Do we Know Why ICU Admissions After Hours and on Weekends are Associated with Increased Hospital Mortality?

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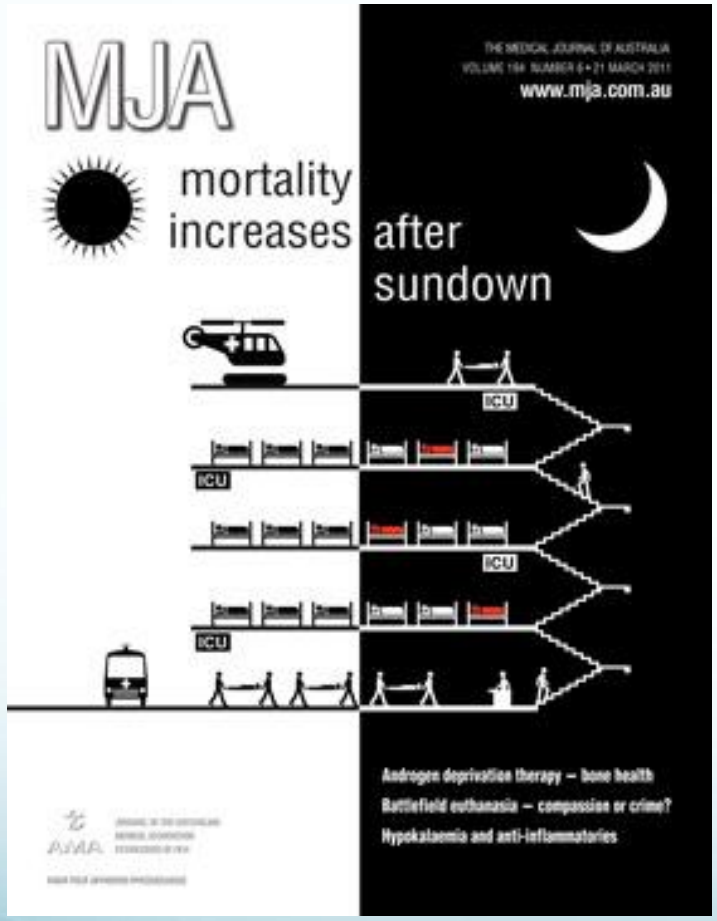
Editor's Choice: Flying blind in the ICU after hours



- "airline passengers would not tolerate a higher crash rate after hours. We assume that management of an ICU, like that of an airline, incorporates enough fail-safe features that, whatever the time of day, patients have the best possible chance of a safe journey"

