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Limitations of the HRG Tariff: The trim point

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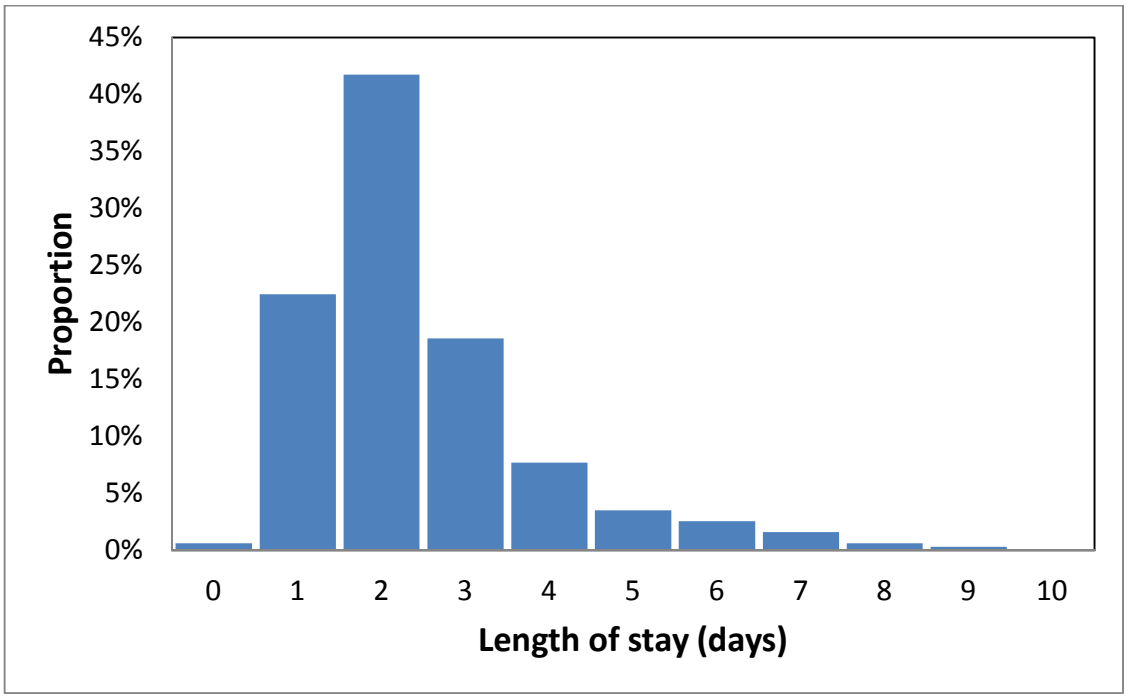
The upper length of stay (LOS) trim point is central to the operation and calculation of the HRG tariff. The upper trim point is defined as the LOS at which 25% of admissions have a higher LOS (third quartile) plus 1.5-times the difference between the third and first quartile LOS (IC 2005). The difference between the first and third quartile is called the inter-quartile range (IQR) and is a measure of dispersion. The IQR for a normal (symmetric) distribution is around 2 standard deviations and so the upper trim point would be 3 standard deviations higher than the average, hence the rationale for the formula.

Figure 1: Typical length of stay distribution for a HRG within a specialty. The average LOS is 2.5 days.

