Assessment

- APGAR
- Easy Cap™ II CO_2 Detector
- Glasgow coma score
- Glucometry
- Mental state assessment
- Neurological status assessment
- Paediatric assessment
- Pain assessment
- Perfusion status assessment
- Pre-hospital ultrasound
- Primary and secondary survey
- Pulse oximetry assessment
- Respiratory status assessment
- Sedation assessment tool (SAT)
- Vital signs survey
- Waveform capnography

Authorisation to practice

APGAR

ACP I ACP II ICP

The APGAR score is a valuable method to determine the health of newborns immediately after birth. It is determined by allocating scores to five simple criteria:

- *colour (**A**ppearance)*
- *heart rate (**P**ulse)*
- *reflex irritability (**G**rimace)*
- *muscle tone (**A**ctivity)*
- *breathing (**R**espiration)*

The purpose of the APGAR score is to determine whether a newborn needs immediate medical care. It is not designed to make long-term predictions of a child's health.[1]

Indications

- An APGAR score is required for all newborns at one minute and five minutes following delivery.

Contraindications

- Nil in this setting

Complications

- Nil in this setting

Procedure

- Using the table provided, assign the newborn a score (0 – 2) for each of the five criteria. Add all individual scores to calculate the total APGAR score (0 – 10).[2]

APGAR SCORE				
	Action	**0**	**1**	**2**
Appearance	Look at skin colour	Blue/pale	Pink (extremities blue)	All pink
Pulse	Count heart rate	Absent	< 100	> 100
Grimace	Monitor response	No response	Grimace	Vigorous cough
Activity	Look at muscle tone	Limp	Some flexion/ extension	Active motion
Respiration	Count and assess	Absent	Slow/ irregular	Good cry

Procedure *(continued)*

- An APGAR score of:
  - 0 – 3 represents severe distress, (refer to *CPG Resuscitation – newborn*).
  - 4 – 7 indicates moderate distress, (refer to *CPG Resuscitation – newborn*).
  - 7 – 10 indicates an absence of difficulty in adjusting to extrauterine life.
  - 10 at 1 minute is uncommon due to the prevalence of transient cyanosis.[1]
- Document the APGAR score accordingly on the eARF.

Authorisation to practice

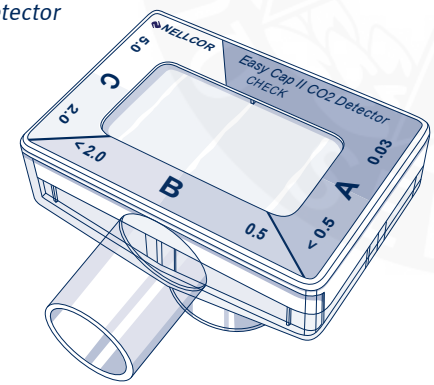
Easy Cap™ II CO_2 Detector ICP

The Easy Cap™ II is a disposable colourmetric $EtCO_2$ detector that measures $EtCO_2$ by colour comparison during patient inspiration and expiration.

At depths greater than 380 m (1250 ft) the LIFEPAK® 12 waveform capnography is unable to be used for ETT placement confirmation due to mechanical error. In this setting (ie. underground mining operations such as Mt Isa) the Easy Cap™ II is mandatory for confirmation of correct ETT placement.

This device is to be used continuously during ongoing care of the ventilated patient until such a time that the waveform capnography (LIFEPAK® 12) is consistently operational (above 380 m underground).

Easy Cap™ II CO_2 Detector



Indications

- Endotracheal intubation (placement confirmation when working at depths below 380 m (1250 ft) underground)

Contraindications

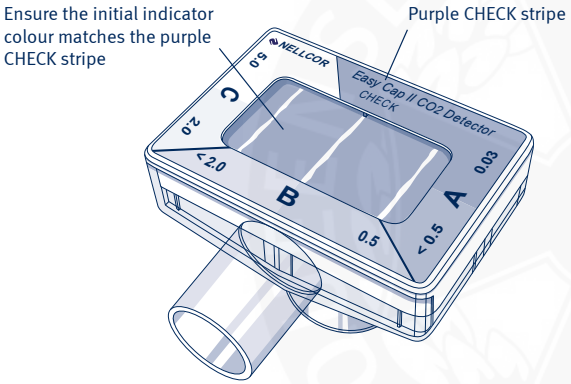
- Patients weighing < 15 kg
- Is not suitable for interpretation by individuals with blue-yellow colour blindness

Precautions

- The Easy Cap™ II may provide a false reassurance of correct placement despite the ETT being situated in the right main bronchus or above the vocal cords.
- Easy Cap™ II accuracy will be affected when subjected to excessive humidity.
- On removal from the packaging the Easy Cap™ II will only remain accurate for a period of 2 hours.

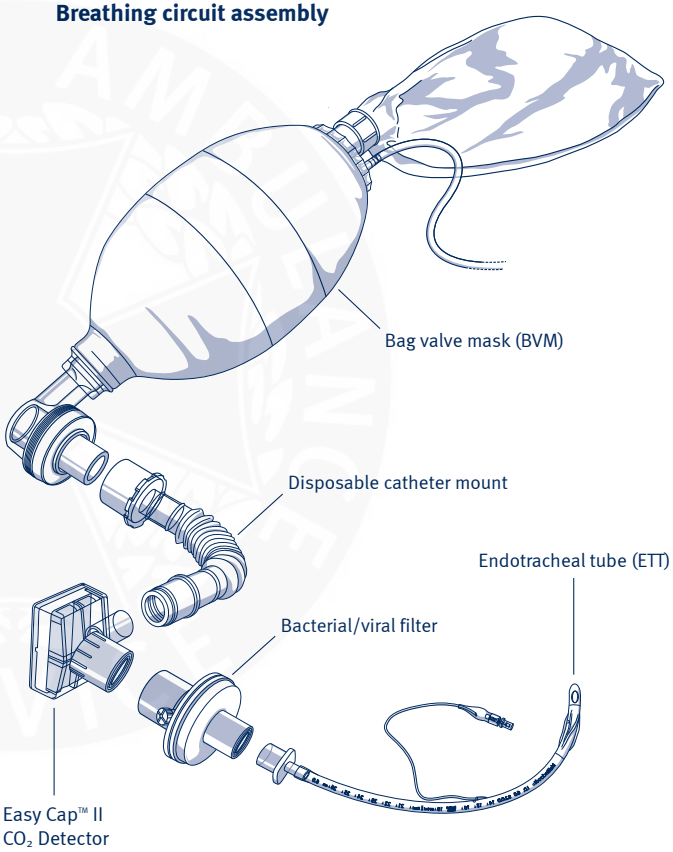
Procedure

- Immediately inspect the Easy Cap™ II after removal from the sealed pouch, matching the initial colour of the indicator to the purple colour stripe labelled CHECK (located around the detector window). Permanent yellow in the indicator windor identifies a damaged indicator.



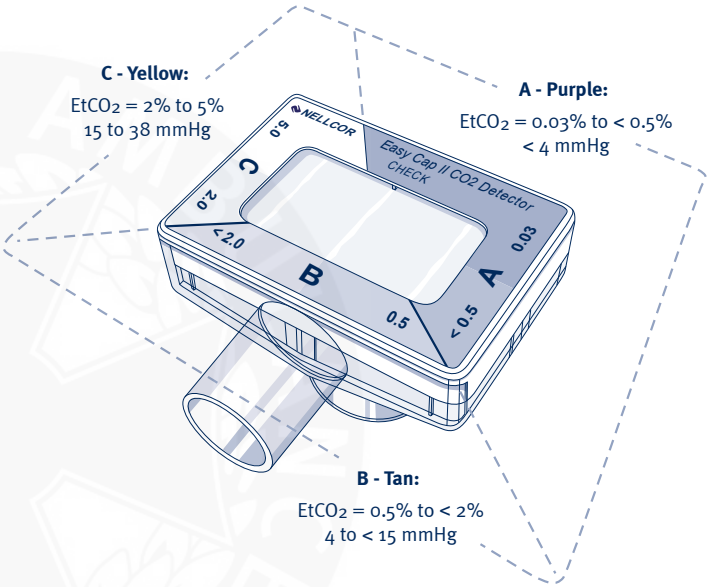
- Attach the Easy Cap™ II to the breathing circuit, ensuring that a bacterial/viral filter is connected on the 'patient' side.
- Confirm CO_2 sensing by performing 6 ventilations of moderate tidal volume. When CO_2 is detected, the indicator colour window will change from purple (on inspiration) to tan or yellow (on expiration) on each respiratory cycle.
- The Easy Cap™ II is single-patient, one-time use only and must be disposed of appropriately after use.

