Advanced Paramedic Upskilling programme

3rd Edition Clinical Practice Guidelines

Manual—Part 1

Spring 2010

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NATIONAL AMBULANCE SERVICE

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Foreword

National Ambulance Services College

The delivery of pre-hospital emergency care in Ireland has changed radically over the last decade, and the pace of change continues to accelerate. Such change is built on the experiences of a relatively short time frame since the introduction of basic ambulance training some 40 years ago. The pre-hospital emergency care practitioner is one of the newest healthcare professionals serving the public. Such practitioners have been required to meet many challenges including the requirement to continually develop their care skills. The professionalisation of pre-hospital emergency care requires that delivered care is safe, equitable and timely. Given the complexity of such care a structured approach is essential.

The introduction of the original PHECC SOP's and later the CPGs have acted both as a catalyst for change and also as a supporting framework for practitioners in ensuring that the level of care provided is appropriate, is based on best available evidence and ensures the continued safety of both the patient and the practitioner. The CPGs will continue to provide practitioners with guidance in a structured fashion. Reform of the delivery of emergency medicine is on-going and places further demands on the pre-hospital emergency care practitioner to deliver first class care from the point of initial contact with the patient.

Since the Advanced Paramedic Programme's introduction in 2004 significant development has occurred, leading to improvements in patient care and in the expansion of the practitioner's role. The 3rd edition of the Clinical Practice Guidelines will further advance the care of the patients. Given the complexity of some of the additional skills and medications a two-phased approach to implementation is planned and will be implemented over the coming two years.

Further additions to the current CPGs may also occur during and beyond this time frame and will be addressed based on the prioritisation of patients' needs and the availability of resources. The coming years promise to be exciting and challenging and will undoubtedly to further improvements both in the delivery of pre-hospital emergency care and also the growth of one of the newest healthcare professions in Ireland. Such change will also allow practitioners in Ireland to comfortably take their places alongside their international colleagues. I am sure that practitioners in Ireland will meet and enjoy the challenges to the benefit of patients.

Dublin Fire Brigade

The Dublin Fire Brigade and Royal College of Surgeons partnership commenced in 2002. DFB/ RCSI is a PHECC accredited institution and provide many of the PHECC approved courses. The institution has run 10 paramedic courses to date and has tutors on all levels of the PHECC tutor framework. The institution provides the current Paramedic Upskilling Programme and is delighted to be involved in the AP Upskilling programme too.

Dublin Fire Brigade also assists in providing field placements for the UCD/NASC Advanced Paramedic internship. To date, Dublin Fire Brigade has put twenty-one people through this programme. It is of benefit for all services to have operational AP's both for improved patient care and by providing clinical leadership in the field.

The Pre-hospital Care Council is happy to be associated with this initiative to upskill all Advanced Paramedics (AP's) on the register in the 3rd edition Clinical Practice Guidelines. These CPG's will increase the scope of practice of AP's thus providing enhanced care for patients encountered.

The upskilling is in line with PHECC's mission statement "The Pre-hospital Emergency Care Council protects the public by specifying, reviewing, maintaining and monitoring standards of excellence for the delivery of quality pre-hospital emergency care for people in Ireland".

There are 19 additional CPG's, 13 additional medications and 7 new indications for current medications in the 3rd edition CPG's for AP's. PHECC is confident that the professionalism shown by AP's to date will motivate the upskilling candidates to ensure confident and competent practitioners for the future.

PHECC wishes to thank all involved and in particular Dr Niamh Collins for the dedication and effort in bringing this upskilling project to fruition

Introduction

The Pre-hospital Emergency Care Council launched the 3rd edition of the Advanced Paramedic Clinical Practice Guidelines in 2009. There are now a total of 72 CPG's for advanced practitioners; a significant expansion both in number and in relation to scope of practice. All patient care should follow PHECC's "Care Principles" available on pages 14-16 of the 3rd Edition CPG's. The National Ambulance Service and Dublin Fire Brigade welcome this publication and will introduce the new guidelines on a phased basis .

The upskilling process reflects the phased introduction of the new practice guidelines. It will occur in two stages; Part 1 will concentrate on the early implementation of guidelines that either involve a modification of current practice or where large numbers in the community will potentially benefit from the new practice. Part 2 will be introduced at a later stage.

In is anticipated that Part 1 of the Upskilling programme will occur in Spring 2010. The programme has been designed to facilitate the upskilling of large numbers of practitioners over a relatively short period. Changes relating to modification of current practice or those relating to new knowledge are addressed in this manual, while new skills will be taught in a series of skills workshops over a two day period. Competency in the new material will be assessed through a combination of written answers and clinical scenarios.

The upskilling material provided is to be used in conjunction with the 3rd edition of the Pre-hospital Emergency Care Council's Clinical Practice Guidelines. This guide is not a definitive text nor is it designed to replace core pre-hospital care textbooks.

Change and gaining new knowledge is challenging but is ultimately rewarding.

Good luck on this journey.

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1. Patient Assessment

Primary Survey
Major changes include the removal of CUPS and the use of Clinical Status instead. Both the medical and trauma primary survey assess 5 factors:

All life-threatening findings must be treated during the primary survey

- Responsive or unresponsive?
- Airway: patent or not?
- Breathing: Adequate or inadequate?
- Circulation: pulse absent or present? Character—fast, slow or normal?
- AVPU

These 5 elements allow the practitioner determine if the patient's condition is:

Life– threatening | Serious, non life-threatening | Not serious or life-threatening

The Trauma Primary Survey also considers:
1) The risk of C-Spine injury
2) The control of major haemorrhage
3) Exposure of obvious injury (only life-threatening ones to be treated during 1° survey)

Secondary survey
Other significant changes include the introduction of a MEWS score for medical and surgical patients and the Revised Trauma Score for trauma patients. Both of these combine various physiological variables and use a total score as a marker of illness.

MEWS score

Score	3	2	1	0	1	2	3
Resp Rate		<9		9-14	15-20	21-29	>29
Heart Rate		<41	41-50	51-100	101-110	111-129	>129
Sys BP	<71	71-80	81-89	90-159	160-169	170-199	>199
Temp		<35		35-38.4		>38.4	
AVPU				A	V	P	U

Scenarios
Lily's daughter called for an ambulance as her mother was unwell with a cough. You note the following vital signs; Resps 18, Pulse 96, SBP 165, Temp 38.2. She is chatty and orientated.

Tom's neighbour called the ambulance as he didn't open his curtains that day. You find him difficult to rouse (to pain only) and note the following vitals; Resps 32, Pulse 140, Sys BP 90, Temp 34, She tells you he has diabetes.

Lily's MEWS score is 2. Tom's MEWS score is 10.

A MEWS Score>5 needs urgent transport

Scenarios
Sean was cleaning the gutters around his house and fell off his ladder (approx 6 m high) on to the ground. He is complaining of severe left sided chest pain and can clearly remember all events. His airway is patent, his Resp rate 36, Pulse 128 and SBP 160.

Lisa was cycling her bicycle when she hit a pothole and flew over the handle-bars. A by-passer witnessed the event. Initially she got up and walked around. However, you find her lying on the pavement. She eye opens to speech, she localises pain but will not obey commands. She cannot recall what happened or where she was going to. Airway—Patent, Resps 16, Pulse 90 and SBP 120.

What markers of mutli-system trauma are present for Sean and Lisa?
Calculate their RTS

The MEWS score considers 5 variables while the RTS considers 3 variables. They are easy to remember if you follow an ABCDE approach:

	MEWS	RTS
A	-	-
B	Resp Rate	Resp Rate
C	Pulse & SBP	SBP
D	AVPU	GCS
E	Temp	-

Markers of Multi-system Trauma

1. Dangerous mechanism of Injury
2. Resp < 10 or > 29
3. Heart Rate > 120
4. Sys BP < 90
5. GCS < 13
6. Revised Trauma Score <12

Revised Trauma Score

Resp Rate	10-29	4
	>29	3
	6-9	2
	1-5	1
	0	0
Sys BP	≥90	4
	76-89	3
	50-75	2
	1-49	1
	No BP	0
GCS	13-15	4
	9-12	3
	6-8	2
	4-5	1
	3	0

Both Sean and Lisa had a dangerous mechanism of injury. Lisa's GCS score is 12 (E3, M5, V4) so that is another marker of multi-system trauma. Sean's GCS is 15 but he has many abnormal vital signs; his heart rate and respiratory rate are significantly raised.
Sean's RTS score is 11 (Resp 3, SBP 4, GCS 4) and Lisa's is 11 (Resp 4, SBP 4, GCS 3).
Sean has 4 Markers of Multi-system Trauma and Lisa has 3.

Request ALS during the secondary survey if:
A) There are any makers of multi-system trauma
B) A medical patient is acutely unwell (cardiac chest pain, a MEWS score >5 or Pain score >5)

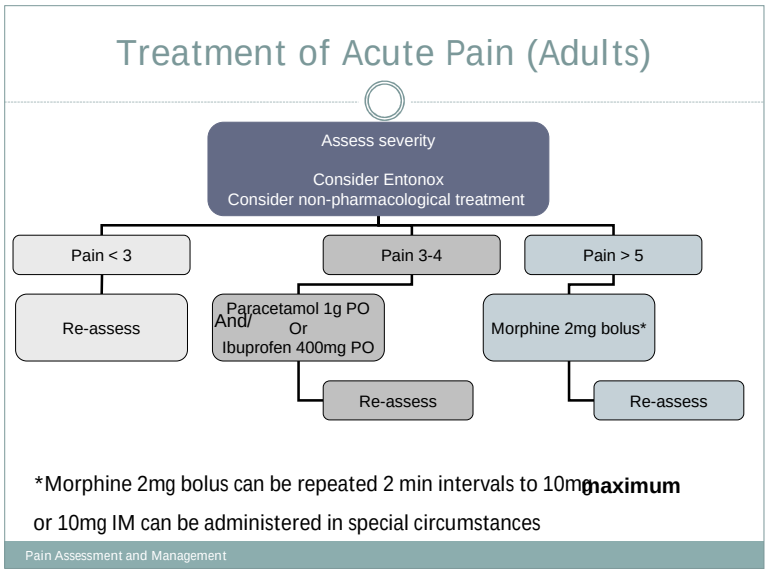
2. Pain management

Pain is responsible for 50% of presentations to the Emergency department so is a real and everyday challenge for pre-hospital staff. It is a protective sign, often warning the patient about actual or potential tissue damage. Our attitude towards and treatment of pain have enormous influence on the patient's perception of a service and a practitioner. Treating pain, unless there are specific contra-indications, is humane and is best practice.

Pain is "what the patient says it is". It may be influenced by previous experience of pain, their personality type, factors altering pain (e.g. alcohol, drugs, extreme emotion or brain injury) and psychological factors such as anxiety. Fear has an enormous influence on pain perception; patients often tolerate musculoskeletal injury better than abdominal pain or headaches as the former while severe is easily explained but the latter may be associated with a fear of an undiagnosed life-threatening illness. Often identifying fears associated with pain can improve pain management.

Pain is often graded on a 0-10 scale (either a Visual Analogue Scale or Verbal Rating Scale). Scales, while imperfect, allows serial measurements of pain severity. They provide a language to communicate with other practitioners and can facilitate "triage" of patients. They may also indicate the urgency that the patient attaches to the pain; 1-3 is often well tolerated, 4-6 indicates that treatment while welcome is not absolutely urgent and 7-10 suggests urgent intervention is wanted.

Pain assessment
P rovocation
Q uality
R egion
Referral
Recurrence
Relief
S everity
T ime



Re-evaluation is an important part of good pain management. Document.

Ondansetron
An anti-emetic that is a potent, highly selective 5 HT3 receptor-antagonist.
Presentation: Ampoule 2 mL (4 mg in 2 mL).
Administration: Intravenous CPG: 2.6, 4.16, 4.30, 7.14
Indications: Prevention and treatment of nausea & vomiting
Contra-Indications: KSAR
Dosage: Adult - 4 mg slow IV. Paediatric - 0.1 mg/Kg IV slowly (max 4 mg)
Side effects: Headache. Sensation of warmth. Flushing. Hiccups

Pain scores in young children are harder to use but even young children can relate to the Wong-Baker Scale.

Morphine is indicated for Wong Baker > 6
The oral dose is twice the IV dose.

Oow! What sort of pain is this?

Pleuritic: A sharp pain in the chest due to inflammation of the pleura. Typically worse on coughing or deep inspiration. Musculo-skeletal pain is similar to pleuritic pain but can be brought on with movement and may be locally tender.

Colicky: A sharp pain that comes on, builds up and eases off (waxes and wanes). Due to a spasm of smooth muscle in a tubular structure (e.g. gall bladder, ureter, bowel or fallopian tubes). The patient often moves around.

Peritoneal: This is a dull pain caused by irritation of the peritoneum (either due to inflammation of an intra-peritoneal organ or the presence of fluid or air within the peritoneum). Typically, the pain eases with lying flat and increases with movement.

Nociceptive: this is caused when nerve endings are irritated and may present as a dull or sharp pain of varying severity. The pain can normally be controlled if the cause of the irritation is removed.

Neuropathic: this is caused by injury, disease or trauma to a small area of the nervous system and frequently results in a sharp, constant, intense pain, often described as "shooting" in nature. It can be stubborn and difficult to control.

Other common terms include Sharp (like a knife), Dull (an Ache), Crampy ("twisting" or "squeezing", Throbbing (vascular or pulsating sensation) and Burning (hot, angry, inflamed).

Morphine

Is a controlled drug that acts as a potent analgesic. It works on μ receptors in the CNS resulting in CNS depression and it alters the perception of pain. It also causes a vasodilatation which results in a reduced pre-load to the heart.

It may be administered IV/IO and PO. It may also be given IM, although there are concerns that this may increase muscle enzyme levels (and confuse the diagnosis of acute coronary ischaemia).

The side effect profile means that it should be used with caution in the very young, the elderly and those with respiratory depression.

