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Patient-level cost minimisation analysis of an Acute Medical Unit expediting General Medicine inpatient care in a tertiary hospital in Singapore

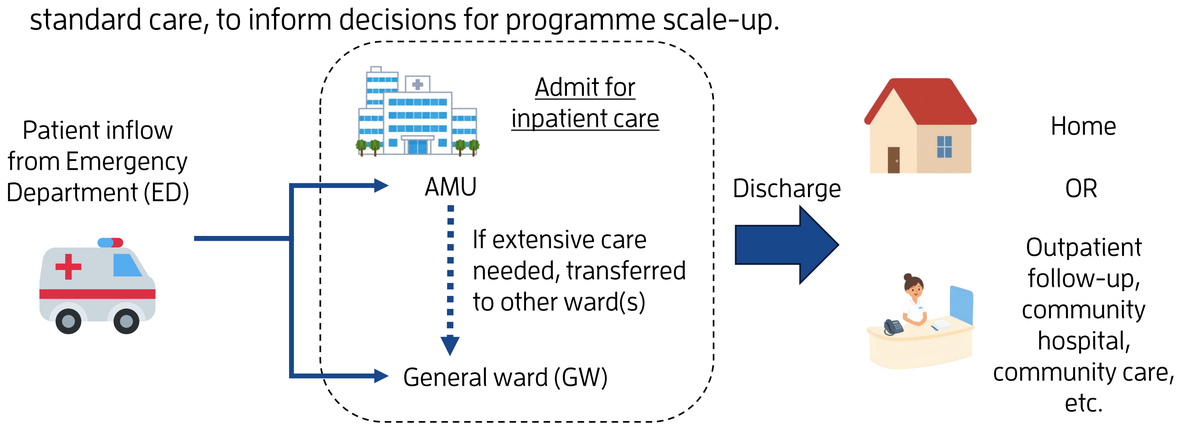
Stephanie A. Fernandez[1*], Juvenia Neo[2], Megan Phua[2], Huiling Guo[1], Geralyn Ong[2], Yan Qing Lee[2], Eunice Lim[2], Lip Hong Tan[3], Angela Chow[1,4,5], Nihar Pandit[3].

[1]Department of Epidemiology and Preventive Medicine, Tan Tock Seng Hospital; [2]Clinical Operations (Medicine), Tan Tock Seng Hospital; [3]General Medicine, Tan Tock Seng Hospital; [4]Saw Swee Hock School of Public Health, National University of Singapore; [5]Lee Kong Chian School of Medicine, Nanyang Technological University

** stephanie.fernandez@nhghealth.com.sg*

Background

- Increasing inpatient demand driven by an ageing population prompted the introduction of an Acute Medical Unit (AMU), a clinical service model within the General Medicine Department (GMD), to deliver expedited diagnosis and early treatment to reduce inpatient length of stay (LOS).
- **Objective:** This study evaluates the impact of AMU on patient-level costs, compared with standard care, to inform decisions for programme scale-up.



Methods

Table 1: Cost minimisation analysis overview

Study population	• Inclusion criteria: GMD patients admitted between 8 October 2025 and 7 January 2026, with anticipated LOS of ≤5 days, and had been discharged at time of analysis • Exclusion criteria: Medically unstable, require isolation precautions, specialised ventilation support, or specific specialist care (e.g. dementia, acute psychosis, haemodialysis, acute stroke, etc.)
Intervention	Admitted to AMU, including inappropriate referrals
Comparator	Not admitted to AMU due to refusal or bed unavailability
Outcome	Direct medical costs were derived using the formulas in Figures 1 to 3
Time horizon	Index admission episode (hospital admission to discharge)

Mean incremental cost (SGD), Student's t-test, deterministic (decision tree model in Figure 4) and probabilistic (Monte Carlo simulation) sensitivity analyses were computed in R.

