

Forecasting Year-End Activity

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We are at mid-year and someone from finance says we are over budget. Time to talk about the profile of activity across a year and methods for forecasting year-end. Do we use simple twelfths or track relative to last years' activity. Neither of these approaches are the preferred option.

Outpatient and inpatient elective activity tends to follow a work days per month profile with fewer effective work days during the summer and December. Easter can occur at year end (March) or start of the year (April). GP referral for first outpatient appointment tends to follow a slightly different profile to appointments seen since a patient can access a GP during the summer holidays but the hospital may not be running as many clinics due to staff holidays. Work days in a month can vary between 17 to 23 depending on the month and year and total work days per financial year ranges from 251 to 255 depending largely on Easter. Elective activity can 'over perform' by 1.6% by simply moving from a 251 to 255 work days year.

Table One: Activity multipliers for non-elective admission to forecast year-end

Month	One-twelfths	T&O	Urology	ENT	Ophthalmology	Gynaecology	Oncology	Elderly Care	Paediatrics	Neurology	Rehabilitation	Haematology	All Specialities
Apr-10	12.0	12.72	12.84	12.27	13.43	12.50	13.31	11.20	12.98	11.30	12.43	11.85	12.48
May-10	6.000	5.971	6.495	6.223	5.735	6.521	6.385	5.877	6.157	5.613	6.195	6.372	6.207
Jun-10	4.000	3.925	4.077	4.163	3.935	4.200	4.224	4.034	4.142	3.746	4.042	4.481	4.098
Jul-10	3.000	2.898	2.954	3.153	2.956	3.092	2.923	3.067	3.158	2.855	3.024	3.254	3.039
Aug-10	2.400	2.305	2.361	2.496	2.454	2.450	2.290	2.480	2.674	2.292	2.409	2.567	2.438
Sep-10	2.000	1.901	1.950	2.096	2.040	2.037	1.888	2.055	2.233	1.940	2.010	2.110	2.031
Oct-10	1.714	1.638	1.660	1.748	1.704	1.747	1.635	1.764	1.890	1.668	1.736	1.732	1.739
Nov-10	1.500	1.449	1.454	1.516	1.469	1.520	1.451	1.548	1.610	1.479	1.506	1.511	1.518
Dec-10	1.333	1.300	1.293	1.335	1.300	1.354	1.305	1.350	1.367	1.313	1.324	1.336	1.336
Jan-11	1.200	1.183	1.181	1.204	1.187	1.212	1.182	1.203	1.212	1.191	1.187	1.201	1.201
Feb-11	1.091	1.090	1.092	1.108	1.093	1.103	1.100	1.098	1.100	1.088	1.087	1.089	1.098

Footnote: Data is from a large acute hospital in the south of England. Weighted monthly work days and non-work days have been used to generate the annual profile. Confidence intervals are not shown.

For emergency admissions each specialty shows a unique profile depending on the sensitivity of various conditions to temperature, pressure, light intensity, viral illness, etc. Since the weather tends to be relatively variable from year to year the confidence intervals for the annual profile tend to be

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far wider for emergency admissions. In theory, emergency admissions should be sensitive to the number of work and non-work days in a month, however, total days per month are usually a good first approximation.

To generate a profile of activity, adjust previous years' activity for growth, divide previous years' activity by work days or total days per month (as appropriate) and then calculate an average with confidence intervals for each month and for cumulative activity. The confidence intervals are probably more important than the average since they enable you to see if the mid-year activity is within the upper and lower confidence intervals. If it is, tell the man from finance to reconsider if he is in the correct industry! Table 1 illustrates the wide range in multipliers which can occur at specialty level and highlight the danger of trying to apply a single profile across all aspects of care.

The alternative method is equivalent to what is called a rolling forecast. Forget about financial years and simply add up the previous 12 months of activity, hence, at the end of April 2009 we have activity from May 2008 to March 2009 (from the 2008/09 financial year) plus April (from the 2009/10 financial year). Use a time trend for such a rolling 12 month total to project to the end of the year and you have a fairly good estimate for year end. Place confidence intervals around the trend line and compare the result with the method detailed above.

Look out for step changes in activity as such a step change will cause the slope of the trend line to change at the point the step change is made. A step change can occur for a variety of reasons most usually to do with how the acute site counts and codes activity and occasionally due to the long-term patterns associated with medical emergency admissions. The suggested reading will bring you up to speed with the details.

Suggested Reading (available from www.hcaf.biz)

- Jones R (1996) Estimation of annual activity and the use of activity multipliers. Health Informatics: 2, 71-77.
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<http://www.docstoc.com/docs/5049790/Level-Playing-Field>
- Jones R (2004) Financial risk in healthcare provision and contracts. Proceedings 2004 Crystal Ball User Conference, Denver. <http://www.hcaf.biz/Financial%20Risk/Microsoft%20Word%20-%20CBUC%20Paper.pdf>
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- Jones R (2010) Unexpected, periodic and permanent increase in medical inpatient care: man-made or new disease. Medical Hypotheses 74(6), 978-983.