Ibuprofen (NSAIDS)
Analgesic, anti-pyretic & anti-inflammatory agent

Inhibit the cyclo-oxygenase enzyme (COX inhibitor) and exert its therapeutic effect by blocking prostaglandin synthesis

This results in side effects – gastric mucosa damage, bronchospasm, renal impairment & foetal damage

NSAIDs include ibuprofen, diclofenac and aspirin

Paracetamol
Partial COX inhibitor but no anti-inflammatory effect

Better gastric tolerance than NSAIDS

Causes severe hepatic injury in overdose

Available in combination with codeine in the community (e.g. Solpadine contains 8mg codeine) or on prescription (solpadol contains 30mg codeine)

Contra-indications to nitrous oxide

S hock
C hest injury
A ltered LOC
R ecent Scuba Dive
I ntestinal obstruction
D ecompression illness
I nhalational injury
C arbon monoxide poisoning
K SAR

3. Respiratory Emergencies

3.1 Changes in Advanced Airway Management

The indications for advanced airway management in the adult have been expanded. Previously, the insertion of a supra-glottic airway or endotracheal tube was only to be considered for apnoeic patients. Now, consideration for an advanced airway can be made if the patient fulfils ALL the following criteria:

1. GCS 3
2. Sats < 92%
3. Resps < 9
4. BVM Unsuccessful

Handy Hint! If there is any suggestion of opiate toxicity (pinpoint pupils, respiratory depression and reduced LOC) then consider naloxone

Further information on the Impedance Threshold Device is available from the manufacturer at www.advancedcirculatory.com

Another change in the 3rd edition CPG's is the introduction of the Impedance Threshold Device.

The rationale for this device stems from two principles 1) increased cardiac filling and increased cardiac output during CPR improve survival and 2) increases in intra-thoracic pressure can reduce cardiac filling. Chest compression is a 2 step process; active compression and recoil. There is negative intra-thoracic pressure during recoil and this results in small amounts of air being "sucked" into the chest. It is proposed that if a device stops the air being sucked in then the negative intra-thoracic pressure will draw more blood into the thoracic cavity instead. This will result in increased cardiac filling.

Early trials suggested an improvement in short-term survival and the American Heart Association gave it a Grade IIa rating (safe, acceptable and probably beneficial). Two large multi-centre trials are underway; ROC PRIVED and ResQ trial. The former was stopped prematurely in November 2009 as the ITD showed neither harm nor benefit.

3.2 Respiratory Disorders: Asthma & COPD

Bronchospasm is an abnormal contraction of the smooth muscle of the bronchi, resulting in airway narrowing and airflow obstruction. In asthma, the obstruction is usually reversible while in COPD the obstruction is only partly reversible.

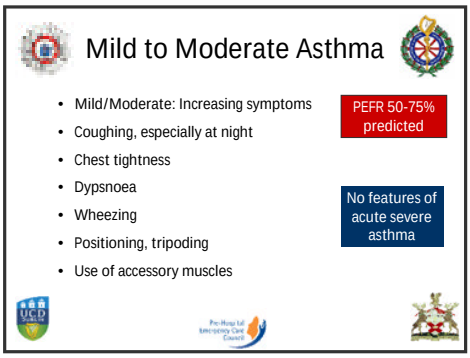
Check the Peak Flow in any wheezy patient

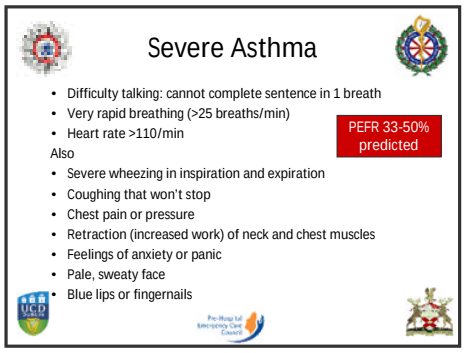
Salbutamol can be given as nebules or using a metered dose inhaler and spacer every 5 minutes (max 4).

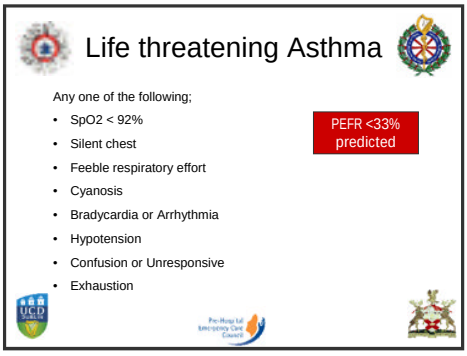
Wheeze: Caused by high velocity air travelling through narrowed airways (asthma or COPD) or due to local obstruction (tumour or mucus plug)

Crepitations : High pitched continuous sounds, usually heard at the end of inspiration. Common causes are pulmonary oedema and pneumonia

Stridor: Usually is an inspiratory , crowing type sound, heard without a stethoscope. Indicates significant narrowing or obstruction of the upper airway (larynx or trachea)







Ipratropium Bromide
Is an anticholinergic bronchodilator (chemically related to atropine). It is a parasympathatholytic that causes bronchodilation and dries respiratory tract secretions by blocking acetycholine receptors.
Pharmacokinetics
Onset: varies. Peak effect: 1.5-2.0 hr. Duration: 4-6 hr. Half life: 1.5-2.0 hr
Indications – asthma and reversible bronchospasm COPD
It is not indicated for the treatment of bronchospasm requiring a rapid response.
Precautions – Monitor vital signs
Caution—elderly patients , cardiovascular disease or hypertension.
Ideally, auscultate the lungs and measure peak flow before and after treatment.
Side effects – palpitations, anxiety, dizziness, headache, nervousness, rash and nausea and vomiting
Dosage – Ipratropium is usually administered with a beta agonist (salbutamol). A maximum of 4 doses are advised in 24 hours.

Hydrocortisone
Hydrocortisone is a potent corticosteroid with anti-inflammatory properties. It inhibits many of the substances that cause inflammation (cytokines, interleukin, and interferon). The pharmacological actions of the steroids are vast and complex.
Pharmacokinetics
Onset—Immediate, Peak Effect 4-8 hrs, Duration 1.0-1.5 days, Half life 90 minutes
Indications – severe anaphylaxis and COPD
Contraindications – no major contraindications in the management of anaphylaxis
Precautions – A maximum of one dose should be given prehospitally.
Side Effects – fluid retention, congestive heart failure, hypertension, abdominal distension, vertigo, headache, nausea, malaise and hiccups.
Dosage – The standard dose of hydrocortisone in the management of severe anaphylaxis is 40 to 250mg administered IV. Can be administered IM

Stimulation of the sympathetic nervous system with salbutamol results in bronchodilation.
Inhibition of the parasympathetic system with ipratropium causes bronchodilation.

Magnesium Sulphate is only for patients with life threatening asthma

Magnesium sulphate
Acts as a physiological calcium channel blocker and blocks neuromuscular transmission
Presentation: 5 g in 10 mL ampoule/2 g in 10ml minijet
Indication: Torsades de pointes (bolus) and persistent bronchospasm (infusion) . Life threatening asthma only
Contraindication: None in cardiac arrest. Asthma: Known severe adverse reaction
Side Effects: Decreased deep tendon reflexes, respiratory depression, bradycardia and hypothermia
Dosage: see CPG. Not indicated in children.

Does the patient have a COPD Alert Card?

Pulmonary Oedema

Pulmonary oedema may be due to cardiac or non-cardiac causes. Cardiac disease, such as acute myocardial infarction, hypertension, valvular disease or ventricular wall injury (stretching, thickening, disease or inflammation) results in an ineffective left ventricle. Less fluid is ejected from the ventricle so fluid/pressure builds up within the system (the end-diastolic pressure is increased). The increase in pressure in the pulmonary capillaries results in fluid leaking from the capillaries into and around the alveoli. Gas exchange can no longer occur effectively and the patient needs to increase their work of breathing to compensate.

Sometimes pulmonary oedema occurs as a result of damage to the capillary-alveoli membrane e.g. from near drowning, toxic inhalation or Acute Respiratory Distress Syndrome. The damage results in increased membrane permeability and fluid leaks from the capillaries.

TASK!
Think of a patient that you managed with pneumonia and another with pulmonary oedema. Compare and contrast their clinical findings.

Careful!
Always consider pneumonia before administering diuretics when you hear crepitations

	Pneumonia	Pulmonary Oedema
Temperature	Maybe raised. Associated chills, sweats or rigors.	Usually normal
Chest Auscultation	Often creps in just one lung	Creps often present in both lungs
Hydration	Patient maybe dehydrated or euvolaemic	Overload (raised JVP or lower limb oedema)
Sputum	Often thick and yellow-green in colour	Usually clear and frothy. Sometimes pink tinged.
Pain	May have pleuritic pain	Usually painless unless associated with acute MI
Type of Shock	Distributive	Cardiogenic

A patient with pulmonary oedema may present with:

- Restlessness, agitation, confusion
- Noisy breathing
- Dyspnoea (SOB)
- Orthopnoea (SOB lying flat)
- Paroxysmal nocturnal dyspnoea (night-time SOB)
- Crackles predominantly
- Tachycardia
- Tachypneoa
- Frothy sputum

Any respiratory illness can cause a patient to tire & no longer breathe effectively

Clinical signs of ventilatory failure (raised CO2):
Hands: tremor, flap and bounding pulse
Head: Altered consciousness
Eyes: Conjunctival injection (red eye) and chemosis (like “a tear that doesn’t fall”)
This is an EMERGENCY

Scenario 1—Chronic stable heart failure
Jim had an MI 18 months ago and has had difficulty with his breathing since. Simple things are now difficult; he has to pause going up the stairs (dyspnoea) and can’t garden (fatigue). He’s noticed that he needs 3 pillows in bed (orthopnoea) and sometimes he wakes up at night unable to breathe (paroxysmal nocturnal dyspnoea). He can’t wear his dress shoes as his feet are just too swollen!

Scenario 2—Acute pulmonary oedema
Julia awoke at 6am feeling very frightened. She couldn’t breathe (dyspnoea) and the sound of her breathing scared her as it was loud, crackly and fast. Her chest felt tight, her heart was pounding and she felt very queasy. She was afraid to get out of bed as she thought she might collapse.

Common medications for heart failure are listed in the table. Check the patient's tablets!

Congestive Heart Failure

Aim of therapy	Agent	Mechanism of Action	Example
Reduce preload & afterload	Nitrates	Venodilation	GTN
Reduce total body water	Diuretics	Na+ & water excretion	Frusemide
Increase cardiac contractility	Digoxin Inotropes	Increases cardiac output	Digoxin
Reduce preload & afterload	ACE inhibitor	Arterial vasodilation	Enalapril
Reduce cardiac effort	β blockers	Reduce sympathetic stimulation of heart	Bisopropolol

Some patients, like Jim, have chronic stable pulmonary oedema. Not all clinical signs always need treatment.

Glyceral Trinitrate

GTN releases nitric oxide which acts as a vasodilator (arterial and venous). It dilates coronary arteries and increases blood flow to the myocardium. It dilates systemic veins reducing venous return to the heart (preload) and dilates the arteries and reduces the heart workload (afterload).

The vasodilatation reduces blood pressure.

Indications: Angina, suspected Myocardial infarction, Pulmonary oedema

Contraindications:

SBP <90mmHg, Viagra or other phosphodiesterase inhibitors (Sildenafil, Tadalafil and Vardenafil) used within previous 24 hours.KSAR

Side Effects:

Headache, Transient Hypotension, Flushing, Dizziness.

Dosage:

Angina or MI: 400 mcg Sublingual at 3-5 min intervals (Max 1.2 mg).

Pulmonary oedema; 800 mcg sublingual. Repeat x 1.

Frusemide

Action: Is a diuretic that acts on the ascending loop of Henle and inhibits the re-absorption of chloride and sodium ions into the interstitial fluid. Water is therefore retained in the loop and eliminated via the bladder. It also causes venodilation which reduces venous return to the heart.

Presentation: 20mg/2ml

Indication: Pulmonary oedema

Contraindications: Pregnancy, Hypokalaemia, KSAR

Dosage: 40mg IV. Not indicated in children

Side Effects: Headache, dizziness, hypotension, arrhythmias, transient deafness, diarrhoea, nausea & vomiting.

Phosphodiesterases are commonly used for erectile dysfunction but also have a role in the treatment of heart failure and pulmonary hypertension.

Trade names include Viagra, Revatio, Cialis and Levitra

4. Resuscitation

4.1 Basic Life Support

The major change in Basic Life Support was introduced in the 2005 ILCOR guidelines. The key change is that any patient with an unwitnessed cardiac arrest should have 2 minutes of CPR performed before defibrillation is attempted as this has been associated with improved outcome.

The defibrillator may be switched to manual.

A blood glucose reading should be taken during infant cardiac arrest.

4.2 Foreign Body Airway Obstruction (Adults and Children)

After each cycle of CPR open the mouth and look for a foreign body.

Again the 2005 ILCOR guidelines have been adopted. It includes the use of 5 back blows and 5 abdominal thrusts in conscious adults and children over 1 year. In conscious infants it is a combination of back blows and chest thrusts.

CPR is advocated for all unconscious patients with suspected Foreign Body Airway Obstrucition.

Advanced practitioners may inspect the airway in an unconscious patient after one cycle of CPR has been completed. This is performed using a laryngoscope. If a foreign body is visible, an attempt to remove it with a Magill forceps is permitted.

If there is no visible foreign body or if the practitioner is unable to remove a foreign body then intubation is recommended.

Correct technique for holding a Magill forceps

4.3 Advanced Life Support—Adult and Paediatric

Adults

The following changes have been introduced:

Medications: An amiodarone infusion can now be administered for a persistent tachyarrhythmia following ROSC if amiodarone was used to convert VF or VT.

Lignocaine is permitted IV and IO at 1-1.5mg/Kg if Amiodarone is unavailable. Max 3mg/Kg.

Magnesium Sulphate: A 2g bolus can be administered if Torsades de Pointes is suspected.

Amiodarone infusion:
300mg Amiodarone in 500ml 5% Dextrose (not 0.9% NaCl) at a rate of 1mg (1.7ml)/min

New equipment has been authorised. These include the Impedance Threshold Device (see Section 3.1) and Mechanical Assist Devices. The decision to use these devices is made at a local or service level. Not all services will employ these devices and as training device specific it will not be covered in Part 1 of the upskilling programme.

Paediatrics

Changes here include:

Airway: Advanced airway management for children <8 years after prolonged cardiac arrest will not be covered in Part 1 of the upskilling programme.
Children aged 8 and above can be managed with an advanced airway as per CPG 3.1

Defibrillation: Paediatric pads should be used for children aged 1-8 years. However, adult pads are permitted if paediatric pads are unavailable. The defibrillator should be used in manual mode so the appropriate energy selection may be made.

Medications: Atropine has been withdrawn for the management of paediatric asystole/PEA.

Glucose: Measure blood glucose reading for shockable and non-shockable arrest rhythms.

Infant (1-12 months)

Medications: Adrenaline IV/IO and Amiodarone IV/IO have been authorised.