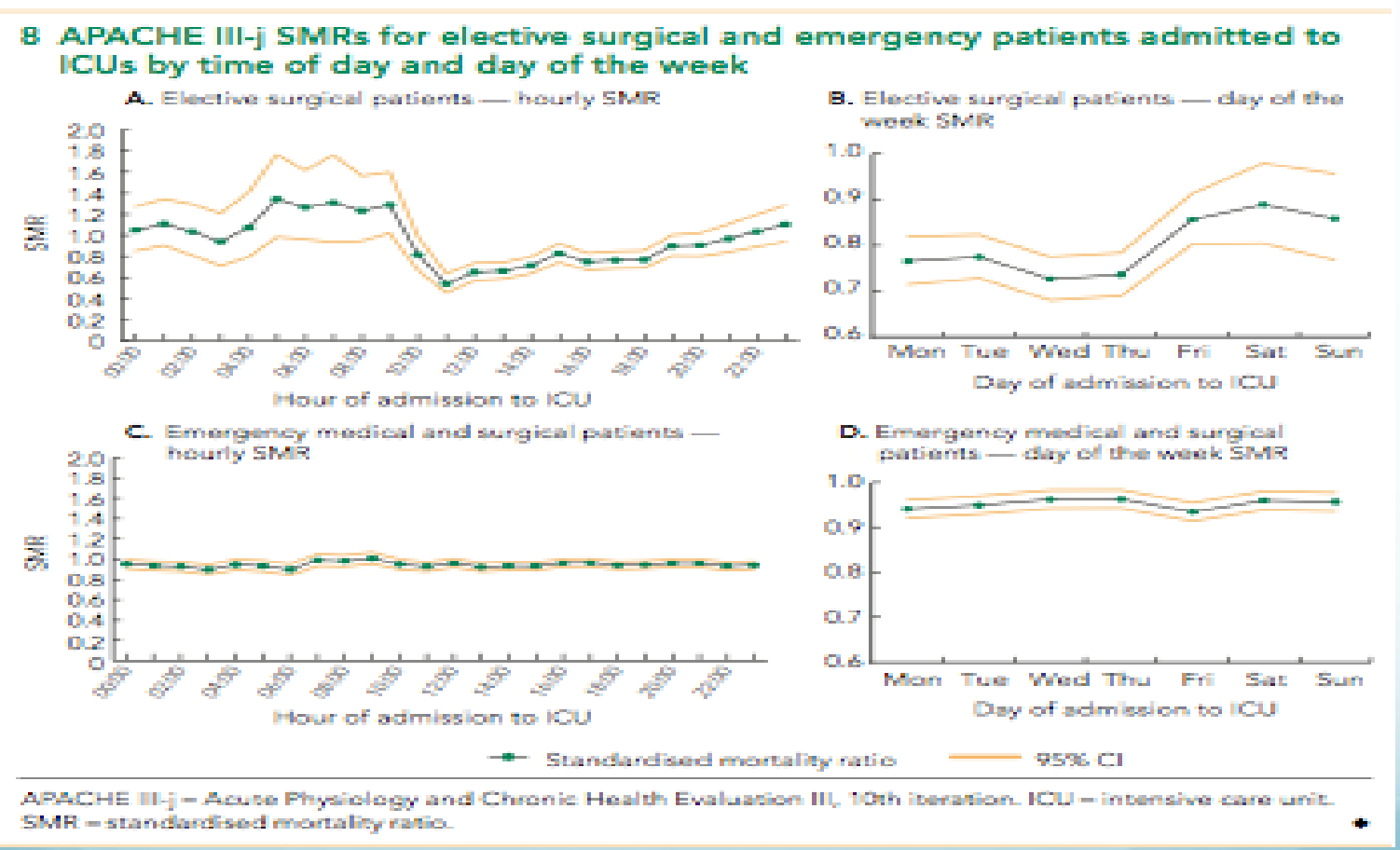
245057 admissions from 41 Australian ICUs from Jan 2000 to Dec 2008

	In-hours	After-hours
Number of admissions	127984 (52.2%)	117073 (47.8%)
Age*	60.74 (0.05)	57.82 (0.05)
APACHE III-j Score**	49 (35-68)	52 (36-73)
APACHE III-j Predicted Risk of Death**	0.04 (0.01-0.17)	0.06 (0.01-0.23)
Ventilated in first 24 hours of ICU admission	47.0% (60189)	46.5% (54380)
Diagnostic subgroups		
All post-operative diagnoses	55.4% (70938)	38.9% (45552)
Elective surgery only	46.1% (59032)	23.4% (27400)
Cardiac surgery only	23.1% (29554)	9.0% (10554)

245057 admission from 41 Australian ICUs from Jan 2000 to Dec 2008

Chronic health status		
Chronic Cardiovascular Disease	12.4% (15839)	10.5% (12276)
Chronic Liver Disease	2.0% (2509)	2.5% (2923)
Chronic Renal Failure	3.5% (4533)	3.9% (4513)
Chronic Respiratory Disease	7.6% (9730)	7.6% (8866)
Immunosuppressed	3.3% (4227)	3.4% (3968)
Outcomes		
ICU Mortality	9.1% (11682)	10.8% (12596)
Hospital Mortality	14.0% (17877)	16.5% (19364)
Standardised mortality ratio[+]	0.834 (0.825 - 0.843)	0.919 (0.911 - 0.928)
Length of stay in ICU in hours**	43.5 (22.9-82.3)	42.5 (19.0-97.4)
Length of stay in hospital in hours**	240.2 (142.1-456.6)	254.8 (122.0-505.6)

48% patients admitted after hours and 20% admitted on weekends



Results

- Multivariate logistic regression -APACHE III-j risk of death, after-hours admission, weekend admission, a medical diagnosis on admission (as opposed to postoperative admission) and emergency (as opposed to elective surgical) admission were all independently associated with increased mortality
- Most variables were highly significant ($P < 0.001$),
- Elective surgical patients had a Wald $\chi 2$ statistic that was over 17 times larger than that of postoperative patients as a whole (847 v 48).

