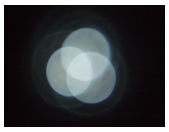
Issue 5.6

Nosokinetics News

December 2008

Bi-monthly Newsletter of the UK Nosokinetics Group
Past issues at http://www.nosokinetics.org/



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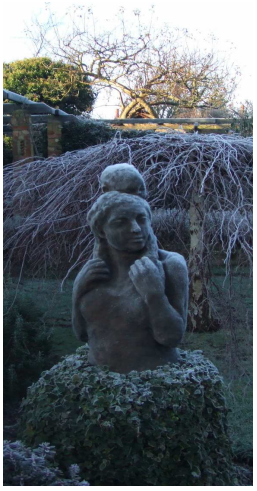
Much has happened since the last newsletter and there is a lot to write about. We have 19 contributions for the Springer Intelligent Patient Management book and Sally McLean is on track to meet the deadline, despite the recalcitrance of your editor. Thankfully, Brendon Rae and Wendy Busby from New Zealand came to my aid. Together, we were able to 'bridge the gap' between the observations made in the St. George's UK 16 year geriatric medicine data set (1968—1984) and the continuing saga of bed crises in the general medicine service at Dunedin Hospital (1992-2007). Confirming the cross-world relevance of the behavioural theory of flow.

Jupiter is next to Venus, above the crescent moon, and fifty years will pass until both planets are again so near to the earth. Also Christmas is upon us, and in the Northern Hemisphere, the 21st of December is the Winter Solstice.



Marking this family and spiritual occasion we extend Seasonal Greetings to our readers, with a picture taken on a frosty morning, of the Mother and Child statue in our garden . Sculpted In 1987 by Mrs Peddy in her 82nd year, based on a biblical theme of Abraham taking the ram to sacrifice.

Also, to celebrate the end of our fifth year, we have replaced the Madonna and Child iceberg with a logo created by the light from a wind up torch. Reflecting the bio / psycho / social aspects of medicine, the sociopoetic nature of health and social care systems and the need for the decision support tools (techniques) that the Nosokinetics Group has created and validated to break out of the darkness into the light.

A glimmer of light is on the horizon. A small step for man, often suggested not done, perhaps a giant step for us. Ahmed Shawky, Assistant Lecturer of Geriatric medicine in Ain Shams University Hospital, Cairo has formed a Nosokinetics Group and started a page in the Wikipedia Encyclopedia about the nosokinetics science and group. Open to editing and contribution by anyone to help sharing information. You can check the page on http://en.wikipedia.org/wiki/Medicine#Interdisciplinary_fields and http://en.wikipedia.org/wiki/Nosokinetics.

Furthermore, a Royal College of Physicians conference in November 'Why do we need so many beds?' was inspired and chaired by Miss Kate Silvester, a doctor with surgical and manufacturing systems engineering experience. Kate facilitates the Clinical Systems Engineering and improvement movement. A collaboration of many organisations within the NHS from primary, secondary and tertiary care, Strategic Health Authorities, and improvement organisations such as the NHS institute for Improvement and Skills, and the Health Foundation. Many medics came out of the woodwork to really get stuck into addressing this problem. A wonderful combination of theorists, pragmatists, activists and reflectors.

Summing up: for Kate-The root problem being how to match the medical manpower capacity (and the rest of the workforce) to the demand (requests) for hospital care. As we can't carry on storing patients at the convenience of the senior medical staff and their batch production system i.e. sessions.

See http://www.steyn.org.uk/

Measuring and modelling phase type distributions in stroke illness

Based on a submission by Prof Malcolm Faddy, Brisbane, Australia

Editor's comment Prof Faddy builds on the research of Revlin Abbi in Elia El'Darzi's group at the Harrow campus of the University of Westminster to show how phase type distributions better describe the process of inpatient care for patients with stroke illness.

Background In the June 2007 issue of Nosokinetics News, Revlin described a two-stage data mining methodology, which extracts specific and unique characteristics (profiles) for each LOS class. Stage one fits a Gaussian mixture model (GMM) to discover LOS groups, which are probabilistically defined and tend to overlap with one another. Stage two, using Bayes theorem, derives LOS classes from the LOS groups.

Gaussian Mixture Models The GMM is a probability density model consisting of a mixture of normally distributed component functions. Given the right number of component functions, GMM is capable of approximating the skewed LOS description.