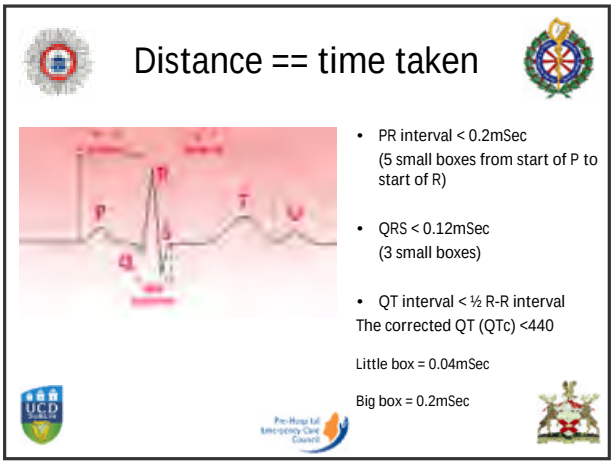
Glucose: Measure blood glucose reading for shockable and non-shockable arrest rhythms.

CPR: One person 30:2. Two person 15:2 (use 2 thumb encircling chest compressions).

Weight calculations: Ask parent, Broselow tape or “3.5Kg Birth, 6Kg 6 months, 10Kg 1 year”

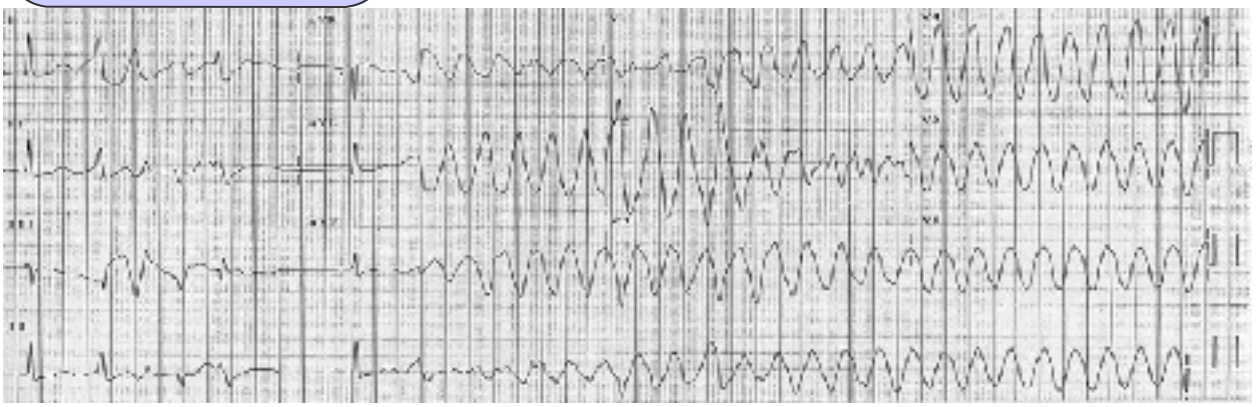
Torsades de Pointes

Torsades de Pointes is a form of ventricular fibrillation. It is associated with a long QT interval. In essence, the period of electrical relaxation (repolaristation) of the heart is prolonged while a new electrical impulse (depolarisation) is being conducted. This can result in chaotic electrical activity and fibrillation of the ventricle may occur.



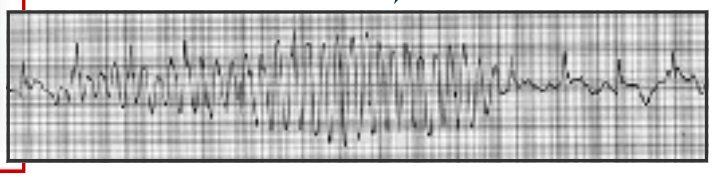
The patient may present with syncope, altered level of consciousness, hypotension or palpitations. There may be a family history of sudden death.

A long QT interval may develop for many reasons; congenital disorders, drug overdose (particularly tricyclic antidepressants), electrolyte abnormalities (groups at particular risk include patients with renal failure, severe alcohol dependence and severe malnutrition), intrinsic heart disease (e.g. myocarditis), hypothermia or neurological events.



ECG features include rotation of the heart's electrical axis by 180 degrees running above and below the iso-electric line. This is also known as a crescendo-decrescendo rhythm. Other features include a prolonged QT interval or it may be preceded by long and short PR intervals or triggered by PVC's.

Examples available at: www.torsades.net



4.4 Neonatal resuscitation

The changes here include:

Medication: IV/IO adrenaline, IV/IO Naloxone and IV/IO 0.9%NaCl have been authorised. The doses are considerably smaller for neonatal resuscitation. Calculations and medication administration will be covered in the skills workshop.

Glucose: Check a blood glucose during cardiac arrest.

4.5 Post-resuscitation Care

This is a new CPG for patients with a return of spontaneous circulation port cardiac arrest.

If a patient is conscious monitor vital signs, perform a 12 lead ECG and check blood glucose. Assess for arrhythmias;
Symptomatic Brady arrhythmias should be treated with 0.5mg atropine IV/IO
Persistent tachyarrhythmia may benefit from an amiodarone infusion.

Do not rely on blood pressure alone as a marker of shock immediately post ROSC.

If the patient is unconscious, there is strong clinical evidence[1] to support the using of cooling or "therapeutic hypothermia" in patients following VF or VT arrests. The evidence for cooling post asystole/PEA is still inconclusive.

During cardiac arrest there is progressive damage to brain tissue associated with reduced blood flow. A variety of toxins are produced in response to ischaemia. A sudden return in blood flow causes a release of calcium, toxins and also causes vasospasm. The rationale for cooling is that 1) Cooling reduces cerebral blood flow and controls the release of calcium and toxic substances and 2) Cooling reduces the metabolic demand of the brain.

There are many methods of cooling[2], many of which require bulky equipment. Cool packs and cooled fluids (4°C) to a target temperature of 32-34°C have been shown to be effective in a pre-hospital setting. Extreme cooling (<30°C) can potentially irritate the heart and trigger arrhythmias. Cooling should be initiated within 2-6 hours and is damaging if initiated >12 hours.

1.Nolan JP, Morley PT, Van den Hoek TL et al. Therapeutic Hypothermia post cardiac arrest. An Advisory Statement by the Advanced Life Support Task Force ILCOR. Circulation 2003;108:118-121
2. Seder DB, Van der Kloot TE. Methods of Cooling; Practical aspects of therapeutic temperature management. Crit Care Med 2009(37);7:S211-222

4.5 End of Life Care

A decision to withhold (not start) or withdraw (stop) CPR is a major decision for any practitioner.

Resuscitation is not indicated for:

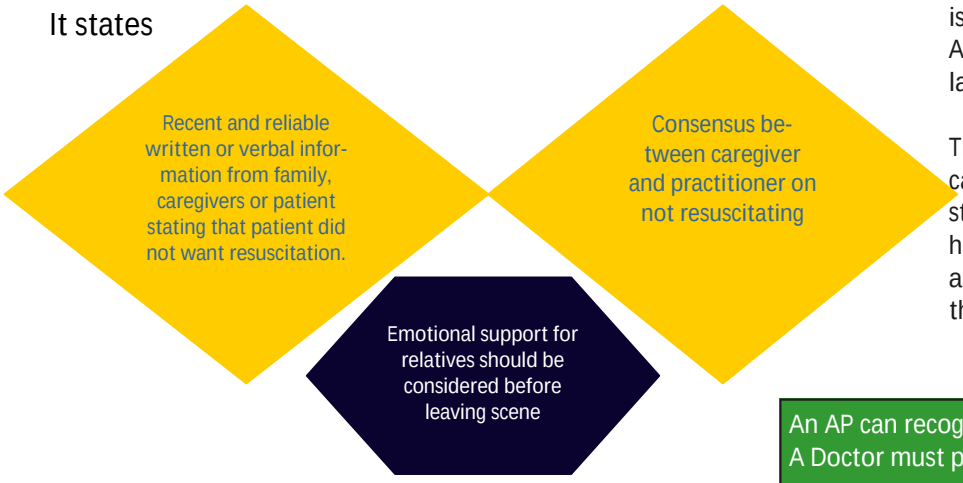
1. Patients with definitive indicators of death [4.15]
2. Patients with an unwitnessed traumatic cardiac arrest (BLUNT TRAUMA) [4.9]
3. Patients with a terminal illness* [4.15]

Stages of grieving
Denial
Anger
Bargaining
Depression
Acceptance
There may be may reactions when breaking bad news to a group

Ceasing resuscitation is permitted for:

1. Patients in Asystole who have not responded to ALS treatment (20 minutes for a practitioner witnessed arrest and 3 x 2 min CPR cycles for an practitioner unwitnessed arrest).

*The current edition of the CPG's [4.15] addresses the management of patients with a terminal illness during cardiac arrest (but not leading up to cardiac arrest). It states



The Law Reform Commission is reviewing the status of Advanced Directives in Ireland.

The 7th Edition of the Medical Council Guidelines 2009 states an Advanced Directive has "the same ethical status as a decision by a patient at the actual time of an illness"

An AP can recognise death
A Doctor must pronounce and certify death

Death and the Law

If death is unexpected or suspicious then the body becomes the "property of the State" until the cause has been identified. The person who determines whether an investigation is required is the coroner.

The Coroner's role is to establish the "Who, When, Where and How" of a death. They are Independent Practitioners who act on behalf of the State in 48 Coroner districts in Ireland.

Under common law, anyone may notify the Coroner of a death. Other groups have legal responsibility. In essence, sudden deaths, deaths as a result of accident (intentional and unintentional) or deaths where the cause is unknown or unexpected must be reported.

Pre-hospital practitioners may transfer responsibility of the body to the Gardaí at the recognition (not pronouncement) of death.

7 point recognition of death

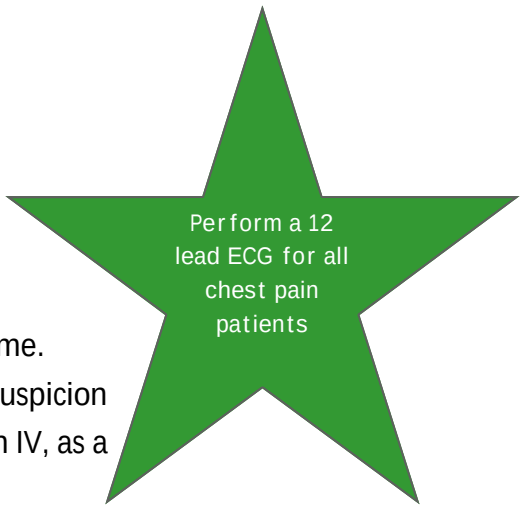
Respiratory System
- No Respiratory Movement
- No Breath Sounds

Cardiovascular System
- No Heart Sounds
- No Central Pulse

Neurological System
- Pupil fixed and dilated
- No Response to Pain

ECG 2 x 10 Second Strip to confirm Asystole

5 Medical Emergencies



5.1 Cardiac Chest Pain

This CPG will be covered in Part I and II of the upskilling programme.
The new medications include Clopidogrel PO if there is a strong suspicion of ischaemia after the ECG has been performed and Ondansetron IV, as a substitute for cyclizine for opiate induced nausea and vomiting.
Thrombolysis and the related medications (IV Tenecteplase and IV Enoxaparin) are not covered in Part 1. ECG interpretation will be covered in the skills workshops.

Cardiac symptoms include chest pain, dizziness, weakness, shortness of breath, palpitations, pain or altered sensation in the arm or jaw and nausea or vomiting.
The elderly and diabetic patients are at higher risk of a Silent MI.
Pallor and sweating are useful signs.

Any recent cocaine use?

Did you ask about cardiac risks?

Family History
Smoking
Diabetes
High blood pressure or cholesterol
Overweight
Sedentary lifestyle

Warning!
GTN after Viagra use may cause severe hypotension

When to do an ECG?
Any chest pain history [4.16]
Any acute neurological symptoms [4.22]
Any altered level of consciousness [4.27]
Any significant variation in vital signs (especially pulse & BP)

Clopidogrel
Blocks the binding of ADP to its platelet receptor and therefore inhibits platelet aggregation. Its mechanism of action is different to Aspirin so together they have a synergistic effect.
Indications: STEMI or NSTEMI
Contra-indications: Non cardiac chest pain, Active pathological bleeding, severe liver disease and KSAR
Side-effects: Prolongs bleeding time, abdominal pain, dyspepsia, diarrhoea

All medications have the potential for side effects so it is very important to assess the patient and decide on a likely cause before starting therapy.

Scenario: a 40 yo man felt unwell, fell and hit his chest off a table. He is now complaining of left sided chest pain. Possible causes include acute coronary ischaemia (causing his collapse), a musculoskeletal injury, a dissecting aneurysm, a pneumothorax or a lung injury.

Administering aspirin and clopidogrel in this situation could worsen a chest or aortic injury by causing significant bleeding. GTN could cause hypotension and risk further collapse.

If there was a significant risk of ischaemia then the potential benefits may outweigh any potential harm.

