FIRST EDITION

# LITTLE RED BOOK OF TRAUMA

BY BILL BESTIC

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# PROLOGUE

Trauma is the leading cause of death for the <44 age group in Australia. Much has changed in recent years in the management of trauma, so much in fact, that clinicians can find themselves increasingly overwhelmed by priorities of treatment.

This book represents personal opinions and experiences. Readers will note differences in approach in some areas, and should decide for themselves the most appropriate response for their patients within their own hospital guidelines and protocols. It is designed to provide background clinical guidance on a range of terms such as Primary Survey, Triad of Death (not a thrash metal band), Damage Control Surgery, Balanced Resuscitation, Permissive Hypotension and many others. Hopefully, it helps bridge a knowledge gap to the large volume of reference texts on trauma, and is designed as an easy read of one clinicians thoughts on trauma.

By way of background, my approach to trauma patients is borne of early training in the Special Air Service teaching on battlefield trauma, and my own personal experiences over 30 odd years in the pre-hospital environment both in Australia and overseas, in hospitals small and large and in many countries, and as an instructor and educator in trauma for the Royal Australasian College of Surgeons, Australian and New Zealand College of Anaesthetists, Australasian College of Emergency Medicine and many others. Often I have found widespread confusion over what interventions should take place during trauma and when. With the introduction of new equipment (ultrasound, ROTEM, etc) and new concepts (balanced resuscitation, permissive hypotension, etc), Team Leaders can be quickly overwhelmed with what should take priority for treatment.

It is up to you, the Team Leader, to decide on what should happen and when. You will need to maintain situational awareness, anticipate problems, control a team of people, some of whom you've probably never met, organise a multitude of activities and tasks, and all whilst a patient is doing their best to die in front of you. Sometimes, the barriers to saving a patient might be obstructive team members, hospital bureaucracy, apathy or incompetence. You will have to find ways to overcome them all!

Couple this with the stress of knowing there are many armchair critics in any trauma who are desperately quiet during the resuscitation (or conveniently not present at all), yet seem to find their voice after the fact, with all sorts of 'gems' and clinical PEARLs with the benefit of 20:20 hindsight. Spend enough time in Trauma, and you learn to spot these people early.

Add to this the stress of performance, meeting your own (hopefully) high professional standards as well as the knowledge that you may be held personally responsible, ethically and medico-legally for the patient's outcome and perhaps it's little wonder there are few volunteers to lead a complex trauma resuscitation and very little teaching or guidance on how to lead these.

Developing your skills as a Trauma Team Leader then, will take courage, a thick skin and a challenging journey with the confidence to keep having a go, despite errors, and the humility and insight to reflect on those errors to improve performance.

It is a worthy challenge and our patients need you!

# -1-

# THE SURVEYS

Airway - Breathing - Circulation. You've heard this mantra before. But how well do you apply it? The Primary Survey is a concept first taught to me in the Army and has been adopted by the American College of Surgeons Advanced Trauma Life Support (ATLS®)[1] that sits as part of the following sequence:

**Zero Survey**: pre arrival stage.

**Primary Survey**: identify and treat immediately life-threatening injuries.

**Secondary Survey**: systematic 'head-to-toe' looking for any other injuries.

**Tertiary Survey**: Complete history and examination, including radiological and other tests done >24 hrs after presentation.

Let's look in a little more detail at each survey.

[1] Recommended reading: ATLS® 10th Edition, American College of Surgeons publication. Even better, do the course!

# ZERO SURVEY
## TEAM - ROLES - EQUIPMENT - BRIEFING

The Zero Survey is the **pre-arrival** stage. A 'batphone' call to the Emergency Department, a text message from a colleague, a phone call to theatre perhaps. It may be a formal **IMIST** handover, or an informal 'heads up' from a colleague. Either way, it should initiate a Zero Survey. So what should occur?

- time & space. How much time do I have to prepare? A lot can occur even in 5 minutes, but the key is to do as much as possible in the time available. The following is an example:
  - attend to own needs (empty bladder, full stomach)
  - assemble the team
  - allocate roles
  - decide on equipment
  - mental rehearsal

Let's look at an example in **IMIST** format:

**I** dentification - 25 M (25 yr old Male)

**M** echanism - High speed MBA (Motorbike Accident )

**I** njuries - Head, Chest, Abdo, Long bones with open femur

**S** igns & Symptoms - GCS 6, HR 132, BP 60/40

**T** reatment - O2 via NRB (non-rebreather) with OPA (Oropharyngeal Airway), PIVC (Peripheral Intravenous

Cannula), 1 L Hartmanns, CT6 (leg traction splint), 10 mg IV morphine

ETA 15 mins

As I've gained more experience, I've found the **Mechanism** heading to be more important than **Signs & Symptoms.**

**Mechanism** will tell me what I'll be *needing to do*, **Signs & Symptoms** will tell me how *urgent* those interventions need to be.

The image in my mind of the patient is forming: an unconscious young man, with *no airway protection*, flung from his motorbike at high speed, with *multiple severe injuries* who will need urgent resuscitation and absolutely requires an *operating theatre*, *surgeons* from neurosurgery, orthopaedics, general surgery, vascular surgery and then *ICU* post op.

I can already see this patient needing:

- intubation
- chest decompression
- pelvic binder
- massive blood transfusion
- arterial and central lines
- more IV access
- fluid warmers
- 'Bair hugger' warming blanket
- an operating theatre
- multiple surgeons
- 3 or more anaesthetists with 3 or more anaesthetic nurses
- multiple scrub nurses
- theatre orderlies
- ICU bed post op
- Radiology imaging, post resuscitation or post op and pre ICU
- Angio suite imaging if possible
- etc etc etc

As I assemble the team, I prepare to speak. The **rhythm**, **speed, volume** and **pitch** (RSVP) of my voice will set the tone for the coming resuscitation. Take a moment to get this right.

It might sound something like this:

*"Hi team, thanks for coming. My name is Bill for those who don't know me. In about 12 minutes we have a 25 year old male, high speed motorbike accident, arriving by ambulance. He has suspected head, chest, abdo and long bone injuries. He is GCS 6, tachycardic and hypotensive at SBP60. He is a scoop & run by ambulance, with OPA, 1L Hartmanns, and PIVC.*

*If it's OK with everyone, I will be Team Leader for the resus and theatre phase?*

*<pause here. You're giving time for anyone to volunteer, and if not, you're establishing yourself as the Leader in a permissive way.>*

*I have activated a 'Code Crimson'[2] and the patient will come straight to this theatre on the ambulance stretcher.*

*If I can have Mel, James and Bec as the airway team please. Your tasks will be to ensure the airway is patent, pre oxygenate and then intubate. I want those tasks done within 5 minutes of arrival if possible. Mel, you will be the Anaesthetic Team Lead.*

*Michael and Karen, you're on the chest. I'm suspecting flail chest with possible tension pneumothorax given mechanism and SBP. I want an EFAST done by you Karen, focussing on*

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[2] Code Crimson is a 'straight to theatre' activation process. Find out what your hospital calls it, how it is activated, and who is expected to arrive.

