

# RRTs can improve care in the Emergency Department

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# Conflicts of interest

- Never received payment from industry or organisation in relation to deteriorating patients / RRTs
- Unrestricted education grants
  - Edwards Lifesciences: AU\$10,000 for non-invasive monitoring in MET calls
  - ACSQHC: AU\$70,000 for multi-centre study of RRTs
- Employment – expertise in deteriorating patients / RRTs
  - Austin Health
  - Eastern Health

# Acknowledgement

- Mostly the work led by Profs Julie Considine & Judy Currey
- Considine J, Jones DA, Bellomo R. Emergency Department Rapid Response Systems: The case for a standardised approach to deteriorating patients. *Eur J Emerg Med.* 2013; 20: 375-381.
- Considine J, Jones D, Pilcher D, Currey J. Physiological status during emergency department care: relationship with in-hospital death after clinical deterioration. *Crit Care Resus.* 2015; 17 257-262.
- Considine J, Jones D, Pilcher D, Currey J. Patient physiological status at the emergency department -ward interface and emergency calls for clinical deterioration during early hospital admission. *J Adv Nurs.* 2016; 6:1287-1300
- Considine J, Jones D, Pilcher D, Currey J. Physiological status during emergency care and rapid response team or cardiac arrest team activation during early hospital admission. *Eur J Emerg Med.* 2016. available on line

# Overview

- Triage in the ED
- Systems for detecting deteriorating after admission to ED
- ED instability predicts in-hospital death
- Predicting early MET calls
- Examples of ED-based RRSs

# Triage in the ED

- Emergency nursing role
  - Complex decision making by expert clinician
- Prioritises time to emergency care based on clinical urgency NOT injury or illness severity
- Standardised national approach
  - triage scale (Australasian Triage Scale – 5 categories)
  - educational preparation (Emergency Triage Education Kit)
  - decision support (ATS physiological discriminators)
  - decisions based on presenting problem, general appearance, primary survey assessment, co-morbidities, risk of instability

### **Immediately:**

Shock of any etiology (cardiac, distribution, hemorrhage), respiratory failure with need for ventilation, airway symptoms after smoke inhalation or burn injury, epileptic state, severe and symptomatic hypoglycemia (Gluc < 1.5 mmol/L), any condition with impaired consciousness (GCS < 9), intubation indicated to protect airways, anaphylaxis

### **< 10 minutes: (very urgent)**

Severe myocardial infarction (STEMI, NSTEMI with persistent pain), acute respiratory problems, haemoptoe, hematemesis, stroke within time window for fibrinolytic therapy, intracranial hemorrhage, postictal state after epileptic seizure, high fever with chills, meningitis, severe sepsis impaired consciousness, acute psychosis/aggressive patient, substance intoxication, hypoglycemia, ketoacidosis

### **< 30 minutes:**

Unstable angina, myocardial infarction without high severity (NSTEMI without pain), abdominal pain, stable hemorrhage, continuous vomiting, pulmonary embolism (stable), hypertensive urgency, presentation after syncope, heart failure (stable), febrile infection

### **< 90 minutes:**

No real emergency situation. Self-limiting infections (i.e. common cold)

### **< 120 minutes:**

Elective presentation or not an emergency indication.

- So at triage
  - Structured, evidence-based system of assessment – expected for all patients
  - Assessment by expert clinicians (nurses)
  - Decision support about response
  - Indication of expected response time
- Also expected post-triage responses / pathways for some conditions
  - Acute coronary syndrome
  - Trauma
  - stroke
  - Post-cardiac arrest management
  - Sepsis

# Detecting deterioration after triage

- Characteristics ED presentations and Rx
  - Heterogeneous age and patient population
  - Variable information available
  - Diagnosis yet to be determined
  - In initial (most unstable) part of illness
  - Workload – unpredictable / uncontrollable
  - Time pressured
  - Overcrowding
  - Frequent interruptions



- Vic. Gov. data 2010-2011 7220 admissions to ICU from ED
  - 70% were triage category 1 or 2
  - 30% were triage category 3,4, or 5 → deteriorated after admission
- Research on ward patients extensive for
  - Unplanned ICU admissions
  - Cardiac arrest
  - Unexpected death
- This research not as comprehensive for ED