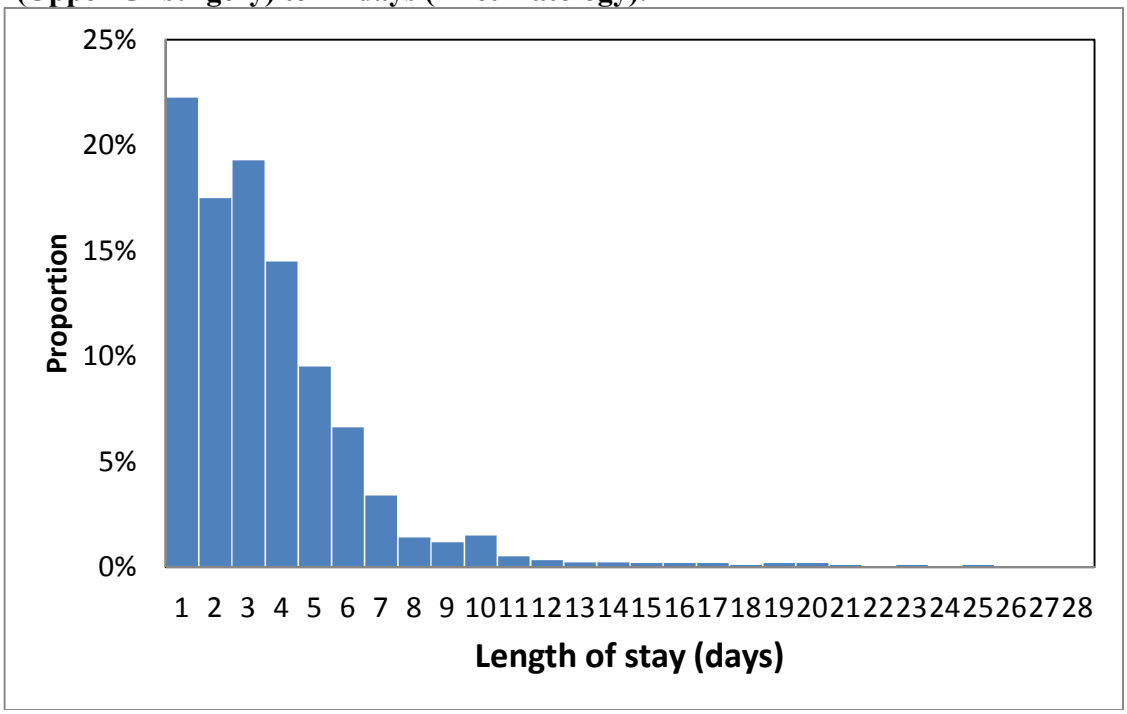


The tariff is broken into two parts. For any LOS below the upper trim point the basic tariff applies. If the LOS exceeds the upper trim point then each day is paid at the excess bed day tariff. The first article in this series demonstrated that the national average cost

for an excess bed day depends on the specialty rather than the HRG (Jones 2008a). A simple ratio of excess bed days per 100 bed days within the trim point was also used to demonstrate that the specialty also strongly influences the overall level of excess bed days. The average cost of a HRG for the 'within trim' portion of the tariff also has a strong specialty-specific dependency (Jones 2008b) as does the average LOS (Jones 2008c). At this point we need to ask the fundamental question, is it possible that the trim point is merely an artifact contingent to ignoring the specialty-specific elements of both cost and LOS?

Firstly, how many specialties are there in the average V4 HRG? The minimum is just one specialty per HRG and this only applies to 3.4% of elective HRG. The average is 16 specialties per elective HRG; however, 41% of HRG contain 17 or more specialties. Some 3.3% contain greater than 40 out of a maximum possible 98 specialty codes, i.e. it is very much the norm to have multiple specialties per HRG. This is all well and good if the average LOS is similar across all specialties – which are not the case (Jones 2008c).

Figure 2: LOS distribution for HRG FC07C (Inflammatory bowel disease) which occurs across 28 specialties with an average LOS (per specialty) ranging from 1(Upper GI surgery) to 21 days (Rheumatology).



To understand the effect on the tariff we need to investigate the nature of LOS and how this will interact with the formula used to calculate the trim point. Unlike a Normal distribution all LOS distributions are highly skewed. Figure 1 demonstrates a typical LOS distribution with an average LOS of 2.5 days. Applying the formula for an upper quartile gives 8 days and hence 1.1% of admissions are deemed to be above the upper quartile.

