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Lecture Abstract : 2013 Conference

Introduction

"If the function of a hospital were to kill the sick, statistical comparisons of this nature would be admissible"

Mortality is not a particularly sensitive measure of quality of care: most patients survive the postoperative observation period, whilst perhaps a substantial proportion of the deaths that do happen are not associated with poor care. We should concentrate on the living, not the dead, on health rather than disease. Unfortunately, information on how good or bad surgery is for people is scarce in comparison with mortality. This talk therefore discusses how to estimate the chance that someone will die and how much this might change following surgery; but in doing so we might reflect on Florence Nightingale's observation that mortality is only an excellent measure of performance for those trying to kill.

In the United Kingdom the middle of the nineteenth century witnessed the confluence of a number of factors that catalysed the publication of mortality statistics for hospitals: the appointment of a Registrar General Office and the standardisation of death certification; the classification of diseases; the alignment of city hospitals with Universities and a scientific discipline; and the import by Florence Nightingale of policies that had reduced hospital mortality in the Crimean war. Florence Nightingale's "Notes on hospitals", published following a presentation to the Social Science Association in 1858, remarked, "accurate hospital statistics are much more rare than is generally imagined, and at the best they only give the mortality which has taken place in the hospitals, and take no cognizance of those cases which are discharged in a hopeless condition, to die immediately afterwards, a practice which is followed to a much greater extent by some hospitals than by others".

And so, in an attempt to avoid hospitals manipulating survival data, '30-day mortality' rates were born, based upon the synodic* period of the moon's orbit around the earth. This arbitrary but set follow-up period is superior to that confined to hospital admission, in part because there are more deaths, so one is more likely to be able to discriminate between different mortality rates. For instance, the 30-day mortalities for myocardial infarction, pneumonia and heart failure are twice the in-hospital mortality rates. The performance of hospitals in the US has been measured with in-hospital mortality, which has favoured hospitals with shorter lengths of stay: unsurprisingly, more patients die the longer you watch. Shorter hospital stays have generally shifted deaths from the hospital to the community: the mean length of hospital stay for heart failure fell from 8.6 to 6.4 days between 1994 and 2006, with the in-hospital death rate falling from 8.2% to 4.5% and the community death rate rising from 4.4% to 6.3% (to 30 days after admission). It is therefore unfortunate that EuSOS, the only large prospective international epidemiological study of unselected surgical patients, used in-hospital mortality as the primary outcome, which reached 3% for elective surgery, 5% for urgent surgery and 10% for emergency surgery.

In that study 60-day mortality was at least twice the 30-day postoperative rate. EuSOS is not the only study to suggest that elective surgery can increase mortality for at least 60 postoperative days. The 30-day mortality in the study by Khuri et al. was also 3%, after which mortality appeared to be elevated for another 1 to 5 months across a range of operations. The interpretation that surgery elevated postoperative mortality beyond 30 days was based upon 'inflection' points in the survival curve. Visual inspection of survival curves is an appealing technique, but it fails to quantify the magnitude to which surgery increases mortality, as well as being susceptible to subjective interpretation. The other feature of that study was the importance attributed to postoperative complications as a determinant of subsequent mortality, both at 30 days and beyond. In another study the excess mortality caused by injury took up to 6 months to resolve, although 90% of that excess was exhausted within 60 days of injury.

