclusion Criteria	Exclusion Criteria	Patients Blinded	Outcome Assessment Blinded	Multicenter	Randomization Allocation Concealment	ITT Analysis
Møller et al., 2002 (12)	Preoperative smoking cessation	Weekly meeting with project nurse; estimate of nicotine dependence; free, tailored nicotine replacement; smoking status measured by carbon monoxide in expired air; advice about cessation or reduction, benefits, side effects, or management of withdrawal symptoms and weight	Standard care: "little or no information about risk of smoking or cessation counselling"	Elective knee or hip replacement	Daily smokers	Weekly alcohol intake > 35 units	No	Yes	Yes: 3 university-affiliated hospitals, Copenhagen, Denmark	Adequate	Yes
Berg et al., 1997 (13)	Long-acting vs. intermediate-acting neuromuscular blockade	Pancuronium	Atracurium or vecuronium	Elective major lower extremity, gynecologic, breast, or abdominal surgery	"Adults," general anesthesia, ASA class I–III	Expected duration of anesthesia < 60 min, >30% ideal body weight, neuromuscular disease, preoperative drugs affecting neuromuscular transmission, renal or liver "insufficiency," increased preoperative creatinine level	No data	Yes	Yes: 2 university-affiliated hospitals, Copenhagen, Denmark	Adequate	Yes
Norris et al., 2001 (14)	General anesthesia vs. general + regional anesthesia and IV PCA vs. epidural PCA	1) General + regional with IV PCA; 2) general + regional with epidural PCA	3) General with IV PCA; 4) general with epidural PCA	Elective abdominal aortic surgery	Elective abdominal aortic surgery	Cross-clamping of thoracic aorta, contraindication to epidural, major operation in the previous 14 d, opioid dependence	Yes	Yes	No	Yes	Yes
Rigg et al., 2002 (15)	Intraoperative + postoperative epidural analgesia	Intraoperative general anesthesia and epidural local anesthetic, then postoperative epidural local anesthetic for 72 h with as-needed opioid (fentanyl or pethidine)	Intraoperative general anesthesia, then postoperative IV opioid and as-needed NSAID, opioid, and paracetamol	Elective major nonlaparoscopic abdominal operations or esophagectomy	Age > 18 y	Surgery < 12 h after admission, contraindication to epidural block	No	No	Yes: Hospitals in Australia, East Asia, and Middle East	Yes	Yes
Park et al., 2001 (16)	Intraoperative epidural anesthesia + postoperative epidural analgesia	Intraoperative "light" general anesthesia + epidural bupivacaine, then postoperative epidural morphine and as-needed IV opioid	Intraoperative general anesthesia, then postoperative IV or IM opioid	Elective aortic, gastric, biliary, or colon operations	Veterans, age ≥ 21 y	Age < 21 y; women; confusion; ASA class I, II, or V; surgery ≤ 12 h after admission; myocardial infarction ≤ 6 mo; previous abdominal surgery ≤ 3 mo; previous aortic procedure; tracheostomy or endotracheal tube; chemo- or immunosuppression therapy other than corticosteroids; study drug hypersensitivity; contraindication to epidural; physician refusal; enrolled in other Veterans Affairs study	No	Yes	Yes: 15 Veterans Affairs hospitals	Yes	Yes
Feron et al., 2003 (17)	Intraoperative epidural opioid	Intraoperative general anesthesia and epidural sufentanil and morphine	Intraoperative general anesthesia and IV sufentanil	Elective abdominal aortic surgery	Consecutive patients for elective abdominal aortic surgery	Contraindication to epidural	No	No	No	Yes	No
Mann et al., 2000 (18)	General anesthesia + epidural anesthesia then PCEA	Intraoperative general anesthesia and epidural local anesthetic or opioid, then postoperative PCEA + opioid	Intraoperative general anesthesia, then postoperative patient-controlled IV opioid	Elective major abdominal surgery for malignant condition	Age > 70 y, ASA class I or II, normal preoperative mental status, no severe malnutrition or cerebrovascular insufficiency, no contraindication to epidural	No additional data	No	Yes for chest radiography, unclear for other outcomes	No	Yes	No

