Validation of a classification system for causes of death in critical care: an assessment of inter-rater reliability

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ABSTRACT

Objective: Trials in critical care have previously used unvalidated systems to classify cause of death. We aimed to provide initial validation of a method to classify cause of death in intensive care unit patients.

Design, setting and participants: One hundred case scenarios of patients who died in an ICU were presented online to raters, who were asked to select a proximate and an underlying cause of death for each, using the ICU Deaths Classification and Reason (ICU-DECLARE) system. We evaluated two methods of categorising proximate cause of death (designated Lists A and B) and one method of categorising underlying cause of death. Raters were ICU specialists and research coordinators from Australia, New Zealand and the United Kingdom.

Main outcome measures: Inter-rater reliability, as measured by the Fleiss multirater kappa, and the median proportion of raters choosing the most likely diagnosis (defined as the most popular classification choice in each case).

Results: Across all raters and cases, for proximate cause of death List A, kappa was 0.54 (95% CI, 0.49–0.60), and for proximate cause of death List B, kappa was 0.58 (95% CI, 0.53–0.63). For the underlying cause of death, kappa was 0.48 (95% CI, 0.44–0.53). The median proportion of raters choosing the most likely diagnosis for proximate cause of death, List A, was 77.5% (interquartile range [IQR], 60.0%–93.8%), and the median proportion choosing the most likely diagnosis for underlying cause of death, List B, was 82.5% (IQR, 60.0%–92.5%). The median proportion choosing the most likely diagnosis for underlying cause of death was 65.0% (IQR, 50.0%–81.3%). Kappa and median agreement were similar between countries. ICU specialists showed higher kappa and median agreement than research coordinators.

Conclusions: The ICU-DECLARE system allowed ICU doctors to classify the proximate cause of death of patients who died in the ICU with substantial reliability.
determined that we would recruit half from Australia and New Zealand, and half from the United Kingdom. No more than one ICU specialist and one research coordinator was selected from a single institution, to maintain independence of raters, as far as possible, when assessing cases.

Classification system
The ICU-DECLARE system required raters to select two proximate causes of death (Table 1) and one underlying (Table 2) cause of death. Lists of causes were adapted from those used in previous critical care trials, with adjustments to make the lists as broadly applicable as possible to cases, and simple to use. These lists were not specifically related to formal death certification processes or coding practices (eg, International Classification of Diseases, 10th revision).

The proximate cause of death was defined as the organ system failure that was considered to have primarily led to death (eg, cardiac, neurological or metabolic causes, or bleeding or sepsis). For the proximate cause of death, raters chose one option from each of List A, which had eight options, and List B, which had five options.

The underlying cause of death was defined as the specific medical diagnosis that precipitated the proximate cause of death. For the underlying cause of death, raters chose one option from a list of 44 options.

Sample size
To determine sample size when using kappa, a null hypothesis value of kappa is required, along with a “goal” kappa. We set these at 0.4 and 0.7, respectively, and used 80% power. With these parameters, a sample size of 74 can be used.9 Treating this as a minimum, we used a sample of 100 cases. Kappa typically increases with an increasing number of raters, and to ensure broad applicability and validity we used a convenience sample of 40 raters.

Our study received ethics approval from the New Zealand Central Health and Disability Ethics Committee (15/CEN/42).

Statistical analysis
There was no gold standard for the proximate or underlying cause of death in the case scenarios. To describe the distribution of the selections for each of the three lists, summarised across the case scenarios, the cause that was chosen by the largest proportion of raters was designated as the most likely actual diagnosis.

Table 1. Options for selection from the two lists of proximate causes of death in the ICU-DECLARE system (raters chose one from each list)

<table>
<thead>
<tr>
<th>List A. Eight options</th>
<th>List B. Five options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurological</td>
<td>Cerebral</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>Cardiac</td>
</tr>
<tr>
<td>Cardiogenic shock</td>
<td>Bleeding</td>
</tr>
<tr>
<td>Distributive (septic) shock</td>
<td>Sepsis</td>
</tr>
<tr>
<td>Hypovolaemic shock</td>
<td>Other</td>
</tr>
<tr>
<td>Hypoxic respiratory failure</td>
<td></td>
</tr>
<tr>
<td>Metabolic</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

ICU-DECLARE = Intensive Care Unit Deaths Classification and Reason.

Table 2. Options for underlying cause of death in the ICU-DECLARE system (raters chose one from the list of 44 options)

<table>
<thead>
<tr>
<th>TBI (unsurvivable primary injury)</th>
<th>Aortic valve disease</th>
<th>Pulmonary fibrosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBI (refractory intracranial pressure)</td>
<td>Mitral valve disease</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>Haemorrhagic stroke</td>
<td>Pericardial tamponade</td>
<td>Aspiration pneumonitis</td>
</tr>
<tr>
<td>Ischaemic stroke</td>
<td>Sepsis with multorgan failure</td>
<td>ARDS (pulmonary trigger)</td>
</tr>
<tr>
<td>Meningoencephalitis</td>
<td>Haemorrhage due to trauma</td>
<td>ARDS (non-pulmonary trigger)</td>
</tr>
<tr>
<td>Cerebral abscess</td>
<td>Haemorrhage not due to trauma</td>
<td>Pulmonary haemorrhage</td>
</tr>
<tr>
<td>Status epilepticus</td>
<td>Hepatic failure</td>
<td>Other respiratory</td>
</tr>
<tr>
<td>Hypoxic brain injury</td>
<td>Anaphylaxis</td>
<td>Vasculitis</td>
</tr>
<tr>
<td>Aneurysmal subarachnoid haemorrhage</td>
<td>Pancreatitis</td>
<td>Drug overdose</td>
</tr>
<tr>
<td>Metabolic encephalopathy</td>
<td>Massive pulmonary embolism</td>
<td>Anorexia/cachexia</td>
</tr>
<tr>
<td>Other neurological</td>
<td>Other cardiovascular disease</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>Chronic obstructive pulmonary disease</td>
<td>Hypoadrenalism</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>Cancer</td>
<td>Drug induced</td>
</tr>
<tr>
<td>Ruptured or leaking abdominal aortic aneurysm</td>
<td>Asthma</td>
<td>Renal failure</td>
</tr>
<tr>
<td>Ruptured or leaking thoracic aneurysm</td>
<td>Other cause not listed</td>
<td></td>
</tr>
</tbody>
</table>

ICU-DECLARE = Intensive Care Unit Deaths Classification and Reason. TBI = traumatic brain injury. ARDS = acute respiratory distress syndrome.
The proportion of raters who agreed with the most likely actual diagnosis was calculated for each list and for each of the case scenarios. The percentage of raters making these majority choices are summarised for each list (A, B and underlying). We report median values with interquartile ranges (IQRs).

The Fleiss multirater kappa statistic, together with bootstrap confidence limits, was used to estimate inter-rater agreement for the proximate causes of death and the underlying cause of death for all 40 raters across all 100 cases. We report kappa values with 95% confidence intervals.

We classified a kappa of 0.21–0.4 as fair agreement between raters; 0.41–0.6 as moderate agreement between raters; 0.61–0.8 as substantial agreement between raters; and > 0.8 as almost perfect agreement between raters.8

We treated missing data (failure to make a choice of proximate or underlying cause of death) as a separate category but also conducted a sensitivity analysis by excluding the missing data.

We conducted pre-planned subgroup analysis by health care profession (ICU specialists v research coordinators) and by country (Australia and New Zealand v the United Kingdom).

We used SAS, version 9.3 (SAS Institute), and the R statistical software (www.R-project.org), packages irr and boot.

### Results

Across all raters and cases, agreement measured by kappa. There was substantial agreement between ICU specialists across all three lists when measured by the percentage choosing the most likely diagnosis, and for proximate cause of death (Lists A and B) when measured by kappa.

The sensitivity analysis excluding missing data did not alter the results (Supplementary Appendix 3).

### Discussion

### Key findings

Using clinical case scenarios, and testing previously used but unvalidated tools with a group of ICU specialists and research coordinators who were involved in clinical research, there was substantial agreement between ICU specialists and moderate agreement between research coordinators in categorising the organ system leading to death and the underlying medical diagnosis causing death.

### Relationship to previous studies

Cause-of-death classification systems in neonatology have been assessed for validity, using kappa, percentage agreement and other measures.10 These systems report agreement ranging from 60% to 96%, which is comparable to the degree of agreement observed between ICU specialists in our study for proximate cause of death. However, the proportion of ICU specialists in our study who agreed with the majority diagnosis for underlying cause was 75%, which is lower than a previous neonatology study.10 One explanation for this is that there may be a small number of causes of death in neonatology and that inter-rater reliability predictably increases with a decreasing number of available categories.11 Other discrete diseases, such as stroke,12 chronic obstructive pulmonary disease13 and cancer surgery,14 also have fewer categories for cause

### Table 3. Kappa for agreement and percentage of raters choosing the majority diagnosis for proximate and underlying cause-of-death lists

<table>
<thead>
<tr>
<th>Raters</th>
<th>List A proximate cause</th>
<th></th>
<th>List B proximate cause</th>
<th></th>
<th>Underlying cause</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kappa (95% CI)</td>
<td>Majority median, % (IQR)</td>
<td>Kappa (95% CI)</td>
<td>Majority median, % (IQR)</td>
<td>Kappa (95% CI)</td>
<td>Majority median, % (IQR)</td>
</tr>
<tr>
<td>All</td>
<td>0.54 (0.49–0.60)</td>
<td>77.5 (60.0–93.8)</td>
<td>0.58 (0.53–0.63)</td>
<td>82.5 (60.0–92.5)</td>
<td>0.48 (0.44–0.53)</td>
<td>65.0 (50.0–81.3)</td>
</tr>
<tr>
<td>Countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>0.57 (0.52–0.62)</td>
<td>80 (65–95)</td>
<td>0.57 (0.53–0.63)</td>
<td>85 (65–95)</td>
<td>0.49 (0.45–0.54)</td>
<td>67.5 (52.5–85.0)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.52 (0.47–0.58)</td>
<td>75 (55–95)</td>
<td>0.58 (0.53–0.63)</td>
<td>85 (60–95)</td>
<td>0.47 (0.42–0.52)</td>
<td>65 (50–85)</td>
</tr>
<tr>
<td>Groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU specialists</td>
<td>0.64 (0.58–0.69)</td>
<td>90 (65–100)</td>
<td>0.66 (0.61–0.72)</td>
<td>90 (75–100)</td>
<td>0.55 (0.50–0.60)</td>
<td>75 (55–85)</td>
</tr>
<tr>
<td>Research coordinators</td>
<td>0.49 (0.44–0.54)</td>
<td>70 (55–90)</td>
<td>0.53 (0.49–0.58)</td>
<td>80 (63.5–90)</td>
<td>0.43 (0.39–0.47)</td>
<td>60 (45–80)</td>
</tr>
</tbody>
</table>

IQR = interquartile range. ICU = intensive care unit.
of death. A lower rate of agreement may reflect the broad diagnostic casemix in the adult ICU patient population compared with other subspecialist groups.

Strengths and limitations

The main strength of our study was that we had a relatively large number of raters from different countries, institutions and training backgrounds, and they assessed causes of death using 100 real-life case histories.

We aimed to validate rating systems for use in a research setting and have not made any attempt to validate the classification system for use by non-research clinicians. We only categorised deaths that occurred in the ICU, for pragmatic reasons, and to allow scope for development of this system in other groups. There was no gold standard for diagnosis in each case, so the diagnostic accuracy of the system could not be tested in this way (against, for example, findings at a post mortem). No allowance was made for discussion of cases, and we recognise that such discussion would occur in a clinical trial setting if a rater was uncertain which category to choose; this may have affected the reliability of ratings observed. Independent ratings are also a pre-requisite for calculation of kappa. Future work could investigate the impact of allowing discussion.

Implications

Our study supports the validity of the ICU-DECLARE system (adapted from previously used systems) to classify deaths in ICU patients, provided classification is performed by ICU specialists. The relatively lower degree of agreement observed among research coordinators may be due, in part, to lack of experience in classifying or describing cause of death. Development and validation of systems of this kind would facilitate standardisation of data and subsequent meta-analysis. Moreover, large-scale studies of the demographics of ICU populations would be enhanced if all centres kept records of cause of death in a standardised way.

The similarity of findings from the five-category and eight-category proximate cause of death classification systems suggests that either classification system may be used. Users can take into account their needs for data resolution (five versus eight categories) and clinical usefulness of the categories in each list as applied to their particular project.

Our finding that the 44-category system for underlying cause of death only provided moderate agreement between raters suggests that further work is needed to optimise this component of the classification system.

Future directions

Independent rating of underlying causes of death by two or more ICU specialists, with resolution of disagreements by discussion, may improve the inter-rater reliability of the categorisation system, but this requires further study.

Additional studies are also needed to establish the validity of these systems for deaths that occur after ICU discharge. The effect of training raters on the use of the system needs to be assessed.

Conclusions

Using the eight-category and five-category lists of proximate causes of death, the ICU-DECLARE system allows ICU specialists, but not research coordinators, to classify the proximate cause of death of patients who die in the ICU, with substantial reliability.

Competing interests

None declared.

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Supplementary Appendix

*This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.*

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</table>
Appendix 1: Case histories
The following 100 case histories are those provided to raters, to have cause of death classified.

Search Strategy and Inclusions:
Wellington Hospital ICU Database. Recent deaths prior to 01/02/2015. Any adult patient who died in the ICU.

Details:
ICU discharge summary or hospital discharge summary included, anonymised.

Exclusions:
Any case currently under investigation by coroner for cause of death.
Case 1

84 year old man admitted post prolonged, complicated AVR + 2x CABG

Presenting Complaint:
Presented acutely w/ AS with 2 month history of SOBOE and chest pain. NYHA III angina and SOB. Some improvement with medical therapy.
Angio - significant disease in mid circumflex and RCA, mild narrowing of distal LMJ
TTE - Normal systolic function, normal size LV cavity, severe AS, mild MR

Background:
- IHD - 3 vessel disease
- AF - on dabigatran normally
- TIA - 2005 - completely occluded R carotid and prev L carotid endarterectomy
- AAA - 4.2cm - under surveillance
- COPD - ex smoker
- CKD - stage III, creat 110

Medications:
- Pantoprazole 20mg OD
- Simvastatin 40mg OD
- Metorprolol 80mg OD
- Metoprolol CR 23.75mg OD
- Symbicort 200/6 - 2 BD
- NKDA

Intraoperative Course:
- Easy intubation
- Preop TOE showed preserved LVSF but impaired LVDF
- Difficult procedure requiring several runs of bypass due to issues with leaking aortic valve - 2x valves used but recurrent issues with paravalvular leakage
- 4x periods on pump - total 553 mins - 216 mins, 254 mins, 19 mins, 64 mins
- Left atrial tear found following AVR requiring cardiac fibrillation to repair due to difficulty with access while on bypass
- Postop echo showed good LV systolic function, mod. Mitral regurg
- Intraoperative blood products: 4 FFP, 2 Plts, 4 Cryo, 6 RBC

A/ Intubated
B/ Sats 97% on 0.35 FiO2, ASV 100%
PaO2 94, PaCO2 47.9, pH 7.27
C/ BP 95/41 (Map 62) on 22 ml/hr noradrenaline, 5 mls/hr milrinone
HR 76/min, SR
D/Neuro/ Sedated on 10ml/hr propofol
E/F/ Na 143, K 5.1, Creat 89, Mg2+ 2.17
G/ NG tube in situ
Coags/ Plts 72, INR 1.5, APTT 38, prothrombin time 17.6
CXR/ cardiomegaly, ?some atelectasis L>R

Imp/
- Elderly man with major cardiac surgery & close to 10 hour bypass time
- Significant ionotrope/vasopressor requirement
- Mild coagulopathy

Plan/
- Titrate noradrenaline/milrinone/fluids to CI/MAP>60
- Replace clotting factors as required
- Transfuse to Hb >95 as per liberal arm of TRICC study
- Standard postop cardiac meds

Treatment and Progress /
At ICU on day of surgery: bleeding --> settled after correction of coagulopathy.
TOE 28/1: whilst on high vasoactive support (norad, milrinone and vasopressin) --> LV fn mildly impaired globally, RV fn mildly impaired but not dilated, no pericardial tamponade, moderate to severe mitral regurgitation, significant prosthetic aortic valve leak.

Despite high degree of support, MODS ensued with AKI on CKI, worsening acidosis, ischaemic hepatopathy and likely ischaemic bowel.

Several family meetings with wife and niece. They did not want to prolong suffering and requested ceasing active treatment which was felt to be a very reasonable request given the situation.

CTS consultant (IN) also met with family through the course.
Case 2
53y male  hanging
T/f to Wellington ICU from Masterton Hosp to facilitate organ donation

Alleged self inflicted hanging. Found by family 40 mins after last seen. Bystander CPR. Paramedics found him in PEA arrest, gcs 3. CPR continued. 20 mins till ROSC. 2 rounds of adrenaline. Presented to Masterton Hosp at 10.30am with asystole and fixed dilated pupils. Intubated and ventilated by Paramedics. Had 24mg Midaz from 12.30 till 3.30 pm. Then switched to propofol. Started on phenylephrine 15mls/ hr for MAP 90.
Fluid in 2.6 litres, uo 2.7 litres

Ix
CT c spine: no dissection. No bony injury.
Cxr ett in good position. L base not seen. Chest clear. Ngt in place
Bloods: improved metabolic and resp acidosis Na 137 k 3 ( prev 4.1) glucose 17

Background
Work pressures leading up to event today
Asthma
Keen rower. Healthy and fit.

Meds
Asthma inhaler ? Which

O/E
A+B ett at 24 cm at lips. Drager simv, fio2 40 peep 5 tv 400mls
Sats 98% ( at Masterton, triggering breaths, breath stacking, paradoxical breathing therefore paralysed with roc 50 before transfer and prop increased to 15)
C when prop started, phenylephrine started 15 ml/s/ hr for MAP 90 decreased to 2 ml/s/ hr for Map 70. ECG sr 100/ min
D prop 15, spont breathing, pupils constricted ?sluggish reacting ( earlier reported in Masterton as fixed and dilated)
30mins after propofol stopped: myoclonic jerks
IDC draining
NGT in place on cxr
Temp 33.4 to 34.7 to 36.6C

Imp: Clearly does not meet criteria for brain death as spont breathing and pupils no longer fixed and dilated ?sluggishly reacting
PEA arrest secondary to hanging- poor neurological prognosis

P/
Stop propofol. Wake and assess neurology.
May need CVL to support vital organs later in the piece.
Check abg including potassium and glucose and panel A, Check cxr, Baseline ECG

Discussed with ODNZ coordinator.  Accepted for DCD
Family consented to process
Surgical team arrived at 21:00
Ventilatory support stopped at 22:25
Passed away at 22:34, pronounced dead via absent response, apnoea, and absent cardiac output on Arterial line.

**Case 3**
75yo post op MVR and Bentalls - complicated procedure

**Hx**
MS sec to Rheumatic Fever - 2 balloon valvuloplasty 2008 and 2011
IHD - 2 stents RCA and ?
- Angio -
  - Diffuse CAD
  - diffuse in LAD
  - Patent RCA Stent with diffuse dx small distal vessels
  - PDA disease
  - Normal LV Function
- ECHO 2014
  LV is mildly dilated with good systolic function
  Severe mitral stenosis with heavy calcification
  Mild AS and mild AR
  Mild TR with elevated RV systolic pressures
  MV gradient 14

Pulmonary HTN mean 23. PAP 60/17
ECG Trifascicular Block

**Other**
Previous cholecystectomy, hysterectomy, cholecystectomy
Ureteric stone 2014

**BG**
1. Increasing SOB past 6/12. Normally independent ADLS
2. Severe MS Gradient 14 on ECHO
3. Elective admission for MVR.

**Intraop COMPLICATED**
1. 12 Hour Procedure -
2. Required Bypass * 2. Total 450m
3. Bleeding from damaged AVR after first CPB - Bentalls with Pericardial Patch Repair.
4. hypokinesis LAD territory with dec MAP on TOE
5. 2 FFP 2 platelets 3 cryo, Protamine * 2. TXA. Milrinone and iloprost boluses.
6. Normal TEG.
7. T/F on Norad and Adrenaline Infusions

**MEDS**
Omeprazole
Warfarin
Atorvastatin
Cilazapril
Metoprolol
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. *Critical Care and Resuscitation* 2015

**o/e**
A B: Intubated and Ventilated PEEP 5 Flo2 100 Spo2 88  
C MAP 65 on norad 0.15mcg/kg/min and adrenaline  
D Propofol 15ml/hr PEARLA

**Bloods**
- pH 7.164
- BE -9.0
- pCO2 57.5
- pO2 77.1
- Fio2 100

**Imp**
- High Risk post cardiac surgery
- High Vasopressor Requirement
- hypokinesis LAD area
- Mixed met and resp acidosis

 Attempted PAC float by ICU SMO but episodes of VT resolving once pulled back. Decided too risky to proceed.

 Norad/adrenaline requirement worsened through the night. Milrinone added.  
 Metabolic acidosis worsened.  
 Developed oliguric/anuric renal failure.  
 Remained on 100% FiO2

 TOE repeated in ICU at 2200: Function reasonable given amount of support. No tamponade.  
 RV not dilated. Valves working ok.

 Discussion between family and ICU SMO: likely unsurvivable.  
 CT surgeon also made aware.  
 Norad and adrenaline capped.  
 Further family meeting to change aim of care to palliative. Extubated 12.25pm.  
 Pressors/inotropes ceased.  
 Passed away at 12:40.
Case 4
Presentation with severe traumatic brain injury, likely unsurvivable.

PRESENTING HISTORY:
Fell whilst intoxicated down ~ 6 concrete steps. Knocked out immediately. GCS 3 when paramedics attended and pupils were noted to be dilated bilaterally and unreactive prior to transfer to hospital. C-spine precautions initiated.

Intubated in ED. Tetanus and diptheria vaccine given. CT head and neck obtained revealing Left occipital calvarial fracture. Right extra-axial haemorrhage consistent with SDH. Right subaxial haemorrhage in parietal, temporal lobes. Associated midline shift and hydrocephalus. No acute C-spine injury. Uncal herniation and tonsilar coning.

BACKGROUND:
1. Heavy alcohol intake.
2. Pancreatic cyst under surveillance.
3. Previous rib fractures and haemopneumothorax following fall.

MEDICATIONS:
Unknown.

IN ICU:
Cardiovascular - HR 90 sinus. BP 110/60 on metaraminol titrated to effect. ECG sinus rhythm.

Respiratory - Size 8 ETT, 23 cm at incisors. Reportedly straight forward intubation. ASV MV 90%, PEEP 5 cmH2O, FiO2 0.3 --&gt; SpO2 93%. PaO2 93 mmHg, PaCO2 37. Lung apices look ok on CT.

Neurological - Pupils fixed and dilated. GCS E1 VT M1 = 3. C-spine collar in situ. See above for CT result. Ethanol mg % 473. Blood oozing from L ear.


Renal - Substantial urine output, not blood stained. Cr 40.

Endocrine - Glucose 5.7

Metabolic - Na+ 140, K+ 2.8, Mg2+ 0.72, Ca2+ 2.0. Temperature 35.4 C --&gt; active warming.

Haematological - Hb 128, plt 107. INR 1.1, APTT 28, fibrinogen 1.5.

Musculoskeletal - Grazes to both shoulders posteriorly, to the left forearm and the right knee. Minor grazes to both shins. Bruise to right upper arm. Sternoclavicular joint swollen on the right.

Lines - R IJ 4 X lumen CVL. R radial arterial line. 18 g IV line in each ACF. NG appropriate. IDC.

IMPRESSION:
Unsurvivable traumatic brain injury. Developing hypothalamic disregulation as evidenced by evolving DI and loss of temperature control.
PLAN:
1. Metaraminol changed to noradrenaline for BP support.
2. SCDs for VTE prophylaxis.
3. Thiamine IV.
4. R IJ central line inserted.
5. Hard collar removed based on CT c-spine.
6. Aim for MAPs of 70-100.
7. Ethanol level plus repeat panel A at 0200.
8. Chest x-ray to confirm CVL placement.
9. Remove 1 X IV line.
10. Treat with DDAVP if urine OP > 300 mL/hr.

PROGRESS:
Noradrenaline commenced for blood pressure support.
DDAVP given to managed diabetes insipidus.
Active warming to maintain temperature.
Electrolytes corrected.
Required multiple fluid boluses to maintain adequate cardiac output on day 0 of admission.
Samples taken for tissue and blood typing.
Brain death testing undertaken and confirmed brain death - time of death 1245.
Transferred to theatre for organ procurement procedure.
Case 5

57 yo admitted with worsening resp distress with severe bilateral pneumonia and myelodysplasia

Issues
High grade myelodysplasia for SCT
Thrombocytopenia 21
Severe bilateral pneumonia and L pleural effusion
ARDS

BG
1. Recent dx (Dec 2014) high grade myelodysplasia (awaiting HLA typing of siblings for SCT
2. Hospital admission with R pleural effusion on 30/12
3. Developed severe bilateral pneumonia.
4. MET call 02/01 for desaturation on 11L hudson mask.
5. Improved on CPAP in HDB overnight.
6. Fruesemide given 03/01 overnight with 1600ml diuresis
7. MET call for tachypnoea 45 with tiring on CPAP.
8. Admitted to ICU and intubated (Grade 2B)

Hx
Normally fit and well
Recurrent sinusitis

Meds
Meropenam
Azithromycin
Hydrocortisone
Loratidine

A: ETT 8 24 cm at teeth
B ASV PEEP 12 spO2 93% on Fio2 0.6
C unsupported MAP >80
D propofol sedation (GCS 15 prior to intubation)

CVS Murmer
Resp Scattered creps with decreased a/e L>R

Plan
1. Intubated in ICU. Continue sedation and ventilation for now.
2. Continue current antibiotics
3. Haematology team to be informed by medical registrar.
4. Husband informed of intubation.
5. Repeat CXR confirm ETT position

PROGRESS
Remains intubated, PEEP 12 increased MV% to 120 as rising Co2 PlatPres 26 oxygenation stable Fi02 0.35 with sats 92 %

Started on cotrimoxazole, remained on azithromycin and meropenem.
Underwent bronchoscopy and BAL. Minimal inflammatory exudate seen down to the 3-4th level of bronchial tree. Bronchoalveolar washings performed & sent for aspergillus, PCP and mycoplasma. Gram stains negative for all.

Family meeting held explaining ongoing issues with poor improvement of pneumonia.

Started on hydroxyurea by haematology team in order to reduce white cell counts. Ongoing thrombocytopenia needing regular platelet transfusions and anaemia requiring RBC.

Variable oxygen requirement - FiO2 of 35-40% increased to 45-55%. Some ongoing issues with light sedation on maximum trial doses dexmedetomidine and propofol therefore fentanyl started.

Despite ongoing broad spectrum antibiosis, condition did not improve. Bone marrow biopsy and aspirate showed transformation to AML.

After discussion with family, patient commenced on low dose chemotherapy with aim to reduce tumour burden in the hope that this may improve respiratory status.

Unfortunately, condition continued to deteriorate. Despite broad spectrum antibiotic cover respiratory parameters continued to worsen. Inability to adequately ventilate led to increasing PaCO2 reaching ~120.

Discussion held with family regarding evolving multiorgan failure, and the likely futility of ongoing aggressive treatment. After discussion the family decided that it was in patient’s interest to withdrawal active management.

Extubated and taken off vasopressor support at 16:40 and passed away peacefully at 16:45 with family present.
Case 6

Transfer from Palmerston North to 6SW
- Silent MI
- LV failure
- hyponatraemia
- AKI

Met Call for ongoing hypotension with increasing dopamine requirements - transfer to ICU

HISTORY
Presented to Palmerston North with 1/52 history of fatigue, dizzy on mobilising. No CP/SOB
Saw GP day before noted to have high digoxin level and low BP

On admission
Alert pain free, afebrile
Hypotensive 70/40 P 66 AF LBBB
Clinically in failure

TnT 10,000
Creat 316 (baseline ? 100)
Na 129, K 4.8
INR 1.7

ECG LBBB (old) AF ST depression inferior/laterally
CXR vascular congestion
Bedside ECHO EF 20% impaired LV contractility, hypokinetic ant/septal wall Mod MR/TR,
thick AoV mild AS and AR, No sign PCE

PICC inserted, commenced on dopamine
Stedialy increased on 6WS post transfer to 10ml/hr to maintain MAP >65

Was noted to have epigastic pain during ECHO, BR 25 now settled

BACKGROUND
AF on digoxin, warfarin and cardizem
Renal impairment
HTN
Carotid endartectomy Right
AS - last nonacute ECHO Oct 2014 AoV Mean Grad 25, valve area 1.2 EF 55% LVH and MR
T2DM on tablets

MEDICATION (preadmission)
candesartan 32mg od
doxazocin 4mg od
omeprazole 20mg od
amitriptyline 20mg od
atorvastatin 20mg od
warfarin as per INR
diltiazem 240mg od
digoxin 250mcg od
frusemide 80mg od
spironolactone 12.5mg od

(new on admission)
aspirin 100mg od
clopidogrel 75mg od
clexane 40mg subcut

ICU
A talking alert
B RR 15 sats 88% RA 94% 2l NP
Bibasal creps
C MAP 65 18ml/hr norad P 90-130 AF HS dual SM
JVP raised, minimal oedema
D GCS 15 BSL 9
E Afebrile
F U/O 50ml 1hr
Abdo Soft

Difficult A line insertion, right femoral under US guidance
R IJV quad lumen

CXR interstitial shadowing consistent with pulmonary oedema
ECG LBBB AF 93

ScvO2 = 62%

Arterial FiO2 0.4 HFNP pH 7.29, PCO2 38, PO2 67 bic 18, BE -7.4

Hb 107, WCC 8.8, plt 311, INR 1.7, Na 130, K 5.9, Ur32, Creat 290, Mg 1.11 Cca 2.45 Po4, Br 25, ALT 83, ALP 111, Alb 29

Issues
- silent MI
- LV failure
- AKI K5.9, pH 7.
- hyponatraemia

PROGRESS
R IJV and R femoral arterial lines inserted
Despite continuing Amiodarone, Noradrenaline and High flow oxygen continued to deteriorate.
Cardiac arrest (asystole/bradycardia), CPR commenced and adrenaline given but stopped due to background of multiorgan failure.
Case 7
62y old lady post L femoral art. Thrombectomy, Sepsis, AKI

Imp: ?Urosepsic shock vs toxic shock due to vasc situation, AKI, hyperkalaemia, acidosis

Hx
L Leg pain since at least early morning of the 6/1. In the afternoon leg pulseless and swollen. Arrived in ED profoundly acidaemic (pH 7.14) and hyperkalaemic in acute kidney failure and received CaGlc, Insulin-Dextrose, NaBic and Salbutamol nebs prior to being transferred to theatre for the embolectomy. Stated in ED that she doesn’t want to be resuscitated.