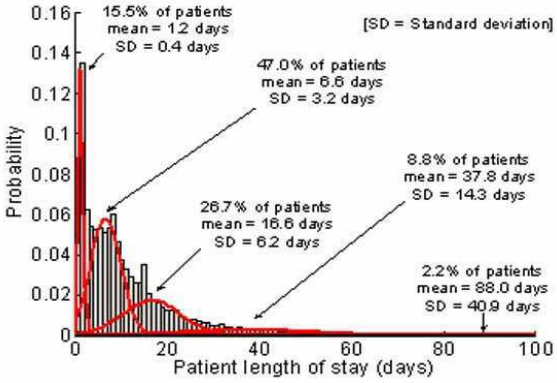


Figure 1. Five component GMM of Stroke patient LOS

Figure 1 shows a five-component model fitted to a data set of stroke patients. From the estimated GMM parameters, the mean, variance and percentage of patients in each group are derived. The mean indicates the expected stay and the variance to describe the homogeneity (variation) within each group.

Phase type distributions Phase-type distributions better describe hospital length-of-stay data than mixtures of normals, partly because they are defined only for positive values (unlike the normal distribution) but mainly because the exponential phases are better able to describe long tailed behaviour.

Stroke illness A phase-type distribution fitted to data from stroke patients in Figure 2 provided a good fit to these data, and could be described as a four component mixture with the component distributions shown in figure 1.

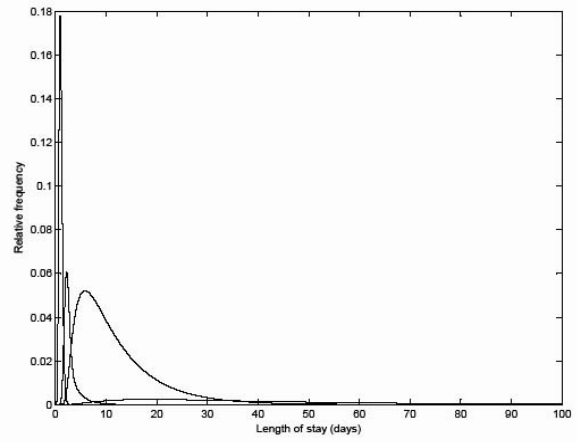


Figure 2. Four phases modelled in Stroke data

These can be summarised as follows:
First phase: 14.1 % with mean length of stay 1.0 days and standard deviation 0.3 days,
Second phase: 10.3 % with mean length of stay 2.9 days and standard deviation 1.5 days
Third phase: 64.3% with mean length of stay 12.0 days and standard deviation 8.1 days,
Fourth phase: 11.3% with mean length of stay 41.7 days and standard deviation 30.9 days.

Editor's comment: I'm not sure if I can do this, however, here's a clinical interpretation. Malcolm's away!

Clinical Group	Percent Admitted	Days in phase (mean)	Days in service	Beds per 100 Low to high (mean)
Transient ischemic attacks	14.1 %	1.0	1.0	0.7 - 1.0 - 1.3
Reversible ischemic neurological deficits	10.3 %	3.9	4.9	1.4 - 2.9 - 5.7
Minor strokes	64.3 %	12.0	16.9	3.9 - 12 - 20.1
Major strokes	11.3 %	41.7	58.6	10.8 - 41.7 -72.6

Notice too that the data set is missing the long stay patients and 'fast-tracking' depends on destination at discharge.

Why current publication practices may distort science Young NS, Ioannidis JPA, Al-Ubaydli O *PLoS Medicine* Vol. 5, No. 10, e201 doi:10.1371/journal.pmed.0050201

Publication bias reinforces the problem of published 'falsehood' in leading journals. Because of the use of "poor" models of decision-making around resource allocation, a plethora of "simple" methods gets published.

Editor's comment: Witness the current focus of 'Evidence Based Medicine' underpinning the planning of clinical services. Ignoring the placebo effect and that prophecies have their own fulfilment. All too often, local implementation of the statistically valid changes made in other services fails to achieve the same results. Perhaps because the charisma of the innovator is not replicated, and / or structural and other factors within and without hospitals influence the outcome of impact on the outcome of inpatient care.

The history and ideas of Marxism: the relevance for OR Ormerod, R. J. (2008). *Journal of the Operational Research Society* 59(12): 1573-90.

Editor's comment: This philosophic paper opened my eyes. If you don't read anything else look at the table.

