University of Glasgow

School of Medicine, Dentistry & Nursing

Vital Signs and Introduction to NEWS

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Contents

Learning Outcomes

- Understand what vital signs are.
- Understand what NEWS is and why we use it.
- Be able to measure a radial pulse.
- Be able to measure blood pressure.
- Be able to measure respiratory rate.
- Be able to measure oxygen saturations.
- Be able to measure temperature.
- Be able to assess a patient's level of consciousness with AVPU and GCS.
- Be able to fully assess a patients vital signs and record them on a NEWS chart.

Introduction to Vital Signs

Vital signs are routinely used to monitor the body's basic functions. The measurements are valuable indicators of the patient's general health and early signs of deterioration in their health. The normal values can vary depending on age, gender and weight. The four main most commonly recorded vital signs are heart rate, blood pressure, respiratory rate and temperature. This document will also add in oxygen saturation and conscious level for completeness of the NEWS chart. (1,2)

National Early Warning Score

The National Early Warning Scores (NEWS) was developed to detect those patients at risk of deterioration by scoring each patients vital signs; respiratory rate, oxygen saturations, temperature, blood pressure, pulse rate and level of consciousness. They are used to draw attention and prioritise patients needing urgent care. A score of 0 is the best, with a score of 3 being the worst for each vital sign. The individual scores are added together to get a patients early warning score. The charts allow easy visualisation of trends in the patient's health, allowing us to see if they are improving or deteriorating. (1,3)

National Early Warning Score (NEWS)*

PHYSIOLOGICAL PARAMETERS	3	2	1	0	1	2	3
Respiration Rate	≤8		9 - 11	12 - 20		21 - 24	≥25
Oxygen Saturations	≤91	92 - 93	94 - 95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature	≤35.0		35.1 - 36.0	36.1 - 38.0	38.1 - 39.0	≥39.1	
Systolic BP	≤90	91 - 100	101 - 110	111 - 219			≥220
Heart Rate	≤40		41 - 50	51 - 90	91 - 110	111 - 130	≥131
Level of Consciousness				A			V, P, or U

*The NEWS initiative flowed from the Royal College of Physicians' NEWS Development and Implementation Group (NEWSDIG) report, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation

Please see next page for explanatory text about this chart

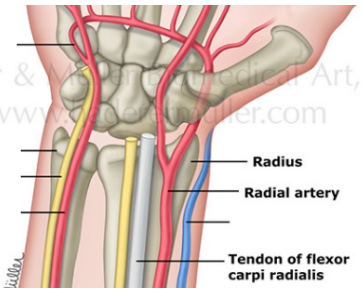
Royal College of Physicians

NHS Training for Innovation

Assessment of Radial Pulse

By the end of this section you should be able to:

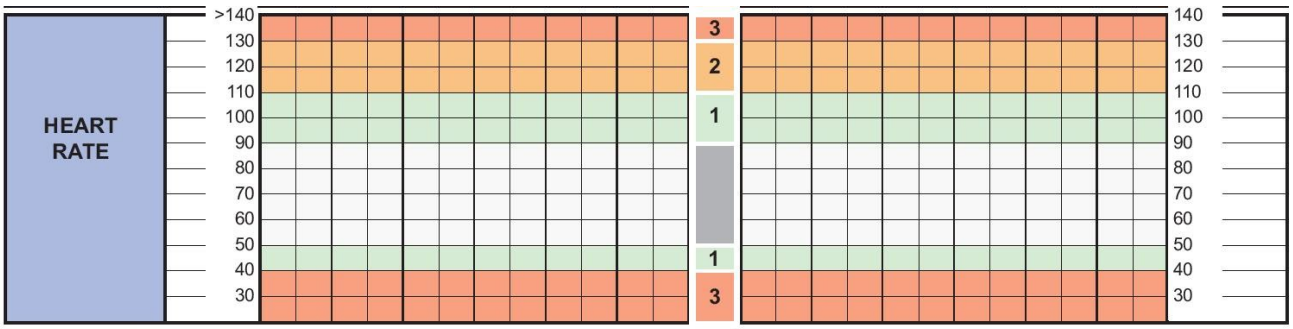
- Locate, measure and record the radial pulse.



