

Standards for Assessing, Measuring and Monitoring Vital Signs in Infants, Children and Young People

CLINICAL PROFESSIONAL RESOURCE





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Publication

This is an RCN practice guidance. Practice guidance are evidence-based consensus documents, used to guide decisions about appropriate care of an individual, family or population in a specific context.

Description

The monitoring and measurement of vital signs and clinical assessment are core essential skills for all health care practitioners working with infants, children and young people. This guidance applies to professionals who work in acute care settings, as well as those who work in GP surgeries, walk-in clinics, telephone advice and triage services, schools and other community settings.

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Evaluation

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1. Introduction

The monitoring and measurement of vital signs and clinical assessment are core essential skills for all health care practitioners working with infants, children and young people (Cook and Montgomery 2010). This guidance applies to professionals who work in acute care settings, as well as those who work in GP surgeries, walk-in clinics, telephone advice and triage services, schools and other community settings.

Vital signs assessment takes place as part of the art of observation and monitoring of the infant, child or young person. The term assessment describes the broader process involving visual observation, palpation (touch), listening and communication to evaluate the infant, child or young person's condition. Assessment can include the characteristics, interactions, non-verbal communication, and reaction to physical surroundings that infants, children or young people may display (Aylott, 2006).

The vital signs included in this document are heart/pulse rate, respiratory rate and effort, blood pressure, oxygen saturations, capillary refill time, level of consciousness and temperature. Weight, height and pain assessment will also be discussed. The following document describes standards, based on current evidence, best practice and expert opinion.

The aim of observing and monitoring infants, children and young people fulfils many functions:

- 1) To provide a baseline of normal vital signs for well children attending for a procedure or surgical intervention, so that their health status can be re-evaluated later following the procedure.
- 2) To provide a baseline of the sick child's physiological state at presentation to hospitals or health care settings. NB: This is not the child's baseline normal physiological state but can contribute to trend analysis of a child's illness.
- 3) To demonstrate a rigorous assessment of physiological state is made eg, at admission to hospital or when there is concern that there is deterioration in a child's condition:
 - to assist in making a diagnosis
 - to contribute to consideration of differential diagnoses
 - to judge how unwell a child is, or whether they are in compensated or decompensated shock.
- 4) To triage workload and to identify potential children at risk of deterioration.
- 5) To allow planning to manage and mitigate those risks.
- 6) To monitor an infant or child's growth.

Paediatric Early Warning Scores (PEWS)

The use of a validated Paediatric Early Warning (PEWS) score may aid individual and team situation awareness of the children at risk of deterioration, particularly for junior staff or those new to caring for infants, children and young people. However, it is acknowledged that PEWS will not identify all children at risk of deterioration, either due to the speed or the mechanism of deterioration. Therefore, it is essential that all clinical staff are trained to recognise common patterns of deterioration with or without the use of a PEWS and not just use the score for reassurance.

Other components of a safe system to recognise and respond to children at risk of deterioration include:

- succinct communication tools to convey critical information eg, SBAR Situation, Background, Assessment and Recommendation (SBAR) tool (NHS Institute for Innovation and Improvement, 2008)
- a multidisciplinary approach to care (Confidential Enquiry into Maternal and Child Health (CEMACH) 2008, McCabe et al., 2009).
- safety huddles.

Continuous assessment

Sequential assessments of vital signs are used to screen children for signs of serious illness or deterioration, measuring success of treatment and provide a trend of how a child's illness is progressing. More frequent and rigorous monitoring of some children will be required for those with acknowledged risk factors for deterioration, where there is concern of serious illness/deterioration and those undergoing high risk treatments eg, chemotherapy, blood transfusion, etc.

Requirements for undertaking vital signs

Nurses at the point of registration, must meet the Nursing and Midwifery Council's (NMC 2010) Standards for pre-registration nursing education, which include the ability to:

- carry out comprehensive nursing assessments of children and young people, recognising the particular vulnerability of infants and young children to rapidly deteriorate physiologically
- select valid and reliable assessment tools for the purpose required
- systematically collect data regarding health and functional status of individuals, clients and communities through appropriate interaction, observation and measurement
- analyse and interpret data accurately and take appropriate action
- recognise when the complexity of clinical decisions requires specialist knowledge and expertise, and consult or refer accordingly.

In many instances vital signs will be assessed, measured and monitored by health care support workers, assistant practitioners and nursing students, who have received appropriate training to undertake this role. Health care support workers, assistant practitioners and nursing students undertake this role under the direction and supervision of a registered nurse, and must understand when they are required to escalate concerns.

Parents and guardians can provide useful context regarding how a child is in comparison to their normal state. Staff undertaking observation and monitoring of infants, children and young people must be cognisant of this and acknowledge and record any concerns raised.