Figure 1: AMU medical manpower adjustment factor, α

$$Cost_{med,w} = \frac{\sum_{s \in S} u_s \times 60 \times h_{sw} \times n_{sw}}{Beds_w}$$

$$\alpha = \frac{Cost_{med,AMU}}{Cost_{med,GW}}$$

$Cost_{med,w}$ = medical manpower cost per inpatient day in ward w
w = ward (GW or AMU)
s = seniority level of medical staff
S = seniority levels of medical staff (Medical & House Officer, Consultant, Registrar)
u_s = unit cost per minute of medical staff of seniority level s (source: institution)
h_{sw} = daily working hours of staff of seniority s in ward w
n_{sw} = no. of staff of seniority s in ward w

Figure 2: Medical ward cost per inpatient day

$$Cost_{GW} = u_{med} + u_{nonmed} + u_{supplies} + u_{facility} + u_{other}$$
$$Cost_{AMU} = \alpha u_{med} + u_{nonmed} + u_{supplies} + u_{facility} + u_{other}$$

u = unit cost per inpatient day (source: institution)
med = medical manpower cost per inpatient day
nonmed = non-medical manpower cost per inpatient day
supplies = supplies cost per inpatient day
facility = facility cost per inpatient day
other = other costs per inpatient day (including IT)

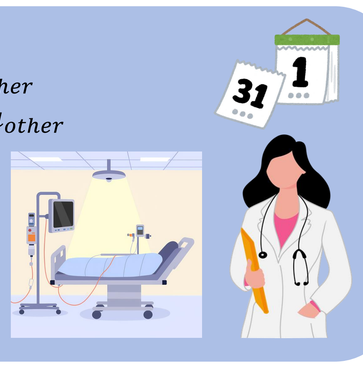


Figure 3: Cost per patient per admission episode

$$Cost_p = (Cost_{GW} \times \text{GW LOS}_p) + (Cost_{AMU} \times \text{AMU LOS}_p) +$$
$$\sum_{i \in I}(\text{Imaging unit cost}_i \times \text{Orders}_{pi}) +$$
$$\sum_{a \in A}(\text{Allied health service unit cost}_a \times \text{Referrals}_{pa})$$

p = patient
i = modality of imaging investigation
I = Imaging investigations (X-ray, ultrasound, computed tomography (CT), magnetic resonance imaging (MRI))
a = Allied health service
A = Allied health services (occupational therapy (OT), physiotherapy (PT), speech therapy (ST), podiatry, dietetics and nutrition)

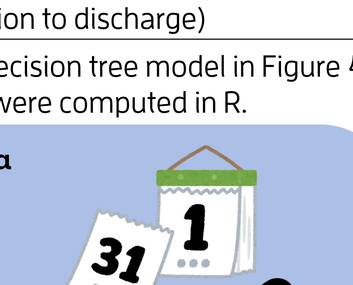
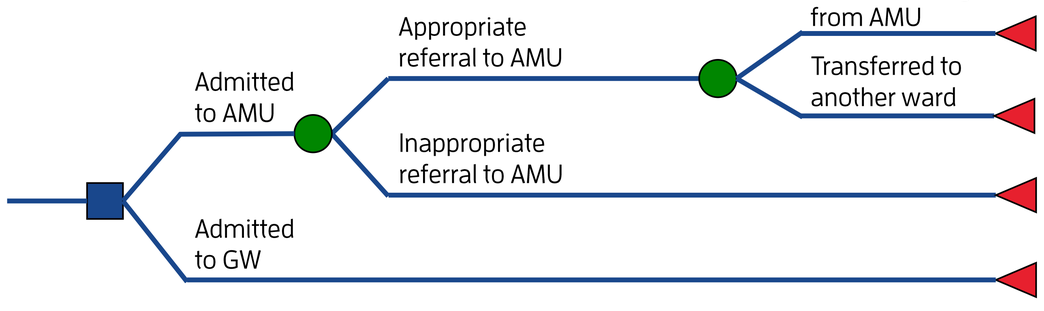


