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INVITED COMMENTARY

Prevention of postoperative pulmonary complications in the hypoxaemic patient – gathering the evidence for noninvasive respiratory support

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This Invited Commentary accompanies the following article:

Leone M, Einav S, Chiumello D et al. Noninvasive respiratory support in the hypoxaemic perioperative/periprocedural patient. A joint ESA/ESICM guideline. *Eur J Anaesthesiol* 2020; **37**:265–279.

Postoperative pulmonary complications are among the most common morbidities encountered in the postsurgical patient.[1,2] A large body of literature has been published regarding the use of noninvasive ventilation for the treatment and prevention of such complications. The joint guideline of the *European Society of Anaesthesiology* (ESA) and the *European Society of Intensive Care Medicine* (ESICM), published in the current issue of the Journal, brings together known studies and applies GRADE methodology to make recommendations regarding the use of noninvasive respiratory support techniques in the peri-operative/periprocedural hypoxaemic patient.[3] Noninvasive respiratory support was defined as high flow nasal cannula, noninvasive positive pressure ventilation or continuous positive airway pressure.

Five major lines of inquiry were explored to determine the goals of therapy, identify patient groups for whom therapy may be beneficial, assess minimal standards of haemodynamic and respiratory monitoring, identify ways of preventing avoidable complications in patients receiving noninvasive respiratory support and identify how and where to initiate therapy. It should be noted that the guidelines address treatment of patients with hypoxaemia (defined as $PaO_2/FiO_2 < 40$ kPa), rather than prophylactic respiratory support to prevent pulmonary complications.

The authors note that the majority of studies compared noninvasive respiratory support and conventional oxygen therapy, and that there were few comparisons between high flow nasal cannula, noninvasive positive pressure ventilation and continuous positive airway pressure.

The evidence supports the use of noninvasive positive pressure ventilation over conventional oxygen therapy to improve oxygenation (Grade 1B recommendation), reduce atelectasis (2C), reduce pneumonia (2A), avoid reintubation (2B) and reduce mortality (2C). There was little evidence to support the use of high flow nasal cannula for these outcomes.

For abdominal surgical patients with hypoxaemia, the use of noninvasive positive pressure ventilation instead of conventional oxygen therapy is suggested for preventing reintubations, shortening ICU stay and ventilator days, and reducing infections, and it is supported by two randomised controlled trials (RCTs) (Grade 1B). The evidence was less clear for high flow nasal cannula, with a grade 2C recommendation based on a single large multicentre RCT demonstrating the noninferiority of this method. Similarly, weak recommendations based on poor evidence were made for patients undergoing lung resection and solid organ transplants. For fibreoptic bronchoscopy, there was evidence of moderate quality for the use of continuous positive airway pressure or noninvasive positive pressure ventilation to reduce postprocedural pulmonary complications.

Minimal standards recommendations were made for clinicians with recognised skills and competence for airway management and ventilation of patients with lung injury (2C), but these were not based on evidence.

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Similarly, the weak recommendation of periodic assessments, physiological monitoring and blood sampling was also based on clinical judgement of the panel in the absence of available studies to support the use of these methods.

Importantly, no recommendations were made for the prevention of complications in patients receiving various types of respiratory support, as the panel could not identify any study addressing this purpose. The guidelines make a weak recommendation (2B) for the use of high flow nasal cannula instead of conventional oxygen therapy in patients unable to tolerate other forms of noninvasive ventilation. Finally, there were no recommendations regarding how or when to initiate noninvasive respiratory support.

Although these guidelines were careful to include only studies of hypoxaemic patients, the findings seem at odds with a Cochrane review that suggested benefit from continuous positive airway pressure initiated during the postoperative period for reduction of postoperative atelectasis, pneumonia and reintubation, but with unclear effects on mortality, hypoxia or need for invasive ventilation in adults undergoing elective major abdominal surgery (very low strength of evidence).[4] The discrepancy in these findings is probably related to the prerequisite of 'hypoxaemia' in the current study.

The authors have been careful to state the major limitations of the current recommendations, including the lack of head-to-head comparisons between the different noninvasive techniques, use of respiratory support outside the ICU and lack of information regarding surgical complications. The use of noninvasive positive pressure ventilation after gastric and oesophageal surgery remains controversial and was identified as an important gap in knowledge.

Readers should be cognisant that the present guidelines do not address the *prevention* of postoperative pulmonary complications using noninvasive respiratory support (i.e. including patients without manifest hypoxaemia). In this regard, we await the results of the multicentre PRISM trial that is designed to evaluate the preventive use of continuous positive airway pressure, commencing immediately after the completion of major abdominal surgery and continuing for at least 4 h (www.prismtrial.org).

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