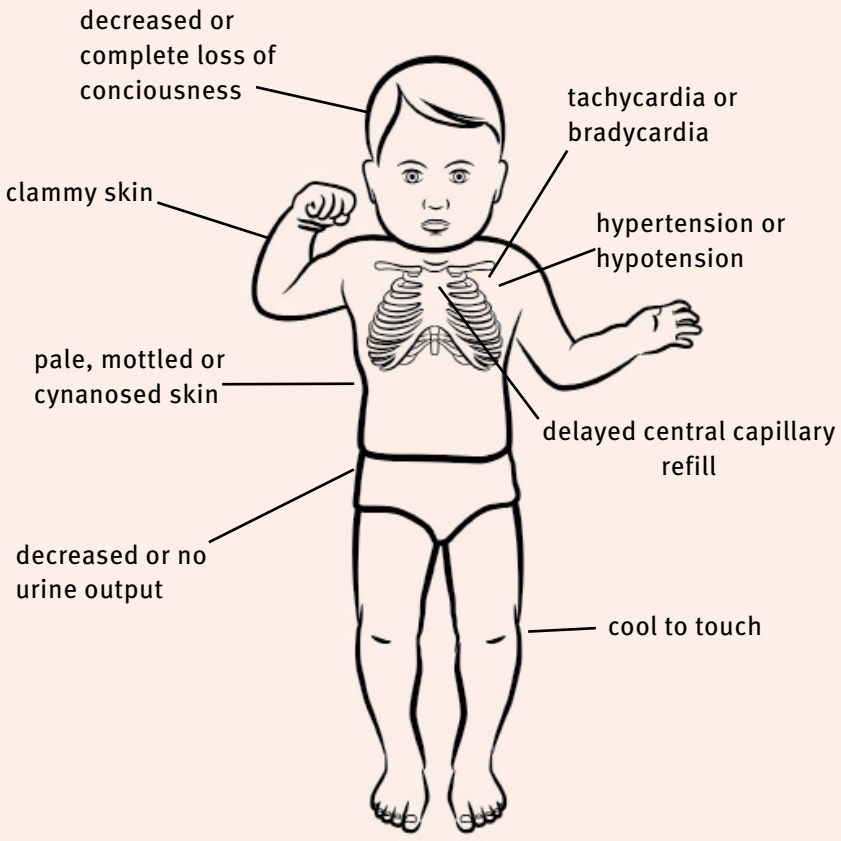
Cardiovascular Assessment

The cardiovascular system provides oxygen and essential nutrients to cells and removes waste products. It is closely linked with other systems in the body. For this reason, a paediatric cardiovascular assessment includes assessing both a primary cardiac assessment (heart rate & rhythm, blood pressure) and as well as a secondary multi-organ assessment (neurological assessment, urine output & skin colour and perfusion).

Signs/Symptoms* of cardiovascular compromise:



* not all potential signs/symptoms listed

ALERT

Despite significant reductions in cardiac output infants and children will generally sustain a normal blood pressure, which can be misleading. Tachycardia can be the first indication there is circulatory compromise and should not be ignored.

Hypotension occurs when compensatory mechanisms (such as tachycardia) have been exhausted. Bradycardia is also cause for concern. In some cases, it may be a pre-terminal sign and should not be ignored.

Carrying out a cardiovascular assessment:

The following information will help you with your assessment, however, remember not all abnormal findings may be listed. For this reason, if you have any concerns promptly discuss them with a senior member of the nursing team or a medical officer.

Step 1: Appearance

Observe colour, activity level and perform a nutrition assessment. All abnormal findings should be escalated as appropriate.

Activity Level

Assessment: Observe the infant or child's activity level and tone. Be sure to involve caregivers in your assessment as they will be able to provide you with valuable information regarding their child's baseline status.

What is expected:

- Alert, calm and comfortable
- They may cry but are consolable
- Good muscle tone (vigorous).

Abnormal findings:

- Agitated, cries and is inconsolable
- Lethargic
- Low muscle tone (floppy)

Colour

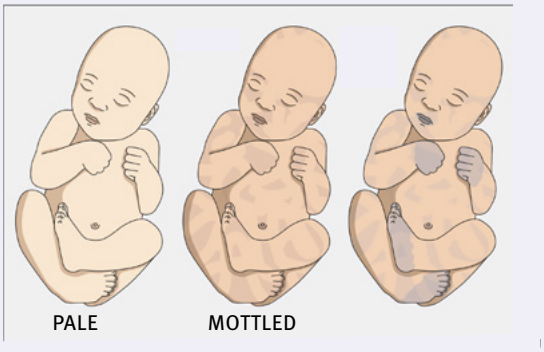
Assessment: Observe the colour of the infant or child's skin and mucous membranes.

