

Limitations of the HRG Tariff – The Reference Cost Index

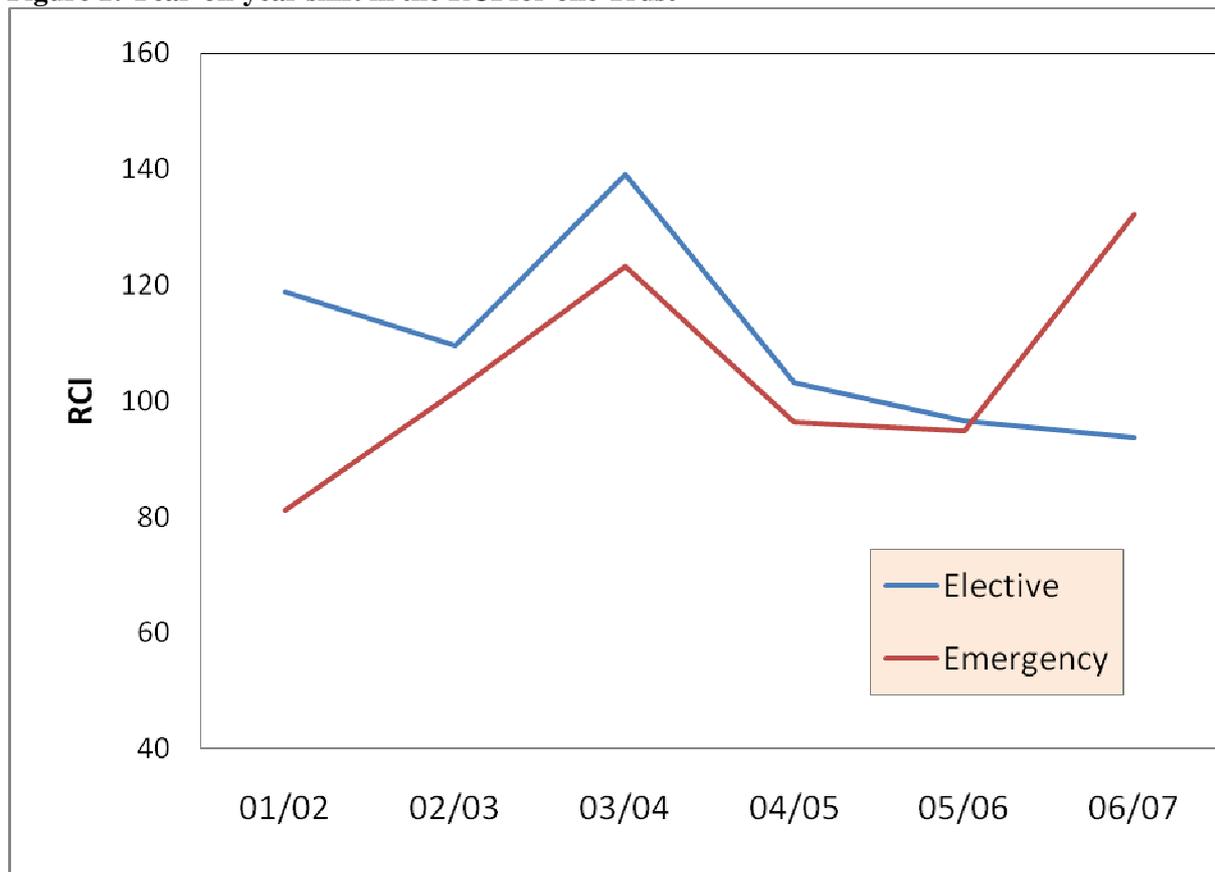
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The reference cost index (RCI) is promoted by the Department of Health (DH) as the definitive measure of organizational efficiency (DH 2008). A somewhat more cautious approach could well be warranted. Figure 1 shows the year-on-year shift in the RCI for one hospital over a period of six years. Are these shifts a measure of real efficiency or are they actually measuring something else such as the validity of the RCI process?