Elective surgical patients
59031 in hours and 27400 after hours

9 Observed mortality and APACHE III-j standardised mortality ratios (SMRs) in hours and after hours for the 15 most prevalent elective surgical diagnoses

Elective surgical procedure	In hours, no. (% observed mortality)	After hours, no. (% observed mortality)	*P* for observed mortality comparison	In hours SMR (95% CI)	After hours SMR (95% CI)
Coronary artery bypass grafting	7732 (1.0%)	2080 (2.0%)	< 0.001	0.74 (0.59–0.93)	1.13 (0.81–1.52)
Valvular heart surgery	8067 (1.4%)	1677 (3.8%)	< 0.001	0.34 (0.28–0.40)	0.67 (0.52–0.85)
Gastrointestinal neoplasm surgery	6057 (5.0%)	3399 (5.5%)	0.29	0.88 (0.78–0.98)	0.90 (0.78–1.04)
Craniotomy for neoplasm	3679 (2.0%)	1149 (3.0%)	0.07	0.80 (0.63–1.00)	0.96 (0.67–1.34)
Elective abdominal aortic aneurysm surgery	3048 (3.6%)	929 (6.5%)	0.003	0.81 (0.67–0.97)	1.36 (1.05–1.74)
Other respiratory surgery	2518 (2.7%)	1165 (2.8%)	0.91	0.58 (0.46–0.74)	0.53(0.37–0.74)
Other gastrointestinal surgery	2413 (3.2%)	1216 (5.7%)	< 0.001	0.82 (0.65–1.02)	1.08 (0.85–1.36)
Other cardiovascular surgery	2094 (2.5%)	781 (4.5%)	0.01	0.53 (0.40–0.69)	0.74 (0.52–1.02)
Carotid endarterectomy	2298 (0.9%)	491 (1.4%)	0.32	0.59 (0.36–0.90)	0.76 (0.31–1.56)
Respiratory neoplasm surgery	1724 (3.3%)	793 (4.9%)	0.06	0.74 (0.56–0.95)	1.17 (0.84–1.59)
Coronary artery bypass grafting with valve surgery	1541 (3.3%)	486 (3.7%)	0.67	0.53 (0.39–0.69)	0.47 (0.28–0.74)
Orthopaedic surgery	1248 (3.1%)	700 (4.7%)	0.34	0.49 (0.35–0.66)	0.66 (0.46–0.92)
Other neurosurgery	1343 (1.6%)	446 (1.8%)	0.83	0.46 (0.29–0.70)	0.47 (0.21–0.93)
Laminectomy or spinal cord surgery	1215 (1.6%)	559 (1.4%)	1.00	0.52 (0.31–0.81)	0.38 (0.16–0.74)
Renal neoplasm surgery	1072 (1.9%)	579 (2.8%)	0.29	0.51 (0.31–0.79)	0.73 (0.42–1.17)