*chest first. Any suggestion of pneumothorax, then I want needle decompression if patient not intubated, then bilateral finger thoracostomies once intubated followed by chest drains. 26 Fr please.*

*Jacqui, Brian and Rachael, if you can be responsible for IV access with ultrasound, then arterial line and central line in that order please. I then want blood sent for x-match, FBC and coags as well as ROTEM. John, you will be the blood man. You will warn out blood bank for MTP, and be the supervisor for all blood entering the theatre, making sure it's checked, and sending ROTEMs and ABGs every 60 mins and updating me on the results.*

*Surgeons, I want Rowan to be the Surgical Team Lead, unscrubbed, and directing the surgical teams. Priority will be haemostasis first. We will aim for a SBP 100, assuming traumatic brain injury (TBI), we can then address other injuries as we find them, probably ex-fix the leg as an example. We will follow Damage Control Surgery (DCS) principles, I want to be out of the operating theatre in 90 mins or less if possible. Packing of abdo is higher priority than finding and fixing bleeding in the early stage, but we will see how the patient is looking as we go.*

*Michelle, you're my scribe and time keeper, please remind me to start my stopwatch as we enter the theatre!*

*Right, I'm sure I've missed something, so let's hear some ideas please.*

*<allow brief discussion at this point>*

*OK, sounds good. Can the respective teams please liaise with your nurses now and get all the equipment you need.*

*Empty bladders and full stomachs too. Hang around at the end, I want to run a hot debrief.*

*We now have about 10 minutes until patient arrival. Crack on."*

At this point, a few things have happened:

- A team has been assembled
- A quick-fire mental rehearsal has taken place
- Roles have been allocated
- Team Leaders have been assigned
- Time has been allowed for individual team briefing and gathering of equipment
- You've established yourself as overall Team Leader
- You've set the tone for the resus by:
  - using clear, calm and controlled voice (paying attention to RSVP, rhythm, speed, volume, pitch)
  - made it obvious you are open to suggestions
  - given the team confidence there will be a Team Leader who is approachable and has a handle on the situation
  - set evidence based priorities and physiological targets

Even if you only have 5 minutes notice of a patient arrival, a lot can happen, and should! Use the **'1/3, 2/3 rule'**. Allocate yourself 1/3rd of the time available before the patient arrives for your own planning and briefing, and then give 2/3 of the remaining time to your team to do their own planning, briefing and preparations.

The Zero Survey is a vital prelude to the primary survey and sets the tone for what is to come.

## PRACTICE TIPS

Always give a Zero Survey Brief.

Set Physiological Targets based on IMIST (they can be adjusted once patient arrives).

Remember 1/3, 2/3 rule.

Think Before You Speak.

Consider RSVP.

# PRIMARY SURVEY
## ID & TREAT IMMEDIATELY LIFE-THREATENING INJURIES

The purpose of the primary survey is to **identify** and **treat immediately life-threatening injuries**.

So what are immediately life-threatening injuries, what do they look like and how do they present?

In my mind, immediately life-threatening injuries are those that will likely kill the patient in the next 3 minutes and *those you can do something about*. **There are only three**! They are:

- Arterial bleeding that is compressible
- Obstructed airway
- Tension pneumothorax

I am only looking for these ***three injuries*** during the primary survey! Other life-threatening injuries can be dealt with later in the Primary Survey, or in the Secondary Survey (that's what I do), like cardiac tamponade, massive haemothorax, severe head injury, spinal cord injury and so on. This approach assumes your primary survey will be rapid.

**Find & Fix**. As I find that particular injury, I fix it. Then move on, looking for the next injury.

In major trauma centres, the primary and secondary survey often happen concurrently, so it's easy to get lost on what injuries take priority. Discipline yourself amongst the noise and chaos to focus first on finding and fixing those three immediately life-threatening injuries. Focus your team on doing the same! One accepted standard of approach is:

## Primary Survey

**C** atastrophic bleeding

**A** irway + Cervical Spine Control

**B** reathing + Ventilation

**C** irculation + Heamorrhage Control

**D** isability

**E** xposure + Environmental Control

Let's examine each of these.

# C ATASTROPHIC BLEEDING

## STOP COMPRESSIBLE BLEEDING

Sometimes called Massive Haemorrhage[3], the challenge here is what constitutes catastrophic bleeding, how do I identify where it's coming from and what do I do about it?

In the acute, resuscitative, primary survey phase, we identify and treat immediately life-threatening injuries. In this case, we look for **compressible arterial bleeding** and **apply direct pressure.**

[3] the military checklist is **< M A R C H >** (**M**assive Haemorrhage, **A**irway, **R**espiration, **C**irculation, **H**ypothermia/Head Injury).

In the primary survey, don't be distracted by trying to find all causes of bleeding or all causes of hypotension. Find any obvious arterial bleeding and stop it by applying direct pressure with hand, tourniquet, pressure dressing, wound packing or splint (eg pelvic splint).

A Combat Application Tourniquet (CAT) is useful in this setting. Apply it 'high & tight', ie at top of arm or leg and wind it up until the arterial bleeding stops.

Once you've identified any compressible, arterial bleeding, or obvious, major venous bleeding, then move on....

**PRACTICE TIPS**

Don't be distracted by trying to identify all causes of bleeding during the primary survey.

**Find** any sources of compressible arterial bleeding and **fix** it with direct compression.

# AIRWAY + CERVICAL SPINE CONTROL

## JAW THRUST + ADJUNCTS

During the primary survey, we are only looking for one thing: **airway obstruction.** Once identified, we fix it using **basic manoeuvres:** jaw thrust (not head tilt as we want to protect the cervical spine). If that fails, we use **adjuncts:** an oropharyngeal airway (OPA) or nasopharyngeal airway (NPA). It's also OK to place a Laryngeal Mask Airway (LMA) at this point. If that fails, we will move to 2-person face-mask, assisted breathing on 100% Oxygen. Once done, we move on!

**Intubation is not a primary survey intervention[4].**

The priority is relieving airway obstruction and providing oxygen. *Identifying the need for intubation* can be articulated, and the Airway Team Lead can be tasked with preparing for intubation, but as the overall Team Leader, you need to get on and make sure you're finding and fixing the next immediately life-threatening injury.

Cervical spine control simply means controlling the cervical spine to prevent secondary injury. The best way to do this is a physical reminder to all that the cervical spine has not yet been cleared. It could be:

- sandbags placed either side of the head
- a cervical spine collar (preferably a soft collar)
- MILS (Manual In-Line Stabilisation)

It also means not unduly flexing or extending the cervical spine, particularly during intubation on the secondary survey.

[4] This is my personal opinion and may differ a little in approach with ATLS®. The reason for this approach is to keep things rapid and simple during the primary survey, doing the most basic interventions first, then moving on to identify the next most life-threatening injury. It is also takes into account the time it will take to prepare and perform endotracheal intubation. In a major trauma team, this can be done concurrently, whilst the Team Leader (you) moves on to gain a rapid overall assessment of the patient. I personally leave any time consuming interventions to the Secondary Survey. A much simpler approach!

## PRACTICE TIPS

Intubation is **not** a primary survey intervention. Patients die from a lack of a patent airway, not lack of plastic.

Do just enough to get a patent airway and then support the patient with 100% oxygen.

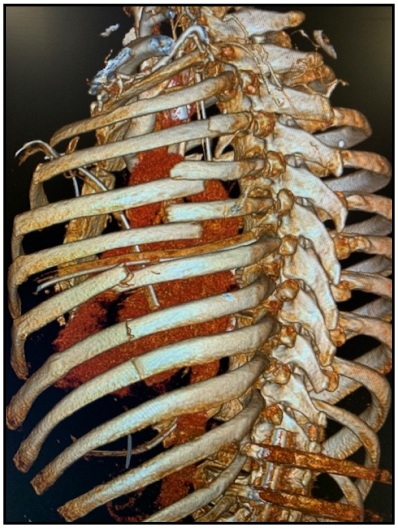
A talking or groaning patient has a patent airway.