In OT worsening acidosis and sepsis, developing vasopressor requirement. A L open femoral art. Thrombectomy was performed but no obvious clot was seen, assuming that it was suctioned out on opening the artery. Leg reperfused without any worsening shock response. Had 2l of fluid and 1x RBC in theatre. Frank pus (1.7l) coming out of IDC. Started on Cefotaxim. Heparin bolus of 5000U given post op.

O/A in ICU:
A+B OETT size 7 (grade 1 view), bilat ventilated, chest clear, minimal resp support
C on 10ml/h of NA to maintain MAP >65mmHg, SR, HS I+II+systolic murmur. Distal L pulse with Doppler only
D lightly sedated on propofol
E afebrile
pH 7.04, BE -18.8, HCO3 10
pCO2 36, K 5.2, Na 137, Hb 83
talked to brother and explained severity of her state and that she may well die.

Background
- recent UTI in and pre admission on Abx from GP for another UTI
- T2DM
- CVA 2007 - left frontoparietal, residual R weakness, apathy
- PVD - amputation L great toe
- Hypothyroidism
- Vision impairment L worse than R
- depression / frontal lobe apathy fost stroke
- fall , since then bed bound in rest home
   despite no #

PLAN:
as d/w SR
keep sedated and monitor acidosis and renal function closely over next few hours, then reevaluate: CVVDHF vs palliation, extubation?
Cap NA at 20ml/h
NG, CXR

PROGRESS
Admitted from theatre intubated and ventilated with noradrenaline requirement.
Acidotic with acute renal failure. Thought to have UTI as well. Extubated the following morning but continued to deteriorate, requiring increasing amounts of noradrenaline. Called in brother and had family meeting explaining that death was likely imminent. Brother stated that patient would not like aggressive therapies and he agreed that given the severity of her illness he would support comfort cares. Noradrenaline withdrawn and commenced comfort cares.

Passed away 5 hours later peacefully with brother at her side.
Case 8
PC: 54yo female, with ?cardiogenic shock/?sepsis

BG:
Turners Syndrome
Hypertension
OA
Coeliac Disease

Usual meds:
Paracetamol, Cholecalciferol (1.25mg monthly), quinapril 5mg mane, folic acid 5mg weekly, kliogest (oestradiol).

HxPC:
Found by neighbour stuck in tree at 2100hr. Had been rescuing cat. ?1-2 hours in tree (left leg stuck between branches).
Taken to Masterton ED.
In ED:
- tachycardic and hypoxic. Treated as ?sepsis - IV fluids (1L) and Abx.
- deteriorated: RR 30, SpO2 90% on 15l O2, HR 150, widespread crackles.
- Given 40mg frusemide and amiodarone for ? AF.
- D/W Wgtn Cardiol - ECG sinus tachy, Amiodarone stopped.
- Futher 2l IVF given.
- CVL and arterial line inserted.
- commenced on noradrenaline for hypotension.

- D/W Wgtn ICU - for retrieval. Inotrope changed to adrenaline
- trial of CPAP for persisting hypoxia.
- nil improvement, therefore intubated at 04:30. Vomited on induction. Pink frothy sputum via ETT post-intubation.

O/A of retrieval team:
A - ETT 7.0, 19cm at incisor
B - SIMV: FiO2 0.8, PEEP 10, PS 10; SpO2 96%
C - HR 130 (sinus tachy), BP 108sys - adrenaline infusion at 0.7mg/hour
D - sedated with morphine and midazolam

Shorly after administartion of 50mg rocurom prior to transfer to stretcher, became hypotenisive with PEA arrest.
7min CPR, 1mg adrenaline. ROSC.
Heli transfer to Wellington Hospital.

O/A to ICU:
A - ETT 7.0, 19cm at incisors
B - CMV - TV 350ml, RR 18/min, FiO2 0.9, PEEP 12, SpO2 96%
ABG: pH 7.1, pCO2 47, pO2 267, BE -15.1
C - HR 150, BP 90sys (MAP 65) ; adrenaline 3mg/hour (30ml/hr)
D - sedated with morphine and midazolam (each at 10mg/ml)
E - Na 149, K 4.3, Creat 160
H - Hb 175, Plt 266
I - T39.0, WCC 30
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

L - 3-lumen CVL right IJ, R femoral arterial line, 22g PIVC R forearm.
M - adrenaline infusion

Imp: ?cardiogenic shock
?sepsis
Plan:
1. Cardiology R/V - for angio +/- balloon pump
2. Adrenaline - ceiling at 50ml/hour
3. Continue Abx
4. Inform family of situation
5. CXR
6. Bloods and ABG

PROGRESS
ECHO- Severe LV systolic impairment, otherwise unremarkable

Taken to Cath Lab
- normal coronary arteries
IABP inserted, Returned to ICU

Started on dialysis

Changed from adrenaline to NA, vasopressin, milrinone
Increasing inotrope requirement throughout admission.
Peripheries became progressively more shutdown, mottling to proximal arms and thighs.

Elevated potassium treated with actrapid boluses x2.

Runs of prolonged VT x2- responded to DC cardioversion.

Discussed with Consultant
- planned withdrawal of treatment due to medical futility

Discussed with family
- in agreement.

Treatment withdrawn. Passed away. Rest in peace.
Case 9

Transfer from Hutt ICU

OOH arrest, inferior ST elevation
Cath Lab - stents to LAD and RCA

39 yo, OOH arrest whilst travelling as passenger in car - noted to have seizure like activity
CPR from partner and off duty nurse
Approx 30 mins CPR
2 AED shocks from fire service, 2 boluses adrenaline from ambulance with subsequent ROSC.
Notes comment on asystole with ambulance crew
Intubated w/o drugs at scene

According to ICU Hutt notes - approx 15 neurofen tablets this morning - ? For chest pain
Possible recent (last 24 hours) attendance to an ED with chest pain
Note patient has apparently attended under multiple names - verbal hand over from Hutt
ICU staff of previous drug seeking behaviour

ETT changed in Hutt - cuff leak - grade 1 view

CV stable in Hutt

Transferred wellington cath lab - RCA and LAD disease, with collateral vessels both L>R and R>L

PCI and DES to both RCA and LAD
Consideration of IABP, but decided against
Aspirin and clopidogrel in Hutt, 9000 units heparin in cath lab

Background
Back pain
Chronic codeine use
Smoker

Currently
Intubated and ventilated, FiO2 0.45
Propofol sedation
CV Hr 130 SR, BP unsupported

Femstop in situ

Plan
Bloods
Maintain sedation 24 hours
Temperature control post OOH arrest - Aim 36.0
D/W cardiologist - not for rate control at present with high risk of large cardiac injury
Ulcer prophylaxis
CXR

PROGRESS
Out of hospital cardiac arrest, inferior STEMI --> cath lab --> PCI and DES to RCA and LAD.
Targeted temperature management for 72 hrs. Following TTM, best GCS remained extending to pain. Ventilator associated pneumonia treated with cefuroxime adequately. Tracheostomy placed in the hope that GCS will slowly improve. Despite this, GCS did not improve. After discussion with family, the aim of care was changed to keeping her comfortable. Decannulated on the afternoon of and passed away at 2020hrs.
Case 10
66yr female electively admitted post-op whipples for ?cholangioCA

PRE-OP
Background:
Obstructive jaundice
-> distal biliary stricture
-> liver lesions not malignant
HTN
GORD

Meds:
cilazapril
atenolol
bendrofluazide

INTRA-OP
Grade 2, easy BM, MAC blade and bougie, ETT 7.5
Laparotomy and pancreaticoduodenectomy and cholecystectomy and reconstruction (Whipples) and feeding jej
300ml blood loss
5l IVF
Epidural running
Vit K given

POST-OP
A - intubated
B - sats 100% on FiO2 50%, PEEP 5
C - HR 73, MAP 87 on mod-high level phenylephrine

PLAN
Clexane tonight
Strict NBM for 5/7
Dextrose 10mls 6 hourly via jej today

ADMISSION COURSE:
Extubated at 2150 on day 0 -- SpO2 96% on RA.
Phenylephrine initially, changed to noradrenaline to maintain adequate MAP (> 65 mmHg).
Epidural infusion titrated to comfort.
Over night, developed periods of hypotension associated with inferior ST segment changes.
Troponin rise of 167 at 0400.
Discussed with cardiology, who reviewed - commenced on enoxaparin treatment dose and aspirin.
Cr 80 -->261 on day 2 post operative.
At 1230 on 11/12/14 had VF cardiac arrest --> advanced cardiac life support.
Despite early effective CPR and defibrillation, the rhythm deteriorated to asystole and the resuscitation was discontinued after 20 minutes.
Case 11
70yr female admitted emergently from MAPU with ?anaphylaxis to flucloxacillin. Admitted with cellulitis and fast AF. Started on tazocin but switched to flucloxacillin today while receiving first dose became itchy, confused, diaphoretic and BP unrecordable. Given 0.5 mg adrenaline with no effect. Intermittent doses continued & IVF bolus. Developed narrow complex tachyarrhythmia 180-200/min and agitated. 2mg diazepam given iv and shock returned to sinus tachyarrhythmia 115.
Adrenaline infusion commenced. 200mg Hydrocortisone given.

Background:
Two recent admissions with sepsis and skin lesions - note of going home on flucloxacillin with one of these:
- Trigeminal neuralgia
- Atypical chest pain with normal angiogram 2010
- Bronchiectasis
- Chronic pain
- Asthma
- Osteoarthritis
- Anxiety
- OSA, intolerant of CPAP
- Mild cognitive impairment
- Bilateral cataract surgery and bilateral blocked tear ducts
- AF on Warfarin
- Increased BMI

Meds:
- Carbamazepine 200mg, 200mg BD (midi and nocte)
- Candesartan 32mg PO OD
- Codeine Phosphate PO 15mg Nocte
- Atorvastatin 20mg PO OD
- Felodipine ER 10mg PO OD
- Omeprazole, 20mg OD PO
- Doxycycline 100mg OD PO
- Symbicort 200/6, Ongoing
- Salbutamol PRN
- GTN PRN
- Marevan 2mg

A - own
B - sats 97% on 15l via non-rebreather
C - HR 115, BP 85.76 non-invasive, cool peripheries
D - agitated and distressed, orientated to PPT

PLAN:
- CVL and art line
- Tryptase now and at 6 hours
- Adrenalin infusion as required
- Immunology f/up

PROGRESS
Initially on arrival to ICU improving haemodynamics, pt settling.
CVL inserted, art line not successful at this stage.
Commenced on adrenaline infusion.
Increasingly agitated, peripheries shut down, BP unrecordable.
Increasing demand in adrenaline infusion, 50ml/h.
Pt intubated due to increasing distress, using propofol, fentanyl and sux.
Worsening acidosis on blood gas, started on CRRT with no improvement.
Developing multiorgan failure, not responding to therapy. Pt time of death - 11.30 am
Case 12
65 y/o male, admitted to ICU post pneumothorax, respiratory arrest.

PMHx
- Bilateral lower limb venous insufficiency
- Heart Failure
- Obesity hypoventilation syndrome
- Severe COPD with FEV1 23%, CO2 retainer
- Obstructive Sleep Apnoea
  - BiPAP at home 18/10cm
  - Home oxygen since 2003
- Gout
- HTN
- Paroxysmal atrial fibrillation

MedHx (as per ED):
- Spiriva 18mcg, 1 puff OD
- Seretide 125, 2 puffs BD
- Salbutamol 100mcg, 2 puffs PRN
- Digoxin 125mcg OD
- Aspirin EC 75mg OD
- Cilazapril 0.5mg OD
- Allopurinol 600mg OD
- Frusemide 160mg mane + 80mg midi
- Betnovate cream TOP BD

 HPC - went to part time work today - nil issues, got home, wife put the fire on while he was sitting in the lazy boy - felt sudden epigastric pain and SOB, ambulance called - stated to wife he felt like he was not going to make it. Ambulance called ED in advance GSC dropped to 3 Sats 75% normotensive.

LMA inserted prior to arrival to ED

On arrival to ED:
- Poorly patent LMA, SAT 75
- Hypertensive
- GCS 3.

Emergent intubation in ED.
Fast-scan: Aortic root dilatation seen - otherwise neg fast scan.
Initially ventilation very hard in ED, BMV.

CXR - Large R) sided pneumothorax
Chest drain inserted by ED physician, good bubble and swing. CXR post insertion of C/D - lung inflated.
ET tube initially too far in - pulled back 5cm.

CT head, chest, abdomen done - no acute findings except pneumothorax.

Patient admitted to ICU.
On arrival to ICU occasional desaturations, mucus suctioned through ET tube.
C/D still bubbling and soon after admission to ICU - started draining frank blood. Bled 700ml in first hour, bleeding around wound. C/D inserted quite anterior, through pectoralis muscle - possibly source of bleeding? Intercostal vein/artery bleed?

Cardiothoracics consulted - Pressure applied to drain insertion site. Pt given RBC and FFP. Coags - Thrombin time high, new information pt on Dabigatran.

Increasing demand of vasopressors - desaturations.

D/W cardiothoracics and ICU consultant and decision of withdrawing treatment made on the basis of:
- Pt physiologic function very limited (end stage COPD, oxygen dependent)
- Pt wish not to be resuscitated
- Pt prognosis of a good recovery very poor and decision to withdraw treatment discussed with family, who agrees with this decision.
Pt extubated at 1900hrs - no cardiac output/resp effort noted. Pt declared deceased.
Case 13
Acute Admission: Emergency Repair of Ruptured AAA with intra-op bleeding+++ 

PMHx:
HTN
Hypothyroidism - ?thyroidectomy for ?multinodular goitre

Meds:
Metoprolol
??Thyroxine

HPC:
1 day abdo pain
PR bleed last night
To GP ?gallstones
Today increased pain, further PR blood, collapse
Initial ambulance SBP 62
Fast Scan 6.7 cm AAA, no free fluid

Usually lives independently

Operative Notes:
* Family history of MH but mother tested negative
* Straight to OT on basis of FAST - no CT
* Grade 1 view with videoscope
* Findings - contained rupture of intra-renal AAA repaired with tube graft
* Bleeding at end - IMV and IVC injury - significant blood loss - IVC permanent ligated
* Fluids: 12u RBC, 7 FFP, 1 platelets, 8000 crystalloid, 3.3 litres cell salvage returned

On return to ICU:
* Ventilation OK
* Norad ~ 12
* Feet cool but perfused

CXR: NG in L main bronchus - removed

Surgeons have spoken to family: "May not go well"

Plan:
Usual supportive care
TED stockings to decrease oedema

PROGRESS
Worsening shock post admission, reaching norad of 40
Severe and worsening acidaemia
Developed anuric renal failure

Family informed this was an unsurvivable situation and treatment was withdrawn.

Patient died with family present at 21:05.
**Case 14**

Semi elective admission for bifrontal craniotomy and resection of olfactory groove meningioma.
Long procedure.
Initially presented after having a fall and being trapped beside her bed for 2 days.

Handed over Grade 1 with oxford pillow.
Long operation, minimal blood loss.
On phenylephrine 25ml/hr on arrival.

Worsening metabolic acidosis intra-op
with BE -4 @ 12:29 to -8.7 on arrival with increasing K+ 5.7 on arrival.

**PMHx:**
Type2DM on Insulin
HTN
Hypothyroidism
CRF
?IHD

**Rx:**
Actrapid
Protaphane
Dexamethasone 8mg bd
Candesartan
Ciltiazem
Atorvastatin
Thyroxine
Omeprazole
Aspirin.

**OE:**
A: ETT
B: FiO2 50% PEEP 10
C: SR with 25ml/hr phenylephrine
D: Pupils equal.

**Imp:**
1) Post op Bilateral craniotomy.
2) AKI on CRF
4) HyperK+.

**Plan:**
1) ECG
2) CXR
3) Switch to Norad
4) CaCl
5) Lactate + Cl
6) Continue Dex + Abx + Phenytoin as per neurosurgical team.
PROGRESS
Deteriorated in Intensive care unit, worsening shock, metabolic acidosis and tachycardia with new LBBB.
Runs of VT, spontaneously reverting
Continued to deteriorate despite escalating supportive therapy, decision made to withdraw care. Extubated - Immediate loss of arterial line trace. Death confirmed
Case 15
58 yr old man referred from renal ward with sepsis secondary to bilateral cavitating pneumonia on background of immunosuppression due to renal transplant.

Background
End stage renal failure secondary to diabetic nephropathy. Previously on CAPD. Deceased donor renal transplant 2012. Developed severe antibody + cell mediated acute rejection of transplant kidney in setting of non-compliance, 2014 (had stopped taking all his meds? Due to depression) Triple therapy immunosuppression restarted, rituximab, IVIG and plasmapheresis. Had major haemorrhagic complications following transplant kidney biopsy, requiring laparotomy. Eventually discharged. Was left with impaired renal function of transplant kidney with baseline creat around 300.

Admitted again with pneumonia and HONK. CXR and CT chest showed cavitating lung lesion. Commenced meropenem and cotrimoxazole. Multiple sputum specimens sent for AFBs were negative. Bronchoscopy with no positive micro thus far. Was discharged with 6/52 course of cotrimoxazole.

HPC
Readmitted again with HONK / DKA (had not been taking insulin). Was treated for possible hospital acquired sepsis / pneumonia with IV tazocin. Cotrimoxazole continued (patient had been non compliant with this at home).

Metabolic disturbance due to HONK corrected with IVF and insulin. Over the next few days developed increasing tachypnoea and WOB. Antibiotics were switched to meropenem yesterday. Blood urine and sputum cultures remain negative. Developing AKI with creatinine up to 425 (from 300).

Renal team requested review today due to increasing tachypnoea and exhaustion.

PMHx
Type 2 diabetes on insulin
Hypertension
Obstructive sleep apnoea, on CPAP
Reactive depression

On examination (on ward prior to admission)
Alert and responding appropriately
Warm to touch, vasodilated, febrile
HR 115/min regular. BP160/70 unsupported
RR 32/min SpO2 94% on 3L NP O2. Says breathing is getting worse
Bilateral crepitations, minimal upper airways wheeze
UOP approx 2ml/hr for last 4 hours

Investigations today
VBG shows metabolic acidosis (normal anion gap) pH 7.31 CO2 32 HCO3 16
Hb 68 on gas (was 74, known anaemia on Epo)

Impression
======
Sepsis due to severe cavitating pneumonia. No microbiological diagnosis but significant immunosuppression

AKI on background of poorly functioning renal transplant with baseline creat 300

Plan
====
Admit to ICU
HFN with NIV as required (patient normally uses CPAP at night)
IVF to maintain UOP
Await outcome of discussion with ID re addition of antifungal to regime
Update family (renal consultant is going to contact family)

Further investigation of bilateral cavitating pneumonia with CT guided lung biopsy. Needed to be intubated prior to CT guided biopsies as SOB and WOB prevented him from laying flat for the procedure. He also developed a degree of shock whilst intubated and renal failure worsened. A central venous line and a vascath was placed for pressors and hemodialysis commenced.

Lung biopsies came back with multilobar pulmonary mucormycosis (fungus). Started on amphotericin.
Failed extubation on - needed re-intubation due to WOB.

Despite treatment with amphotericin, no clinical or radiological improvement.

Multiple multidisciplinary meetings between ICU/ Rena / ID - consensus was further treatment is medically futile.

Multiple meetings between ICU and family : they understood above and understood the rationale for a palliative approach.
Extubated at 1630, died 1650.
Case 16

73 year old female

Admitted from Theatre following on table death to enable family to visit

PMH:
Severe AR
Massively dilated Aortic root
Congestive heart failure
Hypothyroid
Hypertension
Paroxysmal Atrial Fibrillation

Anaesthesia:
Uneventful induction
Right arterial line, CVL and Multi-access catheter placed
Grade 2B intubation
Echo pre-bypass - dilated LV, normal LV function, severe AR
Echo post-bypass - good valve function, profoundly dyskinetic LV incompatible with survival

Surgery:
Femoral access for CPB
Difficult access to mediastinum due to adhesions from previous TOF repair
Very friable aortic root and coronary buttons
Significant blood loss
Poor LV contractility off cardioplegia despite pharmacological intervention and CABG to LAD
Unable to wean patient off of bypass
Death confirmed at 2012
Case 17
58 yr female admitted post-EVD insertion for drop in GCS from SAH

PRE-OP
PC:
Collapse w GCS 3 on tarmac post flight from Rotorua. BP 218/132. Regained consciousness to GCS 14 (M6, V5, E3) with ambulance. C/o severe headache and vomiting.

CT shows acute subarachnoid haemorrhage, likely secondary to a right vertebral artery aneurysm. In ED GCS drop from 13/14->7. Taken to OT for urgent EVD insertion. Re-CT post-op shows increase in bleed.

Background:
?HPT
Chronic back pain
Lupus

Meds:
Fluoxetine

OT
Just prior to EVD insertion - brady to 30 and SBP 350.
EVD inserted promptly - high pressures up to 50cm. BP and brady settled.
Had been labile in OT.

POST-OP
Re-CT after EVD insertion shows increase in amount of blood w blood around brain stem (verbal from neuro). Probably re-bleed when dropped GCS in ED. Prognosis extremely guarded.
Currently not amenable to coiling due to anatomical variant.
Neuro & ICU family meeting - critically unwell

A - intubated
B - sats 95%, FiO2 50%, PEEP 5
C - MAP 101 on mod level phenyl, HR 78
D - sedated, pupils pinpoint (on remi from OT)

PLAN:
Aim MAP 100
Head up to 30 degrees
Nimodipine 4 hrly if BP allows
Clexane (low dose) mane as per neuro
EVD at 15 cm
Keep sedated

EVD inserted
Angio showed right vertebral artery dissection involving PICA origin with no contralateral flow from the left vertebral artery
GCS 3 throughout ICU stay
No spontaneous respiration
Fixed dilated pupils
No cough or gag reflex
Decision made to withdraw treatment
Family in agreement
Patient extubated at 2235 with extended family present
Death certificate issued
Case 18
62 yo male admitted after MET call with multi organ failure

Background
======
1. Stem cell transplant for multiple myeloma, readmitted with neutropenic fevers
2. E. coli sepsis in blood culture - on Cefuroxime
   - Stent 2006.
   - Further angina.
   - New eluting stent placed (on clopidogrel and aspirin) no further angina since.
5. Haematemesis

MET call
======
developed abdominal pain, Heart rate 220, BP 70/40, cold and clammy.

ICU
===
Started on NA, increasing requirements, Electrolytes replaced (K and Mg), Amiodarone Bolus
and infusion started. Erect chest xray not showing any free air. Deteriorating and increasing
NA requirements.
Intubated (RSI, 100 Fentanyl, 80 mg Propofol, 10 mg Suxamethonium), vomiting on
induction, grade 1 view, size 8 ETT, 2000 ml brown fluid aspirated.
Increasing NA requirements (up to 40), Vasopressin started at 4 u/hour, HR 150 Sinus
tachycardia.

Bloods
====
Hb 90, WBC 0.18, Neutrophils 0.14 (increasing), Na 136, K 3.0, Crea 190,

Plan+Progress
====
CT Abdo/Pelvis with contrast
d/w Haematologist, Gen.Surgeon and ICU consultant afterwards regarding further
management

CT scan showed Diffuse pneumatosis intestinalis involving several loops of small bowel with
significant air in portal system. Patient had central line and vas cath placed.

Significant acidaemia 7.17 with BE -12.8 and bicarb of 14.6.

Commenced on dialysis in order to manage worsening acidaemia and increasing renal
failure..

On review at 2am after 2 hours of dialysis patient had a worsening acidaemia, increasing
noradrenaline requirement up to the maximum of 40ml/hr and increasing renal impairment.
A further family meeting was called and discussion that even with maximum therapy patient
was still deteriorating. Decision was made that 2 further hours of treatment and if no
significant improvement patient active treatment was to be withdrawn.
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At 4am, patient had developed liver failure with increasing INR and Transaminases. Ongoing norad requirement and acidaemia. Decision for withdrawal, patient's vasopressors were stopped. Deceased.
Case 19
68 year old male

Admitted following a MET call for reduced level of consciousness

PMH:
Hypercholesterolaemia
Ex-smoker

This admission:
Elective revision of right total hip joint replacement
Uneventful anaesthetic - spinal with propofol TCI
No issues in PACU
Seen overnight for fluctuating level of consciousness - thought to be due to intrathecal morphine - GCS 14 when seen
GCS 15 when seen in the morning
Last documented visit at 1050
Found unconscious at 1530
No radial pulse palpable so arrest call put out and CPR commenced
On my arrival -
- Airway patent, slight snoring, assisted with ambubag
- Breathing spontaneously, sats 100%
- Normotensive, sinus rhythm at 70bpm
- GCS E1M5V1 (localising with right arm only)
Interventions
- NP airway
- Midazolam at 5mg as extensive posturing and gaze locked up and outwards
- CT head
- Transferred to ICU
- Intubated for airway protection
- NG for aspirin

Imaging:
CT head showed thrombus in the right middle cerebral artery
CXR confirms NG and ETT placement

Plan:
NG aspirin 300mg
Withold Rivaroxaban
SCDs
Prophylactic clexane
Assess neurology
Consider NG feed tomorrow
Omeprazole
Consider echo for possible PFO and paradoxical embolus

Progress
No evidence of AF or PFO.
Minimal neurological recovery.
Reviewed by neurology: R) TACI - stuporous due to bilateral forebrain deep brain compression.
Family meeting held - explained that he has had a massive stroke and likely to have a poor outcome. Patient extubated and died later.
Case 20

Admission post cardiac arrest on Haematology ward

BG
- Day 14 post allogenic stem cell transplant for AML (CML conversion)
- Previous failed SCT
- Neutropenic sepsis with
  C Diff on SC
Enterococcus faecalis on BC
Enterococcus faecium on UC
Resistant Candida Nivirensis
- Severe haemorrhagic mucositis - on TPN

- 3/7 history of confusion considered to be multifactorial hypernatraemia (152)/opiate based.
- Currently on Meropenum and vanc for above infections - afebrile
- Thought to be fluid overloaded associated SOB
- NO evidence of engraftment yet
- Supratherapeutic cyclosporin

Arrest Event 00.15

-----------
- Witnessed to stop breathing and moving by Husband
- CPR commenced by nursing staff within 1 minute
- PEA arrest
- 4 cycles with 2 adrenaline given and 1 amiodarone.
- SVT with output after 9-10minutes
- Adenosine given

Further Intervention
----------
Intubated at scene, note large volume of blood in oropharynx. Fentanyl, midazolam and rocuronium used.
Platelets x2, Potassium supplementation, metaraminol x 10mg (in divided boluses)

Transported to CT
- CT head - initial verbal report nil acute bleed noted

Family meeting
- High Risk of death
- Uncertain neurological outcome if wakes
- Uncertain causative mechanism for arrest
- Patient fiercely independent and would not want to be left impaired.

Medications
Omeprazole 40mg IV
Fatty cream T
Intragram P 30g IV Weekly
Aciclovir 250mg IV OD
Amphoteran B 80mg IV
Meropenum 1g IV BD
Clotrimazole cream Top BD
Amoxicillin 1g IV
Filgastrim 300mcg SC OD
Cyclosporin 120mg IV BD

OE
==
Temp 34
A - Intubated
B - ventilated FiO2 0.5, MV 100%, Peep 5, Sats 98%, Decreased AE with crackles throughout.
C - HR 100, BP 95/40, MM Dry, CRT<2, HS Dual, with Systolic murmur, Sinus rhythm.
D - PEARL 4mm

Plan
1. Transfer to ICU
2. Wake to assess
3. Aim normothermia
4. Norad as required

Family meeting held by Haematology and ICU.
- decision to withdrawn treatment due to poor response to treatment
and bone marrow showed failure of engraftment.
- multi organ failure due to probable sepsis.

Patient extubated and subsequently passed away
Case 21
Admitted to ICU following high speed MVA

PMHx
Unknown
German citizen, likely tourist in New Zealand.

High speed MVA 100km/h car vs tree. Found up side down hanging in car, initial GCS 5. E1V2M2. Extricated and intubated at scene. Brought to Whanganui ED. Hypotensive on arrival, BP 80/60, tachycardic Ventilated - FiO2 0.8 Given 1000ml crystalloids, 1 RBC. Pupils fixed, miotic.

Injuries as known so far (verbal report from Whanganui)
- TBI (SAH with ventricular blood, R temporal subdural, no midline shift, petechial intraparenchymal hemorrhage)
- Multiple skull and midface fractures
  - R petrous temporal bone fracture with ossicular disruption
  - Undisplaced anterior and lateral left maxilla fractures, extending superiorly to the inferior orbital margin medial to the foramen
- C2 undisplaced fracture
- 1-2 rib#
- R) scapula #
- R) clavicle #
- L) humerus # (not been Xrayed in Whanganui)
- Bilat lung contusions – no pneumothorax
- R hand extensor tendon injury middle ginger and glass foreign body over 5th Metcarpalphalangeal joint.
Cuts to left hand

- No abdominal pathology

Bloods: Acidotic pH 7.06, BE -10, creat 160, no drop in Hb noted. Coags normal (verbal) D/W neurosurg, transfer to Wellington

On arrival in Whanganui ICU
A + B – intub, PEEP 8, FiO2 0.8
C – Norad 20ml/hr, MAP 60-65, syst 75-85mmHg, tachycardic 140
D – pupils miotic, fixed
Temp 35.8
Metabolic acidosis – pH 7.2, BE-9

Received further 2000ml ivf during transfer – BP improving, MAP 80-85, pulse 95-100. Midazolam and fentanyl infusion as sedation

Plan
1. ICP bolt- aim CPP >60
2. CXR
3. Repeat bloods
4. Ortho involvement - would like Cefzol IV, started
5. Max.facs involvement at later stage
6. Official radiologist report
7. For log rolls for C spine. Leave off c-spine collar whilst in ICU
8. Discussed with neurosurg re: CSF leak - Cefzol satisfactory for cover, no need to broaden antibiotics.