Figure 1: Year-on-year shift in the RCI for one Trust



Footnote to Fig 1: Years 01/02 & 02/03 are HRG V3.1, 02/03 to 05/06 is HRG V3.5 while 06/07 is HRG V4

The science of statistical process control (SPC) is widely used in industry to measure the performance of a process. If the process is stable, i.e. the product is consistent over time, then

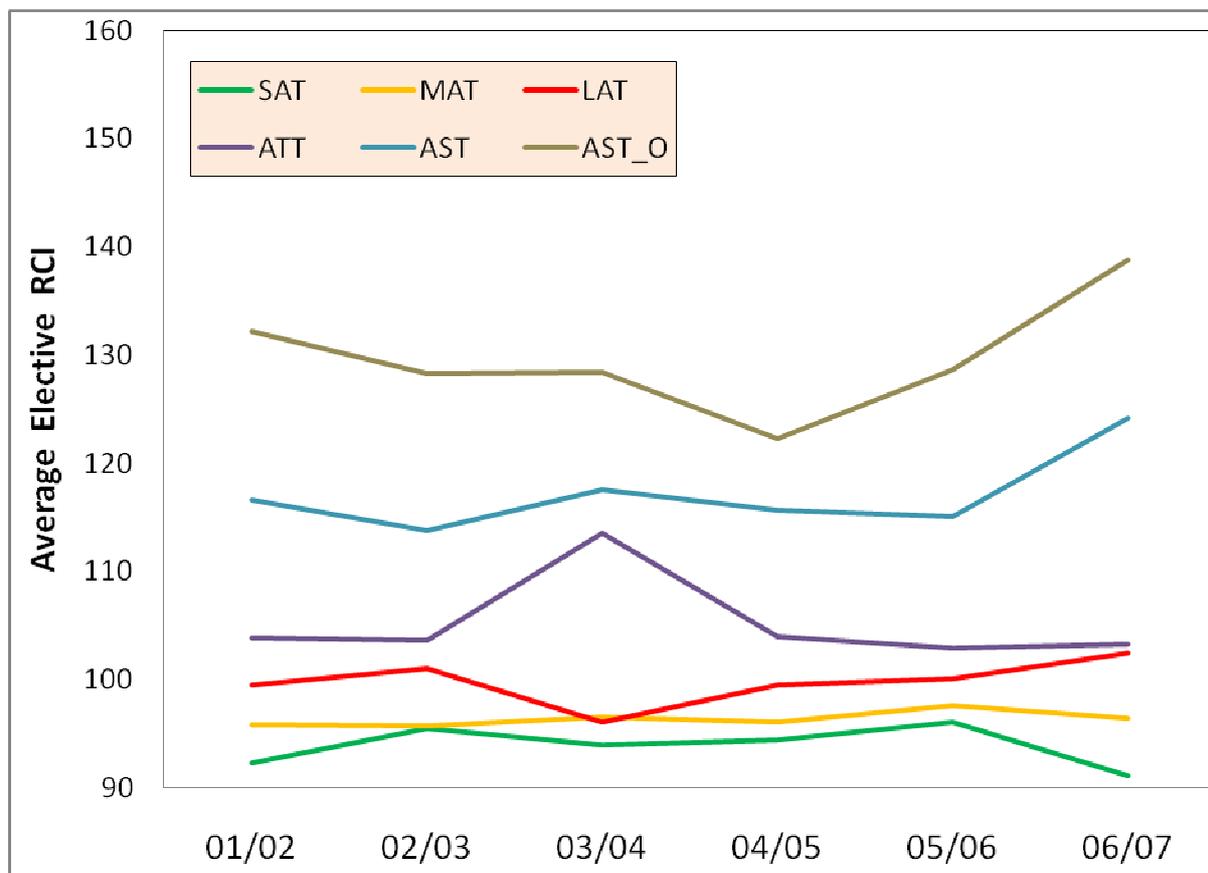
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the process is said to be 'in-control (Wheeler & Chambers 1992). The RCI process includes the following steps:

1. Design of the HRG groups
2. Coding of clinical information at Trusts
3. Collection of Trust costs via the annual reference costs collection
4. Conversion of Trust costs to HRG national average costs
5. Calculation of the RCI

All of these steps are open to errors or bias which will cumulatively affect the RCI calculation 'process' (Northcott & Llewellyn 2003). In SPC the measurement of 'in-control' behavior is determined using the calculation of what is called the average moving range, i.e. the absolute difference between successive values which is then averaged over time. For successive sampling from a process the upper and lower control limits can be calculated as the average for the process ± 2.66 times the average moving range. Values within the upper and lower control limits are regarded as 'in-control'. If the process is very poor then the upper and lower control limits will be wide apart. Intuitively and even without calculation of the moving range Figure 1 may be considered an example of a poorly controlled process, i.e. the RCI jumps around far too much between years. Are the steps in the RCI calculation process for this Trust 'out of control' or is it the case that the national RCI calculation process in general is the real problem?

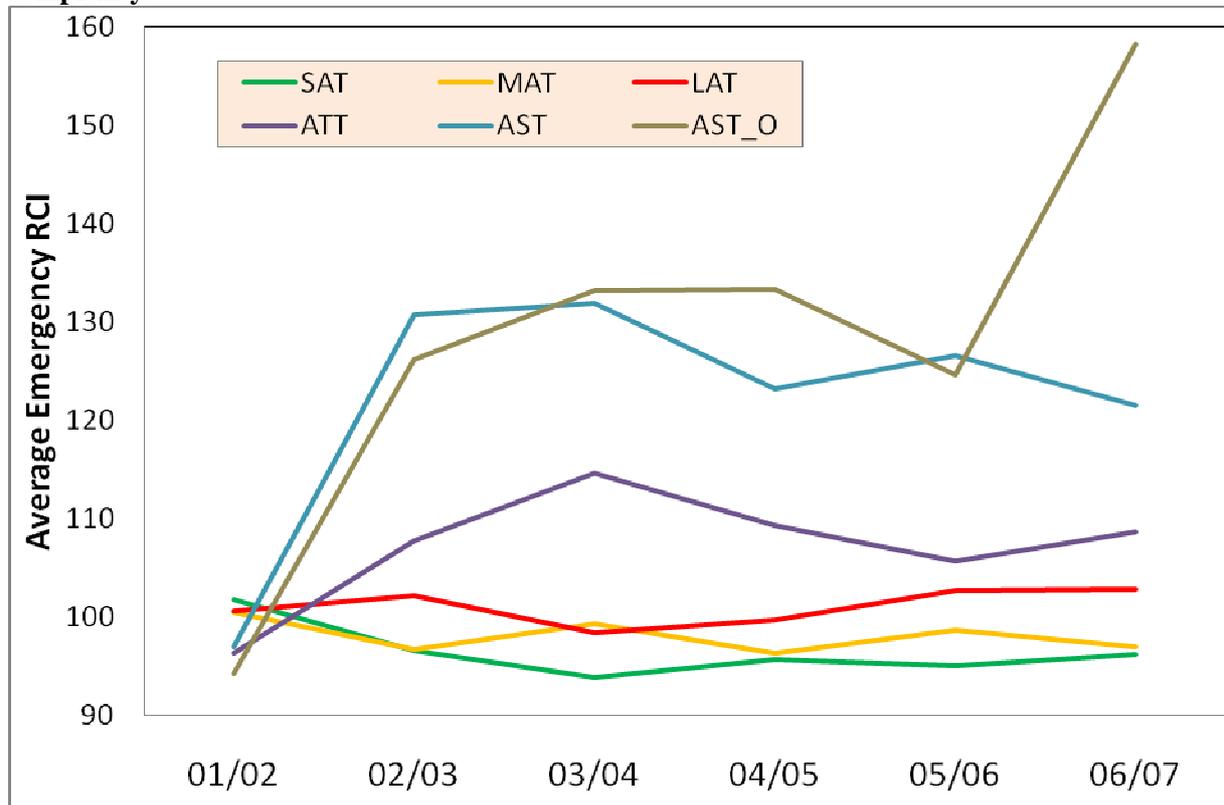
Figure 2: Average RCI for elective admission in Trusts of differing size and complexity.



