

**00288 Optimal Management of Bed Waiting Time and Right Siting Performance at a Tertiary Hospital: An Integer Linear Programming Approach**

*Oh Hong Choon<sup>1</sup>, Chow Wai Leng<sup>1</sup>, Stephanie Ng<sup>1</sup>, Han Shasha<sup>2</sup>, He Shuangchi<sup>2</sup>, Melvyn Sim<sup>2</sup>*

<sup>1</sup>Changi General Hospital, <sup>2</sup>National University of Singapore

**Aims:** This study aimed to determine the effectiveness of an integer linear programming (ILP) model in assignment of beds to Accident and Emergency (A&E) patients requiring inpatient admissions.

**Methodology:** An ILP model was formulated to represent the bed assignment problem of a tertiary hospital with objective of maximizing the joint probability of all A&E admission patients meeting the predefined bed waiting time targets, subject to all relevant assignment constraints in the hospital. An upper limit constraint was also included in the ILP model to contain the overflow rate (i.e. proportion of patients who were not right-sited in terms of specialties and accommodation classes). A numerical experiment was performed where a validated discrete-event-simulation (DES) model which represented the hospital's inpatient ward and bed management unit (BMU) processes in 2015 was employed to study the impact of using the ILP model to make bed assignment decisions on bed waiting time and overflow performances.

**Result:** Compared to conventional bed assignment practice by BMU staff, ILP model based bed assignments could reduce proportion of patients who waited more than 4 hours from 46.1% to 39.1% with minimal change in overflow performance. When the overflow rate constraint in the ILP model was adjusted to allow overflow rate to increase from 7.9% to 13.5% ILP model based bed assignments could reduce proportion of patients who waited more than 4 hours further to 24.5%. The numerical experiment also showed ILP model based bed assignments outperformed both early discharge policies and threshold-based overflowing (i.e. overflow of a patient is permissible once the bed waiting time exceeds a pre-specified threshold) policies.

**Conclusion:** Bed assignment recommendations based on ILP model have the potential of enabling the BMU staff to make bed assignment decisions consistently and objectively, and to balance the tradeoff between bed waiting time and overflow performances.