Indeed, survival itself is not even dichotomous, since—like it or not—we are all on an inexorable decline to our ultimate death. Survival is a special form of continuous variable the analysis of which needs to acknowledge that each day one survives is a day less to live.

Perhaps more importantly, while physicians tend to obsess about causes of death, patients care little for such notions. They are likely to be more interested in how long they will live rather than whether they, for instance, died from malignancy or heart failure. Eliminating malignancy-related deaths from our analysis would have been highly artificial and potentially arbitrary.

We agree that the lack of predictive value of the conventional physiological variables for 30-day survival was surprising. But it needs to be noted that just 2.7% of our study cohort died within 30 days of surgery. In essence, death within 30 days is a relatively rare event which makes the task of identifying this small subgroup statistically challenging.

We did not claim that peak VO$_2$ was not predictive of outcome—but rather that there was no evidence it was a superior predictor to sub-maximal exercise data. The anaerobic threshold is undoubtedly related to age, and, indeed, co-dependency exists between many of the CPET variables. An anaerobic threshold of 9 is only ‘normal’ in an 85-yr-old because 85-yr-olds are ‘normally’ unfit. The Bayesian model averaging (BMA) technique efficiently filters-out variable co-dependence. If much of the predictive information of one variable was also contained in another variable, BMA will still identify the most predictive variable. Our results show that most of the predictive information contained in a patient’s age is in fact contained in their fitness data. Specifically, when the trillions of models potentially explaining our data were distilled down to the few hundred very best models via the BMA process, 66% of those models predicted survival without requiring the input of patient age. The unexpected nature of this finding is remarkable, and probably explains the correspondent’s difficulty accepting that it could be true.

The apparent inconsistency of the interpretation of the results of BMA can be explained by the differing contexts in which this topic is discussed. In pure statistical texts, a posterior probability of $<75\%$ is considered weak evidence. However, in perioperative medicine (and indeed most biological fields), it would be considered strong evidence, given the relative weakness of existing evidence. The discrepancy highlights the fact that Bayesian techniques are not commonly encountered in the medical literature. Some of the associated conventions and subtleties do not readily translate from the hardcore statistical realm into the biological sciences. We believe the interpretation of Bayesian posterior probabilities to be one such example.

We felt it important not to look at subgroup co-morbidity. The charge that we should have included co-morbidities into the modelling would be valid had our study found no relationship between CPET performance and long-term survival. On this point, our results speak for themselves. We deliberately did not include these items, and yet still detected a powerful predictive effect. Clearly, this effect may have been even more powerful had they been included, but then readers may have concluded that CPET was adding little to the risk-stratification process. Clarifying the relative contribution of each component would have added a further layer of complexity to the analysis which we sought to avoid.

**Declaration of interest**

None declared.

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**Cardiopulmonary exercise testing**

Editor—Colson and colleagues’ study$^1$ on the predictive power of cardiopulmonary exercise testing (CPET) for 5 yr survival after major surgery found that no single CPET parameter was predictive, and that the parameters measured in CPET were only weaker predictors than general predictors available without CPET. The three major predictors were gender (female in favour of male), type of surgery, and forced vital capacity ratio. These findings are in agreement with survival statistics in general, as regards gender, and with models derived in the past, cited by the authors, with regard to the type of surgery and FVCR.$^2$ It caught my attention that the study brought a surprising result: survival was independent of age. This would seem counter-intuitive. Age is a predictive factor in actuarial calculations for life insurance, and appears in some predictive models, also cited by the authors.$^3$ Would the authors please comment?

**Declaration of interest**

None declared.

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Reply from the authors

Editor—We thank Dr Dolenska for her letter and completely agree that the finding with respect to the predictive value of patient age is highly counterintuitive.

Age is generally accepted as a powerful predictor of survival in many contexts. However, our results would suggest that it is the decline in fitness with advancing age which is the real predictor, rather than age per se.

We do not believe that the finding could be erroneous. Specifically, when the trillions of models potentially explaining our data were distilled down to the few hundred very best models via the Bayesian model averaging process, 66% of those models predicted survival without requiring the input of patient age.

The general linkage between age and fitness makes age a reasonable surrogate for fitness in the absence of fitness data. However, where one has access to such data, it renders age largely irrelevant.

The day may be fast approaching where life insurers require a cardiopulmonary exercise testing before quoting a premium.

Declaration of interest

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Upper limb regional anaesthesia and altered coagulation function

Editor—Recent advances in ultrasound technology have increased the popularity of regional anaesthetic techniques for upper limb surgery. Benefits include good quality perioperative analgesia, enhanced recovery after surgery, and reduced incidence of postoperative nausea and vomiting. Concurrently, the number of patients presenting for surgery, who are on various anticoagulation and antiplatelet medications, has increased. With their significant comorbidities, they pose a higher risk for general anaesthesia. With no specific guidelines for upper limb regional anaesthetic procedures in this patient population, the neuraxial guidelines are generally used as a surrogate. As the risks and long-term sequelae associated with anticoagulation and haematoma formation during these two procedures are appreciably different, this could deny these patients the advantages of a regional anaesthetic technique. In the absence of an evidence base, we decided to perform a national survey among consultant regional anaesthetists in 42 teaching hospitals (online survey) and nine advanced hand centres (postal survey) in the UK with a view to develop a consensus in the practice of upper limb regional anaesthesia in patients with altered coagulation profile.

Survey questions included: range of INR, platelet count, and days for discontinuing clopidogrel before surgery, at which the operator would perform upper limb plexus block, with or without ultrasound guidance.

We received responses from 36 hospitals (86%) and 169 consultant regional anaesthetists. Eighty-four per cent of the responders replied that there were no local guidelines for their use. Sixty-six per cent were willing to perform an upper limb plexus block using ultrasound at an INR > 1.5, while 74% would not perform the block using a landmark technique if the INR was abnormal.

If the patient had not discontinued clopidogrel, 50% responders would still perform the block using ultrasound but only 22% would do so, using anatomical landmarks (Fig. 1).

As long as platelet count was above 50,000, the majority (83%) would perform the block, using ultrasound.

Seventy-seven per cent of the consultants would perform a block on this patient population for day-case surgery. Twelve complications (9 haematomas, 3 nerve injuries) were reported.

These results show a definite change in practice with the introduction of ultrasound for performing upper limb plexus blocks, with the boundaries, defined by the surrogate neuraxial guidelines, being pushed.

This national survey highlights the widespread variation in practice among consultant regional anaesthetists in the management of patients on anticoagulant and antiplatelet medications. The principal factor could be the lack of national guidelines and use of the neuraxial guidelines as a surrogate. The main concern of increased risk of bleeding in these patients could be reduced by the use of real-time ultrasound scanning with colour Doppler, although there is no published evidence to support this. The National Institute of Clinical Excellence (NICE) does advocate the use of ultrasound guidance during regional anaesthesia.1

The American Society for Regional Anaesthesia (ASRA) has recently published a consensus statement on patients receiving antithrombotic medications.2 For patients undergoing deep plexus or peripheral block we recommend that guidelines regarding neuraxial techniques be similarly applied.


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