The airway does **not** need to be protected during the primary survey.

# BREATHING + VENTILATION

## ALVEOLAR O2 DELIVERY

At this stage of the primary survey, we want to rule out **tension pneumothorax.** What does this look like? In my experience, the traditional teaching of tracheal deviation, diminished breath sounds on affected side, and hyper-resonance to percussion are not at all useful in a busy, noisy and chaotic resus room or operating theatre.



Much more useful is the following approach:

- does the chest *look* normal?

If the chest doesn't appear to be moving normally, that is, in a symmetrical, even manner, then chances are, there is a pneumothorax. Ultrasound is your friend here. It is more accurate than chest x-ray (CXR) at diagnosing pneumothorax, faster and easier. If you don't know how do this, teach yourself!


If you're not sure if the patient has pneumothorax but you are suspicious of it and they are hypotensive without an obvious cause, then decompress the chest bilaterally.

# CHEST DECOMPRESSION

There are three broad methods here:

1. Needle decompression
2. Finger thoracostomy
3. Intercostal Catheter (ICC)

**Needle decompression** is performed in a *spontaneously breathing* patient as a rapid and temporary means of relieving tension pneumothorax. The landmarks are either the second intercostal space in the mid-clavicular line, or 4th intercostal space in the anterior axillary line.

Once you've identified the landmark, advance the needle in a perpendicular plane, aspirating as you go, and looking for bubbles of air in the syringe. Then release the plunger and ensure it stays where it is. Then advance the cannula off the needle to the hilt.

**Finger thoracostomy** is performed in an intubated or *positively pressure ventilated* patient. Same landmarks as for axillary placement of needle. Cut down onto the rib with a

scalpel, then blunt dissect over the top of the rib. Keep going until you hear a 'pop', then advance your forefinger into the pleural space and sweep. In large patients, if the hole you've created keeps closing over, you can place a cuffed ETT in the hole and inflate the cuff to maintain patency as a temporising measure.

**Intercostal Catheter** is placed as for the finger thorocostomy in a spontaneously breathing or positive pressure ventilated patient (because it is a closed circuit once attached to an underwater seal drain). It is performed as a sterile procedure. Lots of badness can happen when placing ICCs. This includes puncturing organs or structures like the liver, spleen, mediastinum, diaphragm. I've seen drains put in all these structures. Take your time to select a high landmark, if you get resistance on advancing the ICC, then **stop**. ICC is a secondary survey intervention in my practice as it can take at least 20 mins to set up and place.

# VENTILATION

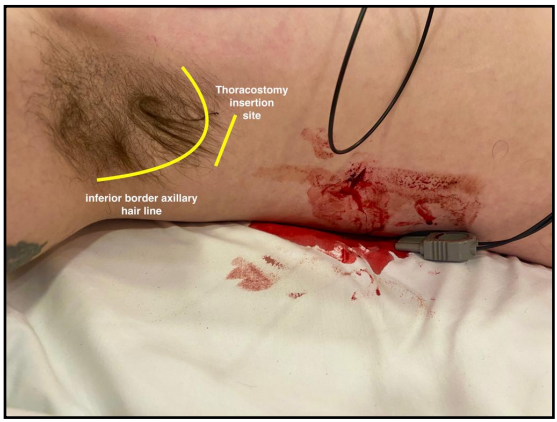
Any positive pressure ventilation (PPV) will reduce venous return, and therefore cardiac output. Be careful about high tidal volumes or high PEEP in trauma patients.

I would recommend 5-7 mL/kg Tidal Volume and PEEP of 5 cmH2O, then reassess.

High airway pressure alarms on your ventilator are most often caused by having your pressure limit set too low (Oxylog default setting is PMax 30 cmH2O, which means the ventilator will cut off at 25 cmH2O, probably too low for most of your trauma patients, so always set the PMax to 40 cmH2O.

Other causes of high airway pressure alarms are the patient biting the ETT as the relaxant wears off, or tension pneumothorax.

PPV can often unmask a small pneumothorax, so always reassess the chest after you've intubated.




**Finger thoracostomy. Far too low!**

## PRACTICE TIPS

Easiest and safest method for chest decompression is 14 G cannula with 5 mL syringe attached with 2.5 mL saline.

Identify armpit hair (or where it would be), then move down slightly from there and identify the intercostal space. This will stop you going too low on either side of chest and hitting liver or spleen.

Bilateral tension pneumothorax kills patients quickly and can be easy to miss. Sometimes it's worth decompressing both sides of chest to rule it out in a dying patient.

PPV can unmask pneumothorax so always be suspicious once you start BMV or any PPV.

When in doubt, repeat the primary survey.

# C IRCULATION + HAEMORRHAGE CONTROL

## END ORGAN PERFUSION

Assessing what the circulating blood volume is left in the patient is always tough!
Some concepts that have helped me are:

- 'on the floor + 4 more'
- classes of shock (ATLS®)
- fluid responsiveness
- mechanism
- permissive hypotension
- **not** using Hb to assess acute blood loss

The question I'm asking myself at this stage is **"Does this patient need blood?"**

The first step is assess how much blood volume the patient *started* with (before the traumatic event). Estimated blood volume is 70 mL/kg.

**EBV = 70 ML/KG**

For example a 70 kg patient would have EBV 4900 mL.

For morbidly obese patients, I take a halfway point between their ideal weight (based on height - 100), and their estimated actual weight.

For example, in a patient 180 cm and 160 kg: ideal weight is 80 kg (180 cm - 100 = 80 kg), halfway between 160 kg and 80 kg is 120 kg. Therefore, EBV is 8400 mL (70 x 120). I also base my drug calculations on this revised weight. No science or evidence behind this, but seems to work for me.

Now that we have a blood volume for what the patient might have started with, let's work out what they might have lost.

# ON THE FLOOR + 4 MORE

This means:

'On the floor': blood lost on scene

'4 more': blood lost into the major body cavities of chest, abdo, pelvis, long bones.

**Chest** is massive haemothorax (can be >1 litre).

**Abdo** is any intra-abdominal bleeding, usually solid organ injury like liver, spleen or kidney but also vascular bleeds.

**Pelvis** means any blood loss from pelvic fractures or arterial beds within the pelvic cavity.

**Long Bones** refers to fractured limbs, especially femurs.

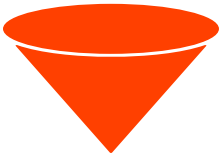
In the primary survey, I am making my best guess at how much circulating volume is left in the patient. Major bleeding should have been addressed as part of **< C > Catastrophic Bleeding**, but here we will double check we haven't missed any other major sources of compressible bleeding.

Tourniquet limbs if needed, you can apply a traction splint, like a CT6, on the secondary survey.

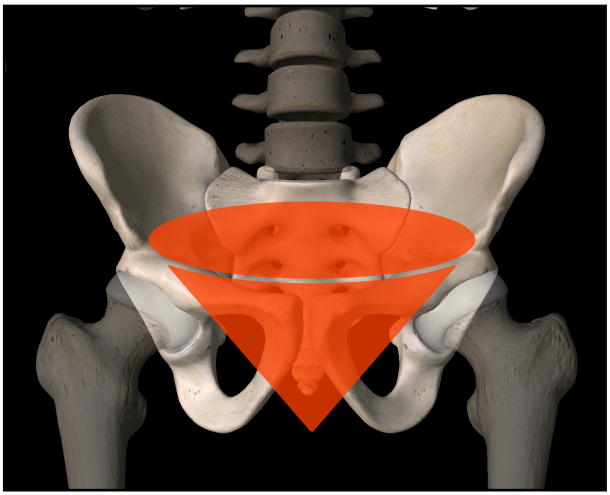
A pelvic binder can be life-saving for pelvic bleeding.