Figure 4: Decision tree model



Results

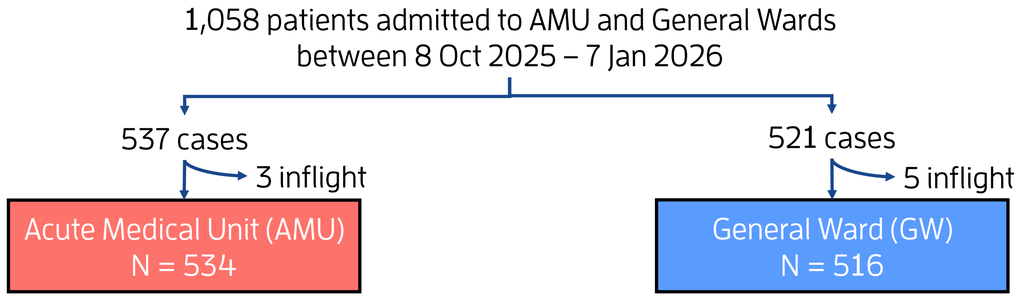
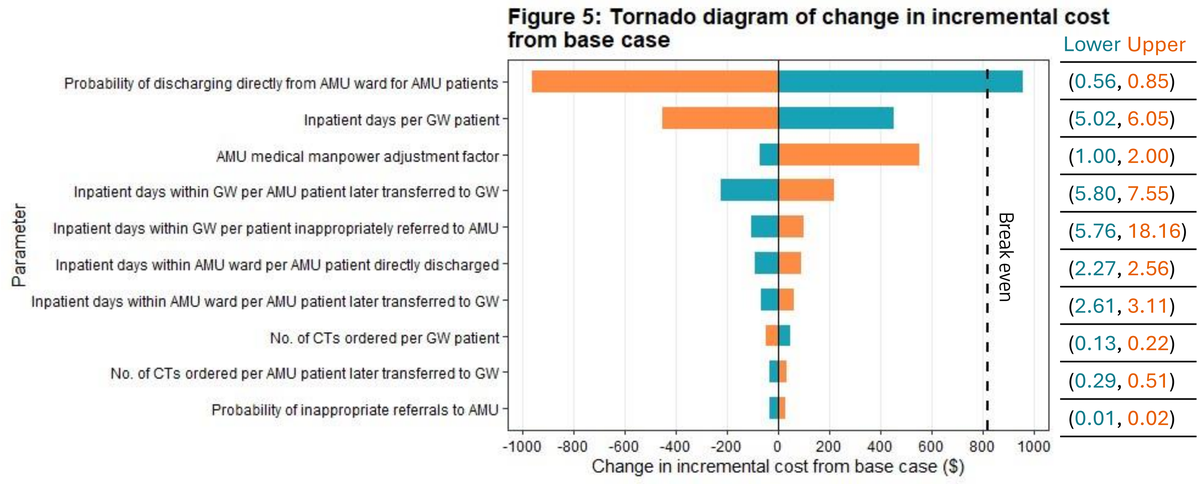