Good record keeping is essential for effective monitoring and interpretation of vital signs. The NMC (2015) *The Code: Professional Standards of Practice and Behaviour for Nurses and Midwives* tells nurses that they must: *'Keep clear and accurate records relevant to your practice'*. Good record keeping is essential to the provision of safe and effective care.

How to use this publication

Each topic covered in this publication includes the standard itself, a set of practice criteria and information on underpinning literature.

The standards provide criteria for practitioners in achieving high quality nursing care. They will be of help in guiding local policies and procedures in relation to vital sign monitoring, performance improvement programmes and education programmes for registered nurses, nurses in training and health care assistants.

The practice criteria will provide the specific information to underpin the standards. They will help health care professionals in developing care plans and performing safely and effectively when assessing, measuring, monitoring and recording vital signs.

References to relevant supporting literature and further reading are also included. The reference list will help practitioners enhance their knowledge and understanding of vital signs.

2. Education and training

Standard

All registered nurses, students, health care support workers, and assistant practitioners who observe and monitor infants, children and young people, are trained and competent in the accurate assessment and recording of the vital signs. These should include: temperature, heart/pulse rate, respirations including effort of breathing, oxygen saturations, blood pressure and measuring height and weight.

Practitioners who assess, measure and monitor vital signs in infants, children and young people are competent in observing their physiological status.

Practitioners are aware of normal physiological parameters for blood pressure, respiratory rate and heart rate for the different ages ranges.

Practitioners are aware of specific conditions that require observation recording to be undertaken on a more frequent basis, for example, in the case of a reduced level of consciousness or head injury where the risk of deterioration is increased.

Practitioners take appropriate action in response to changes in vital sign assessment and measurement.

Practitioners effectively communicate/escalate concerns about a child's deterioration using the SBAR tool. The Situation-Background-Assessment-Recommendation (SBAR) is a communication tool that enables users to quickly convey concise information about a sick child between all health professionals to ensure prompt treatment (RCPCH, 2016).

Where specific equipment is used to record vital signs eg, electrocardiogram (ECG) and pulse oximetry, practitioners are trained in their use, limitations and risks associated with these devices.

Practitioners working in hospital or community settings where early warning scores (EWS) are used to highlight children at risk of deterioration will have had specific training in their use and limitations.

Registered nurses, midwives and health visitors must comply with NMC standards for maintaining their knowledge and skills (NMC, 2015).

All units where children are assessed should have a competency based training and education package which can be built into the practitioner's induction and yearly performance reviews.

Regular audit of clinical documentation of vital signs should be undertaken to ensure good practice and highlight where skills need to be refreshed.

Simulation scenarios at point of care offer the opportunity for all health care professionals to practice recording and interpretation of vital signs in a risk free environment.

The NMC provides detailed essential skill clusters that nursing students are required to respond to appropriately when faced with an emergency situation at their first progression point. By their second progression point students are required to be accurate when undertaking and recording vital signs and respond appropriately to findings outside the normal range.

Practice criteria

Registered nurses, nursing students, assistant practitioners and health care support workers will have undergone theoretical training and practical skill development in the following:

- legal and professional issues in relation to monitoring and assessing infants, children and young people
- anatomy and physiology related to physiological 'norms' in vital signs and why these alter with age
- normal parameters for vital signs in infants, children and young people (See appendix on page 19)
- practical skills in assessing and measuring vital signs in infants, children and young people
- critical thinking when vital signs fall outside the accepted 'norm' for the child
- practical scenarios to develop their skill in communicating concerns about sick or deteriorating children to the nurse in charge or medical staff using the SBAR approach.

3. Teaching children, young people and parents/carers

Standard

Children, parents or carers who are required to perform vital sign assessment, measurement and monitoring are taught by a registered nurse who is competent in performing these skills in accordance with the NMC (2015) *The Code: Professional Standards of Practice and Behaviour for Nurses and Midwives*.

The registered nurse responsible for educating and training children, parents or carers in measuring, recording and monitoring vital signs ensures that no reasonable or foreseeable harm occurs as a consequence of his/her instructions and delegation of care (NMC, 2015).

The practitioner documents the information given to children, parents or carers and records this in their relevant health care record (NMC, 2015).

Children, parents/carers who perform vital sign assessment, measurement and monitoring are supported, trained and signed off as competent by a registered nurse.

Practice criteria

The ability and willingness of the child, parent/carer to perform vital sign assessment, measurement and monitoring should be determined.

Clear information should be given. This includes practical and written instructions on how to assess, measure and monitor vital signs.

Additional guidance should be given about the actions to take in response to abnormal measurements.

Information on the safe use, storage and maintenance of any medical devices should be included.

Children, young people and parents/carers should have time to develop and practice their skills.

Competency packages should be used to establish that the child/parent/carer has been appropriately taught and is confident in undertaking the skill.

Simulated practice can be used for parents and caregivers to gain confidence and enhance their understanding of vital sign monitoring (Levine et al., 2013). A number of different scenarios can be utilised to ensure the parent/carers has the appropriate skills and understanding before signing them off as competent to undertake them unsupervised.