ECG Tips

Location of an MI

- Usually Left Ventricle
  - II, III, aVF – Inferior
  - I, aVL, V5-6 – Lateral
  - V1-4 – Anteroseptal
- Right ventricle
  - ST elevation in V1
  - Look for ST elevation on right sided ECG
  - May need fluids as injured right ventricle needs good pre-load

Posterior and RV ischaemia often accompanies Inferior MI

T waves

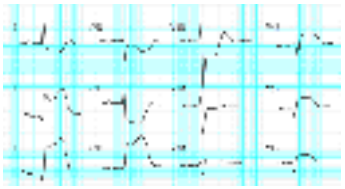
- Normally upright except for aVR & V1
- Lead III varies with respiration
- NSTEMI: Inverted or flattened - Look for changes in corresponding leads
- Tall Tented T waves – Hyperkalaemia
- Flat T waves - hypokalaemia

ST Segment

ST Elevation MI (STEMI):

> 1mm elevation 2+ limb leads or

> 2mm elevationin 2+ chest leads



Non ST elevation MI (NSTEMI):

ST depression

T wave inversion

no Q waves

Other causes of ST elevation

- Pericarditis
  - Saddle ST segments
  - All vascular territories

- Left ventricular hypertrophy
- Aortic dissection – tears into coronary arteries

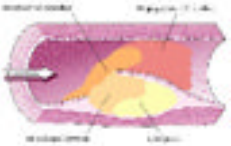
Angina

Stable angina is a fixed obstruction of the coronary arteries due to atherosclerosis

Acute Coronary Syndrome

Acute Coronary Syndrome

- "Recent thrombus (clot) on a pre-existing plaque"
- Plaque (or atheroma) formation is probably due to injury. Lipid gets incorporated into vessel wall.
- "Vulnerable" plaques have a very thin cap
- The plaque ruptures releasing lipid and collagen
- The lipid-collagen combination is very thrombogenic ie it stimulates new clot formation
- It is this new clot that blocks the artery during an acute MI



Consider transport to facility with PCI if this is possible locally

Acute Coronary Syndrome

Treatment of an Acute MI is targeted at different stages of clot formation

Stage of clot formation	Therapy	Agent
Platelets are "sticky" and form small thrombi	Anti-platelet agent	Aspirin Clopidogrel
A platelet thrombus (clot) forms	Anti-thrombin agent	Heparin Enoxaparin
An organised thrombus forms (with platelets, RBC's and activated thrombin or fibrin within)	Fibrinolytic agent (thrombolytic)	Tenectaplase

5.2 Symptomatic Bradycardia

The changes here include:
Adult
0.5mg bolus atropine IV can be given (up to 3mg Max) for symptomatic bradycardia including Mobitz II and 3rd degree block

Poor perfusion in a child:
Delayed capillary refill
Cold peripheries
Drowsy or unresponsive

Child
Bradycardia in a child is a pre-terminal sign.
Oxygenation and support of ventilation is a priority.
Start CPR if HR<60 and Signs of poor perfusion
Atropine has been withdrawn.
Adrenaline 0.01mg/kg/IV permitted every 3-5 min (no maximum dose).
Fluids: Hartmann's 20ml/Kg IV/IO if HR<60 & poor perfusion

Check capil-lary refill for 5 seconds

Symptoms in adults include:
Confusion and reduced responsiveness
Chest pain
SOB or increased work of breathing
Pulmonary oedema
Hypotension
Nausea or vomiting
Shock

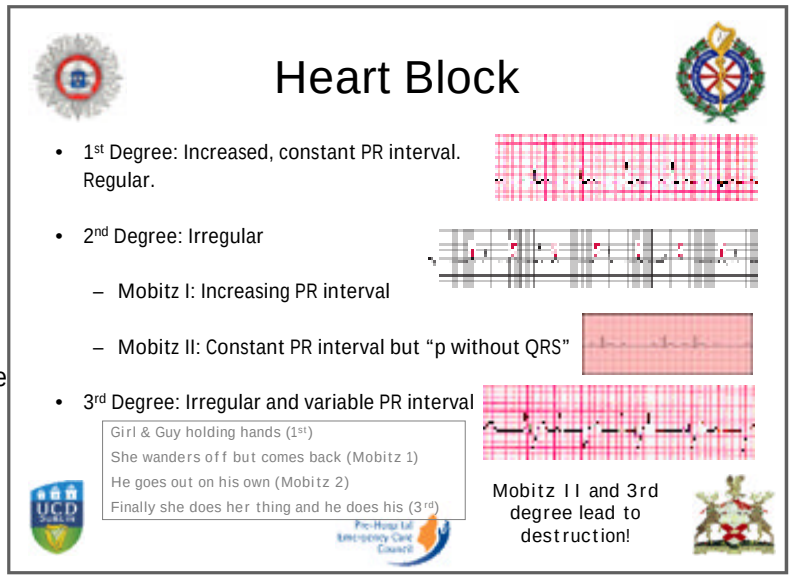
Children arrest due to hypoxia

BP alone is a poor marker of perfusion

Heart Block
1st degree rarely causes symptoms. Well-trained athletes and young people are at higher risk for 1st degree block due to an overly active vagus nerve.

Mobitz Type I (Wenckebach's block): the electrical signals are delayed more and more with each heartbeat, until the heart skips a beat.
On the ECG, the PR interval gets longer and longer until the QRS wave doesn't follow the next P wave.

Mobitz Type II: some of the electrical signals don't reach the ventricle (no warning). Some signals move between the atria and ventricles normally, while others are blocked. On an ECG, the QRS wave follows the P wave at a normal speed. Sometimes, the QRS wave is missing (i.e. the signal is blocked).



3rd degree (complete heart or AV block): None of the electrical signals from the atria reach the ventricles so special areas within the ventricle generate an electrical impulse and contraction occurs (a broad QRS). This natural backup system is slow and uncoordinated with the atria. The normal ECG pattern is disrupted; the P waves are fast and regular while the QRS waves are slow, broad and regular.
Complete heart block can result in cardiac arrest and death. It needs emergency treatment. A temporary pacemaker may be used to keep the heart beating until a permanent pacemaker is inserted.

5.3 Anaphylaxis

This is an extreme systemic form of an allergic reaction involving two or more body systems.
People who have allergies have higher levels of the type of antibody (Immunoglobulin E or IgE) to a specific substance (an allergen). The anaphylactic reaction depends on previous exposure or "sensitization" to a particular allergen. During the first exposure, the body builds up allergen-specific IgE antibodies. Upon re-exposure to the allergen, the IgE antibodies may launch a whole-body (systemic) immune response.

MAST CELL

Histamine is one of these substances released from the cells. The same cells with IgE antibody on their surface release many other inflammatory substances.

The release of histamines may cause the blood vessels to relax (vasodilatation) and become more permeable which makes them leaky, loose intravascular fluid, cause swelling (oedema) and a fall in blood pressure. This is called Distributive Shock. At the same time they can cause contraction of the smooth muscle in the bronchi causing bronchoconstriction . Skin or mucosal changes alone are not a sign of an anaphylactic reaction and can be subtle or absent in up to 20% of reactions (some patients can have only a decrease in blood pressure i.e., a Circulation problem). There can also be gastrointestinal symptoms (e.g. vomiting, abdominal pain, incontinence).

Signs & Symptoms

Anaphylaxis usually occurs rapidly, unexpectedly, and can affect many parts of the body, including:
Warmth, skin flushing, rash itchiness or hives
Tingling or swelling of lips, feet, hands or other body parts
Wheezing, whistling while breathing, or SOB
Difficulty swallowing due to swelling in the throat
Light headiness or faintness
Palpitations or irregular heartbeat
Loss of consciousness or seizures due to low blood pressure

Anaphylaxis Highly likely when 3 criteria met:

- Sudden onset & rapid progression of symptoms
- Life-threatening Airway, Breathing or Circulation problems
- Skin and/or mucosal changes (flushing, urticaria, angioedema)

Other symptoms may include hoarseness, cough, chest tightness, sneezing, and gastrointestinal symptoms.

Common causes of anaphylaxis?
Foods: especially nuts, also fruit, fish and spices
Drugs: Especially penicillin's, anesthetics, NSAIDs and X-ray contrast
Latex: latex gloves, catheters and medical products. Affected people often have occupational exposure
Bee or wasp stings - faint, SOB, rash or swelling away from the sting
Exercise and exercise after food
Unknown: is termed 'idiopathic anaphylaxis'

Beta blockers can mask early signs of an anaphylaxis!

Anaphylaxis or not?

Syncope (Faint): Good pulse, may be bradycardic, pale, normal resp, no oedema or itch

Anxiety: Increased pulse and resp. Tingling of limbs. Scared. Light-headed

Breath-holding: Young children. Distressed. Flushed. Cyanosis. Possible LOC

Anaphylaxis: Poor pulses, tachycardia, resp distress, wheeze or stridor. Rash. Itch

Mild	Moderate	Severe
Urticaria and or angio-oedema	Mild symptoms & simple bronchospam	Moderate symptoms & haemo-dynamic or respiratory compromise

Derm Atlas

Mild

Hives and angio-oedema, but will not have pulmonary or cardiovascular compro-mise. Hives are an allergic skin reaction that comes on suddenly. The are slightly raised, smooth, flat-topped bumps called wheals (look like mosquito bites) and welts that are usually redder in color than the surrounding skin and cause severe itching. Angio-oedema causes swelling of deeper skin tissues, most commonly of the eyelids, lips, genitals, hands, and feet.

Moderate

Mild symptoms
Shortness of breath
Increased respiratory rate
Wheeze

Severe

Signs of shock – pale, clammy ,tachycardia, hypotension
Confusion caused by hypoxia
Resp distress. Cyanosis, a late sign
Peri-oral and mouth swelling

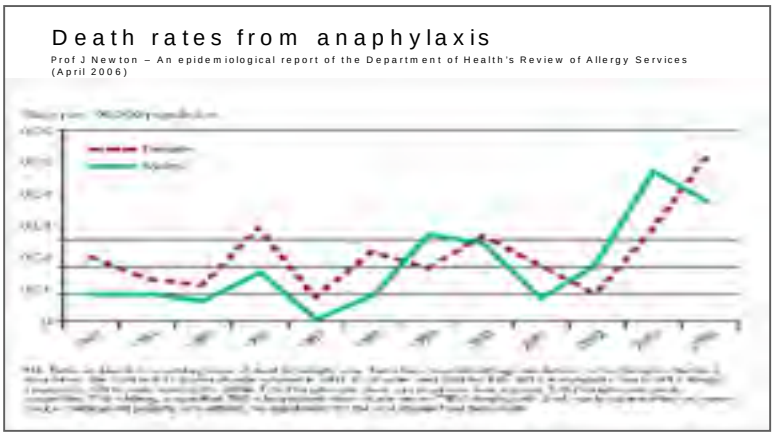
Treatment

Mild: No medication treatment is required however monitor closely in case of delayed reaction

Moderate: Oxygen and then nebulised Salbutamol

Severe
Adrenaline: 0.5mg IM Adults & Children>8 years. Children <6 mth 0.05mg, 6mth-5yr 0.125mg, 6-8yr 0.25mg Repeat x 1
If deteriorating, Fluid replacement Hartmann's: Adults 1L IV/IO (repeat x 1). Child 20ml/Kg IV/IO (repeat x 1)
Hydrocortisone: Adult 200mg IM or Slow IV*. Child IM or slow IV* <1yr 25mg, 1-5yr 50mg, 6-12yr 100mg, >12 130 mg

* Hydrocortisone should be administered over 1-10min. Infusion with 100ml 0.9%NaCl recommended.



Hydrocortisone administration is shown in the Appendix

Indications for Hydrocortisone

Severe or recurrent anaphylaxis

Anaphylaxis in a patient with asthma

5.4 Seizures

New medications and new routes of drug administration have been introduced for this CPG.

If a seizure lasts longer than 5 mins it should be treated as if going to last greater than 30 minutes (Lowenstein, 1999).

Medication

Midazolam is a benzodiazepine related to diazepam. It works by increasing nerve sensitivity to an inhibitory neurotransmitter called GABA (i.e. it makes the neuron more susceptible to the inhibitory effect of GABA)

Presentation: 10mg in 2ml (5mg/ml) ampoule, 10mg in 5ml (2mg/ml) ampoule or 50mg in 5ml buccal liquid (10mg/ml)

Indications: Seizures (Adult 4.20, Paediatric 7.10) - this CPG is covered in Part 1 of the Upskilling Programme.
It is also permitted for acute psychostimulant toxicity (Poison CPG 4.23) and in a mental health emergency for a patient with paranoia or hallucinations who is a risk to self or others (Mental Health Emergency CPG 4.29). These CPG's are not covered in Part 1 of the Upskilling programme.

Contra-indications: Shock, Depressed vital signs, Alcohol related altered level of consciousness, KSAR

Routes of Administration: Intravenous, Intra-osseous, Intra-nasal, Intramuscular or Buccal

Side Effects: Respiratory depression, Headache, Hypotension, Drowsiness, Amnesia

Adult Dosage

Intranasal: 5mg (50% in each nostril) Repeat x 1 PRN

Buccal: 10mg (50% on each side) Repeat x 1 PRN

IM: 5mg Repeat x 1 PRN

IV : 2.5 mg Repeat x 1 PRN

Titrate to effect, ensure resuscitation equipment is available prior to administration

Paediatric Dosage

Intranasal: 0.2mg/kg (50% in each nostril) Repeat x 1 PRN

Buccal: 0.5mg/kg (50% on each side) Repeat x 1 PRN

Do not exceed Adult Dose

Titrate to effect, ensure resuscitation equipment is available prior to administration

Why IN or Buccal?

Socially acceptable compared with PR
As effective
No needles so safer and faster

New routes of drug administration are demonstrated in the Appendices.

Paediatric Seizures: Always check a blood glucose and a temperature!

Epilepsy

- Seizure = Abnormal electrical firing (depolarisation) of cerebral neurons
- Anti-epileptic drugs raise the threshold that triggers depolarisation
- Anti-epileptic drugs work by:
  - Increasing GABA activity at the neuronal junctions
  - Or Blocking Sodium or Calcium channels
- GABA is an inhibitory neurotransmitter

Preventative Drugs	Drugs used in Seizures
Carbamazepine	Diazepam
Valproate	Lorazepam
Phenytoin	Midazolam
Lamotrigine	Phenytoin
Topiramate	Propofol
Levetiracetam	Thiopentone

Literature review – IN Midazolam for Seizures

Lahat et al, BMJ, 2000
Prospective: IN midazolam versus IV diazepam for prolonged seizures (>10 minutes) in children
Similar efficacy in stopping seizures (app. 90%) and time to seizure cessation: IV Diaz 8min, IN Midaz 6.1 min
Conclusion: IV diazepam and IN midazolam have similar efficacy at controlling prolonged seizures in children. However, IN midazolam controls seizures more rapidly (no delay in IV)

Sheepers et al, Seizure, 2000
IN midazolam for treatment of severe epilepsy in adults.
Results: IN midazolam effective in 94% of seizures.
Conclusion: IN midazolam is effective at controlling seizures & is "more acceptable and dignified route" than rectal diazepam

Fisgin, J Child Neur, 2002.
Prospective. IN midazolam versus PR diazepam for treatment of pediatric seizure. Results: IN midazolam effective in 87% of seizures, Rectal diazepam effective in 60%
Conclusion: IN midazolam is more effective.

5.5 Altered Level of Consciousness

This CPG presents a general structured approach to both medical and trauma patients who score V, P or U on the AVPU score. Core skills for the practitioner are their ability to elicit a history, perform a focussed assessment and use important adjuncts (blood glucose and ECG) to develop a differential diagnosis.

Meningococcal disease (either meningitis or septicaemia) is a rapidly progressive disease that AP's can make a time critical intervention on if they suspect it and look for Rash, Photophobia, Temperature (and neck stiffness). Pupillary size and reaction are important signs for brain injury, poisoning or neurological disease. Medic-alert jewellery may advise on specific illness.

While AVPU serves as an excellent tool in the initial assessment of consciousness, a GCS score is more sensitive and is more informative with serial assessments.

