"List" = 1-3 words
"State"= short statement/ phrase/ clause

UNIVERSITY HOSPITAL, GEELONG
FELLOWSHIP WRITTEN EXAMINATION
WEEK 10– TRIAL SHORT ANSWER QUESTIONS Suggested answers

PLEASE LET TOM KNOW OF ANY ERRORS/ OTHER OPTIONS FOR ANSWERS

Please do not simply change this document - it is not the master copy !

Question 1 (18 marks)

A 25 year old man presents following a diving expedition.

a. List four (4) features on history that would support the diagnosis of decompression illness. (4 marks)
- **MSS: Large joint pain** (large single jt most common)
- **Vestibular: Tinnitus, Hearing loss, dizziness, unsteady gait**
- **Pulm: Chest pain, SOB, cough**
- **Waist/loin pain**
- **Headache**
- **LOC**
- **Behavioural/ mood change**
- **Dive characteristics- long ,deep dives, rapid ascent, short surface intervals- multiple interval**
- **Prior episodes of DCI**

b. List four (4) features on examination that would support the diagnosis of decompression illness.(4 marks)
- **Any CNS finding-** incl cerebellar e.g. nystagmus, hearing loss, ataxia
- **Any PNS finding- patchy/ multiple sites motor or sensory change**
- **Balance- sharpened Rhombergs**
- **Hearing loss**
- **Nystagmus**
- **Normal appearing joints (no inflammation) with severe joint pain**
- **Cyanosis**
- **Haemodynamic instability**
- **Pruritic erythematous rash**

c. What is the role of investigations in establishing the diagnosis of decompression illness? State two (2) points in your answer. (2 marks)
- **Clinical diagnosis**
- **Should not delay transfer HBO if Dx clear**
- **IX to R/o other causes eg CTB to R/O other Dx**
- **CXR +/- intravascular emboli (if large emboli)**
- **Doppler US over RV/ Subclavian will usually show microbubbles (may be present in asymptomatic)**

d. State your threshold for consultation with a Hyperbaric Oxygen facility in the setting of diving. (1 mark)
- **Low - Consult with hyperbaric specialist in anyone with suspected decompression illness even if mild**

e. List three (3) justifications for your statement of threshold for consultation with a Hyperbaric Oxygen facility in the setting of diving. (3 mark)
- **Seek specialist opinion**
- **Any symptom or sign (may be subtle) of DCI may be an indication for recompression**
- **Early institution reduces the delayed effects of DCI**
- **Shorter time to first hyperbaric oxygen treatment ass with better outcomes e.g. < 12hrs**
- **Benefits likely even if delayed Rx (up to 14/7)**

f. List four (4) theoretic beneficial effects for Hyperbaric oxygen therapy in Decompression illness. (4 marks)
- **↓ bubble volume**
- **Improves oxygenation of ischaemic tissue**
- **↓ ICP**
- **Inhibits secondary inflammatory & reperfusion injury**
- **Improves brain metabolism**

Additional Qs:

Q. State the definition of decompression illness.(1 mark)
- **Term that encompasses arterial gas embolism and decompression sickness**

(barotrauma of ascent with intravascular +/- extravascular bubbles (generally nitrogen))
(Term introduced because Rx of either condition is recompression. Prognosis differs for both)

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Emergency Medicine (2002) 14, 358–363

MARINE EMERGENCIES SERIES

Emergency Medicine

Decompression sickness

James Francis
Diving Diseases Research Centre, Tamar Science Park, Plymouth, UK

Case studies

A 28-year-old electrical engineer went to work on Monday morning. He was feeling unusually tired and had a bit of a headache. Once settled at his desk he was alarmed to discover that he was unable to understand any of the symbols on the wiring diagram that he had drawn just the previous Friday. He told his General Practitioner that he had spent the weekend diving, with his last dive on Sunday evening being to 25 m for 55 min.

An overweight, 55-year-old company director and a friend dived on a WWII wreck that was lying at a depth of 52 m. They had become increasingly disorientated on the bottom such that they had lost all sense of time. On checking his contents gauge, the director indicated that he was almost out of air and promptly made an emergency ascent to the surface. The buddy had sufficient air to make his stops but, on surfacing, found the director floating face-up on the surface, unable to move his legs.