4. Assessing and measuring vital signs

When assessing, measuring and monitoring the infant, child or young person's vital signs, their psychological needs should be recognised and appropriate action taken.

Clear explanation is given to parents/carers and where possible, children and young people, concerning vital sign assessment and the data collected (NHS England, 2015, Royal College of Paediatrics and Child Health (RCPCH), 2016).

A systematic process is used when assessing, measuring and recording vital signs. In an acutely unwell child the ABCDE approach should be used (Advanced Life Support Group (ALSG), 2016).

Visual observation, palpation (touch), listening and communication, are used when assessing and measuring vital signs. This includes taking note of the views of parents/carers (NHS England, 2015, RCPCH, 2016).

Vital signs of temperature, heart/pulse rate, respiratory rate and effort, blood pressure, pain assessment, level of consciousness, height and weight of all infants, children and young people are initially assessed, measured and recorded when they attend either primary or secondary care.

Respiratory rate, pattern and effort forms part of the assessment and measurement of vital signs for all infants, children and young people.

Tools such PEWS charts/track and trigger should be used to assist in the recognition of deterioration in a child or young person. They should highlight the frequency of observations and triggers for escalation both in the acute and community setting (RCPCH, 2016).

A structured communication tool such as SBAR should be used to ensure a timely and accurate response to deterioration in a child (RCPCH, 2016).

There are policies and procedures, specific to infants, children and young people for monitoring vital signs post-operatively, during blood transfusions and during other therapies.

Vital signs of temperature, heart/pulse rate, respiratory rate and effort, oxygen saturations, blood pressure, pain assessment and level of consciousness are assessed, measured, recorded and monitored post-operatively for all infants, children and young people in accordance with local policies or guidelines.

Vital signs of temperature, heart/pulse rate, respiration and blood pressure are assessed, measured, recorded and monitored on all infants, children and young people before, during and after receiving a blood transfusion in accordance with national and local guidance (Norfolk, 2014).

Nurses should ensure that on arrival to hospital, all children and young people with a decreased level of consciousness are assessed using either the alert, voice, pain, unresponsive (AVPU) scale or the GCS (adult or modified depending on the age of the child). The measurement should be documented (NICE, 2014).

If a child requires regular evaluation of their level of consciousness, GCS measurements should be commenced in addition to, or instead of, the AVPU scale.

The importance of monitoring blood pressure, blood glucose and temperature must not be underestimated in caring for children and young people with a decreased level of consciousness (NICE, 2013, NICE, 2014, Advanced Life Support Group, 2016).

In all children and young people with suspected bacterial meningitis the following vital signs must be assessed and recorded (NICE, 2010, NICE, 2016): conscious level, heart rate, blood pressure, respiratory rate, oxygen saturation, temperature, capillary refill time.

The standards for the weighing of infants, children and young people in the acute health care setting (RCN, 2013) should be adhered to. Each child must have their weight measured and recorded when attending an acute hospital setting such as OPD, A&E, CAU or pre-assessment clinic or when admitted to the ward setting.

In a primary health care, palliative care or community setting, vital sign assessment, measurement, recording and monitoring is at an appropriate level to meet the needs of the infant, child or young person.

Practice criteria

General

- The child, young person and/or parent/carer should consent to vital sign assessment and measurement. Where a child or young person under 16 is unaccompanied, local policies should be followed.
 - Where appropriate, the child, young person and parent/carer should be given the opportunity to assist the practitioner in performing vital sign assessment and measurement (RCPCH, 2016).
 - The infant, child or young person should be positioned correctly and comfortably prior to the assessment.
 - Actions to restrain or hold the infant or child still should comply with best practice guidance (RCN, 2010).
 - Capillary refill time can be a useful addition to vital sign assessment and measurement as it assesses peripheral perfusion and cardiac output.
 - Electronic leads and electrodes should be placed in an appropriate position and changed regularly in order to minimise the risk of damage to the infant, child or young person's skin.
 - Whilst assessing the child and young person's vital signs, their skin should be observed for signs of a petechial rash and NICE guidance followed (NICE, 2010, NICE, 2016).
- ### Temperature
- Reported parental perception of a fever should be considered valid by health care professionals (NICE, 2013).
 - If a child says they feel cold, feels cold to the touch or if the skin appears mottled, the temperature should be measured and recorded (NICE, 2016).
 - A temperature should be measured and recorded on all children who present to health care practitioners with an acute presentation of illness with the device applicable for age.
 - There should be clear guidance for health care professionals on the accurate use of the equipment available for measuring the temperature in infants, children and young people (Foley, 2015).
 - Oral and rectal routes should not be routinely used to measure body temperature in children aged from 0-5 years (NICE, 2013).
 - Where the use of rectal thermometers is clinically indicated in intensive care or high dependency settings, clear guidance for health care professionals should be available.
 - In infants under the age of four weeks, temperature should be measured with an electronic thermometer in the axilla (NICE, 2013).
 - For infants and children aged from four weeks to five years an electronic/chemical dot thermometer in the axilla or an infrared tympanic thermometer should be used (NICE, 2013).
 - For children five years and upwards an electronic/chemical dot thermometer in the axilla or mouth or an infrared tympanic thermometer should be used (Foley, 2015).
 - The thermometer should be left in position for the appropriate time, suggested by the manufacturer's instructions, to gain an accurate reading (Foley, 2015).

