

# How to develop a fair tariff for emergency assessment activities – lessons from England

For further articles in this series go to [www.hcaf.biz](http://www.hcaf.biz)

**Dr Rod Jones (ACMA)**  
**Healthcare Analysis & Forecasting**  
**Surrey, UK**

[hcaf\\_rod@yahoo.co.uk](mailto:hcaf_rod@yahoo.co.uk)

**Part 1 of a 3 part series.**

This replaces and expands upon the previous document titled  
**‘Costing Emergency Assessment Unit Attendances’**

## Key Points

- Average cost for an emergency assessment unit (EAU) attendance is between £220 and £300 with the lower cost due to economy of scale in the largest hospitals.
- Some acute sites are using EAU as an alternative to A&E and in 2006/07 around one million zero day or same day stay 'emergency admissions' were made via assessment units.
- Under the short stay tariff the average profit margin per attendance lies between £340 to £430 and this reflects the impact of context specific coding, i.e. the same codes have different meanings in an assessment versus a genuine inpatient context.
- PCTs have paid somewhere between £340M to £430M more for such zero day stay 'admissions' than the actual cost.
- This 'error of judgement' in the estimation of true cost will then create a set of compensating errors and will have affected the financial flows across the NHS in immeasurably complex ways.
- PCTs cannot be expected to achieve 'world class commissioning' when faced with financial imbalances of such a magnitude.

**Key Words:** emergency assessment units, EAU, costing & pricing, HRG tariff, NHS, England, GP Commissioning, economy of scale, emergency department attendance,

## Abstract

The cost of emergency assessment unit activities is shown to lie in the region of an outpatient attendance or the higher end of an A&E attendance. Significant economy of scale in cost is demonstrated with the larger units having lower average costs. Acute Trusts make an average profit margin of greater than £300 per zero day (or same day) stay admission. This equates to an overpayment of greater than £300M for these 'admissions' and this then creates £300M of compensating errors and distortions across NHS finances. Part two will demonstrate that assessment costs must be added back into the residual A&E costs in order to arrive at a true picture for the overall emergency department costs while part three looks specifically at the costs for paediatric emergency assessment. Both parts will discuss the additional flaws and complexities behind the tariff process relating to the wider emergency department functions.

## Introduction

Payment by Results (PbR) and the tariff for services are central to the NHS in England. Flaws and errors in the tariff can have catastrophic consequences. Up to the present, the Department of Health (DH) has been responsible for the development of the tariff although it has recently been proposed to move this function to the Commissioning Board with the Economic Regulator conducting the technical calculations (DH 2010). While the DH has been careful to run regular ‘consultation’ with the NHS a series of articles in BJHCM has highlighted an extensive series of flaws within the structure of the inpatient tariff (Jones 2008a-e, 2009 a-d, 2010a-d). These flaws expose the tariff to the risk of gaming and creaming and create complex local financial imbalances (Jones 2010e). Apart from a self-imposed internal processes arising from the last major tariff error (DH 2006) the whole tariff concept and calculations have never been subject to the type of scrutiny and debate which could engender alternative approaches within the structure of the tariff. Indeed the transition from HRG version 3.5 to 4 doubled the number of HRG but appeared to make no real change to the fundamental financial imbalances (Jones 2008e).

Of relevance to these issues has been the rapid increase in so-called ‘admissions’ to emergency assessment units (EAU) which have driven the apparent growth in emergency admissions in England since 2001 when the A&E four hour target was introduced (Robinson 2007, Jones 2007, 2009d). In 2006/07 around 50% of ‘admissions’ made via an EAU had a zero day stay, i.e. admitted and discharged on the same day. Many within the NHS will be unaware that there is no definition for an ‘emergency assessment unit’ in the NHS Data Dictionary and activities conducted in an EAU appear to conform to the definition of an A&E attendance (NHS Data Dictionary 2008, A&E Definition 2008) - bold added for emphasis.

“A&E attendance is a care contact. . . . . Attendance may be as a result of a request from a General Practitioner for help with a diagnosis or treatment. **Any facility set up to receive and treat emergency cases is regarded as an A&E department for this purpose.**”

In the USA, New Zealand and elsewhere, such ‘admissions’ would normally be considered part of emergency ambulatory care, i.e. emergency department assessment and observation, and are paid under a separate tariff from otherwise genuine inpatient admissions (Nataraja et al 2009). The need for emergency observation wards was first recognised in 1960 and the July 2000 NHS plan recommended that EAU’s should be more widely established (Cooke et al 2003), however, the unintended consequences of the A&E four hour target introduced in 2001 seems to have taken this desirable feature of the emergency department down an entirely unintended road (Jones 2007). This paper will explore the non-clinical pressures to use EAU’s, investigate the real cost of patient attendance at an EAU and compare this with the tariff set for these activities. The following two papers will explore the knock-on effects to the apparent cost of A&E attendances and particular issues relating to the cost of Paediatric assessment – an area which exposes specific flaws in the current tariff structure.