Breathing circuit assembly

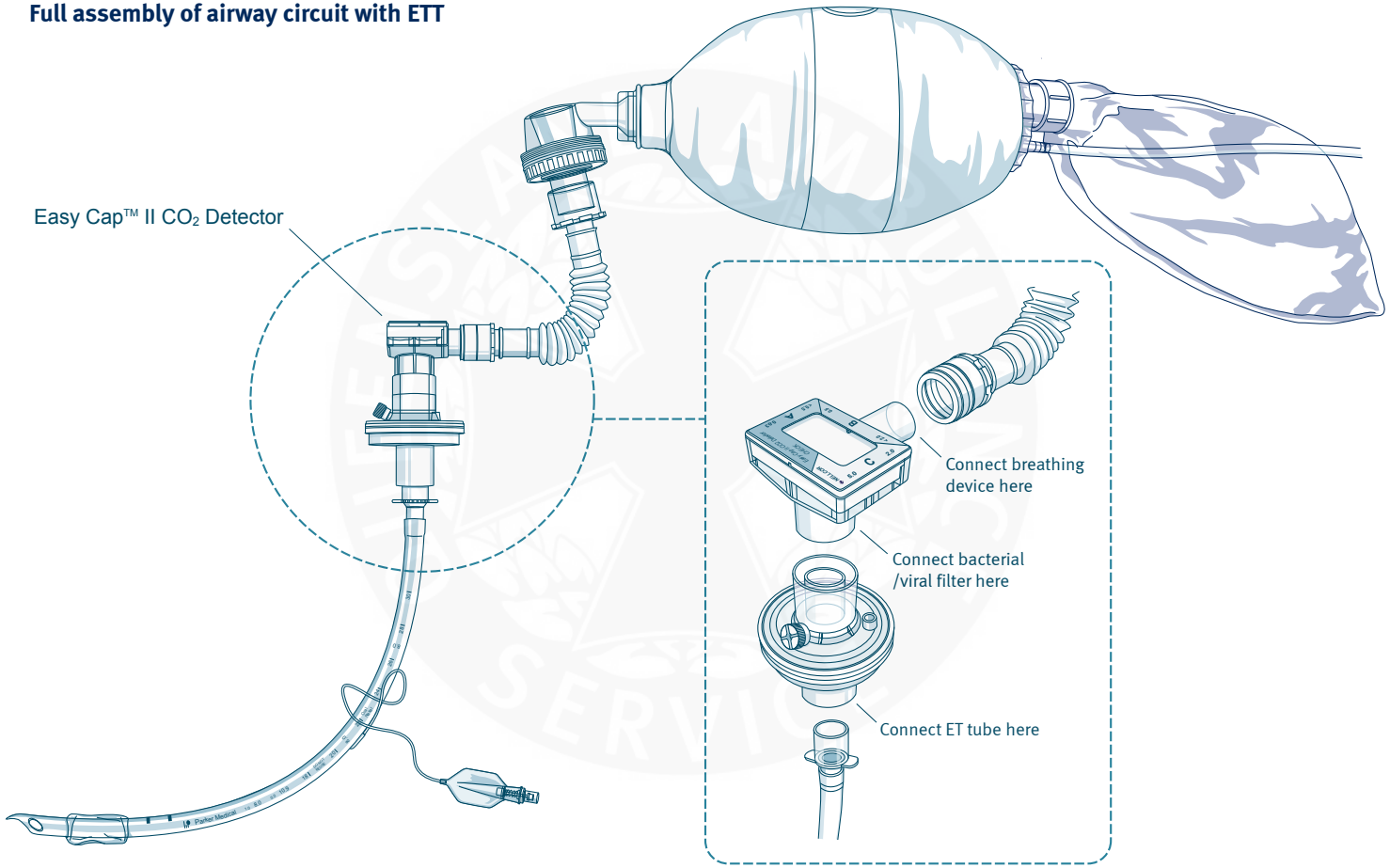


Additional information

- Although colourmetric $EtCO_2$ offers an alternative to waveform capnography, it is not considered as reliable for confirmation of tracheal placement. Therefore, confirmation of tracheal intubation when using the Easy Cap™ II should be made in conjunction with the following:
  - Direct visualisation of ETT passing between the vocal cords.
  - Fogging within the ETT on expiration.
  - No sounds of air entry via auscultation of the epigastrium.
  - Bilateral rise and fall of the chest.
  - Adequate and ongoing oxygenation as determined by skin colour.
- ETT placement is only deemed successful when the Easy Cap™ II registers a colour change in the 'B' and 'C' range, in conjunction with other confirmation checks.
- Interpreting results before performing 6 ventilations can yield false results.
- States of poor or no perfusion will influence the accuracy of the Easy Cap™ II.
- If there is a complete absence of $EtCO_2$ sensing or only registering in the 'A' range (or if the Easy Cap™ II is damaged) the ETT **must** be removed and the failed intubation algorithm is to be commenced.
- Due to varying humidity, lighting or distance from the device, the colour change on inspiration may not be as apparent as initially observed. The $EtCO_2$ can still be read at the end of expiration.
- QAS clinicians must be familiar with the operating instructions, with particular attention to precautions, limitations and troubleshooting. [3] [4]



Full assembly of airway circuit with ETT



Authorisation to practice

Glasgow coma score

ACP I ACP II ICP

The Glasgow coma score (GCS) was first introduced in 1974 as a measure of conscious level – in the setting of traumatic brain injury. Its ease of application has seen its use progress to the assessment of conscious level in many other patient types.[1]

To obtain a total score, three categories are assessed:

- eye opening
- verbal response
- motor response

Ensure that the best response is recorded for each category.

If at all possible, have the same person assess the patient's GCS each time.

Indications

- The assessment of a patient's conscious state

Contraindications

- GCS is not applied to the newborn as the APGAR score is used in this patient group.

Precautions

- As GCS was developed for the assessment of traumatic brain injury, its adaptation to other patient groups can sometimes present limitations.[1] Paramedics must use their clinical judgement to provide an accurate assessment of conscious state.

Additional information

- Ensure accuracy in the assessment of each category.
- The clinical handover of a GCS should involve the finding of each category in addition to the total score.
- The categories in isolation also provide an indication of severity, with motor response of highest importance when correlated to patient outcome.[2]
- If there is a suspicion of spinal injury, painful stimuli above the injury site is recommended (e.g. Supra-orbital pressure).[3]
- In some circumstances, painful stimulus may be required for 15–30 seconds to elicit an accurate response.[4]

Procedure

Assess eye opening as:

- spontaneous
- to voice
- to pain
- nil

Assess verbal response through the patient's speech as being:

- orientated
- confused
- the use of inappropriate words
- only incomprehensible sounds
- nil

Assess motor response through:

- an obeying of commands

or with the application of a painful stimulus the patient:

- localises to the painful site
- withdraws from the painful site
- displays a flexion response (decorticate posture)
- displays an extension response (decerebrate posture)
- shows no motor response.