ICP bolt placed on arrival at Wellington ICU. Difficult management of ICP, Went to theatre early AM for placement of EVD. This was removed the next day since not draining. Repeat CT scan in the evening showed "Increasing pericontusional oedema. Involvement of the corpus callosum in keeping with diffuse axonal injury. Pneumocephalus?secondary to the ICP removal or the base of skull fractures"

Orthopaedic team reviewed patient. L Humerus was placed in cast. Wounds in both hands washed out in ICU and repair of middle finger extensor tendon right hand. Also piece of glass over 5th Metacarpal-phalangeal joint removed.

Fingertip of R index finger was becoming dusky. Hand actively warmed and arterial line changed from R radial to R femoral.
Reviewed by orthopaedic team who feel that there is no indication for amputation at this stage.

ICPs persistently elevated despite maximal therapy (Morphine, Midazolam, Propofol and Atracurium Infusions, active cooling).
On 28/10 taken back to theatre for re-insertion of the EVD under stealth guidance. Difficult insertion. Continued to have difficult ICP management. Better control of ICP eventually.

Sedation off since. GCS remains 3. No cough/gag. Breathing spont regular.

Family meeting, decision made to withdraw treatment. Consented for DCD.
Extubated at 00:50
Asystole at 00:55
Case 22
Respiratory Arrest - COPD Exac

HPC: Initially Very limited hx available - Unknown Female
Unwell for 2/7 - refused to seek medical assessment.
- Nil report of cough/sputum.
Rotary retrieval Featherston community resp + cardiac arrest
Paramedics arrived ~ 1930h severe resp distress / tripod position /
- Given nebulised salbutamol/ipratropium
Resp arrest GCS 15 -> GCS 3
Narrow complex / PEA
- CPR adrenaline
- ROSC after 20min
- RSI: SUX only. Trismus. GRADE 2 view + bougie.
Adrenaline infusion @ 15mcg/min + boluses to maintain BP.
Rocuronium/Ketamine 60mg total
- Given further Rocuronium prior to arrival to Wellington ED (approx 22:30)

In ED
- L radial art line inserted
- R I J CVL
- NGT inserted.
- ETT pulled back to 21cm @ teeth
- Dexamethasone 8mg
- Adrenaline to maintain MAP + bronchodilator
- Blood cultures sent

PMHx: (concerto)
COPD/Emphysema - prev Spirometry
ECG: SR, P-pulmonale
? Resting angina
Endoscopy 2011 - Grossly N
CT-Abdo 2011 - Grossly N

DHx: NKDA (concerto)
Aspirin 100mg
Atorvastatin 20mg
Felodipine 10 mg
Accuretic 20/12.5
Spiriva
Seretide
? amitriptyline

SHx: Marked exertional dyspnoea - short walks/hanging washing. Smoker aged 10yr 25/day.

CXR: Hyperinflated - nil pneumothorax, nil consolidation. Line and tubes satisfactory.
ECG: SR, TWI V1-5, nil ST elevation.
Urea 9.3 Cr 91
Na 127, K 4.2
WCC 21, Neut 20
Trop 36
Ethanol - negative

O/E:
A - ETT 21cm@ teeth
B - ASV 70% MinVent. Good a/e bilat with expiratory wheeze.
C - Adrenaline infusion, MAP 80
D - PERL 3mm bilat.
Nil haemotympanum/battles/periorbital ecchymosis
Nil evidence of trauma
Abdo Soft - not distended.

Imp: Likely Respiratory arrest secondary to COPD exac

Plan:
Warm + Wean sedation and assess
Repeat blds
Not for Abx unless febrile.
MSU
Chase cultures

Desedated with E2, M1 48 hours off sedation. Some spontaneous extension movements.

Impression of profound brain injury. In discussion with family it was agreed a meaningful recovery was impossible.

Once extended family arrived, extubated and died peacefully soon after.
Case 23
86 yo female from ICU post community cardiac arrest

Cardiac Arrest
==========
Witnessed collapse in presence of family this AM, ? Seizure, then pulseless, CPR started immediately by family, 1 shock by ambulance, ROSC 15 min. Intubated by ambulance with 1 mg midazolam and 1 mg morphine.

ED
===
ECG showed SR with borderline LBBB, ST elevation < 1mm V1-V3. d/w Cardiology, not for cath lab/cardiology intervention
Low dose Propofol in ED for sedation, BP stable with small increments Metaraminol, some coughing in insertion NG tube.
2 g Ceftriaxone given.

CT head
========
multiple small emboli (official report pending)

Background
==========
1. CHF - diagnosed on admission under cardiology in 2014
   - ECHO Oct 2014 EF<30%
   - advanced diastolic dysfunction
   - moderate to severe MR, mild AR
2. Recent admission for chest infection
3. Osteoarthritis
4. Sigmoid diverticulae Colonoscopy 2007

Meds:
=====
Frusemide 40 mg OD

Social
=====
lives independently, still works up to 5 x a week.

Plan
=====
ICU
Stop sedation
Family meeting with consultant
chase bloods
await formal CT report

Progress
=====
Family meeting to discuss significant co-morbidity (EF<30%) and ROSC at 15 minutes. Explained to family about appropriate treatment, and significance of health condition. Patient extubated and subsequently passed away.
Case 24
38yo male admitted with acute liver failure - likely secondary to alcohol and paracetamol.

BACKGROUND:
1. Binge EtOH drinker (intermittent)

HISTORY:
Recent travel to Japan 2/52 ago. Stayed there for 10 days. Was admitted to a ?detox unit in Japan (discharge is in Japanese, ?episode of psychosis)
Binge alcohol in the last week ?amount. Took some paracetamol today ?amount.
Presented to GP due to increasing incoherence. Deteriorated en-route to hospital. In ED he was very agitated and required sedation. No history possible from patient.
Given haloperidol 5mg and midazolam 5mg in ED->sedated

MEDs
nil regular

Soc Hx:
works in HR
binge EtOH
has a wife

EXAM:
Hb 122/65, RR 18, HR 105, T 36.3
E2V1M4 - 7/15, maintaining own airway.
No stigmata of chronic liver disease
HS: dual
Chest: clear
Abdo: difficult to examine

Ix: (bloods from prior admission were normal)
bili 295
ALT 4705
AST 3393
GGT385
ALP 173
alb 26

Hb 129, plt 98
Ammonia 155
INR 4.3

Cr 192 (79)
Na 113 (139)

CT head nad

Paracetamol level 155

IMP:
1. Acute hepatitis with metabolic derangements
   - discussed with gastroenterologist
   - alcoholic and paracetamol
   - other (viral, ischaemic)
   - not a transplant candidate due to alcohol history
   - hyponatraemic, low pltS, high INR

2. AKI ?volume depletion ?hepatorenal

**PROGRESS**

*Hepatic / GI*

Ethanol level at admission was 0. Paracetamol level 151. Wife aware of approx total 30g of paracetamol that may have been consumed over the last 10-12 days - does not think any overdose or intentional harm, but was taking it for headache. Viral serologies all negative. Overall impression was acute alcoholic hepatitis and paracetamol ingestion as cause for hepatic failure

Commenced on NAC infusion and this was continued throughout ICU stay.

Intubated shortly after admission to ICU due to hepatic encephalopathy (Grade 3).

NGT was inserted and lactulose and enemas commenced

Given omeperazole, thiamine, multivitamins, Vit K

Albumin 3 units 20% per day

LFTs began to improve somewhat on Day 1 however bilirubin continued to rise.

Hyponatremia (initially 113) gradually improved to 128 at appropriate rate with NaCl maintenance IVF at 100ml/hr.

**CVS**

Reasonably stable for CVS point of view. BP maintained with occasional bolus of IVF. Phenylephrine needed for short period of haemodynamic instability.

**Respiratory**

On Day 2 of ICU admission developed hypoxia with LLL collapse on CXR requiring increased FiO2, PEEP and paralysis. Bronchoscopy was done with minimal improvement. Gram stain from BAL suggestive of aspiration pneumonia. Not on antibiotics.

**Renal**

Has continued to make urine. Creatinine remains around 190 (similar to admission)

**Micro**


Noted to have olecranon bursitis on examination. Aspirate grew staph aureus (and blood culture also positive) for which he was commenced on flucloxacillin 1g qid.

Further events
============
Developed marked haemodynamic instability and fixed dilated pupils at 10am with findings consistent with brain death. Had a CTA which showed no intracranial blood flow (not suitable for clinical brain death testing due to metabolic derangements). After family discussions, went forward for organ donation.
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**Case 25**

Out of Hosp Cardiac Arrest

**HPC:**
- c/o chest pain and then witnessed collapse (wife present)
- 10min down time
- 10-20min CPR by ambulance
- Adrenaline, no shock
- ROSC after
- Intubated at scene

*Seen by Cardiology in ED*  
- not for Angio  
- for medical management

**PMHx**

L CVA 2013  
Type 2 diabetes mellitus  
- 25/3/13 with TIA, affecting right side- normal neurology  
- 13/3/13 hypoglycaemic collapse  
- 9/2/13 multiple embolic strokes  
- L BKA August 2012 secondary to non-healing ulcer.  
- Type II DM - insulin dependent complicated by retinopathy/neuropathy/nephropathy and foot ulcers  
- IHD, prev CABG x4 2005, admission with Angina 2012.  
- ECG: widespread t-wave inversion  
- Multiple previous strokes as seen on CT  
- Hypertension  
- Low mood  
- Anaemia  
- Previous deranged LFTs, normal USS abdomen 2011

**DHx:** NKDA (meds from 2013)  
Novorapid - sliding scale.  
Lantus insulin 20 units s/c daily at dinner,  
Metoprolol CR 47.5mg PO daily,)  
Omeprazole 20mg PO daily,  
Amlodipine 5mg PO daily  
ISMN MR 60mg PO daily,  
Atorvastatin 40mg PO daily,  
Aspirin 100mg PO daily,  
Gabapentin 600mg PO TID,

**O/E:**  
A - ETT  
B - Chest clear anteriorly, Sats 100%  
C - H5 dual, warm peripheries, unsupported. HR 100, BP 150 syst,  
Pupils 2mm equal and sluggishly reactive  
Sedated with propofol

Lines: 18G R-ACF, IO R tibia.
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ECG: ST depression inferolateral. ST elevation AVR.
CXR: Pulmonary oedema widespread interstitial changes. ETT above carina, NGT below diaphragm.
VBG: pH 7.06, Lactate 7.6, BE -16,
Cr 300, K 5.1, Na 135

Imp: OHCA

Plan:
TTM
Aspirin
Clopidogel
Clexane
NOT FOR CPR IF CARDIAC ARREST

Case 26

54 y.o

Day 35 post haploidentical BMT

MET call, reduced GCS - E4, V1, M1

Background
- myelofibrosis
- neutropenic sepsis (enterococcus) & typhlitis on CT abdo
- discharged, readmitted 24h later due to fever

Since admission, on going fever. No source identified.
Only micro = Stap. Epidermis from Hickmann line & removed yesterday
Has been on Vancomycin, Meropenam & Fluconazole.
Loose BM

On my arrival to ward, GCS 9-10 ; E4, V1, M5 on left, M4 on right
Pupils equal & reactive
Intermittent apnoeic episode without desaturation
Urgent CT head = hydrocephalus

Admitted ICU, discussed with neurosurg, for EVD
Intubated in ICU - propofol, fentanyl, roc, Grade I view

Medication
tacrolimus
intragram P
omeprazole
acyclovir (prophylaxis dose)
fluconazole
mycophenylate
vitamin K
meropenam
vacomycin

Plans:
- OT for EVD
- CSF for micro
- CXR
- faeces for C.diff

Progress
After EVD placement, failed to improve neurologically.
Repeat CT Head was suggestive of a cerebellar infarct with ongoing mass effect and hydrocephalus.

Failed to improve neurologically and MRI showed multiple acute cerebellar and subcortical infarcts. The distribution suggested an embolic aetiology (systolic murmur had been found and was awaiting echo). There was ongoing significant mass effect from the left cerebellar infarct with obstructive hydrocephalus and evidence of haemorrhagic transformation within this infarct.
The neurosurgical and intensive care teams met with family and discussed her likely very poor prognosis. It was felt that she would not want to survive in a grossly impaired state so palliative care was provided.

Patient died shortly after extubation with her family present.
Case 27
52 yo male admitted post EVD Placement for cerebellar bleed

History of present admission

Playing touch rugby and collapsed with severe temporal head pain. Initially also left sided facial droop. Ambulance took him to Hutt ED. Fluctuating GCS 11-15/15. CT scan left cerebellar bleed 2.2 x 4.2 cm. CTA suggests aneurysm left superior cerebellar artery vs. AVM
Transferred to Wellington hospital same evening. Initial GCS of 15 dropped to 7 overnight. MET call and patient taken to OT for EVD.

Background

Jehovah’s witness
usually fit and well
fatty liver
Osteoarthritis knee

Meds

Tramadol

Arrival ICU

Ventilated, Hypertensive BP 200/80, Propofol for sedation running

Plan

Morphine, Propofol and Labetolol Infusion to keep SBP < 140
Bloods, NG tube and chest xray
Will go for Angio and Coling at 8:30

Progress:

Went for cerebral angiogram and AVF embolization shortly after arrival in ICU. Sedation stopped afterwards, but patient failed to wake up and developed unresponsive pupils.

CT scan showed increased swelling of the posterior fossa and he went for cerebellar craniotomy and evacuation of haematoma the same evening.

Sedation was then weaned and patient failed to wake, remaining GCS 3 with no response to central painful stimulus (some abnormal flexion to peripheral stimuli). Abnormal pupils - 3mm size, non reactive. A further repeat CT head on 13/10 which showed some residual haematoma and local hemispheric pressure effects causing effacement of the 4th ventricle.

He developed fevers and increased WCC in CSF suggestive of ventriculitis and antibiotics were commenced.
He deteriorated suddenly in the afternoon with marked haemodynamic instability and apnoea suggestive of brainstem dysfunction. He was extubated at 8pm and died with extended family present at the bedside.
Case 28
Admission post Community cardiac arrest

Event
- Family report that he stopped taking medications 1 week ago
- Witnessed cardiac arrest with family performing CPR immediately
- Ambo note PEA and then VT - single shock with ROSC
- Further VT/VF arrest with 5 shocks to return to ROSC
- Total 15 minutes until first shock.
- Intubated at scene

- Hypoxia of 88-90% slow to resolve post intubation.
- So vasopressors required

Taken to Cath lab
- Nil acute thrombus
- LAD mild no obstructive disease
- LCx patent
- RCA diseased but not obstructed

Returned to ICU for post arrest cares

BG
Inferior STEMI thrombolysed (PN)
VF arrest requiring DCCV x 6
PCI to RCA
Hypercholesterolaemia
Previous retinal detachment
Ongoing Smoker
L ankle arthrodesis

Medications – NKDA (from old discharge summary)
Aspirin
Atorvastatin
Metoprolol
Cilazapril
Slow K
Frusemide
Paracetamol
GTN

OE:
Temp 33
A - intubated Grade 3 airway from Ambo note,
B - Good equal air entry bilaterally, Sats 98%, PEEP 8, MV 120
C - HS Dual HR 50, BP 140/78 unsupported, Peripheries cool, central CRT approx 4.
D - BSL 10.8 Pupils not equal note previous cataract surgery

Bloods
PH now 7.32, K 3.4, Ca 1.07, BE -5.6
(was 7.15, BE -4.8, Lactate 4.6, K 2.8)
Plan
1. Keep sedated overnight
2. Amiodarone
3. Furosemide
4. CXR
5. Team to wake mane

Progress:
CVS:
Hypertensive, never required inotropes. Sinus rhythm throughout admission. Commenced on ACEI.

RESP:
Developed a VAP and required increased respiratory support. Treated with tazocin then rationalised to flucloxacillin after sputum grew S. aureus. Respiratory pattern irregular at times.
Trache inserted.

NEURO:
Therapeutic temperature management for 24 hours then sedation hold delayed due to poor respiratory state and agitation during sedation holds. Once sedation discontinued patient was eye opening but not tracking, best motor response abnormal flexion to pain and head thrashing to painful stimulus. Subsequently he developed severe myoclonic jerks of arms and legs. These were terminated with midazolam.

Multiple family meetings were held. After patient developed myoclonic jerks it was explained to his family that he had severe brain damage from which he would not recover and it was agreed that active treatment should be withdrawn.
Decannulated.
Passed away same day.
Case 29
27yo female bicycle vs. concrete wall at 50km/hr

BACKGROUND:
nil known

HISTORY:
Cycling down hill and crashed into concrete wall estimated 50km/hr.
Initial GCS 5/15->3/15 at the scene.
Brought into ED and intubated due to low GCS and bleeding around mouth.

MEDs:
Allergy: penicillin ?what
nil regular known

Soc Hx:
Parents live in Auckland and have been informed

EXAM:
A- intubated
B- Sats 100% FiO2 0.6
C- HR 92

HS: dual and nil
Chest: symmetrical BS
Abdo: SNT

CT head and spine:
There are bilateral intra-axial haemorrhages in the temporal lobes just deep to the
parahippocampal gyrus. The one on the right measures 16 x 11 x 11 mm, and left 4 x 4 x 4
mm.

There is a comminuted mandible body fracture on right and minimally displaced left
mandibular condyle fracture.
Fractured right lower 3rd molar, left lower 1st molar teeth.
Undisplaced fracture/diastasis of left greater cornu of hyoid bone.

C-spine:
No acute fracture identified of cervical spine.

There is an undisplaced transverse process fracture of T3 on left.

A comminuted fracture of left 2nd rib is seen with a fragment of bone protruding into the
left lung apex and an apical pneumothorax on the left.

Impression:
1. Bilateral intra-axial haemorrhages with intra-ventricular extension.
2. Left pneumothorax.
3. Fractures of mandible body, left mandibular condyle, teeth, hyoid, transverse process of
 T3 and left 2nd rib as described above.
CT chest/abdo: liver laceration ?grade 3

IMP:
1. Head injury: bilateral temporal haemorrhages
   - GCS 5->3 at the scene
   - for ICP bolt
2. bilateral mandibular fractures - open wound in mouth
3. Fractured teeth
4. R) clavicle #
5) Comminuted L) rib fractures with L) pneumothorax
   - chest drain inserted by ED
6) #transverse process T3
7) Liver laceration

PLAN:
1. admit ICU
2. art line
3. femoral line
4. await subspecialty input
   - for ICP bolt
   - dental input
   - gen surg input
   - cardiothoracic input

PROGRESS IN ICU
==============
Respiratory:
Intubated in ED. ETT remained in-situ then a percutaneous tracheostomy was placed uneventfully.
No pneumonias. Did develop a left sided pneumothorax secondary to lung injury from the fractured 2nd rib. Required several chest drains. Spontaneously ventilating without support (DTI) after tracheostomy was placed.

Cardiovascular:
Overall stable. Did require Noradrenaline in the first week to maintain an adequate CPP. Noradrenaline stopped when sedation was withdrawn.

Neurology:
Severe traumatic brain injury. Required heavy sedation, osmotic agents, cooling and paralysis to reduce ICPs. ICP bolt inserted and removed 7d later.

Best GCS recorded was E4V1M2, eyes not tracking, no significant neurological improvement over time.

GI/GU:

OUTCOME
========
Once sedation was stopped patient made only minimal responses to pain with signs of brainstem dysfunction. This did not improve over a period of observation (9 days). Due to her severe brain injuries a recovery to an acceptable or desirable level was considered to be very unlikely. In discussion with the family who expressed the opinion that she wouldn’t want to continue, the decision to withdraw active treatment was made.

Decannulated. Passed away next day with family present at the bedside.
Case 30
77 y/o inpatient redo sternotomy, pericardectomy and CABG x 1 LIMA->LAD

BACKGROUND:
1. Constrictive pericarditis
   - haemorrhagic pericardial effusion with tamponade, drainage via diaphragmatic window
   - readmitted with worsening RHF - discussed with wellington
2. Emergency repair of type A aortic dissection
   - seizure activity post-op
   - post-op CVA with small areas of decreased attenuation
3. Prostate cancer 2002
4. diverticular disease
5. R) hemicolectomy for Dukes B adenocarcinoma 1998
6. pulmonary TB with spinal involvement age 17 treated with streptomycin
7. HTN
8. Prev TIA
9. sciatica
10. deformity of L0 foot secondary to tendon injury

HISTORY:
Admitted to Hawkes Bay hospital with SOB and oedema. Transferred to Wellington for assessment of constrictive pericarditis and whether surgical intervention was appropriate. Inpatient and has been on frusemide infusion. Previous target weight 103kg.
Pre-op was only able to speak a few words at a time.
Pre-op: FEV1 1.28L (47% predicted)
Echo: abnormal diastole with thickened pericardium with constriction

Intra-op - oozy throughout to raw myocardium and pericardial surfaces.
Post-op received 6 x FFP, 2 x plt, 6x cryo in theatre.
Normal TEG post-op
Received approx 1.2L cell saver blood. 6L of fluid taken off by bypass machine. Loaded with Amiodarone intra-op.
Post-op TOE: Hyperdynamic function of both ventricles post CPB, both ventricles small and difficult to fill, constrictive physiology persistent with systemic stroke volume approx 30mL.

MEDs on admission:
aspirin 100mg
pantoprazole 40mg
span K 2 tabs od
frusemide 250mg infusion
augmentin 625mg
spironolactone 25mg

Soc Hx:
Patient reported being able to walk 20m?actually able to do this lives with wife currently

EXAM:
A- intubated
B - Sats 97% FiO2 0.35
C- MAP 60 while on vasopressin 4, adrenalin 6, noradrenalin 24, HR 100
ICU:
Drain output ~ 500mL in first hour after arrival in ICU.
Transfused 3 units RBC, FFP, cryoprecipitate, plt and given protamine after arrival in ICU.
Drain output has subsequently slowed.

Ix:
post-op CXR - lines in appropriate position. Nil PTX.

IMP:
1. Pericardial stripping with CABG x 1
   - still has a very constricted pericardium post-op
   - high drain outputs post-op
   - high vasopressor requirement

PLAN:
1. correct coagulopathies
2. monitor drain output

PROGRESS
At ICU:
Bleeding settled after correction of coagulopathy.
Despite being on maximal support (NA 30, VP 4, Ad 8) and cautious fluid boluses --> continued deterioration to MAP 40s, worsened metabolic acidosis, oliguric.

Repeat TOE: no tamponade. Persistent constrictive physiology despite pericardiotomy most likely due to scarred myocardium. Poor filling with very low SV. Good LV systolic function.

Several discussions with family - family conveyed that patient would not want to continue living with his pre-op level of cardiac disability. Continued deterioration MAP down to mid 40s --> futile treatment. Conjoint decision to stop CVS support and extubate. Time of death 0334hrs.
Case 31
Transfer from Hutt ED for cardiothoracic intervention for ascending AAA dissection

BG
Mechanic AVR and MVR 2004
Known Dilated Aorta pending elective repair
CHF with EF 37%
N coronaries on Angio 2014
HTN

History of events
- Approx 4.30pm sudden onset of severe central chest pain radiating through to the back.
- Associated SOB and diaphoresis
- Taken to CT scanner - Type A dissection
- Post CT period of profound bradycardia and loss of output (brief CPR with return of output.
- Responded to fluid bolus

- Developing SOB and increasing O2 requirement
- Total 3.5 litres of crystalloid given.

Transferred
- Repeat CXR showed new ? Pleural effusion on the right
- Increasing phenylephrine requirement
- ECHO performed by Cardiology Consultant with Cardiothoracic Consultant present.
> 3mm pericardial effusion
> Impaired LV function

Decision
- correct Warfarin > 2000iu prothrombinex
- ART line and repeat CT

Medications - NKDA
Warfarin
Spironolactone
Cilazapril

OE
Afebrile diaphoretic
A - Own
B - On 6l via mask, Sats 97%, RR 28, Chest, decreased AE L base progressively worsening.
From initial review
C - HS Dual, HR 80, BP 89/40 on phenylephrine of 40, MM moist, HR dual with PSM, Bilateral radial, femoral pulses palpated.
D - GCS 15, BSL 10,
Abdo soft non tender.

Plan
1. ART line
2. Repeat CT
3. Crossmatch 4 units
4. Fentanyl PRN
5. As per cardiothoracics

Repeat CT showed large volumes of intrathoracic blood from likely descending aorta rupture. Given pathology case discussed with vascular Consultant to see if possible TEVAR - the decision was that this would not be possible.

Patient transfused 2 units of blood.
Surgical planning was to stabilise patient prior to potential descending aorta repair.

Patient intubated - Grade 1 airway with video laryngoscope.

Increasing inotropic support.
When initial chest drain placed to alleviate the respiratory distress blood drained (at pressure) and patient lost cardiac output. Adrenaline administered but no output returned.
**Case 32**
38yo male transferred from Nelson Hospital with neutropenic sepsis

**BACKGROUND:**
1. Dukes C carcinoma colon  
   - R) hemicolectomy 2014  
   - T3N1M0  
   - commenced on chemotherapy oxaliplatin/capecitabine 2014  
2. appendicectomy 2013  
3. R) femoral fracture requiring rod insertion

**HISTORY:**
Transferred from Nelson ICU. Initially presented with painful mouth and skin under chin.  
Started adjuvant chemotherapy.  
Admitted to ward where he deteriorated with massive gut desquamation leading to massive diarrhoea and fluid loss from the gut.  
Became septic with severe neutropenia (started on antibiotics/aciclovir/voriconazole/G-CSF and platelets)  
Transferred to Nelson ICU, intubated.

**MEDs on arrival**
- chloramphenicol ointment q6hrly
- tazocin 4.5g q8hrly
- G-CSF 480mcg od
- aciclovir 925mg q8hrly
- loperamide 4mg qid
- voriconazole 400mg iv bd
- folic 5mg od
- omeprazole 40mg iv bd

**O/E**
- A-intubated
- B Sats 92% FiO2 0.6
- C On norad 3ml/hr to maintain MAP

**HS:** dual and nil  
Chest - clear anteriorly and in axilla  
Abdo: no BS. Distended.

**Ix:**
- Hb96, WCC 0.18, neut 0, plt 16  
- Na 154, K 4, Cr 125 (lowest 98), Ca (corr) 2.11  
- bili 35, ALP 33, ALT 23, alb 16 L

**IMP:**
1. neutropenic sepsis  
   - severe toxicity to capecitabine associated with dihydropyrimidine dehydrogenase deficiency  
   - severe mucositis with significant gut fluid loss  
   - bilateral pneumonia with small amount of pleural effusion
Discussed with med onc consultant
- high mortality rate and can be very sick for weeks.
- however there is a potential for full recovery so he should be for full treatment.

PLAN:
1. increase tazocin to 4.5g qid
2. start octreotide 100mcg subcut tds to slow gut down
3. aim K>4 to help with gut
4. folinic acid 15mg iv bd as partial rescue for chemotherapy
5. G-CSF increased to 600mcg daily
6. continue bowel rest
7. continue TPN

PROGRESS
Increasing vasopressor support required and unable to maintain mean arterial blood pressure.
Further discussion with family and decision was to withdraw treatment. Patient passed away shortly afterwards vasopressor support was stopped.
**Case 33**

64y.o transferred from Masterton ICU - resp arrest 2/52 post pneumonectomy

**Background**

SCC L lung -> L pneumonectomy -> histo 4/8 intrapulmonary and 1 contralateral lymph node

Current smoker/COPD  
Pre op FVC 4L, FEV1 2.5l  
Hep C positive  
Hep B carrier  
IHD, MI stent 2000  
HTN

Transferred to Masterton for post op recovery. Developed increased ox requirement - ABG Type 1 resp failure over the last 3 days. Became tachycardic and hypotensive. Started on empiric tazocin. Also had a diagnostic L pleural aspirate--> GPC most likely staph aureus (contaminant)

Resp arrest 10am. Asystole. 2mg adrenaline. Intubated 1010. ROSC 1008.  
ECHO Dilated RV and RA with moderate TR.  
Pupils 4mm and reactive bilaterally.  
pH 6.8, BE -20, lactate 10


Upon arrival to WPH ICU  
A+B ETT, PSIMV, FiO2 70 PEEP 12, Press limit 30, RR 28, I:E 1:5, sats 93%  
C Peripherally cold and shut down, Norad 24, HR 105/min sinus tachy, ECG TWI antero lateral leads  
pH 7.13, pCO2 60, pO2 103, HCO3 19, BE -10  
Hb 123 Na 133 K 7  
D Prop 10, pupils 3mm equal and reactive  
UO minimal, K 7 treated with calcium chloride and dextrose/insulin  
LFTs ALT and ALP600 and 242, Bili 35  
INR 1.7  
34.6

Imp  
Cardiogenic shock with multiple organ failure  
Pulmonary hypertension - multifactorial : pain, poor oxygenation (type 1 resp failure), poor ventilation, TR, background of COPD and recent pneumonectomy. Possible GPC from L pleural aspirate

P  
CXR - L sided white out, R lung field Ok  
TOE --->RV/RA dilatation, severe TR, No proximal PE  
Pulmonary hypertension ---> correct hypercarbia, acidosis. Ensure normoxia, adequate pain relief.  
For K---> calcium chloride/dextrose/insulin
For possible MI --> aspirin (already on this, had 100mg this morning)
Ensure plateau pressure<30
Avoid excessive fluids
Limits of treatment: not for dialysis, not for CPR, limit of norad = 20mls/hr (100mcg/ml)
Family meeting with sister and sister's husband:
Ceiling of care set with Noradrenaline, antibiotics, ventilation.
Family called in as was continuing to deteriorate despite treatment.
Treatment stopped and patient extubated. Died within 30min of this.
Case 34
MVA - car rolled down hill.