Continued on following page

Appendix Table 1—Continued

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Cuschieri et al., 1985 (19)	General anesthesia + intraoperative and postoperative local anesthetic	Intraoperative general anesthesia and local anesthetic, then postoperative epidural local anesthetic for 12 h, then as-needed IM morphine	Intraoperative general anesthesia, then as-needed IV continuous morphine or intermittent IM morphine	Elective cholecystectomy	Age < 75 y	No additional information	No	Unclear	No	Unclear	Yes
Karayiannakis et al., 1996 (20)	LC	LC with 4-trocar technique	OC with transverse right subcostal incision	Elective cholecystectomy	All patients with symptomatic cholelithiasis	Acute cholecystitis, choledocholithiasis, age > 65 y, body mass index > 29 kg/m <sup>2</sup> , history of pulmonary disease, >10 cigarettes/d	No	Yes for chest radiography	No	Yes	No
Signalì et al., 2004 (21)	LCR	LCR	OCR	Elective colorectal resection	Age > 18 y and candidate for laparoscopic resection	Cancer infiltrating adjacent organs by imaging, NYHA class > 3, arterial Po <sub>2</sub> < 70 mm Hg, liver dysfunction (Child-Pugh class C), "ongoing infection," neutrophil count < 2 × 10 <sup>9</sup> cells/L	No	Yes	No	Yes	Yes
Chumillas et al., 1998 (22)	"Respiratory rehabilitation" with breathing exercises	Instruction about forced expiration technique and cough, chest expansion exercises and diaphragm mobilization, maximum inspiration for 3–5 s, and early ambulation after surgery; exercises were done for 10–15 min QID before surgery and for 10 min every 2 h on postoperative days 1 and 2	No description	Elective supraumbilical laparotomy	Age > 15 y	Not stated a priori	No	Unclear	No	Unclear	No
Fagevik Olsén et al., 1997 (23)	Chest physiotherapy	Preoperative training in DBEs with pursed lips, huffing, coughing every tenth breath hourly after surgery; importance of position change in bed and early mobilization; high-risk patients were also given PEP; postoperative therapy was adjusted per physiotherapist or physician "according to pulmonary status"; duration of treatment was 10–15 min before and 15–20 min after surgery	No training before surgery, no therapy after surgery unless pulmonary complications occurred, then patients given physiotherapy with PEP	Elective open abdominal surgery	No data	No data	No	No data	No	No: "[T]o avoid patient interference, cluster randomization was performed in alternate months"	Unclear
Hall et al., 1991 (24)	IS vs. chest physiotherapy	IS device on bedside table, patient instructed in use; attending physicians' responsibility to promote its use perioperatively, preferably for 5 min in each waking hour	Treatment according to the clinical judgment of attending physicians and physiotherapists	Laparotomy "with manipulation of viscera"	Laparotomy "with manipulation of viscera"	Age < 14 y, preoperative pulmonary complication per outcome definitions	No	Yes	No	Yes	Yes
Hall et al., 1996 (25)	Low-risk patients: 1) IS vs. 2) DBEs; high-risk patients: 3) IS vs. 4) IS + chest physiotherapy	1) and 3) IS: information sheet and encouragement to use IS at least 10 times hourly	2) DBEs: seen once and encouraged to take 10 deep breaths hourly; 4) IS + chest physiotherapy had physiotherapy aimed at producing maximum inspiratory effort at least once daily for postoperative days 1–3, then at further rate per physiotherapist	Laparotomy "with manipulation of viscera"	Laparotomy "with manipulation of viscera"; high-risk patients defined as ASA class > 1 or age ≥ 60 y	Language, pulmonary complication before surgery, lack of consent due to declined participation or insufficient time before surgery	No	Yes	No	Yes	Yes