## Methods

The 2006/07 and 2007/08 reference costs data bases were obtained on CD from the DH (DH 2008). Assessment unit and other costs for 2006/07 were extracted using either Trust type or size. A flag was added to the national data to identify those Trusts which reported separate EAU costs from those who had aggregated these costs in with general inpatient emergency

admission costs. To determine the relationship between average cost of an EAU admission and size the assessment units were ranked according to size, split into fifty equally spaced size bands and the weighted average price calculated. The minimum possible profit margin was calculated using 2004/05 zero day stay case mix (obtained via a bespoke extract from the Hospital Episode Statistics database). In 2004/05 there were 778,347 zero day stay admissions at an average cost of £636 using the 2008/09 short stay tariff. The most likely profit margin was obtained using the 2006/07 EAU case mix (around one million zero day stay admissions) and applying the 2010/11 short stay tariff. All costs were adjusted for the market forces factor applicable to each hospital. The 2007/08 costs for short stay admissions were aggregated at specialty level and the average cost calculated.

## Reference Costs

In the 2006/07 reference costs submission (the basis for 2009/10 tariff) acute Trusts were mandated to submit separate reference costs for all ‘admissions’ occurring via an EAU, however, some 35% of Teaching hospitals, 18% of large acute Trusts and 31% of medium sized acute Trusts chose to ignore the costing guidance and lumped assessment unit costs in with the cost of an ordinary emergency admission. The fact that hospitals chose to ignore the costing guidance can be inferred from a survey conducted in 2007 which showed that of 201 English hospitals only 23 did not have an EAU (10%) and these were all specialized units (cancer, women, children) or small community hospitals (NCEPOD 2007).

Analysis of the different costs reported by Teaching hospitals shows that the apparent cost of an emergency admission is greater than 25% lower at those Trusts where the two costs have been lumped together (Table 1). The true cost of an emergency admission has simply been diluted by low-cost EAU activities and the greater than 25% difference implies that the cost of an EAU ‘admission’ is likely to be very low in comparison to a true inpatient admission.

**Table 1: Cost for high volume emergency ‘admission’ at Teaching hospitals**

HRG	Description	Separate	Lumped	Cost Difference
UZ01Z	Invalid codes	£2,026	£672	67%
EB08I	Syncope or Collapse without CC	£1,173	£595	49%
PA11Z	Acute Upper Respiratory Tract Infection and Common Cold	£1,293	£669	48%
PA61Z	Healthy Baby	£808	£478	41%
DZ22B	Unspecified Acute Lower Respiratory Infection with CC	£1,885	£1,247	34%
DZ11B	Lobar, Atypical or Viral Pneumonia with CC	£2,159	£1,474	32%
LA04A	Kidney or Urinary Tract Infections with Major CC	£3,354	£2,267	32%
PB02Z	Minor Neonatal Diagnoses	£1,481	£1,023	31%
PA19Z	Viral Infections	£922	£633	31%

Footnote: In the column headed ‘Separate’ Trusts have separated out the cost of EAU admissions while in ‘Lumped’ the costs are combined under the general heading of an emergency admission.

The failure of a significant proportion of acute Trusts to submit separate prices effectively forced the Payment by Results (PbR) team to lump the two costs together and estimate the likely cost of a short stay admission via the short stay tariff. For whatever reason the PbR team chose to include zero day and one day stay within the short stay tariff which somewhat obscures the real nature of the problem in that the majority of ‘admissions’ occur between the

hours of 9 a.m. and 9 p.m. and hence will be ‘discharged’ before midnight. Given the failure of so many Trusts to submit separate assessment unit costs, the PbR team changed the costing methodology and the 2007/08 reference cost submission no longer required separate costs for assessment units but instead asked for costs of short stay admissions (zero and one day stay combined). Hence the 2006/07 reference costs represented the last and only opportunity to independently verify the true cost of an EAU ‘admission’ and thus to independently assess the adequacy of any tariff devised by the DH for use in subsequent years. The failure of so many acute organizations to submit valid prices as requested by the DH raises serious questions as to why this was allowed to happen?

## Short Stay Tariff

The short stay emergency tariff is the means by which ‘short stay’ activities are priced. The name is somewhat of a misnomer since some 57% of HRG are not covered by the short stay tariff. In these HRG it is assumed that short stay admissions are in the minority or are for genuine surgical procedures, however, short stay admissions do occur even in HRG describing very complex procedures presumably due to errors in the coding process or assessment unit procedures translated inappropriately into the appearance of a more complex HRG (Jones 2007). It is important to note that the DH appears to have made no reference to the 2006/07 cost data collected from the 70% of Trusts which did submit valid costs, but instead chose to continue with its preferred logic which was based on an assumed length of stay (LOS) of 1 day for anything with a zero or one day stay. The total cost of an inpatient admission was then assigned to the short stay tariff as a simple ratio of costs based on the average length of stay for each HRG. In the 2010/11 tariff a zero day stay in a HRG covered by the short stay tariff costs from £92 to £2171 while a zero day stay in a HRG not covered by the short stay tariff can cost from £146 to £33,531.