Trapped for 45 mins.
Initial GCS 3. Extricated and intubated with Sux, Fent, and ketamine.
1st Sats 97%, BP 90/60 HR 45.

On arrival to ED: Intubated and unresponsive.
BP 80/64 HR 45.
Pupils unequal L sluggish 5mm R reactive 4mm.
Given 20mls of 23% conc salt. No change to pupillary responses.

Started on adrenaline infusion given 2000 crystalloid.
Art line inserted.

Initial ETT 8 was leaking around cuff and this was exchanged using cook catheter and video laryngoscope. Nil issues.

CT scan showed:
There is no evidence of acute intracranial haemorrhage.
2. There is a completely displaced fracture of the posterior column of C7 vertebra involving bilateral laminae and right pedicle. The spinal canal at this level is slightly narrowed.
3. There is also a minimally displaced fracture of the C6 spinous process.
4. Apart from a new right 2nd rib fracture, no significant abnormality detected in the thorax.
5. No solid organ injury detected in the abdomen.

CXR:
2nd rib on the right, and a displaced mid shaft clavicular fracture

PMHx:
T12 paraplegic with metalware T7-L4.
Independent with ADL's.
Hunts and rides quad bikes.
2012: Severe cellulitis

Rx: NKDA
Quinapril 20mg mane
Felodipine ER 10mg mane
M-Eslon 30mg q12h

OE:
A: ETT 8.0
B: ASV. Occasional spont breath. Minimal respiratory support required.
C: Adrenaline infusion 5-6ml/hr. Map >65.


Imp:
1) C7 # with spinal canal compression.
2) T1-2 # (not on report)
3) L2 #.
4) Some spinal dysreflexia.

Plan:
1) Sedate
2) Full spinal precautions
3) CVL - Position adequate.

MRI demonstrated extensive cord contusion and at least partial transection of the spinal cord at the level of C7/T1
Spinal surgeons consulted - no reversible pathology
Full spinal cares throughout his stay

Brief sedation holds revealed tongue movement upon demand but no limb movement

Discussion with the patient’s father revealed that patient had previously clearly expressed his desire for withdrawal of treatment should he progress from paraplegic to tetraplegic.

Further sedation hold performed and patient informed of his injuries.

Staphylococcus Aureus grown in wounds, sputum and blood cultures, accompanied by new shock and multi-organ failure.

Decision made to withdraw all active treatment with the family present

Extubated and pressors ceased and he died shortly after.
Time of death 17h10
Case 35
Patient presented to Palmerston North at 4:00 am, having awoken from sleep in severe flank and abdominal pain.
CTA showed ruptured suprarenal AAA.
Patient cardiovasc. stable with 2l of fluids throughout transport to Wellington hospital, where he went directly to OT for AAA repair.

PMHx: HTN
SHx: lived independently

The AAA repair was technically successful but patient died within 2.5 hrs post op of severe, unsupportable shock in multi organ failure at 16:28h.

CVVHDF had been started to improve the severe acidosis he came with from theatre but failed soon after because of his BP decreasing despite Noradrenaline, Vasopressin, fluid and blood transfusion.

The family was talked to by SMO and was present when patient died.
Case 36
TRANSFERRED FROM HDB: RLL PNEUMONIA

BACKGROUND
ESRF secondary amyloid and probable hypertensive component
- haemodialysis
  - when last dialysed noted to be 10kg over target weight at end of dialysis
Hypertension
Chronic venous eczema

HPC
1/52 SOB and chest pain
Stayed with cousins the night prior to due being unwell (usually lives with flatmate). Seen at Kenepuru then transferred to Wgtn ED.

ED:
Febrile and tachypnoic (RR 44).
Commenced on CPAP, given frusmide, GTN spray, aspirin, tazocin.
BSL 2.8, neutrophils 0.23

CXR showed RLL opacification.

DIALYSIS:
Dialysed and 4L fluid removed. Hypoxic in dialysis with sats reaching max of 80% on 15L O2.

WARD:
Transferred to ward and on arrival unresponsive and hypoxic- MET call at 2247 hours.
I met patient at MET call. GCS improved to ~14 with IV dextrose (difficult to assess due to language barrier). Remained hypoxic with sats 90% on 15L O2. Patient should go to HDB for trial of NIV and close monitoring of BSL.

0030 I reviewed patient on HDB. RR 45 on CPAP with FiO2 85% and looked exhausted.
Transferred to ICU with plan for invasive ventilation.

ICU:
On arrival resps had improved to 30-35/min and once on NIV via Hamilton vent able to wean FiO2 to 55%. Decided to trial further period of NIV.

Had seizure while IAL being placed. ECG noted to be sinusoidal, calcium carbonate given but proceeded to have bradycardic/asystolic cardiac arrest.
BSL 0.9 - given IV dextrose(total 60mL 50% with improvement to BSL 3.8)
Intubated, midazolam given for seizure and hyperkalaemia treated with further calcium carbonate and salbutamol infusion.
Adrenaline infusion started for bradycardia and shock.

Family arrived during resuscitation.
Had ~45 minutes total of attempted resuscitation with intermittent rounds of chest compressions and periods of external pacing.
While attempting to place vascath patient became asystolic. CPR discontinued with family present.
Blood tests returned post-mortem:
INR 3.1, APTT 49
Platelets 100
WCC 0.43, Neuts 0.12
ALT 1523
Bili 15
Case 37
73 y.o community cardiorespiratory arrest. Choked on steak, unconscious collapse, cyanosed. Initial rhythm asystole. Witnessed arrest with bystander CPR. Time to ROSC 32 minutes.

Management by paramedics

Initially LMA - effective ventilation. Steak fished out with Magill’s forceps by paramedics. Then intubated with no drugs. GCS 3 through out, pupils bilaterally small and reactive.

CPR by family then fire service then paramedics.
Asystole --> 1* adrenaline --> bradycardia --> 2* atropine 600 --> LBBB

ED

Worsening metabolic acidosis BE -6 --> -9, HCO3 21-->16
Improving resp acidosis CO2 53 --> 38
Initial pH 7.20-->7.25
Started on low dose propofol 5mls/hr (1%) and given rocuronium 50mg* 2 for twitching/coughing/gagging (no purposeful movements). Pupils remained small and reactive.
ED reg discussed with family regarding poor prognosis and mentioned possibility for organ donation

PMHx

Polycythaemia rubra vera - sees specialist at Kenepuru - no notes in system
Previous MI 30 years ago, arrhythmia ?LBBB
Hypertension
Gout

Drugs

Many - but wife does not know details

Social

Lives with wife. Ind. with ADLs. Owns and looks after 3 properties (painting etc)

O/A at ICU
A+B ETT size 8, ASV, FiO2 60 PEEP 5 MV 100 sats 100 PO2 132
C 130/80 HR 80/min LBBB on ECG
D Propofol 5-->10 due to coughing. Pupils bilaterally small and reactive.
Temp 34.3C
IDC in situ, UO 25mls in the first hr, Creat 200
NG in situ on free drainage

ABG on FiO2 0.6: pH 7.26, pCO2 41, pO2 132, HCO3 18, BE -8.7
Gluc 6.7, K 3.9, Na 139

Imp
Cardioresp arrest with prolonged down time --> likely poor neurological outcome
Renal impairment ?acute

p
CXR - ETT satis position, NG satis postion, lung fields nil focal.
TTM <36C for next 24 hrs
Monitor for worsening renal function
Family meeting with wife/daughter/son in law/brother/sister in law. Family understands regarding TTM for the next 24 hrs and that neurological assessment will occur after that. They are also aware that there is a high probability of poor neurological outcome from HIE and death
Chase existing drugs and medical history during daylight hrs from GP and private hospitals.

PROGRESS
Worsening kidneys, anuric
developed myoclonic jerk
HIE, poor neurology outcome
discussion with family, decision made for comfort care

patient passed away on at 14:47
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

Case 38
Admission post cardiac arrest

Event
- Community cardiac arrest
- 40 minutes of CPR (started by family, continued by paramedics)
- Asystole then VF - Shocked x 6
- Amiodarone and adrenaline given
- Intubated by paramedics

In ED
- Max dose adrenaline
- Difficult IV access
- CT head - nil acute bleed
- Atropine, amiodarone, morphine and midazolam.
- D/W Family likely poor outcome by the ED consultant.
- Brought to ICU for palliation and extubation

BG
NSTEMI 2007
Junctional bradycardia and collapse post MI
HTN
Dyslipidaemia
Chronic pancreatitis
Bipolar effective disorder
Parkinsonism
AAA repair
Recurrent UTI
Hypothyroidism

Social
Lives with grandson - usually independent with ADLS but progressive cognitive impairment recently with admission and CT head showing chronic ischaemic changes.

OE
A - Intubated size 8, 24 lips
B - With no sedation occasional breaths, <3. Sats 95% on ventilation. ASV Vt 750
C - BP 90/30 with 15ml/hr adrenaline, norad 8mls hr. HR 90
D - Glucose of 1, 50% administered.
GCS VT, M1, E1, pupils fixed and dilated (noted to have previous cataract surgery.

Plan
1. Family meeting
2. Comfort cares

Pt extubated and inotropes switched off 23.50.
Breathed for 10 minutes.
RIP
Case 39
Large SAH.

Had a witnessed collapse at home @ ~ 08:08. Husband started CPR. 
Ambulance arrived on scene @ 08:29
Was found to be in PEA arrest. 
CPR, Adrenaline 1mg, Intubated. ROSC ~ 08:41 total downtime ~ 40 mins.

Hypotensive and started on adrenaline infusion, Given Rocuronium and ketamine by 
ambulance.

On arrival ED GCS taken to CT scan which showed evidence of subarachnoid haemorrhage 
with an abnormal appearance of the brain and cerebellum highly suspicious for extensive 
infarction. The CTA is also markedly abnormal and suggests severe diffuse vasospasm. This 
reduces sensitivity for detection of an aneurysm.

CT neck: No evidence of #.

PMHx:
Back pain issues.

Rx:
Nil
NKDA

OE:
A: ETT 7.0
B: ASV nil spont breaths. Minimal resp support
C: SR 58 with adrenaline infusion 10-15ml/hr (100mcg/ml) MAP 65-70.

Temp 33
No sedation given since ambulance.

Imp:
1) Extensive SAH with oedema.
2) PEA arrest with down time ~ 40mins - hypoxic brain injury.

Plan:
1) Refer neurosurgery.
2) warm to 36 degrees
3) Maintain homeostasis.
4) Discussion with family ?organ donation.
5) DDAVP if becoming DI.

Supported with Adrenaline initially and then Noradrenaline
Warmed from 33.2 to 36.6
Neurosurgical input confirmed that surgical intervention was not appropriate
Required 2 doses of DDAVP due to polyuria
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

Spontaneous breathing until 1600
Brainstem testing performed at 2200
Treatment withdrawn at 2200
Patient passed away at 2345
Case 40
90y.o post emergency laparotomy R hemicolecotony + ileostomy for ischaemic bowel + shock + MODS

Presented to ED with acute abdo, tachycardia, metabolic acidosis, lactate 5, and Creat 400. Had vomiting and diarrhoea for 5 days. CT with contrast: non specific colitis
ED 4L crystalloid

OT
grade 1 view, further 4.5 l fluid (500mls colloid, 4l crystalloid), Started on phenylephrine which rose to 40mls/hr, then switched to metaraminol 20mg/hr
Cefuroxime/Metronidazole
Enoxaparin 20mg s/c od

Laporotomy for R + partial transverse hemicolecotony. Necrotic asc + transverse colon. No macroscopic perforation
Most likely embolic event therefore therapeutic clexane requested

PMHx
HTN
Prev TIA and CVA
Previous PE
Splenectomy
Cholecystectomy
Appendicectomy
Hiatus hernia repair

Drugs
Iron tablets
Aspirin
Simvastatin

NKDA

SHx

In ICU
A+B ASV FiO2 70 PEEP 5 sats 97% good AE both sides
C   Metaraminol 20mg/hr MAP 70 HR 130/min AF, warm
      Upon SLR MAP 70-->80
D   Prop 5
IDC in situ, 60mls last hr, 110 mls in OT. Creat 400 BE -11 --> -10
GI NGT in situ, bile draining, 1* drain 100mls in situ, stoma nil output
36.7C
Blood gas: metabolic acidosis, BE worsening

Issues
Post laparotomy for ischaemic bowel, severe shock with worsening BE, renal failure
Already had 8L crystalloid, 500mls colloid
P

Limits of care --> peripheral pressors, not for dialysis
increase PEEP
CXR/Bloods
ECG fast AF
Broad spectrum abx - cefuroxime+metronidazole (renally adjusted)
magnesium/cautious fluids including albumin
Renally adjusted therap clexane
Family meeting --> very high chance of death

Initially required high doses of Metaraminol (20ml/hr) however this requirement reduced over the space of 18 hours.
Unstable with any turning requiring large increases in Metaraminol
The stoma itself quickly became dusky and the surgeons were alerted to this.
The acidosis seen in theatre worsened with the BE reaching -15.

Discussed multi organ failure with family and that this was a terminal event. Treatment withdrawn and patient died 4-6hr later.
Case 41
81 yr male in multi-organ failure with pneumonia, heart failure (BNP 913), acute on chronic renal injury (creatin 265, oliguria) and pressor requirement.

Admitted from HDB after 2nd MET call - for tachypnea and hypoxia. Appeared to have rigors on ward and spiked a temp.

In ICU became profoundly hypotensive requiring large doses of phenylephrine, switched to metaraminol. On NIV saturating adequately on FiO2 0.8 and very fatigued. Ceiling of care had been discussed with pt on ward by another ICU reg at the time of Met call and pt had described good level of function and a wish to receive full treatment including ventilation. In ICU decision made to proceed to intubation and ventilation in view of worsening CVS parameters and high oxygen requirement and fatigue.

HPC:
Increasing SOB over past two weeks; felodipine stopped by GP two weeks ago as was hypotensive (SBP 110). Denied cough or sputum. Worse SOB with chest tightness today - called ambulance. Marked hypoxia on arrival to ED with sats 74% on RA. Oxygen, aspirin, GTN, frusemide, ceftriaxone and gent given.

Background:
Diffuse coronary disease with no significant critical stenotic lesions
Paroxysmal atrial fibrillation
Mildly depressed AF with 49% ejection fraction and moderate mitral regurgitation
Known to cardiology
Moderate renal dysfunction (creat 165)
Can walk 15-20mins without limitation
Lives in retirement village with wife

Meds:
Amiodarone
Carvedilol
Aspirin
frusemide
arcoxia
doxazosin

Echo 2012:
Moderately reduced LV function, Moderate MR

o/e

A - intubated
B - mucky sputum on intubation, sats 94% on FiO2 0.8 and PEEP 12, b/l CXR changes
C - MAP 66 on 13mls norad, HR 83

PLAN:
Cefuroxime
CVS support
Resp support
Over the course of ICU admission:
Blood cultures grew: Gram -ve bacilli.
Worsening AKI.
Increasing vasopressor support with noradrenaline capped at 30ml/hr.
Discussion between SMO and family: poor prognosis. Decision was made to withdraw active treatment and patient passed away quickly with family present.
Case 42
MULTI-TRAUMA

MVA - High speed head-on collision car vs truck. Restrained driver. Car split in 2 pieces.
At scene - GCS 3, R pupil dilated and unreactive
Intubated by ambo (Grade 1), suspected aspiration of vomitus.

ED
===========
Shocked, given 3L saline, 2 units O neg.
1g TXA, ADT, antibiotics
Abdomen increasingly distended in ED and persistent bleeding from large scalp lac

CT
===========
Head: small traumatic subarachnoid bleed. N grey/white differentiation
C-spine: #C5 - lamina, lateral mass, minimal displacement. No vertebral dissection on angio
Chest: RUL pulmonary laceration, small pneumothorax. Moderate pneumomediastinum.
Complete LLL and partial LUL collapse
R T12 rib #
T-spine: T1 lateral process fracture
Abdo: Grade IV liver injury, R renal laceration 1cm, 1cm splenic laceration. Undisplaced R
superior pubic ramis and R sacral fractures.

OT
===========
Laparotomy- packing and suturing of liver, spleen packed. Retroperitoneal haematoma.
R ICD placed

Neuro: Washout and closure of scalp lac and ICP monitor placed.
Bronchoscopy in OT - 'muck' in L bronchial tree, some suctioned, mild improvement in ventilation initially.
P148 3L, FFP x4, RBC x2, Cryo x3

ARRIVAL ICU
===========
ICP 40, CO2 60, FiO2 70%, difficult to ventilate.
Morphine and midazolam added, paralysed, bolus Conc Na, %Min vol increased and C-spine
collar removed (sandbagged)

PMHx
==========
Childhood asthma, no longer symptomatic

MEDS
==========
Nil reg

O/E:
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

==========
NEURO: ICP now 21, pupils. Steep head up.

CVS: sinus 120/min, MAP 82 on norad 14 ml/hr. HS dual, nil added.

RESP: sats 100%, EtCO2 42 on ASV 200% min vol, PEEP 12, FiO2 40%. Poor compliance, Ppeak 40cm. Harsh B/S R chest, decreased A/E L. R ICD swinging.

GIT: NG on free drainage. Abdo distended, minimal ooze on dressing.

SUMMARY
==========
Multitrauma:
1) TBI with low GCS at scene and secondary insults of hypotension and hypercapnia
2) C-spine - needs log roll and sand bag until cleared
2) Chest - poor compliance, ongoing LLL collapse
3) Abdo distended, at risk of compartment syndrome

PLAN
==========
Orthopaedic R/V re spine
Keep deeply sedated and paralysed
Not for bronchoscopy at present
Secondary survey
Try bronchodilator
Family meeting

Summary of injuries and interventions
=====================================
BRAIN - ICP bolt inserted on arrival. Refractory ICPs throughout stay - required paralysis, sedation, cooling, concentrated saline and phenobarbitone to control. EVD was inserted. Decompressive craniectomy was discussed but not indicated / recommended and family did not want. Prognosis poor - death or severe disability most probable outcomes. ICP bolt removed after repeat CT head showed cerebral oedema but no infarct or new lesion.

SPINE. Ortho reviewed C spine # and this was considered unstable. Maintained full spinal precautions throughout. T spine # considered stable.

CHEST. L sided collapse / aspiration injury improved significantly. Had chest drain on R for pneumothorax (and also developed surgical emphysema / pneumomediastinum). ICD was removed on day 4

ABDO. Following initial laparotomy had relook and removal of packs 2 days later - no ongoing bleeding. Some turbid fluid (swab grew stenotrophomonas but not thought significant pathogen as per micro). Developed ileus - NG placed on free drainage and started TPN. Worsening acidosis and shock - CT abdo suggestive of ischmeic gut so had repeat laparotomy - all gut viable. Abdo left open to prevent compartment syndrome / assist with neuroprotective measures.

OTHER scalp, R elbow and R thigh lacerations sutured. No underlying bony injury. Pelvic #s managed conservatively.
Family were kept updated of progress and likely poor prognosis of TBI (severe disability or death most probable) throughout.

Started tazocin for new infiltrate on CXR. Developed worsening shock - full aggressive treatment with antibiotics, lines changed, noradrenaline, vasopressin, methylene blue. R pupil blew but resolved with conc salt.

Died despite full treatments - family were present at the bedside at the time of death. CPR not attempted as per previous agreement with the family.
Case 43
Collapse in community following large SAH. ~ 19:00

Patient was seen to clutch head and collapse to ground with bystander CPR. On arrival ambulance GCS 3 with PEA arrest, CPR + 1mg Adrenaline. Intubated. Then low output with further CPR + adrenaline. Total down downtime ~ 15mins.

On arrival to ED. GCS 3. Fixed dilated pupils. No sedation given at all.
Started on adrenaline infusion down in ED.

CT scan showed: Large SAH with basilar tip aneurysm. Loss of grey white differentiation and early hydrocephalus.
No surgical intervention possible with poor outcome.
Discussed organ donation with family and they expressed patient would like to be a donor.

PMHx:
Previous aneurysm 30 years ago. Conservative management. Otherwise fit.

Rx:
Nil
NKDA

OE:
A: ETT
B: ASV with no spont breaths. Oxygenating well.
C: SR 110 with MAP 90 on adrenaline infusion 20ml/hr of 60mcg/ml.

Imp:
1) Catastrophic SAH.
2) PEA arrest
3) Candidate for organ donation.

Plan:
1) CVL + Art Line
2) Norad.
3) As per organ donation NZ guidelines.
4) Formal brainstem testing tomorrow.

Formal brain death testing the next morning - second test confirmed brain death at 11:25am.
RIP
Case 44
CARDIOGENIC SHOCK post STEMI, THROMBOLYSED

HPC

Harvesting puha, developed central chest pain and SOB.
Hastings ED thrombolysed for posterolateral STEMI. (akinetc post/lat cardiac wall on echo by cardiologist).
Frusemide for pulmonary oedema, dose repeated in Wellington with poor result. Progressed to HFNP, FiO2 50%.
Dopamine at 30 ml/hr. Remains shocked and dopamine near CCU max. O2 requirement increasing.

Productive cough 1/52, no fevers. Started on augmentin and azithromycin on CCU.

PMHx

Type II DM on insulin, retinopathy
Hypertension
Ex-smoker 9/12

MEDS

Lantus 40U OD

SOC Hx

Lives with partner.
Works at freezing works.

O/E

CVS: Icy cold peripheries (arms cool to mid forearm). HR 86, sinus, RBBB. HS faint. No peripheral oedema.
RESP: Sats 95% on FiO2 50%, PEEP 5, PS 5. Widespread wheeze.
RENAL: Oliguric post frusemide
NEURO: E3V5M6

PLAN:
1) Milrinone and norad
2) Wean dopamine
3) Stop antibiotics
4) CPAP

Patient worsened despite high dose Inotropes. Cardiac Catheter showed chronic occlusion of distal RCA and recent occlusion of LCx. Unable to successfully PCI because of huge thrombus burden.
Patient required Intubation and Balloon Pump in Catheter lab. Was also started on dialysis for acute renal failure.

Cardiogenic shock worsened despite maximal inotropic support.
After multiple family meetings, it was decided to withdraw therapy. The patient passed away at 19:30 in the presence of his family.
Case 45
81y.o post laparotomy for perforated diverticulitis and fecal contamination with severe septic shock and multiple organ failure

Background
===============
Immunosuppressed on oral steroids for GCA (histo confirmed)
Hypertension
Current smoker 10/day
Past appendicectomy
Lives by self, I with all ADLs, still works, still involved in community work
Exercise tolerance > 2 flights

Usual drugs
===============
Prednisone 7.5mg od
Other antihypertensives – family unaware of which
Acc to family does not have AF, not on warfarin.

Presented to ED with septic shock, chest & abdo pain.

ED
===============
IV antibiotics (Cefuroxime/Metronidazole). Hypotensive, tachycardic, AF. Resuscitation commenced at ED. 3L of fluid. Intubated due to agitation and ongoing haemodynamic instability. Copious vomiting during intubation with 2 unsuccessful attempts at first. Sats in the 60s for at least 20 mins.
CT abdo: Pneumoperitoneum

OT
===============
Difficult ventilation with FiO2 100% to FiO2 75%, PEEP increased to 12, MV 130%
Ju CVL (RIJ attempt unsuccessful, tract was dilated). L radial arterial line
Hemodynamic instability: Norad 10--->16, adrenaline 10mcg boluses then adrenaline infusion started 12--->7.5
Worsening base excess in OT -3 to -8, small UO concentrated
1 pre op Gent

Surgical findings
4 quadrant fecal contamination, diverticular disease, washout
Hartmann’s procedure (stoma). Abdo wall closed but wound left open (high risk of infection)
Drains *2

Upon arrival to ICU
===============
A+B ETT, ASV, FiO2 100%--->60% PEEP 12 MV 130% sats 96-100% TV approx. 250mls, RR mid 30s, Peak pressure high 20s, compliance poor
C Norad 16 -->20, Adrenaline 7.5-->9 within 1 hr, required 1L Fluid A
D Prop 12
R UO 30mls first hr, worsening metabolic acidosis BE at end of first hr worsened (-10)
Temp 35.4C
P
========
Bloods
CXR
ECG
Hydrocortisone 50mg qid
Replace K/Mg --> Amiodarone load
20% albumin 100mls over 30mins
Discussed with ICU SMO
  Not for dialysis
  Cap sum of norad and adrenaline to 30
Family meeting - with daughter and son - chance of death is very high

Continued to deteriorate post ICU admission with increasing Noradrenaline and adrenaline requirements and further crystalloid/albumin. Worsening metabolic acidosis.

Further update when MAP in the 40s consistently between family and Reg --> decision was made to change focus of care to keep patient comfortable and to withdraw active treatment.

Patient rapidly died after cessation of vasopressors and inotropes. Time of death 0610.
Case 46
Transferred from New Plymouth with severe pneumonia (?flu) due to full unit

PMHx:
* Alcoholic cirrhosis with ongoing ETOH use
* Oesophageal varices with bleeds January and Oct 2011
Previous IVDU
Hep C positive
T2DM on insulin
Current smoker, likely COPD but no previous spirometry

Usual Meds:
Insulin
Omeprazole
NKDA

Shx: Recently in court for DUI, no ETOH for 5 weeks, Home detention (ankle bracelet removed in New Plymouth, police informed), current smoker ++

HPC:
* Unwell for 2 weeks - headaches, fevers, myalgia, arthralgia, sore throat, green sputum
* ED on 11/08 - discharged as flu
* Worsening cough and dyspnoea
* To ED early hours of 16/8 following syncopal episode

Progress in New Plymouth
* Sats 75% on arrival, RR 30. Some improvement with BIPAP and 15L O2
* Intubated 04:15 on 16/8. Limits on treatment discussed prior - patient requested full treatment
* Low dose Amiodarone after intubation
* Fast AF treated with loading dose Amiodarone
* ABs:
  - flu swabs pending
  - Blood culture grew G+ cocci resembling staph
  - Has had Ceftriaxone (1 g due to liver disease??), stat vancomycin, PO roxithromycin changes to IV clarithromycin and tamiflu

OE:
* A - size 8 tube
* B - FiO2 0.6 -> PCO2 100, BE -3.8
* C - P 90, SBP 120, loud SM -> axilla, also ?ESM
* Abdo - SNT, hard liver up under CM, widespread spider naevi, no obvious ascites (fluid thrill negative)

Plan
* Ceftriaxone, Azithromycin and Oseltamivir. Further stat Vancomycin
* Flu swabs, Hep C and HIV
* Daily call to family who were distressed at his transfer

Blood and sputum cultures from Taranaki have grown MSSA - antibiotics changed to IV flucloxacillin. Flu swab negative, oseltamivir stopped. Diarrhoea tested negative for C diff.
Had TTE to look for vegetations (TOE not possible due to varices) - poor views but valves looked ok with no vegetations seen (but could not exclude completely)

Required ongoing respiratory support with no significant improvement over 5 days in ICU. Developed pneumomediastinum and surgical emphysema due to barotrauma. Developed renal impairment with creatinine increasing up to 228 (no indication for CRRT).

Atrial fibrillation - had 2 x loading doses of Amiodarone. Episode of mucosal mouth bleeding requiring platelet transfusion.

Deteriorated further on 22/8 with likely new sepsis (new temp, increased WCC, new shock). Given dose of meropenem and vasopressor support increased. Then started to have significant bleeding from mouth which appeared to be coming from oesophagus? Variceal bleed.

Given background of cirrhotic liver disease and current multi organ failure it was felt that further treatment would be futile. After discussion with the family, vasopressor support was withdrawn.
Case 47
77 yr old man with known ILD referred by medicine / HDB with worsening hypoxia despite CPAP

Background
===============
Interstitial lung disease with basal fibrosis and honeycombing, probable asbestosis. Also has a suspicious RML mass which has been stable on interval CT scans. Bilateral calcified pleural plaques. Not on home O2. PFTs show restrictive pattern with TLC and RV approx 50% predicted. Recent 6min walk - managed 330m, did desat to <90%. Under Medical who feel his ILD is relatively stable currently. Difficult to ascertain normal level of functioning but it seems he is usually able to walk for a few minutes, perform ADLs and do jobs around the house such as lawn mowing and fixing the car. This function has significantly deteriorated in the last week but there has also been gradual decline over this year.

HPC
=====
BIBA early this morning after collapse at home while getting up to the bathroom. RR 64/min with SpO2 <50% RA on ambulance arrival. Improved to 87% with 15L O2 via rebreather. Initially treated as MI with aspirin GTN and morphine by ambulance. Initial ECG changes resolved.

Had been nonspecifically unwell for a few days and felt breathing had worsened. No fevers reported. In ED treated for infection and PE (ceftriaxone, azithromycin, clexane).

CTPA showed extensive background interstitial lung disease with honeycombing in keeping with pulmonary fibrosis. New ground glass opacification in the left upper lobe has a broad spectrum of differential diagnosis that range from infectious process (including opportunistic infections), acute alveolar disease (pulmonary oedema, ARDS) and exacerbation of interstitial lung disease/UIP. Also a right upper lobe, posterior segment PE. Indeterminate middle lobe nodule shows no interval growth.


Was admitted under medicine to HDB. Put on HFNP but still desaturating, therefore commenced on CPAP. Sats dropped further to 66% at one point - MET call.

On arrival at MET call
Alert and maintaining own airway
RR 40s, SpO2 88-92% on 85% O2 with PEEP 7.5cmH20
Speaking a few words only, moderate resp distress
HR 100-125/min. NIBP acceptable.
ABG shows CO2 46 PO2 53 on 84.5% O2

PMHx
=====
Previous right breast cancer on tamoxifen
GORD on omeprazole
Ex smoker
Chronic cough, likely multifactorial (post nasal drip, acid reflux, traction bronchiectasis)
Impression

Type 1 resp failure in patient with significant background chronic lung disease and reasonably limited functional capacity. If any reversible component exists then likely to be infection (PE on CT probably inconsequential and would not cause this degree of hypoxia)

Plan

Admit to ICU for NIV at this stage - but would be for I & V if needed
Arterial line
Continue antibiotics
Clexane to continue for now but could consider decreasing to prophylaxis only given small subsegmental PE.
Midazolam charted for NIV tolerance.