A 21-year-old female student strapped on her SCUBA gear and prepared for her first dive of the season. It had been 6 months since her last dive and the set felt very heavy. She walked down the beach and entered the water with two of her friends. They had planned to dive to no more than 15 m for 45 min. On surfacing, they discovered that, during the dive, the tide had taken them over a mile out to sea and they had a hard swim back to shore. On removing her set, she noticed a dull aching pain in her right shoulder, which she thought had been caused by the pressure of the straps on her diving set.

All of these people were suffering from acute decompression sickness and needed first aid management and referral to a facility where they could be recompressed in a chamber.

Introduction

Decompression sickness (DCS) is a multisystem condition that occurs when gas molecules, that are normally dissolved in body tissues, leave solution in sufficient numbers to permit bubbles to form. The principle component of these bubbles is inert gas, usually nitrogen. The stimulus for bubble formation is decompression, either from atmospheric pressure to altitude or from a raised pressure to atmospheric. Thus, the vulnerable populations are aviators flying in unpressurized or inadequately pressurized aircraft, the occupants of aircraft or spacecraft that accidentally decompress and those who are temporarily exposed to raised pressure such as caisson workers, tunnellers, and divers. Since it is the latter group, and particularly the large and expanding population of recreational divers, that are the principle victims of DCS, I will focus on the condition that arises from short dives in which air is used as the breathing mixture.

As will be discussed below, the most prevalent manifestations of DCS involve the nervous system. In a substantial proportion of cases it may be difficult or impossible to determine, with confidence, whether the patient is suffering from DCS or arterial gas embolism (AGE) secondary to pulmonary barotrauma. Equally,

Key words: *barotrauma, diving, gas exchange, pathophysiology.*

Correspondence: Dr James Francis, 2 Merton Cottages, Tregatta, Tintagel, Cornwall PL34 0DY, UK. Email: tjrf@btinternet.com
James Francis, MBBS, MFOM, PhD, Consultant in Diving Medicine.

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Emergency Medicine

MARINE EMERGENCIES SERIES

What you need to know about diving medicine but won't find in a textbook

Gregory M Emerson
Departments of Diving and Hyperbaric Medicine and Emergency Medicine, Royal Brisbane Hospital, Australia

Abstract

The old adage that 'if a patient in your emergency department (ED) is wearing a wetsuit, fins and a mask, then he/she probably has a diving related illness' is one that should be remembered. This is an obvious statement that should not need stating; however, simple clues can be missed or disregarded. This article will address issues that may confront emergency physicians and for which there are few resources to find the answers. It aims to explain the reasons behind some of the advice given during consultation with a hyperbaric physician. The second aim is to bring emergency physicians up to date with new diving practices and how these may impact upon traditional diving injuries. To achieve these aims, this article is a compilation of answers to frequently asked or pertinent questions related to diving medicine.

Key words: *decompression illness, diving, oxygen, recompression.*

Can a diver get decompression illness despite diving within dive table limits?

There is a widely held belief that a diver cannot get decompression illness (DCI) while diving within dive table limits. Consequently, divers may not seek aid for symptoms and doctors may misinterpret them. Dive tables give no-decompression limits. These are the maximal times the diver can spend on the bottom without having to do a decompression stop (a short delay in ascent from depth to 'breathe off' accumulated nitrogen). More recently, dive computers have become popular and they adjust the no-decompression limits with every change in depth. They also enable the diver or diving physician to download the dive profile onto a computer. In a similar way to the paracetamol toxicity continuum, where the nomogram treatment line has been drawn arbitrarily at a level where the risk of liver toxicity is thought to be 'acceptable', no-decompression limits have been designed to give guidelines where the risk of DCI is 'acceptable.' With the enormous amount of variability in every dive and diver, it is impossible to test the tables to evaluate the exact risk. So, the possibility of DCI should not be discounted from a differential diagnosis, just because a diver dived within their table or computer guidelines. Rapid or multiple ascents during the dive also invalidate the tables because

Correspondence: Dr Gregory M. Emerson, Department of Emergency Medicine, Royal Brisbane Hospital, Herston Road, Herston, Qld 4029. Email: Greg_Emerson@health.qld.gov.au
Gregory M Emerson MRChB, DipObs, DipDHM, FACEM, Staff Specialist, Department of Emergency Medicine, Royal Brisbane Hospital and VMO, Wesley Centre for Hyperbaric Medicine.