A wider analysis of the 2006/07 EAU activity gives some exceedingly important indicators about the nature of ‘assessment units’.

- Very high volume of ante-natal care (HRG commencing ‘N’ or ‘M’)
- High volumes of investigation & observation
- High volumes of general symptoms
- The 11<sup>th</sup> highest volume activity was for invalid codes
- Work covered by paediatric assessment units can be discerned as HRG commencing with ‘P’ and includes what are otherwise considered to be ‘healthy babies’.

The case mix is very much A&E focused and is characterized by a set of diagnoses which are described by short-hand descriptions, hence, the high number of invalid codes when attempting to run the HRG grouper which was developed to analyse genuine inpatient activities (Jones 2006, 2007). This is especially relevant to the 57% of HRG are not covered by a short stay tariff.

Analysis conducted by the author shows that the use of ICD chapter R (signs & symptoms) diagnosis codes are far more prevalent in zero day stay medical assessment admissions. Under the current short stay tariff there is huge potential for short-hand descriptions of otherwise minor conditions, tests and procedures to end up in what appear to be HRG describing costly admissions of over £20,000. For example under the previous HRG V3.5, a

diagnosis of ‘chest pain on breathing’ was allocated to HRG D34 while ‘unspecified chest pain’ was allocated to HRG E36. This short hand coding is indicative of the fact that this is not a genuine inpatient environment and the assignment of a definitive diagnosis is not essential but that it is the cost of the ‘process of diagnosis’ which is the more relevant measure.

The next issue to be addressed is the proportion of so-called emergency admissions which are made up from EAU activities. This is illustrated in Figure 1 where data for all Trusts reporting separate assessment activities is compared as a proportion of total ‘emergency admissions’. As can be seen there is considerable variation, however, a trend to higher proportions for smaller Trusts is evident.

### **A&E Waiting Time**

A&E waiting time can be understood using queuing theory (Lane et al 1998, Gunal & Pidd 2006, Mayhew & Smith 2007, Smith 2008). Queuing theory informs us that at a constant ratio of attendances per staff the length of time in a queue will increase as the size of the facility decreases (Stallings 2000). Hence the common national target for a four hour wait in A&E will penalize smaller A&E departments both in terms of the cost per attendance and ability to consistently achieve a fixed target. As can be seen in Fig. 1 there is indeed a tendency for smaller Trusts to process much higher proportions of patient flows via assessment units. If assessment units were being used to process a clinically necessary proportion of patients then there would be no size dependant feature to this figure. This is the expected outcome of a target which does not recognize the importance of size. This concurs with queuing theory analysis which concluded that the re-designation of patients formed a significant part of the apparent ‘improvement’ in A&E performance (Mayhew & Smith 2007, Smith 2008).

With respect to the above conclusions it should be noted that in Scotland over 50% of hospitals admit >80% of inpatient admissions directly via A&E (Audit Scotland 2010). In other words even if we assume that all admissions not made via A&E go via an assessment unit then the average for Scotland is going to be much less than 20% on the Y-axis of Fig. 1. It is therefore fairly obvious that the position in England is not typical nor a reflection of real need.

As noted in the methods section there were 778,347 zero day stay emergency admissions in 2004/05 while in 2006/07 some 800,000 zero day stay ‘emergency admissions’ were recorded by those Trusts who reported the correct cost data (a further 823,000 assessment unit admissions went on to become an overnight stay). Adjusting this for the Trusts which did not report these activities gives around one million zero day stay admissions, i.e. patients admitted and discharged back home on the same day as would be expected of an A&E attendance with associated observation (in the absence of an arbitrary four hour target).

While most Trust’s will publically claim that this has nothing to do with the A&E four hour target it can be appreciated that diverting large volumes of such attendances into an ‘admitted’ care environment (where the four hour target does not apply) may have some advantage.

In the DH document ‘Clinical exceptions to the four hour emergency care target’ (Alberti 2003) it was envisioned that less than 1% of A&E patients would need to be diverted to an observation unit which is only equivalent to 150,000 to 200,000 observation unit ‘admissions’ across the whole of England. Figure 1 shows that the use of assessment units far exceeds this guideline. Given the role of size as a pressure to divert patients into an assessment unit the acceptable proportion of patients will be toward the lower edge of the data shown in Fig. 1. This appears to be somewhere around 15% of emergency admissions for Trusts with 20,000 or more genuine emergency admissions (i.e. excluding zero day admissions) per annum. Trusts above this limit may be using the EAU in a way that is not clinically justified.

