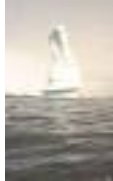
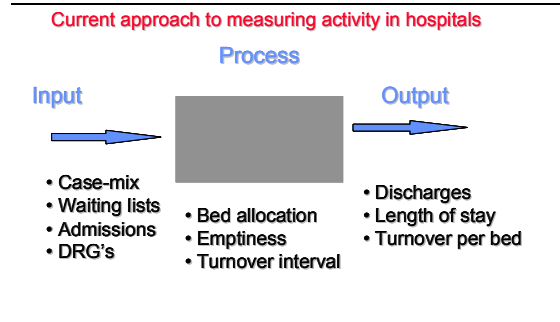


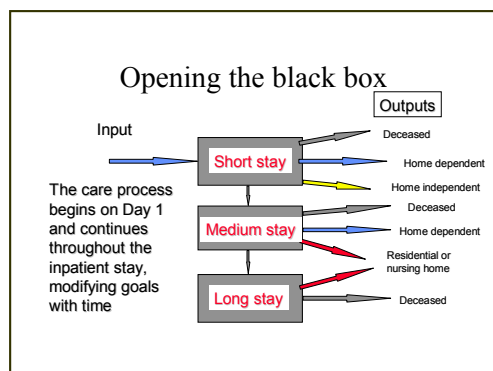
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Modelling health and social care systems: opening the black box. Peter Millard

It's wintertime in Australia and summertime here. So bed crises are a hot topic down under, whereas in Britain everyone is basking in the sunshine of intermediate care. On June 3rd the radio programme "Australia talks back" asked "How do we cure our sick hospitals?" The health system is a "dog's breakfast of competing interests". And John Menadue says the answer is to let the Feds run the whole show. What answer would you give?



My interest in modelling health and social care systems began in the 1970's soon after Hospital Activity Analysis was introduced. Nothing was further from my mind when I qualified in medicine in October 1960. Sixteen months later, single-handed, I was running a 60-bedded hospital in West Cameroon, West Africa. Surprisingly, my education at a London teaching hospital meant that I knew what ought to be done. However, giving the anaesthetic while operating reading the book was a life changing experience. Surprisingly, the death rate went down.



I returned to England in 1964 and became a junior doctor in geriatric medicine. One of five doctors at the bedside, I had no idea what to do. What is rehabilitation? How do you motivate an older person to walk? What risks can you take? Is falling a sign of disease? How do you manage social problems? Do families really not care, or is it the institution that needs to change? Why do so many 'bed-blockers' improve when they leave acute care? Many questions, no answers. The population is ageing, the cost of care is rising, what book would you recommend the Minister's advisors to read?

There are many medical and nursing textbooks that describe the special needs of older people, however, to my knowledge, not one of these books describes the dynamic interactions between acute, rehabilitative and long-stay care. My interest in modelling health care systems began in the 1970's when Hospital Activity Analysis began and we realised that the computer generated average length of stay in our geriatric medical service was a thoroughly bad measure of inpatient activity, because it combines and confuses output from rehabilitation and long stay care.

In this issue Mark Mackay explains why average length of stay of discharged acute patients is a poor measure, and argues that more numbers than one are needed if differences in services are to be compared. The pressure is on in Australia to improve efficiency by 70%. Contributing to the debate on efficiency, Nuala O'Sullivan considers the concepts behind six sigma and their relevance to health care systems.

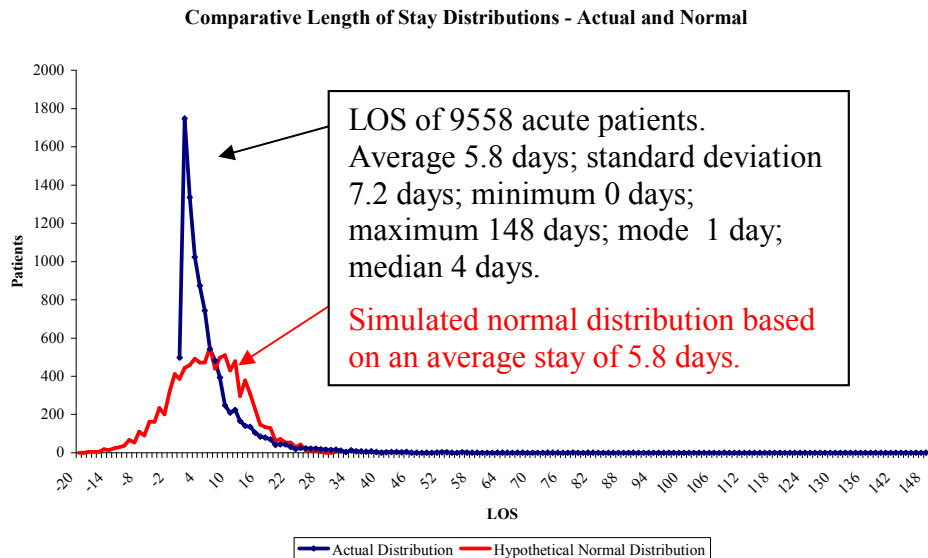
What's wrong with the Average Length of Stay? Mark Mackay