The formula for the volume of a cone is:

$$V = \pi r^2 \frac{h}{3}$$



This means in an 'open book' fracture of the pelvis, or any fracture where the radius of the pelvis is made bigger, there will be a 2-fold increase in volume. Put another way, an



increasing radius is going to have the biggest impact on increasing the volume in a cone. Increasing the radius of the pelvis, like in an 'open book' injury, is going to drastically increase the amount of space that blood can be lost into.

Early placement of a correctly applied pelvic binder (over the greater trochanters), will reduce any potential volume for blood to collect.

# CLASSES OF SHOCK

An ATLS® concept, I've found this useful in guiding how much blood the patient might have lost. A memory aid to help you recall the classes of shock is to think of scoring in a tennis game (0-15, 15-30, 30-40, 40).

| Class | % blood loss | HR | SBP |
|---|---|---|---|
| I | 0-15 | normal | normal |
| II | 15-30 | mild increase | normal |
| **III** | **30-40** | **tachycardic** | **decreased** |
| IV | >40 | max tachy | decreased |

I've abbreviated the shock diagram above, but the key point is that if the patient's SBP is low, especially if <100, and I think this is due to blood loss, then they have probably lost 1/3-1/2 of their blood volume. They need urgent blood replacement with blood products, probably a Massive Transfusion via MTP, and likely urgent theatre.

# FLUID RESPONSE

Another tool that helps me assess blood loss is the patient's physiological response to a fluid challenge (this can be crystalloid or packed red blood cells).

Essentially, this is the fairly rapid infusion of about 500 mL fluid/blood and assessing any change to heart rate or blood pressure.

One of three things will happen:

1. No change to HR or SBP (**non-responder**)
2. Temporary improvement only in HR and SBP (**transient-responder**)
3. Sustained improvement of HR and SBP (**responder**)

Non-responders are actively bleeding, need blood products and urgent theatre.

Transient responders are still bleeding and may be stable enough for CT, but can become non-responders quickly. They need blood products and theatre.

Responders have probably lost blood but are relatively stable, probably not actively bleeding and can have CT and more detailed surgical opinion.

Trauma is a dynamic process, so we can't base all decisions on fluid response or estimated blood loss. We use a number of markers to form an impression of likely injury, stability of patient and best disposition (theatre, ICU, etc).

# MECHANISM

Mechanism can be helpful too. If the patient has, for example, a stabbing wound to the neck that involves the carotid artery, you can expect a significant degree of hypovolaemia from blood lost on scene.

Equally, a seemingly stable patient with significant mechanism (eg fall from cliff), probably has occult injuries that haven't yet declared themselves.

# PERMISSIVE HYPOTENSION

Once a reasonable estimate of blood loss has been established, and you've decided on whether to give blood products or not, the next question to ask yourself is **"What blood pressure should I target?"**

The concept of tolerating a lower than normal blood pressure is not new. Bickell's landmark article on the subject was published in 1994![5] In essence, it means:

**Tolerate a lower than normal blood pressure until a surgeon can stop the bleeding.**

The theory here is an artificial increase in blood pressure, for example with the use of vasopressors or copious amounts of intravenous fluid, will increase the rate of bleeding, disrupt blood clot that has formed, and dilute coagulation factors.[6]

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[5] Recommended reading: Bickell et al, *Immediate versus delayed fluid resuscitation for hypotensive patients with penetrating torso injuries*, N Engl J Med, Oct 1994

[6] I was taught in the Army, in the bad old days, that for every litre of blood lost, required three litres of IV fluid to replace it. What were we thinking?

So what blood pressure do I target exactly? Here are some guidelines:

**penetrating trauma, SBP 60-70**

**blunt trauma, SBP 70-80**

**TBI with major haemorrhage, SBP 100**[7]

**Isolated TBI, SBP 110**

Penetrating trauma is any trauma where blood can leave the body, eg gunshot, stabbing, open fracture. A **SBP 60 is roughly equal to palpable carotid pulse.**

Blunt trauma is any trauma where blood is contained in the body, eg closed pelvic fracture, solid organ rupture, closed long bone fracture. A **SBP 80 is roughly equal to a palpable radial pulse.**

TBI is any head injury with mechanism for head injury and reduced GCS or neurological deficit, eg 'blown' pupil.

Some caveats on these targets:

- not everyone supports the concept of permissive hypotension and you will need to get the team's consent when you suggest a target
- the non-invasive BP cuff is notoriously inaccurate in hypotensive patients and can quickly become a 'random number generator'. Beware of the numbers it produces!
- look for other markers of perfusion, eg a talking patient is making sense with a SBP of 60 clearly only needs that SBP to maintain cerebral perfusion.
- The SBP targets represent the lowest possible blood pressures for a given presentation

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[7] Chestnut et al, *The role of secondary brain injury in determining outcome from severe head injury*, J Trauma, Feb 1993

- Remember that the aim is to move the patient rapidly to an operating theatre and get a surgeon to the source of bleeding as quickly as possible. Not languish in a resus room.
- permissive hypotension doesn't mean 'I don't care about the blood pressure', it is a considered approach to balancing ongoing bleeding in a severely hypovolaemic trauma patient's physiological needs versus rapid movement to theatre
- As always, there's no correct answer but the general principle of avoiding vasopressors (except maybe in TBI or SCI), replacing blood loss with blood products and getting the patient to theatre are the key message.

## PRACTICE TIPS

Assess blood loss against the patient's starting estimated blood volume.

Decide early on a SBP target and communicate this with your team.

Replace massive blood loss with blood products (not IV fluids).

Avoid vasopressors, except maybe in TBI and SCI.

Bleeding, unstable patients need an urgent transfer to an operating theatre.

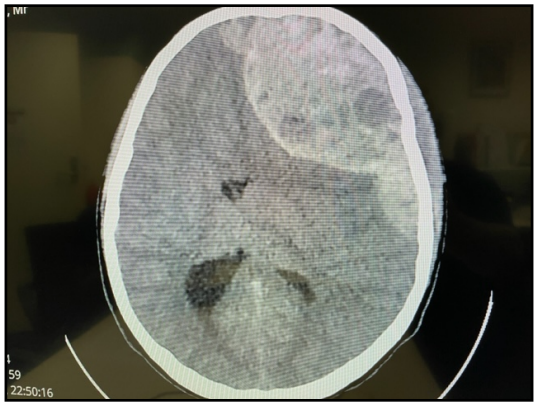
Stop any obvious compressible bleeding and then let the surgeons do their thing.

Don't delay a surgical intervention with unnecessary tests or lines (eg arterial line). They can all be done after the surgeon starts cutting.

# D ISABILITY

## GCS - PUPILS-MOVING 4 LIMBS

Make a rapid assessment of the patient's level of consciousness (LOC) and if they are moving their arms and legs. You are looking for evidence of




traumatic brain injury (TBI) or spinal cord injury (SCI).

**AVPU** is useful here:

**A**lert & Orientated
Unconscious but responds to **V**oice
Unconscious but responds to **P**ain
**U**nconscious with no response

If the patient deteriorates down the AVPU scale, then their head injury is getting worse. For example, they were

responding to voice, but later, only respond to pain, then they are deteriorating from a TBI perspective.