Question 2 (12 marks)

A 29 year old man presents following a high speed motor bike collision.

a. State four (4) abnormal findings in this X-ray. (4 marks)
   - **# L superior pubic ramus**
   - **# L inferior pubic ramus**
   - **Pubic symphysis diastasis**
   - **L sacral #**
   - **Indistinct superior border of the bladder suggestive of rupture**

b. State four (4) pros for the use of a FAST scan in this patient. (4 marks)
   - **Free fluid would strongly support bladder rupture/ other intra abdo bleed**
   - **Immediate results:**
     - **-ve will aid disposition planning e.g. IR vs theatre**
     - **+ve scan may increase surgical response/ rapid transfer to either OT or CT**
   - **Bedside in ED (pt does not require transfer out of dept)**
   - **Non invasive/ no radiation/ no contrast**
   - **Repeatable**

c. State four (4) cons for the use of a FAST scan in this patient. (4 marks)
   - **False negative if < (150-) 200 ml bleed**
   - **False negative for retroperitoneal injuries**
   - **False negative for hollow organ injuries**
   - **False +ve in the setting of ascites**
   - **Operator dependent**
   - **Requires training and credentialing**
   - **Body habitus dependent**

Question 3 (12 marks)

a. List three (3) indications for the utilisation of Non-invasive Ventilation that are supported by high level evidence. (3 marks)
   - **Respiratory failure caused by:**
     - **APO**
     - **COPD**
     - **Immunosuppression**

b. List three (3) indications for the utilisation of Non-invasive Ventilation that are supported by low level evidence only. (3 marks)
   - **Pneumonia**
   - **ARDS**
   - **Asthma**
   - **Children**
   - **Preoxygenation**

c. List four (4) physiological benefits of Bi-level Positive Airway Pressure support (BiPAP) in COPD. (4 marks)
   - **IPAP- reduces WOB**
   - **Increases end inspiratory volume**
   - **EPAP prevents the normal physiological collapse during expiration**
   - **Alveoli stay patient- increases time for gas exchange**
   - **Increases arterial oxygenation**
   - **Increases CO2 elimination**
   - **WOB decreased - no energy required to reopen collapsed alveoli**
   - **Enables closed circuit and therefore high/constant Fi O2 avoiding hyperoxia**
     (Strictly speaking avoidance of ETT may be considered a physiological benefit, because of the physiological deterioration that may occur at induction/ during prolonged ventilation)

d. List two (2) patient factors that must be met to initiate BiPAP. (2 marks)
   - **Spontaneous ventilation/ able to initiate each breath**
   - **Alert/ Able to cooperate/ tolerate**

Additional Q:

Q: Assuming that the BiPAP machine has been tested and is functioning correctly, state four (4) steps in setting up the BiPAP machine for use in a patient with COPD. (4 marks)

NB: States "setting up the machine" so "explain to pt" or "reassure pt" are not appropriate answers

- **Fit mask, ensure tight seal and comfortable**
- **Set oxygen flow rate- titrate to maintain a suitable sat level**
- **IPAP 10 (range 10-12) titrate up to 15-20 or maximum tolerated, adjust according to CO2**
- **EPAP 4 (range 4-6) adjust according to SpO2**
- **Adjust the sensitivity of insp/exp triggers to max pt synchronicity**

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Question 4 (12 marks)

A 7 year old boy has these lesions on his legs for the past 7 days. His 4 year old sister has the same skin eruptions.

a. What is the most likely diagnosis? (1 mark)
   - **Impetigo +/- Bullous**

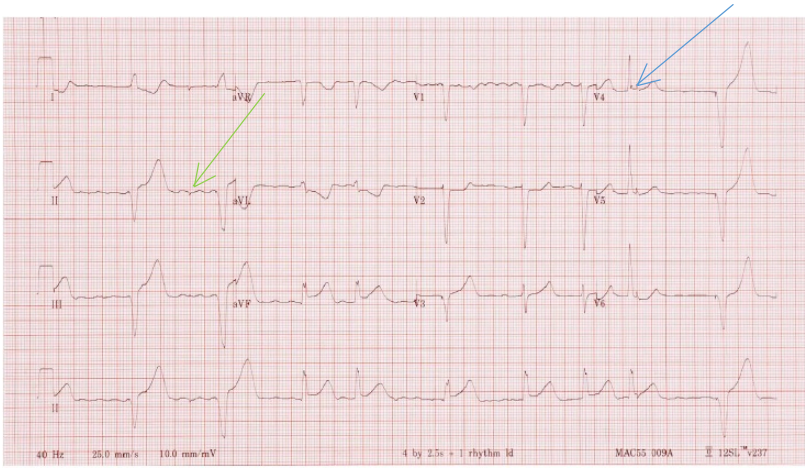
b. State three (3) features of this presentation that support this diagnosis. (3 marks)
   - **Family member also similar lesions**
   - **Yellow/brown crust**
   - **Exposed areas**
   - **Erythematous base**

c. List four (4) steps in the treatment of this patient. State one (1) justification for each choice. (8 marks)