Note: *when applying painful stimuli, always use the least amount necessary to elicit a response. A central painful stimulus is recommended to elicit an appropriate reflex response.*

Scores are placed as per the attached table with a total out of 15 obtained. Note that an infant assessment can also be attained.[5]

GLASGOW COMA SCALE			
Infant		**Child/Adult**	
Eye opening			
Spontaneously	4	Spontaneously	4
Reacts to speech	3	Reacts to speech	3
Reacts to pain	2	Reacts to pain	2
No response	1	No response	1
Best verbal response			
Babbles, follows objects	5	Orientated	5
Irritable, cries	4	Confused	4
Cries to pain	3	Inappropriate words	3
Moans and grunts	2	Incomprehensible	2
No response	1	No response	1
Best motor response			
Spontaneously	6	Obeys commands	6
Localises to pain	5	Localises to pain	5
Withdraws from pain	4	Withdraws from pain	4
Flexion response	3	Flexion response	3
Extension response	2	Extension response	2
No response	1	No response	1

Authorisation to practice

Glucometry — ACP I, ACP II, ICP

Field blood glucose testing, using a glucometer, is a quick and convenient way of obtaining an indication of a patient's blood glucose level (BGL).

Common BGL for:

- hypoglycaemia < 4 mmol/L
- hyperglycaemia > 10 mmol/L

Note: *chronic or poorly controlled diabetics may be hypoglycaemic despite a BGL › 4 mmol/L.*

Indications

- Seizures
- Sick paediatric patients
- Impaired consciousness
- Post collapse
- Abnormal behaviour
- Any patient who is suspected of being hypoglycaemic

Note: *A patient with impaired consciousness must have BGL checked whenever practical, even if the ALOC is suspected to be of other causes.*

Contraindications

- Although no actual contraindication exists to glucometry and the recording of BGL, it must be remembered that this procedure is invasive and so judgement must be used as to the appropriateness of performing the procedure.

Precautions

BGL readings should not be interpreted in isolation, but with consideration of the other clinical signs and available history.

Numerous variables may distort test results such as:

- blood volume on the sensor
- oxygen level of the blood
- glucose contaminants on the skin.

Procedure

- Ensure QAS infection control guidelines are applied.
- Clean area to be tested using an alcohol swab and allow to dry.
- Prepare lancing device, ensuring it is a fully disposable lancet.
- Without touching the 'blood target area', insert the sensor electrode into the test port of the glucometer, ensuring it turns on.
- Lance the side of the finger with the lancet and obtain a hanging drop of blood.
- Move the glucometer to the finger and apply a drop of blood to the target area of the sensor strip.
- The test will start automatically and the BGL reading will appear on the screen.
- Discard the lancet and sensor electrode appropriately.
- Cover the wound with the bandaid.
- Record the patient's BGL on the eARF.

Additional information

- Blood may be drawn from a cannula while gaining IV access.
- Some machine configurations allow the sensor strip to touch the skin, while others specify that the sensor must not touch the skin.
- Ensure glucometer is callibrated as per manufacturer's recommendation.[1]
- Alcohol can affect the BGL result; the use of a new bandaid represents a readily available near-sterile option for drying the site.

Authorisation to practice

Mental status assessment

ACP I ACP II ICP

A mental status assessment is the process of conducting a systematic evaluation of the patient's thought processes at a particular time. The intention of such an examination is to guide the paramedic in identifying pertinent behavioural manifestations, but not to diagnose a specific condition. The information gained, along with any pertinent history, is useful in completing an Emergency Examination Order (EEO), if required.

Indications

- Behavioural abnormalities

Contraindications

- Nil in this setting

Complications

- Violent patients
- Refusal of assessment and/or treatment

Procedure

- Assess the patient appropriately to try to ascertain the cause of the presenting signs and symptoms.
- Exclude and/or manage other causes of behaviour.
- Attempt to treat the patient only if safe to do so.
- Using the guide to mental status examination observe, question and note relevant information.

Additional information

MENTAL STATUS ASSESSMENT GUIDE			
Appearance	• grooming • posture • build • clothing • cleanliness	**Thought form**	• amount • rate • derailment • flight of ideas
Behaviour	• eye contact • mannerisms • gait • activity level	**Thought content**	• disturbances • delusions • suicidal • obsessions
Speech	• rate • volume • pitch • tone • flow • pressure	**Perception**	• Illusions • thought insertion • broadcasting • hallucinations - auditory - olfactory - tactile - visual - gustatory
Mood	Emotion as described: • anxious • depressed • cheerful	**Insight & judgement**	• cognition • illness - understanding - cause & effect
Affect	Emotion as observed: • restrictive • blunted • labile		

Authorisation to practice

Neurological status assessment

ACP[I] ACP[II] ICP

The neurological status assessment forms part of the overall patient assessment process.

Patients with an impaired level of consciousness or obvious impairment require as detailed a neurological assessment as is practicable to the circumstances.

Indications

- To assess the patient's neurological status

Contraindications

- Nil in this setting

Precautions

- The normal neurological status of a patient must be taken into account during assessment

Procedure

There are five critical areas to a neurological assessment:

Level of consciousness

- The AVPU scale represents a tool easily applied during the initial patient assessment. In the AVPU assessment, three questions are asked:

***A**lert*	Is the patient alert?
***V**erbal*	Does the patient respond to a verbal command?
***P**ain*	Does the patient respond to a painful stimulus?
***U**nconscious*	With no response to any of the above, the patient is considered unconscious.

- A formal assessment of the GCS is subsequently performed as soon as possible and repeated throughout patient management.

Pupils

- Pupil size must be determined as:
  - pinpoint (< 2 mm)
  - normal (2–6 mm)
  - dilated (> 6 mm)
- Assess the pupillary reaction to light using a small bright light. Direct light reflex is assessed by covering one eye and shining the light directly into the open eye which should result in a rapid constriction.

Procedure *(continued)*

- Assessment is repeated on the other eye. Both reactions should be equal.
- Document any unusual eye movement such as deviation from midline, dilated, or non reactive pupils on one side, indicating possible raised intracranial pressure (ICP) or nerve compression.[1]

Procedure *(continued)*

Five critical areas to a neurological assessment: *(continued)*

Motor function

- Muscle strength and tone, including any obvious facial weakness
- Abnormal movements such as seizures, tremors or decorticate/decerebrate posturing. The latter is an ominous sign and may occur spontaneously, or to painful stimuli.

Sensory function

- Hearing and ability to understand verbal communication.
- Superficial sensation (light touch or pain).

Vital signs

- Assess respirations for rate, rhythm and effort.
- Assess blood pressure and pulse to ensure adequate perfusion status. Note that a widening pulse pressure and slowing pulse rate may indicate a rising ICP. [2]
- Assess body temperature and maintain normothermia.