What is expected:

- 'pink' skin
- 'pink' mucous membranes

Abnormal findings:

- pallor – can indicate poor cardiac output or anaemia
- mottling– impaired circulation to the skin. This can be a natural occurrence in some infants however it can also indicate circulatory compromise and serious infection.
- cyanosis – indicates the tissues near the skin surface are deprived of oxygen



ALERT

Abnormal findings should be escalated as appropriate. If you have any concerns promptly discuss them with a senior member of the nursing team or a medical officer.

Nutrition

Assessment: With the involvement of care givers carry out a nutrition assessment. This involves assessing mucous membranes, oral intake and urine output.

What is expected:

- Feeding well (greater than 50% of their usual oral intake)
- Moist mucous membranes
- No changes in urine output. A normal urine output in a child under 2 years of age is between 2-3ml/kg/hr. Children over the age of 2 have a normal urine output between 0.5-1ml/kg/hr)

Abnormal findings:

- Decreased feeding (less than 50% of their usual oral intake)
- Dry mucous membranes
- Reduced urine output (yellow/orange colour) or minimal/anuric
- Reduced number of wet nappies in 24hrs or nappies feel lighter
- Diarrhoea - hard to assess how much urine produced
- Sunken eyes, dark rings around eyes, eyes less 'bright'

Step 2: Physical inspection

Palpate pulses and observe for physical indicators or cardiovascular compromise.

Skin temperature

Assessment: Using a bare hand feel the infant's skin centrally (torso) and peripherally (hands and feet)

What is expected:

- Warm to touch
- Dry
- No or minimal discrepancy when comparing central and peripheral warmth

Abnormal findings:

- Cool to touch
- Temperature discrepancy between central and peripheral skin temperature (warm centrally however cool peripherally)
- Clammy skin

ALERT

Abnormal findings should be escalated as appropriate. If you have any concerns promptly discuss them with a senior member of the nursing team or a medical officer.

Oedema

Assessment: Inspect both centrally and peripherally for the presence of oedema. To assess peripherally remove the childs shoes and socks. Apply gentle pressure, with your thumbs to the top aspect of the childs' left and right foot, hold for 3-4 seconds before removing.

What is expected:

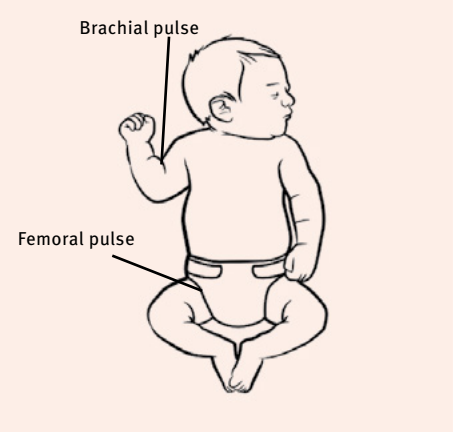
- On removing your thumbs no dip or pit should be present.

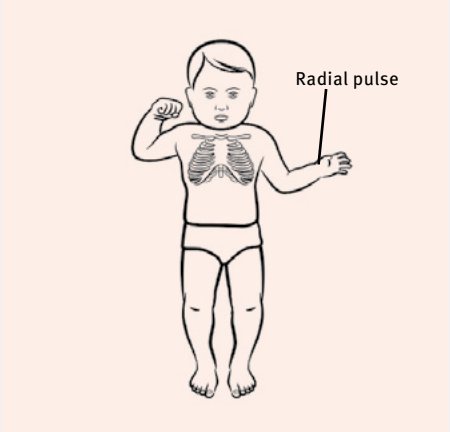
Abnormal findings:

- On removing your thumbs if a dip is present, the child may have peripheral oedema.

Palpate pulse

Assessment: In infants, palpate the brachial artery pulse. In older children you can palpate the radial pulse. Neonates and infants, should also have bilateral femoral pulses checked. Abnormalities such as a weak femoral pulse can indicate a congenital cardiac defect.





