



The NUS Global Asia Institute Newsletter

#1: April 2013

We are pleased to present the first edition of NUS Global Asia Institute's quarterly newsletter. Each quarter, we will feature an academic paper, explained for the layperson. This week, we highlight Singapore's hospital bed crunch and feature a potential solution provided by a research team from NUS GAI and the National Healthcare Group in a May 2012 paper.

We hope that you enjoy reading it as much as we have enjoyed writing it. If you should have any questions and comments or require more information, please do send us an [email](#).

The Inaugural J Y Pillay Comparative Asia Research Centre Conference to be held in May 2013



The J Y Pillay Comparative Asia Research Centre will be holding their inaugural conference from 22 to 24 May 2013. The theme of the conference is **"40 per cent of the World: Population Change, Human Capital and Development in China, India and Indonesia"**. Presenters

will address issues currently pertinent to Indonesia, China and India at the conference. Registration to this conference is by invite only. Members of the public or researchers interested in attending the conference should email jyprac@nus.edu.sg to express their interest. For more information, please visit [the J Y Pillay event page](#).

In the works: An Operations Research solution for mitigating bed shortfalls in hospitals

By Therese Chan (NUS GAI) and Jin Qi (NUS Business School)

By 2030, 20% of Singaporeans will be aged 65 and above¹ and more hospital resources will be needed to look after this growing group. Due to the projected increase in the elderly population, the already existing problem of hospital bed allocation must be addressed. The solution may not be too far off in the future; a research team from the NUS Business School and the National Healthcare Group has started work on it.

In 2012, there were 3.1 hospital beds for every 1,000 people in Singapore. This number is lower than some developed countries², where the average ratio is 4.2 beds per 1,000 people³. As the number of elderly increases in Singapore, this ratio will fall even further unless a solution is implemented quickly.



Hospital beds are a critical resource and bed shortfalls in hospitals can result in long waiting time for ward admissions. A newspaper article published in The

¹ "MOH outlines Healthcare 2020 Masterplan", *Channel News Asia*, 6 March 2012

² The average number of beds per 1,000 people ratio for the UK, Italy, France and the USA

³ World Health Organization, *World Health Statistics 2012*, pg 122-9

Straits Times on 17 February 2012⁴ revealed that public hospitals are borrowing bed space from nearby private hospitals to house their emergency patients, and some patients may spend up to 6 hours in a ward's corridors before being allocated a bed. This indicates that hospital resources are inadequate to meet the current medical requirements of residents in Singapore.

Operations Research, a discipline of applying advanced analytics to help make better decisions, may provide a solution to alleviate bed allocation situations in hospitals. A NUS research team and analysts from the National Healthcare Group⁵ is studying how setting quotas on non-urgent admissions could be used to control the daily beds availability and reduce the incidents of bed shortfalls. While the idea is simple, the key challenge is to decide how these quotas should be determined dynamically in anticipation of uncertain arrivals of patients and their duration of stays in the hospitals. There is a delicate balance between maintaining the overall supply of beds for non-urgent admissions and enforcing a lower quota in the days when bed shortages are highly anticipated from urgent admissions.

The research team proposes an optimization solution to determine these quotas so that incidents of bed shortfalls are reduced. A relatively new optimization technique known as *Robust Optimization* is used to mitigate the risk of shortfalls as the result of uncertain arrivals of patients and their durations of stays. A simulation test was conducted with annual data consisting of the hospital's daily admission figures and the length of stay of each patient. The test showed that the robust optimization model was able to allocate beds more efficiently compared to traditional optimization models where uncertainties are ignored. The team is still working on a more efficient model to address this situation. This model could potentially be integrated in decision support systems to better manage bed allocations for non-urgent admission in hospitals.

⁴ Selma Khalik , "Shortage of hospital beds, so some ops delayed", *The Straits Times*, February 17 2012, A05

⁵ Daizhou Chen, Fanwen Meng, Jin Qi, Meilin Zhang, James Ang, Singfat Chu, Melvyn Sim and Palvannan Kannapiran, "A Robust Optimization Model for Managing Elective Admission in Hospital", under revision for submission to *Operations Research* (2012).