Patient Name: _____

Examiner Name: _____ Date/Time of Exam: _____

AMERICAN SPINAL INJURY ASSOCIATION

STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY [3]

ISCOS

MOTOR

KEY MUSCLES

	R	L	
C5			Elbow flexors
C6			Wrist extensors
C7			Elbow extensors
C8			Finger flexors
T1			Finger abductors

UPPER LIMB TOTAL (MAXIMUM) ____ + ____ = ____ (25) (25) (50)

	R	L	
L2			Hip flexors
L3			Knee extensors
L4			Ankle dorsiflexors
L5			Long toe extensors
SI			Ankle plantar flexors

Voluntary anal contraction (Yes/No) ____

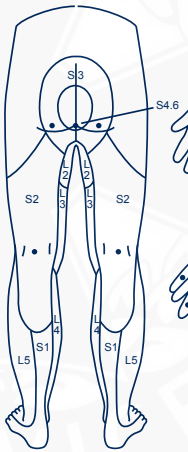
LOWER LIMB TOTAL (MAXIMUM) ____ + ____ = ____ (25) (25) (50)

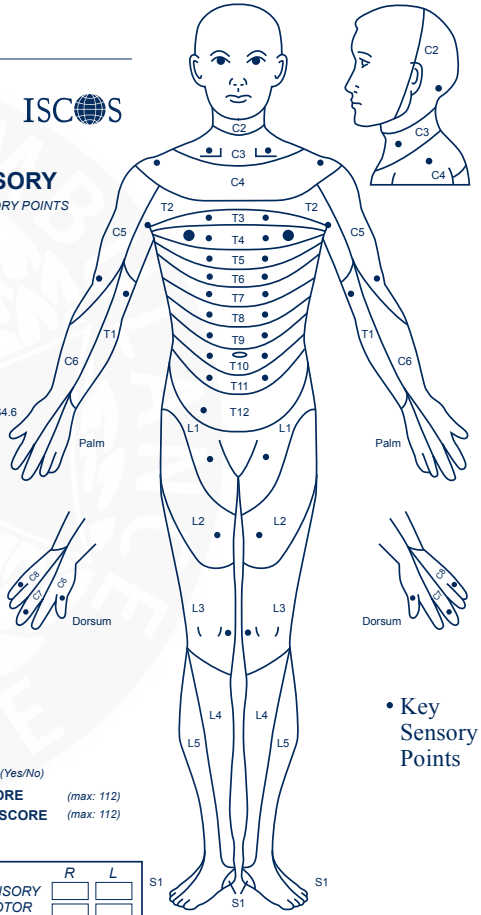
SENSORY

KEY SENSORY POINTS

	LIGHT TOUCH R	LIGHT TOUCH L	PIN PRICK R	PIN PRICK L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

0 = absent
1 = impaled
2 = normal
NT = not testable





- Key Sensory Points

Any anal sensation (Yes/No) ____

TOTALS (MAXIMUM) ____ + ____ = ____ (56) (56) (56) (56)

PIN PRICK SCORE ____ (max: 112)

LIGHT TOUCH SCORE ____ (max: 112)

NEUROLOGICAL LEVEL
The most caudal segment with normal function

	R	L
SENSORY		
MOTOR		

COMPLETE OR INCOMPLETE? ____
Incomplete = Any sensory or motor function in S4-S5

ASIA IMPAIRMENT SCALE ____

ZONE OF PARTIAL PRESERVATION
Caudal extent of partially innervated segments

	R	L
SENSORY		
MOTOR		

Authorisation to practice

Paediatric assessment

ACP I ACP II ICP

QAS clinical practice defines a paediatric patient as 12 years of age or less.

Children are not to be considered small adults due to marked anatomical and physiological differences. Further to this, their exceptional ability to compensate well for significant injury or illness means that the severity of their condition may be overlooked or underestimated.[1]

The assessment of a paediatric patient requires a high level of clinical knowledge and judgement, incorporating not only the patient's age, development and social circumstances, but also their anatomical, physiological and psychological status.

This is pertinent to all paediatric age groups, but it is of particular relevance in patients **under 2 years of age** where signs and symptoms of serious injury or illness may be subtle and rapid deterioration is common.[1] It is therefore recommended that all paediatric patients be transported by QAS for further assessment.

Indications

- A detailed patient assessment is required on all paediatric patients irrespective of the nature of case.

Contraindications

- Nil in this setting

Precautions

- When paediatric compensatory mechanisms fail they can do so rapidly, catastrophically and often irreversibly.[1]

Procedure

The process of paediatric assessment includes the same elements as the assessment of an adult. However, assessment is performed with consideration of four key categories that encompass the primary differences:

- weight
- anatomical
- physiological
- psychological

Weight

Most paediatric drugs or therapies are administered on a per kilogram of weight basis. A new paediatric weight estimation method – the Luscombe formula – is more accurate than the Argall and Advanced paediatric life support formulas, as well as the 'best guess' method.[2]

Several studies have shown that it is the most accurate estimation formula for paediatrics in developed countries, and, as such, it has been adopted by the QAS to estimate paediatric weights:

(Age x 3) + 7

Procedure *(continued)*

Anatomical

Airway

There are significant differences between adult and paediatric airways, including:

- narrow nostrils
- large tongue
- loose teeth
- compressible mouth floor
- horseshoe-shaped epiglottis
- high anterior larynx.

Breathing

- A small amount of airway obstruction can have significant effects on airflow.
- Infants are considered diaphragmatic breathers, therefore rapid gastric decompression can improve respiratory function.[3]
- Muscles can fatigue quickly.
- A compliant chest wall means significant underlying injury can occur without rib fracture.

Procedure *(continued)*

Circulation

- Small blood or fluid loss in the infant or small child is clinically significant due to a small total blood volume.[1]
- Hypotension is a serious and late sign in the paediatric patient.[3] The decision to resuscitate should be primarily based on other clinical signs such as:
  - heart rate
  - capillary refill
  - appearance.

Procedure *(continued)*

Physiological

The expected vital signs throughout paediatric age groups differ to that of the adult patient. These are summarised as follows:

Age	Neonate	6 Months	Age in Years											
			1	2	3	4	5	6	7	8	9	10	11	12
Weight (kg)	3.5	7	10	13	16	19	22	25	28	31	34	37	40	43
Heart rate	100 – 160	100 – 160	90 – 150	80 – 140				70 – 120						
Respiration	25 – 50			20 – 30				15 – 25						
Systolic BP	60 – 70	70 – 100		80 – 110				90 – 115						

Psychological

- Paramedics must consider stages of child development and behaviour when assessing paediatric patients.
- Specific challenges lie in communication and alleviation of a child's fear.
- Parents and carers should be involved in the assessment process whenever practical.

Authorisation to practice

Pain assessment

ACP I ACP II ICP

Relieving pain is an important component of patient care. Appropriate assessment and adequate analgesia underpins all aspects of paramedic practice.

The accurate assessment of pain is challenging as pain is a subjective sensation and unique to the individual. For this reason the paramedic must take care not to let personal experience or preconceptions affect their assessment and appropriate management.

Indications

- Any patient suspected of experiencing pain or discomfort

Contraindications

- Nil in this setting

Precautions

- The absence of pain does not always indicate the absence of injury.

Procedure

The assessment of pain is dependant on age, verbal and cognitive capacity of the patient.

A commonly accepted mnemonic used for the assessment of pain is:

- ***O*** *Onset: What was the patient doing when the pain started (active, inactive, stressed), and was the onset sudden, gradual or part of an ongoing chronic problem.*
- ***P*** *Position/palliation:* Where is the pain? Does anything make the pain better or worse?
- ***Q*** *Quality:* Describe the pain. For example is it dull, sharp or crushing.
- ***R*** *Region/radiation:* Does the pain radiate or move anywhere?
- ***S*** *Severity:* How severe is the pain? *(See below).*
- ***T*** *Timing:* When did the pain start and does it come and go?

Self reporting of pain is the recommended method to assess severity. Strategies have been developed dependant on age.

Adult

- The most common method for assessing pain severity in the adult is with a numerical rating scale of 0 to 10 (0 denoting no pain through to 10 denoting the worst pain imaginable).[1]
  - 0 = nil pain,
  - 1–4 = mild pain,
  - 5–7 = moderate pain,
  - 8–10 = severe pain.

Procedure *(continued)*

- Should the patient be unable to comprehend the numerical scale, a verbal rating scale can be used with the patient describing severity as no pain, mild, moderate or severe.

Child

- The Wong-Baker FACES Pain Rating Scale is the preferred severity assessment tool in children aged three and above.

Wong-Baker FACES Pain Rating Scale [2]

- Point to each face using the words to describe the pain intensity. Ask the child to choose a face that best describes their own pain and record the appropriate number.