Deteriorated further shortly after arrival on ICU and was intubated and ventilated on ASV. Despite full medical treatment for the small PE and a possible infectious process he deteriorated further and after several family meetings care was withdrawn, and he died peacefully.
Case 48
73 y/o female admitted from ED with metabolic acidosis, hypotension and hypothermia

ED presentation
================
Found by carer this morning with increased SOB and confusion.
BIBA with hypotension, hypothermia, hypoglycaemia. Initial Hb 70, but then 51 after 2 l O2,
2 u RBC given
CXR no free air, AXR NAD, stool pos. for occult blood
distended, tender abdomen, not peritonitic

PMH
====
HTN
Mild features of Asperger’s
OA
R eye injury 1999, cataract extraction and lens implant

Medications
============
Bendrofluazide 2.5mg OD
Cilazapril 0.5 mg OD
Atorvastatin 20 mg OD

Social
=====
lives with brother
normally talkative and mobile

Assessment by ICU in ED
========================
A +B spont. RR 28, sO2 96 % on RA
C BP 58/30 HR 77, RBC running
D GCS 14-15/15, pupils difference R>L, T 33.7

ABG ED
=======
pH 6.9, Glucose 1.1, Lactate 16

Plan
=====
CT Abdo with contrast
ICU
consider Vas cath and dialysis depending on CT scan
2 FFP for Coagulopathy

Add on:
=======
CT shows superior mesenteric artery occlusion plus omental metastasis of unknown primary

Seen by Gen. Surgery:
- likely to have ischaemic gut, with a new diagnosis of metastatic cancer of unknown primary.
- not a surgical candidate
- suggested palliative approach.

Family meeting to explain findings and decision for palliative treatment. Patient moved into sideroom, phenylephrine stopped and patient subsequently passed away at 1920.
Case 49
ICU admission for cardiorespiratory support during sepsis

BG
ALL rx with COGAALL0232
3 years of maintenance chemo
Pulse therapy with vincristine and prednisone (last this year)
Weekly methotrexate
[stopped due to neutropenia and thrombocytopenia]
Recent bone marrow biopsy 2/52 ago - no recurrence of disease
Autistic spectrum

Issues
Inpatient under Haematology with
- Non neutropenic sepsis
- Thrombocytopenia
- Splenic lesions ? abscess
- immunosuppression with methotrexate and steroid
- no resolution and worsening resp and cardio function whilst on vanc and meropenem

Original presentation
- Noted to have fevers
- Associated abdominal pain LUQ
- CT abdo showed ? Splenic abscesses
- Rx with cefuroxime and tazocin initially
- Changed to vanomycin and meropenem
- Ongoing fevers, worsening abdominal pain and decreased blood pressure -> MET call pending - referral to ICU

PMH
As above

Medications prior to admission:
Co trimoxazole
Aciclovir
Fluconazole
Omeprazole
Laxsol
NKDA

OE
Pale, diaphoretic
Temp 37.8

RESP
RR 40, Sats 92%, Minor creps R midzone on expiration, decreased percussion bilaterally at the base.

CARDIO
HS Dual, HR 125, MM Dry, CRT<2, JVP not seen
ACCESS - PICC line R ACF and peripheral cannulae

ABDO
Soft, tender enlarged spleen and epigastric region, percussion tenderness over the spleen.
Nil hernia palpated.
Other
Sig bruising bilateral antecubital fossae

Impression
Sepsis secondary to cholecystitis, splenic abscesses
Possible recurrence of ALL
?? Fungal infection

Plan
1. Analgesia
2. D/W Surgeons re possible OT will require platelet cover
3. Maintain O2 sat >92%
4. Strict fluids balance - not for catheter yet
5. ART line
6. Bone marrow biopsy prior to surgery
7. Repeat coags
8. 2 unit FFP now

Went to theatre for splenectomy and cholecystectomy. Had 1L blood loss and required 3 FFP 4RBC 7PLT intraop. Intraoperative findings of thickened GB with bile-stained fluid (no perforation). Stiff oedematous liver. Enlarged spleen - no obvious abscess on macroscopic examination (or initial microscopic examination). Had bone marrow aspirate done pre op and prelim results (verbal report) did not suggest ALL recurrence.

Returned from OT hypotensive on moderate dose noradrenaline. Significant acidosis with BE -17.9 on arrival back in ICU. RII CVL and vascath inserted. Noradrenaline requirements increased (up to 59/ml/hr given via existing PICC line) and vasopressin was added at 4u/hr. Glucose 2.1 - corrected with IV dextrose. Continued to deteriorate and then lost output at 21:20hrs. CPR commenced and had 3 x 1mg adrenaline. Underlying rhythm asystole. Decision to stop CPR after 10min due to futility. Patient's mother present at bedside at time of death 21:30hrs.
Case 50
Re-admission to ICU following sudden respiratory distress
- ? PE ? Aspiration Pneumonia

BACKGROUND:
1. Admitted to ICU following laparotomy and omental patch for repair of duodenal ulcer on. Discharged D2.
2. Squamous cell Ca - right oropharynx
   - having palliative radiotherapy
   - T4b N2 M0
   - 1yr life expectancy
3. Asthma

HISTORY:
* Initial admission to hospital due to dehydration.
* Developed hospital acquired pneumonia and commenced on tazocin.
* Seen by Gen surg & CTAbdo showed bowel perforation
* Discussion between gen surg and family - keen for operation, family are aware that she may not survive.
* Laparotomy
* AKI (Cr double to 80)
* D/C from ICU D2

09/08/14: MET CALL for Tachypnoea
Became suddenly short of breath at about 02:00 (denies gradual deterioration).
Nil CP or calf pain/swelling.
Coughing up purulent sputum. Nil abdo pain n/v.

AIRWAY NOTE
Awake fibre-optic intubation for OT.
Examined by ENT Reg 05/08/14
- Grade 3 with MAC3
- Grade 1 with McGrath size 3

MEDs on admission:
omeprazole 40mg bd
fentanyl patch 12.5mcg
dexamethasone 4mg od
metoclopramide
enoxaparin
Tazocin 4.5g
thiamine 100mg

Soc Hx: lives at home with husband.

EXAM:
T 38.7
RR 40 - settled to 28, Sats 77% RA - 92% 15L NRB,
HR 135, BP 110/55
HS: dual and nil
Chest: marked transmitted upper airway sounds + coarse creps, nil focal, nil wheeze.
Abdo: midline laparotomy scar, 2 x drains, SNT BS_N
Calves: SNT - minimal ankle oedema.

Fluid Balance about negative 100ml in 24hr.
ECG: Sinus tachy - Nil RV strain.
CXR: Clear nil consolidation/effusion

ABG: PO2 73% on 15L NRB

Intubated by On call Anaesthetist
- Awake Fibreoptic Intubation 6.0 ETT.
- ENT as backup in case of Trache.

Impression:
Acute Respiratory Distress
- ? PE
- ? Aspiration pneumonia

PLAN:
1. Clexane - Treatment dose
2. Continue iv tazocin
3. maintenance fluids
4. NG on free drainage
5. h. pylori triple therapy when po intake ok.
6. Consider CTPA when stable
7. NorAdrenaline 0-25ml/hr max
8. Vasopressin 0-4ml/hr

Patient deemed unsafe for transfer to CT in early hour of morning given increasing cardiorespiratory instability. Enoxaparin given.

Family meeting held with SMO and poor prognosis and impending death explained.
Limitations of therapy set
- No CPR (previously decided)
- Norad of 25 and Vasopressin of 4
- Continue ventilation

Progress
Increasing inotrope requirement which met limits set
25 noradrenaline and 4 of vasopressin.
Worsening acidosis and Respiratory function on serial ABGs.
Due to worsening cardiovascular effort further family meeting was held and decision to withdraw care was made.

Extubated and inotropes stopped 15:30

Time of death 15:55
Case 51
ADMITTED FROM OT: CRANIECTOMY and EVAC of SUBDURAL HAEMATOMA

Tackled playing rugby, alert on ground at first, carried off field, lost consciousness and seized. GCS 3 at scene and vomited.

AMBULANCE:
'snorning resps', nasopharyngeal airway placed. GCS improved to 6 (M4). Occasional extensor posturing.

PALMERSTON NORTH:
Intubated in ED (?decerebrate posturing)
CT Head: small R subdural with 8mm midline shift
C-spine cleared on CT

WGTN:
Straight to OT: Thin acute subdural, venous sinus bleeding. At end diffusely swollen brain herniating though skull defect.
Neurosurgeon anticipates poor prognosis. Family informed by neurosurgery.

CT Head repeated post-op. Neursurgeon happy there is plenty of space and brain looks better than expected.

PMHx:
Unknown

PLAN:
Keep sedated overnight
Desedate mane and assess

PROGRESS
Desedate, but poor neurology
MRI showed diffuse brain injury
Discussed with family, agreed for palliative care
Was consented for DCD, extubated & continued to breathe --> continue comfort care
Patient passed away at 11.30.
**Case 52**

69yr old man post emergency laparotomy for peritonitis and bowel perforation following R lap nephroureterectomy

**Background**

Laparoscopic R nephroureterectomy (AKS) for urothelial malignancy in R renal pelvis with background of Lynch Syndrome (HNPCC),

**HPC**

Day 3 post op developed hypoxia and peritonitic abdomen with increasing WCC. AKI with creat up to 298 (from 211). CXR showed bibasal atelectasis and consolidation. Given oral contrast but CT abdo not done - taken to OT for acute laparotomy

**Findings** - enteric / biliary peritonitis. 2 x small bowel enterostomies identified. R hemicolectomy but remaining colon was ischemic so progressed to completion colectomy and 20cm small bowel resection with end ileostomy. 3 x drains placed. Rectus closed but superficial wound remains open with VAC dressing in situ.

**PMHx**

Previous anterior resection for rectal ca (and radiotx)
Prev NH Lymphoma
CRF with pre op creat 211
Excess alcohol intake 6-8 beers / day
Known complete R carotid occlusion - having surveillance USS, LCA 16-49% occlusion
GORD
Hypertension
Retinal migraines

**Meds**

Metoprolol 95mg
Felodipine 5mg
Aspirin 150mg
Atorvastatin 20mg
Clonidine patch 0.2mg/24hrs (BP control)
Omeprazole 20mg

**SHx**

According to anaesthetic record ex tolerance 3 METs. Gets SOB carrying firewood. According to anaesthetic consent had expressed wish not to be aggressively resuscitated and had said would not want a tracheostomy.

**On arrival**

Sedated with propfol
HR 90/min BP 100/60 on Norad 7ml/hr
Ventilated with 50% O2 and PEEP 5 initially
Impression

==========

1. Intra abdominal sepsis - now has source control. Ongoing vasopressor requirement.

2. Acute on chronic kidney injury. Multifactorial - single kidney, septic, contrast nephropathy, possible element of abdo compartment syndrome. Will likely require CRRT but not currently indicated. Would need discussion with family re whether they would want this given wishes not for aggressive resus expressed pre operatively.

3. Feeding - currently NG on free drainage. May be candidate for early TPN.

4. Hyponatremia Na 125. Was 135 pre op. Likely related to renal impairment.

5. Atelectasis and hypoxia - was on FiO2 0.65 but has responded well to recruitment, Now FiO2 0.4 and PEEP 12.

Plan

====

Post op CXR
IVF and noradrenaline for hypotension
Uro Reg has spoken with patient's wife
IV cef and met as per urology
Await micro
NG free drainage currently - no oral meds
Consider TPN mane
Renal dose clexane from tomorrow if no obvious bleeding
Will need to consider CRRT and TPN mane

PROGRESS

====

Deteriorated post-op
- Continued to need vasopressor support
- Remained intubated and ventilated
- Had worsening metabolic acidosis, hyponatraemia with derranged LFTs and Acute Kidney injury.
- Continued TPN, IVABx (Cef + Met), Clexane.

Was extubated however dropped his GCS and became hypotensive ? Cause.
- Was re-intubated
Then developed worsening lactate on dialysis and worsening liver functions with hypoglycaemia.
Was taken back to theatre to look for reversible causes of the worsening lactic acidosis. No reversible causes were found.
A family meeting was had with wife and daughter. Treatment was withdrawn due to extensive multiorgan failure with deterioration.
Died shortly after withdrawal of treatment.
Case 53
777 IN ULTRASOUND- SHOCK ?sepsis ?ischaemic bowel

19th: PR Bleed - overnight admission gen surg.
22nd: Outpatient sigmoidoscopy. Found diverticulosis and polyps, performed polypectomy
22nd: Diarrhoea. Overnight admission for 'gastroenteritis'
31st: BIBA from GP having presented to GP with black stools and found to be shocked.
Hypotensive and acidic in ED. Admitted medicine.

Started on cefuroxime and metronidazole.
Abdo distented so underwent ultrasound. Found large volume free fluid. While in USS
became clammy, grey, unrecordable BP. MET Call put out. Given IVF bolus and admitted ICU.

On arrival ICU markedly shutdown peripherally but MAP > 65 and GCS 15. Abdo grossly
distended but non-tender.
Unable to get peripheral access and IAL challenging due to peripheral vasoconstriction.

Metabolic acidosis progressively worsening over day. BE -15.
AKI with Cr 251
WCC 35

PMHx:
Hypertension- ACEi recently stopped due to renal impairment
Hypercholesterolaemia
Previous Thyrotoxicosis

MEDS: Unknown

SOC HX:
Security guard at rest home.
Smoker

O/E:
CVS: cool clammy peripheries, sinus 112/min. BP 94/61.
RESP: RR in mid 20s to 30. Sats unrecordable on probe. >92% on gas.

IMP:
? Intra-abdominal sepsis
? Ischaemic bowel

PLAN:
Surgical R/V
Peripheral IV access then CVL
Tazocin
IVF resus
IAL

Surgical R/V: Not an acute abdomen- for CT abdo. Discussed likelihood of ARF with contrast
with patient and family.
CT: Caecal lesion with possible local perforation

Laparotomy:
* Limited right hemicolecctomy with ileostomy
* 200ml ascitic fluid in abdo, no faecal contamination
* Large caecal tumour palpable
* All bowel intact - initially pale and mottled, but colour improved
* Normal liver and gallbladder
* No gross pelvic or peritoneal seedlings

Shock became unsupportable. Family present.
Pressors ceased when family ready.
Heart stopped shortly after.
Time of death 1:13am
Case 54
57 yo female transferred from HDB with severe COPD exacerbation post MET call

Current Admission
==============
Admitted 26/7 with increasing SOB and cough on a background of severe COPD and Asthma. Had increased her usual dose of Prednisone from 10 mg to 60 mg daily and was using home nebs q4 hours.
Initially febrile and IV ceftriaxone and azithromycin given in ED. Admitted to HDB for BIPAP. Worsening throughout this morning and Met call put out 10:40 for RR 40, Desaturation Tachycardia and severe resp. distress.

Background:
==========
Asthma
Severe COPD
  - FEV1 .87 l (37 predicted, was 18 % before quite smoking)
  - ICU admission 7/13
  - 4 hospital admissions since beginning of this year
Hayfever
severe Depression
Previous spine # => chronic lower back pain
Hiatus Hernia with GORD
Ex Smoker

Regular Meds
============
Ventolin 2.5mg nebuq, 1 neb inh qid prn
Amitriptyline, 25mg po od
Flixonase nasal spray, 1 spray bd
Frusemide, 40mg po od
Spiriva, 18mcg inh od
symbicort 200/6, 2 puffs inh qid
prednisone 20mg mane, 10mg nocte (taper dose)
Omeprazole 20mg OD
loratadine 10mg OD

started on admission:
Hydrocortisone 100 mg IV QID
Amoxicillin 1 g po TDS
Clexane 40 mg OD

MET call:
========
Patient very distressed and panicky
sO2 mid 70 to mid 80s with BIPAP (3l O2)
RR30, HR 120-140, BP 200/90

Chest auscultation: diminished bilateral air entry, widespread exp. Wheeze.

Chest X-ray: No Pneumothorax, flat diaphragm
Impression:
========
Severe Exacerbation COPD
Type II respiratory failure

For full resuscitation as discussed with patient and medical consultant

Plan:
====
Transfer to ICU
Continue CPAP/BIPAP
for intubation if necessary
Continue AB
A-line and ABG
chase Flu swab
chase Echo report (had Echo last week, no report on system)
chase sputum sample (Heavy growth of Gram negative bacilli)
chase Blood cultures and urine culture (neg. so far)

PROGRESS
====
Despite a stable six months last year patient has had several hospital admissions in 2014 and likely progressive deterioration in lung function and reserve.

Although being on full medical treatment her condition deteriorated further and she expressed a clear wish not to be intubated and even refused continuing BIPAP on the 30th. In a family meeting including the respiratory team the situation was discussed with daughter a switch to a palliative approach - this was suggested and agreed upon.
She passed away at 18:20.
Rest in peace.
Case 55
80 yo male transferred from medical HDB for further management of type 1 respiratory failure due to Pneumonia

Current admission

80 year old presented with 2 - 3 weeks history of cough/ productive with clear sputum + shortness of breath + chest discomfort.
Chest x-ray showed R UL Pneumonia. Also in AF ? secondary to dehydration.

During this admission

Admitted to HDB, AF was treated with Digoxin and Amiodarone and reverted into SR.
Started on Ceftriaxone and Azithromycin. Needing CPAP support to maintain oxygenation.
Getting increasingly exhausted and worn out. Medical Consultant requesting ICU admission for further management.

Background:

1) no known IHD
2) Asthma since 2 year old
3) Ex smoker for 10 years
4) Hernia repair pending - meant to have it next Monday
5) Previous bowel cancer has had operation.
6) Once functioning kidney
7) AAA- pt said stable

Awaiting hernia repair and seen by Anaesthetic Consultant for GA. Was mowing lawns and walking up 2 flights of stairs without dyspnoea up to three weeks ago. Lives independently with wife.

Assessment HDB

Dyspnoeic and exhausted patient with RR 26, sO2 90 % with FiO2 of 60 % and CPAP of 10 mmHg. BP 141/80, HR 106.
Patient fully orientated.

Meds:

Ceftriaxone
Azithromycin
Seretide inhaler
Flixonase
Aspirin EC
Omeprazole
Quinapril (WH)
Clexane
Salbutamol PRN
Ipratropium PRN

Impression
Severe exhaustion with Type I respiratory failure

Plan

Admit ICU
Art line
Chest X-ray
CPAP

? Intubation if deteriorating - will be discussed at evening ward round
Continue IV AB
Chase Flu swab

Intubated in ICU. Developed large troponin leak - acute myocardial infarct. Deteriorated, developed large vasopressor need, non responsive to treatment. Lab informed team patient flu A positive.
D/W family and SMO, no possibility for survival. Active treatment withdrawn, allowed natural death in ICU.
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Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

Case 56
MULTI-TRAUMA - TBI, C-spine and pelvic fractures

HPC:
Fell through roof (10-15m)
Friends unable to get to him as building locked.
GCS 4 (V2) then 3 in ambulance.
Sats 96% dropping to 89% enroute. Attempted intubation x1 in ambulance (view obscured by blood).

In ED: GCS not assessed prior to intubation. No eye opening. Pupils unreactive. Left eye bruised and swollen and bleeding profusely from nose and mouth. Boggy swelling on head.

Intubated in ED, grade 1 view.
Hypoxia resolved with suction and PEEP (blood ++ on suction).
Brief period of hypertension and reflex bradycardia post intubation.

Metaraminol started to maintain MAP 90.
Given TXA in ED

CT:
HEAD - Skull fractures (bilateral frontal bones, L maxilla, sphenoid)
   Bifrontal subdural haematoma
   Small foci of acute intra-axial haemorrhage involving
   L posterior midbrain, R cerebral crus and R parietal lobe.
   Pneumocephalus
C-SPINE - # C4, C6
CHEST - Pulmonary contusion
PELVIS - # L lateral mass of sacrum, R acetabulum and R pubis - reported as unstable

PMHx:
Epilepsy

MEDS:
Levetiracetam
Lamotrigine

SOC Hx: University student

O/E:
NEURO: Sedated on propofol 20/hr
Pupils L 5mm, R 4mm both unreactive.
L eye grossly swollen and bruised

FACE: Bleeding from nose and mouth
CVS: Sinus with occasional non-conducted p waves. HR 40-70. MAP 60-100 on metaraminol.
HS dual, nil added. No chest deformity

RESP: sats 96% on FiO2 30%, PEEP 12. Chest clear with equal A/E throughout. No surgical emphysema
GIT: Abdo non-distended, clear urine
MSK: No limb deformity or swelling.
IMP:
Multi-trauma with severe TBI.
PLAN:
1. TBI- for conservative management as per neurosurgeons. Desedate once collar on
2. C-spine - Philadelphia collar, log roll
3. Needs secondary survey
4. Tetanus
5. Compound skull fracture - stat dose ceftriaxone
6. Family - Phone call from mother, summarised injuries and explained severe head injury with poor prognosis. Parents planning to fly over on first available flight.

Multiple family meetings were held to discuss severe brain injury and likely death from this. Sedation was stopped and he remained GCS 3 but continued to breathe. His family were keen for consideration of organ donation. Organ donation after cardiac death was undertaken after the patient passed away at 10:02.
Case 57
66 yo female transferred from Masterton ED post out of hospital cardiac arrest

Background:

Lives with husband, chronic hoarder
On Flixotide and Ventolin
"buggered heart"

Pre Masterton ED

Patient felt unwell and called ambulance about 2 PM.
On arrival distressed, GCS 13, low BP and rhythm with ideoventricular rate of 120 BPM. Long pauses of 10-20 s.
Went into cardiac arrest, 15 min of CPR, intubated, externally paced at 60 for some time. 2 mg Atropine and 4 to 6 mg Adrenaline given.
Transferred to Masterton ED with wide complex rhythm and BP 100 systolic.

Masterton ED

Pressure support with initially Dopamine and then Noradrenaline. Two episodes of PEA with spontaneous circulation resumed after one minute of CPR.
Labs showed severe Acidaemia with pH 6.8 and K 7.7. Ca Gluconate, Bicarbonate, Insulin and Glucose given to lower K.
Pupils dilated and non-reactive throughout.

Arrival Flight team in Masterton

Access:
R femoral Arterial line - working fine
18 G R external jugular IV line
triple lumen R subclavian CVL => turned out to not be working properly and not used for transfer
18 G IV line right antecubital not working and removed
20 G IV line right hand placed for transfer

While in ED, further drop in HR to 45 and drop in SBP to 90 Systolic, Pacing attempted at rates 60, 70 and 80, but further drop in SPB to 75 (loss of atrial kick with Pacing). Good effect from .6 mg of Atropine.

Transfer

No sedation/muscle relaxant given
Noradrenaline 6-18 ml/hour
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Another 2 x 600 mcg of Atropine given with HR of 45
No pacing used

O/A in ICU
=========
A+B ventilated
C on 14ml/h of NA via R IJ, HR 48/min
D pupils still 5/5, not reactive
E K 6.6, pH 7.02, HCO3 11.4, BE -20.1, pCO2 46
  mottled feet, central T 30,2*C, axil. T not recordable
  distended but soft abdomen, several huge haematomas on R&L side
  of neck (prev. CVL attempts?)

Plan
=====
CVL, Vas-Cath and start CVVDH ASAP
increase ventilation
Chest x-ray
Bloods
Pacing pads on

PROGRESS
CT head normal

Sedation discontinued. Remained deeply unconscious.
Anuric renal failure, on CVVHD
Increasing inotropes Noradrenaline /vasopressin.
Abdominal distension. AXR distended small bowel loops and possible pneumotosis, raising possibility of GI ischaemia. Further investigation /surgery deemed futile.

In view of continuing deterioration and poor prognosis, and after discussion with family, extraordinary life support withdrawn.
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Case 58
88 yo female admitted night of surgery from ward 7N with persistent low BP despite fluid challenges

L fem-dp bypass today
- 1-2 l blood loss reported
- uneventful OT
- Hb 90 (previous 130)

PMH:
STEMI 2010
PVD
HTN
CVA 2009 cognitive impairment
DVT l leg many years ago
Hiatus hernia
Gastritis
ECHO: normal valves, decr. LV function, now obvious RWMA

Social: lives alone, 4 x weekly home help

Current Meds:
Augmentin
Enoxaparin
Frusemide
Omeprazole
CaCarbonate
Aspirin EC
Metoprolol CR 95 mg OD
Candesartan (w/h DOS)
Simvastatin
Nortripyline
Paracetamol
Morphine PCA

Exam:
BP 74/45, HR 80, SO2 93 on 2l O2, UOP 20-30 ml per hour
Patient alert, not distressed, no CP, no SOB
Lungs clear, Heart RRR, no murmur

Bloods:
Troponin 621, Crea 110, Hb 90

ECG:
SR, rate 82, marginal changes compared to previous ECG (ST depression lead I and II, ST elevation V1 (preexisting), T-wave inversion aVR and aVL (preexisting))

Impression:
persistent postoperative hypotension, not responding to fluid
? Perioperative ischaemic event
Plan:
ICU for Phenylephrine
Aim for SBP 100 to 110 (important to maintain graft perfusion)

PROGRESS
Had a NSTE-ACS perioperatively. Unfortunately she continued to deteriorate despite vasoactive support. The family were informed of the poor prognosis and were present when she passed away in the intensive care unit.
Case 59
62 y/o male

Admitted from ED following a OH cardiac arrest.
Previously fit and well. Works as a postman. Alcohol usage daily according to family.

No medications

Was found at home by daughter, had twitching movements in arms, grey, limp shortly after.
Ambulance called, arrived to scene 6 min after 111 call. Cardiac arrest, PEA. 6 min CPR, 1 mg adrenaline led to ROSC, in total; 12 min after 111 call.

Arrival in ED, intubated. Fighting tube, but GCS 3.

A Intubated 24 at lips ETCO2 confirmed and good position on CXR
B Occasional spont resps - Vent 12 bpm pmax 18 SaO2 100% on FiO2 0.5
Interstitial oedema on CXR
C HR 75 BP 13-140 on arrival, MAP 80 on Propofol 10ml/hr

ECG SR initially inferolat ST depression , peaked T waves . No reperfusable change

D pupils equal 4mm --> 2mm post fentanyl No response to pain initially - slight ? extension to insertion NGT
T 35.

Bedside US
RV < LV
No Pericardial fluid
Aortic root < 4mm

Contractile LV ( I cannot comment on regional wall motion)
No PTX
No free fluid Abdomen
Abdominal Aorta < 3mm

VBG on arrival
pH 7.17 Lac 8.0 BE -10 HC03 17 K+ 3.8 Na 139 Hb 146 Gluc 13 Ca 1.15
pCo2 48

CT head - clear.

Possible myoclonus observed in ED, unsure. Administered rocuronium.

Admitted to ICU post resusc care

Plan
1 Keep sedated O/N
2. Art line to be inserted
3. Sedation hold in morning
4. Temp < 37.5
CT head showed global hypoxic brain injury
After prolonged discussion with family & x2 neurology opinions, decision made to withdraw treatment & allow a natural death

Palliative team involved.
Patient died @ 1030
Case 60
55 y/o female, admission to ICU following SAH.

Hx
- Normally fit and well
- Smoker

Found by husband at 5.30pm, ambulance called to scene. Initial GCS by paramedics 14. IN ED 8 (E2V2M4). Intubated.
Pupils equal and reactive on admission to ED in Taranaki.

CT-head showed extensive SAH.
Subsequently pupils found unequal, R 4+ L 2.

Advanced to CTA, which shows two aneurysms in tip of basilar artery.
Bloods unremarkable in Taranaki.

Admitted to ICU in Taranaki. Liaised with neurosurgical team in Wellington, transfer requested to ICU Wellington.

At Taranaki, pupils 4/2, BP map 65-70 mmHg. No ventilation issues.

During transport aimed for MAP 80. On transport episode of bradycardia (30) and severe hypertension (250/130). Responded to propofol, fentanyl and conc.salt. Pupils remain unchanged. Hemodynamics supported with norad.

On admission to ICU
Intubated, ASV, no issues with ventilation.
Propofol sedation, norad vasopressor.

Plan
1. Repeat CT - if worsening hydrocephalus insertion of EVD
2. If repeat CT shows no increase in hydrocephalus, sedation hold and assess. Aim for obeying commands, if not EVD insertion to be assessed.

Repeat CT scan on arrival showed increased hydrocephalus and patient was taken to theatre for External Ventricular Drain placement. Post procedure pupils fixed and dilated and repeat CT scan showed rebleed. Some improvement with conc. salt. Patient deteriorated further over the next 24 hours. GCS 4 E1VT M2, increasing seizure activity and pupils become unreactive.

Treatment withdrawn after discussion with Family
Extubated 17:45 and time of death 21:10.
**Case 61**
Transfer from PN hospital for neurosurgical review/intervention

**Issues**
1. Anterior comm Artery aneurism rupture - SAH
2. Hypertension - difficult to control
3. Chronic Hep B carrier
4. Smoker
5. 6 months of recurrent headaches/migraines

**History**
- Sudden onset severe headache at 16.00
- Associated vomiting with LOC ? Duration +/- seizure
- Further seizure in ambulance with associated urinary incontinence
- GCS initially in ED 15/15 but deteriorated to GCS 3
- CT scan showed Large SAH with 4mm midline shift and patient intubated
- D/W Neurosurgical team in Wellington, due to Low GCS not for intervention at that moment.
- Commence on nimodipine and GTN for hypertension
- Fentanyl infusion
- Family meeting and DNR discussed and agreed upon
- GTN and nimodipine stopped due to ? Bradycardia
- Given labetolol, fentanyl and propofol boluses to maintain BP < 180 systolic.