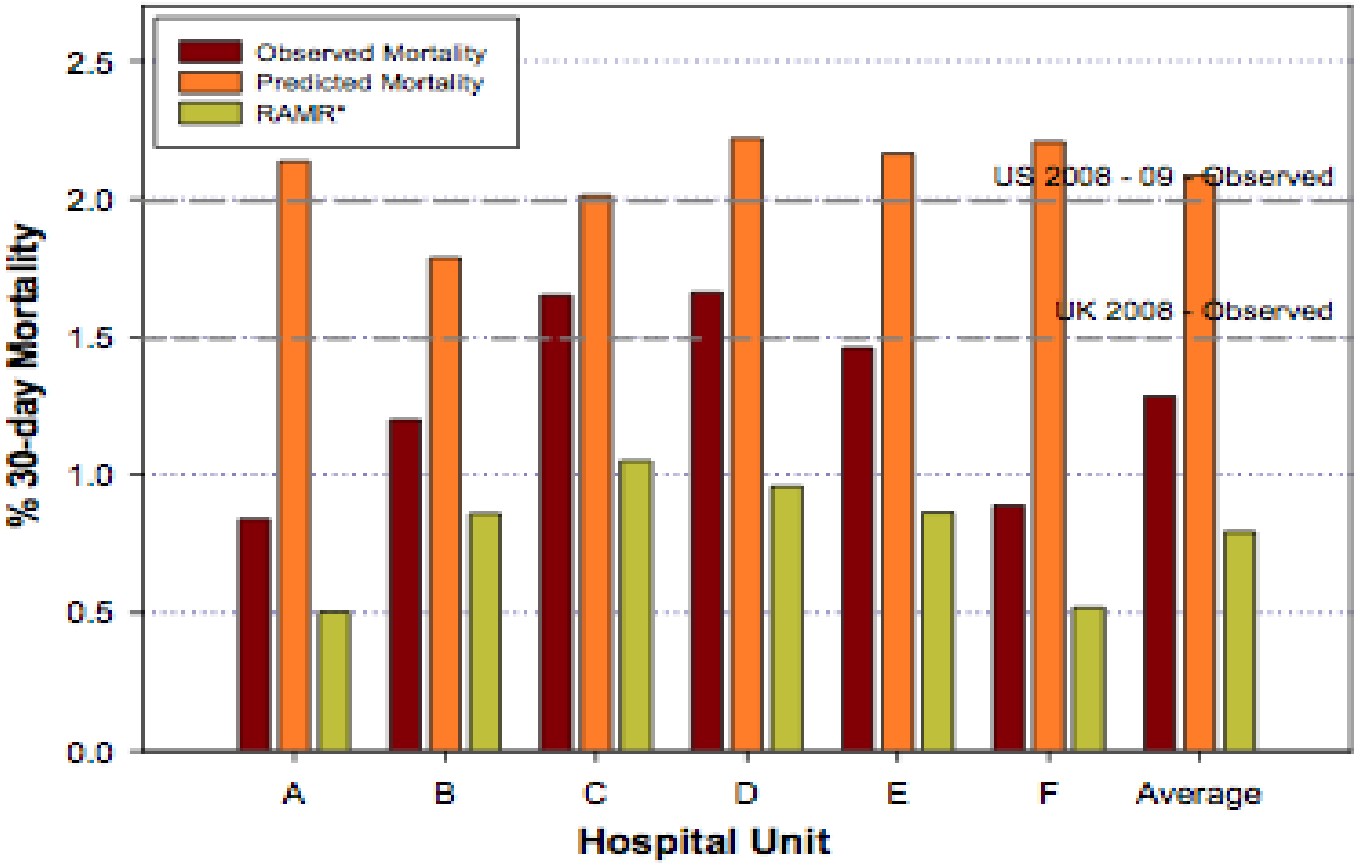
APACHE III-j = Acute Physiology and Chronic Health Evaluation III, 10th iteration.

CABG(most common)

- In hours CABG-7732 – 1% mortality =77 deaths
- After hours-2080 – 2% mortality= 40 deaths
- If no. of deaths constant over 8 years then ~5 deaths per year after hours
- Data from 41 hospitals – approximately 20 of them have cardiac surgical units
- If no. of death evenly distributed then~ 1 death per unit every 4 years!

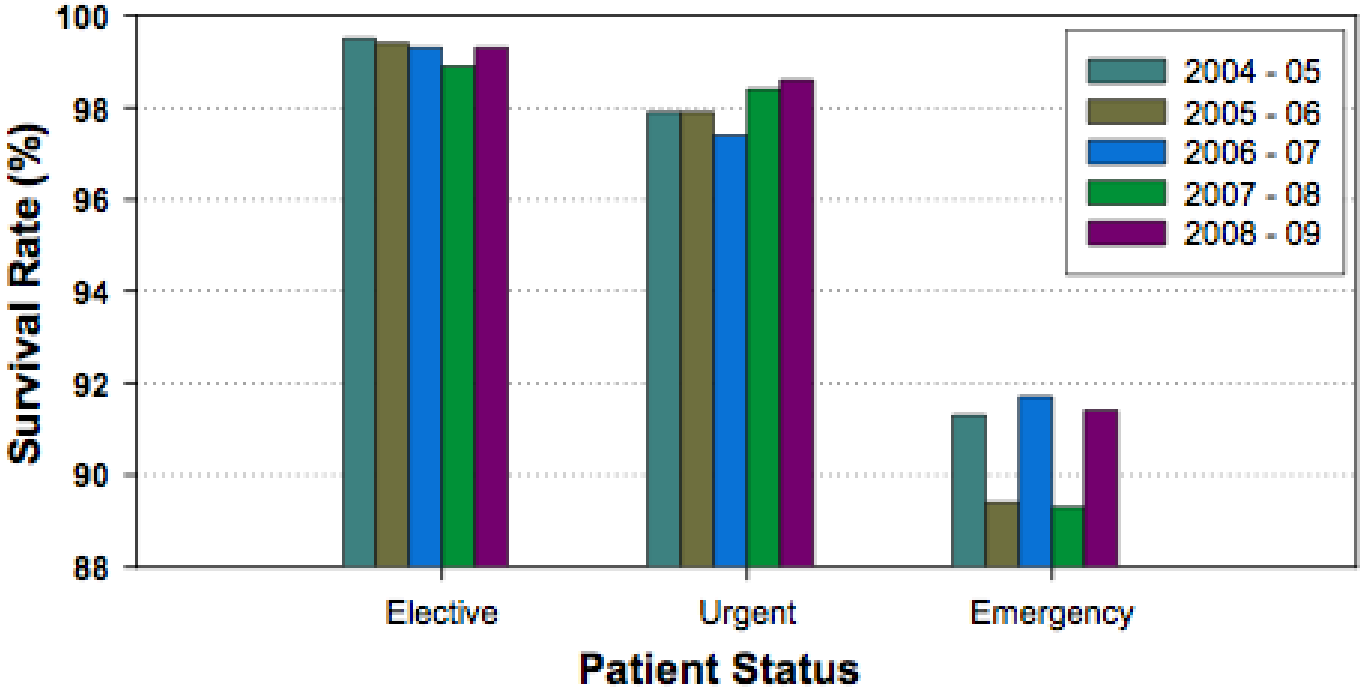
ASCTS Cardiac Surgery Database Project: Victorian Cardiac Surgery Database project Annual Public report (accessed 2/8/2011)

