

UK analysis suggests potentially serious complications in 1 in 18 procedures under care of an anesthetist

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New survey data from the 7th National Audit Project of the Royal College of Anaesthetists (NAP7) published in the journal *Anaesthesia* shows that potentially serious complications occur in one in 18 procedures under the care of an anaesthetist.

The [risk factors](#) associated with these potentially serious complications include very young age (babies); comorbidities; being male; increased frailty; the urgency and extent of [surgery](#); and surgery taking place at night and/or at weekends.

This paper has been produced by a team of authors across UK hospitals, including Dr. Andrew Kane, Consultant in Anesthesia, James Cook University Hospital, Middlesbrough and Fellow, Health Services Research Centre, Royal College of Anaesthetists, London, UK; Dr. Jasmeet Soar, Consultant in Anesthesia and Intensive Care Medicine, Southmead Hospital, North Bristol NHS Trust, Bristol, UK; and Professor Tim Cook, Consultant in Anesthesia and Intensive Care Medicine, Royal United Hospitals Bath NHS Foundation Trust, Bath, UK, and Honorary Professor, School of Medicine, University of Bristol, UK.

Complications and critical incidents during anesthesia, arising due to patient, surgical or anesthetic factors, may cause harm themselves or progress to more severe events, including cardiac arrest or death. As part of the Royal College of Anaesthetists' 7th National Audit Project, which focuses on peri-operative cardiac arrest, the authors studied a prospective national cohort of unselected patients.

Anesthetists recorded anonymous details of all cases undertaken over four days at their site through an online survey. Of 416 hospital sites invited to participate, 352 (85%) completed the study. Obstetric cases were analyzed separately and will be the focus of a separate paper later.

Of 20,996 non-obstetric cases, 1,705 potentially serious complications were reported during 1,150 (5.5%) cases. Circulatory events (such as severely low blood pressure or abnormalities of heart rate and rhythm) accounted for most of these complications [616; 36%], followed by airway complications (e.g., low oxygen levels) [418; 25%], metabolic [264; 15%], breathing (e.g. difficulty in ventilating the lungs) [259; 15%], "other" [107; 6%] and neurological [41; 2%] events. A single [complication](#) was reported in 851 (4%) of total cases, two complications in 166 (1%), and three or more complications in 133 (1%).

In [elective surgery](#), all complications were "uncommon" (1-10 per 1,000 cases) or even less frequent. Emergency (urgent and immediate priority) surgery accounted for 3,454 (16%) of the included cases, but 714 (42%) of the recorded complications with severe low blood pressure (hypotension), major bleeding, severe alterations in heart rhythm (arrhythmias), septic shock, significant acidosis, and electrolyte (mineral) disturbances all being "common" (10-100 per 1,000 cases).

Complications were associated with very young age (less than 1 year); higher comorbidity as assessed by the American Society of Anesthesiology (ASA) physical status; male sex; increased frailty; urgency and extent of surgery; day of the week (higher risk at weekends); and [time of day](#).

Estimated risk of complications by risk factors

Lines with * are the most prominent effects—babies, high ASA ("serious underlying medical issues"), [emergency surgery](#) (e.g. bleeding

from trauma), operations at night (nearly all emergencies)

- *Newborn babies (age less than 28 days) (18%) 3.8 times higher risk than [young adults](#) (19-25 years, 4.7%)
- Older adults compared with younger adults (19-25 years, 4.7%):
 - Adults aged 66-75 years—6.0%, 28% higher risk
 - Adults aged 76-85 years—6.1%, 30% higher risk
 - Adults aged over 85 years—5.7%, 21% higher risk
- *ASA1 (fit and healthy, 3.5%) v ASA 4 (patient with major medical conditions e.g. heart or lung disease, 19%), 5.5 times increased risk for ASA 4 patients
- Males (6.4%) v females (4.7%), 40% higher risk for males
- Frail (e.g., needing help with daily activities such as cooking, shopping and housework, 8.5%) vs. non-frail (4.5%), double the risk for patients who are frail
- *Emergency ("urgent surgery" 8.8%, "immediate surgery" 39%) vs. elective (4%): immediate surgery 10 times risk versus elective, and 4 times the risk of urgent
- Minor surgery (e.g. skin lump removal, 3.4%) vs. complex major surgery (e.g. bowel resection for cancer, 9%) 2.5 times increased risk for complex major surgery
- Weekday (approx. 5%) vs. weekend (Sat., 6.5%, Sun., 10%) thus increased risk of 30% for Saturday vs. weekday and double risk for Sunday vs. weekday
- *Nighttime surgery (20%) versus daytime (5%)—4 times increased risk for night-time vs. daytime

Importantly, the above comparisons are univariate (comparing only one factor) and factors interact. For instance, at weekends and nighttime only the most urgent cases are operated on, often being in elderly, frail and unwell patients. It maybe these factors in combination are the cause of increased complications at this time. Similarly almost all neonatal surgery is urgent and major in babies who are unwell, which in part

accounts for the higher rate for complications.

Dr. Kane says, "These new data from the NAP7 Activity Survey present the first estimates for the rates of potentially serious complications and critical incidents observed during modern anesthetic practice. The data confirm that during elective practice, individual complications are uncommon, and this is reassuring for patients, surgeons and anesthesiologists. Conversely, the data also highlight the relatively higher rate of complications in emergency settings."

Prof. Cook adds, "The data show the potentially serious consequences occur frequently during anesthesia and these may arise from patient, surgery or anesthetic causes. Almost all anesthesia care in the UK is provided by highly trained doctors and the data show that although anesthesia is not a risk-free undertaking, the care delivered by the anesthesia and surgical team means very few of these events progress to patient harm and anesthesia remains very safe."

Dr. Soar concludes, "As part of the same project we recently reported that patients have become older, have more comorbidities and more often living with obesity than a decade ago. All these factors, combined with the complications we report today, make undergoing anesthesia and surgery intrinsically more hazardous. Our findings are likely to be of value for risk assessment and consent."

Dr. Fiona Donald, President of the Royal College of Anesthetists, said, "Anesthesia remains very safe and anesthetists along with the whole [surgical team](#) are doing a good job of managing complications when they arise. But the more we understand about which patients are at greater risk of complications and the reasons for that, the better equipped we are to make further improvements in perioperative care and this study takes us a long way along that road of understanding."

Note that this paper includes the results from NAP7, which will be published in full on 17 November 2023. The Royal College of Anaesthetists National Audit Projects study rare but potentially serious complications related to anaesthesia. They are intended to examine, report on and drive improvements in practice and are delivered by the Royal College of Anaesthetists' Centre for Research and Improvement. Each NAP focuses on a different topic important to patients and anaesthetists. NAP7 examines perioperative cardiac arrest.

More information: The incidence of potentially serious complications during non-obstetric anaesthetic practice in the United Kingdom: an analysis from the 7th National Audit Project (NAP7) activity survey, *Anaesthesia* (2023). doi.org/10.1111/anae.16155

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