- Repeat CT scan on 6/7/14 - further oedema, no increase in midline shift though
- Desedation occurred and patient had GCS M6, E3, VT, re-discussed with Neurosurgery and transferred here

**NKDA, nil regular medication**

**OE in Palmerston North:**
A - ETT size 7, 25 at the teeth, ventilated at 16 per minute FiO2 40%, PEEP 5 with sats of 100%,
B - Good expansion bilaterally, mildly decreased AE L base but otherwise good with no added sounds
C - BP 155/82, HR 110, MM dry, CRT<2 centrally, Cool feet but DP palpated. Access 1 Multilumen picc line R ACF. Recent loss of art line. 60ml Hour IV fluids
D - Intubated Eyes R2, L2 + 1/2, sluggish

**Flight - uneventful with propofol being switched from 25 down to 18 to compensate for G force and pressure change.**

**OE in Wellington**
RESP: RR 16, 94%, FiO2, Clear
CARDIO: HS Dual, HR 66 BP 228/107 , MM moist

**Plan**
1. ART line
2. Remain Sedated
3. GTN infusion for BP control and calcium channel blocker
4. Neurosurgical review - likely angiogram mane
5. CXR
6. restart nimodipine
7. Re-discuss NFR status

Transferred to WPH ICU in evening because there was some improvement in neurology. However, pupils blew later that evening. Treated with conc salt and re CT:
No significant change in the volume or distribution of extensive intracranial haemorrhage due to ruptured AComm aneurysm.
Subtle bifrontal loss of grey-white matter interface may reflect an early infarct.
In view of neurological deterioration, large bleed and evolving infarct: neurosurgeon opinion was that this has very bad prognosis with high risk of death. Therefore coiling no longer pursued.
Neurologically became worse and brain death ensued.
Formal brain death testing done by 2 clinicians.
Organ donation offered but family did not want.
Time of death 10:42am
Case 62

79, female
Community cardiac arrest
Witnessed collapse by daughter
No CPR until ambulance arrived in about 6 min
x2 shock for VF --> ROSC
Down time about 17 mins
Intubated at scene, grade I view
Large vomitus, likely aspirated
HR dropped to 40 in ambulance, atropine 600mcg & adrenaline 50mcg given
Also given Rocuronium because of spontaneous breathing

In ED
In fast AF, rate ~110
adrenaline infusion 3mcg/min
aspirin 300mg, amiodarone 300mg
ABG : respiratory acidosis, pH 7.03, pCO2 82, BE -5
12 lead ECG : lateral ST depression. Review by cardiology, not for reperfusion therapy

Admit ICU via CT head
CT head NAD

Background :
IHD, NSTEMI 2013 (medically managed), recent admission to Hutt with chest pain
AF, no anticoagulation
HTN
GORD
prev hernia & cholecystectomy

Meds (from d/c summary):
paracetamol
omeprazole 20mg
digoxin 62.5mcg
clopidogrel 75mg
metoprolol CR
frusemide 40mg
atorvastatin 20mg
ISMN 60mg
aspirin 100mg
morphine

Plan:
- TTM, aim < 37 C
- A line, CVL
- d/w family
- CXR

Case 63
68 year old man post op elective HIGH RISK MVR, AVR, TVA and CABG x 2

Background
==========
Several months of SOB and CP NYHA2 --> now NYHA3. Pre op echo shows poor LV function with EF 30%, Severe MR with flail posterior leaflet, AS with AVA <1cm. Dilated LA and AF. Mild RV impairment with mildly elevated RVSP. Angio shows severe 3VD.

Significant background CRF. Usual creatinine around 330. CRF is due to previous vasculitis (1992), R renal atrophy, and L partial nephrectomy for RCC in 2011. Is awaiting fistula for HD and has apparently been accepted by P North renal team for long term HD if this should be required as a result of this surgery.

PMHx
=====
1. Chronic renal failure - pre dialysis, Creat 330. See notes above
2. AAA repair 2011 - required HD for 3/12 post op
3. Previous ANCA + vasculitis (1992-1997). Not currently on any steroid or other immunosuppressive treatment
4 Hypertension
5. Hypercholesterolaemia
6. Coronary artery disease with previous angioplasty 1999
7. Previous steroid myopathy
8. Gout
9. L partial nephrectomy for RCC 2011
10. AF on digoxin

Intraoperative course
=====================
IABP placed pre op due to poor LV function.
Lines inserted - RIJ vascath for post op dialysis. LIJ CVL and LIJ PA sheath. PA catheter in sheath but not floated due to tricuspid surgery.
CABG x 2 (SVG to PDA & OM), mechanical AVR, mechanical MVR, TV annuloplasty.
Long bypass time 220min X clamp 170min
No issues coming off bypass
Had cell saver 600ml plus 2 RBC 2 FFP 1 platelet in OT

On arrival
==========
350 ml total in drains already. Ongoing bleeding. FFP and cryo already ordered.
Propofol sedation
Noradrenaline 7ml/hr
Adrenaline 7ml/hr
Milrinone 0.25mcg/kg/min
IABP 1:1
Maintaining MAP approx 60mmHg on these settings
Soon after arrival rapid AF with rate 110/min and some associ hypotension

Plan
===
- Keep sedated and ventilated overnight (and beyond!)

- Check CXR for line placement - PAC initially looped around RIJ vas cath and not able to withdraw but resolved with tension on vas cath. However not able to refloat PAC after 2 attempts - cannot pass beyond 30cm. Other lines satisfactory position

- Aim to wean adrenaline (rapid AF) and increase noradrenaline. Aim MAP >65mmHg
- Check ScvO2 in lieu of CO monitoring via PA cath
- Amiodarone for AF
- Bleeding - give 3 cryo 2 FFP now, then recheck coags immediately post
- Continue milrinone at 0.25mcg/kg/min - room to increase (renally cleared but likely dialysed tomorrow)
- Wait until bleeding settled and CVS stable before considering CRRT (will need heparin with protamine to avoid pt anticoagulation)
- Use fentanyl rather than morphine for analgesia
- Place NGT as likely to be intubated for a few days at least

PROGRESS
Post op triple valve and CABG x 2.
High vasopressor requirements.
On RRT.
Worsening metabolic acidosis with multi organ failure.

Condition deteriorated and decision made to withdrawal day 3 in consultation with family.
Case 64
Transfer for Cardiology intervention and ongoing norad requirement

Issues
1. Ant Lateral STEMI, atypical presentation
2. CHF secondary to above
3. Uncontrolled Diabetes mellitus
4. AKI

History
Sudden onset of severe abdominal pain through to the back, eased with vomiting. Associated diarrhoea. S/B GP and referred to ED - on arrival pain free and feeling better. Thought to be gastritis/gastroenteritis. D/C

Since then worsening SOBOE, initially noted on walking and progressed to simple ADL's. S/B GP and ECG showed Anterolateral Q waves so referred to ED

Events:
Developed AF with fast ventricular response 150. Started on Amiodarone infusion but minimal response and patient dropped BP 77 - DCCV under Ketamine and midazolam sedation. 1 shock of 250j. Ongoing poor BP and decreased urine output. Discussed with ICU SMO and recommended Norad, ceftriaxone and cultures

Norad went to 8ml/hr and weaned down to 3ml/h with map above 70. Lowest urine output is 5ml/hr to 36 ml hour with 3.5l of fluid (hartmanns and NaCl)

Noted to be increasingly SOB this morning and IV fluids stopped

Bloods
Trop I 31.2
Glucose 20-25
K 4.8, Crt 109 -> 167

Currently on Insulin infusion
Norad of 3ml/h

Metoprolol w/h due to hypotension
Clexane w/h due to AKI
Due to increasing SOB and creps D/W SMO: given furosemide 120mg.

PMH
Diabetes
Ex smoker
FH Cardiac disease

Medications - not taking any regularly

Social
Lives on own, independent of ADLs
Normally able to manage at list 14 stairs and can walk as far as she wishes
OE by flight team on arrival in Masterton
Apyrexial
RESP
RR 28, Sats 94% on 2l nasal, creps to midzone, 3-4 word sentences
CARDIO
HS Dual, HR 70, Map 76, Pitting oedema to knee, unable to visualise JVP, DP palpable
ABDO
Obese, soft, non tender at present

Alert orientated in time place and person

On arrival to Wellington:
RR 24, Sats 97%, Speaking in full sentences
Map 75 on 8 of norad

Impression
1. CHF secondary to STEMI
2. ? Septic component note ongoing diarrhoea and vomiting
3. Diabetes - poor control

Plan
1. Wean norad as able
2. Insulin infusion until eating and then switch to protophane and novo/actrapid
4. Restart clexane
5. W/H Metoprolol at present
6. TTE

Norad 4-->8 with cool peripheries upon arrival to Wellington ICU.
ECG STE inferiorly as well as q waves anterolateral.
Seen by cardiologist upon arrival to Wellington ICU, TTE: hypokinetic anterior wall.
Taken for urgent angio --> prox LAD lesion, 2* bare metal stents. RCA lesion --> 1* bare metal stent.

After return from cath lab:
Norad increased up to 10 overnight (100mcg/ml) with a rising base deficit and oliguria.
ScVO2 60% and peripherally cool. Started on milrinone.
Discussed with cardiologist --> not for surgery.
Went into AF and then VT arrest. 1* DC shock. Converted to broad complex tachycardia with no pulse. Decision made to abandon further attempts at resuscitation considering non-viable myocardium with nil further management options available for reversal.
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Case 65
PC: OHCA

PMHx: none known by wife

Meds:
Was on a cholesterol pill - ran out 6 weeks ago after shifting to Tawa and need to find a new GP

HPC:
Went out for usual run this morning. Came home. Wife heard a crash in the bathroom. Daughter immediately called ambulance. Wife got neighbour. Pulled him out of a corner - blue and slow gaspy breaths - commenced CPR. Ambulance called 06:34, ROSC 07:04 = 30 mins with 7 shocks. 1 further 2 mins of CPR without shock. Tubed following this.

In ED: inferior ST change on ECG. Pulmonary oedema on CXR. To angio - culpirt lesion stented (bare metal stent) mid RCA. Other L sided IHD noted.

Given aspirin 300 and clopidogrel 600 + 5000 u heparin

To ICU:
- small superficial abrasion on top R of head from fall
- no norad requirement
- unsedated and unparalysed for some time in angio without observed movement. Pupils reacting
- peripheral cannulas

Plan:
- Targeted temperature management for 24 hours
- Family meeting

Progress:
Patient has suffered severe brain injury secondary to hypoxia resulting from the cardiac arrest.

A long discussion was had between the family and ICU SMO. The severity of the problem was highlighted.

Extubation occurred at ~0145

Death was certified at 0201
Case 66
20 yr male emergency admission after 777 for collapse in toilet
c/o chest pain and SOB prior to this. Septic emboli on lungs, spleen and kidneys on CT
yesterday. Echo planned.
Unrecordable BP, pulse absent. CPR commenced. Igel inserted. Bolus of adrenaline with
return of consciousness. Self-extubated. Further bolus of adrenalin required twice when
pulse dropped away again.
Bld glucose checked - 1.3 -> 50mls 50% dextrose given.
Started on adrenalin infusion in ICU.
Some agitation - seems to be pain related. c/o chest pain, SOB and upper abdominal pain

Issues:
* Neutropenia (WCC 0.03) and thrombocytopenia (14) post-chemo
* Pulmonary, splenic and renal septic emboli
* PICC line in place
* MRSA on blood cultures - sens to vanc
* Testicular infiltration with pain ++ - - plan for radiation

Background:
Precursor B ALL dx and started rx in Sri Lanka in Dec, but discontinued rx there; came to NZ a
month ago; relapsed
Testicular infiltration - planned for radiation rx
Chemo during this admission
ESBL positive on rectal swab
MRSA on screening
Dexamethasone induced psychosis with chemo in Sri Lanka and in this admission

o/e
A - own initially
B - sats unrecordable, PO2 128 on non-rebreather, good a/e throughout.
C - MAP 58 on 16ml adrenaline
D - responds appropriately to family and examination, distressed with pain and becomes
quite agitated
Abdo: soft, tender epigastric, distended

* Worsening acidosis despite high levels of pressors and fluids
* Deterioration neuro with blown pupil and GCS 3 - mannitol and conc salt given and
intubated

d/w family about events

PLAN:
IVF
pressors
CT head

PROGRESS
Worsening acidosis and shock despite pressors and fluid.
Pupil blown - no response to mannitol or conc salt.
CT scan showed no bleed and no cause for neurological deterioration found.
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Worsening shock in CT - unsupportable. Arrested.
Discussion with family while pt in CT - multi-organ failure. Call from CT during family meeting - patient had arrested and died. Informed family of death.
Case 67
61 y/o female.

Admitted to ward for gr II subarachnoid haemorrhage
Coiled in theatre.

Developed pseudoaneurysm in R) groin, exploration in theatre.

Been on clopidogrel, aspirin and heparin infusion. Dropped GCS and suspected vasospasm today. CT head yesterday showed small frontal lobe intraparenchymal hematoma.

Vomited coffee ground coloured vomit today, suspected GI bleed. Drop in Hb to 93, heparin infusion stopped at 2pm. Dropped in GCS in afternoon. Repeat CT head revealed increasing intraparenchymal hematoma, also bleeding into lat. Ventricles.
After CT scan deteriorated further drop in GCS, unresponsive and extension of upper limbs. Hypertensive 220/120, bradycardic (been bradycardic during hospital stay for several days) D/W Neurosurg. To be intubated, new CT scan to be done.

Upon arrival in ICU deteriorating resp.drive, intubated with propofol, fentanyl and rocuronium without problems.
Hemodynamics stable, with phenylephrine infusion.

Blown L) pupil shortly after intubation. Corrected with conc.salt, mannitol and controlled hyperventilation.
CT scan revealed increased hematoma.

D/W neurosurg team, who will take pt. to theatre for insertion of EVD.

D/W shortly with pt. husband, aware of situation.

Unfortunately replacement of R) frontal EVD was unsuccessful in theatre.

PLAN:
1. stop anticoagulation
2. to remain sedated overnight
3. neurosurgery have said not for further intervention (EVD/decompression)

PROGRESS:
Admitted to ICU intubated.
Neurological deterioration with extensor posturing and fixed pupils.
Extensive discussion between ICU and Neurosurgical team. Not further medical/surgical treatment available.

This was explained to family and decision was made to withdrawal treatment.
**Case 68**
Transferred from Masterton Hospital

**BACKGROUND:**
1. Depression
   - known to psychiatric team
   - currently in respite care
2. Dual chamber pacemaker 2009 for syncope/sinus arrest
3. Smoker
4. heavy EtOH last year

**HISTORY:**
Depression started after move to Greytown 2 years ago. Symptoms worse over last few months. Worsening particularly over the last few weeks. Family have noticed worsening slurring of speech over the last few weeks. Family report 30kg of weight loss over last few months. Has been drowsy and c/o SOB for the last few weeks.

Presented to ED with SOB
- had high flow oxygen
- initial ABG showed CO2 retention, and switched to nasal prongs.
- deteriorated overnight with increasing drowsiness.
- initial CPAP and then intubated and ventilated.
- required noradrenaline to maintain BP
- given ceftriaxone and aciclovir in Masterton

**MEDICATIONS:**
olanzapine 5mg nocte
venlafaxine 75mg od
clonazepam 0.125mg
seretide 125/25 1 puff inh  bd

**EXAM:**
A- intubated
B- Sats 96% ventilated
C - MAP 65 on phenylephrine. HR 100
D - pupils equal and responsive to light, sedated on propofol

**INVESTIGATIONS:**
Urine - barbiturate positive
ethanol nil
paracetamol nil

**ABG:**
0304: pH 7.3, pCO2 84, pO2  41, bicarb 31.9, BE 10.3
0732: pH 7.13, pCO2 137, pO2 79, bicarb 31.9, BE 9.3
1402: pH 7.489, pCO2 39.8, pO2 61.5, bicarb 30, BE 6.4
Hb 137, WCC 13.3 H, neut 11.2, plt 244
Na 144, K 4.4, Cr 43
Mg 0.65 L, Ca (corr) 2.2, PO4 0.79 L
LFT: alb 31, bili 6, ALP 64, ALT 14

ECG: Sinus tachycardia

CXR: pacemaker in situ, nil consolidation,

CT head: nil haemorrhage, nil mass lesions seen (non-contrast scan)

IMP:
1. Decreased level of consciousness, possible due to 2, other
2. Type 2 resp failure - likely underlying COPD given smoking history

Discussed with SMO

PLAN:
1. stop sedation
2. aim sats >90%
3. monitor CO2, aim for normal level

During ICU stay not successfully weaned of ventilator, two extubation trials which failed within minutes, reintubated.

Investigations undertaken regards to pt. muscular weakness and associated type 2 respiratory failure. Did not match criteria for Myasthenia gravis or other treatable condition. ENMG suggested neuromuscular disease. Poor prognosis, no curative treatment available.

Issues discussed with relatives and patient, not for tracheostomy and continued ventilation. Natural death allowed. Pt. extubated which followed by a respiratory arrest within minutes.
Case 69
23 yr female admitted from theatre after failed intubation with hypoxic arrest and hypoxic brain injury
Had been planned for ERCP for known gallstones with recurrent pancreatitis. Known potentially difficult airway with poor mouth opening.
Awake fibre optic intubation, initially going smoothly but when ETT placed, breathing felt difficult to patient. Position of ETT uncertain, so removed. Bagmask ventilation commenced, oxygenation achieved but ventilation not. Rapid drop in sats and LOC. Progressed rapidly to emergency trache by ENT. Difficult trache.
Cardiac arrest. CPR commenced.
Intermittent ROSC during prolonged CPR (25mins). One shock for VT. High doses of adrenaline required with response to adrenaline noted, but not maintained.

Family updated by gastroenterologist during events.
ECHO showed flaccid ventricle, any activity only sustained by high doses of adrenaline.
Tension pneumothorax developed - ICC inserted.
Pupils fixed and dilated.
Brought to ICU to allow family time to say goodbye.

This hospital admission:
Admitted to hospital with gallstone pancreatitis.
Previous ICU admission during this stay when developed LLL consolidation, continuous BIPAP required.

ERCP planned with pediatric scope from Starship as mouth opening poor and adult scope would not pass.
LFTs improved but ERCP plan held as had multiple previous episode of gallstone pancreatitis requiring hospital admissions.
ICU admission had been electively planned for post-ERCP

Background
============
1. Limb girdle muscular dystrophy with associated kyphoscoliosis and respiratory failure - in 2013 FEV1 0.28 FVC 0.30 - usually on home BIPAP overnight + intermittent during day.
   Settings EPAP 4 IPAP 15
2. Thoracic spinal fusion
3. Swallowing difficulties (takes time to eat) but maintaining reasonable weight
4. Previous episodes of gallstone pancreatitis in PNth

o/e
A - emergency trache
B - ventilated FiO2 0.5, PEEP 5
C - 40mls adrenaline ongoing w HR 129

PLAN:
Withdrawal of treatment when family ready
Disconnected from ventilator and adrenalin infusion.
Time of death 14h00
**Case 70**

51 y.o traumatic brain injury

Drinking ETOH in town with family. Came home in taxi intoxicated. Was leaning backwards on fence in balcony. Wife witnessed fall backwards over the balcony. 4m drop onto concrete. When wife got to his side, he was unconscious.


Actions: MV increased to 160% from 100%. PEEP increased to 10, FiO2 increased to 90. Sedation increased and paralysed with rocuronium. Conc salt (23% NaCl) given.

CT head/c-spine/chest/abdo/pelvis

Occipital condyle fracture.
Rib fractures.
Aspiration pneumonitis.

Discussed with Neurosurg:
- unsalvageable, not for surgery

Social hx
electrician
Usually fit and well
Expecting first grand child next week (daughter in Auckland)

Meds
Anti depressant , NKDA

O/E
A+B ETT ASV FIO2 90% PEEP 10 MV 160% sats 93%
C 150/80 HR 68/min SR
D GCS E1V1M1 on Propofol 15mls/hr, rocuronium given at midnight
IDC in situ - draining clear urine
Temp 33.2C
Art line in situ
C-spine collage on

P/
Family meeting with wife: explained that patient has sustained a severe brain injury and will likely die from this.
Aim to keep SBP>65, sats>90%, normothermia >35C
Monitor UO - ensure <200mls/hr
Central line
ABG
Actrapid sliding scale

Admitted to ICU and supportive care was given including placement of CVL and noradrenaline for BP support. Rmained GCS 3 with fixed and dilated pupils. Underwent brain death testing and was declared dead at 10:20am.
Case 71
Admitted following PAR referral for high O2 req.

Out walking 0730s hit by car that failed to stop at pedestrian crossing. Thrown 3-4 metres. Pain + deformity to upper L) arm, thoracic back pain and lac to posterior aspect of head. Conscious, alert and orientated at scene. C-Spine precautions at scene and en route by paramedics.

In ED requiring O2 5L via hudson mask to maintain sats
CT body:
- Displaced left neck of humerus.
- Multiple thoracic vertebral compression fractures of uncertain age.
- Head: NAD, No solid organ injury in the abdomen. No free gas or free fluid.

Underwent closed reduction of left humeral spiral fracture and POP
IV ketamine analgesia for sore left arm
Not complaining of chest pain
Supplemental O2 5L Hudson Mask

BACKGROUND
Prostate Ca - prostatectomy
Previously investigated for SOB
- S/B cardiology
- normal (incomplete) ETT

ALLERGIES
Penicillin/augmentin - diarrhoea
Metoprolol - nausea
NSAIDs - diarrhoea
Gluten/dairy.
Nil anaphylaxis.

SHx - lives in own home in Karori. Independent. Can walk 30-60 minutes. Ex-smoker as 20 year old.

O/E (on admission ICU)
A - own
B - HFNP FIO2 80% RR 20 Sats 95%, flail sternum
C - unsupported BP 115/60, HR 70 sinus
HS dual + ESM radiating to carotids
peripheries warm/perfused
good urine output
D - alert/oriented, GCS 15, PEARL
E - occipital laceration - sutured

Bloods
Hb 133 plt's 219
Coags N
creat 73 Na 137 K 3.9
PLAN
- admit ICU
- NIV/CPAP
- fentanyl PCA
- consider inpt ECHO ?aortic stenosis

PROGRESS
Needed to be placed on CPAP.
Had IDC placed and close monitoring or U.O.
Had progressive deterioration in cognition - fatigued GCS 14.
Poor oral intake - started on NG feeds.
Fractured humerus managed with closed reduction and collar and cuff then plaster cast.

Intubated 14:00 because of increasing respiratory fatigue and support (GCS14). Maintained on propofol.
- had several desaturations and required FiO2 - 100%
Tracheostomy replaced ETT after 3d

CVL inserted - started on Noradrenaline.

Hb dropped to 70 - transfused.

Deteriorated next day
- hypoxia and tachycardia and febrile: Sepsis - likely chest source.
- started on IV ABx
- required high level or respiratory support.
- cultures grew staph aureus.
- likely ventilator associated pneumonia

Developed rapid AF
- started on Amiodarone and digoxin

Had several episodes of haemoptysis - thought to be due to pulmonary contusions/haemorrhage.
Had ECHO - possible R side PV endocarditis

Continued to deteriorate despite IVABx, and cardio-respiratory support.
Discussed with family who were in agreement about starting end of life cares.
Tracheostomy decanulated.
Patient died within 1 hour following this.
Case 72
Admitted 6/7 ago for Abdo pain
2 x MET call in the last 2/7 days. For tachycardia, tachypnoea, hypotension. Likely sepsis ?Source.

Course in hospital:
Abdo pain with distension. CT (with contrast) showed (verbal report): small lesions in liver ?abscess ?lymphoma with swelling of the pancreatic head. Moderate free fluid. No obvious obstruction.
Reviewed by surgical reg who felt there was no obvious surgical cause
Also worsening AKI .
Became more tachypnoeic on ward and hypotensive. MET call put out.

PMHx:
Diffuse Large B Cell lymphoma on R-CHOP last cycle 16/7 ago.
Previous NSTEMI + Stent (Now asymptomatic)
Echo 2013 - good LV Fx EF 71% with no valvular pathology.
HTN
Paraneoplastic Hypercalcaemia
Hospitalised post cycle three with fever of uncertain source; resolved.
Hospitalised post-cycle 4 RCHOP with severe PCP pneumonia requiring three week admission.

Rx:
Aspirin EC 100mg
ISMN 60mg OD
Atorvastatin 40mg
Omeprazole 40mg od
Co-trimoxazole 480mg bd
Beclomethasone Nasal Spray
Vannair inhaler bd
Tazocin 4.5g IV qid
Metronidazole 500mg bd
Lactulose 20mg bd

SHx:
Lives with wife. Independent with ADL’s
Farmer- was working prior to Dx of lymphoma.
Smoker 30 pack year Hx.

A: Own
B: Tachypnoeic 40. 6L Face mask sats 96%. Exp Wheeze throughout chest.
C: SR 120bpm. BP 70/40
D: patient is confused not orientated to time/place.

Imp:
1) Septic Shock ? Source - likely chest due to High RR and exp wheeze. CXR possibly LLL pneumonia.
2) AKI Cr 153 from 80
3) Acute hepatitis ?cause (Hep C + B serology sent+ HIV) with lesions seen in liver.
4) Acute delirium.
5) Metabolic acidosis secondary AKI + hypoperfusion.
6) ?DIC low platelets, increased INR

Plan:
1) Art Line and vasopressors target MAP > 65
2) chase cultures and serology.
3) Continue Abx
4) NBM and surgical team will RV mane.
5) Fluid boluses as required.
6) High flow nasal prongs.

PROGRESS
Sudden drop in GCS to E4V1M5. Sats unrecordable.
Rapidly intubated and ventilated. Profound unsupportable shock developed despite 10ml adrenaline and 40mls norad.
Worsening renal failure.
Plan to CT head looking for cause of altered GCS but too unstable for transport.
Discussion with family re profound deterioration - family present when patient passed away shortly after onset of deterioration.
**Case 73**

**Background:**
1. ESRF 2' ANCA+ve glomerulonephritis on haemodialysis - admitted to hospital with symptomatic postural hypotension + diarrhoea + raised CRP
2. rash widespread since starting haemodialysis - worsening with peeling, red and tender - likely Steven Johnson syndrome likely 2' to heparin
3. sepsis, staph epidermidis on blood culture - tunnel line removed and reinsertion on 2d later - on Vancomycin
4. chronic diarrhoea - ? Cause
5. malnutrition

**PMHx:**
ESRF as above
HTN
severe GORD
obese
hyperlipidaemia
previous endometriosis

**O/E:**
Alert
Uncomfortable, in pain
Spo2 98% RA RR 17/min, poor air entry, nil obvious creps to hear
HR 130/min BP 88/54
HS normal
abdomen soft
widespread skin rash with peeling

**Plan:**
Start CVVHD, slow fluid removal if tolerate then increase fluid removal
Continue antibiotics
NO HEPARIN or ALCOHOL Swabs
TPN
Analgesia
skin care as per dermatology (fatty cream)

**Issues and progress:**
Staph epi line sepsis -> vanc as per ID
Worsening shock
Left lower lobe PE -> bivalirudin
Resp failure requiring intubation
ESRF on RRT -> problems with filter clotting as unable to use heparin anticoagulation;
predilution helping somewhat
Steven Johnson syndrome from heparin
Worsening lactic acidosis
Treatment capped

Dying despite full icu level support.
Dw with Family and allowed to die peacefully.
Case 74
Admitted following MET call with LOC

Hx:
Fell around 12 midnight, slipped and knocked head on window, reported this to nursing staff and had hourly neuro observation with nil concerns
6am sitting on the toilet, staff in attendance, became unconscious and apnoeic.
MET call put out.
GCS 3/15, pupils left mildly dilated not reactive
Hypoxic requiring BMV to SpO2 96% on 15L O2
Hypertensive 200/103 HR 78/min
Transferred to ICU and intubated and transferred to CT for scan

CT head: SDH with 13mm midline shift

Background:
Asthma
Previous spontaneous left pneumothorax
HTN
Type II DM on metformin
Hypercholesterolaemia
BPH

Meds:
finasteride
doxazosin
paracetamol
metformin
atorvastatin
omeprazole

O/E:
A; intubated
B: SpO2 100% on 35% Fio2 5PEEP
   chest clear
C; MAP > 80 HR 90/min
D; sedated on propofol

Plan:
D/W and seen by neurosurgeon - for OT
maintain MAP> 80
Keep sedated

PROGRESS
Limited improvement following SDH evacuation.
Extubated/reintubated for desaturation following vomiting.
On methylprednisolone following biopsies (in case of steroid responsive disease process). No improvement.
Extubated and reintubated again for decreased GCS and respiratory failure.

Given worsening respiratory function due to neurological decline, after discussions with family and patient palliative approach taken.
Died at 0645.
Case 75
83y Male

Emergency admission following L laparoscopic adrenalectomy complicated by Coeliac axis and SMA laceration requiring laparotomy, ligation and bypass graft, and abdomen left open with vac dressing for relook tomorrow.

Easy intubation, top dentures. Intra-op ~1130 sudden 1.5-2L blood loss. Given 2U RBC. 4.2L crystalloid. Clips placed and adrenalectomy completed. Vascular called to assist, Celiac axis and SMA were clamped -> ligated. Bypass from aorta to SMA with second skip graft. Gen surg called and assessed bowel to be dusky in segment but viable, closed with bogata bag and vac. No packs inside.

Background:
Renal cell Ca - previous R nephrectomy and R adrenalectomy
- new L adrenal mass on f/u -> for OT
AF on warfarin - INR 1.2 pre op
HTN
Polio as child - nil deficit
Previous melanoma
Ex tolerance >2 flight of stairs, active (bowls, gardens, sole carer for wife who is ill)
Preop creat 114

Endocrine consulted pre-op. Given 100mg hydrocortisone on induction. For 50mg Q6H while NBM. Then 20mg mane, 10mg midday and 4pm. Fludrocortisone 100micrograms once drinking. To see on ward as inpatient post op

OE
A - ETT 8.0. Easy BVM and intubation
B - Bilat AE. Saturating well on ASV, 100%, PEEP 5, FiO2 0.3
C - HR 90-100 AF. Freq PVC's. BP 90/65 - MAP 70 on Norad 8ml/hr, warm periph.
D - Sedated on prop 20ml/hr
E - Temp 36.2

Abdo - vac dressing over open abdo. Small drainage.
IDC. CVL. Artline.
ABG on arrival - BSL 3.9, K 6.4

Plan:
-Remain intubated for re look tomorrow ?bowel ischemia
-IV hydrocort as per above
-Monitor BSL and D50 now
-Calcium
-IVF + norad for MAP 65
-Monitor K ?dialysis
-Liaise with Urology and Gen surg regarding plans for return to OT if worsening acidosis/lactate & ?reverse coagulopathy
-Update family
-Abx per surgeons
Patient remained in a critical state with shock, hypoxia, severe acidosis despite dialysis, an ongoing transfusion requirement due to GI bleeding, hypoglycaemia and frequent arrhythmias.