Heart/pulse rate

- Parents/carers/health play specialists can assist in distracting the child to reduce anxiety whilst the child/young person's heart rate/pulse is measured.
- An appropriately sized stethoscope should be used to auscultate the apex heart rate of children less than two years of age.
- The pulse of an older child is taken at the radial site at the wrist. Palpate the artery using the first and second fingertips, pressing firmly on the site until a pulse is felt (Nevin et al., 2010).
- Heart/pulse rates should be counted for one minute noting the rate, depth and rhythm.
- The pulse rate should be consistent with the apex beat.
- Electronic data should be cross-checked by auscultation or palpation of the pulse.

Respirations

- Normal respiratory pattern is an easy, relaxed, subconscious philological activity which takes place at a rate dependent on the age and activity of the child.
- Where oxygen saturation monitoring is indicated, respiratory assessment and measurement should be made and recorded simultaneously in order to give a complete respiratory assessment.
- Children whose normal oxygen saturations fall outside the normal acceptable limits should be documented, for example, a child with a cyanotic heart lesion.
- The pattern, effort and rate of breathing should be observed and recorded.
- Skin colour, pallor, mottling, cyanosis and any traumatic petechiae around the eyelids, face and neck should be observed and documented.
- Infants and children less than six to seven years of age are predominantly abdominal breathers therefore, abdominal movements

should be counted (Nevin et al., 2010).

- Signs of respiratory distress eg, nasal flaring, grunting, wheezing, stridor, dyspnoea, recession, use of accessory and intercostal muscles, chest shape and movement should be assessed by looking and listening and findings documented.
- Respirations should be counted for one minute.
- The frequency of respiratory assessment and measurement should be increased if the child's condition deteriorates during opiate infusions, or in respect of any other drug which may cause hyperventilation or apnoea. For example: prostaglandin infusion.

Blood pressure measurement

- It can be difficult to obtain a manual BP in infants and young children because they are unwilling to co-operate or remain still for sufficient period of time (Cook and Montgomery, 2010, Nevin et al., 2010). Therefore, an electronic machine that measures blood pressure by oscillometry should be used (Cook and Montgomery, 2010).
- Movement can affect the accuracy of an electronic blood pressure machine.
- The electronic blood pressure machine must be in good working order and be used according to the manufacturer's instructions (Cook and Montgomery, 2010, Green and Huby, 2010).
- Sucking, crying and eating can influence blood pressure measurements and these should be noted on the observation chart/nursing notes.
- The arm should be used for measuring blood pressure, but if this is not possible in infants, the lower leg can be used ensuring alignment with the artery. If regular BP measurements are being undertaken, the same limb should be used to identify any changes.
- The correct size cuff is essential for gaining an accurate reading. If the cuff is too small, a false high blood pressure will be given and vice versa (Cook and Montgomery, 2010).

- The cuff should be sufficient size to ensure overlap to cover 100% of the circumference of the arm and 2/3 of the length of the upper arm or leg. The bladder must cover 80% of the arm's circumference (but not more than 100%) and should be positioned over the artery from which the blood pressure will be taken (British Hypertension Society, 2016a).
- Single patient only cuffs or cuffs that can be cleaned between patients must be used and the healthcare professional should document the size of the cuff used.
- The blood pressure reading should be checked against an appropriate BP centile chart to ensure that it is within normal parameters (ALSG, 2016).
- If a blood pressure reading is consistently high on an electronic blood pressure machine it should be re-taken using a manual blood pressure machine.

Blood pressure measurement with an electronic blood pressure machine

(British Hypertension Society, 2016a)

- Where possible the child or young person should be seated for at least five minutes, relaxed and not moving or speaking.
- Where appropriate involve the health play specialist where one is available and employ distraction techniques.
- The child/young person's arm must be well supported at the level of the heart.
- Ensure that there is no tight clothing constricting the arm.
- Place the cuff with the centre of the bladder over the brachial artery. The bladder should encircle at least 80% of the arm.
- Activate the electronic blood pressure machine.
- Record the readings.

