# Aeromedical Tasking Schema Do we need an ATS for Prehospital and Retrieval Medicine?

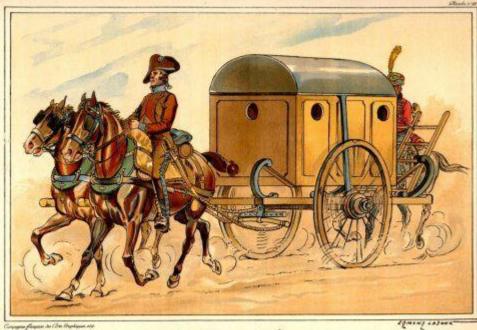




# Where have we come from?

#### **Ambulance Volante**

> Napoleon in 1792



Ambulance Volante du Baron Larrey . 1807



# Where have we come from?

#### From War to Civilian

- > Ambulance Corps & Pre-hospital Care
- > 1869: US civilian ambulance service
- > Aeromedical transport after WW1





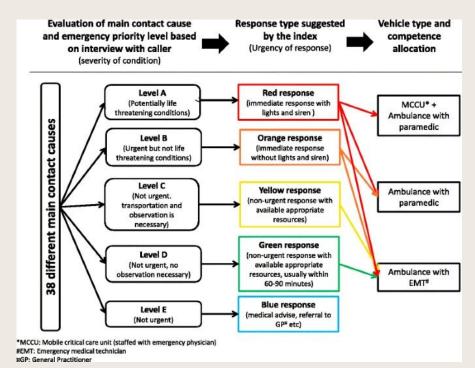


# **Prehospital Triage**

#### **Road Transport**

- > Differently applied in different countries.
- > Lack sensitivity and specificity
- > Not applicable for hospital use
- Many systems are validated only for trauma triage.
- > Assumption:

Relatively consistent time to arrival





### **Hospital Triage**

#### **Emergency Departments**

- > Australasian Triage score (2000)
- > Canadian Triage Assessment Scale
- > Manchester Triage System

#### Assumptions:

- 1. Triage category = same window
- 2. All patients receive the same quality of care

Australasian Triage Scale Category	Response Time	Category Description	Clinical Indicators
Category 1 (RED)	Seen Immediately	Life Threatening Conditions	Cardia/Respiratory Arrest Immediate risk of alway, respiratory rate < 10/min, Extreme Respiratory Distress. BP less than 80 in adult. Severe shock in child/rdant GCS scale less than 9 Prolonged seizurue IV overdose Severe behavioral dioorder
Category 2 (ORANGE)	Seen within 10 minutes	Imminently life threatening, time sensitive treatment needed, or Severe pain.	Arrwy ris (strider) Croulatory Comomie (Hi less than 50 or greater than 150, Hypotension, severe blood loss, poor perfusion), Chest pain likely cardiac related Suspected sepsis, Forlie Neutropenia, Fever with lethargy Acute Stroke GCS less than 13 Suspected Testicular Tonsion High Risk History foat legestory, exenomous bite, pain suggesting PE, AAA, ectopic pregnancy.
Category 3 (GREEN)	Seen within 30 minutes	Potentially life threatening, situational urgency, or severe pain	Severe Hypertension, Moderate blood loss Moderate Shortness of breath Vomiting Dehydration Seizure (post Ical), Head Injuny vibi LOC (now alert) Physiologically stable suspected sepsis Lumb Injuny consisting of Ilms deformity or severe laceration, altered sensation, absent pulse. Potential child abuse Behavioral/Physiolatic patient were distressed, risk of self-harm, potentially aggressive.
Category 4 (BLUE)	Seen within 60 minutes	Potentially serious condition, situational urgency or complex case	Mid Hemorrhage Foreign Body Agalration without respiratory distress Chest injury without (hb pain or respiratory distress Minor head injury without LOC Moderate pain Vomitting or diarhea without dehydration Inflammation or foreign body in eye without vision changes Minor limb trauma (ankle sprain, fracture, uncomplicated laceration with normal vital signs) Swollen, erythematous joint Semi Urgent memati hashit problems with no immediate risk to personnel.
Category 5 (white)	Seen within 120 minutes	Less urgent or Clinical- Administrative problems	Milima Jain with no risk factors Low risk history Minor ymptoms of liness Minor ymptoms of sw risk condition Abrasions or minor laceration Schedulde revist Immunzations Patient with chronic asychiatric symptoms in social crisis.



