Royal College of Nursing

Standards for assessing, measuring and monitoring vital signs in infants, children and young people

RCN guidance for nurses working with children and young people

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Contents

Introduction

The assessment, measurement and monitoring of vital signs are important skills for all practitioners working with infants, children and young people. This guidance applies to health care professionals who work in acute settings as well as practitioners who work in GP surgeries, walk-in clinics, telephone advice and triage services, schools and other community settings (Cook and Montgomery, 2006). The vital signs included in this document are temperature, heart/pulse rate, respiratory rate and effort, blood pressure, pain assessment and level of consciousness. Important information gained by assessing and measuring these vital signs can be indicators of health and ill health. However, we believe they should not be performed in isolation to the broader observation and assessment of the infant, child or young person.

In many instances vital signs will be assessed, measured and monitored by health care assistants and nursing students, under the direction and supervision of a registered nurse.

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

- carry out comprehensive nursing assessments of children and young people, recognising the particular vulnerability of infants and young children to rapid physiological deterioration
- 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.

Good record keeping is essential for effective monitoring and interpretation of vital signs. The NMC's *Record keeping guidance for nurses and midwives* (2009) states that: "Good record keeping is an integral part of nursing and midwifery practice, and is essential to the provision of safe and effective care."

The following document describes standards, based on current evidence, best practice and expert opinion. The term assessment has been used to indicate a broader process involving visual observation, palpation (touch), listening and communication in order to give a holistic assessment of 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).

Whilst this document views standardising assessment, measuring and monitoring of vital signs as a key aspect of patient care they are only one important aspect of detecting the sick or deteriorating child. Other components of early recognition are:

1. a recognised paediatric early warning tool,
2. a system which allows clear communication of findings and concerns, such as the Situation, Background, Assessment and Recommendation (SBAR) tool
3. a multidisciplinary approach to care (CEMACH, 2008; McCabe et al, 2009).

How to use this document

Each topic covered in this document 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 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.

1

Education and training

Standards

All registered nurses, students, health care assistants, 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 of temperature, heart/pulse rate, respirations and blood pressure.

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 according to best practice, for example in the case of a reduced level of consciousness or head injury.

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. 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 (NHS Institute for Innovation and Improvement, 2011).

Where continuous electrocardiogram (ECG) and pulse oximetry are used, practitioners are trained in the use, limitations and risks associated with these devices.

Practitioners working in hospital or community settings where paediatric early warning systems are used have undergone specific training in their use and limitations.

Registered nurses, midwives and specialist community public health nurses comply with NMC standards for maintaining their knowledge and skills (NMC, 2010).

Where capillary refill time (CRT) is included in vital sign assessment, recording and monitoring, practitioners receive clear guidance on its use and are given appropriate training.

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

Practice criteria

Registered nurses, students, assistant practitioners and health care assistants will have undergone theoretical and practical training in the following:

- legal and professional issues
- anatomy and physiology
- normal parameters for vital signs in infants, children and young people
- methods of assessing and measuring vital signs in infants, children and young people
- communicating their concerns about a sick or deteriorating child to medical staff using the SBAR tool.

2

Teaching children, young people and parents/carers

Standards

Patients, 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 and in accordance with the NMC's code of professional conduct (2008).

The registered nurse responsible for educating and training patients, parents or carers in measuring recording and monitoring vital signs ensures that reasonable and foreseeable harm does not occur to a person as a consequence of his/her instructions and delegation (of care) (Dimond, 1990; NMC, 2008).

The practitioner documents the information given to patients, parents or carers and records their response in the relevant health care record (Redman, 1997).

Patients, parents/carers who perform vital sign assessment, measurement and monitoring are supported by a registered nurse.

Practice criteria

- The ability and willingness of the patient, 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.

3

Assessing and measuring vital signs

Standards

Prior to assessing, measuring and monitoring the infant, child or young person's vital signs, their psychological needs are recognised and appropriate action is taken.

A systematic process is used when assessing, measuring and recording vital signs.

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.

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

Clear explanation is given to parents/carers and where possible, children and young people, concerning vital sign assessment and the data collected.

There is a clear policy in relation to paediatric early warning systems, their use and limitations in either hospital or community settings.

Vitals signs of temperature, heart/pulse rate, respiratory rate and effort, blood pressure, pain assessment and level of consciousness of all infants, children and young people are initially assessed, measured and recorded on attending hospital and at varying frequencies from then on. If a child's decreased level of consciousness persists, this child should have their Glasgow Coma Scale (GCS) measured and documented every 15 minutes if the GCS is equal or less than 12, and every 60 minutes if the GCS is greater than 12, until there is an improvement in condition.