Eyes	Max 4
Open spontaneously	4
Open to voice	3
Open to pain	2
Don't open	1
Verbal	Max 5
Orientated	5
Confused	4
Incomprehensible	3
Groans	2
Nothing	1
Motor	Max 6
Obeys commands	6
Localises (identifies site of pain)	5
Withdraws from pain	4
Flexes limbs to pain	3
Extends limbs to pain	2
No movement	1

FAST TEST
Facial Droop
Arm Weakness
Speech Abnormal
Time

Common medical problems associated with Diving

Decompression sickness
Arterial gas embolism
Barotrauma
Nitrogen Narcosis
Hypothermia
Near drowning
Marine bites or stings

5.6 Decompression illness

Consider DCI in any person who has been SCUBA Diving within the last 48 hours. Always assess if the diving "buddy" needs assistance too.

Barotrauma – pressure related trauma can occur on either descent or ascent. It commonly affects air-filled cavities (lungs, gut, ear, sinuses).

Treat Supine
Analgesia
Fluids
Remember dive computer, buddy and equipment!

Entonox is absolutely contra-indicated

Decompression Illness
Due to formation of bubbles in the blood during ascent
The deeper & longer the dive – the higher the risk
Symptoms apparent in first 24 hours following ascent:
80% of symptoms/signs on surfacing, 95% within 4 hrs.

Other risks for DCI: Poor fitness, obesity, dehydration, physical exhaustion, low water temperature, multiple dives and alcohol

Hartmann's solution is isotonic so is a good replacement fluid. It has no calories so is a poor source of energy. It contains potassium which limit its use in crush injury and diabetic emergencies.

6. Fluid therapy

Several changes have been made in Fluid Administration

6.1 Adults

Hartmann's Solution is the pre-dominant isotonic fluid used. It is indicated for:

Shock is inadequate oxygenation and perfusion of the Vital Organs. Types: Hypovolaemic, Distributive, Cardiogenic, Neurogenic and Obstructive

<u>Distributive Shock</u>
Anaphylaxis: 1000ml (repeat x 1)
Burns: 500-1000ml (no repeat)
Septic Shock: 500ml stat and 250ml bolus to maintain SBP>100mmHg

Decompression Illness 500ml (no repeat)

IV Fluids are not permitted in the CPG's for hypovolaemia caused by dehydration

<u>Hypovolaemic Shock due to Haemorrhage</u>
500ml stat if clinical signs of shock.
No Trauma: 250ml aliquots to maintain SBP 100mmHg
Trauma & GCS>8: 250ml aliquots to maintain SBP 90-100mmHg (radial pulse)
Trauma & GCS≤8: 250ml aliquots to maintain SBP 120mmHg

10% Dextrose is a hypertonic fluid used to treat hypoglycaemia < 4mmol/L.
250ml bolus given.
Repeat x 1
250ml 10% Dex has 100kCal

Sodium Chloride 0.9% is another isotonic fluid. Its indications are:
Hyperglycaemia 1000ml stat
Crush Injury 20ml/Kg (preferably prior to release)
Post resuscitation hypothermia (unconscious patients) 500ml 4°C
Hypothermia—not covered in Part I Upskilling process

Why so many fluid regimes?

In Distributive Shock (sepsis, burns and anaphylaxis) the total body water content is normal, EXCEPT, it is not in the right place. The inflammatory process causes an increase in capillary permeability and fluid leaks from the intravascular space into the extra-vascular space. This leaves a deficit in the intravascular volume and the result is inadequate perfusion of the vital organs of the body.

Haemorrhagic shock is different. Damage to a body tissue or organ has occurred and blood is leaking from the vessels. The body compensates by triggering the clotting cascade to form a platelet plug and later a thrombus at the damaged site. The vessels go into spasm to prevent excess blood flow to the area. Too much fluid now might disrupt the platelet plug and dilute clotting factors. A system of "Permissive Hypotension" is often used (particularly in penetrating trauma) whereby a low blood pressure will be tolerated if there is no evidence of end-organ damage.

Shock & End-organ perfusion
Poor flow causes:

Skin: pale, cold, clammy

Brain: confused, agitated, drowsy

Lungs: Increased work of breathing

Heart: Increased rate, low BP +/- Chest pain

Gut: nausea & vomiting

Kidneys: Reduced urine output

6.2 Paediatric Fluid Therapy

All fluids can be given either IV or IO

Hartmann's Solution

Distributive Shock

Anaphylaxis: Indicated for severe reactions. 20ml/Kg Bolus. Repeat x 1

Burns: Fluids are indicated if there is >5% TBSA burns and time from injury to ED is > 1hour or if >10% TBSA burns.
Age 5-10 250ml, Age >10 500ml. No repeat.

Septic Shock: Indicated if clinical signs of shock. 20ml/Kg Bolus. Repeat aliquots of 20ml/Kg if signs of inadequate perfusion.

Fluids are not permitted for:

Children <5years with burns

Dehydration

Hypovolaemic Shock

Haemorrhagic Shock: Indicated if clinical signs of shock. 20ml/Kg Bolus. Repeat aliquots of 20ml/Kg if signs of inadequate perfusion.

Cardiogenic Shock

Symptomatic Bradycardia: Indicated if HR <60 AND signs of poor perfusion. 20ml/Kg bolus. No repeat.

0.9% Sodium Chloride

Glycaemic Emergency: Indicated if blood glucose is >20mmol/L
20ml/Kg Bolus. No repeat.

0.9% Sodium Chloride is also listed in the formulary for
1) Crush Injury 20ml/Kg
2) Hypothermia (which is not covered in Stage 1 Upskilling Programme).

10% Dextrose

Glycaemic Emergency:
Indicated if blood glucose is <4mmol/L
5ml/Kg. Repeat x 1.

Update!
Hypoglycaemia in Kids

Treat BM<4mmol/L (not 3mmol/L)
Use 5ml/Kg 10% Dextrose (not 3ml/Kg)

Children

Signs of Shock or Inadequate Perfusion

Tachycardia

Diminished or absent peripheral pulses

Tachypnoea

Irritability/Confusion/Altered LOC

Cool extremities/Mottling

Delayed Capillary Refill

Capillary Refill

Is a very useful sign

Best checked over the sternum or on the sole of the foot (children)

Apply pressure for 5 seconds, release, then count!

7. Trauma

7.1 External Haemorrhage

There are both Adult and Paediatric CPG's addressing 1) the management of external haemorrhage (CPG 6.1 &7.11) and 2) the management of haemorrhagic shock (CPG 6.2 & 7.12).
Fluid therapy is discussed in Sections 7.1 and 7.2.

Management of active bleeding:

Posture-Elevation-Examination-Pressure
Dressings
Oxygen
Depress proximal pressure point
Apply tourniquet

Epistaxis management involves sitting the patient forward, applying digital pressure and encouraging mouth breathing.

The approach to haemorrhage control is the same as previous CPG's.
A new addition to the skill set is the introduction of Tourniquets for haemorrhage that is uncontrolled by any other means. The use of tourniquets has been controversial in many EMS systems as tourniquets were sometimes applied too early by inexperienced personnel or conversely left too late for use and the patient has suffered irreversible shock.

The new CPG lays out clear sequential steps which should be followed before the application of a tourniquet. If a tourniquet is applied it should be left in place. It should also be:

1. Left uncovered
2. Time of application documented and reported to receiving Emergency Dept staff
3. The letter T and time of application written in clear marker on the patient's forehead

New tourniquets that have been developed by the military for ease of use and newer materials are now available in the pre-hospital setting. The brighter orange colour is more suitable for EMS use as it is very visual.

Tourniquet application

- Apply tourniquet to the site.
- Fasten Velcro buckle
- Twist windlass rod until arterial bleeding is controlled
- Secure rod in place with windlass strap
- Document time of application and location of tourniquet
- Write Time on patients on forehead with marker & capital T

Tourniquets only work if they are tight enough to stop arterial blood flow. Arterial blood is under significantly more pressure than venous blood, and it takes more pressure to stop it. Tourniquets should not be too narrow, or they will cut into skin as pressure is applied. A Blood pressure cuff could be used where a tourniquet is not readily available. The wider the tourniquet, the more pressure required to stop blood flow.
Tourniquets should be between 1 and 2 inches wide. Tourniquets on the leg will need to be narrower than those on the arm, due to the increased pressure necessary to stop blood flow in the leg. Tourniquets should be used when you have tried all other methods of controlling bleeding as per CPG.

They are to be used only when there is no other way to stop bleeding.

7.2 Burns

Burns – Adult

Caution with burns to:

Face
Hands
Feet
Flexion Points
Perineum

As with previous CPG's the initial emphasis is to stop the burning process and identify the extent and severity of the burns with particular attention paid to Airway, Breathing and vulnerable areas (face, hands, feet, flexion points and perineum). We have included two commonly used charts for assessing burn area. These are "The Rule of Nines" and the "Lund & Browder" charts. The former is easier to use and is recommended.

Humidified oxygen is now recommended to aid reduce swelling associated with burns to airways and Watergel is only to be used if the burn is less than 10 % of total body surface area. Burns up to 10% TBSA may be dressed with watergel but burns great than 10% should be dressed with cling film, a sterile non adherent dressing or a clean sheet once you have stopped the burning process and cooled the burn.

<u>Fluid therapy</u>

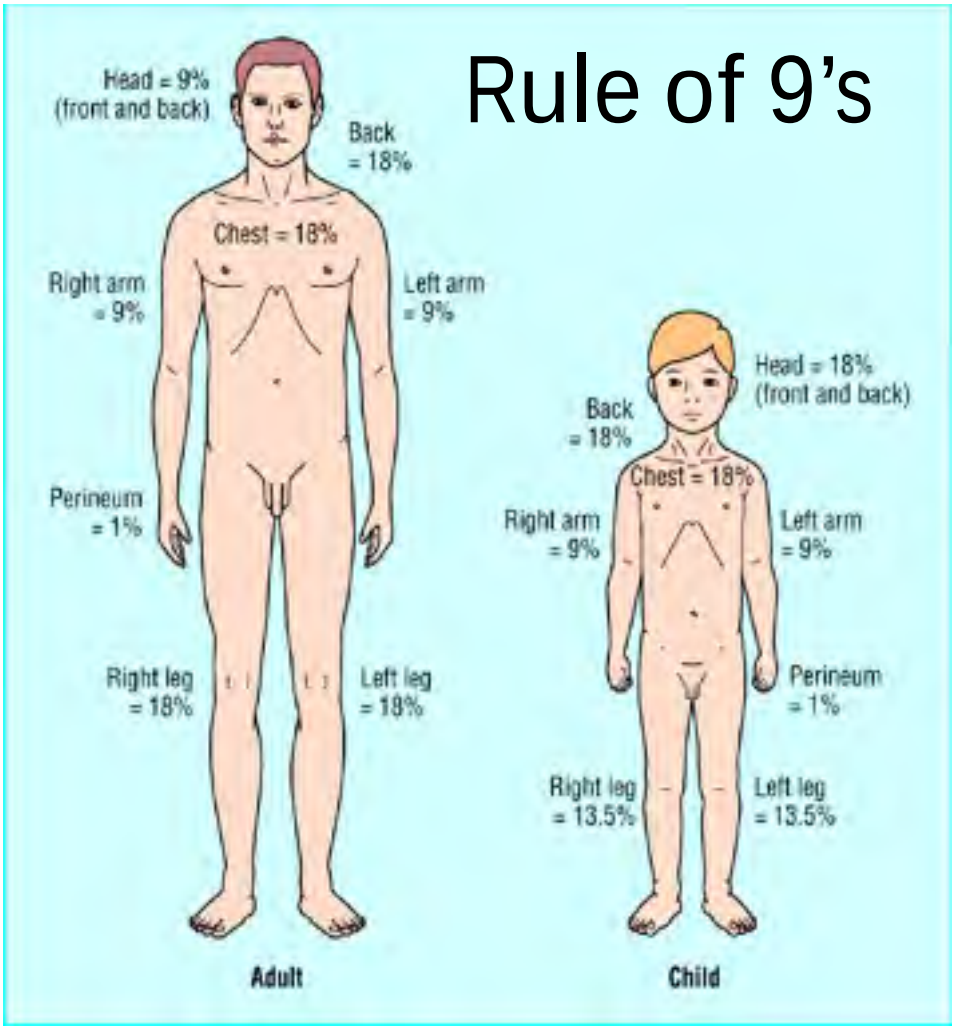
For patients with burns to a total body surface area (TBSA) of greater than 25% an IV should be inserted and 1000 mL of Hartmann's solution should be administered.
The CPG also specifies that this action should be taken for patients with 10-25% TBSA burns and the time from injury to arrival in the Emergency Dept is in excess of one hour.
If your patient has any burn greater than 10% of TBSA then the Advanced Paramedic can use clinical judgement to administer 500ml of Hartmann's solution even if there are short transport times.

Paediatric Burns

The CPG is initially as per adult CPG. It now includes an early ALS request for paediatric patients with a burn greater than 5% body surface area.
Patients (>5 years) with burns greater than 10% of total body surface area should receive Hartmann's solution.

- Paediatrics > 10 years- 500 mL
- Paediatrics 5—10 years - 250 mL

As with the adult patient burns up to 10% Body Surface area may be dressed with watergel but burns great than 10% should be dressed with cling film, a sterile non adherent dressing or a clean sheet once you have stopped the burning process and cooled the burn.



Cool burns for at least 15 minutes

Remember to assess pain, treat it and re-assess.

Burns are extremely painful

Covering the affected area helps treat the pain

Caution

- The very old and very young
- Circumferential burns
- Electrical Burns

Remember to:

Remove jewellery

Remove burnt clothing (unless stuck)

Check patient's temperature

7.3 Traumatic Brain Injury

Increases in intracranial pressure will reduce blood flow to the brain. Increases in blood pressure attempt to compensate for this.

Physiology

The skull and dura around the brain act as a "closed box" and this, combined with the inelastic or non-compliant nature of the brain tissue mean that the total volume within the skull is fixed. This is described in the following formula:

Intracranial volume= Brain volume + CSF volume + Blood volume

The intracranial volume directly affects the intracranial pressure.

The intracranial pressure directly affects blood flow through the brain (cerebral perfusion).

Cerebral Perfusion Pressure = Mean Arterial Pressure – Intracranial Pressure

Pathophysiology

Prevention of secondary brain injury is crucial in management of head injured patients and has the most important impact on the patient's outcome.

Primary Brain injury is the direct trauma to the brain and associated vascular injuries that occur at the time of the injury.

Secondary Brain injury is the ongoing injury processes that are set in motion by the primary injury. Secondary mechanisms include: Elevated ICP, hypoxia, hypotension.

<u>Elevated ICP</u>

If any other mass (eg a haematoma) apart from the normal amount of brain, CSF and blood occupies the skull some other structures will be compromised by the increased pressure inside the rigid skull.
Signs of ICP include: hypertension, bradycardia, altered respiratory pattern.