A pulse is the palpation of blood flow through a compressed artery. The normal range for an adult pulse rate is between 60-100 beats per minute (bpm). When measuring the radial pulse, you should be feeling for the rate and the rhythm. (2) The radial pulse is felt between the radial styloid and the tendon of flexor carpi radialis. Feel with two or three fingers. Do not use your thumb as this has its own pulse. (4) Count the pulse for 15 seconds and multiply by four. If the patient's pulse is irregular or abnormal, you should feel the pulse for a full 60 seconds assessing if the pulse is irregularly irregular or if there is a pattern to the irregularity. You will need a clock with a second hand. Heart rate is raised in a large number of conditions such as shock, pyrexia, pain and anaemia. (2)

Method

1. Ensure appropriate hand hygiene.
2. Introduce self and confirm patient's identity.
3. Seek informed consent.
4. Check both radial pluses simultaneously to make sure that they are equal, and then concentrate on the right radial pulse.
5. Count the rate per minute.
6. Count for 15 seconds and multiply by four (or 60 seconds if any abnormality).
7. Thank patient.
8. Perform hand hygiene.
9. Record the heart rate.



Blood Pressure

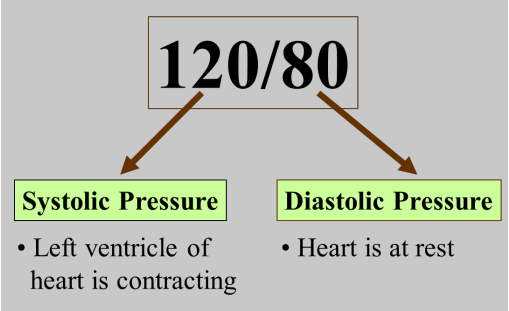
By the end of this section you should be able to:

- Understand what is meant by blood pressure.
- Correctly use the appropriate equipment.
- Assess, measure and record blood pressure.
- Have an understanding of hypertension and hypotension.

Blood pressure is a measurement of the force of blood pushing against the arterial walls. Blood pressure can be measured directly, by inserting a needle or catheter into the artery, or indirectly, by using a blood pressure cuff to occlude the vessels. The indirect method is the one more commonly used, although less accurate, it is quicker and less invasive. (5) It can be measured by an automated device or manually by using the stethoscope and listening to vessels distal to the cuff. The manual method is seen to be more accurate when the appropriate equipment is used correctly. (6) This document will outline how to measure blood pressure manually.

What Blood Pressure Numbers Mean

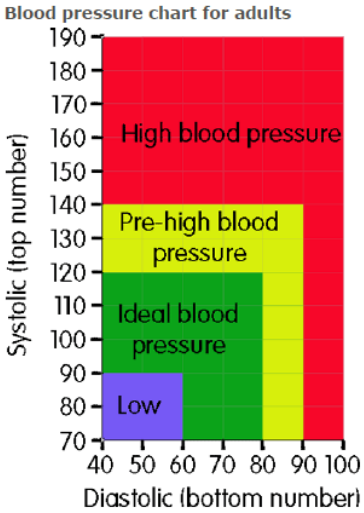
When measuring blood pressure, two pressure measurements are recorded. The higher number, called systolic pressure, refers to the pressure inside the artery when the heart contracts. The lower number, called diastolic pressure, refers to the pressure inside the artery when the heart is at rest. Previously, blood pressure was measured by a mercury manometer, this is why the current blood pressures are recorded in millimetres of mercury (mmHg). (2,5)



The chart shows low, normal, at-risk and high blood pressure levels.

- 140/90mmHg and above = hypertension (high blood pressure).
- Between 120/80mmHg and 140/90mmHg = pre-hypertension where they are at risk of getting hypertension.
- Between 120/80mmHg to 90/60mmHg = normotension (normal blood pressure). This will vary between age, size and health.
- Below 90/60mmHg = hypotension.

BP measurement can tell you about the state of a patient's peripheral circulation and fluid balance. It can also give information about long term stroke and heart attack risks in patients, and the progress of complications of diseases such as diabetes.(7)



Hypertension vs Hypotension

	Hypertension	Hypotension
Symptoms	Dizziness or lightheadedness, lack of concentration, blurred vision, fatigue	Headache, short of breath, chest pain, tachycardia
Causes	Primary – develops over years Secondary – due to an underlying conditions	Shock due to severe infection/anaphylaxis, pregnancy, nutritional deficiency or endocrine problems
Risk Factors	Overweight and obesity, women >65 years old, men > 45 years old, tobacco and alcohol, high sodium diet	>65 years old, family history, alcohol, immobility
Prevention	Maintain a healthy weight, manage stress, avoid tobacco, limit alcohol	Drink more water, eat a better diet, limit alcohol