Footnote to figures 2-5: SAT small acute trust, MAT medium acute trust, LAT large acute trust, ATT acute teaching trust, AST acute specialist trust, AST_O acute specialist orthopaedic trust.

The average for the RCI calculation is 100%, i.e. Trusts are said to have national average efficiency when their RCI score is 100. After all this is a fundamental and unquestioned outcome of the whole process for setting the national HRG tariff and hence the RCI. However, it is always wise to check someone else's hidden assumptions.

Figure 3: The average RCI for emergency admission in groups of Trusts of differing size and complexity.



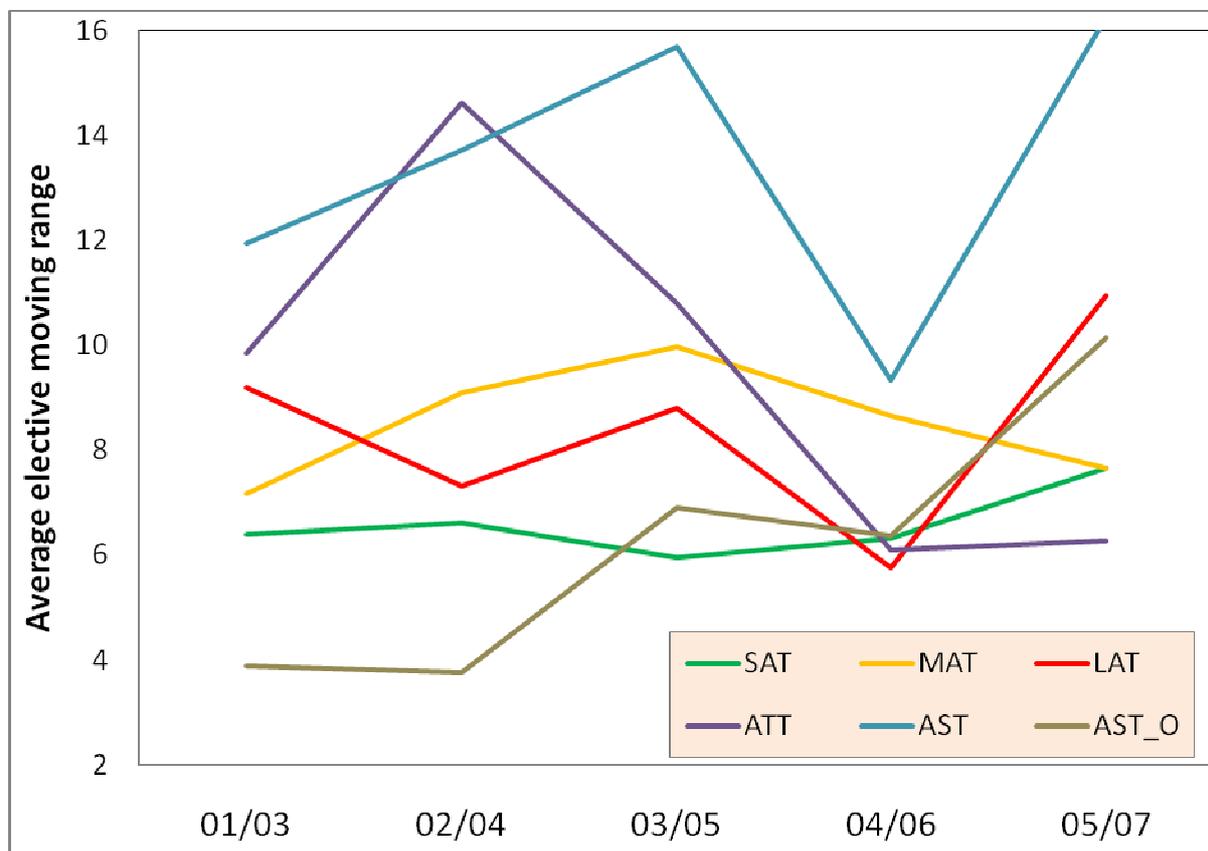
Figures 2&3 show the average elective and emergency RCI for groups of acute Trusts of different size and complexity. These groupings are those assigned by the DH. Averaging the RCI score over groups of Trusts removes the individual contribution from differences in counting and coding and limitations in the local adjustments not reflected in the current market forces factor (Jones 2008b, 2009a). As can be seen the average RCI is not 100; it changes as size and complexity increase and tends to be higher for emergency rather than elective admission. Also apparent is the fact that the average RCI tends to jump around far more as size/complexity increases. In other words the RCI calculation appears to be measuring the effects of size (diseconomies of scale) and complexity rather than efficiency. For a wider discussion of the issue of complexity refer to an earlier article in this series (Jones 2008e).

