

31-Oct-2020

BMJ-2020-062268 entitled "Operative mortality of surgeries performed on a surgeon's birthday: observational study"

Dear Prof. Jena,

Thank you for sending us your paper. We sent it for external peer review and discussed it at our recent manuscript meeting, where we considered it for the Christmas issue of the journal. We thought it important and interesting enough to also fit in a regular issue of the journal. There are, however, some important matters that need to be addressed before we can make a final decision about acceptance. We hope you are willing to revise your paper as explained below in the report from the manuscript meeting. Deadlines for the Christmas issue are tight, so ideally you would send the revision back in a week or so if that's possible.

Please remember that the author list and order were finalised upon initial submission, and reviewers and editors judged the paper in light of this information, particularly regarding any competing interests. If authors are later added to a paper this process is subverted. In that case, we reserve the right to rescind any previous decision or return the paper to the review process. Please also remember that we reserve the right to require formation of an authorship group when there are a large number of authors.

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Thanks again for thinking of The BMJ and for your devotion to the Christmas issue!

Sincerely,
Elizabeth Loder

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Report from The BMJ's manuscript committee meeting

These comments are an attempt to summarise the discussions at the manuscript meeting. They are not an exact transcript.

Present: Joe Ross (chair); Tim Cole (statistician); David Ludwig; Wim Weber; Clara Munro; Elizabeth Loder; John Fletcher; Tiago Villanueva; Tim Feeney

Decision: Request revisions for Christmas

* This is a rather large effect, and potentially worrisome.

* We think the hypothesis that surgeons are more distracted on their birthdays is really tricky - you argue that they will try to rush to complete their surgeries earlier. Could we see if there is a dose response effect (ie, more surgeries performed on the day is worse)? We recognise you may not have

time stamps to examine time of day. Perhaps consider a falsification test - how likely is it that this is random chance - could you test their half-birthdays too to see if there is an effect?

* Our statistician noted that Figure 1 is very striking. He also felt that the analysis is comprehensive, with many sensitivity analyses in supplementary tables.

* We wonder why you fit fixed effect rather than random effect models, but don't view this as critical.

* 2064 out of the 980,876 procedures were on the surgeon's birthday. If birthdays and operations are uniformly distributed then this proportion ought to be $1/365$ or 0.27%, whereas the actual proportion is 0.2% or $1/475$, i.e. 23% smaller. This suggests that surgeons are less keen to work on their birthdays. Yet eFigure 3 shows the same number of procedures per surgeon on their birthday as on neighbouring days, and this confuses us. We need to know the distribution of this same prevalence of birthday procedures per surgeon, as it could generate bias.

* Figure 2 could be omitted, and eTable 2 could add a column showing the inverse of the proportion of birthday procedures as $1/nnn$ to compare with the expected $1/365$.

* In eTable 8, why not 2064 birthday procedures?

* Several editors were concerned about borderline p-values (and attendant risk for Type 1 error), and thought we need more information on a number of things, including confounding by "surgeon mix". Some surgeons will care about working on their birthday and will be organised enough to plan ahead or be confident or senior enough etc to actually book the time off. Some won't for whatever reason and it seems possible that the surgeons who actually work on their birthdays may be systematically different to those who do not work on their birthdays. A design that skirts this problem would be to compare each surgeon's mortality rate on their birthday with their mortality rate on other days. This design also addresses more directly the RQ "Do individual surgeons perform differently on their birthdays?" At the moment the study answers the question "Do patients operated on by a doctor who works on their birthday fare differently?"... not quite the same. You say they have adjusted for individual surgeon (that's an awful lot of indicator variables) and maybe this goes some of the way to addressing this but we weren't sure. Can you comment?

* Can you provide information on surgeons' characteristics, e.g. are younger or female surgeons more likely to take a day off for birthdays? (Earlier papers showed that these had lower mortality rates too). Are "better" doctors more likely to be in a position to take their birthday off?

* The distribution of birthdays had several outliers, including January 1, which would have emergency procedures only. We are concerned about the accuracy of birthdates, noting bunching on several dates that seems improbable. Can a subset of birthday dates be checked in some way, for example with the doximity database? Could this skew the results? As the denominator in the birthday procedures is not that large, you only need a few procedures going wrong to get a difference.

* Our statistician commented that this is a natural experiment and as such we can't argue with the design but we can worry about bias. He suggested that there may well be bias operating in the way surgeons conduct surgery on their birthday but it seems perfectly clear that mortality is raised. Because it's a natural experiment many of the biases we can think of don't exist and this raises the possibility that relatively minor distraction is sufficient to have an impact on mortality.

* Can you say more about why a birthday is such a distracting event? A surgical trainee at the meeting noted that "This is very topical. Human factors and distraction in the OR is a huge topic." She thought more focus on elective vs emergency surgery would be important, since that has an effect on 30 day mortality. She also wondered about the focus on mortality rather than complications, as she thought surgical complications would be a more common outcome with distraction.