### **Evolution of Principles**

Where we've ended up so far....

- 1. Treating the sickest first
- 2. Evacuating them to the most appropriate care facility in priority order
- 3. Maximising the use of our available resources for maximum patient benefit
- 4. Aiming for minimum time to definitive treatment





### **Aeromedical Triage**

#### USA

- > Air Medical Prehospital Triage (AMPT) score
- For primary trauma patients most likely to benefit from HEMS compared with ground EMS
- > Potentially cost effective in trauma
- > Not validated in medical patients

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#### Development and Validation of the Air Medical Prehospital Triage (AMPT) Score for Helicopter Transport of Trauma Patients

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IMPORTANCE Little evidence exists to guide helicopter emergency medical services (HEMS) triage, and current practice is inefficient. The Air Medical Prehospital Triage (AMPT) score was developed to identify patients most likely to benefit from HEMS compared with ground EMS. To our knowledge, no studies have evaluated the potential effect on costs and outcomes of a more targeted HEMS triage strategy, such as the AMPT score. Invited Commentary page 268

Figure Supplemental content

CME Quiz at jamanetwork.com/learning

**OBJECTIVE** To evaluate the cost-effectiveness of current practice compared with the AMPT score for HEMS scene triage of trauma patients.

DESIGN, SETTING, AND PARTICIPANTS A cost-effectiveness Markov model was developed for the US health care system to compare current practice with the AMPT score as HEMS scene triage strategies from the health care system perspective over a patient lifetime horizon. A base case was estimated using national data of patient characteristics from the National Trauma Databank from 2007 to 2012. Model inputs, including demographic information, health care costs, survival, and utility estimates, were derived from literature and national

> VITANLIA'S 40 EIGHT YEARS IN A A ROW A COW ABLE CURN



## **Aeromedical Triage**

#### Australia - fixed wing

- > No national agreed model
- > Priority system for urgency
- > Acuity and Crew: senior clinician discretion

Air Response		
Code	Description	Dispatch goal
Priority 1	Any pre-hospital mission (RW)	Immediate
	Immediate threat to life or limb	
	Clinical management outside skills of local hospital for life-threatening problem	
Priority 2	Other urgent conditions	< 3 hours
	Condition of patient likely to overwhelm the local hospital (but not yet doing so)	
Priority 3	Acute but not life-threatening pathology	< 12 hours
Priority 4	Moving patient for a planned procedure	Routine; within agreed timeframe
Priority 5	Normal emergency	'Backloads'

Excerpt from NETS 2016 tasking guideline



A focus on dispatch times may result in inequitable time to definitive care

A focus on urgency may underestimate acuity, resulting in inequitable quality of care.





(aka Wild Boars principle)





#### (aka Wild Boars principle)

- > Current priority levels are "time to doors closed"
- > extrapolated from the ED metric of "maximum time to cubicle" or "time to CT scan" or "time to needle"
- > Fundamental paradigm shift of "time to definitive care"





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- > extrapolated from the ED metric of "maximum time to cubicle" or "time to CT scan" or "time to needle"
- > Fundamental paradigm shift of "time to definitive care"
- > TDC May range from 30 mins for a metro HEMS task to 7 hours for a regional FW task.

TDC flight time scene time road time ramp time



#### (aka Wild Boars principle)

#### > Future focus:

Could data analysis determine a validated aeromedical triage priority (ATP) algorithm that takes TDC into account?

eg ATP = Clinical priority category / TDC





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Could data analysis determine a validated aeromedical triage priority (ATP) algorithm that takes TDC into account?

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> While TDC could be based on averages, ideally TDC would be dynamic based on AI determination of current weather, crew availability, ambulance delays and ramping; with agile patient prioritisation based on queuing theory and real-time data.