From: Hockenberry MJ, Wilson D: *Wong's essentials of pediatric nursing*, ed. 8, St. Louis, 2009, Mosby. Used with permission. Copyright Mosby.

Infant

- Behavioural cues may become the primary means to assess pain in infants who are unable to speak, comprehend or use self-reporting tools due to their varying developmental stages of life.

Procedure *(continued)*

- This is achieved with the use of the FLACC behavioural assessment scale: [3]

Categories	SCORING		
	0	1	2
Face	No particular expression or smile	Occassional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry, (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching hugging or being talked to, distracted	Difficult to console or comfort

Additional information

- The paramedic is to perform regular pain assessments throughout their treatment. Of particular importance is severity, particularly after analgesic administration.
- Severe, uncontrolled pain may lead to irrational and unexpected behaviour in some individuals.

Authorisation to practice

Perfusion status assessment

ACP I ACP II ICP

Perfusion is the ability of the cardiovascular system to supply the body tissues with an adequate blood supply to meet their functional demands.

With inadequate systemic perfusion there is usually an initial loss of blood flow and pressure to less crucial organs (e.g. skin and gastro intestinal system) in order to maintain the flow to more vital organs (i.e. brain and heart).

Early vital sign assessment is crucial within the systematic approach to patient care, which considers perfusion as a time critical determinant of management.

Indications

- All patients who raise a suspicion of haemodynamic compromise, either clinically, in history, or by mechanism of injury

Contraindications

- Nil in this setting

Precautions

- Nil in this setting

Additional information

- Other factors may affect the interpretation of perfusion, for example, the environment, medication, age and anxiety.
- It is important to remember that, despite normal vital signs, significant hypovolemia may be present.

Procedure

ADULT PERFUSION STATUS ASSESSMENT				
	Skin	**Pulse**	**BP**	**Consciousness**
Adequate perfusion	Warm, pink, dry	60 – 100 bmp	> 100 mmHg systolic	Alert and orientated in time and place
Borderline perfusion	Cool, pale, clammy	50 – 100 bpm	80 – 100 mmHg systolic	Alert and orientated in time and place
Inadequate perfusion	Cool, pale, clammy	< 50 bpm or > 100 bpm	60 – 80 mmHg systolic	Either alert or altered in their orientation to time and place
Grossly inadequate perfusion	Cool pale, clammy	< 50 bpm or > 120 bpm	< 60 mmHg systolic or unrecordable	Altered state of consciousness or unconscious
No perfusion	Cool pale, clammy	Absence of palpable pulses	Unrecordable	Unconscious

CHILD PERFUSION STATUS ASSESSMENT				
	Skin	**Pulse**	**BP**	**Consciousness**
Adequate perfusion	Warm, pink, dry	80 – 160 bmp	> 70 mmHg systolic	Alert and orientated in time and place
Borderline perfusion	Cool, pale, clammy	50 – 80 bpm	50 – 70 mmHg systolic	Alert and orientated in time and place
Inadequate perfusion	Cool, pale, clammy	< 75 bpm or > 130 bpm	40 – 50 mmHg systolic	Either alert or altered in their orientation to time and place
Grossly inadequate perfusion	Cool pale, clammy	< 50 bpm or > 140 bpm	< 40 mmHg systolic or unrecordable	Altered state of consciousness or unconscious
No perfusion	Cool pale, clammy	Absence of palpable pulses	Unrecordable	Unconscious

Note: *The lowest criterion determines the overall perfusion status.*

Authorisation to practice

Pre-hospital ultrasound

Trained ICP officers approved by the Medical Director

ICP

Pre-hospital ultrasonography is a growing field in the assessment of trauma and critically ill patients.[1] It includes focused assessment of sonography for trauma (FAST), lung ultrasound and focused echocardiography. The QAS currently utilises this modality in proof of concept trials.

Indications

- FAST and lung scanning
  - blunt trauma
  - penetrating trauma
- Focused echo
  - cardiac arrest

Contraindications

- Nil in this setting

Precautions

- FAST is a dynamic investigation. Clinical judgment continues to guide patient therapy irrespective of ultrasound findings.

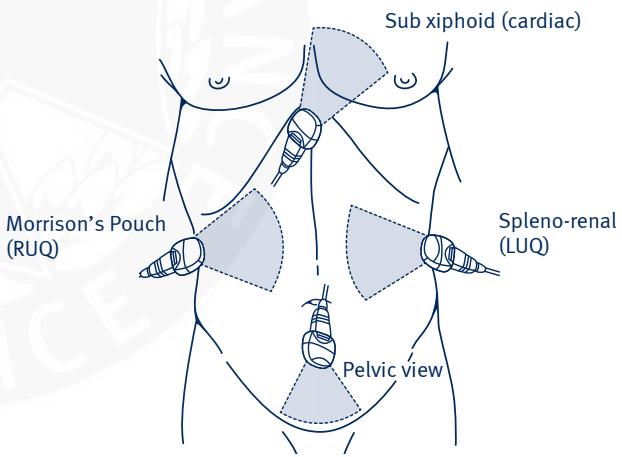
Additional information

FAST

FAST is a portable ultrasound examination used for trauma patients to determine whether there is any fluid within the abdomen and/or pericardium.[2] In the trauma setting this fluid is assumed to represent blood and is visualised as anechoic (black) on the ultrasound.

Four views comprise a FAST scan:

- Morrison's pouch – right upper quadrant (hepatorenal space)
- splenorenal space – left upper quadrant
- subxiphoid pericardial view
- pelvic view – longitudinal and transverse.



Additional information *(continued)*

Ideally, the total time to complete the examination should be within two minutes.[3]

Visualising fluid in any of the above views constitutes a positive FAST scan. Morrison's pouch is the view which is most likely to demonstrate significant fluid within the peritoneum, regardless of the actual injury.

Ultrasound can detect volumes of fluid greater than 100 mL.[2] A 0.5 and 1.0 centimetre rim of fluid in Morrison's pouch represents 500 mL and 1000 mL centimetre of blood loss respectively.

A positive FAST scan communicated to a receiving emergency department facilitates timely definitive care of the patient's injuries.[3]

Lung scanning

Pneumothorax

Ultrasound can further be employed to determine the presence or absence of a pneumothorax.[4]

A normal scan is visualised as a series of horizontal lines down to the bright pleura, beneath which is a speckled pattern representing the moving lung, which has been likened to waves on a seashore.

A scan positive for pneumothorax does not demonstrate the speckling beneath the pleura interface. Instead the horizontal lines continue below, indicating no lung movement beneath the pleural line.

Haemothorax

An extension of Morrison's Pouch view and the splenorenal view can include scanning above the diaphragm to visualise the lung and determine whether or not fluid is present – representing haemothorax in the setting of trauma.

Focused echo in cardiac arrest

Ultrasound is also employed in the cardiac arrest setting to aid diagnosis and prognosis.

Cardiac echo can be used to diagnose or exclude potentially treatable causes of cardiac arrest, including tamponade, massive pulmonary embolism, severe ventricular dysfunction and hypovolaemia.[5]

Furthermore in the PEA arrest scenario, focused echo can guide prognosis: the appearance of cardiac standstill implies further resuscitative measures are futile.[6]

Authorisation to practice

Primary and secondary survey

ACP I ACP II ICP

This assessment forms an essential component of patient management. It comprises many individual and often 'stand-alone' components all of which, when viewed together, provide a comprehensive clinical picture of the patient.

The paramedic should initiate a primary and secondary assessment as soon as possible in every case. The collecting of patient assessment information and administering care are carried out simultaneously.

Indications

- All patients in QAS care are to be provided with a comprehensive clinical assessment irrespective of the reason for contact.