Deeply unconscious patients, or those with GCS <8, likely warrant intubation. ("**GCS less than eight, intubate**").

Your assessment of LOC will signal the need for intubation, but it can happen once you've finished your primary survey.

Do these three things:

1. Talk to the patient to see if they respond
2. Check Pupils (looking for 'blown' pupil) if they don't
3. Ask them to move 4 limbs, or observe any movement of limbs. Ask pre-hospital team if the patient was moving limbs on scene.

If TBI is suspected, then you need to aggressively guard against hypotension (SBP < 90 and) and hypoxia (SpO2 < 90).[8]

Discovering a TBI already tells me the following need to be planned for (and articulated):

- intubation
- arterial line
- CT scan
- neurosurgical consult
- possible operating theatre
- ICU bed

I will also know that the following need to occur:

- head elevated to 30 degrees
- cervical spine collar replaced with sandbags

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[8] Chestnut et al, *The role of secondary brain injury in determining outcome from severe head injury*, J Trauma, Feb 1993

- ETT tie replaced with tape
- Osmotic agent given or available throughout transport
- IDC placed
- Normal Saline for IVF
- Aim for ETCO2 30 mmHg (to give PaCO2 35 mmHg)
- Check glucose
- vasopressor connected
- Central line

None of these interventions should delay CT or surgery and all can occur at the completion of the primary survey.

## PRACTICE TIPS

Talk to patient to assess LOC.

Ask patient to move squeeze your hand and move their legs.

If unconscious, assess pupillary light reflex.

GCS < 8, intubate.

Set up for intubation but complete primary survey first.

If evidence of TBI, SBP 100 if poly-trauma with severe bleeding, otherwise SBP 110.

If evidence of neurological deficit (ie 'blown' pupil) or abnormal posturing, then give osmotic agent (ie Mannitol @ 1 g/kg).

SBP < 90 or SpO2 < 90 doubles mortality.

# EXPOSURE + ENVIRONMENTAL CONTROL

## LOG ROLL + TEMPERATURE CONTROL

Exposing the patient in the primary survey essentially means looking at the back. The best time to do this is when when patient is being transferred onto the resus bed in ED or onto the operating table from their resus trolley or ambulance stretcher.

It does put the primary survey a little out of order, but allows you to assess the back quickly. If the patient is awake and stable, then you can feel down the spine looking for steps and asking for pain on palpation. Anal tone (the patient's) can also be assessed here.

If the patient is unconscious and unstable, then just pause briefly on the log roll and look for obvious injuries, such as exit wounds, burns or penetrating lacerations.

Temperature control reminds us at the end of the primary survey to prevent hypothermia, a killer of trauma patients (see the 'Triad of Death').

## PRACTICE TIPS

Examine the patient's back on the log roll during transfer onto the operating table or resus bed.

Preventing hypothermia means:

- Forced Air Warmer (Bair Hugger)
- IV Fluid warmer
- Temperature probe
- Warming the theatre

# END OF PRIMARY SURVEY

At the end of the primary survey, which should take < 3 minutes, the following should have occurred:

- identified and treated the three immediately life-threatening injuries
- identified the need for intubation, chest drains, surgical control of bleeding, CT scans, ICU admission etc.
- set basic BP, SpO2, and ETCO2 targets
- identified the need for MTP or Code Crimson
- tasked your team with coordination of above and preparation for life-saving interventions
- be ready to start a secondary survey

# SECONDARY SURVEY
## HEAD - TO - TOE

The purpose of the secondary survey is to **identify any further life-threatening injuries.** After our rapid primary survey, finding and fixing the three immediately life-threatening injuries, we can can now move on to a full head-to-toe examination of the patient, and, if conscious, take an AMPLE history:

**A** llergies
**M** edications
**P** ast medical history (brief)
**L** ast ate & drank
**E** vents leading up to the accident

Key secondary survey interventions can now also take place:

Intubation
Finger thoracostomy or Intercostal Catheter (ICC)
Pelvic binder
Long bone reduction and splints (eg CT6)
Arterial line (time permitting)
Central line (time permitting)
Indwelling Catheter (IDC) (time permitting)
Active warming (Bair Huggers, temp probe)
*Preparing to move* next destination:
CT, angio, theatre or ICU

Whilst these interventions are taking place, you, as Team Leader, will direct the examination of the patient from head-to-toe.

It might sound something like this:

*"Ok team, we've completed the primary survey. I now want the following to occur:*

*Mel, you and your airway team can go ahead and prepare to intubate the patient, check the pupils before you do. I then want a careful examination of the head and neck.*

*Michael, I want you and your team to decompress the chest bilaterally with finger thoracostomy once the patient is intubated. ICCs can happen in theatre. Then I want you to examine the chest, abdo and limbs again looking for any injuries. Re-scan the chest with ultrasound after intubation and thoracostomies.*

*Rachael, you and your team get an arterial line in, continue with MTP and get mannitol ready please. I also want an IDC before we leave. Matty, you're on drugs, I want ketamine, 100mg rocuronium and draw 500mcg fentanyl. Don't give anything until I tell you.*

*John, call CT to prepare a scanner, then call the Duty Anaesthetist in theatres and ask them to prepare a theatre and send an anaesthetist down here please. After that, call ICU and ask for a ventilated bed.*

*Blood pressure target is still 100 systolic.*

*Any other suggestions anyone?*

*Let's do it."*

Again, we are giving clear direction to the tasks that need to be done, forecast and prepared our next destinations, and allowed space for your team to offer suggestions.

Now that I'm cognitively offloaded, I can focus on observing the head-to-toe examination by the respective teams, making sure nothing is missed and being available for key findings to be reported back to me.

I am **not**:

- on the phone
- examining the patient myself
- performing interventions or procedures
- distracted by anything other than the secondary survey

Let's look at some of the key interventions in a little more depth.

# INTUBATION OF THE TRAUMA PATIENT[9]

Top tips:

1. Brief the airway strategy:
    1. Plan A: RSI Intubation
    2. Plan B: LMA
    3. 2-person BMV with adjuncts
    4. CICO Rescue, cannula first, then scalpel if fails
2. Brief drugs:
    1. Ketamine 100mg if conscious, 50mg if not, none if obtunded and nearly dead
    2. Rocuronium 100mg
    3. Fentanyl 100mcg if TBI
    4. Metaraminol available

[9] For more detailed information see *Who Plans Wins* in Apple Books or GoogleBooks

**3.** Cricoid pressure is a personal preference (I personally do not use it for trauma patients)
**4.** External Laryngeal Manipulation (ELM) will almost always improve your view of the cords
**5.** Tragus of ear at or above sternal notch.
**6.** Use a bougie for first attempt
**7.** Consider pre-oxygenation with LMA if patient unconscious and will tolerate
**8.** A higher BP peri-induction is better than a 'dumping' the BP for TBI (remember Chestnut!)
**9.** You don't need an arterial line to intubate.
**10.** It shouldn't take more than 10mins and ideally <5 mins.
**11.** If it looks difficult, then go to theatre and intubate there.

If the patient is combative, then consider a Delayed Sequence Intubation (DSI). That is, give ketamine IV in aliquots until the patient is no longer combative. Start with 40mg IV then give 10-20mg every 3-5 mins until they're quiet.

If no IV access, give 100mg IM and repeat in 10mins if needed.