Principal Project Officer, Department of Human Services, Adelaide

Who in the health care business, especially those working in hospitals or central bureaucracies, hasn't heard of the *average length of stay* (ALOS)? I'd be confident that most people reading Nosokinetic News have heard of this measure. It is found in annual reports, performance indicators and case mix funding models, and frequently used in modelling, etc. But is it the best measure of patient flow to use?

The use of the ALOS to compare outcome of treatment in services in different hospitals is rarely questioned. Yet, the average stay gives no indication of the spread of data around the average. In a normal distribution the mean (average), mode (most frequent number) and median (middle value) are the same. Even if these numbers are the same we need to know the standard deviation or a confidence interval to understand the distribution of the data.

The figure shows the skewed distribution of patient stay from an Australian acute care setting. And a simulated normal distribution based on the same mean and standard deviation. Comparison of the two curves reinforces the need for planners and decision makers to understand the distribution of their LOS data.



Problems in reporting averages for skewed distributions are not new. Often wage disputes are argued on the basis of differences in average pay rates. In some places, the media now reports the median weekly pay. The median is a better measure to use when a distribution is skewed. Whether people understand the difference between the average and median is an entirely different matter.

Research stemming from the work of Gary Harrison and Peter Millard indicates that patient stay can be better modelled with *compartmental flow models*. (See *Nosokinetics News 1.1*). Such models provide alternative parameters that can replace the ALOS. The use of such measures would lead to a range of outcomes, including better decision-making and reduce gaming in funding models.

In conclusion: "Has the time come to replace the ALOS? Yes! Is the health sector ready for the change? Probably not. The ALOS is well ingrained and considerable education will be required to see a change in use. The demonstration of better decision-making may make this happen sooner.

[mailto:Mark.Mackay@dhs.sa.gov.au?subject=Average LOS](mailto:Mark.Mackay@dhs.sa.gov.au?subject=Average%20LOS)

Six Sigma: What does it mean? Nuala O'Sullivan

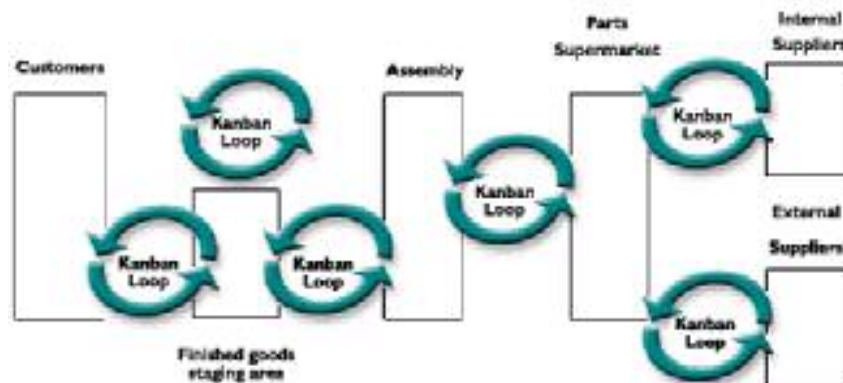
Visiting Lecturer and PhD student, University of Westminster, London

Six Sigma is a management improvement strategy which tries to reduce defects with a view to improving a firm's marketing position¹. Sigma (Σ , σ , s) is the Greek letter statisticians use as a measure of variation. Hence six sigma means a variation of ± 3 from the norm (mean) or from the centre line of a control chart.

Six Sigma uses the principles of lean systems and total quality management to achieve bottom line results of no greater than 3.4 defects per million^{2,3}. This is an improvement on the estimated norm of most companies who operate around the three sigma level which would translate into approximately 67,000 defects per million operations.

The core belief underpinning Six Sigma is that if you can measure how many "defects" you have in a given process you could also systematically eliminate them with the goal of aligning as close to Zero defects as possible⁴. The approach relies heavily on the earlier Just In Time (JIT) and lean systems approach to manufacturing, cutting away waste and realigning a system with multiskilled workers, a few chosen suppliers and little or no storage.