Having established that a high proportion of acute Trusts appear to be using EAU admissions in a way that closely approximates to an A&E attendance the final proof is to look at the cost of activities occurring in EAUs.

### Cost of an EAU ‘admission’

Figure 2 shows the average cost of ‘admissions’ to assessment units. Costs have been averaged for two reasons. Firstly the short hand coding process is probably leading to artifacts in the HRG allocation process and secondly an average price is a good indication of genuine resource intensity. The average cost for persons progressing to admission or discharge home is roughly the same, i.e. the average cost for both ‘admission’ types can be used to obtain an accurate assessment of overall average costs. Data for 11 Trusts with average costs over £700 have been excluded. Discussion with one of these Trusts indicates that this very high cost was the result of incorrect counting and similar errors will be assumed for this group. As can be seen there are economies of scale to be gained in the larger Trusts with cost declining from £300 (at the smallest) to £220 per ‘admission’ at the largest Trusts. The key observation is that the average cost of an ‘admission’ to an EAU is around that of an outpatient attendance or the high end of an A&E attendance. Claims by acute Trusts that EAUs are high cost due to intensive care and diagnosis is not supported by the submitted costs. The issues specific to Paediatric assessment will be explored in more detail in part three of this series.

**Table 2: National average cost for A&E attendances**

A&E Treatment	Teaching	Large Acute	Medium Acute	Small Acute	All Acute
Category 3 (category 1-3 treatment)	£172	£226	£163	£111	£143
Category 2 (category 4 treatment)	£109	£271	£156	£168	£145
Category 2 (category 3 treatment)	£180	£165	£150	£207	£174
Category 3 (category 4 treatment)	£322	£330	£331	£295	£328
Any category 5 treatment	£408	£440	£216	£264	£339
Average of raw reference cost data. From Jones (2010f)					

As can be seen in Table 2 the A&E attendances closest to an assessment unit admission are Category 2 (with category 3 or 4 treatment) with an average cost of £145 to £175, Category 3 (with category 4 treatment) with an average cost of £328 or any category 5 treatment costing

£339 (Jones 2010f). The differences in average price across the different types of acute Trust appears to be partly due to differences in allocation of patient attendances to the different A&E attendance categories and treatment sub-categories.

The absolute minimum cost for a zero day stay emergency admission is £92 (for the 43% of HRG with a short stay tariff) or £146 (for the 57% of HRG not covered by a short stay tariff) while the maximum possible cost for a category 5 treatment in A&E is £339. Hence it is fairly obvious that under the current tariff arrangements any Trust choosing to divert A&E activity to an EAU will make a substantial financial gain by calling these activities an ‘emergency admission’.

A calculation of the surplus arising on EAU admissions can be made using national average zero day stay spell-based case-mix from 2004/05 with an average price of £636 (using the 2008/09 tariff) set against an average cost of £220 to £300 (Fig 2) giving £336 to £416 average profit margin per EAU attendance. Alternately using the 2010/11 tariff coupled with the 2006/07 assessment unit actual costs and case mix gives a higher figure of between £430 (admitted and discharged the same day) to £544 (admitted to an assessment unit and then progressing to inpatient status) per assessment ‘admission’. Hence the magnitude of over-payment ranges from £336 to £431. The higher apparent profit for those patients who progress to become an inpatient is probably due to a difference in case-mix between the two groups. This apparent ‘profit’ is purely notional as the cost of assessment for these patients is carried forward into the cost of their entire inpatient stay. Judging from Fig 1 a high proportion of acute Trusts may be achieving a trust-wide surplus from this single lucrative source of profit.

At this point the DH may argue that the short stay tariff covers both zero and one day (overnight) stays. However a common sense check reveals that this argument is likewise flawed. For example, if we assume that patients who stay overnight incur £200 of ‘hotel costs’ for their overnight stay in addition to their assessment costs and if we assume an equal number of zero and one day stays we end up at an average cost of around £360 (range £320 to £400) for the equivalent of a short stay tariff. While £200 is an approximate average cost for a day stay in hospital (Jones 2008a) it should be noted that the incremental cost of the last day stay in hospital has been shown to be very low (Fine et al 2000, Taheri et al 2000), i.e. the figure of £200 is an overestimate of the real cost. The actual average price paid under the short stay tariff is somewhere around £730 (based on 2006/07 case mix) which generates an overall profit margin of around £360 for two million assumed admissions or £720M of excess payments by PCTs. By whatever argument the short stay tariff has clearly been calculated using incorrect assumptions on the nature of hospital costs.