A family meeting was held a few hours after admission to explain the severity of his condition.

He returned to theatre 6/06 and necrotic right colon and caecum was excised. The spleen appeared dusky but the stomach, small bowel and liver all appeared viable. The aorta to SMA grafts were patent.

He deteriorated further despite resection of the necrotic bowel. A meeting was held with family to explain the futility of continuing to provide active treatment. They agreed to withdraw active treatment and he died soon after supports were withdrawn.
Case 76
Admitted following transfer from Wairau Hospital with severe sepsis and MOF ?source (on background immunosuppression from steroid Rx for autoimmune hepatitis)

2-3 day history of feeling generally unwell, with watery diarrhoea and abdominal discomfort. Developed rash over right leg. Over same period increasingly breathless with minimally productive cough.

CXR unremarkable.
Severe progressive metabolic acidosis.
Acute renal injury creat 139
Raised inflam markers CRP 200 plts 57 WCC 3.5
Deranged LFTs and INR 1.8 (note background autoimmune hepatitis)

In ED progressively shocked
- given total 5L IVF.
- noradrenaline started right brach art line, LJ CVL
- AF -> digoxin
- IV ceftriaxone/flucloxacillin
- Oligo/anuria.
- Low grade temps 37.7

Referred to WRH for CVVH/ICU support.

On arrival of flight team in Blenheim pt clinically appearing severely fatigued. RR 45, sats 95% on 2L NP02. Looking very tired.
Initial ABG pH 7.31 pCO2 21 pO2 65 HCO3 10 BE -14
on arrival pH 7.11 pCO2 28 pO2 65 HCO3 9 BE -20

Decision made to intubate.
RSI propofol/fentanyl/rocuronium
Transient hypotension requiring noradrenaline bolusing during intubation
ETT right mainstem, withdrawn 2cm 23 -> 21cm
Transfer/flight uneventful.

BACKGROUND
Autoimmune hepatitis - on steroid treatment
Haemochromatosis
HTN
Prev perf bowel during flexi sigi 1900s
Back pain
Glandular fever 1995

MEDS
Pantoprazole
CaCO3
Metoprolol
Fosamax
Prednisone
Ceftriaxone
Flucloxacillin
SHx - lives with Husband in Blenheim. Independent. ?smoker

PLAN
- repeat ABG/bloods
- CVVHDF
- continue IV Abs
- consider imaging
- repeat cultures
- CXR post vas cath

PROGRESS
Patient remained unstable, with worsening metabolic acidosis despite continuous veno-venous haemodiafiltration and increasing ventilatory supports.

Surgical team were consulted 0320hrs - Patient was quite unstable, therefore was unsuitable for surgery, but would consider it if patient stabilises.

Similar opinion from orthopaedics, deemed severe cellulitis. Current management with antibiotics, resuscitation appropriate.

Achieved maximal vasopressive, ventilatory therapy overnight. Family were informed about poor prognosis, and patient may not survive prior to their attendance

Patient passed away peacefully 0932hrs.
Case 77
Admitted following transfer from Blenheim hospital with SAH secondary to right MCA aneurysm

1930hrs collapse at home in presence of carer, with faecal and urinary incontinence and emesis. No seizure activity. On arrival of ambulance assessed as GCS 6. Brought to ED.

On arrival in ED GCS 8 - E2 V1 M5

CT head revealed right cerebral bleed with extensive subarachnoid blood, with blood in basal cistern and 5mm MLS.
Subsequent CTA showed right MCA aneurysm.

BACKGROUND
Intellectual disability
- lives with caregiver (who is also her Aunt)
- non-verbal but makes non-verbal noises
- mobilises independently
Otherwise well

MEDS
Nil, ?allergies

O/E
A - ETT size 7.5 24cm at lips.
B - SIMV Vt 500ml RR 15 FIO2 .5, chest clear.
C - MAP 75, HR 60 – sinus, BP unsupported, No nimodipine as BP borderline
D - sedated with propofol 25ml/hr, PEARL 2mm
E - RIJ CVL, Peripheral IVC

Bloods - pending

PLAN
- CXR
- bloods
- art line
- remain sedated pending N/S review

The attempt to coil the aneurysm had to be abandoned as the morphology was not conducive to endovascular treatment, so subsequently patient went to theatre for clipping. Unfortunately the aneurysm ruptured intraoperatively, requiring prolonged clipping of the proximal MCA. This resulted in a large infarction in the right MCA territory (CT) and a midline shift of 1 cm to the left. No flow was seen in right frontal M3 MCA.
The family were spoken to about the prognosis and expressed their wish for palliation and organ donation.

Patient declared brain dead at 16:10hrs.
Case 78
Elective admission following 2-vessel CABG

Background:
1) NSTEMI 2005 - BMS to LAD + IR(2 grafts)
2) Angina 2012 - LAD/IR restented (occlusion)
3) Ulcerative colitis - colectomy + Stoma

HPC: Progressive increasing angina frequency (to daily). Recent angio showed diffuse LAD disease, LCX intermediate occlusion, +ve ETT. Listed for elective surgery.

Colchicine for acute gout 29/5/14. Caused high stoma outputs, resultant acute renal impairment (Cr 85 --> 155)

OP: CABGx2
LIMA to LAD, Left radial to RI
CPB: 58min
Had some protamine for slightly abnormal TEG as coming off bypass

ICU admission:
A- ETT
B- FiO2 0.45. Sats 99%
D- Pupils equal and reactive

Warm peripheries. Cap refill 3s

Plan: CXR
Bloods
Pressors if required

PROGRESS
Patient extubated at 2345 3/4/14
Started complaining of central chest pain similar to his usual angina around 1am, felt nauseated and vomited then collapsed and started having agonal breathing with likely PEA arrest

Trial of pacing which was not successful, CPR commenced promptly. Emergency sternotomy performed. Minimal blood noted, internal cardiac massage commenced. Adrenaline boluses were given which then changed to an infusion with noradrenaline infusion running concurrently were being administered while sternotomy and cardiac massage was performed.

There was a brief return of cardiac contraction with marginal output but then developed VF arrest which was not reverted with 2x shock.

Cardiothoracic team in attendance, resuscitation discontinued in view of likely occluded coronary grafts with poor outcome.

Time of death 1:40am.
Case 79
ADMITTED FROM OT: R DECOMPRESSIVE CRANIECTOMY + EVAC SUBDURAL (sec BLEEDING AV FISTULA R OCCIPUT)

HPC:
Admitted Hawkes Bay Hospital with 5/7 hx headache, 1/7 dizziness and blurred vision, nausea. Subsequent loss of vision (L homonymous hemianopia)
CT Head: R Occipital AVM
Transferred to Wgtn same day.

Left ward to smoke, on return collapsed, was agitated then deteriorated to GCS 3, R pupil dilated. Intubated during MET call (Grade 2B, suboptimal positioning) and given mannitol with no improvement. CT showed large intraparenchymal haemorrhage surrounding AVM with marked midline shift and uncal herniation.

OT: Large R craniectomy and evacuation of subdural. No active bleeding seen from AVM.

PMHx:
Asthma - multiple admissions
Chronic back pain

Meds:
Salbutamol
Seretide

SOC Hx:
Beneficiary/tattoo artist/seasonal orchard worker
Smoker
Lives with partner

O/E:
NEURO: Sedated on propofol, good cough on suctioning. R pupil 5mm, L pupil 2mm
CVS: Sinus 87/min, BP 140-180 systolic, HS dual, nil added
RESP: Good A/E throughout, wheeze RLZ, PEEP 5, FiO2 40%, sats 98%
GIT: Abdo soft
RENAL: Large volume dilute urine

PLAN:
Keep sedated overnight
For angio +/- coiling mane
Systolic BP <140 as per neuro

PROGRESS
Patient went for angio and embolisation next day 11am, GCS 3 on propofol sedation, pupils 3- R and 2+ left.

On return from angio at 1900 L pupil dilated and became unreactive within 30min. Given 20mls conc saline (only had peripheral access) and increased minVol% for pCO2 ~36. Required metaraminol infusion for BP.
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

Taken for urgent CT head which showed further bleeding, marked oedema and hydrocephalus. Taken to OT after CT for EVD insertion.

Overnight both pupils became fixed and dilated. GCS remained 3. Brain stem death testing confirmed brain death at 1440 following day.
Case 80
Admission from ED post Hanging and PEA arrest


In ED:
NG placed. CXR ETT + NG satisfactory.
Sedated with propofol.
Pupils 3mm mildly reactive
In fast AF - single 150J synched shock - reversion to sinus
Hypothermic (33.8)
IDC inserted

CT head/neck: Unremarkable

PMHx
Seronegative A with chronic left ankle synovitis
Vasculitic leg ulcers with histology showing vasculitis
- previous treatment with cyclosporin
- SSG 2011
- admission Nov 2013 treated with IVABx, debridement and IVlg
Inflammatory papules on feet since 2002 with low grade vasculitis or panniculitis on biopsy
Osteoporosis
Bipolar - previous mania precipitated by steroids. Manic episode 5/12 post partum. Ongoing anxiety last couple of months

Meds
Etanercept weekly injection
Voltaren SR 75mg BD
Haloperidol 1.5mg nocte ?? Still takes
Quetiapine 200mg nocte
Paracetamol
Methotrexate ?dose
Folic Acid

O/E
A. ETT size 8, 22cm at teeth
B. ASV 120%, PEEP 5, FiO2 0.8, Sats 99%
C. P 70, BP 103/88 No support. Sinus
D. Pupils 3mm reactive. Occasional myoclonus
Abdo soft.
Bruising to anterior thighs from injury 1 week ago
Bandaged legs secondary to leg ulcers
Neck not significantly swollen

Family (parents) updated regarding severity of situation and plan from now. Husband at home with 1 y.o. child.
Imp: Hanging with PEA arrest - poor prognosis

Plan:
Sedation for 24-48 hours
Temperature control
Started on targeted temperature management, aiming Temp of 36°C - temperature labile.
Myoclonic jerks noted throughout evening and the next day.
On ward round on the 26/5/14: spontaneously breathing 30/min and doll’s eye reflex present but no cough/gag/corneal reflexes present.
Deemed at WR by SMO to most likely spont breathe for > 1hr after extubation therefore not for DCD.

Case 81
63 y.o re-admission
post stem cell transplant day 6 - requiring CVVH for AKI

In ICU at day 1 following SCT with fluid overload/TRALI. Treated with frusemide and HFNP.
Amiodarone loaded for AF.
Developed AKI. Cyclosporin dose reduced once developed AKI

In Ward
Worsening AKI. K 6.3,
Seen by renal team on the 20/5/14 who planned on starting on intermittent dialysis over the
next 24h
Platelets 11 Hb 85 WCC 0.02
INR 1.2, APTT 35, Fibrinogen 7.2

PMHx:
1) AML
   - Dx 2013, Chemo complicated by acute sepsis (ICU admission)
2) paroxysmal AF
3) natal cleft wound - now healed
4) Normal echo 2013. MUGA 2014 LVEF 63%
5) R upper limb DVT - completed course clexane
6) Right internal jugular vein thrombosis, 2014
7) few very small pulmonary emboli in 2014

Meds:
Fluconazole 200mg OD
Losec 40mg OD
Metoprolol CR 47.5mg OD nocte
Metoprolol CR 23.75mg OD mane
Metoclopramide 10mg QID
Acyclovir 400mg BD
Ondansetron 8mg BD
Cyclosporin as per level
Vitamin K 10mg 2x/week Mon+Thu
Nystatin 1ml QDS
Calcium resonium
Laxsol

O/E
A+B     NP sats 98%
C  119/73 HR 87/min SR On monitor
D    GCS 15
Renal: UO 30mls/hr
Creat 68---> 500
BE-8, pH 7.33 pCO2 30 HCO3 15

PLAN
2 u platelets (platelets 11) then insert vascath -> start CVVH
Bloods/ECG
PROGRESS
AKI --> started on CVVH [given 2 units of platelets prior to vascath insertion]
Fast AF - started on regular amiodarone + continued on usual metoprolol.

Developed fevers [neutropenic sepsis]. Klebsiella pneumonia (despite being on prophylactic Cefuroxime and bacteria sensitive to Cef) in blood cultures and urine. Started on Tazocin.

Seen by haem team: cyclospoin dose adjusted based on levels. Weekly intragram started.

New positive blood cultures on 26th:
gram neg bacilli
gram pos cocci resembling staph & strep, covered by tazocin

Sadly, being in neutropenic septic shock, we reached the maximal therapy on Noradrenaline and Vasopressin and her respiratory failure and acidosis deteriorated despite being on CVVHDF. So in consent with the family we withdrew therapy.

She died at 16:45pm.
Case 82
66y.o. male

ICU level admission for respiratory failure secondary to pneumonia

BG
asthma - on inhalers
depression
renal colic

PROBLEM
unwell for several days
saw GP, started amoxil + roxi same day
deteriorated and admitted to Nelson hospital
bilateral pneumonia on CXR
treatment with ceftriaxone / roxithromycin / metronidazole
IV hydrocortisone
respiratory distress on ward (sats < 88% despite high flow O2)
=> ICU on BiPAP
unable to tolerate and decision to intubate and sedate
requiring small amounts of noradrenaline for MAP > 65
referred to WLG with deteriorating condition

FLIGHT TEAM
arrived with patient requiring 20ml/hr propofol + fentanyl infusion for sedation
(dyssynchrony issue)
intubated
ASV @ 140%, FiO2 0.60, PEEP 18 sats 94%
0.1mg/ml noradrenaline at 2ml/hr
- maintaining MAP of 70
swallowing against tube

ACTIONS
paralysis
change to transport vent
SIMV with 18 breaths/min, PEEP 18, 500ml TV
unchanged respiratory state
- in fact, slight improvement on gas with pCO2 falling < 100
transported on propofol, norad and fentanyl
boluses of rocuronium for paralysis
sea level pressurisation, long roll out, priority landing

ON ADMISSION TO UNIT
transferred to ICU bed
ICU ventilator suffered disconnection on vent side
desaturated to 75% and bagged easily back to >90% using 15L/min oxygen and 20cm PEEP
periods of desaturation very brief, no difficulty in airway / breathing management and no
further concerns
ventilator checked and functioning perfectly on 3rd try

OUTSTANDING ISSUES
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1. right femoral central line needs changing to neck line
2. flu swab and isolation
3. antibiotic choice

PLAN
CXR
change central line
monitor gases
continue current IVAB regime until AM ward round

PROGRESS
Influenza A +ve.
Completed 7 days ceftriaxone.
Developed acute kidney injury.
Nursed prone. Intermittently paralysed.
Trialed on iloprost.
CRRT commenced.
Episode of VT next day, reverted with 1X200J DC shock. Loaded with amiodarone.
Transfused RBCs.
Poor progress.
Significant deterioration d5. On maximum dose NA 30ml.hr, requiring 100% O2 + poor saturations.
Discussion with family re: poor prognosis. Recommended withdrawal of life supportive measures, but continue full supportive cares. All in agreement.
Life support withdrawn.
Case 83
Emergency retrieval from Palmerston North ED with type A aortic dissection.

Background:
1) Hypertension
2) Vasculitis causing cerebral haemorrhages 2007 - treated conservatively
3) DVT right leg 2008
4) Traumatic brain injury 1995
5) Previous steroid induced psychosis

HPC:
Was sitting in chair reading a book, suddenly collapsed. Wife concerned about cardiac arrest and started 'thumping' at his chest.
Roused spontaneously, wife called ambulance. Initially, was reporting visual loss, which improved, but had residual tingling in arms and legs.

Transferred to P.North ED. Appeared pale, clammy, systolic BP 55/35. Alert, orientated. BP improved to 78 systolic with fluids(4L fluid total)

Bedside U/S showed 4cm abdominal aorta. CT showed ruptured ascending aorta with cardiac tamponade/pericardial effusion.

Case discussed with cardiothoracics in Wellington, and urgent transfer organised.

On arrival of flight team,
A- own
B- RR 38-42.sats 88-93
C-BP 78/45.P88-120. Capillary refill 3-4s
D- Confused, agitated at times but directable.
Tender epigastrium

Hb 144,Plt 178. WCC 15.7,Cr 137.
ALT233,GGT 141,AST 259

Similar obs during flight. On arrival, cardiothoracic/theatre team in attendance and urgent surgery planned.

Plan: Urgent bloods,X-Match
Review post-surgery

PROGRESS
Progressive deterioration post-op:
Worsening shock and acidosis despite crystalloid and colloid fluid boluses, noradrenaline up to 30ml/hr and vasopressin.
Commenced on CVVHDF with fluid exchanges up to three litres but acidosis worsened to pH 7.10 with BE -16.

It was felt that this was most likely related to ischaemic gut and that ongoing treatment was futile.
After discussion with his wife and daughters dialysis was stopped and the patient was extubated and vasopressor support discontinued. He died soon after.
**Case 84**

PC: Multitrauma from Nelson

**Background:** Previously well. Allergic to cashew nuts

**HPC:** motorcycle at 100 km/hr, clipped car, down a bank ~ 12:40. Very damaged crash helmet. Wearing leathers

**Progress:**
* GCS 3 at scene. Tubed at scene after brief loss of output ?cause
* Choppered to Nelson
* Fast +ive -> pan-CT
* L and R chest drains
* Trauma laparotomy - nil significant found
* Ortho surgery to L wrist - x-fix
* In Nelson ICU for last 24 hrs - transferred given possibly severe TBI
* Products - 4 (?5) units RBC, 2 FFP, 2 * conc albumin

**Injuries:**
* TBI: DAI with petechial haemorrhage. A little blood in the sylvian fissure
* ?C1/C2 subluxation and angulation - notes question significant of radiological findings.
* L chest: haemopneumothorax. Marked upper lobe contusion. 2nd rib two fractures. Fractures of 3 - 5. No flail reported
* R chest: pneumothorax. Mild upper contusion. Costochondral dislocation ribs 2 - 6
* ?L diaphragm injury - intra operatively "boggy" with free fluid in abdomen and no abdominal leak found. No tear palpated on laparotomy
* Pneumomediastinum
* Extensive surgical emphysema, R > L
* L clavicle # 2 sites
* L scapula #
* Compound # L wrist - external fixation + flucloxacillin
* #/dislocation L elbow treated with immobilisation
* CT suggested mild contained liver and L kidney contusions
* R knee - swollen -> later xray --> flattened medial distal femoral condyle (?impaction injury)

**OE:** On transfer:
A - ETT 22 at teeth (pulled back from 26 in ED yesterday)
B - FiO2 50, PEEP 8, with PaO2 ~100
C - MAP ~ 80, pulse ~ 90 (trending down from 120 today), on Norad 12, pH improved from 7.1 post-op yesterday to 7.44 today
D - not assessed. Propofol 20, fentanyl 120 mcg/hr, coughing noted yesterday, pupils 3 mm sluggish
Renal - eGFR 85, 7 litres positive yesterday, good urine output
Bloods - INR 1.6. Hb 110
Infection - afebrile, raised WBC, on fluxclox
Lines - R femoral CVL inserted in ED. 2 * R arm peripherals. R art line

**Plan**
* Neuro assessment
* Tertiary survey
* Ortho also aware
Operations:
Day 2 L wrist washout
Day 7 L wrist washout
Day 8 IVC filter insertion (suspected small PE, high risk, unable to anticoagulate due to intracranial bleed, unstable ventilation)
Day 15 ORIF L clavicle/ elbow/ radius
Day 16 MRI head + split skin graft L arm

Other significant events:
C-spine cleared by orthopedics
Staph aureus Pneumonia -> Erythromycin & Flucloxacillin started, staph aureus in L arm wound -> repeated wash outs
GCS dropped to 3/15
Large Pneumothorax post CVL -> drained
  Tracheostomy
  CT head: new bleed in R frontal area

L chest drain reinserted due to recollection of pneumothorax, surgical emphysema

Day 14 Chest drain removed

MRI head showed diffuse axonal injury. OT for split skin graft - after return from OT, acute desaturation with complete collapse L lung, unable to recruit, bronchoscopy revealed adherent white fibrin

Day 17: back on DTI

Repeat bronchoscopy with respiratory physician showed L bronchial tear, close to carina, chest drain insertion L side attempted - not possible due to heart abutting chest wall.

Day 23: acute deterioration, marked hypoxia with persistant complete L lung collapse
  - d/w Interventional Resp, Auckland, not for stenting
  - no surgical option available
  - Prolonged desaturation
  - Discussed with family - given further hypoxic injury on top of existing brain injury, poor neurological progress and prognosis => for palliation
  - Extubated 15:15 with family present.
  - Time of death 15:20
Case 85
71 y.o readmit to ICU post MET call with decreased GCS

Infective endocarditis. Post op mitral valve replacement day 17. Discharged from ICU. Prolonged ICU stay with slow wean after cardiac surgery/AKI/staph aureus septicaemia - remains on flucloxacillin.

In ward:
AKI - being dialysed on alternate days
Persistent drowsiness and confusion in ward,
CT: Recent embolic shower. An area of low attenuation in the right basal ganglia is in keeping with this as are other more subtle areas within the brain. There is no intracranial haemorrhage or mass.
On Warfarin INR 2.8 today

At MET call:
A+B unable to protect airway but maintaining sats 99% on 15L via HM
   vomited *1 just prior to MET call activated
C     Hypertensive 170/100 HR 100/min SR but flicking into AF at times
D    GCS E1V1M5 (withdrew to pain in R arm), pupils R and L 3mm R less reactive than L. L = sluggish
   BSL 7.8, K 3.5

Brought to ICU:
Intubated and ventilated [anaesthetic registrar called for airway assistance]
Drugs: Fentanyl 100mcg, Propofol 100mg, Suxamethonium 100mg
Airway : video laryngoscope Grade 1 view, ETT size 8 at 22cm at lips
   CXR ETT satisfactory position
Placed on ASV, FiO2 30% PEEP 5 MV 100%
Required 4mg of metaraminol in 4 small boluses post intubation
Noted to have labile BP

Taken to CT:
Left basal ganglia bleed with extension into the ventricles causing hydrocephalus and midline shift to the right. This is most in keeping with an acute hypertensive haemorrhage.

INR 2.8 this morning. Prothrombinex 25 IU/kg and 2 u FFP given. Repeat coags done.

ICU SMO discussed CT findings with family and explained high risk of death. Also explained high likelihood of impaired functioning in the long term, no matter what is done.
Neurosurgeons contacted --> family have opted for EVD.

PLAN
OT for EVD

Blood gas at MET call (venous)
pH 7.44, pCO2 38, pO2 119, HCO3 25, sats 99%
Na 139 K 2.8 but later 3.5 post suxamethonium
Lactate 1

PROGRESS
Readmitted to ICU after suffering from massive intracerebral bleed and after having EVD inserted. Sadly the intracerebral bleed was unsurvivable and patient passed away at 11:10am.

Rest in peace.

Case 86
Admitted following transfer from Masterton emergency department with severe sepsis and multi-organ failure ?meningococcaemia

24h history of vague illness - generally unwell, tired, dizzy. Also diarrhoea and vomiting. No blood. Saw GP day before admission who started norfloxacin for ?UTI

Presented to hospital 0400hrs as husband concerned about lethargy and rapid breathing.

Hypotensive on presentation to Masterton - fluid resuscitation with total 6L crystalloid. Noted to have differential blood pressure between arms. Also progressive hypoxia managing 90% sats on 10L O2 via non-rebreather.

Concerns about potential PE or aortic dissection. Taken for CT chest abdo: verbal report from radiologist - negative study.

Developed fevers 38.5

Progressive deterioration with multi-organ failure and DIC: deteriorating respiratory function requiring intubation/ventilation worsening shock requiring noradrenaline up to 30ml/hr acute renal failure with eventual anuria severe coagulopathy with widespread purpura and haematuria GCS remained 15 and oriented until time of intubation.

Treated with IV cefuroxime, metronidazole and ciprofloxacin

BACKGROUND
Previous splenectomy secondary to trauma ?in 20s

SHx - lives in Masterton with Husband

On arrival of flight team:
A + B - I+V size 7.5 FIO2 100% PEEP 15 PS 15 PaO2 450mmHg pCO2 35 C - noradrenaline 30ml/hr, peripherally cool, mottled, weak pulses, HR 150 ?A flutter D - sedated porpofol 20ml/hr CXR -> right mainstem intubation

Placed femoral central line
-> given 300mg amiodarone over 10 minutes
HR settled to 120 sinus tachy
Transfer uneventful.

On arrival in Wellington;
A - ETT 7.5 22cm at teeth (withdrawn since last Masterton XR)
B - ASV 100% FIO2 .6 PEEP 10
C - noradrenaline at 12ml/hr
   peripherally cool/mottled/shut down
D - propofol 20ml/hr

PLAN
- ABG
- bloods
- RIJ vascath
- CRRT
- continue IV Abs
- repeat cultures

PROGRESS
Despite maximal inotropic support (Adrenaline, Vasopression, Milrinone and Noradrenaline),
condition deteriorated further.
We discussed the fatal diagnosis in a family meeting and the decision to palliate was made in
agreement with the family and treatment was withdrawn.

Died at 09:33.
May she rest in peace.
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Case 87
83 Female, Admitted from ED with community VF arrest

Background:
TIA 2012
Epilepsy
HTN
OA
HxPC
Previously well, independent. Was at home with husband and son when they heard her cry out, found her unresponsive, making gurgling noises.

Ambulance called 0812am. CPR started by son within 2-3 minutes of collapse. Ambulance arrived after 9 minutes, shocked x1 for VF and given 1mg adrenaline and further 9min CPR before ROSC. Total downtime 20min.

Intubated with ambulance. Reported to be difficult airway, suctioned out 2 large pills (usual meds) from oro/hypopharynx. Required 3 attempts. Grade 2 and bougie required.

Given 2L IVF in ED but not required further BP support.

Meds:
Aspirin
Topiramate
?Cilazapril or simvastatin
Multivitamins
NKDA

OE
A - ETT 7.0, 22cm lips
B - ASV 100%, PEEP 5, FiO2 0.5, bilat AE
C - HR 80 SR with PAC’s, BP 100-140 systolic, well perfused
D - on 10ml propofol, pupils 2mm bilat, no eye opening, withdrawing to pain
E - Temp 35

ECG ST elevation 1mm lead III, widespread ST depression elsewhere
CXR clear lung fields, ETT position good
CT head no IC bleed

Imp - Comm VF arrest ?MI ?primary arrhythmia

Plan:
TTM aim 36, cool if required
Propofol as required for tube tolerance
Discussed with cardiology. Not for acute PCI/thrombolysis. For aspirin/clopidogrel loading, clexane to be considered. They will arrange an ECHO. Serial troponins as requested by cardiology

PROGRESS
Input from Cardiology. Treated with therapeutic enoxaparin, clopidogrel and aspirin.
Cooled to normothermia for 24 hours. On desedation, had several seizures. Baseline seizure disorder normally quite well controlled. Phenytoin added. Neurology input thought was likely due to cardiac arrest rather than underlying seizure disorder. Developed worsening BP with dynamic ST changes - likely cardiogenic shock. Changed to care with palliative intent. Deceased at 11:35.
Case 88
69yr old male, transferred from Wanganui with sepsis ?source ?gastro/chest/vascath associated.

BACKGROUND
ESRF - HD Mon/Wed/Fri at Palmerston
T2DM
AF - not on warfarin
IHD - prev MI '00 and '01
Myeloma
Gout
Right lung lobectomy (aged 30)
Laparotomy 2012 for SBO secondary to adhesions from CAPD - loop ileostomy - reversed

Recent ICU admission with RLL pneumonia and sepsis - ventilated (189hrs), discharged to P Nth after 10 days, later discharged home

HPc:
1/52 history of loose stools up to 3x daily. Settled since admission. 1/7 lethargy, cough and green sputum. Episode of syncope while wife dressing him 12/5/14. Presented to hospital, hypotensive (SBP 50-70). Given IVF 750ml. Drowsy since admission, some improvement with noradrenaline.
Was due dialysis 12/5. Creat 813, urea 17.7, K 5.7 Temp 37.3 WCC 11 on admission. Blood culture gram +ve rods.
Serial troponin rise from 0.3 -> 3.65.
ABG pH 7.13 pCO2 56.6 pO2 72.5 HCO3 18 BE -9.6
CXR - clear on admission, repeat increased opacification
ECG AF, rate 96

MEDS (NKDA)
omeprazole
digoxin
atorvastatin
aspirin
vitamin C
multivitamin
NEW
tazocin
noradrenaline

On arrival of flight team:
A - own
B - RR 14 sats 93% on 2L NP
   reduced A/E right mid-lower zones
C - HR 104 BP 73/38 on 27 ml/hr noradrenaline (60mcg/ml), loud systolic murmur
D - GCS 14-15, temp 37.8 abdo soft, non-tender

In transit
Relatively stable. Dropped sats to 85%. O2 uptitrated to facemask O2 8l/min to maintain sats > 92%. BP maintained MAP > 70 on 18ml/hr noradrenaline (100mcg/ml)
Jerking movements in shoulders noted with upward gaze in flight, fluctuating level consciousness. On arrival at WRH unresponsive with upwards nystagmus.

**PLAN**
- continue tazocin
- blood cultures from vascath
- sputum culture if possible
- CVVH
- 12 lead ECG
- ?ECHO

**PROGRESS**
- Admitted ICU with above plan
- Tazocin continued
- CRRT commenced
- New RIJ vascath placed
- Left IJ vascath removed

- pCO2 on admission 78
- Started on NIV/BPAP

Noradrenaline increased to (and capped at) 30ml/hr

Progressive hypotension despite this

CRRT stopped as unable to dialyse with high access pressures/low MAP

0615hrs pt attempting to communicate with family.