Contraindications

- Nil in this setting

Precautions

- Nil in this setting

Procedure

The purpose of a primary survey is to identify and immediately treat life-threatening conditions. The sequencing of the primary survey has been changed to bring it in line with contemporary clinical practices.[1]

Primary survey:
Danger
Response
Circulation
Airway
Breathing

The secondary survey is aimed at obtaining a detailed history, along with vital signs and then performing a focused physical examination based on the patient's symptoms.

Secondary survey:
History
Vital signs survey
Physical examination

PRIMARY SURVEY	
DANGER	Check for **DANGER** (yourself, partner, bystanders and patient)
RESPONSE	Check the patient's **RESPONSE** to stimulus to determine level of consciousness. Use the AVPU scale: Is the patient **A**lert? Is the patient responding to **V**erbal stimuli, responding only to **P**ainful stimuli, or **U**nresponsive?
CIRCULATION	Check if the patient has a pulse **(CIRCULATION)** and, if so, determine if it is adequate. Assess capillary refill in paediatric patients. **Consider: Defibrillation, haemorrhage control, leg elevation (except for spinal injury), IV/IO access and fluid therapy**
AIRWAY	Check if the patient has a patent **AIRWAY** and ensure there is no danger of future airway obstruction (e.g. stridor). **Consider: C-spine immbolisation, simple airway manoeuvres, suctioning, basic and advanced airway adjuncts – OP, NPA, LMA, ETT**
BREATHING	Check if the patient is **BREATHING** and has adequate ventilations. **Consider: Oxygen and IPPV**

Procedure *(continued)*

SECONDARY SURVEY	
HISTORY	Obtain a comprehensive history: **O** Onset **P** Provocation **Q** Quality **R** Radiation **S** Severity **T** Timing **S** Signs/symptoms **A** Allergies **M** Medications **P** Past medical Hx **L** Last meal **E** Events prior
VITAL SIGN SURVEY	Complete a more detailed assessment of all appropriate vital signs: • pulse • respiration rate • blood pressure • temperature • SpO_2 • blood glucose level • Glasgow coma scale • 12-Lead ECG
PHYSICAL EXAMINATION (head-to-toe)	Complete a comprehensive physical examination of the patient as appropriate. This is particularly applicable in trauma, but may not be relevant in many medical presentations.

Procedure *(continued)*

HEAD		
Inspect	*General*	Lacerations, deformity, facial muscle, or asymmetry
	Eyes	Pupils or evidence of raccoon eyes (bruising around orbits suggestive of basal skull fracture)
	Ears	Blood in canal or evidence of battle's sign (significant bruising behind the ears (over mastoid process) suggestive of base of skull fracture)
	Nose	Deformity or epistaxis
	Mouth	Loose teeth, bite malocclusion (suggestive of a mandibular fracture) or airway/tongue swelling
	Voice	Hoarseness
Palpate	*General*	Crepitus, bony tenderness, or subcutaneous emphysema

NECK	
Inspect	Deformity, laceration or either raised JVP or JVD or jugular venous distension
Palpate	Tracheal position, bony tenderness, carotid pulse, subcutaneous emphysema, or lymphadenopathy.

Procedure *(continued)*

CHEST	
Inspect	Expansion, paradoxical movement, accessory muscle use, lacerations, or deformity
Palpate	Tenderness, subcutaneous emphysema, bony crepitus, or apex beat
Ausculate	Heart sounds, air entry and breath sounds, or additional sounds
ABDOMEN	
Inspect	Laceration, bruising, distension, or priapism (spinal trauma)
Palpate	Tenderness, guarding, rigidity, rebound tenderness, or masses
Ausculate	Bowel sounds
PELVIS	
Inspect	Laceration, bruising, or deformity
Palpate	Bony tenderness
UPPER AND LOWER LIMBS	
Inspect	Laceration, bruising, deformity, shortening, or rotation
Palpate	Neurovascular status, bony tenderness, or crepitus
BACK	
Inspect	Laceration, bruising, or deformity
Palpate	Bony tenderness, or evidence of a bony step

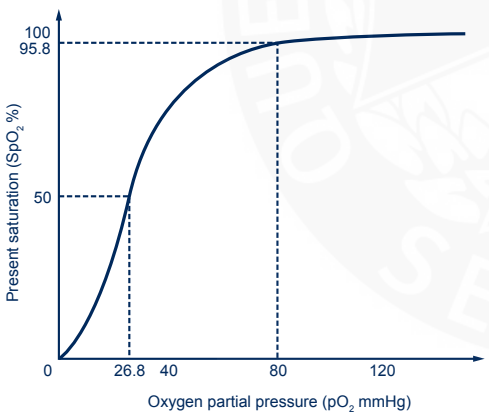
Authorisation to practice

Pulse oximetry assessment

ACP[I] ACP[II] ICP

Pulse oximetry estimates the oxygen saturation in arterial blood (SaO_2), by directing both red and infrared light from two LEDs through a patient's translucent fleshy body site (usually a finger or earlobe). The absorption of the two wavelengths differs significantly dependant on the level of haemoglobin oxygenation and the pulse oximeter translates this ratio into a percentage (SpO_2).[1]

It is important to consider the relationship between blood oxygenation and measurable haemoglobin saturation when interpreting pulse oximetry. A graphical interpretation is represented below.



Oxygen dissociation curve [2]

A small change in saturations (e.g. a drop of 97% to 90%) represents a large change in blood oxygenation (PO_2 100 to 60 mmHg).

Indications

- To determine patient oxygen saturation

Contraindications

- Nil in this setting

Precautions [1]

The reliability of SpO_2 readings depends on the following factors:

- correct sensor size and placement
- adequate blood flow through the sensor site

Inaccurate pulse oximetry readings may occur when the following factors are present:

- excessive patient movement
- exposure to ambient light
- dirt or nail polish under the sensor site
- methaemoglobinaemia
- carbon monoxide
- insufficient amplitude on the pulsing pleth wave

Procedure

- Ensure SpO_2 cable is connected and the sensor is placed on the patient.
- Observe the pulse bar/pleth wave for amplitude; this indicates relative signal strength,
- Note the SpO_2 reading and document accordingly.

Additional information

- The SpO_2 of arterial blood is usually 94–100%.
- QAS oxygen saturation monitors are unable to differentiate between carboxyhaemoglobin and oxyhaemoglobin [1] therefore patients with carbon monoxide poisoning are to be administered the maximum oxygen dose irrespective of SpO_2.
- Pulse oximetry is not a complete measure of respiratory or circulatory sufficiency.

Authorisation to practice

Respiratory status assessment

ACP I ACP II ICP

There are several components to a comprehensive respiratory assessment in the pre-hospital setting.

Indications

- All chest and respiratory symptoms and complaints including chest pain or shortness of breath
- Impaired consciousness

Contraindications

- Nil in this setting

Precautions

- Nil in this setting

Procedure

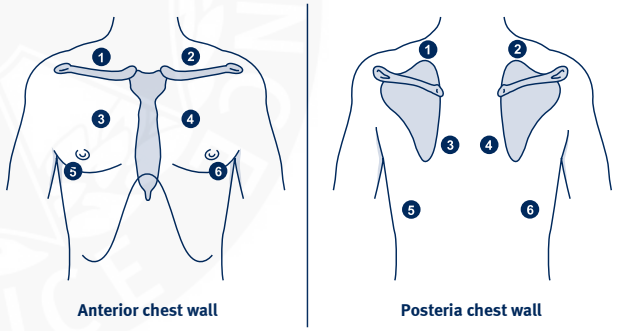
RESPIRATORY STATUS ASSESSMENT		
Components	**Normal**	**Respiratory distress**
Conscious State	Alert	Altered
General appearance	Calm and quiet	Distressed, anxious, struggling to breathe, exhausted
Speech	Clear, fluent and steady	Difficult, short sentences or phrases, unable to verbalise
Ventilatory rate *	12 – 18 (adult)	> 18 (adult)
Ventilatory rhythm	Regular or even cycles	No respiratory pause, prolonged expiratory phase
Ventilatory effort	Minimal with little chest or abdominal movement	Marked chest movement, use of accessory muscles
Skin	Pink	Pale and sweaty; cyanosis is a late and serious sign
Pulse rate *	60 – 80 (adult)	Tachycardia; bradycardia is a late and serious sign
Breath sounds	Usually quiet	Upper airway stridor Bronchospasm: wheeze Pulmonary oedema: crackles with possible wheeze

** Refer to paediatric assessment CPP for relevant physiological parameters for paediatric patients.*

Procedure *(continued)*

Chest auscultation

- Limit external noise where possible.
- Position patient upright where possible.
- Ask patient to breathe normally through their mouth.
- Ensure that the stethoscope is held still and that the conductive tubing is kept clear of contact with any surface to avoid extraneous noise.
- Listen to both sides of the chest in a methodical manner. It is important to listen to several respiratory cycles in each location, noting the quality and intensity of the lung sounds.