What is expected:

- Strong regular pulse
- Bilateral femoral pulses present

Abnormal findings:

- Absent, weak, thready, bounding or irregular pulse

ALERT

If you are unable to palpate a pulse and the infant or child is unresponsive, immediately commence CPR and call for help.

The following are abnormal pulse findings that need escalating urgently to a medical officer:

- Weak
- Thready
- Irregular
- Bounding

Central Capillary Refill

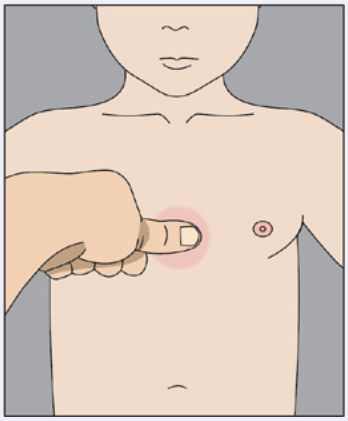
Assessment: Use two fingers or a thumb to apply gentle pressure to the skin over the centre of the sternum. Hold for 5 seconds, release and count in seconds how long it takes for the blanching to resolve and the skin to return to its original colour.

What is expected:

- Less then 2 seconds

Abnormal findings:

- Greater then 2 seconds. Prolonged central capillary refill may be an indication of systemic hypoperfusion as a result of low cardiac output.



Step 3 - Vital Signs

Obtain and document a full set of observations on the age appropriate Children's Early Warning Tool (CEWT). Any abnormal findings should be actioned as per the CEWT. Obtain an ECG to review the heart rhythm.

Guide to Normal Parameters

The table below is a guide for normal parameters of vital signs by age group.

Age	< 1 year	1-4 years	5-11 years	> 12 years
Respiratory rate (RR) (breaths/minute)	21-45	16-35	16-30	16-25
Heart rate (HR) (beats/minute)	100-159	90-139	80-129	60-119
Blood Pressure (systolic range)	75-119	80-124	85-129	90-149

ALERT

Hypotension is a late indicator of cardiovascular compromise or collapse. If you have an infant or child found to be hypotensive seek an immediate medical review.

For tips on how to obtain a set of observations in an infant or child please see the box on page 6. For an in-depth explanation, including choosing the correctly sized blood pressure cuff, please refer to the Obtaining a Basic Set of Observations Skill Sheet.

Tips for obtaining observations:

Heart Rate:	With the use of a stethoscope obtain a heart rate by listening to the apical pulse located on to the left of the centre of the chest. You should count for a full 60 seconds. Note any abnormal sounds such as a heart murmur.
Respiratory Rate:	When counting an infant's respiratory rate gently rest your hand over their chest and abdomen. For younger children over 12 months sit the child in the caregiver's lap or have them sit close to their child in bed for comfort. Ask the caregiver to unbutton or lift their child's shirt to expose the chest enabling you to count from the end of the bed.
Blood Pressure:	The blood pressure should preferably be obtained when the infant or child is not distressed, and the limb should remain still during measurement. The limb should be bare and the infant or child should be seated or supine with the limb at heart level.

For further information:

CHQ Nursing Standard: Clinical Assessment of the Paediatric Patient – Rapid Assessment / Primary and Secondary Survey / Vital Signs (QH only)

Nursing Standard: Clinical Observations - Considerations in Children. (QH only)

References:

This Queensland Paediatric Emergency Nursing Skill Sheet was developed by the Emergency Care of Children working group (funded by the Queensland Emergency Department Strategic Advisory Panel) with the help of the following resources:

Children's Health Queensland Health and Hospital Service. (2020, March 26). Clinical Observations – Considerations in Children. Queensland Health Intranet. https://qheps.health.qld.gov.au/__data/assets/pdf_file/0016/724003/ns_00253.pdf

Children's Health Queensland Hospital and Health Service. (2017). Transition to Paediatric Practice Acute Paediatric Program. In Paediatric Assessment - Module 3 (5th ed., pp. 27–38). Queensland Health.

Faan, P. R. P. M. H. J., & C(Inc), R. D. (2018b). Wong's Nursing Care of Infants and Children. In Chapter 9 The High-Risk Newborn and Family (11th ed., p. 274). Mosby.

The International Federation of Red Cross. (n.d.). Measuring oedema (water retention) in children. Retrieved February 22, 2021, from https://ifrcgo.org/ecv-toolkit/action/measuring-oedema-water-retention-in-children/

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