The importance of monitoring blood pressure and temperature must not be underestimated in caring for children and young people with a decreased level of consciousness.

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, 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 blood pressure, pain assessment and level of consciousness 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. 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). The measurement should be documented.

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.

In a primary health 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 assist the practitioner in performing vital sign assessment and measurement.
- The infant, child and/or young person should be positioned correctly and comfortably prior to the procedure.
- Actions to restrain or hold the infant or child still should comply with best practice guidance (RCN 2010).
- Post-operative assessment should include the level of consciousness.
- Capillary refill time can be a useful addition to vital sign assessment and measurement.

Temperature

- "Whenever a child feels warm to the touch the temperature should immediately be measured even if it was normal a short time before"(Hockenberry, 2003).
- If a child feels cold or if their skin appears mottled the temperature should be measured.
- A temperature should be recorded on all children who attend with an acute presentation of illness with the device applicable for age.
- There should be clear guidance for practitioners on the accurate use of the equipment available for measuring the temperature in infants, children and young people.
- Mercury thermometers are hazardous and should not be used.
- Oral and rectal routes should not be routinely used to measure the body temperature in children aged from nought to five years (NICE, 2007b).
- Where the use of rectal thermometers is clinically indicated in intensive care or high dependency settings, clear guidance for practitioners should be available.
- In infants under the age of four weeks, temperature should be measured with an electronic thermometer in the axilla (NICE, 2007b).
- 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.
- The thermometer should be left in position for sufficient time to gain an accurate reading, according to the manufacturer's instructions.

Heart/pulse rate

- A stethoscope should be used to auscultate the apex heart rate of children less than two years of age.
- Electronic data should be cross-checked by auscultation or palpation of the heart/pulse rate.
- 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.
- Heart/pulse rates should be counted for one minute.
- The pulse rate should be consistent with the apex beat.

Respirations

- 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.
- Skin colour, pallor mottling, cyanosis and any traumatic petechiae around the eyelids, face and neck should be observed.
- Infants and children less than six to seven years of age are predominantly abdominal breathers therefore, abdominal movements should be counted.
- Signs of respiratory distress e.g. nasal flaring, grunting, wheezing, stridor, dyspnoea, recession, use of accessory and intercostal muscles, chest shape and movement should be noted by looking and listening.
- Respirations should be counted for one minute.
- The frequency of respiratory assessment and measurement should be increased during opiate infusions or in respect of any other drug which may cause hyperventilation or apnoea, for example, prostaglandin infusion.

Blood pressure

- The arm should be used for measuring blood pressure, but when this is not possible in infants, the lower leg can be used.
- The arm should be positioned at the level of the heart and well supported.
- The correct size of cuff is essential for gaining an accurate recording.
- The cuff should be of sufficient size to ensure overlap to cover 100 per cent of the circumference of the arm and ⅔ of the length of the upper arm or lower leg. The bladder within the cuff must cover 80% of the arm's circumference and should be positioned over the artery from which the blood

pressure will be taken. Incorrect cuff placement is a frequent source of error in both electronic and manual blood pressure measurement (Wedgbury and Valler-Jones, 2008; Valler-Jones and Wedgbury, 2009).

- Sucking, crying and eating can influence blood pressure measurements and these should be noted.
- Movement can effect the accuracy of automated blood pressure monitors.
- The first reading of automated monitors should be disregarded.
- If a blood pressure reading is consistently high on an automated monitor over a period of time it should be re-measured using a manual sphygmomanometer.

Blood transfusion

- Temperature, respiration, pulse and blood pressure should be assessed, measured and recorded prior to infusing the first unit of blood; 15 minutes after the start of each unit; and on completion of the transfusion. If an adverse reaction occurs, vital signs should be measured and recorded more frequently and a medical practitioner informed (McClelland, 2007).

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 (Zeitz 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 (PACU) – heart rate, ECG, respiratory rate, oxygen saturation, non-invasive blood pressure and skin temperature should be recorded (Trigg and Mohammed, 2010) continually until the patient regains consciousness
- a post-operative assessment should include the level of consciousness.
- 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, Wilson, Winkelstein and Kline, 2003)
- following a simple procedure – vital signs 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
- after the immediate recovery period following adeno/tonsillectomy vital signs 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.

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 postoperative instructions. Maintaining an accurate fluid balance record is also recommended.