The figure illustrates how the "Kanban card" accompanies the order throughout the supply chain, "pulling" necessary parts as they are needed. Electronic scanning ensures that at each stage the process of the order can be monitored.



Extrapolating these findings to health care systems is difficult. Adopting a Six Sigma or Just-in-Time philosophy implies that everyone must change. Multi-tasking implies that multi-disciplinary teams must share their basic skills. In the case of General Motors the "Just-in-time" concept fell foul of the Trade Unions and a costly strike ensued. More pertinently Six Sigma is inappropriate in a health care setting since the organisation has no control over the inputs (patients) which would be essential for a six sigma aspiration. However this is not to say that selected lean principles cannot be applied to aspects of the organisation with a view to improving services and optimising resource use.

[mailto:nuala@osullivan63.freemove.co.uk?subject=Full version of paper on Six Sigma](mailto:nuala@osullivan63.freemove.co.uk?subject=Full%20version%20of%20paper%20on%20Six%20Sigma)

1. Revere, L., Black, K. & Huq, A. (2004). Integrating Six Sigma and CQI for improving patient care. *The TQM Magazine*. Vol 16, No. 2 pp105-113

2. Harry, M. & Schroeder, R. (2002). Six Sigma: The breakthrough management strategy revolutionising the world's top corporations. Doubleday.

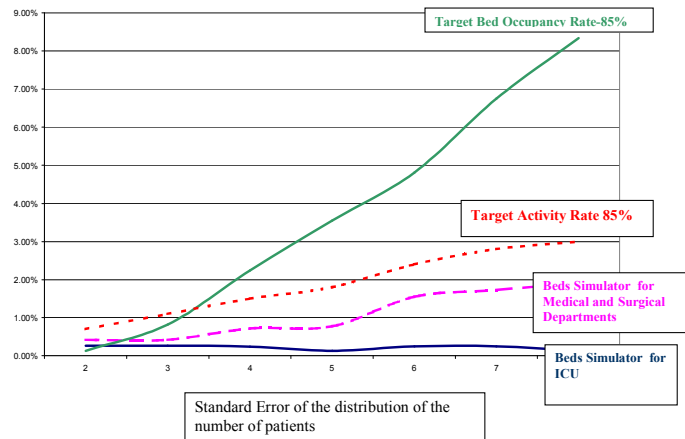
3. Young, T., Brailsford, S., Connell, C., Davies, R., Harper, P. & Klein, J. (2004). Using industrial processes to improve patient care. *BMJ*. Vol 328, pp 162-164

4. Breyfogle, Forrest. & Salvekar, Arvind. (2004). Lean Six Sigma in Sickness and in Health. Smarter Solutions inc. Austin, Texas.

Method to optimise hospital bed capacity. Jean Michel Nguyen. Laboratoire de Statistique et D'Information Medicale, Faculte de Medicine, NANTES FRANCE
<mailto:jeanmichel.nguyen@chu-nantes.fr>

Jean Michel Nguyen has developed a method which takes into account variability in hospitalization demands over time. The score has three parameters

1. The number of transfers due to lack of space (security and accessibility),
2. The number of days with no possibility for S unscheduled admissions (proxy quality), and
3. The number of days with at least a threshold of U unoccupied beds (efficiency- productivity).



The optimal number of beds is the number for which both the mean and the standard deviation of the score reach their minimum. This decision rule is based on the properties of a new statistical information called sample limits developed by the author. Software is available for use (www.sante.univ-nantes.fr/med). The second version of Beds Simulator[®] is also available.

Is time-slice analysis superior to total hospital length of stay in demonstrating the effectiveness of a month-long intensive effort on a medicine service?

Bellin E, Kalkut G. Qual Manag Health Care. 2004 Apr-Jun;13(2):143-9

Benefits of efficiency interventions are frequently assessed by reductions in average stay. However, average LOS is a crude metric when trying to assess the utility of an intervention focussed on a particular service or over a specific time window. Using an extension of the Cox proportional hazard model (S-plus), the authors modelled the expected average LOS, during a one month intervention, controlling for the appropriate variables. Comparison with a conventional average LOS demonstrates the superiority of the "time slice" method over the conventional analysis of LOS.

A Profile of Residents Admitted to Long-Term Care Facilities for End-of-Life Care.

Porock D, Oliver DP, et al. Journal of the American Medical Directors Association 2003;4:16-22.