Ormerod argues: Anyone seeking to change the world (and we are no exception to that ambition) needs to understand the impact of Marxism on the development of social theory within social science. Although aspects of Marxism must be rejected, his ideas that theory is closely related to practice, and that intellectual and social power cannot be separated from class, remains convincing. Witness political discussions about which class (or group) benefits.

OR in the UK is largely engaged in improving the efficacy, efficiency and effectiveness of an advanced capitalist society. Ninety percent of 200 case studies published in JORS between 2002 and 2006 belong to the 'official' paradigm; 8% related to activities in the 'reformist' paradigm and two only can be considered as being in the 'revolutionary' category. One (JORS 37:335-44) describes involvement of public and patients in improving services in UK, which is hardly revolutionary as it is government policy.

Three archetypes of OR policy have a different focus and a different vision.

- *Smart bits* - quantitative modelling and algorithmic activities, forecasting. scheduling and what if modelling, etc.) where the central focus in on technical tasks.
- *Helpful ways* - generally problem solving and intervention - where changing the process of care is central to the solution and OR expertise facilitates the outcome.
- *Things than matter* - e.g. health, housing, transport … which puts the political process at the centre.

Editor's comment: Given that hierarchical structure we can see where we stand, and the problem we face. Unlike the pygmy from the 'Where Are We Tribe' jumping up and down in high grass to find out where they are, we have a map. A structure that explains where we are.

Hierarchical structure of three archetypes of OR		
Smart bits:	Helpful ways	Things that matter
Technical	Process	Political
Process	Political	Technical
Political	Technical	Process

We have few labourers in the vineyard. Each with their own agenda. Mainly the research effort is unfunded, though collaboration with managers and clinical groups is beginning to change this. However, our paradigm is different It's 'Bottom Up' not 'Top Down', because it's all a question of time, space and behaviour. It's all a question of time.

The concept is simple, but the mathematics is complex: opaque to say the least. And as Mark Mackay argues, overleaf, many decision makers do not know that the mean is the same as the average. So we have a long way to go. But keep smiling for Rome wasn't built in a year.

Editor's insert: Reflecting on local and national politics I recalled *The Indian Reservation syndrome*: "Me big chief: ten beds in teaching hospital. You little chief :200 beds in swamp." And a constant refrain, there is no organ or system which justifies its presence, as old people are being treated in all specialties of adult medicine. In the next issue I will highlight another paper in JORS which shows that it is a question of.knowledge,

Mark Mackay writes: Is it time for the idiot's guide to "Health care data analysis and modelling"?

Context: Years of frustration inside the "industry" working with people who refuse to "move" beyond a single measure that usually is poorly understood and usually misused or abused.

The solution: Apart from reforming the education sector - too long and what is substituted to include the additional material in the course anyway - the other option is to produce a book that provides a basis for the beginning journey along the highways of health care data analysis for those who are interested or perhaps have a need because of their current work.

Why an "idiot's guide?" - Of course it doesn't have to be an "idiot's guide" - there are a variety of series now available that are designed as simple introductory texts. For example, the Schaum series (on many academic topics) have been around for years and are still in production.

So what would be covered in such a book? Many people working in the health sector have professional backgrounds and may have received some statistical training during their university training. That training may have been:

- A long time ago and things have since changed (e.g., computers are now found at most work stations).
- Done purely as a course requirement and quickly forgotten.
- Interesting, but never had the opportunity to use it (now a bit rusty), or
- Some combination of the above.

Of course, there's some who may never have received any training in statistics or data analysis.
The book would therefore cover the following:

- Data - what is and why it's important - Data capture - What to do with captured data? - Creating a table - Creating a graph - Some basic statistics	- Basic statistics - Beware of the traps - Pivot tables - Some health specific more advanced tools: moving averages, etc - When to call for help! (*an important topic*) - Where to from here - resources and further training

And be based upon using MS EXCEL® as this is commonly available.

So what's the benefit? Maybe, just maybe, the road to better-informed decision-making would be progressed a little more. And maybe, just maybe, I wouldn't have to have the conversation as often about "Yes, the mean is the same thing as the average"; and "Yes, it is possible to compare two means".

So why write this in NK News - your feedback would be appreciated. Is this something that the NK society should be promulgating? Certainly, we could ensure that the examples relate to NK issues, though clearly to capture readership, it would have to include other material as well.

What say you! Please email me at mark dot mackay *at* adelaide *dot* edu *dot* au

Editor's comment:
I queried Mark as to whether the book should also contain issues related to the streams of flow in clinical systems and he replied:

I wouldn't be inclined to add the bit about clinical medicine - what we're (or perhaps it should be me) talking about here really is the use of the mean in policy setting situations and applied "health services research" and sometimes "financial" applications.