Capillary refill time (CRT)

Measuring capillary refill time is recommended when assessing the circulation in sick infants and children (RCUK, 2006b; Steiner et al., 2004), although its usefulness has been questioned (Leonard and Beattie, 2004) and thus should not be used in isolation. It is the rate at which blood returns to the capillary bed after it has been compressed digitally.

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, 2007).

Pain assessment

Acknowledging pain makes pain visible and should be incorporated into routine observations as the fifth vital sign (Royal College of Nursing, 2009). In the pre- and post-operative surgical child, pain can indicate a child who is sick. Additionally, the effect of uncontrolled pain can have detrimental effects on the child who is already cardiovascularly compromised (Twycross et al., 2009).

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, 2007a). In the neurosurgical and neurological child this should be assessed using an appropriate GCS scoring system. However the AVPU system is sufficient for all other children and young people.

4

Medical devices and equipment

Standards

Medical devices have a CE marking (denoting a product that meets the requirements of the applicable European Directive) and are suitable for use with infants, children and young people and are appropriate for the setting where they are to be used ie hospital, community or home.

All medical devices and equipment are regularly cleaned during on-going use by one patient and between different patients, in accordance with infection control policies and guidelines.

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

Alarms on medical devices are set to quickly alert staff to changes in vital signs. These settings must be based on the individual child's normal vital signs.

All disposable or single use equipment is identified and used as such.

All medical devices are serviced and calibrated regularly in accordance with manufacturers' instructions.

There are clear policies and procedures concerning the hazards associated with all medical devices and in particular those containing mercury.

The accuracy of data from cardiac and other monitors is checked, as a minimum, at the start of each shift.

Practice criteria

- Training in the use of medical devices should comply with CNST (Clinical Negligence Scheme for Trusts) requirements.
- Training should include the correct setting and use of alarms.
- Cables should be kept tidy to prevent damage and risk to others.
- Battery-operated equipment should be charged when not in use.

- When not in use, all equipment should be stored in a safe place, with use by unauthorised personnel restricted.
- Medical device errors and failures should be reported in accordance with NPSA (National Patient Safety Agency) and MHRA (Medicines and Healthcare Regulatory Authority) guidance.

5

Record keeping

Standards

There is an organisation-wide policy describing best practice in recording vital signs. Nurses should receive regular training to reinforce good record keeping skills and this should be part of the organisation's compulsory training programme.

There is a clear plan of care for the assessment, measurement, monitoring and recording of vital signs that includes actions in response to deviations from normal or other changes.

All vital sign assessments and measurements are recorded contemporaneously and clearly in accordance with NMC guidelines for record keeping (2009).

Alarm limits are clearly documented.

Actions taken in response to variations in vital signs are clearly documented in the relevant health care record.

The charts 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 any changes.

Observation charts should be incorporated into the emergency department notes, whether written 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.

Practice criteria

- 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.
- The method or devices used for assessing and measuring vital signs should be clearly documented.
- The sites used for measuring vital signs should be recorded in the relevant health care record.
- Where continuous monitoring is in use, recordings should be made hourly, as a minimum.
- Information gained from the broader assessment of the infant, child or young person should be recorded, for example, crying, distress, laughing, playing.
- Observations and comments made by the child, young person, parents/carers should be clearly recorded.

6

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7

Further resources

Websites

British Hypertension Society	www.bhsoc.org
Better Blood Transfusion Continuing Education Programme	www.learnbloodtransfusion.org.uk
Department of Health	www.gov.uk/dh
Department of Health, Social Services and Public Safety for Northern Ireland	www.dhsspsni.gov.uk
Every Child Matters: Change for Children	www.education.gov.uk
Medicines and Healthcare Regulatory Authority	www.mhra.gov.uk
National Institute for Health and Clinical Excellence	www.nice.org.uk
NHS Institute for innovation and improvement	www.institute.nhs.uk
National Patient Safety Agency	www.npsa.org.uk
NHS Commissioning Board	www.england.nhs.uk
NHS Litigation Authority: Clinical Negligence Scheme for Trusts	www.nhsla.com
Nursing and Midwifery Council	www.nmc-uk.org
Resuscitation Council (UK)	www.resus.org.uk
Royal College of Nursing	www.rcn.org.uk
NHS Scotland	www.scot.nhs.uk
Skills for Health	www.skillsforhealth.org.uk
UK Blood Transfusion and Tissue Transplantation Services	www.transfusionguidelines.org.uk
Welsh Assembly Government	www.wales.gov.uk

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