#### **Case example:**

- Remote stroke <4 hours from onset in remote community; TDC 3.5 hours to tertiary hospital by FW.
   ATP: ED Cat 2 / 3.5h = 0.57
- Multitrauma primary MVA with head injury, TDC 1.5h.
   ATP: ED Cat 1 / 1.5h = 0.67
- This algorithm prioritises the stroke slightly above the MVA in this scenario
- Both have brain cells that need saving, but the distance of the stroke patient elevates his priority.



- Crewing is often determined for aeromedical flights aligned with the urgency of the task.
   => P1 = doctor,
  - => P2 = flight nurse (+/- doctor)
  - => P3 = flight nurse/paramedic.
- > An aeromedical tasking schema that identifies both urgency and acuity may bring consistency across states and territories

A P2, time critical stroke

- may be low acuity
- may also be the highest priority task

A P3, non-time critical psych patient may require a critical care team for ketamine infusion or intubation/ventilation

- high acuity
- low priority



#### Aeromedical Clinical Tasking Guideline 🔞 😰 📀 🔕 💿 🙆 🧕



#### 1 Executive Summary – Tasking Priorities – Timing and Acuity

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Response Acuity Priority		Acuity	Cilical Citeria	Recommended Tasking Crew		
1 or 2	45 mins		Critical Subspecialty	Reguires Special Operations Team / rotary extraction           Requires ECMOLABP           Paediatric Trauma <12 years of age meeting the following state-wide criteria for level 1/2 trauma.           • Any primary paediatric trauma direct from incident           • Mechanism of injury including MVC = Sokom/hr or vehicle severely damaged: ejection from a vehicle or death of an occupant; pedestrian struck at = 30km/hr; cyclidit (pedal or motor) struck or fall from at = 30km/hr; prolonged extinciato line (= 30mins); fall > 2m (age < 2 years - fall from > 2 times the child's body height); fall from or licked by a horse (or other large anima); handlebar (or other significant bluetin linury) to the abdomen; hanging / Traumatic Asphyxiation; gunshet wound (SKV); drowning: other significant bluetin motion of hight or busine or other significant blueting bryos blueting average compromise (including intrubation or attempted intubation) or severe cruck provide provide verifs or akide reichcem large ariang); houring the size of the size of the cruce; amputation or severe crucking provide verifs or akide reichcem initiation; burns > 20% ISSA and/or inhalationab burns; high voltage electrical injury (> 1000volts)           Abnormal physiology including astructure; GSS & 13           Paediatric Medical (CU < 12 years of age           Premature or crickal neonate           Premature of crickal neolectory of 3740, ± 25/40 with viable pregnancy (see Pre-Term	MedSTAR (SA) or hospial specialist (NT) + <i>RFDSCO</i> <i>Midwife</i> for <i>Obstetric</i>	
		ACUTE	High	Labour Tasking Guidelino)           Tramas -12 years of age with the following mechanism (aligned with state-wide level 1/2 fauma)           Any primary trauma direct from incident           Any secondary retrieval with ejection from a vehicle or death of an occupant; pedestina struck at 3 30km/hr; Cyciel (aged) or motory struck or fail from at a 30km/hr; Cyciel (aged) or motory struck or fail from at a 30km/hr; Cyciel (aged) or motory struck or fail from at a 30km/hr; Cyciel (aged) or motory struck or fail from at a 30km/hr; Cyciel (aged) or motory struck or fail from at a 30km/hr; Cyciel (aged) or kiked by a horse (or other large 17auma > 12 years with sionficant physiology or inkery profile.           Tasuma > 12 years with sionficant physiology or inkery profile.         GSW/h; Gwering 100km/GS + 31           Any secondary retrieval with airway compromise; fail cheat subcutaneous emphysems; ongoing uncontrolled significant haemorthage penetrating injury to head, neck or torso; major pelvic fractures; signial injury with neurological signs; femur fracture jus one other long bone fracture: simplation or severe crush, proximal to the wrist or ankle; burs > 20% BSA and/or inhalational burs; high voltage electrical injury (>100v0/st)           Tauma > 65 years of age/L10 (in presence of significant high: blacking leareting in facture (pone fracture) compone fracture (pone fracture) is onto being leareting burst have beeding leareting isolated #NOFe); long bone fracture(pone fracture (proximal to wrist/ankie - excluding isolated #NOFe); long bone fracture);	Critical Care retrieval leam (RFDS/MRaCC Critical Care Credentialled Doctor + Flight Nurse)	
1 or 2	45 min		High (continued)	Cardiorsspiratory           Cardios arrhythmia with hypotension (SBP <80)	Critical Care retrieval team (FPDS)MR4CC Critical Care Credentialited Doctor + Flight Nurse)	

