What happens to the high risk patients who don’t die?

Perioperative SIG meeting PBLD Noosa 2015

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In the process of writing this problem based learning discussion I have read a reasonable number of articles on the topics of long term postoperative survival, quality of life and recovery after surgery. I have also been into the frailty literature.

Below is summarised some of the tools and papers that are worth looking at if you have an interest in the area.

**Tools for estimating mortality and complications**

1. **Surgical Outcome Risk Tool (SORT)**

Built from an NCEPOD study “Knowing the Risk”. See paper below explaining evolution.

Accessible at [www.sortsurgery.com](http://www.sortsurgery.com)

**Development and validation of the Surgical Outcome Risk Tool (SORT). Protopapa et al. BJS 2014; 101: 1774-1783.**

Used data from NCEPOD Knowing the Risk study. Data from 19,097 patients from 326 hospitals in UK collected over 7 days. 2309 excluded due to criteria or missing data leaving 16,788.

Aimed to develop a risk tool to predict 30 day mortality after non-cardiac surgery. Used logistic regression.

Model comprised of 6 variables

- ASA
- Urgency of surgery
- High risk speciality (GI, thoracic, vascular)
- Surgical severity
- Cancer
- Age 65 years +
2. **American College of Surgeons Surgical Risk Calculator**

Often referred to as the NSQIP calculator

Developed by the American College of Surgeons from NSQIP (National Safety and Quality Improvement Project) data.

Built using >1.4 million operations and data from 393 hospitals participating in NSQIP from 2009-2012. Uses surgical operation code and 21 patient predictors

Provides estimates of 30 day mortality and complications

Freely accessible online

www.riskcalculator.facs.org

3. **POSSUM score**

Often used in the literature and quoted by surgeons. Needs preoperative and intraoperative data. Means it doesn’t work as a good preoperative tool as you have to estimate intra-operative data.

See different nomenclature for the POSSUM scores for different types e.g. v-POSSUM for vascular surgery etc.

www.riskprediction.org.uk provides online versions for colorectal, oesophagogastric, vascular and general surgery.

Long term mortality and the impact of complications

There is evidence that surgery alters a patient’s mortality trajectory for a prolonged period and this can persist for months to years, particularly if they suffer perioperative complications.


Landmark study of its time showing long time implications of surgery and postoperative complications.


- Nonruptured AAA
- Infra-inguinal vascular reconstruction
- Carotid endarterectomy
- Colectomy
- Open cholecystectomy
- Laparoscopic cholecystectomy
- Lobectomy/pneumonecctomy
- THJR
Calculated 30 day, 1 year and 5 year mortality with and without postoperative complications.

Independent of preoperative risk, any complication within 30 days reduced median patient survival.


Cohort of 1362 patients from a single centre in the UK

Gives discharge, 30 day, 1 and 5 year mortality.

Excluded patients dying within 15 days of operation from survival analyses.

Risk factors associated with reduced long term survival

- Age
- Cancer history
- P-POSSUM
- General or vascular surgery
- Postoperative neurological morbidity
- Morbidity persisting after 15 days

Showed that prolonged postoperative morbidity (>15 days post surgery) associated with increased risk of death up to 3 yrs.


An excellent commentary on how we should be thinking about postoperative recovery.

Recommended read as is thought provoking.

Main concepts:

- Most patients survive the postoperative period. Mortality is an insensitive measure of care.
- Elderly patients have a certain hazard of dying related to their age “One’s mortality hazard – the risk of dying this month – is inextricably linked with one’s survival trajectory”
- Purpose of risk estimation
  - Reduce morbidity and mortality
  - Using data to distribute resources more rationally
  - Create a context in which patients can determine their own fates through collaborative decision making
- Perioperative interventions assume that they will have a larger absolute effect on patients with a higher mortality risk. Should actually think in terms of change in mortality risk.
- 1 month mortality risk is of almost no use to patient in decision making. They need to weigh up risk and benefit.
- Postoperative mortality remains elevated beyond 30 days
  - EuSOS and a US study give an overall 30 day mortality rate of 3% - both studies showed a persistent effect past this.
Scheduled surgery increases mortality, sometimes for more than 3 months, with the survival curve taking more than 1 year to equal survival of patients who have not had surgery.

- Should measure survival and quality of life months and years after surgery
- “the elderly do not have many years of life left to lose, with median life expectancy of 3.5 or 5 years (fig 1) but are at considerable risk of high postoperative mortality and lost function and lost independence”
- Has developed a calculator with 4 variables
  - Average survival
  - Co-morbidities (MI, angina, stroke, TIA, heart failure, PVD)
  - Renal function
  - Physical fitness

**Functional recovery**

Surviving surgery is only the beginning, returning to or improving premorbid function is the true goal of most patients. Recently this area has become of interest with researchers exploring recovery trajectories of survivors, looking at quality of life measures.


Introduces concept of using WHODAS in the perioperative setting.