* You attribute mortality to the lead surgeon, but often there are assistants, including trainees. Might it be the case that surgeons trying to get home for a birthday celebration will allow trainees to do more during the surgery in order to shorten the time, or will scrub out and leave junior assistants to finish?

* A surgeon on the committee comments that before covid surgeons often had their phones in the OR and that messages, especially birthday messages, could be distracting. During covid phones are no longer allowed.

* Your model has a lot of dummy variables. On the one hand does that reduce power. The p values are borderline for such a large database, so we are at risk for a type 1 error here.

* Can you tell us more about model 3, for example how many surgeons were in it?

* Another editor thought the analysis might be more convincing if you stick to the clear emergency surgeries.

In your response please provide, point by point, your replies to the comments made by the reviewers and the editors, explaining how and where you have dealt with them in the paper.

Comments from Reviewers

Reviewer: 1

Comments:

Comments to authors:

1. Types of surgery, characteristics of hospital, characteristics of surgeon, and more coexisting medical conditions (such as ischemic heart disease, stroke, and liver cirrhosis) should be considered in this study. These factors are potential confounding factor for the association between surgeon's birthday and mortality risk.

2. How about the ROC curve for the surgeon's birthday and mortality risk?

3. Please use logistic regression to calculate the risk of mortality associated with surgeon's birthday and show the OR (95% CI).

4. Please show the IRB number of this study. It is very important whether this study was approved by the institutional review board.

5. Please do a competing risk analysis.

6. The discussion section should more fully discuss how to propose these results be implanted in clinical practice.

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Reviewer: 2

Comments:

Thank you for sending me this interesting and thought provoking paper for comment. I have a few suggestions which I hope will prove helpful.

First, the paper is rather well described and thoroughly analysed, although some uncertainties remain on exactly what was done. Specifically the authors refer to a window around the birthday of the surgeon, and separately refer to the actual date of the birthday; please clarify what is done here as this is pretty crucial to the interpretation (it is not realistic to think that an event 13 days after a birthday is really distracted by that birthday in mature adult surgeons). On the basis of the mortality rate denominators described in the paper it seems clear that they used the actual day, so that the description needs to be clearer.

Second, the authors mention 'trends to significance' in the results section. This should be removed and replaced with less deterministic language (eg describe what is actually there rather than what might be achieved in a bigger study).

Third, the logistic models are over fitted (given the number of deaths, the number of surgeons and the other patient level explanatory variables) and they should be removed. The alternative of fitting surgeons as random intercept terms could be considered but it is unclear that this will add anything very much.

Fourth, the table on type of procedure is rather important (e9) and might be happier in the main paper. It is quite striking to the untutored eye that a couple of clearly acute procedures (eg fracture of hip / femur and appendectomy) both have no difference, while the others often have quite a bit difference. The authors really should pull out the acute events and compare them with the planned ones. They discuss it but it should be available for all admissions. There may be a latency that less severe cases are avoided (we can imagine the way that this might happen) and only the more urgent are done. This would mean that subjects within any characteristic would be more severe in an unmeasured way which is a form of confounding by indication. This clear mechanism and potential latency in their analysis should be described as a possibility (They could refer to Ian McEwan's Saturday where a surgeon at UCLH does an operation when we might consider that they could be distracted) anyway a full discussion on this potential bias is very important and it could easily explain the results. Related, the comment in the discussion that patients are alike on observed characteristics between birthdays and non birthdays misses the point that it is these unobserved differences that lead to confounding by indication. Thank you again for sending me this interesting paper for comment.

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Reviewer: 3

Comments:

This interesting paper examines a novel idea: whether outcomes are worse when surgeons operate on their birthdays. The study design is in essence an event-study approach which examines mortality on a surgeon's birthday compared to the days surrounding the birthday. Figure 1 provides suggestive evidence that outcomes are worse on the surgeon's birthday, as there is increased mortality on the surgeon's birthday but not on subsequent days. It is an interesting paper and I would suggest the following revisions:

- 1). The authors don't seem to have adjusted for the type of surgery (i.e., surgical procedure). The data they are using should have the surgical CPT code and so perhaps to could include procedure fixed effects in their models.
- 2). To further minimize confounding, a difference-in-differences approach could be used. In essence, for a given day, the approach would compare mortality for surgeons having a birthday on that day vs., surgeons who do not (i.e., May 15, 2015 is a birthday for some surgeons and not for others). This approach could be implemented by using date effects (i.e., a dummy for May 15, 2015). However, this might not be computationally feasible given the large number of days so perhaps an alternative would be to use week fixed effects (i.e., a dummy for the week of May 15, 2015).

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