Perhaps an example is appropriate. Think of a health system (local) that is divided into regions. How to allocate funds to each region. We create a simple model of resources = use + indicator of risk + other indicators (say). (It is recognised that these don't capture "need" - that's something I guess).

The problem is that the indicators are "sampled" and while the means are different, when "statistically" compared there's no real difference. Thus, allocating money on this basis is done on a flawed basis. It could be argued that it's a policy issue - but if so, it's poor policy as the evidence doesn't support it.

What say you?

READERS WRITE

Nosokinetics News Useful

Kieran Keyes, Executive Director Corporate Services, Royal Brisbane and Women's Hospital

Thanks Peter. I always enjoy reading through the newsletter. I am interested in somehow describing the various patterns I observe through the management of a large acute hospital, and until such time as I can develop my hypothesis your newsletter gives me plenty of good ideas and some current literature on the topic.
Kieran Keyes

Australian pathology workforce crisis

Chris Bain : Melbourne writes
I have attached a link to a national report on the Australian pathology workforce crisis
http://www.aushealthcare.com.au/documents/news/12432/ML%20211008.pdf
There is huge potential for the roles of IT in - problem analysis, and workflow support for pathology
Regards Chris

Nosokinetics in Wikepedia

Dear Prof P Millard

I have had the honour of putting Nosokinetics into the Wikipedia encyclopedia. I was searching for something and stumbled on the webpage of medicine that contain a section on "Interdisciplinary

fields" related to medicine. So many fields and I thought Nosokinetics should be put here so I added it and started its page. I hope others can start adding more useful contributions.

Wikipedia articles are very popular online, so a Nosokinetics page would help in bringing nosokinetics into light, introducing it to more people, the advancement of modeling of health care and disseminating the views and models adopted by the group.

You can check the page on http://en.wikipedia.org/wiki/Medicine#Interdisciplinary_fields

and http://en.wikipedia.org/wiki/Nosokinetics.

Notice I have put the Nosokinetics page in the categories of Greek loanwords, Medical terms, Medicine stubs (articles that need development) and Nosokinetics

(a new category that I have started that might later on contain all related articles).

I would like to inform you also that i have started with a group of colleagues here in Egypt many discussions about nosokinetics that we hope that it would start new research projects soon. I would like you to give me permission to consider it a section of the nosokinetics group here in Egypt (Egypt Nosokinetics group).

Ahmed Shawky,

Assistant Lecturer of Geriatric medicine, Ain Shams University Hospital, Cairo

Right Project Work Book: Which Model and Why?

Modelling and Simulation Techniques for Supporting Healthcare Decision Making - A Selection Framework

The work book was developed by a team of researchers from five UK universities with a grant from the UK Engineering and Physical Sciences Research Council (EPSRC), investigated the use of modelling and simulation in healthcare as part of the RIGHT (Research Into Global Healthcare Tools) project. To produce this summary guide, thousands of articles were categorised according to the techniques used, where they were used, and with what resources.

This workbook provides guidance for people who are making decisions in healthcare. It is aimed at anyone who wants to find out more about different modelling and simulation techniques what they are, when to apply them, and what resources are required to use them. It will not only help decision makers commission more appropriate modelling work, but also assist professional modellers and business consultants to expand their modelling repertoire in order to meet the diverse needs of their clients.

Purchasing: 'Modelling and Simulation Techniques for Supporting Healthcare Decision Making - A Selection Framework', ISBN 978-0-9545243-3-3, is available for purchase by downloading the following order form (http://www-edc.eng.cam.ac.uk/books/edc-books-orderform.pdf) £30.00.

Stochastic Modelling for Healthcare Management : ASMDA - 2009, in Vilnius Lithuania. Sally McClean and Adele Marshall organising a special modelling stream Deadline for Abstracts with Proceedings 20th December. Conference date June 30- July 3, 2009 (http://www.asmda.net/asmda2009/)

6th Annual ICMCC Event: 1-3 June, 2009

University of Westminster, Psychology Business School, London, UK

Patient 2.0 Empowerment - EHR for Personalizing and Improving Care

Knowledge Management; Social and ethical aspects; Digital homecare; Future (visionary)

Deadline submission of full event papers: 1 February, 2009
Authors are encouraged to focus their contributions from a patient's perspective.
http://2009.icmcc.org

Delivering better health services - Call for abstracts
3 & 4 June 2009, HSRN & NIHR SDO joint annual conference, Birmingham

Supplement of the Journal of Health Services Research & Policy. Abstract deadline 14th January conference webpage (http://www.nhsconfed.org/specialist/specialist-4432.cfm)

Congratulations to Adele Marshall and Barry Shaw Queen's University of Belfast, Northern Ireland

The Essence of OR! The JORS Editors have selected a dozen recently published case-oriented papers, a suitable cross-section of papers for study by interested readers seeking to know what Operational Research (OR) is all about.