#### Aeromedical Clinical Tasking Guideline



					Doctor Service
1 or 2	45 min		Medium	Missed dialysis with systemic compromise and inability to render temporising treatment (e.g. BIAP, calcium gluconate, GTN)     Septie shock     Stapic sho	RFDS:MRaCC doctor (including QP/registrar) + Flight Nurse Or 2 Flight Nurse (Vitigh Acuty Skills) (Single Flight Nurse should only be taked by exception)
			Low	Cardiorespiratory           INSTEMI (+ topponin, pain free for 12 hours, no arrhythmia, no failure, stable GTN infrusion           Unstable Angina (-) troponin, no pain currently           Neurological - Persistent GCS 13-14. or V on AVPU           Headactor with neurological signs           Suspected stroke within treatment window with mild symptoms           Acids behavioural disturbance requiring minimal addation           • RASS score may not be purplered           Obstation: - Lind, Risk Labour           • Tresticular torsion           • Tresticular torsion           • Testicat torsion           • RASS score purpleried due to requirement for ongoing intermittent sedation or	Single Flight Nurse (consider upgrading to 2 clinicians if evolving acuity tevel and risk of deterioration) RFDS/MRaCC Dr + Flight
3	3 hrs		Low	potential for airway compromise <u>Trauma</u> – Fully evaluated by referring doctor; normal vital signs, pain controlled Infection - Responsive to treatment and MEVIS <4 <u>Cardiorespiratory</u> INSTEMI (+) toponin, pain free for 12 hours, no arrhythmia, no failure, no GTN infusion Unstatele Angina (-) troponin, no pain currently <u>Neurological</u> - Any persisting new-onset neurology Acute behavioural disturbance requiring minimal seatation Real. Missed diaysis with K + of - 7 and no EGG changes <u>Obsteting</u> - Abdominal pain in early pregnancy. Uncomplicated labour of which birth is not imminent	Nurse, or 2 Flight Nurses Single Flight Nurse
4 or 5	6 to 12 hrs	SUB-ACUTE	Medium	Acute behavioural disturbance requiring sedation • RASS score purple/red due to requirement for ongoing intermittent sedation or potential for airway compromise	RFDS/MRaCC Dr + Flight Nurse, or 2 Flight Nurses



... and the Binary acuity fallacy

- > Retrieval team vs. LAMR
- > Emerg vs. non-emerg

>





... and the Binary acuity fallacy

- > Retrieval team vs. LAMR
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- > Acuity is a spectrum
- > Patient safety risks evolve due to
  - patient factors
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  - is there a missing middle **MAMR**







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  - austerity factors
  - is there a missing middle MAMR

What if there was an acuity scoring system? Considering eg:

- Level of referring assessment (3= bystander, 1= clinician, 0=Clinician + labs/imaging)
- Evolution of illness/injury

   (3 = requires airway/titrated drug
   infusion; 2 = acute/evolving, may not
   have peaked; 1= subacute/improving,
   likely has peaked;
   0= stable)
- **Distance from crew augmentation** (2 = >1.5 hrs; 1 = 45 min-1.5 hours; 0=<45 min).
- ACUITY SCORE:
  - 7-8 = retrieval team
  - 4-6=2 clinicians
  - 0-3 = single clinician



Should we, as a unique aeromedical community, consider

1. Redefining aeromedical urgency and consider time to definitive care rather than time to dispatch?

2. Redefining aeromedical acuity from a patient-centred risk perspective - better aligning crew mix with surety of assessment, phase of the clinical condition and time in austerity?