Blood pressure measurement with a manual blood pressure machine

(British Hypertension Society, 2016b)

- Where possible the child or young person should be seated for at least five minutes, relaxed and not moving or speaking.
- Where appropriate involve the health play specialist where one is available and employ distraction techniques.
- The child/young person's arm must be well supported at the level of the heart.
- Ensure that there is no tight clothing constricting the arm.
- Place the cuff with the centre of the bladder over the brachial artery. The bladder should encircle at least 80% of the arm.
- Estimate the systolic beforehand.
- Palpate the brachial artery.
- Inflate the cuff until pulsation disappears.
- Deflate cuff.
- Estimate systolic pressure.
- Inflate to 30mmHg above the estimated systolic level needed to occlude the pulse.
- Place the stethoscope diaphragm over the brachial artery and deflate at a rate of 2-3mm/sec until regular tapping sounds are heard.
- Measure systolic (first sound) and diastolic (disappearance of sound) to the nearest 2mmHg.
- Record the readings.

Blood Transfusion (Norfolk, 2014)

Children and young people should be under regular visual observation. For each unit transfused, minimum monitoring should include:

- pre-transfusion assess, measure and record heart rate, blood pressure, temperature and respiratory rate

- fifteen minutes after the start of the transfusion assess, measure and record heart rate, blood pressure and temperature. If there is a deviation from the child's normal parameters respiration rate must also be assessed, measured and recorded
- if there are any signs or symptoms of a possible reaction assess, measure and record heart rate, blood pressure and temperature and respiratory rate and stop the infusion. Appropriate action must be taken according to local guidelines
- post-transfusion assess, measure and record heart rate, blood pressure and temperature not more than 60 minutes after the transfusion is completed
- inpatients must be observed over the next 24 hours and children who have been discharged given appropriate safety netting advice. The safety net should provide the parent or carer with verbal and or/written information on late symptoms and how and when to access further advice (Roland et al., 2014).
- a post-operative assessment should include the level of consciousness and level of pain
- a post-operative care plan should clearly state the frequency and duration for assessing and measuring vital signs. The frequency should vary in accordance with the child's condition or if any of the values fluctuate (Hockenberry and Wilson, 2014, Aylott, 2006)
- following a simple procedure – heart rate, respiratory rate and blood pressure should be recorded every 30 minutes for two hours, then hourly for two to four hours until the child is fully awake, eating and drinking. It can be good practice to include pulse oximetry and an assessment of capillary refill time. A temperature should be recorded once and at intervals of one, two or four hours according to the infant, child or young person's general condition. A further set of vital signs should be recorded prior to discharge
- in the case of day surgery where children may be discharged more quickly a full set of observations should be undertaken on discharge. This should include: temperature, pulse, respiratory rate, blood pressure and oxygen saturations

Post-operative care

All vital signs can be affected by surgery and anaesthesia and research suggests that monitoring of vital signs has traditionally been routine and regulated (Zeitzy and McCutcheon, 2006). Frequency of observations should therefore reflect the child's level of sickness or instability. Although there is no specific evidence base from which to determine best practice in recording vital signs post-operatively (Aylott, 2006), the following guidance will enhance practice in this area:

- in the recovery unit – heart rate, ECG, respiratory rate, oxygen saturation, non-invasive blood pressure and skin temperature should be recorded (Trigg and Mohammed, 2010) continually until they can maintain their own airway, have stable cardiovascular and respiratory systems and are awake and able to communicate (Association of Paediatric Anaesthetists of Great Britain and Ireland (AAGBI), 2013)
- after the immediate recovery period following adeno/tonsillectomy, pulse, respiratory rate, blood pressure and oxygen saturations should be recorded every 30 minutes for four hours, or more frequently if there is any evidence of bleeding.
- following complex procedures – in addition to monitoring blood pressure and temperature, continuous cardio-respiratory monitoring and pulse oximetry should be in place for a minimum of four hours, in the following circumstances: theatre time greater than six hours, significant fluid loss, under one year of age, physiological instability pre-operatively, physiological instability during the recovery period. If the child is stable after continuous monitoring for four hours, routine four hourly observations can then be undertaken.

Whilst these standards for post-operative observations provide a generic solution, a National Patient Safety Agency (NSPA) rapid response report has highlighted the failure to recognise post-operative deterioration in patients following laparoscopic procedures until circulatory collapse or septic shock develops (NPSA, 2010). Whilst careful monitoring of vital signs and the use of early warning systems remain important aspects of monitoring there are other signs and symptoms which could be early indicators of deterioration.

These include:

- unresolved abdominal pain requiring opiate analgesia
- anorexia or reluctance to drink
- reluctance to mobilise
- abdominal tenderness and distension
- poor urine output.

It is recommended that these patients include specific reference to the above signs and frequency of initial observations documented in the post-operative instructions. Maintaining an accurate fluid balance record is also recommended.