Prospective observational cohort study. 510 patients 18 yrs. or over, intermediate or major non-cardiac, cardiac or non-elective surgery.

Used WHODAS and a number of other quality of life/recovery scales. Gives a good description of all the ones used (WHODAS, QoR-40, EQ5D, Katz ADL and modified Brief Pain Inventory)

Defined disability as WHODAS > 25% and new disability as an increase of >8%.

Those with new disability had

- Longer hospital stay (median 6.89 vs 5.34 days)
- More likely to have a complication (20% vs 11%)
- Complications varied in effect on disability
  - Decrease with postop MI
  - Increase with stroke

Overall disability free survival

- 72% 30 day
- 74% 3 months
- 80% 6 months
- 76% 1 year

Pattern of recovery varied due to ASA. ASA 3 and 4 patients had a more delayed recovery with significant recovery not happening till 3 months and a plateau at 6 months.

223 patients 75yr +. Japanese multicentre study (29 hospitals)

1 year survival 92.1% - 3 died of cancer, 10 of other causes
28.3% had major postoperative complications

24% had decline in ADL at 1 month.

QoL declined after surgery but recovered by 3-6 months

Authors believe that most patients are unlikely to develop a mid to long term decrease in ADL after they survive the perioperative period.


Followed up survivors of prolonged ICU stay (>5 days) after cardiac surgery.

194 patients out of a total of 1859 patients who underwent cardiac bypass in a single centre

17 (8.75%) died within 30 days (compared with 2.0% of those stayed less than 5 days)

19 died during follow-up

- Cumulative 1 year survival 84.6%
- Cumulative 2 year survival 80.9%
- Cumulative 3 year survival 75.1%

Quality of life at 1 year

- 80% better condition than preoperatively
- 11.5% no change
- 8.5% degradation

At 1 year

- 89.4% lived at home without assistance
- 6.4% lived at home with help of relatives
- 3% lived in nursing homes
- 1.2% remained hospitalised

Frailty

Frailty is an interesting concept. There is no firm definition but most people refer to the frailty phenotype developed by Fried et al listed below.

I see measuring it in an objective way to be potentially useful to be able to document your impressions in clinic and communicate your concern to medical and surgical colleagues.

A review of frailty.

Explains frailty is a strong predictor of postoperative complications, institutionalisation and death independent of comorbidities and functional disability.

**Frailty in Older Adults: Evidence for a Phenotype. Fried et al. Journal of Gerontology 2001. 56A: M146-156.**

Developed frailty phenotype using theoretical framework and the Cardiovascular Health Study. The CHS was a study of 5,317 men and women >65 yrs., followed up for 4-7 years from a number of US states.

Used theoretical framework to come up with phenotype.

Most frailty assessments are based on this concept.

**Accumulation of deficits with age and possible invariants of aging. Mitnitski et al. Scientific World journal 2002. 2:1816-1822.**

Discusses concept of the frailty index as an accumulation of deficits.

Used National Population Health study from Canada.

The other concept of frailty.

Would be more difficult to calculate – would need algorithm.


Discusses frailty concepts and the literature - associated with increased risk of postoperative complications after both cardiac surgery and major noncardiac surgery.

Discusses slow gait speed as a surrogate clinical marker of frailty. Also suggests timed get up and go (TUG) test, chair rise and stair climb.


Studied Timed Up and Go Test in elective colorectal and cardiac operations. Denver VA medical centre.

Patients 65yr + undergoing elective colorectal or cardiac operations. TUG test done preoperatively. Grouped as fast (≤10 sec), intermediate (11-14 sec), slow (>15 sec).

Slower TUG test associated with increased 1 year mortality.
Authors comment that it provides a quick and simple way of stratifying preoperative risk in older persons. Saves time compared to comprehensive geriatric assessments.

**Addition of Frailty and Disability to Cardiac Surgery Risk Scores Identifies Elderly Patients at High Risk of Mortality or Major Morbidity. Afilalo et al. Circ Cardiovasc Qual Outcomes 2012; 5:222-228.**

Prospective cohort in US and Canada 2008-2010 (4 hospitals)

152 consecutive patients 70 yrs. + undergoing CABG and/or valve surgery

Measured 4 frailty, 3 disability and 5 cardiac surgery risk scores

Primary Outcome: Composite of in–hospital mortality or major morbidity

Most predictive scale for frailty was 5 metre gait speed >6 seconds.

Mean frailty scores higher in group of patients that had a major morbidity or mortality.

Authors comment in discussion that 5 metre gait speed outperforms more complex scales in previous studies. Has advantage that is objective.


594 patients 65yr+ presenting to John Hopkins Medical Centre for elective surgery over a 1 year period July 2005-July 2006.

Standardised preoperative interview and frailty assessment.

Used 5 point scale based on Fried phenotype (Fried was an author)

10.4% were frail and 31.3% were intermediately frail.

- Frailty was an independent predictor of complications.
- Frailty increased length of stay
- Frailty increased risk of discharge to a care facility