This is an interesting observation since the HRGs are supposed to correct for complexity yet they are most evidently not doing so! Despite considerable development over the years the latest HRG V4 appears to perform no better than its predecessors. This appears to be consistent with the observation that the omission of specialty within the HRG design process has led to a rather fallible set of HRGs (Jones 2008a-e, Jones 2009a). Indeed research by others has shown that Teaching Hospitals cost 9% to 13% more than a DGH and that

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innovative hospitals cost around 10% more than their non-innovative peers (Dormont & Milicent 2004).

Figure 4: Average moving range for elective admission to Trusts of different size and complexity.

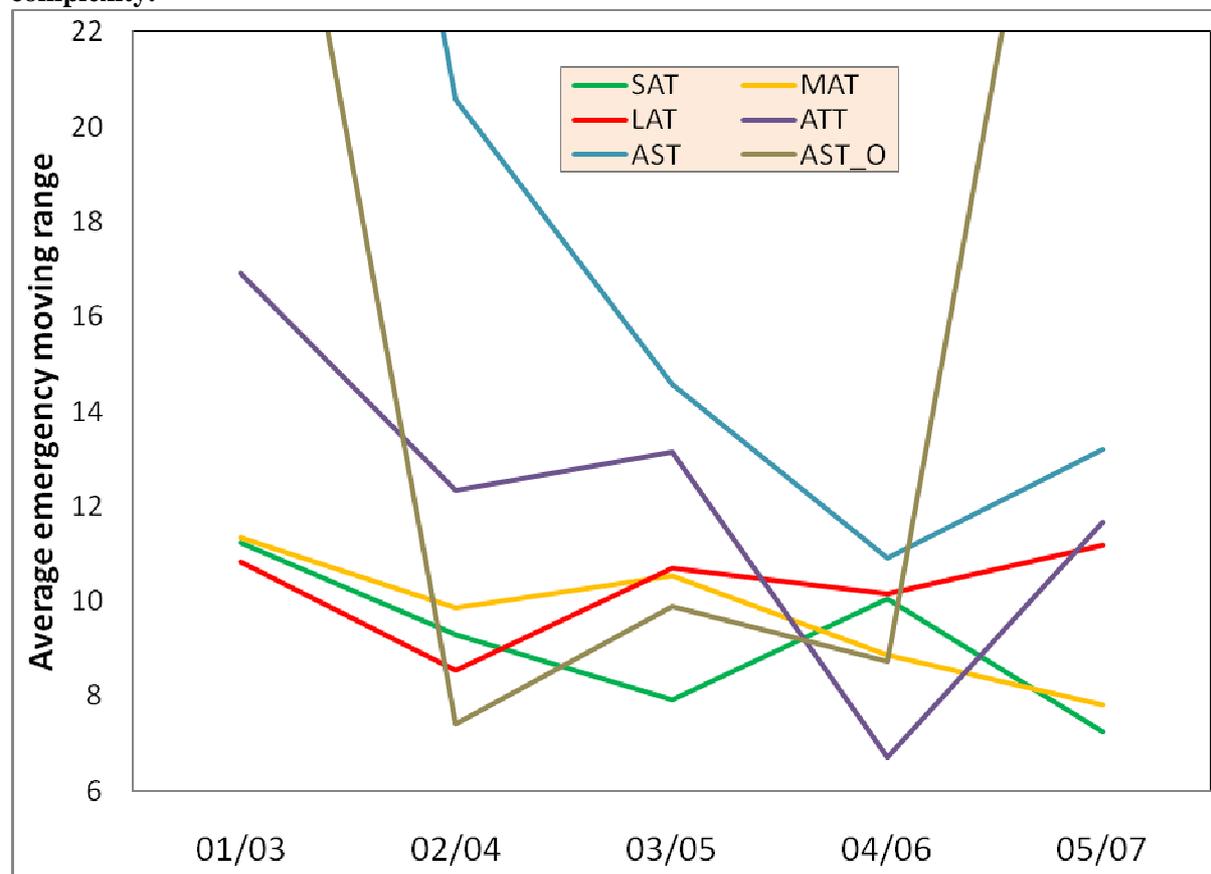


Footnote for Figs 4 & 5: 01/03, etc refers to the difference between successive years 01/02 to 02/03 , etc.

Figs 4&5 show the average moving range for the groups of Trusts of differing size & complexity. Recall that the upper and lower control limits are 2.66 times these values. Once again size and complexity has a powerful effect on the stability or apparent ‘in-control’ behavior and the erratic behavior of the average moving range between each successive set of years is indicative of an unstable process. In other words the Trust in Figure 1 is merely reflecting the lack of ‘in-control’ behavior for the national RCI process in general rather than poor individual performance per se. Note the large jump upward in the transition from V3.5 to V4 for the complex organizations, i.e. HRG v4 is not doing a good job of correcting for complexity but is in fact reflecting ‘average’ district general hospital behavior. This is always the danger of attempting to create groups where specialist hospitals are in the minority. The general use of the procedure and diagnosis codes will always swamp out their specialist usage via mass action. Having determined that the average is different for the various organization types within the NHS we now need to determine the average moving range.