Table 2: Cost minimisation results of the base-case scenario

		AMU	GW	P-value
Medical Manpower				
Daily hours (per Medical & House Officer, Consultant, Registrar)		10, 10, 10	9, 9, 9	-
Daily no. of staff (per Medical & House Officer, Consultant, Registrar)		2, 1, 0.5	5, 2, 1	-
No. of beds		18	39	-
AMU medical manpower adjustment factor		1.11		-
Imaging Investigations				
Average X-rays per patient (N = total no. of X-rays)		1.65 (N = 879)	1.78 (N = 921)	0.173
Average ultrasounds per patient (N = total no. of ultrasounds)		0.22 (N = 118)	0.24 (N = 126)	0.512
Average CTs per patient (N = total no. of CTs)		0.17 (N = 90)	0.17 (N = 89)	0.896
Average MRIs per patient (N = total no. of MRIs)		0.05 (N = 29)	0.07 (N = 38)	0.336
Allied Health				
Average OT referrals per patient (N = total no. of OT referrals)		0.10 (N = 55)	0.29 (N = 149)	<0.001
Average PT referrals per patient (N = total no. of PT referrals)		0.20 (N = 106)	0.49 (N = 254)	<0.001
Average ST referrals per patient (N = total no. of ST referrals)		0.02 (N = 9)	0.07 (N = 36)	<0.001
Average podiatry referrals per patient (N = total no. of podiatry referrals)		0.02 (N = 9)	0.05 (N = 27)	0.005
Average dietetics and nutrition referrals per patient (N = total no. of dietetics and nutrition referrals)		0.06 (N = 32)	0.14 (N = 73)	<0.001
Program Indicators				
Average no. of inappropriate referrals to AMU		0.02 (N = 10)	Not Applicable	
Average no. of ED reattendances within 72h per patient		<0.01 (N = 2)	0.01 (N = 3)	0.629
Average no. of inpatient days spent in AMU/GW per discharged patient from index admission	AMU	2.53	Not Applicable	
	GW	2.15	5.54	<0.001
	Total	4.68	5.54	0.011
Base case incremental cost per patient				
Incremental cost per patient ($\bar{C}_{AMU} - \bar{C}_{GW}$)		-$819.02		0.012

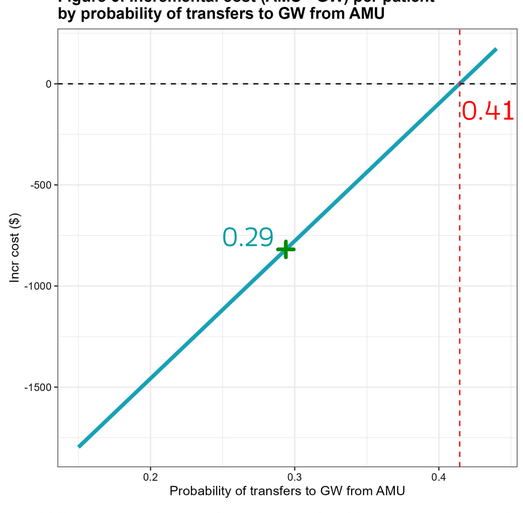
Compared to standard of care (GW), AMU was cost-saving at the base-case scenario (Table 2).

Figure 5: Tornado diagram of change in incremental cost from base case



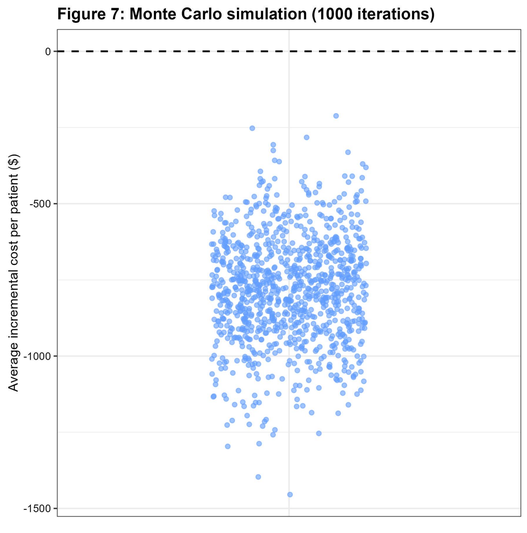
The incremental cost was most sensitive to the probability of direct discharges from AMU, and correspondingly, the probability of transfers to GW from AMU (Figure 5).

Figure 6: Incremental cost (AMU - GW) per patient by probability of transfers to GW from AMU



A 12% increase in transfers to GW from AMU for extended care would result in AMU reaching cost-neutrality (Figure 6).

Figure 7: Monte Carlo simulation (1000 iterations)



AMU remains 100% cost-saving across all 1,000 iterations (Figure 7).

Conclusion

AMU reduces patient-level costs relative to standard care. Yet, more in-depth evaluation on how AMU impacts hospital-level costs is needed to better support the case for programme scale-up.