# -2-

# PRIMARY/SECONDARY SURVEY IN THE OPERATING THEATRE

## REPEAT THE SURVEY

On arrival to the operating theatre, the anaesthetist needs to repeat the primary/secondary survey in quick order, whilst the surgeons get scrubbed and get ready to start operating.

**This is when momentum is sometimes lost!**

If I've prepared the team with a **Zero Survey brief**, things will move a lot more swiftly when the patient arrives, (even better when I've gone to collect the patient myself). As the patient rolls into theatre, I will focus myself on completing a rapid head-to-toe of the patient ruling out immediately life-threatening injuries (primary survey) and identifying any other major injuries.

If I have a team, I can delegate key aspects of this as per the secondary survey.

If the patient is intubated, I need to see the ETCO2 for myself on the monitor, check ETT depth, and check ventilator settings. I should be able to clearly see the monitor, the patient and my team from where I'm positioned in theatre.

The end of the operating table, looking towards the patient's head is best.

What's most important during the phase before the scalpel touches the skin, is that I'm confident I haven't missed an injury that will kill the patient.

**Trauma is a dynamic process**, just because an injury has been ruled out prior to coming to theatre, doesn't mean it won't develop. Tension pneumothorax is an insidious injury that can develop quietly during the transit to theatre, especially in a ventilated patient, and the only clue to it's presence might be low blood pressure. In a poly trauma

patient with hypovolaemia and suspected spinal cord injury, a pneumothorax will be easily missed and assumed to be something else.

**If you don't look for it, you won't find it.**

The most commonly missed injures in my experience are:

- tension pneumothorax
- blown pupil from unrecognised worsening TBI

- misplaced ETT (eg right main bronchus, oesophageal intubation, kinked or patient biting on ETT)
- tension pneumothorax
- cardiac tamponade
- long bone major fracture
- tension pneumothorax
- retroperitoneal haemorrhage
- pelvic fracture
- tension pneumothorax
- spinal cord injury

**If *you're* not considering these injuries, then *who is*?**

## PRACTICE TIPS

Trauma is a dynamic process.

Repeat the primary and secondary survey on arrival to theatre.

Don't delay surgical access with arterial or central lines, these can be done concurrently.

Start your stopwatch when the patient arrives, aim for knife to skin <15mins (this includes intubation).

# TERTIARY SURVEY
## EVERYTHING ELSE

The purpose of the tertiary survey is to **identify any other injuries that might have been missed.** This is done >24hrs after admission to hospital and includes reviewing all imaging, blood tests, echocardiography results etc and, where indicated, ordering tests to rule out other injuries.

By their nature, these injuries are not usually life-threatening, but may be life altering. The sorts of injuries found on tertiary surveys include:

- carotid artery dissection
- bony fractures of metacarpals/metatarsals
- rib fractures
- splenic aneurysms
- foreign body

In one tertiary survey, our team discovered a tampon in an intubated patient that was causing sepsis. The patient had been in hospital for several days and was still intubated from the initial trauma.

One approach to the tertiary survey is as follows:

- review the mechanism and initial injury
- review all imaging to date (even better, do this with a radiologist)
- review all tests to date
- consider what tests still need to be done
- take detailed history from patient

- do detailed head to toe exam of patient, looking in every hole and checking every tube going into, or out of, the patient
- this will include examination of:
  - cranial nerves
  - neurological system
  - cardiovascular system
  - respiratory system
  - musculoskeletal system
- consider needs for further surgery and liaise with sub-specialty teams
- consider DVT prophylaxis in context of injuries and further surgery
- consider antibiotic regime
- start planning for discharge, including via rehabilitation hospitals
- have discussions with family and NOK

By the end of the tertiary survey, you should have a clear idea of the issues remaining for this patient, their likely discharge destination and a plan going forward.

If the patient is intubated for a long period, you will need to repeat the tertiary survey, or a modified version of it, when they are extubated.

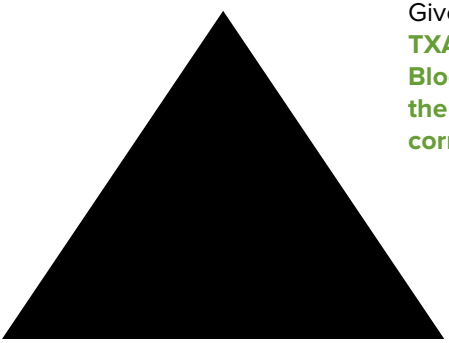
# -3-

# TRIAD OF DEATH

## HYPOTHERMIA - ACIDOSIS -COAGULOPATHY

**Coagulopathy**

**consumptive &**
**cold induced & acidosis**
**makes bleeding worse**
Give:
**TXA**
**Blood products**
**the 'yellow stuff'**
**correct temp & perfusion**



**Hypothermia**

**exposed patient**
**poor peripheral perfusion**
**causes clotting enzymes to cease, bleeding worse**
Correct with:
**fluid warmers**
**forced air warmers**
**temperature probe**
**warm theatre**

**Acidosis**

**end organ hypoperfusion**
**causes reduced heart function & increases bleeding**
Correct with:
**PaCO2 35mmHg**
**ETCO2 30mmHg**
**correct perfusion**

As far as memory checklists go, the 'Triad of Death', or 'Lethal Triad' is by far the most useful for me during any trauma resuscitation.

Revisit the triad at least every 30 mins during the resuscitation and theatre phase. ROTEM will guide your coagulopathy with products such as:

- fibrinogen concentrate
- fresh frozen plasma
- prothrombinex
- platelets
- cryoprecipitate

Check your ETCO2 is 35 mmHg (lower if hyperventilating for TBI with neurological deficit). Try to address hypoperfusion with improved end-organ perfusion by giving volume to improve blood pressure, within the confines of permissive hypotension if needed. Avoid vasopressors where possible, except for TBI and SCI if required.

Hypothermia needs to be addressed early and is part of the primary survey. Never give fluid or blood to a trauma patient without a fluid warmer, cover the patient as soon as possible, begin active warming, and place a temperature probe.

# -4-

# DAMAGE CONTROL SURGERY

## HAEMOSTASIS

Not a new concept (liver packing was first described by Pringle over 100 years ago), the term 'Damage Control' was described by Rotondo et al[10] in 1993 as

**'initial control of haemorrhage and contamination followed by intra-peritoneal packing and rapid closure, resuscitation to normal physiology in the intensive care unit and subsequent definitive re-exploration'**.

Further studies have supported this approach in patients who have low base excess, high transfusion requirements, and low temperature.[11]

Importantly not every patient requires a DCS approach! Those patients with severe bleeding, acidosis (**pH < 7.3**), who are cold (**Temp < 35 deg**) with high transfusion requirement (**MTP**) and those with likely surgical time **> 90 mins** seem at

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[10] Rotondo et al, *Damage control: an approach for improved survival in exanguinating penetrating abdominal injury*. J Trauma Sep 1993

[11] Timmermans et al, *Predicting mortality in damage control surgery for major abdominal trauma*, South African Journal of Surgery, Mar 2010

most benefit of a DCS, with Damage Control Resuscitation (DCR) approach.[12]

The DCR approach prioritises haemostatic resuscitation, addressing each arm of the Lethal Triad in concert with:

- permissive hypotension
- limited crystalloid use
- early transfusion of blood and products
- early use of TXA
- DCS

Johnson et al[13] describe a four phase approach to DCS:

**Part Zero**

- pre-theatre phase with early recognition of DCR, need for DCS and rapid transport to theatre (Code Crimson)

**Part One**

- immediate exploratory laparotomy with rapid control of bleeding

**Part Two**

- ICU phase to achieve physiologic return to baseline (temperature/acid-base/coagulation)

**Part Three**

- Return to theatre 24-48 hrs later for more definitive surgery.