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This works out at a very reasonable 3.9 excess bed days per 100 bed days within trim point. This is far lower than the average of around 15 to 25 for both V3.5 and V4 HRG which are formulated by ignoring the specialty-specific nature of LOS (and cost). However, imagine that in the following year one person who would have otherwise stayed one day develops a rare complication and stays 30 days. The upper trim point would show a small increase but the ratio of excess bed days per 100 bed days in trim would show a large increase. HRGs with less than 100 admissions will be far more sensitive to these small changes, i.e. V4 is far less stable by virtue of roughly half the number of admissions per HRG.

Now imagine we have a HRG made up of 28 specialties with an average LOS ranging between 1 and 21 days, i.e. 28 distributions of different magnitude and shape are jumbled together. This gives the equivalent to Fig. 2 which is multi-modal (i.e. peaks at 1, 3, 10 days) due to the peaks from the underlying specialties; has a lower maximum proportion and has a far longer tail. In this case the calculation of the upper trim point becomes an artifact of ignoring the underlying specialty-specific nature of the HRG and the long tail significantly increases the proportion of excess bed days per 100 bed days in trim.

Our next question needs to be, how will this affect the transition from HRG V3.5 to V4? By virtue of the doubling of HRG from V3.5 to V4 we can surmise that the calculation of the trim point at HRG level will become far more unstable and show increasing specialty dependence with a resulting longer tail of admissions falling into the trim point. Indeed this is the case and Table 1 clearly shows that at specialty level the transition to V4 has been marked by huge swings in the number of excess bed days per 100 bed days within trim. It is only when the data is summed up to specialty level can the true significance of the shifts be demonstrated.

The transition has also been marked by an overall shift to higher volumes of excess bed days. This has several effects. Firstly, particular specialties are now paid for via a different proportion of total cost within the excess bed day arena. For example, Pain Management has a 29% reduction in elective excess bed days but a 29% increase in emergency excess bed days. This acts to shift the basis on which Trusts are paid and may lead to unforeseen changes in income for Trusts with an emphasis on particular specialties. In this respect on a national level greater than £185M and £35M has been moved out of the standard emergency and elective tariff respectively and is now dependant on the excess bed day tariff. These higher sums of money are far more dependent on small number chance events rather than systematic processes, i.e. potential income is at a far higher level of risk. These changes have almost certainly led to some of the unexplained shifts in the calculated Reference Cost Index (RCI) for Trusts based on the 2006/07 data. The change also gives a perverse incentive to increase LOS in those specialties where the average is close to the upper trim point for the HRG! Lastly, it leads to an incentive to create admissions in specialties where the LOS is far lower than the overall HRG average in order to gain financial benefit.

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Table 1: Ratio of excess bed days per 100 bed days within trim for both V3.5 and V4 HRG at specialty level.

