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## ***Intensive Care Medicine* launches a call for papers on perioperative critical care**

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The practice of perioperative medicine is one of the most illustrative approaches in medicine of the famous proverb “prevention is better than cure”. Modern “perioperative critical care” describes the medical care of patients at high risk from the time of the first anesthesia consultation, which evaluates risk factors for postoperative complications through the operative period and eventually to full recovery. This pathway may include an intensive care unit (ICU) stay [1]. Contrary to the management of typical patients admitted to medical ICUs, where admissions are largely unplanned, the aim of perioperative medicine is to

optimize the management of the surgical patient and to avoid ICU admission if possible. If admission to the ICU is necessary, it is often planned and careful preoperative assessment and intraoperative care can lead to improved outcome. In the practice of perioperative medicine, the surgeon, anesthesiologists, intensivists, and medical consultants all work in concert for the patient’s benefit.

It is estimated that more than 230 million patients per year undergo a surgical procedure, often requiring general anesthesia with endotracheal intubation and controlled mechanical ventilation [2]. Although successful surgery is a necessary condition for satisfactory postoperative outcomes, the benefits of any surgical procedure may be mitigated by the development of postoperative complications. Cardiovascular and respiratory postoperative complications are a leading cause of increased morbidity and mortality [3]. These postoperative complications are often associated with ICU admission, prolonged ICU and hospital stay, and increased health care utilization and costs. Identification of patients with high risk of postoperative complications is a challenge in all surgical specialties [4, 5]. Improved preoperative identification can lead to preoperative, intraoperative, and postoperative optimization of care and result in reduced morbidity and mortality. Evidence supporting best practices in perioperative medicine is expanding, though historically this field has been directed by common practice and experience.

Modern critical care was founded by European anesthesiologists taking the skills learned in the operating room (OR) and applying them to the victims of the polio epidemics of the 1950s [6]. In the last decade, lessons learned in the modern ICU are being taken back to the OR. This cross-pollination between the ICU and the OR benefits patients in both of these areas, reducing morbidity and mortality. The OR and the ICU are similar environments and indeed anesthetic care can be viewed as the short-term, intensive care of a single patient. In both

**Table 1** Main studies published in the field of perioperative care in *Intensive Care Medicine* since 2013

References	Title	Type of surgery	Study design	Patients	Main results and messages
Cardiac surgery Bjursten (2013)	Increased long-term mortality with plasma transfusion after coronary artery bypass surgery	Cardiac	Retrospective, observational, single center	5261 (adult)	No association between red blood cell transfusion and mortality Plasma transfusion associated with increased mortality Platelet transfusion associated with decreased mortality
Morgan (2013)	Perioperative interventions, but not inflammatory mediators, increase risk of acute kidney injury after cardiac surgery: a prospective cohort study	Cardiac	Prospective physiological, observational, single center	109 (pediatric)	Inflammatory mediators upregulated following cardiopulmonary bypass No association between levels of inflammatory cytokines and cardiac surgery associated acute kidney injury (CS-AKI) Intraoperative administration of glucocorticoid does not appear to be an effective intervention for reducing the risk of CS-AKI
de Gast-Bakker (2013)	Safety and effects of two red blood cell transfusion strategies in pediatric cardiac surgery patients: a randomized controlled trial	Cardiac	Randomized controlled trial, single center	107 (pediatric)	Perioperative period restrictive red blood cell transfusion policy (threshold of Hb 8.0 g/dl): safe, shorter hospital stay and less expensive
Bergan (2014)	Impact of improvement in preoperative oral health on nosocomial pneumonia in a group of cardiac surgery patients: a single-arm prospective intervention study	Cardiac	Single-arm prospective intervention study, single center	226 (adult)	Preoperative dental care that improved oral hygiene reduced postoperative pneumonia
Pasero (2015)	Improving ultrasonic measurement of diaphragmatic excursion after cardiac surgery using the anatomical M-mode: a randomized crossover study	Cardiac	Randomized crossover study, single center	50 (adult)	Motion-mode (MM) echography overestimates diaphragmatic excursion in comparison to a new imaging modality named the anatomical motion-mode in cardiac surgical patients Using MM may lead to a lack of recognition of diaphragmatic dysfunction
Corley (2015)	Direct extubation onto high flow nasal cannulae post cardiac surgery versus standard treatment in patients with a BMI $\geq 30$ : a randomized controlled trial	Cardiac	Randomized controlled trial	155 obese (adult)	Prophylactic extubation onto high flow nasal cannulae post cardiac surgery in patients with a BMI $\geq 30$ kg/m <sup>2</sup> : did not lead to improvements in respiratory function
Noncardiac surgery Kirkpatrick (2013)	Intra-abdominal hypertension and the abdominal compartment syndrome: updated consensus definitions and clinical practice guidelines from the World Society of the Abdominal Compartment Syndrome	Abdominal	Systematic review		Intra-abdominal hypertension and the abdominal compartment syndrome common and frequently associated with poor outcomes Appropriately designed intervention trials needed for patients with intra-abdominal hypertension and the abdominal compartment syndrome common
Bassetti (2013)	A research agenda on the management of intra-abdominal candidiasis: results from a consensus of multinational experts	Abdominal	Recommendations for the management of immunocompetent adult patients with intra-abdominal candidiasis	22 members (surgeons, infectious disease, and intensive care physicians)	Specific recommendations elaborated on intra-abdominal candidiasis management based on the best direct and indirect evidence and on the expertise of a multinational panel