Treatment step (4 marks)	Justification (4 marks)
Analgesia	**Painful condition**
Antibiotic topically Bactroban (Mupirocin)	**Topical- treatment of choice for localised impetigo**
Antibiotic oral flucloxacillin or cephalexin orally	**Such extensive impetigo probably requires oral (isolated lesions do not)** **+/- presence of secondary cellulitis from skin breakdown**
Remove crusts	**Infection won't clear unless bacteria containing crusts are removed** **Reduce the nidus of infection and allow better penetration of topical abx**
Isolate from school/ cover lesions	**Highly contagious**
Follow up	**LMO** **Swabs for ? resistant MRSA which will alter prescribed abs** **Treat sister/household contacts - often multiple people in house with impetigo** **Parenteral education and explanation: ensures better adherence to Rx plan and ongoing engagement with HCP**

Question 5 (12 marks)

A 64 year old man presents to your tertiary hospital, emergency department with 1 hour of chest pain and shortness of breath.



a. State five (5) the abnormal findings in this ECG. (5 marks)

- **Rhythm Aflutter (waves in V1/ II)**
- **Failure to sense - inappropriate spike after 1st QRS in V4, V5,V6 (blue arrow)**
- **STE 2 mm aVF isolated lead STE- native QRS**
- **STD 1mm aVL , V2, I**
- **TW- biphasic I, aVL**
- **+/- Failure to capture I, II, III (green arrow)**

(NB: The presence of an appropriately paced beat is not an abnormal finding)

b. What is the significance of the findings in this ECG for this patient? Provide three (3) statements. (3 marks)

- **Given symptoms and STE/STD pattern- Rx as INF STEMI**
- **PPM may not be functioning appropriately (given failure to sense)- probably relating to underlyi ischaemia**
- **Anticipate further rhythm disturbance given PPM malfunction/ Inf STEMI/ underlying need f PPM**

c. List four (4) steps in the treatment for this patient over the next 15 minutes. (4 marks)
NB: "tertiary hospital"

- **STEMI call/ Urgent cardiology referral**
- **Aspirin 300mg** *(decrease absolute mortality by 3%, administration prior to reperfusion appears to be imp in decr mortality)*
- **Clopidogrel/Ticagrelor** *(reduces absolute CVS cx rate by 2-3%)*
- **Heparin bolus 5000 IU**
- **Morphine- cautious use given possibility of RV involvement**
- **Fluid bolus if BP ↓- RV involvement**
- **Facilitate transfer for PCI < 1 /24**
- **Prepare for transcutaneous pacing +/- obtain PPM magnet**
- **(If PCI > 1 /24 then thrombolyse if no CI)**
- **(Try to confirm STE in II or III with repeat ECG in meantime)**

Question 6 (12 marks)

A 29 year old man presents with fever and acute ankle and wrist pain with no history of trauma.

Joint fluid results

Appearance	Cloudy
Microscopy	WCC 50,000 (Mainly neutrophils)
Gram stain	No bacteria seen
Crystals	None seen

a. List four (4) likely differential diagnosis for these results. (4 marks)
   - **Septic arthritis-** most important to consider/ exclude
   - **Gonococcal Reiters syndrome**
   - **Gout-** less likely no crystals
   - **Pseudogout** less likely no crystals

b. List four (4) further investigations that you would perform in the Emergency department. State one (1) justification for each choice. (8 marks)

Investigation (4 marks)	Justification (4 marks)
Joint fluid culture	**Identify causative organisms and may alter antibiotic voice and duration treatment**
STI screen Urethral swab, PCR urine	**Sensitive for gonorrhoea or other STI**
Ankle and wrist XR	**Identity occult fractures, degenerative disease**
FBE	
CRP	**Elevation supports diagnosis of infections/inflammation (Marker of potential bacterial sepsis)**
Blood culture	**Indicated early in management if febrile to identify organism and guide antibiotic treatment- may offer little benefit over Joint fluid m,c +s**
Glucose	**undiagnosed diabetes may prolong healing tine, early identification and treatment will improve recovery times**

