

sion and nausea and vomiting after spinal doses of bupivacaine generally exceeding 8 mg, but there was no evidence that it reduced other maternal or neonatal morbidities.

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## Anesthetic induction with etomidate, rather than propofol, is associated with increased 30-day mortality and cardiovascular morbidity after noncardiac surgery

Komatsu R1, You J, Mascha EJ, Sessler DI, Kasuya Y, Turan A

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### ABSTRACT

**Background:** Because etomidate impairs adrenal function and blunts the cortisol release associated with surgical stimulus, we hypothesized that patients induced with etomidate suffer greater mortality and morbidity than comparable patients induced with propofol. **Methods:** We evaluated the electronic records of 31,148 ASA physical status III and IV patients who had noncardiac surgery at the Cleveland Clinic. Among these, anesthesia was induced with etomidate and maintained with volatile anesthetics in 2616 patients whereas 28,532 were given propofol for induction and maintained with volatile anesthetics. Two thousand one hundred forty-four patients given etomidate were propensity matched with 5233 patients given propofol and the groups compared on 30-day postoperative mortality, length of hospital stay, cardiovascular and infectious morbidities, vasopressor requirement, and intraoperative hemodynamics. **Results:** Patients given etomidate had 2.5 (98% confidence interval [CI], 1.9-3.4) times the odds of dying than those given propofol. Etomidate patients also had significantly greater odds of having cardiovascular morbidity (odds ratio [OR] [98% CI]: 1.5 [1.2-2.0]), and significantly longer hospital stay (hazard ratio [95% CI]: 0.82 [0.78-0.87]). However, infectious morbidity (OR [98% CI]: 1.0 [0.8-1.2]) and intraoperative vasopressor use (OR [95% CI] 0.92: [0.82-1.0]) did not differ between the agents. **Conclusion:** Etomidate was associated with a substantially increased risk for 30-day mortality, cardiovascular morbidity, and prolonged hospital stay. Our conclusions, especially on 30-day mortality, are robust to a strong unmeasured binary confounding variable. Although our study showed only an association between etomidate use and worse patients' outcomes but not causal relationship, clinicians should use etomidate judiciously, considering that improved hemodynamic stability at induction may be accompanied by substantially worse longer-term outcomes.

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## Comparison of the effects of albumin 5%, hydroxyethyl starch 130/0.4 6%, and Ringer's lactate on blood loss and coagulation after cardiac surgery

Skhirtladze K, Base EM, Lassnigg A, Kaider A, Linke S, Dworschak M, Hiesmayr MJ

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### ABSTRACT

**Background:** Infusion of 5% human albumin (HA) and 6% hydroxyethyl starch 130/0.4 (HES) during cardiac surgery expand circulating volume to a greater extent than crystalloids and would be suitable for a restrictive fluid therapy regimen. However, HA and HES may affect blood coagulation and could contribute to increased transfusion requirements. **Methods:** We randomly assigned 240 patients undergoing elective cardiac surgery to receive up to 50 ml kg<sup>-1</sup> day<sup>-1</sup> of either HA, HES, or Ringer's lactate (RL) as the

main infusion fluid perioperatively. Study solutions were supplied in identical bottles dressed in opaque covers. The primary outcome was chest tube drainage over 24 h. Blood transfusions, thromboelastometry variables, perioperative fluid balance, renal function, mortality, intensive care unit, and hospital stay were also assessed. **Results:** The median cumulative blood loss was not different between the groups (HA: 835, HES: 700, and RL: 670 ml). However, 35% of RL patients required blood products, compared with 62% (HA) and 64% (HES group;  $P=0.0003$ ). Significantly, more study solution had to be administered in the RL group compared with the colloid groups. Total perioperative fluid balance was least positive in the HA group [6.2 (2.5) litre] compared with the HES [7.4 (3.0) litre] and RL [8.3 (2.8) litre] groups ( $P<0.0001$ ). Both colloids affected clot formation and clot strength and caused slight increases in serum creatinine. **Conclusions:** Despite equal blood loss from chest drains, both colloids interfered with blood coagulation and produced greater haemodilution, which was associated with more transfusion of blood products compared with crystalloid use only.

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## Clinical review: What are the best hemodynamic targets for noncardiac surgical patients?

Lobo SM, Oliveira NE

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### ABSTRACT

*Perioperative hemodynamic optimization, or goal-directed therapy (GDT), has been show to significantly decrease complications and risk of death in high-risk patients undergoing noncardiac surgery. An important aim of GDT is to prevent an imbalance between oxygen delivery and oxygen consumption in order to avoid the development of multiple organ dysfunction. The utilization of cardiac output monitoring in the perioperative period has been shown to improve outcomes if integrated into a GDT strategy. GDT guided by dynamic predictors of fluid responsiveness or functional hemodynamics with minimally invasive cardiac output monitoring is suitable for the majority of patients undergoing major surgery with expected significant volume shifts due to bleeding or other significant intravascular volume losses. For patients at higher risk of complications and death, such as those with advanced age and limited cardiorespiratory reserve, the addition of dobutamine or dopexamine to the treatment algorithm, to maximize oxygen delivery, is associated with better outcomes.*