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Böhner et al., 2002 (26)	Nasal CPAP for 12 h after surgery	Intermediate care for at least 24 h after surgery with nasal CPAP at 10 cm H <sub>2</sub> O for at least 12 h after surgery to keep O <sub>2</sub> saturation > 95%	Intermediate care for at least 24 h after surgery with oxygen by face mask or nasal cannula to keep oxygen saturation > 95%	Elective midline abdominal vascular surgery	Elective midline abdominal vascular surgery scheduled to be extubated in the operating room	Emergency surgery, repair of thoracoabdominal aneurysm, exclusively retroperitoneal approach	No	No data	No	Yes	Yes
VA TPN Cooperative Study Group, 1991 (27)	Preoperative TPN	TPN to caloric goal of 1000 kcal > resting metabolic expenditure; optimal was 7–15 d before surgery; suboptimal was < 7 d; TPN continued 72 h after surgery; oral intake as clinically allowed or tolerated	No TPN or forced enteral intake before surgery or after surgery for 72 h, then TPN or enteral if indicated	Elective laparotomy or thoracotomy	Age ≥ 21 y, elective laparotomy or thoracotomy	Death expected within 90 d, TPN in previous 15 d, other surgery within previous 30 d, contraindication to delay in surgery for TPN, TPN contraindicated, major concurrent illness, TPN essential, well-nourished	No	No	Yes	Yes	Yes
Pacelli et al., 2001 (28)	TEN vs. TPN	Postoperative TEN (during induction of TEN, TPN was added to achieve the same caloric intake as in the TPN group)	Postoperative TPN	Major elective abdominal operations	Age 18–80 y, malnourished, nutritional risk index < 90%	Emergency surgery, elective appendectomy, cholecystectomy or viscerolysis	No	Unclear	Yes	Yes	Yes
Bozzetti et al., 2001 (29)	TEN vs. TPN	Postoperative TEN: jejunostomy feeding tube or nasojejunal feeding tube placed during surgery	Postoperative TPN	Elective major resection for gastrointestinal cancer	Weight loss ≥ 10% usual body weight in previous 6 mo, histologically proven cancer	Age < 18 y, liver dysfunction (Child–Pugh class > 2), serum creatinine level > 265.2 μmol/L (>3 mg/dL) or hemodialysis, NYHA functional class > III, history of stroke, pregnancy, ongoing infection, previous intestinal anastomosis of the large bowel without a diverting stoma	No	No	Yes	Yes	Yes
Gianotti et al., 2002 (30)	Enteral immunonutrition	1) Oral immunonutrition for 5 d before surgery, no supplementation after surgery; 2) oral immunonutrition for 5 d before surgery and by jejunal feeding after surgery until oral intake resumed	3) Usual care, no enteral supplement, IV 5% glucose and electrolytes	Elective major resection for gastrointestinal cancer	Histologically proven cancer	Weight loss ≥ 10% of usual body weight in past 6 mo, age < 18 y, liver dysfunction (Child–Pugh class > B), Pao <sub>2</sub> < 70 mm Hg, creatinine level > 265.2 μmol/L (>3 mg/dL) or hemodialysis, NYHA class > 3, Karnofsky < 60, pregnancy, ongoing infection, neoadjuvant radiochemotherapy or neutrophil count < 2 × 10 <sup>9</sup> cells/L	No	Unclear	No	Yes	Yes
Sandham et al., 2003 (31)	Pulmonary artery catheter in high-risk surgical patients	Pulmonary artery catheter placed before surgery; treatment directed to a priori established physiologic goals and priorities	No pulmonary artery catheter, central venous catheter allowed	Urgent and elective major abdominal, thoracic, vascular, or hip fracture surgery	Age ≥ 60 y, ASA class III or IV	No additional inclusion criteria	No	Yes	Yes	Yes	Yes

\* ASA = American Society of Anesthesiologists; CPAP = continuous positive airway pressure; DBE = deep breathing exercise; IM = intramuscular; IS = incentive spirometry; ITT = intention-to-treat; IV = intravenous; LC = laparoscopic cholecystectomy; LCR = laparoscopic colorectal resection; NSAID = nonsteroidal anti-inflammatory drug; NYHA = New York Heart Association; OC = open cholecystectomy; OCR = open colorectal resection; PCA = patient-controlled analgesia; PCEA = patient-controlled epidural analgesia; PEP = positive expiratory pressure; QID = four times daily; TEN = total enteral nutrition; TPN = total parenteral nutrition; VA TPN = Veterans Affairs Total Parenteral Nutrition.