associated with death are inconsistent, because cost can be high, for example with death after many days in the ICU, or low with sudden postoperative death.

How can we reconcile Pearse and colleagues’ study with that by Wunsch and colleagues,1 who looked at variation in critical care services across the USA, Canada, and western Europe? Wunsch identified a substantial difference in ICU admissions, for example a ten-times difference between the USA and Germany, and a seven-times difference between the UK and Germany. The Netherlands, with one of the lowest mortality rates in Pearse and colleagues’ study, was in the lowest rank in terms of availability of ICU beds of the eight countries assessed by Wunsch and colleagues. Such data suggest that quality assurance in surgery relies on several factors, of which the availability of ICU beds is only one. In future studies, we need to learn more about the relevant issues and optimum processes to secure quality. Targets could include the type of intensive care beds needed, volume, university versus community hospitals, and surgeons’ qualifications. Costs for the overall postoperative course would also be key, to allow us to propose cost-effective and relevant corrective measures.

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Should intravenous catheters be replaced routinely?

Currently the US Centers for Disease Control and Prevention (CDC) state that peripheral catheters do not need to be replaced more frequently than every 72–96 h to reduce the risk of infection and phlebitis in adults.1 Although results from some observational studies have shown that the risk of phlebitis rises with increasing catheter dwell time,2,4 other studies have not confirmed this finding.5,6 Catheter replacement trials are frequently limited by study design and small sample size.5,8 Therefore, the study in The Lancet by Claire Rickard and colleagues,8 which compares intravenous catheter replacement in adults every 3 days with replacement when clinically indicated, is a major contribution to this debate. It is a large (3283 patients), multisite, randomised trial with high quality methods, excellent enrolment (97%) and follow-up (100%), and broad inclusion criteria.

The investigators postulated that occurrence of phlebitis and other complications would be equivalent when intravenous catheters were replaced when clinically indicated compared with routine changes every third day. Indeed, the occurrence of the primary outcome of phlebitis was 7% in both groups (absolute risk difference 0·41%, 95% CI –1·33 to 2·15). Rickard and colleagues acknowledge that the non-masking of research nurses was a limitation that could have biased the recording of phlebitis. However, the high quality of this study provides a strong basis for their
conclusion that a fifth of patients will avoid unnecessary procedures when catheters are changed as clinically indicated. Indicative of the realities of a busy acute care setting, 30% of catheters in the routine change group were not changed as frequently as required. Although this nonadherence decreased the difference between groups in catheter dwell times, in view of the costs associated with routine catheter changes, the potential benefits of clinically indicated catheter changes are still very large indeed.3,4,10

Occurrence of phlebitis in this study was low compared with other reports6,7 but within the 1–7% occurrence reported with polyurethane intravenous catheters.3,11 Use of polyurethane catheters, insertion of 40% of catheters by an intravenous insertion team, and daily presence of research nurses at study sites might have contributed to this low level of phlebitis. Factors such as catheter material, insertion procedures, and personnel6,11–13 are associated with an increase in the rates of phlebitis and catheter-related infection. Therefore, the findings of this study might not be generalisable to settings in which different types of intravenous catheters and insertion and maintenance procedures are used.

Because the median catheter dwell time of 84 h (IQR 64–118) in the clinically indicated group is within the CDC guidelines of up to 96 h, some clinicians might argue that these findings are not enough to support a policy of clinically indicated catheter changes for intravenous therapy of more than 96 h. However, there was nothing to suggest an increase in the risk of phlebitis when catheters were used for longer periods. Additionally, no data suggested that patients who required catheters for longer periods were more prone to catheter-related bloodstream infection. A quarter had catheters in situ for more than 5 days with no evidence of infection, and only one person (who was in the routine change group) had a catheter-related bloodstream infection. Although catheter colonisation was 5%, this finding was not associated with bloodstream infection, confirming previous reports that catheter contamination is a poor predictor of infection.14

To prevent complications, Rickard and colleagues emphasise that a policy of resiting of intravenous catheters as indicated must be accompanied by close monitoring and prompt removal of catheters at the completion of treatment and when complications occur.