Recommended ausculation locations on the anterior and posterior chest

Authorisation to practice

Sedation assessment tool (SAT)

ACP[I] ACP[II] ICP

The SAT is a simple, rapid and useful measure of agitation and sedation in patients with acute behavioural disturbance (ABD).

It is determined by assessing two objective descriptors based on responsiveness and speech and allocating a score derived from a 7-point scale (+3 to -3).

The purpose of the SAT is to determine the patient's level of agitation and response to medication administration with resultant level of sedation.

Indications

- A SAT is required for all patients with ABD prior to and at regular intervals following sedation medication and should complement the patient's standard vital sign survey.

Contraindications

- Nil in this setting

Complications

- Nil in this setting

Procedure

- Using the patient's responsiveness and speech as described in the table below identify the SAT score.
- Allocate the appropriate SAT score (+3 to -3) by determining the highest ranking (for example a patient displaying very anxious and agitated behaviour but who speaks normally will receive a score of +2).
- Following the delivery of any sedative medication, the patient must be regularly assessed (every 5 mins) and have documentation of the SAT score as well as standard vital signs (GCS, HR, BP, SpO_2, RR) on the eARF.
- Any airway adjuncts/maneuvers or requirement for supplemental oxygen must be documented on the treatment and free text section of the eARF.

SEDATION ASSESSMENT TOOL		
Score	**Responsiveness**	**Speech**
+3	Combative, violent, out of control	Continual loud outbursts
+2	Very anxious and agitated	Loud outbursts
+1	Anxious/restless	Normal/talkative
0	Awake and calm/cooperative	Speaks normally
-1	Asleep but rouses if name is called	Slurring or prominent slowing
-2	Responds to physical stimulation	Few recognizable words
-3	No response to stimulation	Nil

Additional information

- A SAT score of +2 or +3 is a good predictor of the need to administer sedation and should prompt the ACP to consider requesting ICP backup for assessment and management. In areas with no ICP availability the attending paramedics should call the QAS 24/7 Consultation Line for patient management options.

Authorisation to practice

Vital signs survey

ACP^{I} ACP^{II} ICP

Indications

- QAS paramedics are to obtain vital signs on all patients under their care.
- As a minimum requirement, two full sets of vital signs are to be documented for all patients.

Contraindications

- Nil in this setting

Precautions

- Vital signs may not be taken when doing so would place the paramedic at undue risk of harm.
- A blood pressure is not to be taken on the arm of a patient that has an AV fistula present or on the arm that corresponds to the side of a mastectomy.
- Machine measurements must be correlated with patient condition.

Procedure

Respirations

- The patient should be assessed to note respiratory rate, rhythm, effort and symmetry of chest , which is often most accurately viewed from the foot end of a supine patient.
- Auscultation should then be performed.

Pulse

- Assess pulse at the radial, or carotid artery pulse points.
- Other pulse points can be assessed when there is a requirement to determine more specific perfusion. Examples include: distal perfusion to the lower extremities (pedal pulse) or the patient who is in *extremis* (femoral pulse).
- Note that the brachial artery also provides a pulse point and is commonly used in the paediatric patient.
- ***Paramedics must palpate the presence of a pulse.*** It is not sufficient to rely exclusively on a rate obtained from an ECG, or pulse oximeter.

Blood pressure

- Accepted methods to measure BP include *auscultation, automated NIBP* and, in appropriate circumstances, *palpation.*
- The operation of any automated NIBP monitor used within the QAS should be in accordance with QAS training and manufacturer's instructions.[1]

Procedure *(continued)*

Capillary refill

- Capillary refill can be used as an indicator of perfusion and is assessed by applying pressure to the skin for five seconds and then observing the return of colour to the area. The area should return to a pink colour (well perfused) within two seconds to be classed as normal. To assess distal perfusion, apply pressure to the nail bed of a finger or toe. Central perfusion may be assessed through pressure to the forehead, or sternal area.

Temperature

- The QAS recommends tympanic thermometers for the measurement of temperature.
- Paramedics should familiarise themselves with the specific tympanic thermometer available to them.[2]
- Ensure a disposable sleeve or cover is used over the thermometer probe.
- The probe is gently placed into the patient's ear and held for an indicated time frame after the thermometer button is depressed.

Authorisation to practice

Waveform capnography — ACP I, ACP II, ICP

Waveform capnography is the continuous measurement of exhaled carbon dioxide (CO_2). This is displayed graphically as a capnogram (waveform) representing CO_2 throughout the respiratory cycle. End tidal CO_2 ($EtCO_2$) is the peak value at the end of each exhalation, and this is displayed numerically in mmHg. [1] [2]

Measurement of $EtCO_2$ in patients with an advanced airway is an effective, non-invasive indicator of cardiac output during CPR, and may be an early indicator of ROSC. [3] [4]

Capnography will provide objective evidence of breathing patterns and pre-empt any reduction in oxygen saturations. It provides real-time monitoring and readily detects apnoea or respiratory depression. [5]

$EtCO_2$ monitoring is mandatory to confirm ETT placement and throughout subsequent ventilation. [4] [6]

Indications

- CPR or IPPV (BVM/LMA/ETT)
- Sedation and procedural sedation
- Endotracheal intubation (placement confirmation)
- Ongoing monitoring of ventilation

Contraindications

- Nil in this setting

Precautions

- When performing effective CPR during cardiac arrest, $EtCO_2$ values are **not** to be used to vary IPPV from the recommended rate. [3]
- LIFEPAK® 12 capnography is not designed to operate at a depth greater than 380 m (1250 ft) or at an unpressurised altitude greater than 4572 m (15,000 ft). [7]
- In specific underground mining operations alternative devices for monitoring $EtCO_2$ may be approved under Local Work Instructions.
- When capnography is not in use, failure to keep the $EtCO_2$ connnection port door closed may cause water or contaminants to enter the $EtCO_2$ sensor and cause capnography to malfunction. Should the $EtCO_2$ connection port door become dislodged, the port is to be protected with tape, and a replacement or repair is to be arranged ASAP.