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[12] Lamb et al, *Damage control surgery in the era of damage control resuscitation*, BJA, Aug 2014

[13] Johnson et al. *Evolution in damage control for exsanguinating penetrating abdominal injury*, J Trauma, 2001, vol. 51

## PRACTICE TIPS

Identify those patients most likely to benefit from a DCR/DCS approach.

Communicate this to your team, especially your surgical colleagues whom may not have been at the initial resuscitation.

Target a theatre time of 90 mins as a rough guide, then to ICU for return to theatre in 24-48 hrs.

Be guided by the Triad of Death for how well the patient is tolerating surgery.

Keep abreast of the surgical plan and keep surgeons updated on how much time they have.

Consider appointing a Surgical Team Lead for complex cases with multiple surgical teams.

# -5-

# TEAM LEADERSHIP

# THE BENEVOLENT DICTATOR

Leading a major trauma resuscitation can be a highly satisfying experience. Like all high performance functions, the key is to try and enjoy it!

**So what does good leadership look like?**

If you've been to enough traumas, you know within moments of your arrival if there's an effective Team Leader. In my experience, the shortest, most succinct definition of good


leadership is "positive influence". That means that your presence as a leader can influence the outcome in a positive

way. When the opposite occurs, I call that 'toxic presence'. We've all seen plenty of situations when that one person creates a toxic presence and projects a negative influence on the situation. Identifying and removing those people from your team is another skill itself!

Here are my top 12 tips for being effective:

1. **Think about *what* you want to say before you speak and *how* you will say it**

Make each packet of transmission that comes out of your mouth as something worth listening to. And make sure everyone in the room is hearing you. This will mean a clear, loud voice, delivered with steady rhythm, slower speed, higher volume and calm pitch. Think about how the pilot talks to the passengers over the intercom on a plane.

**2. Set the *tone* and *targets* with your first 'transmission'**

This can happen during the Zero Survey, or when you first arrive and are allocated, or allocate yourself, as Team Leader. Give a *very brief* **recap** of the clinical situation, followed by your physiological targets for blood pressure and what your priorities of treatment are. Allocate people to those tasks and invite input from the team. Then let the team get on and do them! This means, don't transmit for at least 3-5 mins. When you next speak, make sure it is something worth listening to.

**3. Keep it simple**

The adage 'an 80% solution delivered on time is better than a 100% solution delivered late' was a mainstay in the Army, and works well in trauma too. This is not rocket

science, stick to the basic principles **< C A B C D >**, be clear in your own mind about where you're up to in the primary or secondary survey, and don't miss life-threatening injuries.

### 4. Maintain 'hands off' leadership

Position yourself at the end of bed, arms folded, no gloves (this will stop you touching the patient). Delegate *everything*. And I mean, everything. When handed an ABG or ROTEM result, hand it to someone who knows them, ask them to read it, and give you a summary and their advice. This keeps the team involved, and keeps your brain free to maintain situational awareness. Matt Doane tells me at a trauma centre he worked in, the Team Leader held a coffee mug with "hands off" on it. Holding it worked like a 'fidget tool' to stop you going anything else but hold the cup!

### 5. Fight to maintain situational awareness

Situational awareness is defined as 'the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their future status.' [14]

In practice, this means keeping your brain off fixed tasks to remain able to observe the situation. If you can do that, you're much more likely to pick up things that have been missed, tasks being performed incorrectly, and more importantly, think about the next steps for this resuscitation.

### 6. Create space ahead of the patient.

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[14] Endsley, M., *Toward a theory of situation awareness in dynamic systems*. Human Factors, 37, 1995,

This means if you are in the resus room in ED, task someone to get CT and theatres ready. If you're in theatre, make sure CT and ICU are expecting you. This maintains *forward momentum* for the patient and stops you languishing in one place whilst the Triad of Death works its black magic.

**7. Be supportive and personal with your team**

Use first names, thank people when they do a task, give compliments. The benevolent dictator.

**8. Use Functional Leadership**

Army officer training has long used John Adair's leadership model as a mental checklist to make sure you're addressing the three core needs of any leadership task:

*Task Needs* (setting tasks and performance standards)
*Group Needs* (communication, motivation, team building)
*Individual Needs* (coaching, counselling, motivating)

There are lots of resources on this approach, worth a read!

**9. Consider your style of leadership for the situation**

This means knowing when to switch between the three broad styles of leadership:

*Authoritative* (best for time pressured situations)
*Participative* (you have time to ask for input and take suggestions from the team)
*Free-rein* (brainstorming during zero survey for example)

There will be times during a single resuscitation when you need to switch between these various styles, based on the clinical situation.

**10. Share the mental model and recap**

About every 20-30 mins, and less frequently for a longer theatre case, it's worth stopping the team, getting their attention and providing a *very brief* recap, followed by your thoughts. For example:

"OK team (very loud voice), can I get your attention for a moment please (less loud), we have (less loud again):

A 25 yr old male, MBA with TBI, chest, pelvis and long bone fractures. We have been in theatre for 1 hour now.

He has an airway, bilateral chest drains that are swinging with good airway pressures and both lungs up on ultrasound, no obvious solid organ injury on CT, open book pelvis currently being ex-fixed by surgeons, bilateral open femurs for ex-fix. MTP in progress with 12 units RBC so far.

His temperature is 35.6 degrees, pH 7.3 and ROTEM looks good.

The plan going forward is to complete ex-fix of femurs and pelvis, then via CT to ICU for warming.

I would like to slowly bring the BP up to 110 now that we have bleeding under control and re-check pupils for need for more mannitol.

I'm concerned about temperature and acidosis at the moment and would like to be out of here in < 60 mins.

How does that sound to everyone?

Any issues so far?

Ok, good work, crack on."

You are re-establishing yourself as Team Leader. You are bringing the team up to speed to create a shared situational awareness, you are setting targets, and forecasting the next steps.

### 11. Remember that you are setting the scene for the *next* trauma

Your behaviour and performance will be remembered the next time you step up. This can be a good thing if you've done a good job! If you've been approachable, caring, and actually demonstrated some leadership, then your team is going to have confidence in you.

You can't make everyone happy, and chances are, someone won't like what you've done or how you've done it. Trauma brings out the critics, especially after the event!

Conversely, if you've spent more time worrying about what people think of you, trying to be popular, or too afraid to give firm direction, then you are likely to struggle on your next attempt to lead.

You write your own report with your performance.

### 12. Run a debrief and reflect on your own performance

As soon as possible, once the patient is in ICU, get the team together and run a 'hot'[15] debrief. You'll gain valuable insight into things you missed and pick up subtle clues to your own performance.

Reflect on how you went but don't be too hard on yourself. You will make errors, sometimes really big ones, but so long as you are making decisions in the interest of the patient and you have insight into your own abilities, then you will continue to get better.

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[15] This is a 'down & dirty', quick fire debrief at the end of the session. What the debrief lacks in structure is countered by the immediate nature of the debrief to the event that has just taken place. It will help team members shape and frame their memory of the event in a positive way.

**"You may not be the best, the strongest, or the brightest, but you might just be the only one willing to put yourself out there. The time may come when you choose to do the difficult right over the easy wrong. When that day comes, do your best and be prepared to do it again and again and again."-** C. Craighead, Special Air Service.