To view this selection go to http://www.palgrave-journals.com/jors/case_oriented_papers.html

Shaw, B. and A. H. Marshall (2007). "Modelling the flow of congestive heart failure patients through a hospital system." *Journal of the Operational Research Society* 58(.): 212.-218 doi:10.1057/palgrave.jors.2602240 Published online 5 July 2006 is included in the list;

Using a Markov Model, Adele and Barry reveal three streams of patient flow in the occupied beds, putting a further nail into the coffin of the average stay.

Nosokinetics News is the newsletter of the UK Nosokinetics Group

Nosokinetics is the science / subject of measuring and modelling the dynamic aspects of patient and client movement (flow) through health and social care systems. From the Greek, literally, *noso* (sickness) and *kinetics* (movement).

The group collaborates to organise conferences and disseminates news of our and others research and practical use of modelling to enhance decision making in health and social care systems.
Past issues in PDF at http://ww.nosokinetics.org/

Thanks to IMS our web archive of full texts of submitted papers between 2006-2007 is at:
http://www.iol.ie/~rjtechne/millard/index0.htm

To receive a personal copy follow the instructions at

http://www.jiscmail.ac.uk/lists/NOSOKINETICS-NEWSLETTER.html

Pot Pourri

As an experiment in reader participation, herewith, an author listed selection of papers on the clinical aspects of modelling. I have an arrangement with the RSM library to trawl every month for clinical papers on modelling. I know which one's interest me. But what about you?

Also if you have a publication that you want others to know about why not send us the details. With 50 words great, if not just the title to put in the list.

Amador, L., F,, O. Reyes, Carlos,A,, et al. (2007). "Discharge destination from an acute care for the elderly ACE unit." Clinical interventions in aging 2(3): 395-9.

Asaro, P., V,, L. Lewis, M,, et al. (2007). "Emergency department overcrowding: analysis of the factors of renege rate." Academic emergency medicine : official journal of the Society for Academic Emergency Medicine 14(2): 157.

Chen, Y. Y., A. F. Connors, Jr., et al. (2008). "Effect of decisions to withhold life support on prolonged survival." Chest 133(6): 1312-8.

Cheng, H., Yong, (2007). "Biostatistics note: more could be done in predicting nursing home admission using the Cox proportional hazards model." Journal of the American Medical Directors Association 8(4): 271.

Cochran, J., K, and A. Bharti (2006). "Stochastic bed balancing of an obstetrics hospital." Health care management science 9(1): 31.

Cooper, K., S. C. Brailsford, et al. (2007). "Choice of modelling technique for evaluating health care interventions." Journal of the Operational Research Society 58(2): 168.

Curry, J., M,, C. McGregor, et al. (2007). "A systems development life cycle approach to patient journey modeling projects." Medinfo. MEDINFO 12(Pt 2): 905.

Donnan, P. T., D. W. Dorward, et al. (2008). "Development and validation of a model for predicting emergency admissions over the next year (PEONY): a UK historical cohort study." Arch Intern Med 168(13): 1416-22.

Eitel, D. R., S. E. Rudkin, et al. (2008). "Improving Service Quality by Understanding Emergency Department Flow: A White Paper and Position Statement Prepared For the American Academy of Emergency Medicine." J Emerg Med.

Elkhuizen, S. G., S. F. Das, et al. (2007). "Using computer simulation to reduce access time for outpatient departments." Quality & safety in health care 16(5): 382.

Faddy, M., J, and S. McClean, I, (2007). "Using a multi-state model to enhance understanding of geriatric patient care." Australian health review : a publication of the Australian Hospital Association 31(1): 91.

Fairbanks, C., B, (2007). "Using Six Sigma and Lean methodologies to improve OR throughput." AORN journal 86(1): 73.

Flottemesch, T., J,, B. Gordon, D,, et al. (2007). "Advanced statistics: developing a formal model of emergency department census and defining operational efficiency." Academic emergency medicine : official journal of the Society forAcademic Emergency Medicine 14(9): 799-809.