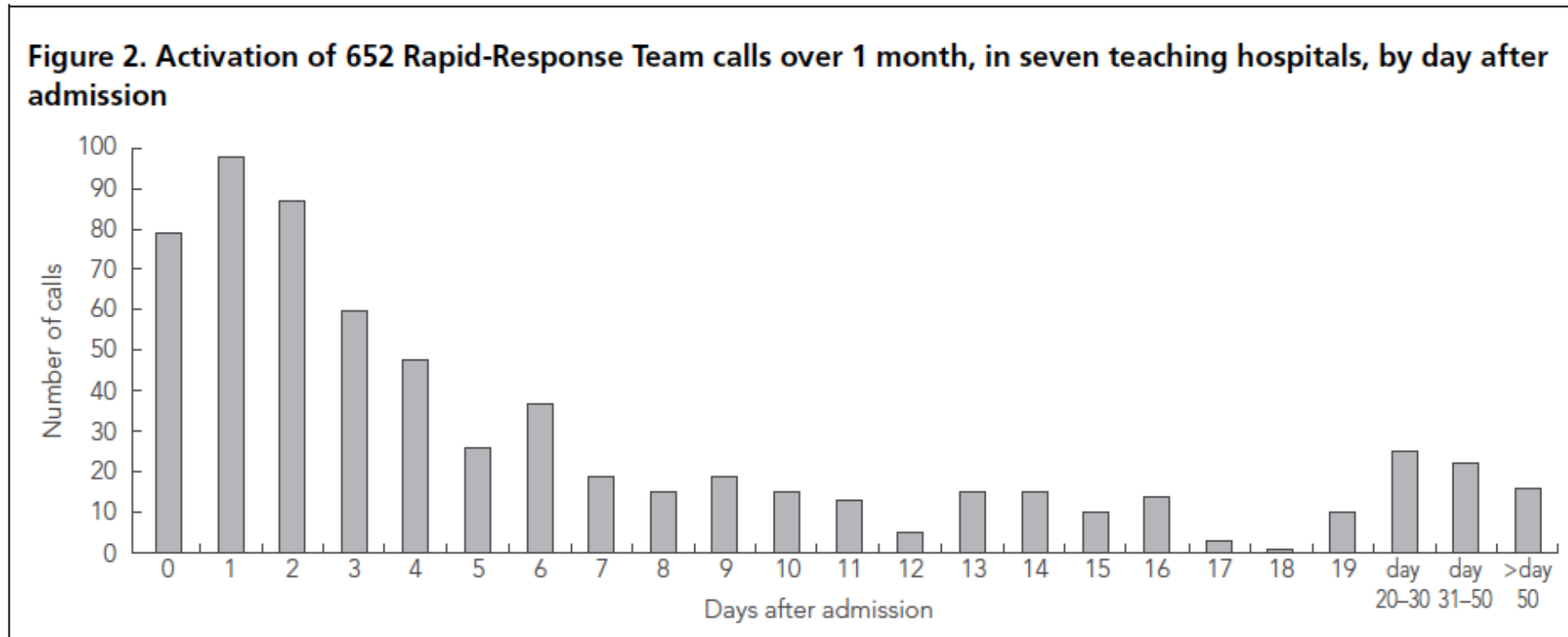
- Most EDs do not have a systematic approach to R+R deterioration
  - Acquisition of vital signs variable / at discretion of clinicians
  - No objective criteria for escalation of care
  - Parallel processing / frequent interruptions
  - Pressure for disposition of patient
  - Transfer of patient to monitored area
  - Expectation to escalate to more senior clinicians
- 1.5 – 15% of ED patients fulfill RRT-activation criteria <sup>1-3</sup>

1. Considine. Crit Care Resus. 2012
2. Hosking J Australias Emerg Nurs J 2014
3. Considine Australias Emerg Nurs J 2015

# ED physiological instability predicts in-hospital death

- Three hospitals in Vic Australia
- 660 patients who experience a RRT or CA call within 72 hr admission
- Patients who died more likely  $\geq$  RRT criteria in ED (45.9% v 34.8%; P = 0.029)
- Individual vitals
  - tachypnoea (21.1% v 13.4%, P = 0.039),
  - hypotension (20.2% v 11.8%, P = 0.018),
  - Hypoxaemia (8.3% v 3.1%, P = 0.001)
  - altered conscious state (6.2% v 1.3%, P = 0.001)
- Risk-adjusted odds ratio (OR) for in-hospital death highest for altered conscious state during ED (OR = 4.6; 95% CI, 1.4–15.7; P = 0.014).