Table 1 continued

References	Title	Type of surgery	Study design	Patients	Main results and messages
Lorut (2014)	Early postoperative prophylactic noninvasive ventilation after major lung resection in COPD patients: a randomized controlled trial	Thoracic	Randomized controlled trial, multiple center	360 COPD	Prophylactic postoperative noninvasive ventilation: not reduce acute respiratory events in COPD patients undergoing lung resection surgery No influence on other postoperative complications, mortality rates, and duration of ICU and hospital stay
Tridente (2014)	Patients with fecal peritonitis admitted to European intensive care units: an epidemiological survey of the GenOSept cohort	Abdominal	International epidemiological survey	977 (adults)	6-month mortality, 32 % Predictors of mortality: age, development of acute renal dysfunction during the first week of admission, lower hematocrit, and hypothermia on day 1 of ICU admission Review and updated
Montravers (2015)	What's new in postoperative intensive care after bariatric surgery?	Bariatric surgery	Review	Obese adults	Acute mesenteric ischemia (AMI) ICU mortality, 58 %
Leone (2015)	Outcome of acute mesenteric ischemia in the intensive care unit: a retrospective, multicenter study of 780 cases	Abdominal	Retrospective, observational, multicenter study	780	Age and SOFA score: risk factors for mortality Lactate >2.7 mmol/l: independent risk factor, but values in the normal range not exclude the diagnosis of AMI

areas continuous monitoring of physiological variables (i.e., hemodynamic and ventilatory function) allows immediate management. Among recent developments are (1) an anesthesia-surgical safety checklist designed to improve team communication [7]; (2) perioperative hemodynamic management in cardiac and noncardiac surgeries [8–11]; (3) ventilatory management by the application of preventive “lung protective ventilation” in abdominal surgery [12, 13]; (4) use of neuromuscular blockade to facilitate mechanical ventilation [14]; and (5) preventive postoperative noninvasive ventilation [15] and (6) anesthesia and pain management using regional anesthesia methods.

ICU management of ARDS patients using lung protective mechanical ventilation including low tidal volume (6 ml/kg of ideal body weight, IBW) with moderate to high PEEP (5–15 cmH<sub>2</sub>O) with or without recruitment maneuver has led to improved outcomes [16]. This lung protective strategy has been transferred from the ICU to the OR care not only in patients with lung injury but also in patients with healthy lungs [13]. For example, it was recently shown that development of postoperative lung injury was dependent on the intraoperative ventilation strategy and, therefore, should be seen as a complication that is potentially preventable by the use of lung protective mechanical ventilation strategies during surgery [13]. The Intraoperative PROtective VEntilation (IMPROVE) trial was a prospective randomized controlled study [12] in which a multifaceted strategy composed of low VT (6–8 ml/kg IBW) ventilation, moderate levels of PEEP (6–8 cmH<sub>2</sub>O), and repeated recruitment maneuver aimed at keeping the lung open was compared with nonprotective ventilation in 400 intermediate to high-risk patients undergoing major abdominal surgery. Consistent with previous findings in similar abdominal procedures, an overall postoperative respiratory failure rate of 12 % was found. Compared with nonprotective ventilation, prophylactic lung-protective ventilation was associated with improved postoperative clinical outcomes, as suggested by a 69 % reduction in the patients requiring intubation or noninvasive ventilation for postoperative respiratory failure (relative risk 0.29, 95 % CI 0.14–0.61,  $P = 0.001$ ).

In the field of perioperative hemodynamic management, Pearse et al. [9] reported the results of a randomized clinical trial exploring the effects of a cardiac output-guided hemodynamic therapy algorithm on the incidence of postoperative complications compared with usual care. OPTIMISE is the largest trial of a perioperative care, cardiac output-guided hemodynamic therapy algorithm. This trial [9] evaluated the clinical effectiveness of a perioperative cardiac output monitoring to guide administration of intravenous fluid and inotropic drugs as part of a hemodynamic therapy algorithm. A total of 734 high-risk patients, aged

50 years or older, undergoing major gastrointestinal surgery at 17 acute care hospitals in the UK were enrolled. Intervention group patients received intravenous fluid and inotropes according to a cardiac output-guided hemodynamic therapy algorithm. This algorithm was developed for OPTIMISE by an expert group. It was designed to be delivered in the OR and the postanesthetic care unit by both medical and nursing staff, ensuring that critical care admission was not necessary for protocol adherence. The OPTIMISE study was considered as a negative study because it did not reduce a composite outcome of complications and 30-day mortality. However, the authors performed an updated meta-analysis with the inclusion of the OPTIMISE study data and founded that the intervention was associated with a reduction in postoperative complications. One important lesson of both OPTIMISE and IMPROVE is that, while large, randomized controlled trials are never easy to conduct, and they may be easier to complete in the OR than in the ICU as a result of the large numbers of patients at risk. Hopefully the lessons learned

in these trials will, in many cases, be applicable in the ICU as well.

*Intensive Care Medicine* recognizes the importance of the learning relationship between the ICU and the OR. Studies in the perioperative care of critically ill patients have implications not only for this specific population but also for critically ill patients in general. Table 1 reports the main studies published in the field of perioperative care in *Intensive Care Medicine* since 2013.

*Intensive Care Medicine* is opening a call for additional, high-quality papers in perioperative medicine mainly in the fields of cardiac, thoracic, abdominal, and neurologic surgeries to be published in these pages. The submission deadline is 1 October 2015.

**Conflicts of interest** Dr. Jaber reports receiving consulting fees from Dräger, Hamilton, Maquet, and Fisher Paykel. Dr. Citerio reports receiving fees from Codman for educational activities. Dr. Talmor reports receiving grant support from the National Institutes of Health and the Gordon and Betty Moore Foundation.

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