Kaandorp, G., C, and G. Koole (2007). "Optimal outpatient appointment scheduling." Health care management science 10(3): 217.

Kahn, J., M,, A. Kramer, A,, et al. (2007). "Transferring critically ill patients out of hospital improves the standardized mortality ratio: a simulation study." Chest 131(1): 68.

Kwa, P. and D. Blake (2008). "Fast track: has it changed patient care in the emergency department?" Emerg Med Australas 20(1): 10-5.

Langhan, T. S. (2007). "Do elective surgical and medical admissions impact emergency department length of stay measurements?" Clin Invest Med 30(5): E177-82.

Laniece, I., P. Couturier, et al. (2008). "Incidence and main factors associated with early unplanned hospital readmission among French medical inpatients aged 75 and over admitted through emergency units." Age Ageing 37(4): 416-22.

Laughlin, A., M. Parsons, et al. (2007). "Predictors of mortality following involuntary interinstitutional relocation." Journal of gerontological nursing 33(9): 20.

Lee, A., H,, W. Fung, K,, et al. (2003). "Analyzing hospital length of stay: mean or median regression?" Medical care 41(5): 681.

Lee, A., H,, K. Wang, et al. (2007). "Maternity length of stay modelling by gamma mixture regression with random effects." Biometrical journal. Biometrische Zeitschrift 49(5): 750-64.

MacLellan, D., G,, P. Cregan, C,, et al. (2008). "Applying clinical process redesign methods to planned arrivals in New South Wales hospitals." 188(6): S23.

Magnussen, J. and K. Nyland (2008). "Measuring efficiency in clinical departments." Health Policy 87(1): 1-7.

Marik, P. E. and L. Hedman (2000). "What's in a day? Determining intensive care unit length of stay." Critical care medicine 28(6): 2090.

McClean, S. and P. Millard (2007). "Where to treat the older patient? Can Markov models help us better understand the relationship between hospital and community care?" Journal of the Operational Research Society 58: 255.

Nguyen, J. M., P. Six, et al. (2007). "An objective method for bed capacity planning in a hospital department - a comparison with target ratio methods." Methods of information in medicine 46(4): 399.

Patrick, J. and M. Puterman, L, (2008). "- Reducing wait times through operations research: optimizing the use of surge capacity." Healthcare quarterly (Toronto Ont.) 11(3): 77.

Quinn, M. P., A. E. Courtney, et al. (2007). "Influence of prolonged hospitalization on overall bed occupancy: a five-year single-centre study." QJM : monthly journal of the Association of Physicians 100(9): 561.

Roberts, R., M,, K. Dalton, L,, et al. (2007). "A service model of short-term case management for elderly people at risk of hospital admission." Australian health review : a publication of the Australian Hospital Association 31(2): 173.

Rohleder, T., R,, D. Bischak, P,, et al. (2007). "Modeling patient service centers with simulation and system dynamics." Health care management science 10(1): 1.

Santibanez, P., M. Begen, et al. (2007). "Surgical block scheduling in a system of hospitals: an application to resource and wait list management in a British Columbia health authority." Health care management science 10(3): 269.

Sibly, E., C. M. Wiskin, et al. (2007). "Short stay emergency admissions to a West Midlands NHS Trust: a longitudinal descriptive study, 2002 2005." Emergency medicine journal : EMJ 24(8): 553.

Srijariya, W., A. Riewpaiboon, et al. (2008). "System dynamic modeling: an alternative method for budgeting." Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research 11(Suppl 1): S115.

Supervía, A., D. Aranda, et al. (2008). "- Predicting length of hospitalisation of elderly patients, using the Barthel Index." Age and ageing 37(3): 339.

Testi, A., E. Tanfani, et al. (2007). "A three-phase approach for operating theatre schedules." Health care management science 10(2): 163.

Van, H., Mark,, O. van, Jeroen,M,, et al. (2007). "Improving operating room efficiency by applying bin-packing and portfolio techniques to surgical case scheduling." Anesthesia and analgesia 105(3): 707.

Wodchis, W., P,, G. Teare, F,, et al. (2007). "Cost and quality: evidence from Ontario long term care hospitals." Medical care 45(10): 981.

Xie, H., T. J. Chaussalet, et al. (2007). "A simple graphical decision aid for the placement of elderly people in long-term care." Journal of the Operational Research Society 58(4.): 446.