Table 3 explores the issues discussed in the above paragraph in more detail by taking the 2007/08 reference cost data which was specifically collected for short stay admissions. On this occasion the costs have been averaged at specialty level to clearly reveal the underlying cost behaviour. Admissions to the specialty Accident & Emergency are mainly zero day stay and most closely approximate to an emergency department (A&E) attendance. The average cost is indeed below the lower end of average cost in Fig. 2 and both General and Geriatric Medicine likewise fall within the range. The other specialties in Table 2 have an average cost above £500 simply because the proportion of overnight stay ‘genuine’ inpatient admissions is progressively increasing.



**Table 3: Average cost of short stay admissions**

Specialty	Admissions	Average Cost	Outpatient Attendance Cost
Accident & Emergency	402,870	£305	£117
General Medicine	1,073,580	£334	£222
Geriatric Medicine	135,180	£368	£257
Paediatrics	382,777	£502	£236
Gynaecology	150,223	£539	£135
General Surgery	219,248	£545	£204
Trauma & Orthopaedics	108,206	£876	£148

Footnote: Short stay admissions cover zero and one day stay. Data is from the 2007/08 reference costs averaged at specialty level rather than the usual approach using HRG. The outpatient first attendance cost for 2010/11 given for comparison.

It is worth noting that the average cost of a short stay admission from the 2007/08 reference cost data is only £470 yet the DH has chosen to ignore this directly collected cost data in the calculation of 2010/11 prices and persisted in calculating prices for a large number of HRG where no discount is allowed for short stay admissions, i.e. all admissions are paid at full cost. Due to this choice in the way the tariff is formulated PCTs end up paying around £730 for short stay admissions when they should be paying around £470, i.e. the issues around compensating errors in other parts of the tariff.

The current formulation of the short stay tariff is therefore acting to encourage the drift to ‘admission’ via an EAU. Both zero day and one day stay are indicative of low resource usage, however, an average tariff for both only leads to a high profit margin for those trusts that are making the greatest use of the zero day stay ‘loophole’. Commissioners are within their rights to claim that this is not due to the needs of patient care and above a 15% EAU whole hospital admission rate the activity is better described by the appropriate A&E treatment category which have a maximum average cost of £339 per ‘admission’ for the equivalent of category 5 treatment at an A&E. Alternatively the price equivalent to a first outpatient attendance (an urgent attendance) in the appropriate specialty may also be appropriate ‘tariff’ for these activities (range £160 to £425).

Based on the profit margin calculated above and the above number of zero day stay admissions it can be estimated that PCT’s paid somewhere in excess of £340M more for these ‘admissions’ than their real cost. Herein arises a cascade of knock-on effects of profound complexity. The tariff always retains a cost neutral effect across all organizations within the NHS; hence, a £340M error in one part of the tariff creates a compensating £340M error elsewhere. In this case genuine inpatient prices will be depressed by £340M. These two errors then create a series of gains and losses across the financial landscape of the NHS. For those PCTs where the local acute Trust counted far higher than average numbers of zero day stay EAU ‘admissions’ the PCT will have made a real loss and the Trust made a real gain. The reverse will have happened in those locations where Trusts have counted fewer than

average (Jones 2006, 2007). The losses and gains across the total NHS may come to zero but the profound effect on local NHS finances certainly does not!

At this point we need to ask how the DH could have made such a fundamental error in its appreciation of the true nature of EAU costs. It would appear that a common sense cross-check against outpatient and A&E costs was not performed and that application of an inpatient model of care and costs related to length of stay was incorrectly applied.

## Conclusions

The short stay tariff is a classic case of the error of attempting to create a single cost for what are essentially different activities. It has created a financial and ethical quagmire. This error in the appreciation of true cost has been cumulative and hence over the period 2006/07 to 2010/11 comes to over £1,000M in total. Particular acute Trusts are, and have been, rewarded for diverting clinically unnecessary volumes of work via EAUs. No mechanism exists to re-divert this money back to its intended use – although the 30% marginal rates in 2010/11 will act to partially reduce the size of the benefit. PCTs servicing these Trusts may then be blamed for poor financial management. In other locations the reverse holds true.

As in the USA and elsewhere where these activities are separately identified and paid under a separate tariff and it appears that the NHS desperately needs a dedicated acute assessment tariff which is far more focused on the cost of necessary diagnostic tests than on the diagnosis per se. Given the fact that the NHS plan of 2000 recommended wider implementation of EAU's (Cooke et al 2003) we need to ask how it has arisen that by 2010 the DH was unable to develop a relevant tariff and in the process of not doing so has inadvertently created such a large financial imbalance? There is something seriously wrong and lessons need to be urgently learned. A similar situation has been highlighted with PCT activity planning (Jones 2010d).

My suspicion is that it is a technical impossibility to derive a fully fair and equitable tariff (i.e. the issues of economy of scale raised in this article and the multiple deficiencies explored in the earlier series of articles) and hence there will always be winners and losers. This reality needs to be recognized and a cap placed on the profit margin achieved by any public hospital. This provides a partial mechanism for re-diverting money to its intended use. However, far greater and more open discussion is required on how best to formulate a tariff which is fair across the multiple dimensions which go into the nature of 'real world' health care costs. The NHS deserves 'world class' tools which are fit for purpose of 'world class commissioning'.