# Predicting early MET calls



- Are patients who have a RRT or CA call shortly after admissions more likely to have instability in ED?
- Case control study in 3 hospitals
  - 660 randomly selected patients who had RRT/CA team call within 72hr
  - 2 matched controls (1320) for each case – did not have RRT/CA team call
  - 1980 patients
    - median age = 78 yr (653-85)
    - 48.8% male
  - ? Difference in proportion who fulfilled hospital-specific criteria in the ED

**Table 2 Rapid response team activation criteria documented during emergency department care**

	Exposures ( <i>n</i> = 660) [ <i>n</i> (%)]	Unexposed controls ( <i>n</i> = 1320) [ <i>n</i> (%)]	<i>P</i>
Tachypnoea (breaths/min)	97 (14.7)	105 (8.0)	< 0.001
Hypotension (SPB in mmHg)	87 (13.2)	107 (8.1)	< 0.001
Staff concern	67 (10.2)	90 (6.8)	0.010
Tachycardia (beats/min)	51 (7.7)	70 (5.3)	0.034
Hypoxaemia (SpO <sub>2</sub> %)	26 (3.9)	33 (2.5)	0.076
Altered conscious state	15 (2.3)	25 (1.9)	0.572
Bradycardia (beats/min)	13 (2.0)	14 (1.1)	0.100
Bradypnoea (breaths/min)	5 (0.8)	1 (0.1)	0.018

RRT or CAT activation within 24 h of emergency admission

	OR	95% CI	<i>P</i>
Tachypnoea fulfilling hospital RRT activation criteria during ED care	2.69	1.78–4.07	< 0.001
Hypotension fulfilling hospital RRT activation criteria during ED care	1.55	0.99–2.40	0.051
Tachycardia fulfilling hospital RRT activation criteria during ED care	1.42	0.85–2.35	0.176
Staff concern fulfilling hospital RRT activation criteria during ED care	1.56	0.91–2.65	0.104
Limitation of medical treatment order on ED discharge	1.68	1.21–2.34	0.002
ED arrival by ambulance	1.10	0.81–1.51	0.534

- Differences in outcomes early RRT calls vs no early RRT call

	Exposures ( <i>n</i> = 660)	Unexposed controls ( <i>n</i> = 1320)	
<b>Hospital admission outcomes</b>			
Limitation of medical treatment order in place on ED discharge	187 (28.3)	236 (17.9)	< 0.001
ICU admission from ward	78 (11.8)	9 (0.7)	< 0.001
In-hospital death	109 (16.5)	47 (3.6)	< 0.001
Unexpected in-hospital death (death in the absence of limitation of medical treatment order)	13 (2.0)	2 (0.2)	< 0.001



- Other hospitals
- EWS in 790 medical patients South Africa <sup>1</sup>
- EWS 225 medical patients Ireland <sup>2</sup>
- Association between increased EWS and
  - Admission into hospital <sup>1</sup>
  - ICU admission <sup>2</sup>
  - In-hospital death <sup>2</sup>

1. Burch VC. Emerg Med J 2008 (South Africa)

2. Groarke JD. Emerg Med J 2008

# Example of ED based RRSs

- Australian
  - Single parameter trigger
  - Escalation to ED physician and nurse in charge
  - Only 2-3 activations per day, 93% nurse initiated
  - 204 patients in cohort
  - Hypotension and tachycardia most common
  - Interventions relatively simple
  - Most physiological abnormalities resolved within 1 hr
    - Median time 39 (5-129) min
  - 57.8% required hospital admission
  - 4.4% admitted to ICU

# Conclusions

- Research into antecedents into unplanned ICU admissions and cardiac arrests on ward extensive
- Evolving research in ED environment
- Presence of RRT / EWS criteria in the ED predict
  - Hospital admission
  - Need for ICU
  - In-hospital mortality
- Triage at ED presentation well established
- Less well established is RRS-type approach once in ED