<u>Herniation</u> occurs when the brain starts to move towards the foramen magnum. Signs include: unequal or unresponsive pupils, abnormal motor findings e.g. decorticate (abnormal flexion) or decerebrate (abnormal extension) posturing, cheyne stokes breathing, respiratory arrest, cardiac arrest.

<u>Hypoxia</u>

Irreversible brain damage occurs within 4 – 6 mins of cerebral anoxia. For oxygenated blood to be delivered to the brain, the airway must be patent and the lungs must work normally. Hypoventilation can lead to significant hypercapnia which causes cerebral vasodilation and increased pressure in the cranium. Hyperventilation can lead to hypocapnia and will constrict blood vessels thus leading to a decrease in oxygen delivery to the brain.

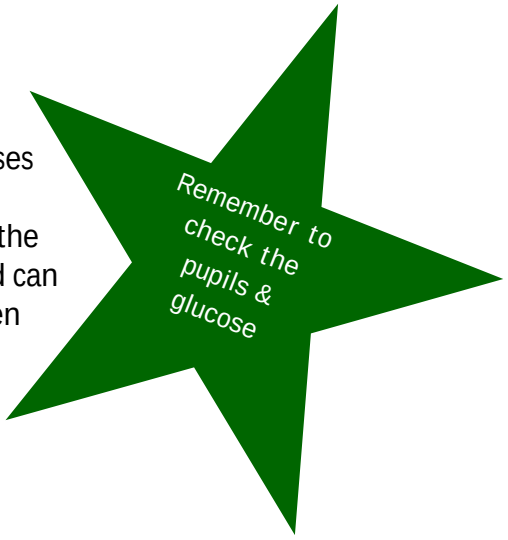
<u>Hypotension</u>

Hypotension reduces cerebral blood flow (perfusion) and therefore, reduced delivery of oxygen and glucose to brain tissue. Hypoglycaemia and hypoxia leads to damaged neurons. The management includes maintenance of the circulation with IV fluids and haemorrhage control.

Important! an isolated head injury will not cause hypotension, consider other causes.

Seizures

A patient with a traumatic brain injury is at risk of seizures. Some causes include: hypoxia, hypoglycaemia and electrolyte imbalance.
Seizures can aggravate pre existing hypoxia caused by impairment of the respiratory function. During a seizure, the neurons are very active and can deplete the oxygen



PRINCIPLES OF BRAIN INJURY MANAGEMENT

Management of head injury as per CPG

a. Maintain airway- consider advanced airway
b. If GCS ≤ 8 = 10 degree upward head tilt
c. Maintain BP >120mmHg

IMPROVING OXYGENATION

Ensure the airway is patent
Use adjuncts (oro or nasopharyngeal airways)
100% oxygen
Consider advanced airway if Apnoea or ALL of the following are present:

- BVM ineffective
- GCS = 3
- SPO2 <92%
- RR ≤ 9

MINIMISING INCREASES IN ICP

Following Primary Brain Injury ICP can increase significantly and affect blood flow

Head down tilt - increases ICP
Upward tilt 10 ° - decreases ICP

All of the following will increase ICP; pain, anxiety, vomiting, suctioning and gag reflex. A very tight cervical collar may also increase ICP.
Consider anti-emetic therapy.

IMPROVING CEREBRAL PERFUSION

If GCS <8 then maintain systolic BP> 120mmHg with Hartmann's solution (250mls IV/IO aliquots).

Remember! Isolated brain injuries do not cause hypotension...Look for sources of bleeding

5 sources of bleeding—on the floor and 4 more! External, chest, abdomen, pelvis and long bones.

! Inappropriate attempts at intubation may trigger the gag reflex, increase ICP and worsen secondary brain injury.

Consider transport to most appropriate ED (hospital bypass) - local policy applies

Manage haemorrhagic shock, Glycaemic emergencies and seizures as per CPG's

Eyes	Max 4
Open spontaneously	4
Open to voice	3
Open to pain	2
Don't open	1
Verbal	Max 5
Orientated	5
Confused	4
Incomprehensible	3
Groans	2
Nothing	1
Motor	Max 6
Obeys commands	6
Localises (identifies site of pain)	5
Withdraws from pain	4
Flexes limbs to pain	3
Extends limbs to pain	2
No movement	1

7.4 Spinal Immobilisation

Although there was an existing CPG for spinal rule out for Advanced Paramedics, however you will note that the current version is for Paramedic and AP level. The new CPG is definitive but the steps taken while assessing for a possible spinal injury must be sequential and all must be present before being allowed to rule out a spinal injury.

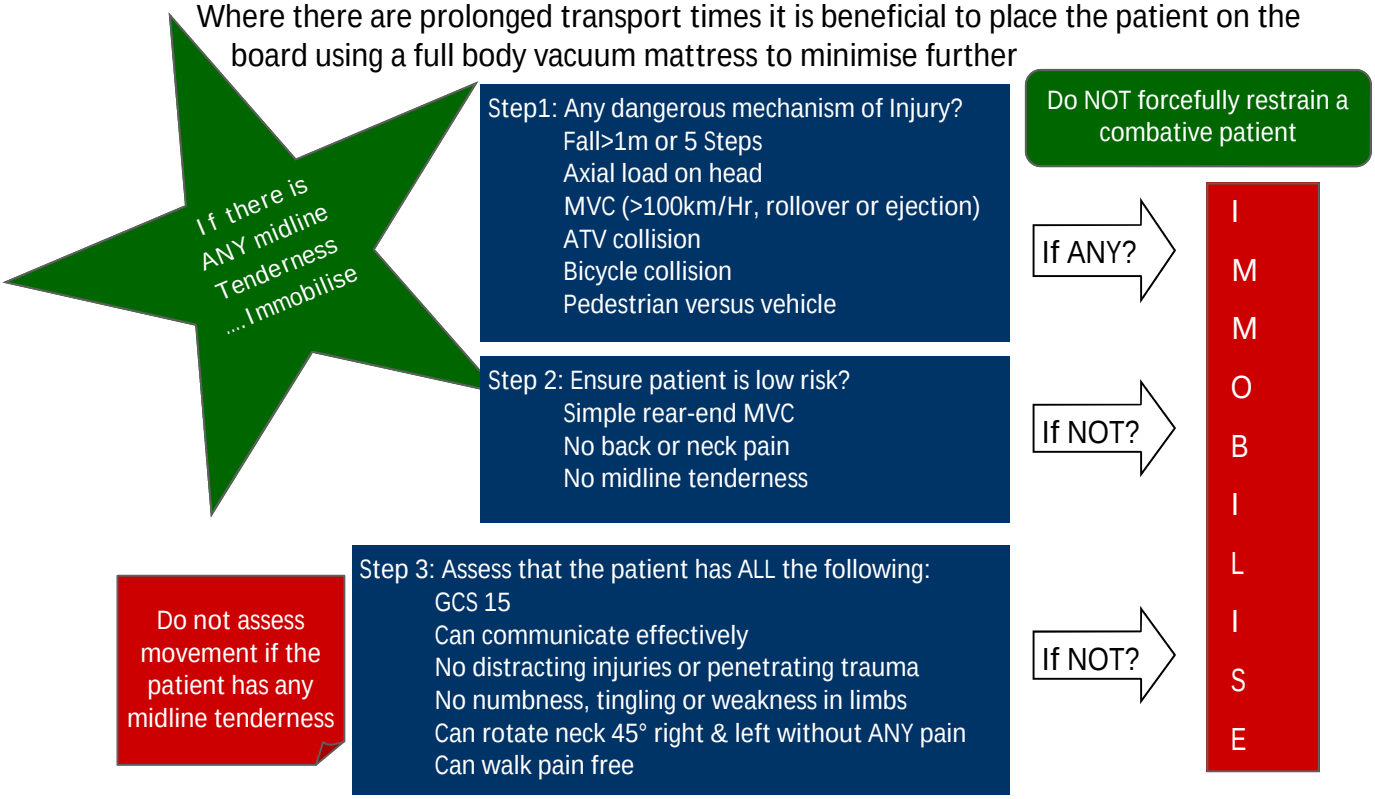
The CPG clearly lists what are the dangerous mechanisms of actions and also low risk actions for the practitioner to rule out. Please note the red box which states that you should use your clinical judgement at all times and that if in doubt you should treat as spinal and fully immobilise your patient.

Use clinical judgement. If in doubt….Immobilise.

Paramedics and AP's should be conservative in their approach towards this CPG to ensure that no patient is inappropriately moved if they have a possible spinal injury

As with previous extrication decision processes if the patient has life threatening injuries then it is rapid extrication with a collar and board. For patients with non life threatening injuries a collar and short vest extrication device should be used in conjunction with a spinal board.

Where there are prolonged transport times it is beneficial to place the patient on the board using a full body vacuum mattress to minimise further



Suspected Spinal Injury in Children

If an injured child is sitting up in an undamaged child car seat, then a collar should be applied and the patient immobilised in the car seat.

If the child car seat is damaged then the patient should have a collar applied, be extricated and loaded onto a vacuum mattress or long board.

All children with life threatening injuries require Rapid Extrication

8 Paediatrics

8.1 Paediatric assessment

8.1.1 Primary survey

Major changes include the removal of CUPS and the use of Clinical Status instead. Both the medical and trauma primary survey assess 5 factors:

- Paediatric Assessment Triangle
- Airway: patent or not
- Breathing: adequate or inadequate
- Circulation: pulse present or absent (>1yr) or <60 (<1 yr). Is the rate appropriate for age?
- AVPU

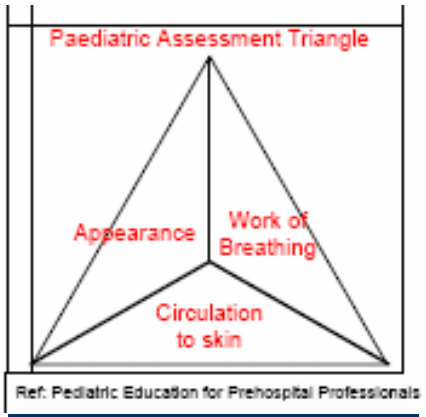
All life-threatening findings must be treated during the primary survey

These 5 elements allow the practitioner determine if the patient's condition is:

Life– threatening	Serious, non life-threatening	Not serious or life-threatening

The Trauma Primary Survey also considers:

1) The risk of C-Spine injury
2) The control of major haemorrhage
3) Treatment of life-threatening injury



The Paediatric Assessment Triangle is a useful tool. It looks at 3 factors:

1. Child's appearance
2. Work of Breathing
3. Circulation to Skin

Appearance: Well children are alert, playful and curious. A quiet or withdrawn child is concerning.

Work of Breathing: Rate, nasal flaring, cyanosis, grunting, recession (subcostal, intercostal, tracheal tug and sternal recession).

Circulation to Skin: Capillary refill, pallor, mottling, temperature.

Children's weight:
<1yr: 3.5Kg Birth, 6Kg 6 months
≥1yr

(Age x 2) + 8

8.1.2 Secondary survey

The History should include the Chief Complaint and events leading up to it, asking about the child's feeding, toileting, energy levels and medication/vaccination history.

The Examination should initially be "Hands Off" where the practitioner observes the child (their activity level, the relationship with those around them etc). Then perform a "Toe to Head" exam particularly looking for rashes and injuries. The timing of when to check a child's vital sign will depend on the child's activity levels. Resp rate is often best checked when the child is quiet.

Normal range for Vital Signs

Age	Pulse	Respiration
Infant	100-160	30-60
Toddler	90-150	24-40
Pre-school	80-140	22-34
School age	70-120	18-30

Is the child dehydrated? Check for sunken eyes, dry lips, dry mucous membranes and less wet nappies.

8.1.3 Paediatric Pain Management

This is referred to in Chapter 2. Here's a reminder of the drug dose and sequence:

Entonox if NO Contra-indications

Pain Score 2-5: Paracetamol (20mg/Kg) AND/OR Ibuprofen (5mg/Kg)

NO REPEAT (but both medications can be given)

Pain Score 6-10: Morphine (0.05mg/Kg IV or 0.1mg/Kg PO)

Can Repeat x 2 (to max dose 0.15mg/Kg IV or 0.3mg/Kg PO)

The Paediatric dose of morphine has increased

Anti-emetics are NOT routinely used in the treatment of nausea and vomiting in Children (but may be used if opiates are the cause of the symptoms)

Cyclizine 0.7mg/Kg Slow IV. NO Repeat.

Ondansetron 0.1mg/Kg Slow IV. No Repeat.

8.1.3 Child safety & welfare

The Children First Guideline's protect people who report suspected cases.

There is NO mandatory reporting in Ireland.

Children can be abused or mistreated in many ways (neglect, physical, emotional or sexual abuse) and society has a duty to protect children. Pre-hospital practitioners often have the opportunity to note potentially harmful situations that other responsible people (eg teachers or other health care workers) do not witness.

What to do?

Listen and observe: History, child's behaviour and appearance, rapport with carers

Seek an explanation of the injury illness (non judgemental manner)

Ask the child what happened? Are there inconsistencies?

Record: History, concerns, actions and outcomes

Reported all suspected cases to ED staff and recorded it on PCR.

The exact method for reporting concerns varies within different HSE areas. Information is available for each area from the HSE website.
Generally social workers are available Mon-Fri 9am-5pm.
Concerns outside these times should be reported to the Gardaí.
Some ED's stock reporting forms—check local policy.

Neglect

Persist failure to meet a child's physical or psychological needs:

Persistent infestations
Non-compliance with medical treatment
Poor hygiene
Failure to attend appointments eg Doctor or Dentist
Not immunised
Growth Failure
Inadequate clothing

Emotional Abuse

May manifest as:
Inconsistent behaviour
Fearful / withdrawn
Low self esteem
Aggressive behaviour
Habitual rocking
Affection seeking
Clinginess
Rage at minor provocation
Self harm
Bed wetting
Defecating inappropriately

Physical Abuse

Unusual bruising/petechiae (unsuitable explanations, clusters, similar size/shape, non-bony areas).
Ligature marks, bites, cigarette burns
Circumferential burns or scalds
1 or more fractures with unsuitable explanation

Sexual Abuse

Unusual sexual behaviour in pre pubertal children eg; oral / genital contact with doll or child
Recurrent dysuria, anal or genital symptoms
Gaping anus or offensive vaginal discharge
Hep B 13 – 17 yrs old

8.2 Respiratory emergencies

8.2.1 Advanced airway > 8 years

Please Note:
Advanced Airway Management for Children <8 years will be covered in Part 2 AP Upskilling

An endotrachael tube or Supraglottic airway can now be used in a patient of 8 years or above. The formula for calculating the size of an endotrachael tube size is:

(Age ÷ 4) + 4 = Tube Size

There are many Supraglottic devices available for use pre-hospital. These include the Laryngeal mask Airway (LMA), the i-gel, and the Laryngeal Tube (LT) airway.