Specialty	Elective			Non-elective		
	Ratio			Ratio		
	V3.5	V4	% Change	V3.5	V4	% Change
All Admissions	10.0	13.0	56%	16.8	21.9	35%
General Medicine	29.1	38.3	32%	19.6	26.4	35%
Geriatric Medicine	68.3	80.0	17%	30.2	39.3	30%
Trauma & Orthopaedics	8.2	8.2	-1%	17.4	22.6	30%
General Surgery	7.9	10.0	27%	14.9	16.8	12%
Obstetrics & Midwife	n/a	n/a	n/a	10.1	12.3	22%
Paediatrics	30.9	36.3	17%	15.5	18.6	20%
Cardiology	11.0	14.5	32%	18.6	24.6	32%
Urology	7.0	8.2	18%	20.5	21.2	4%
Gynaecology	5.3	5.1	-5%	12.0	10.7	-11%
Respiratory Medicine	14.6	15.2	5%	18.0	18.0	0%
Gastroenterology	20.1	18.4	-8%	18.4	21.0	14%
Oncology & Radiology	14.4	13.9	-3%	19.3	18.8	-3%
Clinical Haematology	29.9	30.5	2%	29.9	31.6	6%
Nephrology	23.8	63.2	165%	32.8	37.0	13%
ENT	9.0	17.6	96%	23.0	24.3	5%
Neurosurgery	9.1	16.0	76%	20.4	27.5	34%
Neurology	24.3	30.6	26%	43.6	59.0	35%
Plastic Surgery	9.8	13.7	40%	13.1	18.2	39%
Vascular Surgery	10.2	11.0	7%	20.5	20.6	0%
Cardiothoracic Surgery	7.5	5.9	-20%	16.3	14.1	-13%
Accident & Emergency	5.7	20.6	261%	5.7	8.2	44%
Rheumatology	21.2	35.2	67%	30.0	37.6	25%
All Others (inc Spinal)	19.5	295.3	1416%	26.2	568.7	2070%
Cardiac Surgery	6.4	10.6	65%	15.0	20.4	36%
Ophthalmology	12.0	19.5	63%	20.8	25.8	24%
Colorectal Surgery	10.6	12.9	22%	16.6	19.7	19%
Infectious Diseases	20.3	23.3	15%	24.1	24.9	3%
Diabetic Medicine	16.8	18.2	9%	15.6	21.5	38%
Endocrinology	15.8	16.5	4%	19.3	20.7	7%
Paediatric Surgery	9.1	9.4	3%	25.6	27.4	7%
Oral & Dental Surgery	18.9	21.9	16%	15.4	11.7	-24%
Dermatology	20.2	60.3	199%	27.8	43.3	56%
Thoracic Surgery	5.8	8.4	44%	10.8	18.4	70%
Palliative Medicine	33.1	49.2	49%	23.7	42.9	81%
Upper GI-tract Surgery	7.4	20.5	179%	18.1	26.6	47%
Hepatology	17.6	21.7	23%	25.1	19.2	-24%
Neonatology	18.7	15.6	-17%	17.8	54.7	208%
Breast Surgery	3.7	5.0	36%	12.7	15.6	23%
Hepato/Pancreatic Surgery	7.9	15.4	95%	21.7	19.3	-11%
Gynaecological Oncology	18.6	9.2	-50%	20.7	23.8	15%
Maxillo-Facial Surgery	16.0	22.3	39%	16.0	14.4	-10%
Paediatric Cardiology	10.2	10.3	1%	35.2	38.8	10%
Transplantation Surgery	9.7	10.5	8%	29.0	15.0	-48%
Paediatric Neurology	24.1	28.5	18%	106.2	110.9	4%
Cardiothoracic Transplant	17.5	14.0	-20%	28.0	27.0	-3%
Blood and Marrow Transplant	29.6	19.4	-34%	20.2	33.5	66%
Pain Management	22.6	16.2	-29%	16.1	20.8	29%

Specialties with the highest total bed days are at the top of the table. The range of specialties has been adjusted to match those in use in 2005/06. Since no comparative data is available for a single year V3.5 is 2005/06 reference cost data and V4 is 2006/07 reference cost data. All Obstetric data has been grouped as Non-elective

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In conclusion, the move to higher proportions of excess bed days per 100 bed day in trim is an inevitable outcome of halving the number of admissions per HRG (as per V4). The assumption that all specialties have an average LOS close to the HRG average is leading to the calculation of an upper trim point that is more an artifact than fundamental property of a real LOS distribution. Large shifts in income flows for particular Trusts can be envisaged; for example, those who specialize in emergency Palliative Medicine or Dermatology or in elective Dermatology and Nephrology. This income will become far more dependent on small number chance events. Yet another round of market driven counting changes could arise in order to exploit this weakness in the tariff structure. As soon as the 2009/10 tariff (based on the 2006/07 reference costs) are released Trusts should check their potential income streams, my own calculations at Trust level show that some nasty shocks are in store!

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