Measure	Normal	Septic	Inflammatory
Volume, mL (knee)	<3.5	Often >3.5	Often >3.5
Clarity	Transparent	Opaque	Translucent-opaque
Color	Clear	Yellow to green	Yellow to opalescent
Viscosity	High	Variable	Low
WBC, per mm3	<200	>100,000*	2,000-10,000
PMNs, percent	<25	≥75	≥50
Culture	Negative	Often positive	Negative
Total protein, g/dL	1-2	3-5	3-5
LDH (compared to levels in blood)	Very low	Variable	High
Glucose, mg/dL	Nearly equal to blood	<25, much lower than blood	>25, lower than blood

WCC may be much lower in septic arthritis (2000 - 100,000)

Ie lower virulence organisms, immunocompromised

Question 7 (12 marks)

A 7 year old boy presents to your emergency department after sustaining an eye injury at school 2 hours prior. On arrival, he is actively vomiting.

a. State the most concerning abnormal feature in this photograph. (1 mark)
   - **Hyphaema** (grade 1 (<33%) to II (33-50%)

b. State 4 possible complications of this injury. (4 marks)
   - **Glaucoma- of hyphaema**
   - **Rebleeding- of hyphaemia (occurs in ~ 10%, common day 3-5, ↑ in children)**
   - **Vision loss**
   - **Periorbital cellulitis- from skin breach**

c. List five (5) medications that may be used for this patient. (5 marks)
   - **Cyloplegics** (tropicamide 1%)
   - **Acetazolamide** (50mmg IV stat then 250mg PO TDS)
   - **Timoptolol** (0.5% i drop BD if incr IOP)
   - **Antiemetic** *(not metoclopamide- theoretically ↑IOP)*
   - **Analgesia** (avoid NSAID) e.g. paracetamol, opioid

d. State the expected prognosis for this patients' injury, assuming the condition does not deteriorate. (1 mark)
   - **Good, no visual loss likely**

e. State one (1) justification for this choice of prognosis. (1 mark)
   - **Hyphaema < 1/3 of the anterior chamber have a good prognosis**

(Mx- Guided by Opthal. Rest eyes, eye shield (not a pad), rest at 30° head up (↓ further bleeding from 20%→10%), may need laser Rx to stop ongoing bleeding)

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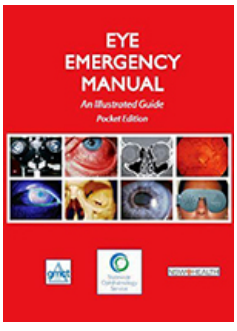

Question 8 (8 marks)

A 2 year old boy is brought to your emergency department by his grandparents, having found him unresponsive in their home. He has no significant past medical history.

Venous blood gas

			Reference Range
pH	7.1		7.35-7.45
pO_2	50	mmHg	
pCO_2	37	mmHg	40-52
HCO_3^-	11	mmol/L	24-32
Lactate	8.8	mmol/L	0.5-2.0
Na^+	143	mmol/L	135-145
K^+	3.8	mmol/L	3.5-4.8
Cl^-	110	mmol/L	95-110
Glucose	1.8	mmol/L	3.0-6.0

a. Provide two (2) calculations to help you to interpret these results.
(NB: it is a venous gas- so expected PC02 and A-a etc can't be calculated)

Derived values:

- **AG 22**
- **Delta ratio = 10/13 = 0.77**

b. Using the scenario and the derived values, define the primary acid/base abnormality/s.
- **HAGMA (22)**
- **Resp acidosis**

c. Using the scenario and the derived values, define the secondary acid/base abnormality/s.
- **Resp alkalosis**
- **NAGAMA**

d. Provide a unifying explanation for these results.
- **Lactic acidosis**
- **↓ GCS secondary to**
    - Sepsis
    - Ingestion eg OHA, iron, propranolol
    - Seizures
    - (Not methanol/ renal failure/ ethylene glycol

Dr Tom Reade (Staff Specialist, University Hospital, Geelong Emergency Department)
Email: tomre@barwonhealth.org.au