Recommended Size guidelines for ETT and SGA's (≥8 years)

	ETT	LMA	I-gel	LT
Age 8:	6mm	2.5	2	2
Age 9:	6mm	2.5	2.5	2.5
Age 10:	6mm	2.5	2.5	2.5
Age 11:	6mm	3	2.5	2.5
Age 12:	6mm	3	2.5	2.5
Age 13:	6mm	3	2.5	2.5

8.2.2 Stridor

The key points from this CPG are:

- Consider FBAO
- If there is any suggestion of croup or epiglottitis DO NOT put anything in the child's mouth
- Transport the child is a position of comfort. They may sit up in a tripod position to maximise air entry
- Administer humified O2 (as high a concentration tolerated)
- Use Sats and ECG monitoring

Avoid distressing the child

Other causes of respiratory depression in children include seizures and raised ICP

8.2.3 Inadequate respirations

There is no CPG Pulmonary oedema in Children. Tension Pneumothorax is similar to adults. In a suspected case respiratory depression secondary to opiate ingestion then the dose of Naloxone is 0.01mg/Kg IV/IO/IM (max dose 0.1mg/Kg).

Consider the possibility of child abuse 8.1.3

Asthma is discussed in Chapter 3.2. Useful reminders include:

Peak Flow

Is extremely useful
Small children may find it difficult
Depends on height and weight

Expected PEFR=(Age x 30) + 30

Kids with asthma deteriorate suddenly

A wheeze in a <1 yo is usually due to secretions not bronchospam. Bronchodilators are rarely useful.

A child who can't feed is a sick child

Children with mild to moderate exacerbations of asthma can use a Metered Dose Inhaler and a Spacer.

Let the child use their own spacer if possible as they are more familiar with it.

8.3 Medical Emergencies

8.3.1 Anaphylaxis
This is covered in Chapter 5.3

8.3.2 Glycaemic emergencies
This is covered in the Chapter on Paediatric Fluids 6.2

Glucagon
Dose: >8 years 1mg, <8 years 0.5mg
Ineffective in low glycogen stores (very young children) or if used within 24 hours

8.3.3 Seizures
This is covered in Chapter 5.4

Medications for Seizures
IV/IO Access: Diazepam 0.1mg/Kg. Repeat x 1
No IV/IO Access:
PR Diazepam < 3yo 2.5mg, 3-7 yo 5mg, >7 yo 10mg. Repeat x 1.
IN Midazolam 0.2mg/Kg. Repeat x 1
Buccal Midazolam 0.5mg/Kg. Repeat x 1

TRAUMA

8.4 Trauma
8.4.1 External Haemorrhage This is covered in Chapter 6.2 and 7.1
8.4.2 Burns are covered in Chapter 7.2
8.4.3 Spinal Injury is covered in Chapter 7.4

8.3.4 Septic Shock

The fluid management of Septic Shock and the recognition of poor perfusion are covered in Chapter 6.2.

Antibiotics are permitted if meningococcal disease is suspected. Meningococcal disease can either infect the blood stream causing meningococcal septicaemia or infect the meninges around the brain causing meningococcal meningitis. The symptoms of each are shown in the chart on the right.

Meningococcus is a bacteria and 3 strains exist A,B, C.

Vaccination against Strain C is offered to children in Ireland.

Traditionally, it is sensitive to penicillin antibiotics (although some resistance is developing).

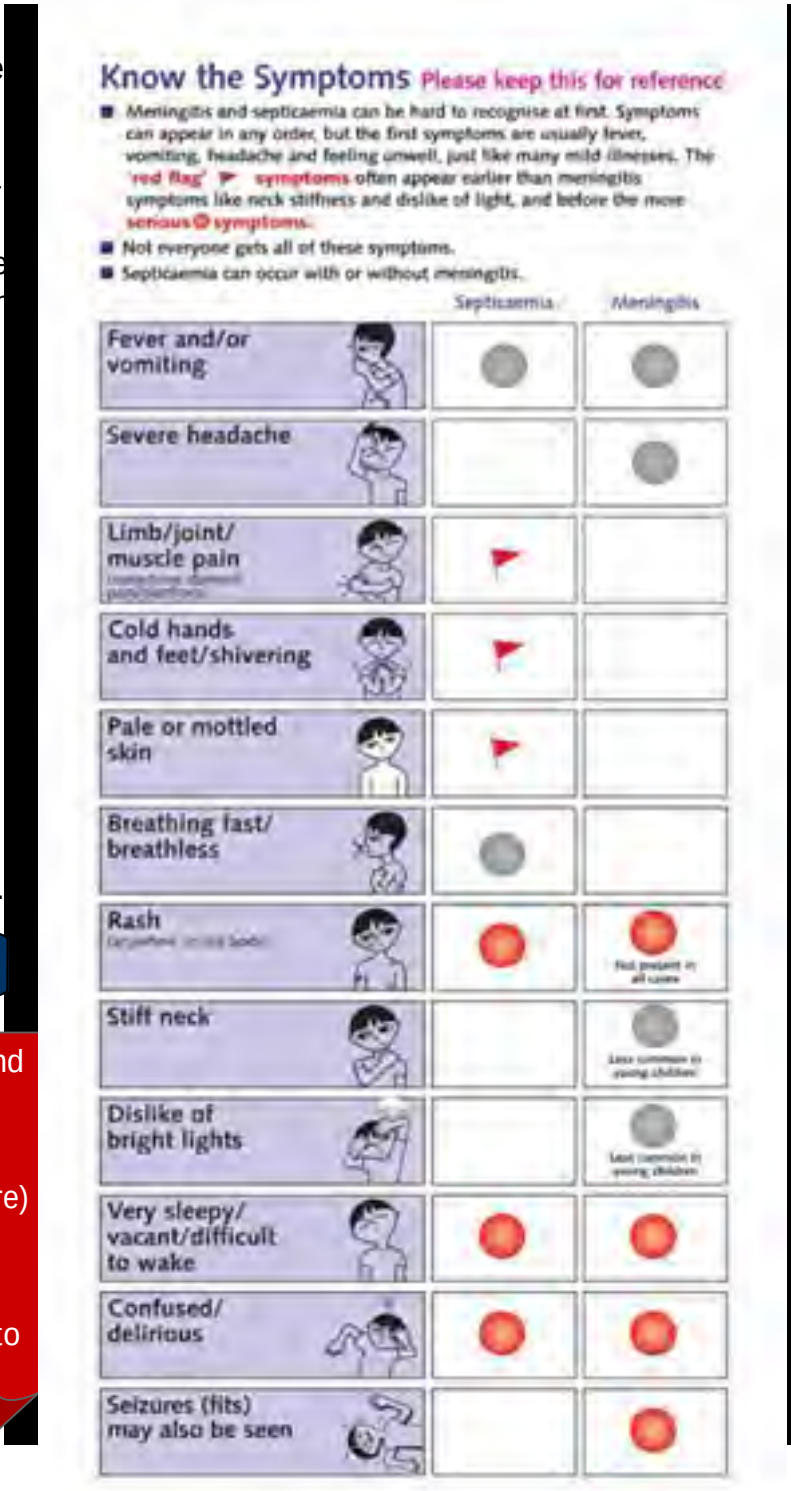
www.menigitis.org

In any sick child, look for and document if there is any:

Rash
(that doesn't fade with pressure)
Neck Stiffness
Photophobia

Temporarily remove clothing to look for rash

Benzylpenicillin
Is a bacteriocidal antibiotic, that kills the bacteria by acting on the cell wall.
Doses: <1 yr 300mg, 1-8 yrs 600mg, >8 year 1200mg
Administer: IM—reconstitute each 600mg in 2ml
IV/IO: reconstitute each 600mg in 4ml. Give over 3-5 min
Contra-indications: Known severe adverse reaction
Side effects: GI disturbance, hypersensitivity reaction.



Additional Resources

Textbooks

Nancy Caroline's "Emergency Care in the Streets". AAOS 6th Edition 2007

Mosby's "Paramedic Textbook". Sanders revised 3rd Edition 2007

"Oxford Handbook of Pre-hospital Care". I Greaves, K. Porter. 1st Edition 2006

Mosby's/JEMS "PHTLS Pre-hospital Trauma Life Support". 6th Edition 2006

British National Formulary

Electronic Information

British Thoracic Society (www.brti-thoracic.org.uk)

Provides consensus guidelines on the management of Asthma/COPD

ILCOR/AHA Guidelines (www.ilcor.org and www.americanheart.org)

Provides consensus guidelines on resuscitation and cardiovascular disease

NICE guidelines (www.nice.org.uk)

Provides consensus guidelines on many topics including Traumatic Brain Injury and Non-Accidental Injury in Children.

Critical Appraisal; two useful sites are the Centre for Evidence Based Medicine (www.cebm.net) and Best Bets (www.bestbets.org.uk)

Information on Sepsis is available from the Surviving Sepsis Campaign (www.survivingsepsis.org) and on Meningicoccal Infection (www.meningitis.org)

Information is also available from JRCALC in the UK (www.jrcalc.org.uk), the HSE (www.hse.ie) and the Dept of Health and Children (www.dohc.ie). The HSE provides excellent electronic library access for all HSE employees via an Athens Password (www.hselibrary.ie)

Other sites include:

Trauma information (www.trauma.org)

E-medicine and Medscape www.emedicine.com

Appendix 1: Changes arising from Version 3 of the PHECC Clinical Practice Guidelines

CPG Title	Teaching method	Upskilling Programme
Patient Assessment		
2.1 Primary survey medical - adult	Knowledge	Part 1 – Page 8
2.2 Primary survey trauma - adult	Knowledge	Part 1 – Page 8
2.4 Secondary survey Medical - Adult	Knowledge	Part 1 – Page 8 & 9
2.5 Secondary survey Trauma – Adult	Knowledge	Part 1 – Page 9
2.6 Pain Management – Adult	Knowledge & Skills	Part 1 – Page 10
Respiratory Emergencies		
3.1 Advanced airway – Adult > 8yrs	Skills	Part 1 – Page 12
3.2 Inadequate Respirations – Adult	Knowledge & Skills	Part 1 – Page 13, 14 & 15
3.3 Exacerbation of COPD	Skills	Part 1 – Page 13
Medical Emergencies		
4.1 Adult BLS	Knowledge	Part 1 – Page 16
4.2 Child BLS	Skills	Part 1 – Page 16
4.3 Infant BLS & ALS	Knowledge & Skills	Part 1 – Page 16
4.5 Foreign Body Airway Obstruction – Adults	Knowledge & Skills	Part 1 & Part 2 (Needle cricothyroidotomy) Page 16
4.6 Foreign Body Airway Obstruction – Paeds	Knowledge & Skills	Part 1 & Part 2 (Needle cricothyroidotomy & advanced airway) Page 16
4.7 VF or Pulseless VT – Adult	Knowledge & Skills	Part 1 – Page 17 & 18
4.8 Paediatric VF/Pulseless VT	Skills	Part 1 & Part 2 (Advanced airway management) Page 17
4.9 Symptomatic Bradycardia - Paeds	Knowledge & Skills	Part 1 & Part 2 (Advanced airway management) Page 23
4.10 Aystole Adult	Skills	Part 1 – Page 20
4.11 Pulseless Electrical Activity- Adult	Skills	Part 1 – Page 17
4.12 Paediatric Asystole/PEA	Skills	Part 1 & Part 2 (Advanced airway management) – Page 17
4.13 Asystole decision tree	Knowledge	Part 1 – Page 20
4.14 Post-resuscitation care	Knowledge	Part 1 – Page 19
4.15 Recognition of death	Knowledge	Part 1 – Page 20
4.16 Cardiac Chest Pain – ACS	Knowledge & Skills	Part 1 & Part 2 (Thrombolysis) – Page 21
4.17 Symptomatic Bradycardia – Adult	Knowledge & Skills	Part 1 – Page 24
4.18 Allergic reaction/ anaphylaxis	Knowledge & Skills	Part 1 – Page 25
4.19 Glycaemic Emergency	Knowledge	Part 1 – Page 29
4.20 Seizures/convulsions – adults	Knowledge & Skills	Part 1 – Page 27
4.21 Septic Shock – Adult	Knowledge	Part 1 – Page 29
4.22 Stroke	Skills	Part 1
4.23 Poisons – Adult	Knowledge & Skills	Part 2
4.24 Hypothermia	Knowledge & Skills	Part 2
4.25 Epistaxis	Knowledge	Part 1 – Page 31
4.26 Decompression Illness	Knowledge	Part 1 – Page 28
4.27 Altered level of consciousness	Knowledge	Part 1 – Page 28
4.28 Behavioural emergency	Knowledge & Skills	Part 2
4.29 Mental Health Emergency	Knowledge & Skills	Part 2
4.30 Significant nausea/vomit – Adult	Knowledge	Part 1 – Page 10

CPG Title	Teaching method	Upskilling Programme
Obstetric Emergencies		
5.1 Emergency childbirth	Knowledge	Part 2
5.2 BLS & ALS – Neonate (<4 weeks)	Knowledge & Skills	Part 1 – Page 19
5.3 – 5.6 Obstetric Complications	Knowledge & Skills	Part 2
Trauma		
6.1 External Haemorrhage	Knowledge & Skills	Part 1 – Page 31
6.2 Haemorrhagic Shock – adult	Knowledge	Part 1 – Page 29
6.3 Spinal Immobilisation	Knowledge & Skills	Part 1 – Page 36
6.4 Burns – Adult	Knowledge	Part 1 – Page 29 & 32
6.5 Limb fracture	Knowledge & Skills	Part 2
6.6 Head Injury	Knowledge & Skills	Part 1 – Page 34
6.7 Submersion Incident	Knowledge	Part 2
6.8 Crush Injury	Knowledge	Part 1 – Page 29
6.9 Traumatic Cardiac Arrest	Knowledge	Part 1 – Page 20
Paediatric Emergencies		
7.1 Paediatric Primary Survey Medical	Knowledge	Part 1 – Page 37
7.2 Paediatric Primary Survey Trauma	Knowledge	Part 1 – Page 37
7.4 Secondary Survey – Paediatric	Knowledge	Part 1 – Page 37
7.5 Inadequate Respirations – Paeds	Knowledge & Skills	Part 1 – Page 13, 39
7.7 Advanced airway (< 8 years)	Skills	Part 2
7.8 Anaphylaxis – Paeds	Knowledge & Skills	Part 1 – Page 25
7.9 Glycaemic emergency – Paeds	Knowledge	Part 1 – Page 30
7.10 Seizure/Convulsion – Paeds	Knowledge & Skills	Part 1 – Page 27, 40
7.11 External Haemorrhage – Paeds	Knowledge & Skills	Part 1 – Page 31
7.12 Septic Shock – Paeds	Knowledge	Part 1 – Page 30, 40
7.13 Haemorrhagic Shock – Paeds	Knowledge	Part 1 – Page 30
7.14 Pain Management - Paeds	Knowledge & Skills	Part 1 – Page 10, 11, 38
7.16 Burns – Paeds	Knowledge	Part 1 – Page 30 & 32
Pre-hospital Emergency Care Operations		
8.1 – 8.4 Major Emergency	Knowledge & Skills	Part 2
8.5 Conducted Electrical Weapon (TASER)	Skills	Part 2