Using Kaplan-Meier survival curves, the authors analysed the clinical characteristics of 9615 admissions to nursing homes in Missouri. 432 (4.5%) of 9615 admissions met the 'end-of-live' definition, with a median survival 33 days: at six months only 17% remained. In contrast, only 5% of the other admissions died within a month, 15% within six months and 30% within the year. The results support a US Department of Health and Human Services finding that 30% of residents will die within the first year following admission, whereas only 13% of current residents will die by the end of the year. This explains why, when we visit homes, we see 'survivors' and not 'movers'.

Comment on Computerised Medical Records in the UK.

John Crimmins, Chairman of the Standing Committee of General Practitioners writes in the London Royal College of Physicians Commentary.

"The entire area of computerised medical records and the exchange of information between primary care and secondary care is currently a nightmare. There is not even common agreement on anything as basic as systems to be used or universal Read codes."

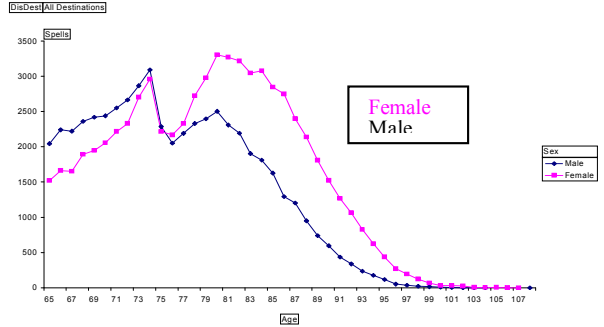
Nosokinetics News

Making the world a smaller place for Health Care Modellers

Issue 1.3

<http://www2.wmin.ac.uk/coiec/nosokinetics.htm>

June 2004

<p>New Australian Course in Health Systems Simulation. Contact Dr Geoff McDonnell geoff.mcdonnell@unsw.edu.au, Research Fellow at the Centre for Health Informatics, UNSW.</p>	<p>A missing generation: the biological impact of the 1914-18 war. Discovered by Chris Vasilakis' PhD research using OLAP and the English National Hospital Episode Statistics Data</p>
<p>A Practical Hands-On Simulation Course using the new AnyLogic multi-method simulation software from www.xjtek.com The learning approach takes the form of structured walkthroughs of a portfolio of classical and real case studies. Currently face-to-face, later may be offered through web-based delivery. Targeted to a broad range of student participants.</p>	 <p>Age of UK Stroke admissions aged 65 and over in 1994</p>


<p>Wanted. Research Fellow in Patient Flow Modelling within the Operations Research group of the Department of Mathematics and Statistics at the University of Melbourne</p> <p>Funded by the ARC Linkage Grant “Modelling patient flows through hospitals: optimizing effective use of resources”. You will be required to provide mathematical and statistical analysis and programming expertise to the project. The mathematical analysis and programming work involves understanding the problems to be tackled, and the interplay of techniques required for formulating these into a mathematical or computing framework for analysis, developing the solution methods and analysing specific examples using computer modelling. The position’s description is available from http://www.hr.unimelb.edu.au/pds/Y0014284.pdf</p>

<p>Health Papers for Oxford International System Dynamics Society Conference July 23rd - 29th Papers posted on the Conference Website at http://www.systemdynamics.org/conf2004/indexpapers.htm</p>

<p>American Institute for Health Care Improvement It’s not mathematical, but practical tips on improving flow that can be found at http://www.qualityhealthcare.org/IHI/Topics/Flow/</p>

<p>Two papers showing benefit of consultant involvement in medical decision making</p> <p>Implementation of a voluntary hospitalist service at a community teaching hospital: improved clinical efficiency and patient outcomes. Auerbach AD, et al. Ann Intern Med. 2002;137:859-65</p> <p>Effects of physician experience on costs and outcomes on an academic general medicine service: results of a trial of hospitalists. Meltzer D, et al. Ann Intern Med. 2002;137:866-74</p>

<p>Forthcoming conferences</p> <p>An up-to-date list of relevant forthcoming conferences can be found on our webpage at: http://www2.wmin.ac.uk/coiec/nosokinetics.htm</p>

<p>Good News: Mail out 175</p> <p>Nosokinetics News now reaches 175 people: UK 85; Australia 60; New Zealand 8; Canada, France, Romania, USA 3; Cuba, Ireland, Netherlands, 2; Chile, Hongkong, Germany, Japan, Slovakia 1. Contributions, ideas, suggestions welcome.</p>	<p>Stop Press: PhD success.</p> <p>Congratulations to Haifeng (Kevin) Xie, University of Westminster, Health and Social Care Modelling Group on his successful defence of his thesis on. “Modelling issues in institutional long term care: placement, survival and costs”.</p>	
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