We are now in a position to calculate the upper and lower control limits which are given in Table 1. Hence if your organization is a specialist Orthopaedic Trust (AST_O) then as long as your elective RCI lies between 113 and 146 no one has the ability to discern if your true RCI is any different to the average expected for that type of organization.

Figure 5: Average moving range for elective admission to Trusts of different size and complexity.



So where does all this lead to? Firstly we must conclude that the current process needs the input from additional research into how to adjust for those local factors which are important but not incorporated into the whole process (Jones 2009b). Coding accuracy at acute Trusts is still a weakness with recent audits indicating that the apparent RCI could be shifted by 15% to 20% simply by improving the coding process (Jameson 2007, Joy 2008) and the elimination of bias and errors in the reference cost collection must also be encouraged.

Table 1: RCI with lower and upper control limits (LCL and UCL)

Organisation Type	Elective			Emergency		
	Average RCI	LCL	UCL	Average RCI	LCL	UCL
SAT	94	76	111	97	72	121
MAT	96	74	119	98	72	124
LAT	100	77	122	101	74	128
ATT	105	80	131	107	75	139
AST	117	82	153	122	66	177
AST_O	130	113	146	128	79	177

LCL = lower control limit, UCL = upper control limit

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There are very few Trusts outside of the limits given in Table 1. This appears to support the earlier analysis of Harper et al (2001) who used econometric techniques and data envelopment analysis to conclude that after adjusting for economy of scale and other factors there was no evidence for widespread differences in efficiency and that only a very small number of units show genuine poor performance.

Until these things happen the RCI will remain a vague indication of true efficiency which cannot be used to infer that one Trust is more efficient than another. Indeed it is difficult to know if shifts in the RCI at the same organization are real. The HRGs themselves may almost need 'a back to the drawing board' revision to include the vital role of specialty in their formulation. The inclusion of specialty has been shown to reduce the spread in calculated RCI especially for specialist organizations (Jones 2009a).

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