Capillary refill time (CRT)

Capillary refill time (CRT) is the rate at which blood returns to the capillary bed after it has been compressed digitally. Measuring capillary refill time is recommended when assessing the circulation in sick infants and children (ALSG, 2016), although its usefulness has been questioned (Crook and Taylor, 2013) and thus should not be used in isolation. Crook and Taylor (2013) found that measurements of CRT taken at the sternum and fingertip were not comparable. Fingertip CRT was on average 0.42 seconds quicker than sternum CRT.

Important elements of practice include the following:

- the skin of the forehead or chest (sternum) are better for estimating CRT
- where fingers are used, elevate the hand to the level of the heart
- apply pressure with a forefinger, sufficient to blanch the skin
- maintain pressure for five seconds, then release
- count in seconds how long it takes for the skin to return to its normal colour
- the skin generally perfuses in less than two seconds in children and less than three in neonates
- record the site used (Glasper, McEwing and Richardson, 2015)
- consider any factors that may affect CRT eg, a cold environment.

Pain assessment

- Acknowledging pain makes pain visible and should be incorporated into routine observations as the fifth vital sign (RCN, 2009). Pain can indicate a child who is sick. Additionally the effect of uncontrolled pain can have detrimental effects on the child who is already cardio-vascularly compromised (Twycross et al., 2013).
- To assess pain, effective communication should occur between the child, (whenever feasible) their family/carers and health care professionals (APAGBI, 2012).
- Standardised assessment tools should be used in their final validated form. The tool should be appropriate for the child's age and developmental level (RCN, 2009, APAGBI, 2012).

Level of consciousness

- Level of consciousness is a vital sign that is integral to assessing the acutely unwell child and should be recorded routinely (NICE, 2014). In the neurosurgical and neurological child conscious level should be assessed using an age appropriate Glasgow Coma Scale (GCS) scoring system. However, the AVPU system is sufficient for all other children and young people.
- In children and young people with an altered level of consciousness, neurological observations should be undertaken and recorded on a half hourly basis until their GCS is equal to 15 (NICE, 2014).
- Children and young people admitted to hospital with a head injury who have a GCS equal to 15 should have their level of consciousness assessed using the GCS:
 - half hourly for two hours
 - then hourly for 4 hours
 - then 2 hourly
 - if their GCS falls below 15 at any time after the initial two hour period, the frequency of recording should revert to half hourly and follow the original frequency schedule (NICE, 2014).
- If any of the following signs or symptoms are observed the child should be urgently reviewed by the senior medical team:
 - agitation or abnormal behaviour
 - a drop of one point in GCS (for at least 30 minutes). Greater weight should be given to a drop of one point in the motor response score of the GCS
 - a drop of two points in motor response score or a drop of three points or more in the eye opening or verbal response scores of the GCS
 - severe or increasing headache or persistent vomiting
 - new or evolving neurological symptoms or signs such as pupil inequality, asymmetry of limb or facial movement.

- To reduce inter-observer variability when recording neurological observations, a second health care professional should perform a set of observations to confirm deterioration.

Height

- Depending on the child's age and ability to stand, either the child's length or height should be measured (World Health Organization (WHO), 2008).
- If a child is less than two years old measure their length lying down (recumbent).
- If a child is aged two years or older and able to stand, their standing height should be measured.
- In general standing height is 0.7cm less than recumbent length (WHO, 2008).
- Length should be measured using a length board, rollametre or table with a fixed headboard and moveable footplate. Height is measured using a stadiometer mounted at a right angle between a level floor and against a straight vertical surface.
- The child's height/length must be recorded on the appropriate growth/centile chart. Rate of growth should be noted as this is a more sensitive measure of failure to grow.
- If a child is noted to be failing to grow, consideration should be given as to whether there are any safeguarding concerns and appropriate actions taken (Department for Education, 2015).

Measuring length

- Ensure the measuring board is on a firm, flat surface.
- Lay the infant/child on the board. Their head should be in contact with the headboard and placed so that the corner of the eyes is horizontal to the middle of the ear.

- A second person should position the child with their feet together, heels touching the back plate, legs straight and in alignment with their body, buttocks against the backboard and their scapula, wherever possible, against the backboard. They should hold the ankles to ensure the position is maintained whilst moving the footboard flat against the soles of the feet with the child's toes pointing upwards.
- Read the measurement and record the length in centimetres to the last completed millimetre (WHO, 2008).

Measuring height

- The child/young person should remove any shoes, socks and hair ornaments.
- The child/young person must be positioned with their: feet together and flat on the ground, heels touching the back plate, legs straight, buttocks against the backboard/wall, scapula, where possible against the backboard/wall and arms loosely at their side. Their head should be placed with the corner of the eyes horizontal to the middle of the ear.
- The headboard should be placed carefully on the child/young person's head. Read the measurement and record the height in centimetres to the last completed millimetre (WHO, 2008).