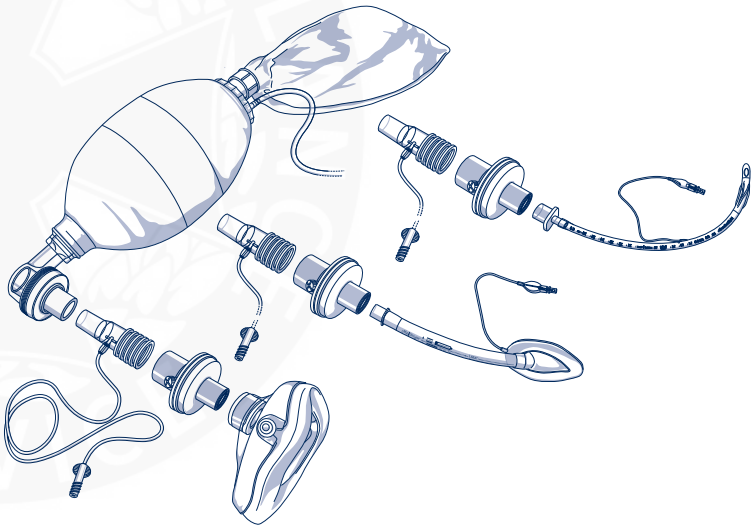
Procedure

Procedure for capnography monitoring [7]

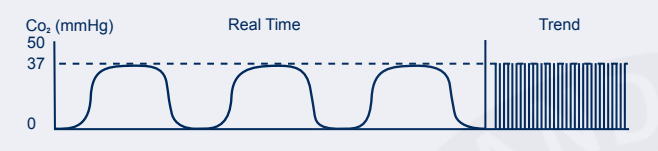
- Attach the $EtCO_2$ sample tube to the capnograph device.
- When using a BVM, LMA or ETT, attach the $EtCO_2$ sample tube airway adaptor to the breathing circuit, ensuring that a bacterial/viral filter is connected on the 'patient' side.
- It is mandatory that continuous waveform $EtCO_2$ is working and included in the circuit prior to ETI.
- Carefully route the $EtCO_2$ sample tube to avoid patient entanglement or strangulation.
- Confirm capnography values are displayed.
- If the $EtCO_2$ sample tube becomes contaminated or blocked, replace immediately.
- $EtCO_2$ sample tubes are single-patient, one-time use only, and must be disposed of appropriately after use. Do not clean or reuse sample tubes.

Additional information

- In cardiac arrest, tracheal placement of the ETT must be confirmed using capnography. If there is a complete absence of $EtCO_2$ (or if the capnography device becomes unserviceable) the ETT must be removed, and the failed intubation algorithm is to be commenced. [3] [4]
- In non-cardiac arrest situations, tracheal placement of the ETT must be confirmed and monitored continually with capnography. If the capnogram indicates that tracheal placement cannot be confirmed, the ETT must be removed and the failed intubation drill is to be commenced. [4] [6]
- In situations where IPPV is provided without an ETT, (ie when using a BVM or LMA), capnography is highly desirable and it should be connected as soon as other urgent priorities allow. [4]
- QAS clinicians must be familiar with the operating instructions, with particular attention to warnings, alarms and troubleshooting.



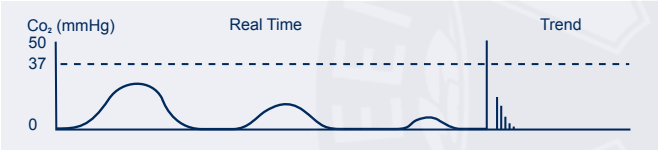
Normal capnogram



A normal capnogram is present when the patient:

- is spontaneously breathing or adequately ventilated
- has normal cardiac output
- has normal metabolic function

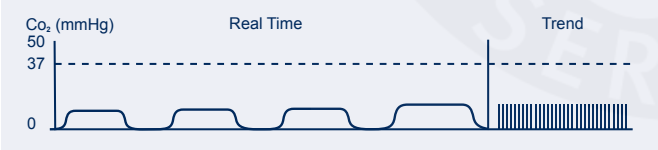
Endotracheal tube in the oesophagus



Oesophageal intubation may be confirmed by:

- an absence of waveform and $EtCO_2$
- small transient diminishing waveforms

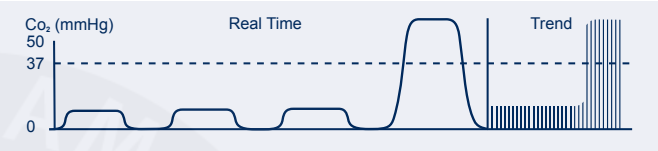
Reduced $EtCO_2$ levels



Possible causes:

- shock
- pulmonary embolus
- effective CPR being performed during cardiac arrest

Sudden significant increase in $EtCO_2$ levels



Possible cause:

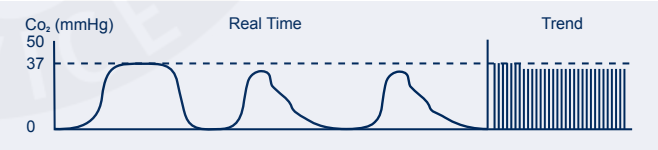
- return of spontaneous circulation

Absent $EtCO_2$ levels and waveform

Possible causes:

- no metabolic activity
- no CPR in cardiac arrest
- exsanguination/profound shock
- equipment failure
- apnoea
- airway obstruction
- oesophageal placement

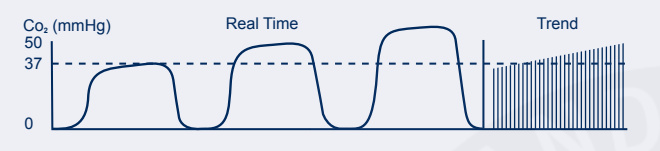
Inadequate seal around endotracheal tube



Possible causes:

- a leaky or deflated endotracheal or tracheostomy cuff
- an artificial airway that is too small for the patient

Increasing $EtCO_2$ levels from normal



Possible causes:

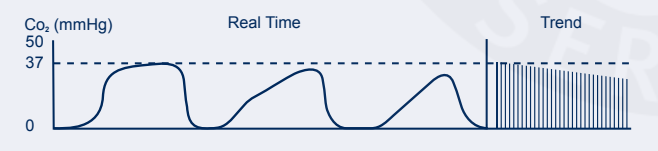
- respiratory depression/failure
- inadequate respiratory rate and or tidal volume
- increased CO_2 production through increased metabolic rate or temperature or reperfusion of ischaemic tissue

Decreasing $EtCO_2$ levels from normal

Possible causes:

- increased respiratory rate and or tidal volume
- diminished CO_2 production through decreased metabolic rate
- falling cardiac output

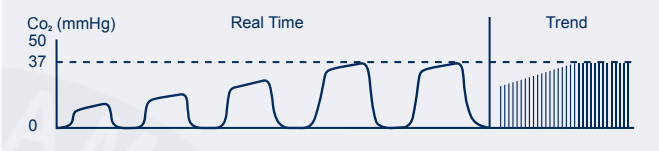
Obstruction in breathing circuit or airway



Possible causes:

- obstruction in the expiratory limb of the breathing circuit
- presence of a foreign body in upper airway
- partially kinked or occluded artificial airway
- bronchospasm

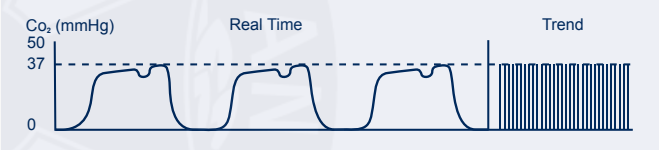
Increasing $EtCO_2$ values towards normal



Possible causes:

- restoration of normal respiratory rate and or tidal volume
- cardiac output improved
- improved integrity of airway seal (BVM/LMA/ETT)

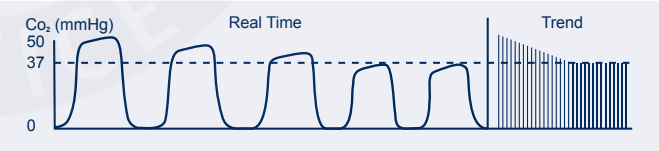
Curare cleft



Possible cause:

- inadequate or 'lightening' of paralysis

Decreasing $EtCO_2$ levels towards normal



Possible causes:

- restoration of normal metabolism/CO_2 production
- normalised respiratory rate and or tidal volume