**Conflict of Interest: The author provides consultancy services to health care organisations.**

## References

A&E Attendance Definition (2008)

[www.datadictionary.nhs.uk/data\\_dictionary/nhs\\_business\\_definitions/a/accident\\_and\\_emergency\\_attendance.asp?shownav=1](http://www.datadictionary.nhs.uk/data_dictionary/nhs_business_definitions/a/accident_and_emergency_attendance.asp?shownav=1)

Alberti G, Heyworth J, Holt L, McGowan A (2003) Clinical exceptions to the 4 hour emergency care target.

[www.dh.gov.uk/en/Healthcare/Emergencycare/Keyemergencycaresdocuments/index.htm](http://www.dh.gov.uk/en/Healthcare/Emergencycare/Keyemergencycaresdocuments/index.htm)

Audit Scotland (2010) Emergency departments: Summary of performance by hospital. A report for the Auditor General, Scotland. [http://www.audit-scotland.gov.uk/docs/health/2010/nr\\_100812\\_emergency\\_departments\\_summary.pdf](http://www.audit-scotland.gov.uk/docs/health/2010/nr_100812_emergency_departments_summary.pdf)

Cooke M, Higgins J, Kidd P (2003) Use of emergency observation wards: a systematic review. *Emerg Med J* 20: 138-142.

Department of Health (2006) Report on the tariff setting process for 2006/07. <http://www.library.nhs.uk/healthmanagement/ViewResource.aspx?resID=258725>

Department of Health (2008) NHS reference costs 2006-07 [www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_082571](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_082571)

Fine M, Pratt H, Obrosky D, Lave J, McIntosh L, Singer D, et al (2000) Relationship between length of hospital stay and costs of care for patients with community acquired pneumonia. *Amer J Med* 109(5): 378-385.

Gunal, M M and Pidd, M (2006) Understanding accident and emergency department performance using simulation. Proceedings of the 2006 winter simulation conference. <http://www.informs-sim.org/wsc06papers/053.pdf>

Jones, R (2006) Zero day stay emergency ‘admissions’ in Thames Valley. *Healthcare Analysis & Forecasting*, Camberley, UK. <http://www.docstoc.com/docs/5049800/Benchmark-zero-day-stay-emergency-admissions>

Jones, R (2007) *Equilibrium*. *Healthcare Analysis & Forecasting*, Camberley, UK. <http://www.docstoc.com/docs/5049762/Counting-and-Coding>

Jones R (2008a) Limitations of the HRG tariff excess bed days. *BJHCM* 14(8), 354-355.

Jones R (2008b) Limitations of the HRG tariff day cases. *BJHCM* 14(9), 402-404.

Jones R (2008c) A case of the emperor’s new clothes? *BJHCM* 14(10), 460-461.

Jones R (2008d) Limitations of the HRG tariff the trim point. *BJHCM* 14(11), 510-513.

Jones R (2008e) Costing orthopaedic interventions. *BJHCM* 14(12), 539-547

Jones R (2009a) Limitations of the HRG tariff efficiency. *BJHCM* 15(1), 40-43.

Jones R (2009b) Limitations of the HRG tariff the RCI. *BJHCM* 15(2), 92-95.

Jones R (2009c) Limitations of the HRG tariff local adjustments. *BJHCM* 15(3), 144-147

Jones R (2009d) Length of stay efficiency. *BJHCM* 15(11), 563-564.

Jones R (2010a) Emergency preparedness. *BJHCM* 16 (2), 94-95.

Jones R (2010b) A maximum price tariff. *BJHCM* 16 (3), 146-147.

Jones R (2010c) Benchmarking length of stay. *BJHCM* 16(5), 248-250.

Jones R (2010d) Health care costs and the HRG tariff. *BJHCM* 16(9), 451-452

Jones R (2010e) Limitations of the HRG tariff. *Healthcare Analysis & Forecasting*, Camberley, UK. [http://www.hcaf.biz/Recent/Limitations\\_of\\_the\\_HRG\\_tariff.pdf](http://www.hcaf.biz/Recent/Limitations_of_the_HRG_tariff.pdf)

An edited version of this article has been published as: Jones R (2010) A fair tariff for emergency assessment activities – lessons learned. *British Journal of Healthcare Management* 16(12): 574-583. Please use this to cite.

Jones R (2010f) Targets, game playing and queuing theory: impact of the accident and emergency targets in England. *BJHCM* 17(1), in press

Lane, D., Monfeldt, C and Rosenhead, J (1998) Emergency - but no accident: a system dynamics study of an accident and emergency department.