Introduction to Sphygmomanometry

A sphygmomanometer (often abbreviated to sphyg) is the device used to non-invasively measure the blood pressure in the patient's arteries. A handheld manual sphyg, which you will be using, consists of a pressure gauge and an inflatable cuff that wraps around the upper arm. The principle behind sphymomanometry is to manipulate the artery pressure by constricting the vessel by inflating the cuff, and then reducing the pressure to record the points where flow returns. The recording of the return of flow is done by listening with a stethoscope to hear the 'Korotkoff Sounds'. As the sphyg cuff is deflated, the artery becomes less constricted allowing blood to flow through the artery. The turbulent flow causes sounds to be heard through the stethoscope. (5)

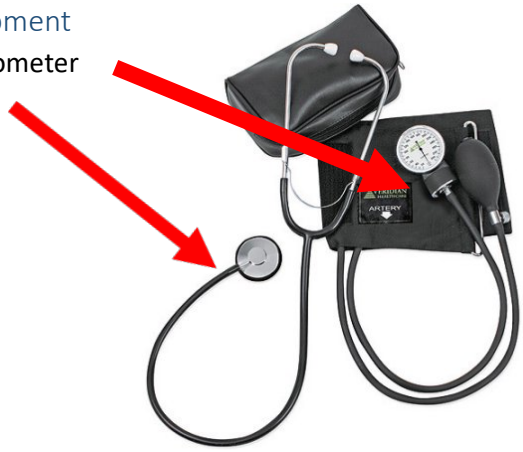
1. Korotkoff I – sharp thud as only systolic pressure exceeds the cuff pressure
2. Korotkoff II – loud blowing sound as the flow becomes less turbulent
3. Korotkoff III – soft thud
4. Korotkoff IV – soft blowing sounds, muffled flow
5. Korotkoff V – silence as flow becomes laminar and cuff is deflated with no pressure on artery

Systolic blood pressure is the pressure in the artery when the heart contracts (systole), making this the maximum arterial pressure – Korotkoff I. The pressure at this point is greatest and is able to force blood through the constricted artery causing the first Korotkoff sound. Diastolic blood pressure is the lowest arterial blood pressure during the cardiac cycle as it reflects the relaxation of the heart between contractions (diastole). When the artery is fully open, there is no turbulent flow, and therefore nothing to hear giving us Korotkoff sound V. This represents the flow of blood during diastole. (5)

It is not important to be able to differentiate from the 5 different sounds. However, you must be able to recognise when they first appear (SYSTOLIC BP) and when there is silence (DIASTOLIC BP). Whilst appearing rather complex to begin with, with a little practise it is a skill that is easily mastered.