Question 9 (18 marks)

a. List five (5) benefits of a collocated "Short Stay Unit" associated with an ED. (5 marks)
- **↓ LOS**
- **Allows further investigation**
- **Allows ED admissions/ prolonged LOS eg for toxicology pts**
- **Avoid D/C at night**
- **Spare temporary capacity for main ED (eg pt awaiting transport/ ward bed)**
- **Safety valve- prevent unsafe D/c when no I/P team will admit**
- **Financial benefit- reward for ↑ admissions**
- **KPI- NEAT target improvements**

b. List four (4) limitations of a collocated "Short Stay Unit" associated with an ED. (4 marks)
- **Delay necessary admissions**
- **Deferral of decision making**
- **Failure to exclude serious Dx (eg Abdominal emergencies/ poisonings)**
- **Access block if used for pt awaiting a ward bed**
- **Multiple handovers of staff for 1 patient**
- **Generation of Discharge summaries**

c. List five (5) predictors of admission failure for a Short Stay patient. (5 marks)
- **Referral to inpatient unit prior to SSU admission**
- **Inability to wt bear/ walk, when previously able**
- **Need for ongoing Rx**
- **>1 active problems**
- **Multiple medical comorbidities**
- **Progressive deterioration prior to presentation despite optimal Rx and minimal change to Rx on admission**

d. List four (4) examples of suitable conditions/problems to admit to a Paediatric Short Stay Unit. (4 marks)
- **Minor CHI**
- **Gastro- NG rehydration**
- **Poisoning- mild**
- **Asthma- mild- moderate**
- **Single seizure**
- **Allergic reaction**
- **Post conscious sedation**
- **Low risk Marine/ snake bite**

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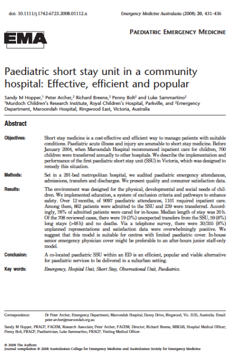
doi: 10.1111/j.1742-6723.2008.01112.x Emergency Medicine Australasia (2008) 20, 431–436

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PAEDIATRIC EMERGENCY MEDICINE

Paediatric short stay unit in a community hospital: Effective, efficient and popular

Sandy M Hopper,[1] Peter Archer,[2] Richard Breene,[2] Penny Bolt[2] and Luke Sammartino[2]
[1]Murdoch Children's Research Institute, Royal Children's Hospital, Parkville, and [2]Emergency Department, Maroondah Hospital, Ringwood East, Victoria, Australia

Abstract

Objectives: Short stay medicine is a cost-effective and efficient way to manage patients with suitable conditions. Paediatric acute illness and injury are amenable to short stay medicine. Before January 2004, when Maroondah Hospital recommenced inpatient care for children, 700 children were transferred annually to other hospitals. We describe the implementation and performance of the first paediatric short stay unit (SSU) in Victoria, which was designed to remedy this situation.

Methods: Set in a 291-bed metropolitan hospital, we audited paediatric emergency attendances, admissions, transfers and discharges. We present quality and consumer satisfaction data.

Results: The environment was designed for the physical, developmental and social needs of children. We implemented education, a system of exclusion criteria and pathways to enhance safety. Over 12 months, of 9097 paediatric attendances, 1101 required inpatient care. Among them, 862 patients were admitted to the SSU and 239 were transferred. Accordingly, 78% of admitted patients were cared for in-house. Median length of stay was 20 h. Of the 708 reviewed cases, there were 19 (3%) unexpected transfers from the SSU, 59 (8%) long stays (>48 h) and no deaths. Via a telephone survey, there were 30/355 (8%) unplanned representations and satisfaction data were overwhelmingly positive. We suggest that this model is suitable for centres with limited paediatric cover. In-house senior emergency physician cover might be preferable to an after-hours junior staff-only model.

Conclusion: A co-located paediatric SSU within an ED is an efficient, popular and viable alternative for paediatric services to be delivered in a suburban setting.

Key words: *Emergency, Hospital Unit, Short Stay, Observational Unit, Paediatrics.*

Correspondence: Dr Peter Archer, Emergency Department, Maroondah Hospital, Davey Drive, Ringwood, Vic. 3135, Australia. Email: peter.archer@maroondah.org.au

Sandy M Hopper, FRACP, FACEM, Research Associate; Peter Archer, FACEM, Director; Richard Breene, MBChB, Hospital Medical Officer; Penny Bolt, FRACP, Paediatrician; Luke Sammartino, FRACP, Visiting Medical Officer.