Measuring weight

- The *Standards for the Weighing of Infants, Children and Young People in the Acute Health Care Setting* (RCN, 2017) should be adhered to.
- Clothing: *The Child Growth Foundation* (2012) recommends that children aged 0-2 years of age should be weighed naked. Children aged over two years of age should wear minimal clothing and nappies, shoes and slippers and the contents of pockets must be removed. If a child's clothing cannot be removed or if a child is weighed with additional equipment eg, splint, cast, dressing, this must be documented in the

child's clinical notes. A child who is unable to sit or stand should be weighed in light clothing on a hoist scale.

- Preparation for weighing a child or young person: The weighing scales must be on a flat, hard surface and must be checked, cleaned and calibrated prior to use. The child must be prepared for the procedure and the health play specialist may be involved to provide distraction therapy (RCN, 2017).
- Weighing procedure: A child aged 0-2 years should be weighed on baby scales. Children over two years of age should either sit or stand on scales. A child with complex needs may need to be weighed in a hoist. The child or young person should stand centrally on the scales with their feet slightly apart. The reading must be taken when the child is still and documented accordingly. If a child refuses to stand still, they may be weighed in the arms of a parent, carer or health care professional (RCN, 2017).
- Actions to take if there are concerns regarding a weight measurement: where there are concerns, the child or young person and the parent/carer should be consulted regarding any history of changes in appetite and/or feeding patterns. Previous weight measurements should be obtained for comparative purposes (RCN, 2017). A further assessment should be undertaken using a malnutrition screening tool and a referral made to the dietetics department where indicated.
- If a child is noted to be failing to grow or is morbidly obese, consideration should be given as to whether there are any safeguarding concerns and appropriate actions taken (Department for Education, 2015).

5. Record keeping

Standards

1. There is an organisation-wide policy describing best practice in recording vital signs and clinical assessments (Wood et al., 2015). The policy should include recommended actions to be taken in response to abnormal vital signs.
2. Use of a Paediatric Early Warning score (PEWS) is recommended to aid individual and team situational awareness of the child with increased risk for deterioration (Hammond et al., 2013).
3. There must be clarity around which observations must be recorded at which frequency to calculate the PEWS score. Escalation actions at a given PEWS score should be clearly outlined.
4. Nurses, health care assistants and nursing students who undertake monitoring and assessments of vital signs should receive annual training to reinforce good record keeping skills and this should be part of the organisation's compulsory training programme.
5. The charts (paper or electronic) used for vital sign recording and monitoring are suitable for use in monitoring infants, children and young people and in a format that enhances the assessment and monitoring of trends in physiological state.
6. In the emergency department, observation charts should be incorporated into the emergency department notes (paper or electronic), to encourage nurses to measure and document the observations of all children and young people presenting with an acute illness in which a decreased level of consciousness may be a feature.
7. All vital sign assessments and measurements are recorded contemporaneously and clearly in accordance with the NMC (2015).
8. The nurse in charge of the ward carries the responsibility for supervising the ward team to ensure that children are receiving an appropriate level of monitoring and observation for their clinical condition.

Practice criteria

1. There should be a consistent approach by practitioners to the way in which vital signs are recorded, for example, in using dots, crosses and arrows when recording blood pressure.
2. The method or devices used for assessing and measuring vital signs should be clearly documented.
3. The sites used for measuring vital signs should be recorded in the relevant health care record.
4. Where continuous monitoring is in use, recordings should be made hourly, as a minimum.
5. Information gained from the broader assessment of the infant, child or young person should be recorded, eg, behaviour, irritability, playing, etc.
6. Observations and comments made by the child, young, person, parents/carers should be clearly recorded.
7. As part of evaluation of a ward or department's safety culture there should be evidence of compliance with the monitoring and observation policy (Wood et al., 2015), and reporting of significant deterioration events. These include respiratory assessments, cardiac arrests, peri-arrest, emergency transfer to the high dependency or paediatric intensive care unit or unexpected death.

6. Medical devices and equipment

Standards

All medical devices must have a CE marking. This indicates that the product specification meets certain key criteria stipulated by European standards. However, it does not automatically guarantee that the device is either appropriate or configured for use with infants, children or young people or that it is appropriate for use in particular setting ie hospital, community or home. Suitability on both these counts will be determined by local policy. Devices that have not been approved though local processes should not be used ad hoc.

All medical devices and equipment must be regularly cleaned both during ongoing use by one child and between different children. This should be undertaken in accordance with local infection control policies and guidelines.

All probe sites should be changed regularly in rotation to prevent tissue damage. All changes should be documented.

Alarms on medical devices are set to alert staff to changes in vital signs. These limits should be based on the individual child's current circumstances. Settings will usually be drawn from the normal vital signs ranges specified in the local early warning score (EWS) policy. Variations from the EWS should usually only occur on the direct instruction of senior clinical staff; any such variation should be documented in the child's notes. It is important to appreciate that automatic alarms are not completely reliable and they should never be considered as a substitute for direct clinical observation.

All disposable or single use equipment, identified by the symbol below, should be clearly identified and used as such.