Appendix 2: Medications required for PART 1 AP Upskilling Programme

Drug	Presentation	Indication
Amiodarone	Pre-filled 10ml syringe (30mg/ml)	Vfib/Pulseless VT
	150mg in 3ml vial (50mg/ml)	Infusion if ROSC post shockable arrest
Aspirin	300mg soluble tablet	Cardiac chest pain
Atropine	1mg/10ml prefilled syringe	Symptomatic bradycardia
		PEA arrest
		Organophosphate poisoning
	3mg/10ml prefilled syringe	Asystole cardiac arrest
Benzylpenicillin	600mg vial for reconstitution	Suspected meningococcal sepsis
Clopidogrel	75mg tablet	Suspected myocardial infarction
Cyclizine	50mg in 1ml ampoule	Mgt of nausea/vomiting post opiates
		Mgt of significant nausea/vomiting
Diazepam Injection	10mg/2ml ampoule	Sustained seizures
Diazepam Rectal Solution	2.5mg/1.25ml (2mg/ml)	Sustained seizures
	5mg/2.5ml (2mg/ml)	
	10mg/2.5ml (4mg/ml)	
Epinephrine 1:10,000	1mg/10ml prefilled syringe (0.1mg/ml)	Cardiac arrest
		Refractory paediatric bradycardia
Epinephrine 1:1,000	1mg/ml minijet, ampoule or autoinjector	Severe anaphyllaxis
Frusemide	10mg/ml in 2ml ampoules	Pulmonary oedema
Glucagon	Powder 1mg with 1ml reconstitution solution	Hypoglycaemia
Glucose gel	Tube or sachet	Hypoglycaemia
Glyceryl trinitrate	400mcg metered dose aerosol spray	Angina or suspected MI
		Pulmonary oedema
Hydrocortisone	100mg vial for reconstitution	Severe anaphyllaxis or COPD
Ibuprofen	Suspension 100mg/5ml	Paediatric Pain
	200 & 400mg tablet	Adult Pain
Ipratropium Bromide	0.25mg in 1 ml nebule	Adult & Paediatric bronchospasm
Lignocaine	100mg in Pre-filled 10ml syringe (10mg/ml)	When amiodarone is unavailable
Magnesium sulphate injection	1g (2ml, 50% solution) ampule or a 2g (4ml, 50% solution) pre-filled syringe	2g Torsades de Pointes
		1.5g **infusion** life threatening asthma
Midazolam	10mg/2ml IV/IM/IN Solution. 10mg/ml Buccal solution "Epistatus"	Sustained seizures
		Mental Health Emergency
		Pyschostimulant Poisoning
Morphine	10mg in 1ml ampoule	IV analgesia - Severe pain
	2mg/ml suspension	Oral analgesia -Paediatric Severe Pain
Naloxone	0.4mg in 1ml ampoule and pre-filled syringe	Symptomatic opiate overdose
Nitrous oxide 50% Oxygen 50%	Gas	Analgesia
Ondansetron	4mg in 2ml ampoule (2mg/ml)	Mgt of nausea/vomiting post opiates
		Mgt of significant nausea/vomiting
Oxygen	Gas	Inadequate oxygenation/ventilation
Paracetamol	500mg tablet	Adult analgesia
	120mg/5ml PO suspension	Paediatric Pain or Pyrexia
	60mg* & 180mg Rectal suppository	
Salbutamol	2.5mg in 2.5ml and 5mg in 2.5ml nebules	Adult and paediatric bronchospasm
	0.1mg metered dose aerosol inhaler	

Fluid	Presentation	Indication
Dextrose 10%	250ml* and 500ml soft pack	Hypoglycaemia
Hartman's Solution	500ml & 1000ml soft packs	Shock, anaphylaxis, burns, decompression illness, symptomatic bradycardia (Paeds)
Sodium Chloride 0.9%	10ml ampoules	Reconstituent agent for other medications
	500ml & 1000ml soft packs	Hyperglycaemia, cardiac arrrest, crush injury, hypothermia
Water for injection	10ml ampoules	Reconstituent agent for other medications

Also
500ml 5% dextrose needed for IV Amiodarone infusion
100ml 0.9% NaCl needed for IV Magnessium/IV hydrocortisone infusion

BLUE Font implies a therapy/medication already in use
GREY font implies a new therapy/medication/indication introduced in the 3rd Edition CPG's

Appendix 3: Medication Administration Technique

Preparation of an Intravenous Infusion

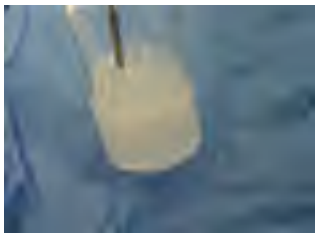
Three medications are administered as infusions; hydrocortisone, magnesium sulphate and amiodarone. The principles of preparing an infusion are similar for all three medications. Amiodarone and magnesium sulphate are liquids in either ampoules or mini-jets while hydrocortisone is a powder in a vial.

The preparation of hydrocortisone is shown here. Currently the only presentation of Hydrocortisone available contains 100mg for reconstitution in 2mLs of fluid.
If given in IM form each vial should be prepared and delivered into separate deep IM sites to prevent tissue necrosis.
Alternatively medication may be delivered by IV Infusion over 1-10 min.
To prepare infusion the following is required (For pediatrics patient dosage should be adjusted accordingly):

<u>Adults</u>

2 x Vials of Hydrocortisone 100mg
10mL solution for reconstitution
1 x 5mL Syringe
1 x Drawing up filter needle
1 x IM needle
1 x 100mL Bag for infusion

Using a filtered drawing up needle Draw 4 ml of fluid into a 5 ml syringe deliver 2 ml to each vial and allow reconstituted medication to settle and become clear do not over agitate vial as it may become frothy and take additional time to clear.



Draw out medication from both vials into the 5 ml syringe and change to an IM needle for delivery to the giving bag (this prevents any leakage from the medication port by the larger needle) Insert IM needle into medication port of the 100ml bag and deliver entire contents invert bag several time before attaching to giving set.

Label infusion with:

- Drug name
- Dose
- Volume
- Date and Time

Calculating a drip rate
Number of drips (guttate or gtt) per min depend on the drip set (20 or 60gtt/ml).
Rate x Drip Set = Drops/minute (ml/min x gtt/ml = gtt/min)
Adults: Amiodarone (300mg/500ml) at 1.7ml/min, Magnesium sulphate (1.5g/100ml)at 5ml/min. Hydrocortisone (200mg/100ml) over 1-10min. Run in.
Paediatrics: Hydrocortisone is the only infusion required in Children. Inject required dose into 100ml 0.9%NaCl and run in over 1-10 minutes.

Intra-nasal Medication Administration

The mucosal atomiser device (MAD) is an atraumatic, semi-soft nasal plug on a flexible applicator. It allows the application of topical drugs directly into the nasal cavity by gently pressing the nasal plug against the nares. The nasal plug design prevents accidental trauma if a child or patient suddenly moves head and provides a good seal during drug delivery. The atomizing tip converts any liquid medication into an approximately 60 micron sized droplet spray. This sized droplet comes out of the air and sticks to the mucosa in a thin layer. Atomization enhances amount of surface area covered, improving total absorption of the medication.

The MAD fits onto any luer-lock or slip fit syringe (1, 3 and 5ml are ideal). The nasal cavity cannot absorb large volumes so 0.2 to 0.5 ml per nostril are preferred, though 1 ml per nostril will work.

Method

Step 1:

Assess the patient to ensure their nasal cavity is free of blood or mucous. If these are present you can choose a different method to deliver the drug or suction the nose prior to drug delivery.

DO NOT USE THE MAD IF THERE IS A POSSIBILITY OF A BASE OF SKULL OR FACIAL FRACTURE. CHECK! ANY BRUISING AROUND THE EYES OR BEHIND THE EARS? ANY CSF FROM THE NOSE OR EARS? ANY BLOOD FROM THE EARS?

Step 2:

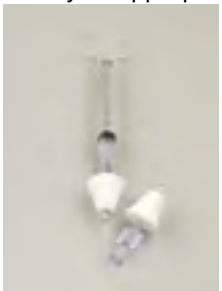
Calculate the dose and volume of medication required using the most concentrated form of the drug available. The MAD adds an additional 0.1ml of "dead space" (medication left within the MAD after administration) so draw up the required volume of the medication + 0.1ml.

Step 3:

Gently but firmly place the MAD nasal against one nostril.
Insert the MAD into the nostril at a 45 degree angle (this is different to naso-pharyngeal airways which are inserted horizontally). Point the syringe away from the septum and towards the lateral wall of the nose.
Briskly compress the syringe to delivery half the drug as an atomized mist into one nostril. Repeat in other nostril delivering the remaining half of the drug (this doubles the surface area available for drug absorption).

Step 4:

Assess patients' response to the medication and repeat therapy or choose alternate treatment if needed.
Nasal drugs onset of action is 3-5 minutes and peak effect is 12-20 minutes.
It may be appropriate to titrate to effect (for example when treating pain) in a fashion similar to IV therapy.



Remember!

- Aim slightly upwards and toward ear on same side as the nostril (this delivers the drug to the turbinates where the majority of the nasal mucosa lies)
- Use the most potent – highly concentrated drug – NEVER dilute it
- Some discomfort may occur initially on delivery (especially with Midazolam) this is usually very transient
- Do NOT use the nasal route if a base of skull fracture is suspected (it may aggravate the injury and also deliver the medication directly into a blood vessel).

Buccal Administration of medication

Two medications are delivered by this route; glucose gel and a special preparation of midazolam. The medications are absorbed into the systemic circulation through the very vascular mucosa inside the check. For maximum benefit the medications should be viscous to minimise it being swallowed (gastric absorption would reduce the bioavailability of the drug and delay its onset of action) and should be delivered in a high concentration.

Paramedic and Advanced Paramedics are very familiar with glucose gel.
Buccal Midazolam (Epistatus) is a new medication. It is supplied in a bottle containing 5mls of a 10mg/ml viscous solution of midazolam. It has a child-resistant cap, a self drainage bung and four 1ml syringes. The extra 1ml is to allow for spills or leaks that may occur. Midazolam administered buccally has a peak blood concentration after 5-10 minutes, a 3 hour half life and small volume of distribution.

Method

Drawing up

Calculate the dose and then the volume of the medication required.
Open the bottle by pressing down on the lid and twisting it in an anti-clockwise direction. Insert one of the syringes firmly into the opening (bung) on the top of the bottle, with the plunger of the syringe pressed fully in. Holding the bottle firmly, turn it upside-down and slowly pull back on the plunger of the syringe to withdraw the prescribed amount of medicine. Replace the lid on the bottle to avoid accidental spillage and evaporation.

Replace the cap immediately!
The solution can evaporate and the midazolam will precipitate. If the medication appears milky then dispose immediately and DOCUMENT

Administration

Support the head by standing behind the patient and holding the chin or alternatively if the individual is on the ground hold the chin to keep the head steady. Take care not to press accidentally on their throat
Gently open the mouth by holding the chin and applying a downward pressure to the lower lip with your thumb. Wipe away any excess saliva etc (there is no need to part the teeth).
Insert the syringe horizontally into the mouth, between the lower gum and the cheek. Locate the buccal cavity by tilting the syringe downwards and slowly squeeze half of the medicine into this space.
Repeat the procedure on the other side.
If it is too difficult, or the patient is on the ground then it is permissible to give all the medicine to one side (the lower side if they are on the ground).
Gently hold the lips together for a minute or so prevent leakage.

Note!
Maintain BLS measures
Patient may be drowsy for several hours
The last dose can be difficult to aspirate—remove the bung!

Appendix 4: Paediatric Drug Calculations

Include "0." before the dose/ volume eg 0.25mg not .25mg

Children, especially very young children and infants, have a lower body weight, a different water-body fat-muscle composition and altered liver and renal function. These impact enormously on the pharmacokinetics of a medication. Therefore consideration of the absorption, distribution, metabolism and excretion of a medication must taken into account when administering medication to children.

7 "Rights"
Right Patient
Right Medication
Right Dose
Right Route
Right Time
Right Documentation
Right to Refuse

Neonatal Resuscitation—4 medications are permitted:

1) Adrenaline (1;10,000) 0.01mg/Kg IV/IO
2) Naloxone 0.01mg/Kg IV/IO
3) 0.9% NaCl 10ml/Kg IV/IO
4) 10% Dextrose 5ml/Kg IV/IO

The volumes of adrenaline and naloxone for a 3.5Kg infant are very small; 0.35ml of 1:10,000 Adrenaline and 0.087ml of Naloxone (0.4mg/ml) so a 1ml syringe should always be used . Medications should also be drawn up using a 3-way tap. This will be covered in the skill stations.

0.35ml of Adrenaline 1:10,000 for a 3.5Kg child (0.01mg/Kg)

17.5ml of 10% Dextrose for a 3.5Kg child (5ml/Kg)

Common medications for a 1 year old child (10Kg)

Diazepam
0.1mg/Kg = 1mg = 0.2ml
of 10mg/2ml solution

Paracetamol
20mg/Kg = 200mg = 8.3ml
of 120mg/5ml solution

Morphine
0.05mg/Kg IV = 0.5mg = 0.5ml
of a diluted 1mg/ml solution

Calculations — Calculating the correct dose is crucial
Calculate the weight
Use the formulary & weight to calculate the dose in milligrams
The volume required will depend on the concentration (see container)
3 methods:
1) Ratio and proportions
2) Formula: volume required = Dose required (mg) X volume in ampoule (ml) / Concentration (mg/ml)
3) Formula: concentration x volume = dose (mg/ml x ml = mg)
Where the volume is unknown

Paediatric Weight
Less than 1 year
Ask parents or
Birth 3.5Kg
6 months 6Kg
12 months 10Kg
Age 1-12
(Age x 2) + 8


RCSI


Pre-Hospital
Emergency Care
Council


UCD
DUBLIN