A major finding of this study was the high proportion of catheter failures, at nearly 30%. The failure of catheters due to infiltration, occlusion, or accidental removal was far more frequent than phlebitis and infection. Therefore, future studies that identify means of prevention of such catheter failures might have even greater implications for cost, reduction of unnecessary invasive procedures, and staff workloads than the present findings.

This is a worthy paper describing a large scale, pragmatic, real-world trial that shows the potentially very large benefits in questioning of accepted practices. Clinically relevant studies such as this one are very important to improve evidence for clinical practice. Discontinuation of unnecessary practices is ever more important when clinical demands and health budgets continue to increase. Since routine replacement of intravenous catheters does not seem to decrease phlebitis and infection, future clinical practice should focus less on routine catheter changes and more on the resources, training, and education needed to ensure the highest level of care in the insertion, maintenance, and assessment of intravenous catheters.

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Ether-based anaesthesia was introduced by William Morton in 1846. General anaesthesia has since been regarded as one of the most important medical advances; it has facilitated life-saving and enhancing surgical procedures and has protected patients from suffering and physiological duress. However, this advance came with a high toll. Until recent decades, there was a substantial risk of adverse events with general anaesthesia, and many patients died. Anaesthetists, recognising the need to prevent devastating complications, established patient safety initiatives and foundations. Examples include the Anesthesia Patient Safety Foundation in the USA, the Australian Incident Monitoring System, and the Safety Committee of the Association of Anaesthetists of Great Britain and Ireland. Safer anaesthetic drugs were introduced, new surgical and anaesthetic techniques were pursued, pulse oximetry and capnography were incorporated into anaesthetic practice, simulation was included in training, and process improvement checklists were implemented.

Daniel Bainbridge and colleagues, using a meta-regression technique, took on the daunting task of reviewing the published medical work on anaesthesia-related mortality, cardiac arrest, and overall perioperative mortality over six decades in countries around the world, and report their provocative findings in The Lancet. They confirm the impression that perioperative mortality, defined as death from any cause within 48 h of surgery, has been steadily declining from an estimated 1.06% (95% CI 1.04–1.08) before the 1970s to 0.12% (0.11–0.12) in the 1990s–2000s. This improvement was noted despite data showing that patients with more severe and uncontrolled morbidities are undergoing surgery today than in the past. Encouragingly, this declining pattern was evident both in developed and in developing countries. Nevertheless, a discomfiting finding is that, over the past six decades, perioperative mortality has consistently been much higher in developing than in developed countries. Furthermore, the decrease in mortality and cardiac arrests has been more extensive in developed than developing countries.

Bainbridge and colleagues’ findings are of considerable interest, and we agree with the investigators that evidence-based interventions should be implemented to mitigate some of the disparities between developed and developing countries. Fortunately, many of the recent gains in patient safety in developed countries are based on process improvement, not expensive technologies. For example, the Safe Surgery Saves Lives Study, undertaken under the banner of WHO, showed that a structured checklist, with simple interventions spanning the perioperative period, could markedly affect mortality and improve surgical outcomes: 30-day mortality among patients undergoing non-cardiac surgery was decreased from 1.5% to 0.8% after introduction of the checklist. This effect was noted across the entire gamut of developed and developing countries.

However, Bainbridge and colleagues’ findings must be placed into a broader context to avoid a sense of complacency in developed countries. All but four of the included studies described deaths that occurred intraoperatively or within the first 48 h postoperatively. This procedure-centric definition belies the reality of perioperative patient outcomes. We know from large epidemiological studies that 30-day all-cause perioperative mortality for patients undergoing a broad range of in-patient surgeries remains between 1% and 2%. There is less information on intermediate-term mortality, but from studies including both high-risk and broad surgical patient populations we can estimate that 1-year mortality is alarmingly high—between 5% and 10%. The logistical and cost challenges of tracking patient outcomes far beyond...