All medical devices should be serviced and calibrated regularly in accordance with manufacturer's instructions. (This would normally be undertaken by your local medical engineering department).

All staff utilising a medical device should be made aware of the policies and procedures describing its use. It is particularly important that they should be made aware of the limitations and risks associated with using the device as part of competency training.

Practice criteria

- All staff must receive appropriate competency based training before utilising a medical device.
- This training must be compliant with Clinical Negligence Scheme for Trusts (CNST) requirements and should include information regarding:
 - the setup of the device including the use of alarms
 - the maintenance of the device (in clinical areas)
 - the limitations of the device
 - basic troubleshooting of the device.
- All cables should be kept tidy to prevent damage and risk to others.
- Battery back-up equipment should be connected to the mains supply whenever possible.
- Battery-operated equipment should be placed on charge according to local policy when not in use.
- All equipment should be stored in a safe and secure place when not in use. Use by unauthorised personnel must not be permitted.
- Medical device errors and failures must be reported in accordance with Medicines and Healthcare Regulatory Authority (MHRA) guidance.

Appendix 1

APLS normal values

Normal ranges: respiratory rate (RR), heart rate (HR) and blood pressure (BP)							
Age	Guide weight (kg)		RR At rest Breaths per minute 5th-95th centile	HR Beats per minute 5th-95th centile	BP Systolic		
	Boys	Girls			5th centile	50th centile	95th centile
Birth	3.5	3.5	25-50	120-170	65-75	80-90	105
1 month	4.5	4.5					
3 months	6.5	6	25-45	115-160	70-75	85-95	
6 months	8	7	20-40	110-160			
12 months	9.5	9					
18 months	11	10	20-35	100-155	70-80	85-100	110
2 years	12	12	20-30	100-150			
3 years	14	14		90-140			
4 years	16	16		80-135			
5 years	18	18					
6 years	21	20	80-130				
7 years	23	22					
8 years	25	25	15-25	70-120	80-90	90-110	111-120
9 years	28	28					
10 years	31	32					
11 years	35	35					
12 years	43	43	12-24	65-115	90-105	100-120	125-140
14 years	50	50		60-110			
Adult	70	70					

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Additional resources

National Institute for Health and Clinical Excellence (2009). Diarrhoea and vomiting caused by gastroenteritis. Diagnosis, assessment and management in children younger than five years. Developed by National Collaborating Centre for Women's and Children's Health. London, National Institute for Health and Clinical Excellence. www.nice.org.uk/guidance/cg84

National Institute for Health and Clinical Excellence (2010). Bacterial meningitis and meningococcal septicaemia. Management of bacterial meningitis and meningococcal septicaemia in children and young people younger than 16 years in primary and secondary care. NICE clinical guideline 102. Issued: June 2010 last updates: February 2015. London, NICE. www.nice.org.uk/guidance/cg102

National Institute for Health and Clinical Excellence (2012). SQ19 Quality standard for bacterial meningitis and meningococcal septicaemia in children and young people London, NHS National Institute for Health and Clinical Excellence. www.nice.org.uk/guidance/qs19

National Institute for Health and Clinical Excellence (2013). Feverish illness in children: assessment and initial management in children younger than 5 years. NICE Clinical Guideline. London, National Institute for Health and Clinical Excellence. www.nice.org.uk/guidance/cg160

National Institute for Health and Clinical Excellence (2014). Fever in under 5s. Quality standard. Published: 24 July 2014. London, National Institute for Health and Clinical Excellence. www.nice.org.uk/guidance/qs64

National Institute for Health and Clinical Excellence (2016). Sepsis: recognition, diagnosis and early management. NICE guideline Published: 13 July 2016. London, National Institute for Health and Clinical Excellence. www.nice.org.uk/guidance/ng51

Most NICE guidelines also have information for the public available to download from the guideline website.

Extensive resources are also available for health care professionals on each guideline website under 'Tools and resources'.

UK Sepsis Trust
0845 606 6255
www.sepsistrust.org

Meningitis Research Foundation
0808 800 3344
www.meningitis.org

Meningitis Now
0808 801 0388
www.meningitisnow.org

Macmillan Cancer Support (for people at risk of neutropenic sepsis)
0808 808 0000
www.macmillan.org.uk

More than a cold – Bronchiolitis awareness campaign
www.morethanacold.co.uk

You can also go to NHS Choices for more information on childhood illness at www.nhs.uk

Paediatric Care Online
www.rcpch.ac.uk/improving-child-health/quality-improvement-and-clinical-audit/paediatric-care-online/paediatric-care

Health apps for mobile phones
There are a wide range of health apps now on the market, many of which are free. If you are considering using a health app please be aware of the difficulties of checking the accuracy and reliability of the content and whether or not it is up to date. As a health care practitioner, you are responsible for any information you give to others or use to guide your practice. It is therefore your responsibility to assess any source of information you use.

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