[http://www.orsoc.org.uk/orshop/\(glvhxd55xyni5n45qypqub55\)/orcontent.aspx?inc=article\\_or\\_insight\\_emer.htm](http://www.orsoc.org.uk/orshop/(glvhxd55xyni5n45qypqub55)/orcontent.aspx?inc=article_or_insight_emer.htm)

Mayhew, L and Smith, D (2007) Using queuing theory to analyse completion times in accident and emergency departments in the light of the UK government's 4-hour target.

<http://www.cass.city.ac.uk/ri/RI005.pdf>

Nataraja S, Fontana E, Kennedy E, Wyche M (2009). Next generation capacity management. Collaborating for clinically appropriate and cost-conscious throughput reform. The Advisory Board Company, Washington DC. <http://www.advisoryboardcompany.com/offerings.html>

NCEPOD (National Confidential Enquiry into Patient Outcome and Death) (2007)

Emergency admissions: A journey in the right direction? 20<sup>th</sup> Report.

[www.ncepod.org.uk/2007report1/Downloads/EA\\_report.pdf](http://www.ncepod.org.uk/2007report1/Downloads/EA_report.pdf)

NHS Data Dictionary (2008) [www.datadictionary.nhs.uk](http://www.datadictionary.nhs.uk)

Robinson, P (2007) Four hour target fuels admissions. *Health Service Journal*, **117**(6078), 23.

Royal College of Physicians (2007) Acute medical care. The right person in the right setting – first time. Report of the acute medicine task force.

<http://www.rcplondon.ac.uk/pubs/contents/2a8ed5fa-64af-4b2c-af03-85e90b7a6d20.pdf>

Smith, D (2008) Modelling A&E process times using queuing theory.

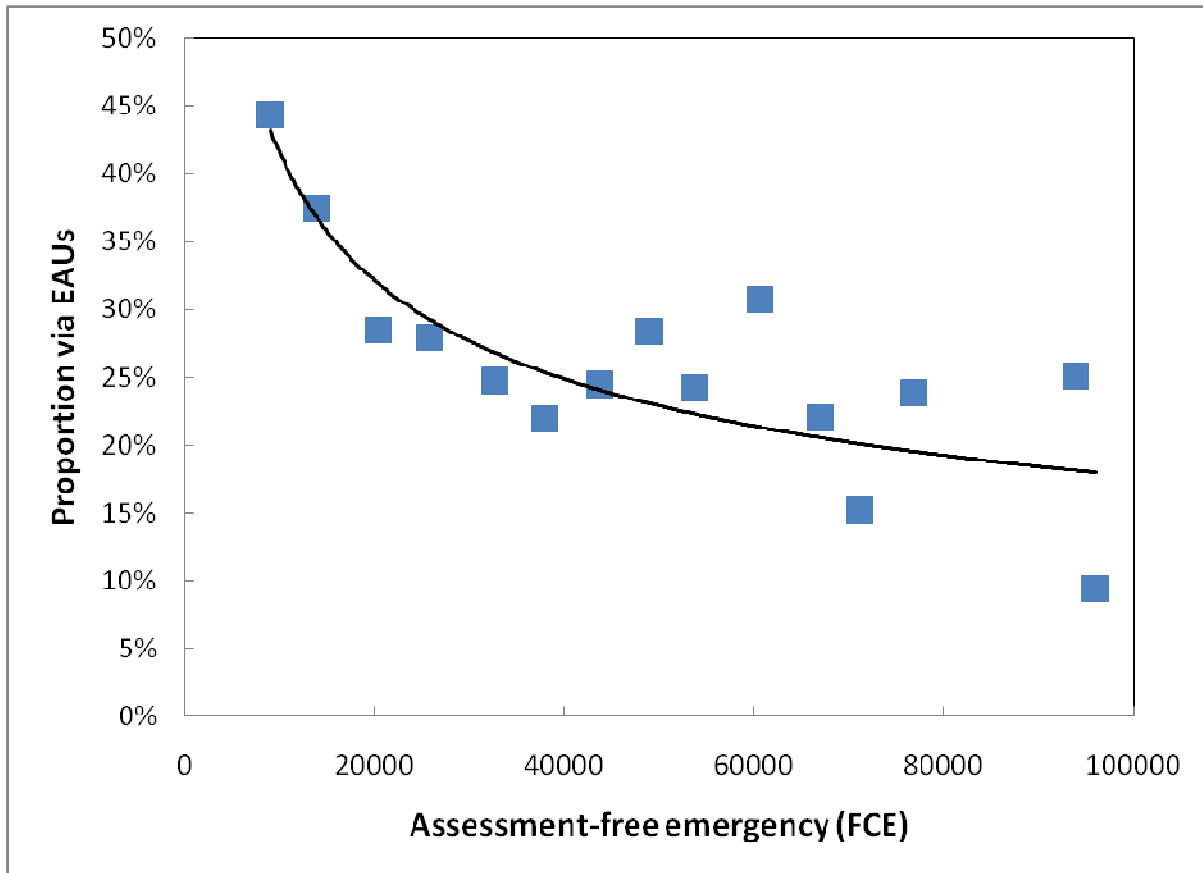
[http://www.actuaries.org/Boston2008/Presentations/HT6\\_Smith.pdf](http://www.actuaries.org/Boston2008/Presentations/HT6_Smith.pdf)

Stallings, W (2000) Queuing analysis.