Decision made to remove NIV given likely futility of ongoing treatment to allow pt to communicate with family.

Passed away at 0630hrs
Case 89
Transfer from Taranaki

MVA vs pedestrian

HPC -
Getting into car, drunk driver hit her
(2 x children witnessed + husband worked across road)
?LOC duration
Agitated at accident - midazolam ED
GCS Dropped to 6 --> intubated Gd 1
CSF from bilateral ears + Nose

PMHx -
fit and well

Meds ?

Trauma CT Scan - (VERBAL from Taranaki - no report that I can find on theirs or our system)
Head - L occipital # + contusion
Nil other injury
C-spine UNCLEARED

On My arrival:
A - ETT
B - 99% FiO2 50%, chest clear, good AE
C - HS 1+2+0, MAP aim 80 (was 60), NA started
D - propofol + fentanyl sedation, Enlarged pupil R eye (4-5mm) which was NEW
PaCO2 was 50's --> hyperventilated to 40
- Given 20ml 23% Saline x2
- 10mg morphine + midazolam
- increased propofol sedation
--> Improved dilated pupil to equal with other
but en route in plane - became dilated to about 3-4 mm

Imp - TBI

PLAN
1 - D/w neurosurg - Repeat CT tonight ?ICP bolt insertion
2 - MAP > 80mmHg
3 - ?Tetanus ?Abx for CSF leak
4 - C spine cares until cleared
5 – CXR

Repeat CT in Wellington at 02:00 am showed extensive unsurvival brain damage:

CT Summary:
Evolving traumatic brain injury with evidence of severe DAI.
Progressive right cerebral/cerebellar hemisphere and left parieto-occipital infarction with mass effect.
Comminuted calvarial and skull base fractures noted.
Family meetings were held involving neurosurgeons and ICU: family understands situation (brain death) and organ donation was discussed and agreed upon as it was patient's wish (as per driver's licence).

She was declared brain dead at 13:22 hrs. RIP.
**Case 90**

64 y.o with SAH

Presented to ED Hutt by ambulance after sudden onset severe headache and vomiting. On ambulance arrival GCS 15. At Hutt ED GCS 14. E3V5M6, nil focal deficit. CT: SAH
Later at ED Hutt, GCS 8 E1V2M5. Intubated and ventilated.
L ACOM aneurysm

SBP 190 on arrival to ED at Hutt. While awaiting transfer post muscle relaxant - 1 episode of hypotension 60/40 - responded to 3mls of 1mg/ml metaraminol.

Transferred to Wellington OR
Anaesthesia:. Started on a small amount of phenylephrine.
EVD placed height 15cm
Aneurysm not secured

PMhx
Hypothyroid

Meds: NKDA
Thyroxine

Social
bus driver
cares for wife who is wheelchair bound
smoker

O/E
A+B ETT size 7.5, ASV FiO2 50% PEEP 5 MV 100% sats 95%
C MAP 80 on phenylephrine 100mcg/ml 8mls/hr, HR80 SR on monitor
D On propofol 10mls/hr, pupils 3mm equal, non-reactive both sides, Corneal reflex present on R but not L, Nil cough on suctioning, Tone increased R leg with clonus 3 beats, Reflexes symmetrical
IDC insitu

Imp
SAH fisher G4, WFNS grade II
still has unsecured aneurysm

PLAN
Aim for SBP 140-160
Watch EVD output as per neurosurg instructions
desedate and assess neurology
Definitive management of aneurysm
nimodipine once not on phenylephrine/norad
Head of bed 10 degrees
Analgesia/antiemetics/
usual icu cares
NEURO:
L ACOM aneurysm coiled. E2VTM2 off sedation with decreased power on R. Commenced hypertensive therapy. Repeat CT showed vasospasm so hypertensive target increased but no improvement in neurologic status.

RESP: Grew H Influenzae on sputum, treated with Tazocin

Family Meeting - discussed poor prognosis despite EVD and coiling. Family agreed that withdrawal of active treatment was appropriate.

Extubated and palliative care was commenced. He passed away at 0850hrs.
Case 91
Transfer from Hawkes Bay ICU - multitrauma

100k/hr motorbike, no helmet. Found prone with GCS 6
Injuries:
TBI - intraparenchymal hemorrhage, increased in size the following day on CT.
ICP bolt placed upon admission: stable between 14-17 on morph/midaz + propofol infusions
+ given conc salt 23% 2* 20mmol bolus because Na 135. Repeat Na was 144.
Possible CSF leak - not confirmed [nil base of skull fracture reported by HB team]
On ceftriaxone prophylaxis

C2 fracture - presumed unstable due to possible ligamentous injury, plan from ortho to
immobilise in Philadelphia collar until MRI neck possible

Multiple facial bone fractures
Seen by maxfax: Had mandibular fracture fixed with bridal wire.
R zygomatic fracture, Fractured ant and post R max sinus walls, depressed bony fragment R
post max sinus, blood in the R maxillary sinus, minimally displaced R orbital floor
On augmentin prophylaxis

Bilateral lung contusions - easy to oxygenate and ventilate

Abrasions: R shoulder and R ant neck, arms and legs multiple

Lacerations - upper lip, R temporal supraorbital area both sutured
Small lacerations R temporal area - too swollen to be sutured (small, superficial)

Periorbital hematoma R + conjunctival bleed + inflamed

Background
Bipolar disorder no meds
Works as a shearer
Partner with 4 young children

O/E
A+B: ETT 24cm at lips, size 8
C: Norad 5 to keep CPP 60, HR 40-60 SR
D: On m+m 1mg/ml each - 10mls/hr and prop 1% 10mls/hr infusion
PEARL 3mm and symmetrical
ICP high teens - spikes up to mid 20s with change of position

IDC in situ
Temp 37C
Na 144

Secondary survey: swollen MCP joints xrayed nil fractures
log roll - nil back injury noted, PR no high riding prostate
trauma sheet filled out
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IMP
multitrauma - ICP under control on multiple agents
Requires plastics input when well for the multiple mid facial fractures
requires orthopaedic input for C2 fracture
requires ophthalmology input ?penetrating eye trauma

PLAN
Continue M+M/Propofol - ensure that Na is >145 ideally
Bloods, CXR, ECG
Neurosurg contacted - will r/v
Plastics reg on call at Hutt contacted - will r/v regarding definitive management of midface fracture - we will need to keep updating them regarding neurological function and prognosis
max fax at hutt contacted - they are aware of patient but don't need to do anything currently as bridal wire in situ
Ortho will r/v
ophthalmology reg contacted - will r/v on Monday - likelihood of penetrating trauma of the eye is small, advised chloramphenicol ointment for R eye
rationalise abx
sent nasal discharge for b2 transferrin
family meeting

Issues:
Facial and orbital fractures that still need max fax repair
Stable Cervical spine fracture in Philli collar
Bilateral lung contusions - resolving
Ongoing CSF leak - for conservative management.
Traumatic brain injury with intracerebral bleed- ICP monitor in place. ICPs relatively stable throughout stay with a few episodes of elevated ICP medically managed.
Sedation weaned on 29 April
Progressing off sedation to obeying commands today.

Sudden deterioration with PEA arrest and bilateral fixed dilated pupils. CPR commenced and continued for 24 mins. Conc salt administered for blown pupils. Adrenaline boluses. ICP unchanged during event. No correctable underlying cause identified.
CPR stopped. Time of death 21h42
Case 92
82 Male

Admitted from HDB with type 1 resp failure secondary to severe pneumonia.

HxPC
6 days of increasing SOB and dry cough. No fever or sputum. Collapsed at GP rooms earlier today, sats 84% on ambulance arrival. Treated with CPAP 10cmH20, 50% O2 with sats stable at 93% however increasing RR to 40 and looking tired, MET call and decision made to admit to ICU.

Background:
IHD - frequent angina, for medical therapy.
CVA
Type 2 DM
Diplopia
Ex Smoker (~ 1yr, stopped 60 years ago)
HTN
Previous PMR, no longer on prednisone

Still drives, independent with help for cleaning only, lives with wife. Only other immediate family is brother. Still drives. Walk 100 yards, frame and stick.

OE
A - own
B - NIV, 10/5, FiO2 0.65 for sats 92
C - HR 80, BP 120/60, periph warm
D - GCS 15
E - afeb

Bloods - Creat 151 (prev 103), Na 140
VBG - pCO2 28, lactate 4.3
Hb 127, WCC 12, CRP 322

CXR - Severe multi-lobar consolidation L>R
ECG LBBB

Plan:
Continue ceftriaxone and azithromycin
Triate NIV to WOB and sats >90%
As d/w SMO and pt - care limited to NIV and pressors
Not for intubation or CPR
Still need to update wife, no answer when called x3 tonight

Patient did not tolerate CPAP machine, desaturate off CPAP ventilation.

After discussion with him and his wife, decision made for palliative care.

All medical support discontinued.
Passed away 0704.
Case 93
54y.o. male

ICU level admission for ongoing management following cardiac arrest

BG:
Ischemic Heart disease
- CABG (26yo) LIMA to LAD, SVG to Cx
- Angio 2012 occluded LAD, RCA, 60% proximal lesions left Circumflex, LIM to LAD graft patent with flow to PDA. Vein graft to Circumflex occluded. Inferior akinesis
- ECHO 2012 showed no valve dysfunction Ejection fraction 37%
- Repair of suprarenal AAA: CT 7.2cm x 14cm
- Considered for surgery 2 years previously but declined repair at that time due to risk.
Hypertension
Dyslipidaemia
Type 2 diabetes
Chronic renal impairment Cr 120s.

MEDS
omeprazole
cilazapril
metoprolol
aspirin
simvastatin
frusemide

CLINICAL SITUATION
Witnessed arrest today
ambulance called immediately (0555)
approx 5mins before CPR commenced
4x shock for VF
final shock produced PEA (0610)
2x failed IV and IO inserted (0618)
1mg adrenaline (0620)
continuous CPR until ROSC (0623)
field intubation

1st CXR demonstrates RMB intubation + Left lung collapse
pulled back on 2nd XR
- reinflating left lung
NGT below diaphragm

ongoing paralysis in ED (3x bolus rocuronium)
sedation with propofol
?focal seizure activity
- CT head NAD

transferred to ICU
cardiology opinion
observation
aim angio if cerebral recovery appropriate
PLAN  
- temp maintenance 35-36  
- sedation  
- BP maintenance  
- aim weaning / waking tomorrow around WR  

PROGRESS  
After the appropriate cooling period sedation was withdrawn on the 26th, but patient never regained consciousness, GCS 3-6/15, but not purposeful movement, only myoclonic jerks. The family was informed about the poor prognosis.  

He was extubated @ 19:35h on the 27th in the presence of his family.  
Time of death 2110.  
RIP.
Validation of a Classification System for Causes of Death in Critical Care: an Assessment of Inter-Rater Reliability
Elliott Ridgeon, Rinaldo Bellomo, John Myburgh, Manoj Saxena, Mark Weatherall, Paul Young and the ICU-DECLARE Investigators. Critical Care and Resuscitation 2015

Case 94
63y.o. female

ICU level admission for pneumonia, retrieved from Wairau

BG
COPD
- previously 50/day smoker, now 25/day
- struggles to make mailbox at front of house
  - this follows repeated chest infections
  - previously able to walk "a reasonable distance"
HTN
Fibromyalgia

PROBLEM
- pneumonia / infective exacerbation COPD
- admitted to Wairau 25th
- on ward overnight and deteriorated, admitted to HDU
  ** - while on HDU 26th expressed desire to go home to die
  ** - also expressed wish not to receive CPAP / BiPAP or to be intubated, patient does not wish for resuscitation in the event of arrest
  ** - patient considered to be competent at that time
- deteriorated later, NIV mask placed, patient hypoxic
- patient’s attempts to remove own mask considered to be made by incompetent adult at that time due to hypoxia / reduced mentation
- treated with tobramycin and cefipime on basis of heavy growth of resistant pseudomonas
- clarithromycin added due to concern of atypicals

ON FLIGHT TEAM ARRIVAL
- patient sedated with 8ml/hr propofol
  - very light, and repeatedly paralysed with rocuronium
- occasional bolus midazolam, but patient’s blood pressure drops, so given infrequently
- on phenylephrine for BP support (28ml/hr dbl strength)
  - 4x peripheral lines
  - arterial line ineffective

ACTIONS
- re-site arterial line
- increased sedation
- change to transport ventilator
  - increased PEEP to 10
  - O2 able to be brought down to 40%
- paralysed for transport, BP fell
- 1mg metaraminol required

TRANSPORT
no significant changes
transferred to WRH ICU without incident

ADMISSION PLAN
central line
run noradrenaline
tazocin and clarithromycin
family meeting
ABG ?pCO2 (high in Blenheim, may need increased MV)

PROGRESS
Admitted ICU as above.

1830 hours developed likely acute bronchospasm with pulmonary oedema with very high airway pressures and small tidal volumes of 20-30mls.
- Suctioned and paralysed. Given salbutamol and frusemide.
- Put back on ventilator. Trial of proning with some improvement in sats but worsening shock. Phenylephrine at 60ml/hr and norad at 25ml/hr
- VT rapidly followed by asystole

Time of death 2027.
RIP.
Case 95
COMMUNITY ASYSTOLIC ARREST

HPC:
At home, walked outside onto deck, grandchildren found him collapsed <1min later.
Daughter started CPR.
First responders (fire service) arrived, AED advised no shock.
Asystolic on ambulance arrival. Lost output twice with ambulance, adrenaline x1mg x4.
x2 intubation attempts, unsuccessful. LMA placed.

38mins ambulance arrival to ED.

Grade 1 intubation in ED with etomidate and sux. Nil sedatives since.

12 lead - anterolateral T wave inversion. ECG reviewed by cardiology, not acute STEMI, not for intervention.

Adrenaline infusion started in ED but persistently hypotensive.

On arrival ICU, systolic in 50-60s, adrenaline (10 in 100) increased to 15ml/hr with good BP response and tachycardia to 120. Adrenaline changed to noradrenaline.

C-spine managed as unstable in ED, given fall from standing.

PMHx:
Nil

MEDS:
Nil reg

SOC HX:
High stress IT job
Smoker - 30g/week
Alcohol intake - family replied, 'don't ask, lots!'

O/E:
NEURO: GCS 3, pupils 5mm, unreactive, no gag, no corneal reflex, no spont resps. No sedation.
CVS: HR 106, sinus, BP 93/67 on noradrenaline 22ml/hr. HS dual, nil added.
RESP: Chest clear, sats 94% on ASV 120%, FiO2 40%, PEEP 5cm
GIT: Abdo soft, liquid bowel motions
RENAL: very small volume dilute urine.

IMP:
OHCA with prolonged downtime
- marked shock possibly neurogenic, +/- cardiogenic
- AKI

PLAN:
Family Meeting
TTM
Replace potassium
Not for spinal cares, low risk mechanism

CT head confirmed SAH. Remained GCS 3 with fixed dilated pupils. Family meeting held. Confirmed brainstem dead with testing following morning, time of death 1310.
Case 96
Admitted post Mitral valve replacement

Hx:
Transferred from Hawkes bay with acute deterioration of SOB & palpitations
Treated for CCF
Echo: torn chordae to posterior mitral valve leaflet with marked prolapse of posterior leaflet + significant MR + RVSP 70mmHg
Diuresis with some improvement

Background:
known CCF
MR with LVEF 35% in 2011

Meds:
omeprazole
calcium carbonate
aspirinEC
frusemide
amiodarone
enoxaparin
Span K

OT:
induction of anaesthesia straight forward
Prebypass TOE: moderately dilated RV
    bordeline TV prolapse with mod TR
    Mild AR
    LV moderately dilated
Xclamp: 91mins
CPB: 121min
postop TOE: mitral prosthesis valve seating well and mean pressure gradient 3mmHg.
Normal AV function. Hyperdynamic function of both ventricles
Deranged coagulation and TEG coming off CPB and Hb 65 - 2x FFP + 1x RBC transfused

O/E:
A; intubated
B: Spo2 99% on 50% Fio2 S PEEP, chest entry equal and sounds normal, 2x mediastinal drain insitu
C: BP 90/60 HR 80 on milrinone and noradrenaline infusion, HS normal, warm peripheries
D; sedated on propofol

Plan:
CXR
FFP + Platelet transfusion
repeat bloods
aim MAP>65
monitor drain output
warfarin to start tomorrow as per surgeon
drain on 20cmH2o suction as per surgeon
Events:
1. significant bleeding drained from mediastinal drain post op in ICU
   - deranged coagulation,
   - blood products transfused - 8x FFP, 1x platelet, 3x cryoprecipitate 3x RBC
   - remained coagulopathic but bleeding slowed down.
2. significant inotropic demand to maintain adequate MAP despite good cardiac index
   - repeat TOE - good functioning ventricles, cardioplegic.
3. worsening metabolic acidosis with raised lactate
   - started on haemodialysis - nil improvement

Died 2130.
Case 97
Admitted from theatre following inpt CABG

Chest tightness for days. Aspirin, clopidogrel and therapeutic clexane
Hemoptysis ?cause
Productive cough 4/12

Background:
ESRF on IHD
IHDz - NSTEMI 2012 w stent placement to LAD and OM1, dominant RCA heavily calcified
DM type 2
Hep B positive
Secondary hyperparathyroidism - parathyroidectomy
PAF
Iron deficiency

Meds:
Metoprolol 95mg
Calcitriol 0.5mcg mon/wed/fri
Ascorbic acid 100mg dly
Multivits 2 dly
Gliclazide 40mg bd
Atorvastatin 40mg dly
Amlodipine 5mg dly
Amiodarone 50mg dly
Metoprolol 95 mg bd
Erythropoetin 10000 units s/c weekly (Thurs)
Laxsol 2 tabs bd
Amoxicillin 1g IV dly
Azithromycin 500mg dly
ASPIRIN 100mg dly until 17th
CLOPIDOGREL 600MG 15th, 150MG 15th, 150MG 16th
THERAPEUTIC CLEXANE 15th AND 16th

PRE-OP

Angio:
LMS 60%
LAD severe prox
Circ patent stent
RCA diffuse, mild

ECHO:
EF 40%
Akinetic apex
AV sclerosis
MV annular calcification
TV severe TR

Carotids:
16-49% stenosed bilaterally

PFT:
55-60% of predicted

CT chest:
1. Consolidation left lower lobe and lingula may be secondary to infection, although I note the lack of infective symptoms. The differential given less marked patchy changes at the left base (2013 chest x-rays) includes the possibility of recurrent aspiration or bronchioloalveolar cell carcinoma. Referral for consideration of bronchoscopy suggested.
2. Ascites noted. Previously present while on CAPD. Currently secondary to right heart failure.

INTRA-OP

Oozy
LIMA - LAD
Rad - OM
Left dominant system
EF 40-50%
Some improvement in TR
INR 1.8, plts 70s
Plts x 1 and 600mls cellsaver given
Filtered on pump
DLT - clotted blood left lung
DDAVP and milrinone on pump

POST-OP

A - intubated
B - sats 100% FiO2 50%
C - MAP 68 5mls norad, HR 57, 200mls mediastnal drain, 80 mls pleural drain, 250mls in first hour

PLAN:
WWWE
CXR
Products

PROGRESS
Returned from theatre with on going bleeding requiring significant products.

Dialysis commenced via juglar vascathe to mitigate acidosis.

High dose vasopressores through the night. TOE in evening showed small rim of effusion not thought to be haemodynamically significant. Repeat TOE and review by cardiac surgeon at 4 am. Discussion with wife at this point.

During Friday, dropped haemoglobin, returned to theatre. Clot evacuated, heart looked grey. Returned to ICU with open sternum. Became unsupportable and died at 21:53 with extended family present.
Case 98
Emergency admission for Out of Hospital Cardiac Arrest (VF)

Several episodes of angina requiring GTN spray during day - resolved. Out at meeting and feeling off colour. Came back home, further GTN use. Felt faint as bent down. Collapsed. Wife phoned ambulance and then commenced CPR (verbal report: relatively ineffective). Ambulance note not available but estimated 20 mins before ambulance arrival. Wife noted probable vomitus with ?aspiration 6x shocks for VF with Adrenaline 2x 1mg + Amiodarone 300mg before ROSC (12 mins from pads on until ROSC). Further 0.5mg Adrenaline given. Intubated in ambulance with Ketamine + Vecuronium Estimated downtime ~25 mins Stable in arrival to ED. Ventilating well. No further arrhythmias.

PMHx
IHD - NSTEMI 2011 managed conservatively. Decided not for angio at time as borderline renal function
- NSTEMI 1993
- CABG x3 1989
CKD - baseline Cr 170-200 CVA 2011 with right homonomous hemianopia

Meds
Clopidogrel 75mg ?stopped
ISMN 60mg mane
Frusemide 40mg mane
Aspirin EC 100mg OD
Cilazapril 1.25mg mane
Bisoprolol ?dose
Atorvastatin 40mg OD
Colchicine ?prn

SHx
Lives with wife. Independent around home. Manages 10 mins of gardening. Often gets angina on walking into cold rooms within house. Doesn’t drive due to hemianopia. Independent with personal cares

O/E
A. ETT (withdrawn 2cm since CXR
B. ASV 100%, PEEP 5, FiO2 100%, Sats 100%. Chest clear.
C. BP 120/60 P 77. ECG: Sinus, RBBB (old).
D. Sedated on 5ml Propofol
Abdo soft

Discussed with cardiologist. Not for intervention at this stage. Advised heparin/clopidogrel/aspirin

For targeted temp mgmt, monitoring electrolytes + CV support. If further deterioration, for consideration of limitation of cares - eg prolonged CPR unlikely to be of benefit
Imp: OHCA 2 to VF

Plan:
Temp 35-37.5 for 36/24
Art line
NG tube + Aspirin/Clopidogrel
Cont Clexane BD
Wean FiO2 for sats >92

PROGRESS
Multiorgan failure / No neurological improvement post Community arrest
D/w Family - Extubated and made palliative
Passed away 2045.
Case 99

Sudden onset of headache + incoordination + right facial droop on the 4th
BIBA - GCS 15/15 - CT showing SAH, blood in ventricles, 2x aneurysms + AVM
5th - Coiling, uneventful - returned to ward, GCS 15/15
- progressive worsening of GCS (13/15) overnight
- repeat CT showing hydrocephalus
6th - EVD insertion in OT - extubated and awakened postop and transferred to PACU but GCS deteriorated to 9-10/15 with airway compromise
- reintubated and repeat CT head - small right frontal haemorrhage along EVD tract,
EVD tip sitting within clot.
- returned to OT - EVD pulled back 2cm but not draining hence removed and reinserted a new EVD

Other issues in OT:
1. poor oxygen saturation despite high Fio2 90% in OT with PaO2 on arterial blood of 106mmHg,
2. INR 1.4 on admission (normally only on aspirin) - 6xFFP + 2X platelets, repeat INR 1.3.
?cause (normal LFTS), surgeon discussed with haematologist, suggest ? Vit K

PMHx
previous CABG 1991 + redo 2000
Good exercise tolerance, play golf and walks 2-3 kms daily
Hypertensive
Previous CVA - no residual
mild asthma

Meds:
quinapril
felodipine
bendrofluazide
sevredol
ondansetron
nimodipine
paracetamol
laxatives - movicol + senna
salbutamol + beclamethasone
aspirin (stopped currently)
cephazolin

O/E;
A: intubated
B: SpO2 95% 60% Fio2 8 PEEP, poor air entry to left
C: BP 135/67 on 5ml/hr phylephrine, HR 67/min, HS normal, warm peripheries, sternotomy scar
D: sedated on propofol, pupils 2 reactive bilaterally
E; soft abdomen

Plan:
1. Repeat bloods + coag
2. CXR
3. aim SBP 120-160mmHg as per surgeon
4. continue Abx
5. EVD @ 15cmh2o

Issues:
* Hydrocephalus -> EVD - technically difficult requiring two separate EVD insertion procedures on 6th
Complicated by -> hematoma formation in EVD tract and probable ventriculitis based on WCC to RBS ratio on CSF (no growth); EVD removed when hydrocephalus settled. Antibiotics given for presumed infection. Initially GCS 13 for 4 days after EVD insertion

* Ongoing fever throughout ICU stay, many cultures taken
* Neurological and resp deterioration on 10th requiring reintubation. Re-CT showing no extension of clot
* Fast AF treated with amiodarone and digoxin
* Hypernatremia treated with free water NG
* Fluctuant neurology with left sided weakness - possibility of vasospasm so treated with hypertensive therapy from 15th with little improvement
* Abnormal movements ? Seizures - > EEG done showing NO seizure activity
* Trache inserted on 16th by ENT to aid respiratory wean
* VAP E coli on sputum 16th - antibiotics restarted

* Multi-organ failure 18th:
  - Acute kidney injury
  - Profound diarrhoea and large gastric aspirates
  - CVS collapse with increasing Norad and tachycardia
  - Neurological failure with worsening GCS
  - Haematological failure INR 2.3
  - Resp failure w increasing PEEP and FiO2 required
  - Fungaemia on blood culture - seen on 18th (call from micro)

Decision to palliate in conjuction with family and neurosurgery

Time of death 14h10
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**Case 100**
Brainstem (Pontine) Haemorrhage --> Likely terminal event

**Pc** -
Admitted ED GCS 15/15 with weakness R Arm + Leg and involuntary leg movements

Dropped GCS 6/15 2100 within 30 min of arrival --> Intubated

CT Scan - Extensive Pontine haemorrhage + extension into 4th Ventricle

**PMHx** -
TIAs
HTN

**Meds** -
Clopidogrel

**Shx** -
Lives alone, independent

**A** - ETT
**B** - 98%, Bilateral BS, FiO2 40%, nil respiratory effort observed
**C** - 200/90 --> Morphine given
**D** - Propofol off

**Imp** -
Brainstem Haemorrhage - likely terminal event
- Neurologist has d/w family very poor prognosis and NFR
- "Not expected to regain consciousness"

**PLAN**
1 - D/w SMO
2 - Stop sedation
3 - NFR or active treatment

D/w Family - very unlikely to survive event
No respiratory effort made off sedation
d/w SMO
Decision to extubate whilst surrounded by family 0300
Appendix 2: Pilot Study

Undertaken between 03/03/15 and 09/03/15, this involved 6 raters (ICU physicians or research coordinators) at Wellington Regional Hospital, New Zealand. A set of 10 case histories was used, with each rater providing proximate causes of death for systems A and B and an underlying cause. Participants were also asked for feedback with a series of multiple choice questions, and a free-text comments box. Results are shown in Table S1.

<table>
<thead>
<tr>
<th>Proximate: System A</th>
<th>Proximate: System B</th>
<th>Underlying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappa</td>
<td>0.73</td>
<td>0.72</td>
</tr>
</tbody>
</table>

- **Mean time taken (total)**: 16.5 minutes
- **Mean time taken (per case)**: 99 seconds

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the interface easy to use?</td>
<td>6 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Were the instructions easy to understand?</td>
<td>6 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Was the classification system easy to use?</td>
<td>4 (66.7%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>I think this system will be a useful research tool:</td>
<td>4 (66.7%)</td>
<td>2 (33.3%)</td>
</tr>
<tr>
<td>I think the amount of information in each case history was:</td>
<td>1 (16.7%)</td>
<td>About right = 4 (66.7%)</td>
</tr>
</tbody>
</table>

*Table S1: results of pilot study*

These results suggest firstly that the classification system is likely to achieve good inter-rater reliability, with kappa ≥ 0.7 for both proximate systems and the underlying system. Ease-of-use of the system and the study interface rated highly. Refinements suggested in free-text comments included sub-division of the 44 underlying cause options to improve readability.

Volume of information – a full admission and discharge summary for each case, taken from hospital database records – was rated as “about right” by two-thirds of participants. This format was retained for the full study. Free-text comments noted errors in spelling and grammar in the copied summaries; these were corrected where possible for the full study, without editing any essential clinical information.
### Appendix 3: Sensitivity analysis for missing data

Not all raters completed every case – some failed to choose a proximate cause of death from List A or B, or an underlying cause. Table S2 shows kappa when either treating these missing answers as a separate category (i.e. expanding List A to 9 choices, List B to 6 choices, and the Underlying cause list to 45 choices) or omitting any case in which data was missing. Kappa does not differ substantially between these scenarios.

<table>
<thead>
<tr>
<th>List</th>
<th>Fleiss kappa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>List A – Eight options, proximate cause</td>
<td>0.542 (0.494 to 0.597)</td>
</tr>
<tr>
<td>Missing rating set to a distinct category</td>
<td></td>
</tr>
<tr>
<td>N =100 cases</td>
<td></td>
</tr>
<tr>
<td>List A – Eight options, proximate cause</td>
<td>0.540 (0.485 to 0.598)</td>
</tr>
<tr>
<td>Missing data omitted</td>
<td></td>
</tr>
<tr>
<td>N=84 cases</td>
<td></td>
</tr>
<tr>
<td>List B – Five options, proximate cause</td>
<td>0.578 (0.531 to 0.631)</td>
</tr>
<tr>
<td>Missing rating set to a distinct category</td>
<td></td>
</tr>
<tr>
<td>N =100 cases</td>
<td></td>
</tr>
<tr>
<td>List A – Five options, proximate cause</td>
<td>0.597 (0.543 to 0.657)</td>
</tr>
<tr>
<td>Missing data omitted</td>
<td></td>
</tr>
<tr>
<td>N=74 cases</td>
<td></td>
</tr>
<tr>
<td>Underlying list – 44 options</td>
<td>0.481 (0.440 to 0.526)</td>
</tr>
<tr>
<td>Missing rating set to a distinct category</td>
<td></td>
</tr>
<tr>
<td>N=100 cases</td>
<td></td>
</tr>
<tr>
<td>Underlying list – 44 options</td>
<td>0.487 (0.440 to 0.526)</td>
</tr>
<tr>
<td>Missing data omitted</td>
<td></td>
</tr>
<tr>
<td>N=85 cases</td>
<td></td>
</tr>
</tbody>
</table>

*Table S2: sensitivity analysis for missing data.*