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# Is length of stay a reliable efficiency measure?

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Length of stay (LOS) has traditionally been used as a measure of the efficiency of acute care. Hence decreasing LOS is good while increasing LOS is 'bad'. Some years ago I proposed that LOS may actually show cycles (Jones 2009), and that the trends in LOS in other countries show evidence for unexplained fluctuation (Jones 2010b). Particular diagnoses also show far higher volatility than others (Jones 2010b)

In the light of these observations Fig. 1 shows the change in deaths (all-cause mortality), admissions, bed days and LOS for admissions to the medical group of specialties in Belfast between Jan-06 and Dec-09. Evidence has been presented elsewhere for a suspected disease outbreak affecting the whole of Northern Ireland which commenced somewhere around the middle of 2007 (Jones 2010b). Does Fig. 1 support this assertion?

Firstly, Fig. 1 is based on the analysis of running 12 month totals (or bed days divided by admissions for LOS) and in a running total a step-like change will show as a ramp, where the onset of the step-change is at the foot of the ramp and the magnitude of the change is revealed at the top of the ramp 12 months later. If the cause of the step-change is removed a step-down (as a ramp) may then ensue.

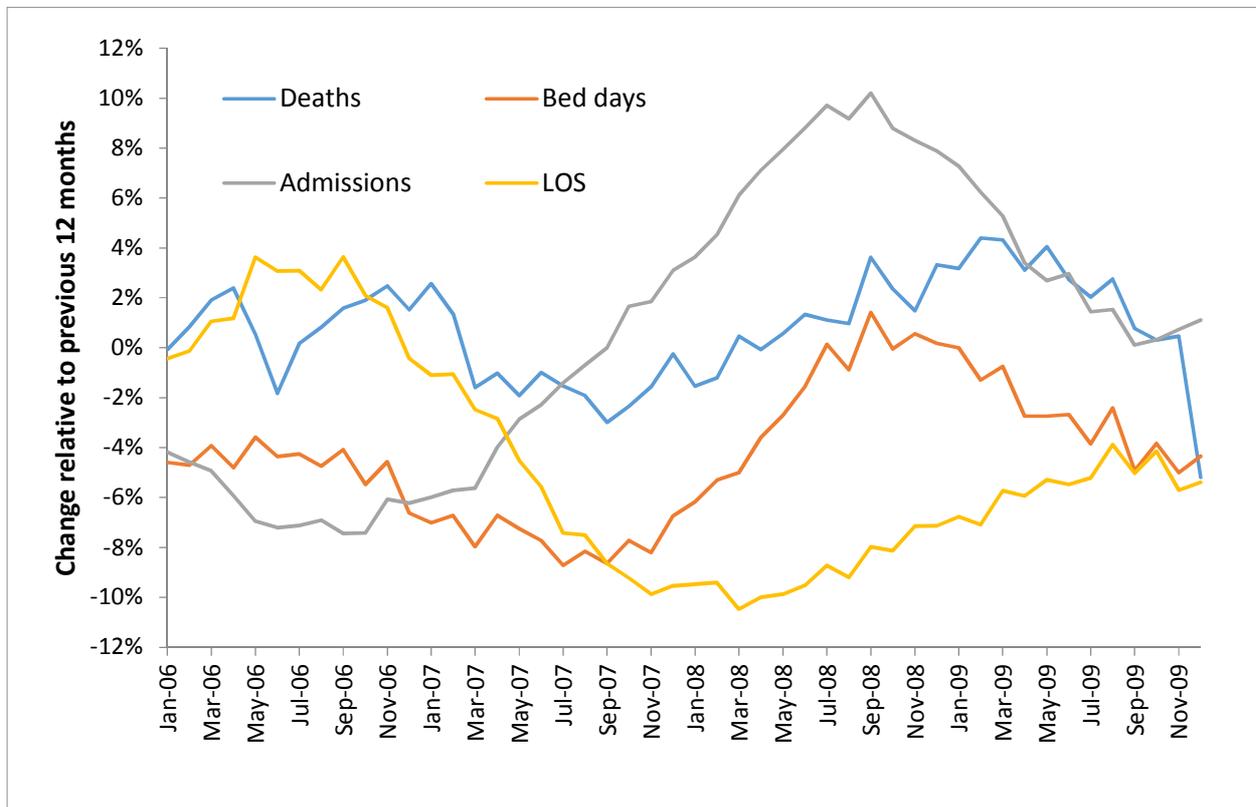
In Fig. 1 a large (and unexplained) step-increase in admissions is clearly seen commencing around May of 2007. This step-like change in admissions leads to 10% higher admissions in every month from May-07 through to Sep-08 after which admissions step down to the underlying trend. Somewhere around one to two months later deaths show a similar step-like increase while bed days increase around the same point that deaths increase.

The actual effect upon LOS is complicated by the fact that average LOS in Belfast commences a longer-term trend downward in 2006 as measures to reduce LOS were introduced across the whole of Northern Ireland. Hence the step-change in LOS appears to occur later than in reality

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and its magnitude is diminished by underlying LOS initiatives. Never the less LOS shows a step-like change as do all the other parameters.

**Figure 1: Relative change seen in a running 12 month analysis**



Footnote: Monthly admissions and bed days for the medical group of specialties kindly provided by the Northern Ireland DHSSPN while monthly deaths are from the NI Statistics and Research Agency.

Admissions probably contain a time cascade of conditions/complexity and never fully return to the base-line position after deaths have dropped back (Jones 2015b). This event seen in 2007 in Belfast swept across the entire UK with deaths for the UK as a whole peaking in the 2008 calendar year (Jones 2015a,b) – which has never been officially explained. In England, the resulting semi-permanent rise in medical admissions ushered in the 70% reduction in the tariff for emergency admissions (Jones 2010a). These events can be traced back to the 1950's and have occurred as recently as 2014 (Jones 2015a,c). All of these events show small- and large-area infectious-like spatial spread (which is both national and international) along with gender, age and condition specificity (Jones 2014a,b, 2015a-e).

Also clearly seen in Fig. 1 is the fact that the 2007/2008 event had a far greater effect on morbidity than mortality, which is in accord with current understanding of these events (Jones 2015a,b)

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Hence while LOS is a useful measure of efficiency it is subject to forces which are sometimes outside of the control of a hospital. Periods of unexplained higher deaths, admissions and bed days result in temporary increases in LOS, and appear to arise from an unknown infectious outbreak. Knock-on implications to NHS costs should be obvious.

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