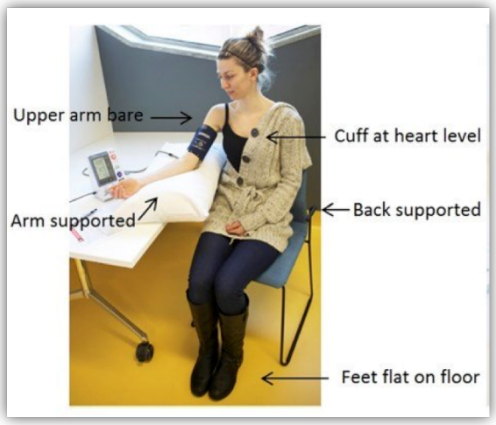
Blood Pressure Equipment

- Sphygmomanometer
- Stethoscope
- Alcohol wipes



Method

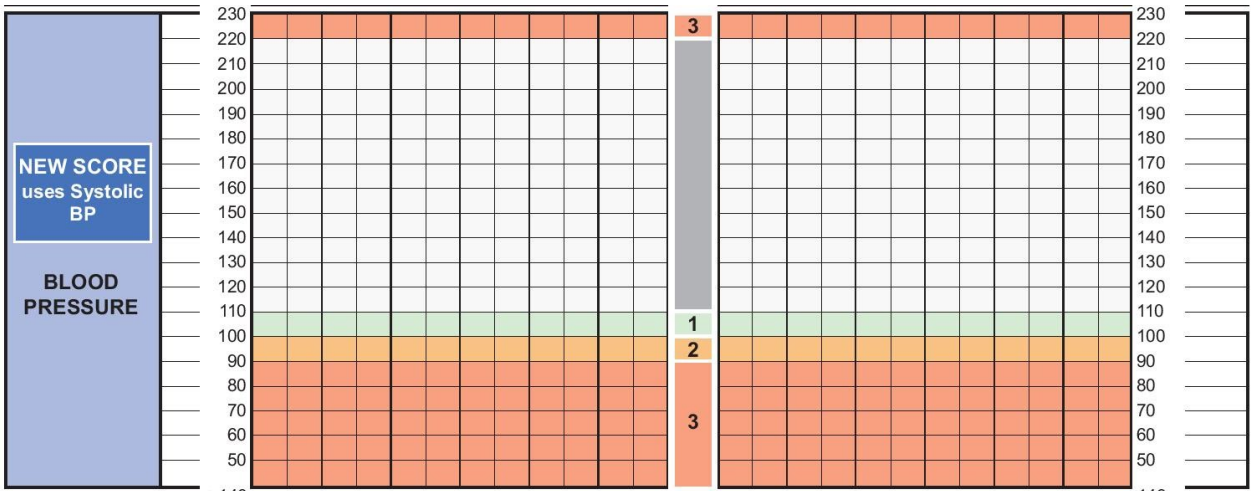
1. Perform hand hygiene and clean stethoscope.
2. Introduce self and confirm patient's identity.
3. Seek informed consent.
4. Position arm on a pillow so that the antecubital fossa is level with the heart and arm is straight but supported.



5. Palpate brachial artery in antecubital fossa prior to positioning cuff.
6. Wrap a suitably sized cuff around the upper arm. The lower border of the cuff should be approx. 2cm above the antecubital fossa.
7. The centre of the cuff should be over the brachial artery – the arrow on the cuff should point towards the artery.

8. Identify and palpate the radial pulse.
9. Inflate cuff while palpating the radial artery until the pulse disappears. Take a mental note of the pressure on the sphygmomanometer dial. Completely deflate the cuff. This reading gives an estimate of systolic pressure.
10. Relocate the brachial artery and place the diaphragm of the stethoscope over the artery.

11. Re-inflate the cuff to 20mmHg above the estimated systolic pressure.
12. Release cuff slowly. Listen carefully with the stethoscope and mentally note the pressure when the first thudding sounds are heard (Korotkoff 1). This is the systolic pressure.
13. Keep releasing the cuff pressure. The noise will get louder, then soft, then muffles and then finally stops. Note the reading when there is silence (Korotkoff 5). This is the diastolic pressure.
14. Finish deflating the cuff quickly.
15. Document the readings as systolic pressure over diastolic pressure, e.g. 120/60 mmHg.
16. If you miss the readings, do not re-inflate the cuff immediately. Deflate the cuff fully, wait until the patient is comfortable and try again from the beginning.
17. Thank patient and wash hands.
18. Record the blood pressure.



Respiratory Rate

By the end of this section you should:

- Understand normal respiration.
- Be able to recognise signs of respiratory distress.
- Be able to assess, measure and record the patient's respiratory rate.

The respiratory rate is the number of breaths per minute. Normal respiratory pattern is an easy, relaxed, subconscious activity which takes place at a rate dependant on age and activity. (8) Thinking about your breathing alters the rate and pattern and therefore to accurately measure the patient's respiratory rate it is best to not make them aware of your assessment. This is usually done after assessing the patient's radial pulse. Continue to pretend to take the pulse rate while observing the rise and fall of the patient's chest. One respiration consists of one complete rise and fall of the chest. This should be done for 30 seconds and multiplied by 2. The pattern, effort and rate of breathing should be observed and recorded. Abnormal patterns can be described as:

- Dyspnoea – difficult, laboured breathing
- Tachypnoea – rapid breathing
- Apnoea – temporary absence of breathing
- Kussmaul's – increased rate and depth, with long grunting expirations – lobar pneumonia/DKA
- Stridor – a harsh, high-pitched noise on inspiration – obstruction

Along with signs of respiratory distress; observe use of accessory muscles and wheeze. A normal respiratory rate for adults can be between 12 and 20 breaths per minute. Respiration rates may increase with fever, asthma, anxiety, pneumonia, congestive heart failure or drug overdose. (2,9)

Method

1. Ensure patient is relaxed and unaware of the counting process.
2. After measuring the radial pulse, continue to pretend to take pulse, while watching the patient's chest.
3. Count the respiratory rate over 30 seconds, observe the depth and pattern of respiration.
4. Record the respiratory rate.

