HYPOXAEMIA
Supporting information

This guideline has been produced with reference to the following:

O'Driscoll BR, Howard LS, EarisJ et al. BTS guideline for oxygen use in adults in healthcare and emergency settings. Thorax 2017;72:i1-i90

https://www.brit-thoracic.org.uk/document-library/guidelines/emergency-oxygen/bts-guideline-for-oxygen-use-in-adults-in-healthcare-and-emergency-settings/

What is the evidence for the postoperative application of CPAP to patients with COPD having major surgery?
Patients with COPD have a 2.7-4.7-fold increased risk of postoperative pulmonary complications (Trayner, 2001).
A study of 65 patients after upper abdominal surgery (Stock, 1985) found that nasal CPAP improved functional residual capacity more than deep breathing or incentive spirometry, but did not improve the incidence of radiographic or clinical complications more than the other two treatments.
A prospective study of 72 patients treated with NPPV after abdominal surgery (Jaber, 2005) found that 48 (67%) were able to avoid intubation as a result of the treatment.

Jaber S, Delay JM, Chanques G, et al. Outcomes of patients with acute respiratory failure after abdominal surgery treated with noninvasive positive pressure ventilation. Chest 2005;128:2688-95
http://journal.publications.chestnet.org/article.aspx?articleid=1083894

Stock MC, Downs JB, Gauer PK, et al. Prevention of postoperative pulmonary complications with CPAP, incentive spirometry, and conservative therapy. Chest 1985;87:151-7
http://journal.publications.chestnet.org/data/Journals/CHEST/21454/151.pdf

Trayner E, Celli BR. Postoperative pulmonary complications. Med Clin North Am 2001;85:1129-39

Evidence Level: IV

What is the evidence for CPAP in surgical patients with sleep apnoea?
A 2021 review suggests that CPAP reduces apnoea and hypopnea frequency and related hypoxemia after surgery (Fagerlund, 2021). This review identified four trials investigating the effect of CPAP on a total of 398 patients with a polysomnographic diagnosis or a high suspicion of obstructive sleep apnoea (OSA). All patients with OSA were newly diagnosed preoperatively, and they were naive to CPAP before the trials. Two trials reported a reduction in the apnea-hypopnea index (AHI) using auto-CPAP, while one of them also reported that oxygen saturation improved, with a reduction in the oxygen-desaturation index. One trial reported that lung function (forced vital capacity) was better if Boussignac CPAP was initiated immediately after surgery in the operating theatre versus half an hour later in the postanesthesia care unit. Auto-CPAP had no effect on postoperative delirium or hospital length of stay. Compliance with auto-CPAP was generally low after surgery in all 3 studies using auto-CPAP. Problems using CPAP included generalized discomfort, nausea, and vomiting after surgery. Many patients regarded CPAP as uncomfortable or intolerable.
The American Society of Anesthesiologists (ASA) guidelines suggest sleep apnoea investigations before surgery in patients at risk, followed by the treatment to reduce postoperative morbidity and mortality (ASA, 2014). Moreover, the Society of Anesthesia and Sleep Medicine (SASM) guidelines published in 2016 recommend that sleep apnoea patients on CPAP should continue with treatment both preoperatively and postoperatively. CPAP use should be considered case by case in suspected but previously undiagnosed obstructive sleep apnoea (Chung, 2016).

American Society of Anesthesiologists Task Force on Perioperative Management of patients with obstructive sleep apnea. Practice guidelines for the perioperative management of patients with obstructive sleep apnea: an updated report by the American Society of Anesthesiologists Task Force on perioperative management of patients with obstructive sleep apnea. Anesthesiology. 2014;120:2686
https://pubs.asahq.org/anesthesiology/article/120/2/268/11781/Practice-Guidelines-for-the-Perioperative

Chung F, Memtsoudis SG, Ramachandran SK, et al. Society of anesthesia and sleep medicine guidelines on preoperative screening and assessment of adult patients with obstructive sleep apnea. Anesth Analg. 2016;123:452–43

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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4956681/

Fagerlund MJ & Franklin KA. Perioperative Continuous Positive Airway Pressure Therapy: A Review With the Emphasis on Randomized Controlled Trials and Obstructive Sleep Apnea. Anesth Analg. 2021;132:1306-13

Evidence Level: IV

Does skin colour effect pulse oximeter readings?

A 2024 systematic review identified 23 pulse oximetry studies that evaluated the impact of skin colour on the accuracy of readings (Singh, 2024). The reviewers concluded that SpO2 measurements may be inaccurate across all skin pigmentation groups and that pulse oximeters significantly overestimate SpO2 for both light and dark skin pigmentation, but this overestimation may not be clinically relevant. A different 2024 systematic review (44 studies) concluded that pulse oximetry can overestimate true SaO2 in people with darker skin tones and that the clinical relevance of this bias remains unclear, but its magnitude is likely to be greater when SaO2 is lower (Martin, 2024). The authors found that the majority of studies reported overestimation of SaO2 by pulse oximetry in participants with darker skin tones or from ethnicities assumed to have darker skin tones.

Martin D, Johns C, Sorrell L et al. Effect of skin tone on the accuracy of the estimation of arterial oxygen saturation by pulse oximetry: a systematic review. Br J Anaesth. 2024;132:945-56
https://pmc.ncbi.nlm.nih.gov/articles/pmid/38368234/

Singh S, Bennett MR 2, Chen C et al. Impact of Skin Pigmentation on Pulse Oximetry Blood Oxygenation and Wearable Pulse Rate Accuracy: Systematic Review and Meta-Analysis. J Med Internet Res. 2024:26:e62769
https://pmc.ncbi.nlm.nih.gov/articles/pmid/39388258/

Evidence level: I

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