## PRACTICE TIPS

Look for good Team Leaders in trauma and model their behaviour.

Recap and share the mental model.

When you speak, make it something worth hearing.

Find a balance between stream of transmission versus total silence.

Position yourself in the room for maximum situational awareness.

Do the basics well **< C A B C D >**

Create space ahead of the patient.

Seek a trauma mentor and debrief with them.

When given the opportunity, have a go! You won't get any better if you don't try.

# -6-

# DEATHS

## A TOUGH DAY AT THE OFFICE

Do enough traumas, and, despite your very best effort on the day, and you'll eventually have a patient die on you.

This is never easy, it's always stressful, and it can really knock you around. There is a considerable secondary trauma associated with these deaths. This includes the orderlies who transferred the patient and were busy running blood products to theatre, the nursing and theatre staff who were part of the chaos, the surgeons, anaesthetists, intensivists, radiologists and every single person who was part of the resus, theatre or ICU will be affected in some way when the trauma patient dies.

I once had a radiologist calling me during a difficult resuscitation in theatre to report the CT findings of our poly trauma patient. She could barely get her words out as she was so distressed by what she saw on CT, and she hadn't even seen the patient. It shows just how far the ripple effect is on all of us when we're presented these cases.

In my mind, there are three broad phases here:

1. Immediate
2. Short term
3. Long term

# IMMEDIATE PHASE

At some point during the patient's resuscitation or surgery it may become clear that they are not going to survive. It might be a sixth sense, or the nature of the injuries are so severe that you hard up against it. Other times, the patient might arrive in cardiac arrest with prolonged CPR in progress, and you have a sense that this particular case is already off to a poor start.

It's important here to forecast to your team what you're thinking and feeling. You have the big picture, but your team are head down, busy doing their tasks. If you cease resuscitation and declare the patient deceased, it can come as a real shock to your team and can have significant negative coping effects afterwards. I've been on a team when the Team Leader did this, and I spent days wondering if we couldn't have done more for the patient or if I should have been more vocal. The reality is, the Team Leader didn't consult with his team or share his mental model, it was a sudden declaration to cease. He was a highly experienced consultant and I'm sure had considered all options, but as a team, we just weren't mentally ready for it.

Take the time to bring your team to your sense of where this is heading (you may even have already decided to cease resuscitation, but don't declare that yet):

*"Ok, if I can have everyone's attention for a minute.*

*We have a <recap> 25yr old male, MBA in cardiac arrest who has had no output or shockable rhythm for >30mins. Our ETCO2 <10 and we have ruled out any reversible causes.*

*I'm thinking this patient is unlikely to survive. Does anyone have any suggestions or ideas of what we might be missing?*

*<wait for suggestions, there's no hurry here>*

*Alright then, if it's OK with everyone, I'd like to do 3 more rounds of CPR and reassess. If we can't find any other cause or there is still no meaningful output, I think we should cease resuscitation. Is everyone OK with that?"*

I'm giving people time to come to terms with what is about to happen. It will make a significant difference in the debrief and for post event reflection and it means the team will know that you care. This helps for the next trauma case too.

After the period of time you've stated (at least 5 minutes), then recap again, review any reversible causes, articulate any key values (ETCO2, pH, fixed pupils, no output, etc), and ask the team to cease all efforts and note the time of death.

Remind the team that no lines or tubes are to be removed from the patient and then run an immediate hot debrief before everyone disperses.

You will need to fill out a series of forms for Police, Coroner, your own department etc.

# SHORT TERM

Over the next few days, the impact of what has happened will become apparent. I find the clinical situation plays out over again in my mind, and I'm highly critical of my own performance as I look for improvement. This might be 'technical' skills or knowledge gaps ("How long should I have left that intra-aortic balloon inflated?") which will direct me to research evidence or guidelines in areas that I'm deficient. It

may be 'non-technical' skills ("I think I was a bit harsh on that team member in the way I spoke to them.").

Throughout this short term phase, processing your own performance looking for improvement, and reminding yourself you're part of an dynamic and capable team doing exciting work and good things for patients in extreme need, helps shape the experience in a powerfully positive way.

Chatting with colleagues about the event, again in a positive way, will help shape our thoughts and feelings about the event. In the very worst of cases and outcomes.

# LONG TERM

How you've processed the event in the immediate and short term will determine the long term psychological impact, in my personal experience. I've been part of many different teams across different domains and a common theme amongst high performing teams with low rates of poor mental health has been:

- a warrior mindset (no victim mentality)
- strong collegiate support
- removal of toxic people
- highly developed coping strategies which process events in a positive way
- feeling part of a high performance team with shared experience
- reminding yourself that you would rather be part of something important (even if it comes with occasional bad days at the office), than in a completely safe environment with zero risk (physical risk in military settings, psychological risk in hospital settings).
- being at the 'coalface' is where life's richest experiences are found

- better to be the person in the arena, than a mere spectator.

# SPECIAL CATEGORY PATIENTS

It's worth noting that some patient deaths will hit us harder than others. These will include:

- any paediatric patients
- pregnant patients
- patients of a similar age to you or the majority of the medical staff (if you're an old fart like me)
- staff members
- members of your own team (in military settings)

Whenever these patient present, and are looking likely to die during the resuscitation or theatre phase, then I will always spend a lot longer in the resuscitation phase than is probably clinically necessary. This is to give the team as much time as possible to start to process a likely poor outcome, in this case, death.

I will take considerably longer in asking for suggestions for the team, and implementing even the smallest suggestion.

It is even more important to run an immediate 'hot' debrief in these events. And then run another debrief a few days later.

# THE DEBRIEF

Running a debrief can be challenging, especially if you've been directly involved. Here are my top tips for running an effective debrief:

1. **Start with introductions and roles**, don't assume everyone will know who everyone else is.

2. Go around the room, and **ask how everyone is feeling**. 'De-grief before debrief'. You might be surprised with what responses you get and it will give you an idea how the room is feeling. Don't get into the clinical course here or what happened. Focus on general emotional responses.

3. **Recap the clinical situation**, what decisions were made and why, and what interventions were done, and why. There will be team members who have no idea what the big picture was and this will fill in the gaps.

4. **Let the conversation flow** for a while, and allow people to express how they're feeling.

5. I find it useful to **guide how the team will process the event** going forward. I want to normalise what people might be experiencing in the coming days/weeks and hopefully guide those thoughts in a positive direction:

- having recurrent thoughts of the event is *normal*
- it's the brain's way of 'catching up' on the the emotions that were parked during the event
- despite the bad outcome, it's important to *feel good* about being part of a high performance team that does great things for the greater good.

- we only get better with experience. Some of those experiences will be bad. Reflecting in a positive way will ensure we learn from each experience. If you lack insight into your own performance, or why a team performed well or not, you won't get any better.
- errors are a normal part of learning. When we own errors we make, we get better.
- have a warrior mindset. Don't be a victim to other people's behaviour or the situation.
- some team members will relish blaming others for their own poor performance and may even target other team members in this crusade. Chances are, they are the perpetual poor performers in your organisation and little can be done to save them! When identified, they are best carefully removed from future traumas. See my earlier comment on 'toxic presence'. Hopefully you have a leader strong enough to recognise this behaviour and support the high performing team members and call out toxic behaviour in others when they see it.

Where possible, schedule a second debrief a couple of weeks or more after the event. Including ICU staff in this is also really helpful. It gives a longitudinal component to the journey and helps us understand the specialised role we each have played.


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# ABOUT THE AUTHOR

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