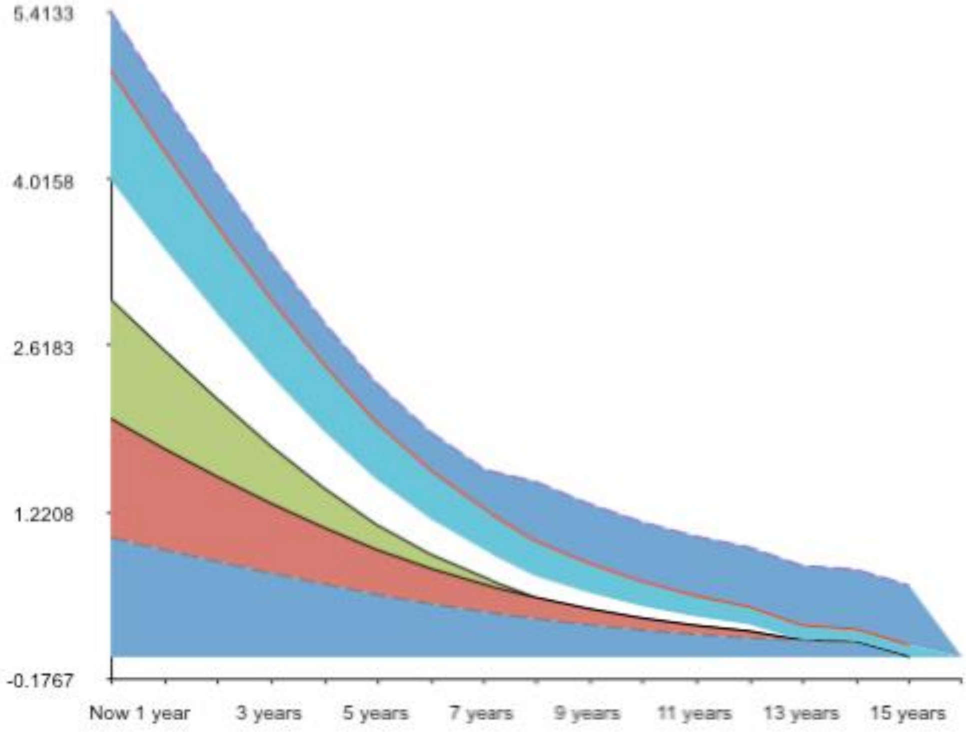
I currently hold the following views:

- The survival curve – the 'baseline' – against which postoperative mortality should be compared is that expected without surgery;
- This comparison should extend years after surgery, on the basis that comparisons up to six postoperative months might unduly emphasise iatrogenic death;
- The baseline survival curve should be adjusted for: year-on-year changes in the survival of the general population; patient variables that affect average population survival, but only that part that is independent of other variables included in the model; variables that are widely measured, so that extraordinary measures do not need to be taken to generate the curve; variables that are not susceptible to large temporary fluctuations;
- We must couple a system of assessment and preparation with prolonged follow-up of patients with surgical pathology, whether or not they have surgery, to determine the effect on life of the pathology and the treatment. Evidence from randomised controlled trials will give these observational data a reliability that the comparison, surgery vs. conservative treatment, would otherwise lack.

My calculator can be downloaded in Excel format from
https://sites.google.com/site/informrisk
or from https:
//www.dropbox.com/sh/i57xhrtyop0pq31/AACEvMTOPRzdMEQnhLbCL2G8a?dl=0

I have developed a spread sheet that will generate a background survival curve i.e. a curve that does not incorporate the effects of surgical pathology, but it does attempt to incorporate the effects of treatment. This deficiency – the failure to adjust for direct effects of surgical pathology – is unfortunate because our main purpose is to inform patients of expected survival with and without surgery. One might expect that most surgical pathologies would not affect survival, for instance inguinal herniae, hip or knee osteoarthritis and so on. However, one can also imagine how this assumption might be incorrect. Unfortunately there are very little data on what happens to patients who don't have surgery, mainly because their follow-up has not been a priority compared to patients that clinicians have treated. I have attempted to generate survival curves for patients with abdominal aortic aneurysms (AAAs), based upon the same sources that surgeons use to justify operating. However, I'm not confident that these estimates of AAA leakage and mortality are accurate.

1. **Average survival: UK Interim Life Tables**
   http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=...
   The calculator first looks up the average mortality for a person the same age and sex as your patient.
2. **Comorbidities**
   The calculator then adjusts this figure for each of six diagnoses (MI, angina, stroke, TIA, heart failure, peripheral arterial disease).
3. **Renal function**
   The calculator then adjusts for eGFR.
4. **Physical fitness**
   The final adjustment is for physical fitness.



These are survival curves generated by the calculator for a 75 year-old man (172cm, 65kg), previous MI, eGFR 55, who has a 5.5cm diameter AAA. Curves are with open AAA repair (red) or without surgery (grey zone).

References

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*There are four orbital periods: sidereal; synodic; draconitic (or draconic); anomalistic. The lunar synodic period is 29.53 days, the lunar sidereal period is 27.32 days.

Recommended Reading

Pre-operative comorbidity and postoperative survival - beyond one lunar orbit.pdf
Assessing fitness and outcome.pdf
Preoperative assessment in high risk clinic with survival.pdf
http://www.perioperativemedicinejournal.com/