<http://www.comms.scitech.susx.ac.uk/fft/networking/queuinganalysis.pdf>

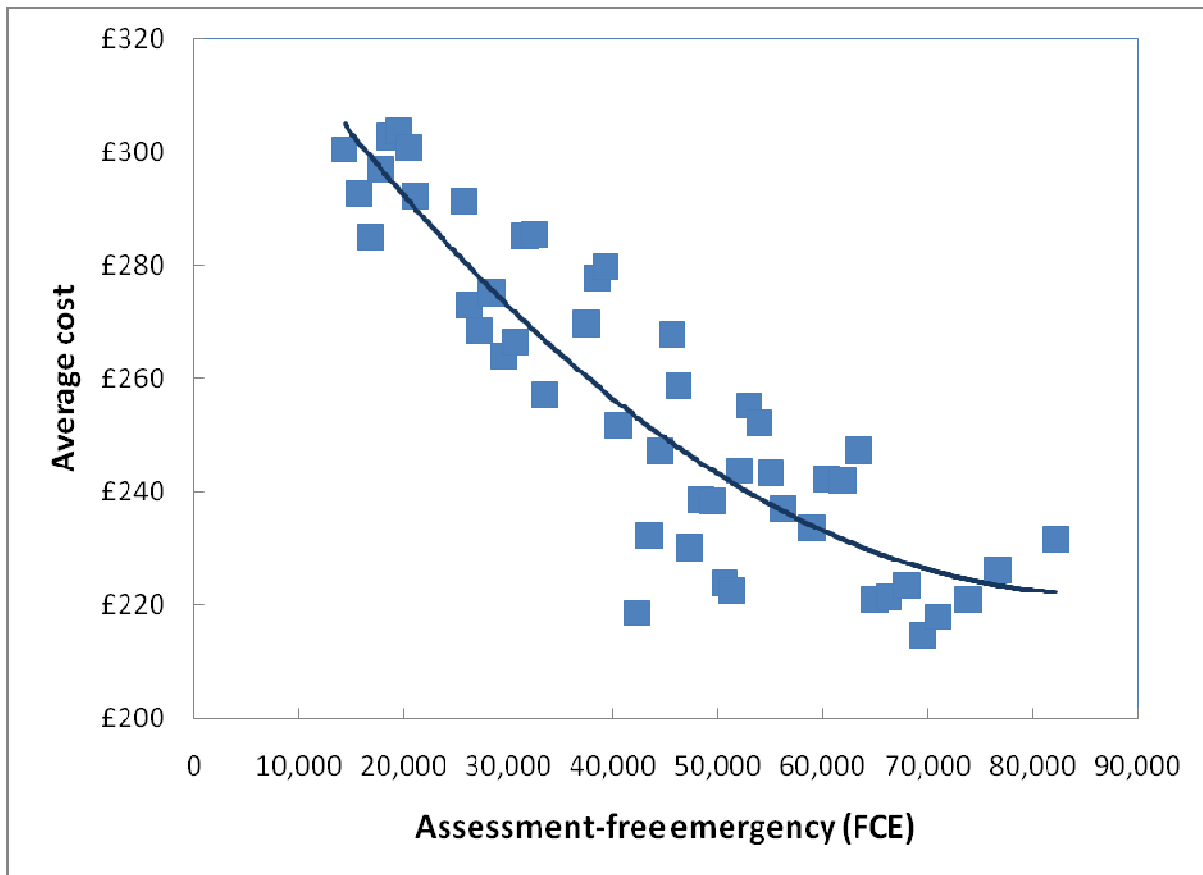
Taheri P, Butz D, Greenfield L (2000) Length of stay has minimal impact on the cost of hospital admission. *J Am Coll Surg* 191(2):123-130.

**Figure 1: Short stay assessment ‘admissions’ as a proportion of total emergency admissions.**



Footnote: Data from 113 NHS Trusts was placed into 20 equally spaced groups based on assessment-free size and the proportion of ‘admissions’ via EAU was averaged. A power law line of best fit has been added. Results for individual Trusts will show higher scatter around the trend line.

**Figure 2: Average cost of an ‘admission’ to an assessment unit**



Footnote: Data from 113 NHS Trusts has been placed into 40 equally placed groups based on assessment-free size and the cost averaged within each group.