Figure 6A: Mortality rate within 30 days following Isolated CABG, for the six Victorian Public Hospital Cardiac Surgery Units during 2008 – 09



ASCTS Cardiac Surgery Database Project Victorian Cardiac Surgery Database project Annual Public report (accessed 2/8/2011)

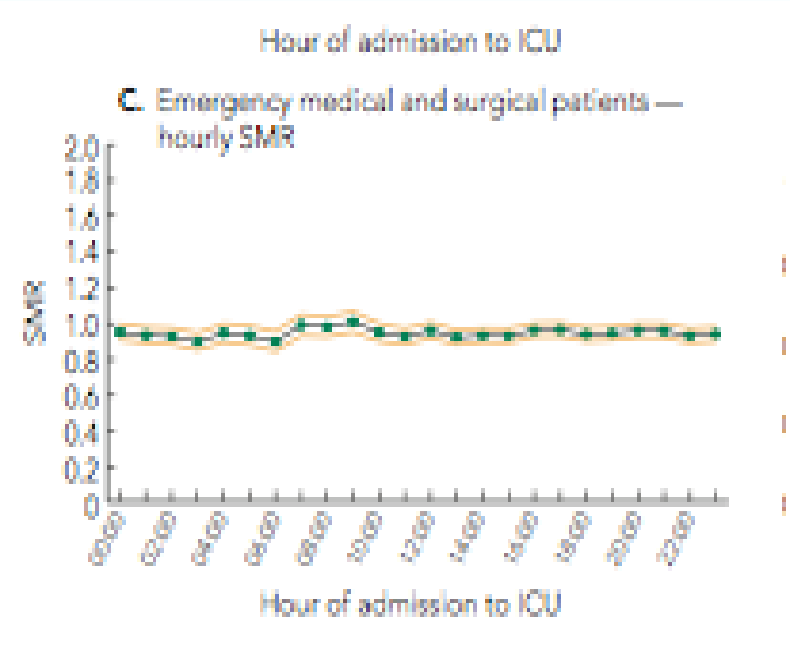
Figure 4: Survival rate for isolated CABG, in relation to the urgency of surgery



Gastrointestinal Neoplasm Surgery- Highest mortality

- In- hours 6057, mortality 5%- ~ 300 deaths
- After hours 3399, mortality 5.5 %~175 deaths
- Not statistically significant
- Deaths at hospital discharge
- Case selection, pre-operative optimisation, intra-op and ICU and post ICU issues
- ? for further review

Emergency admissions
70952 in hour, 89673 after hours



- Why is the SMR of this group so close to 1.0?
- Is the APACHEIII-j a good fit for emergency admissions and not as good for elective surgical admissions?
- Do we need to look at this sub-group in detail too?

Editor's Choice: Flying blind in the ICU after hours

- In reality, even in the most well staffed ICU, the number and seniority of staff available in the unit declines after hours.
- two possible actions: avoid starting major elective surgery at times that make it likely that the patient will be admitted to the ICU after hours; or reconsider staffing practices in ICUs to ensure a more senior presence after hours

I can do this blindfolded….with a Nap-Strap™

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THANK YOU