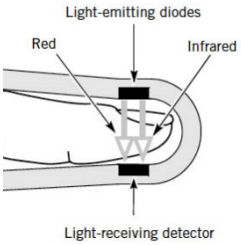
RESP. RATE																								
	≥25												3												≥25
	21-24												2												21-24
	12-20																								12-20
	9-11												1												9-11
	≤8												3												≤8

Pulse Oximetry

By the end of this section you should be able to:

- Understand what pulse oximetry is.
- Understand how the pulse oximetry device works.
- Know the normal ranges of oxygen saturations.
- Measure and record pulse oximetry.

Pulse oximetry is used to assess the saturation of oxygen in the blood in a simple, non-invasive way. Oxygen saturations are useful during surgeries that involve sedation to adjust supplemental oxygen. They are also used to monitor patient's exercise tolerance and the effectiveness of some medications. The pulse oximetry device is a clip-like probe that can be attached to a thin part of the body, for example, an ear-lobe, nose, or most commonly used, a finger. One side of the probe has a light source with two different types of light; infrared and red. The light is passed through the body's tissue to the light detector on the opposite side. A microprocessor calculates the oxygen saturation of haemoglobin by comparing oxygenated (infrared light absorbing) and deoxygenated (red light absorbing) haemoglobin depending on how much of each light was absorbed. The measurements are made multiple times a second, with the readings of the last 3 seconds being averaged out to give the final recording. (10)



Oxygen is breathed into the lungs, passes to the blood where the majority attaches to haemoglobin. Haemoglobin is a protein located inside our red blood cells that transports the oxygen through the bloodstream to the rest of our body and tissues. In this way, our body is given the oxygen and nutrients it needs to function. Oximeters use the light absorptive characteristics of haemoglobin and the pulsating nature of blood flow in the arteries to measure the level of oxygen in the body. (10)

Oxygen saturations should be above 95% in a normal individual. However, it may be lower in those with respiratory disease or congenital heart disease. Nail polish must be removed beforehand as this absorbs the light and gives a false reading. (10)

Method

1. Ensure appropriate hand hygiene.
2. Introduce yourself, check patient details and gain consent.
3. Switch the monitor on.
4. Place the probe on a finger.
5. Ask the patient to rest their hand and keep it as still as possible.
6. Record the oxygen saturations.

$Sp0_2$	≥96																								≥96
	94-95													1											94-95
	92-93													2											92-93
	≤91													3											≤91
Inspired 0_2%	%													2											%

Body Temperature

By the end of this section you should know:

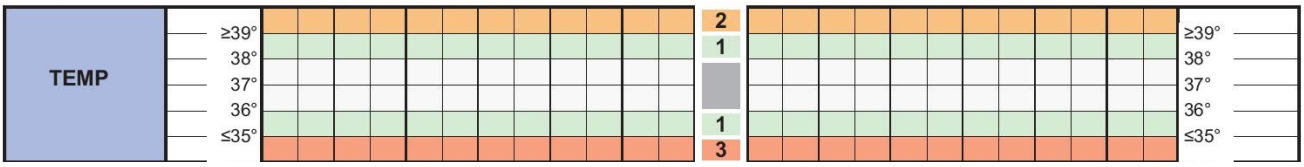
- Indications for measuring body temperature.
- Normal ranges of body temperature.
- Be aware of different ways to measure body temperature.
- How to measure tympanic temperature.

Body temperature is measured using a thermometer or electronic probe. Temperature can be recorded in the axilla, rectum or ear, and should be consistent for each patient. (2) The normal range of body temperature is between 36°C and 38°C, as used in the NEWS Chart. (1,11) A body temperature recording may be needed to establish a baseline reading or monitor patient's being treated for infection. (12)

The tympanic temperature (ear) is now most commonly used in hospitals. It is minimally invasive and due to the close proximity to the internal carotid artery and the tympanic membrane's blood supply it ensures that the temperature is a good reflection of core temperature. (13)

Method

1. Wash hands.
2. Introduce self.
3. Identify patient.
4. Explain procedure.
5. Obtain informed consent.
6. Push protective sheath onto probe.
7. Switch unit on and check ear sign is displayed.
8. Pull ear gently backwards and upwards, inserting probe into the ear canal.
9. Press activation button, it will beep once at beginning of measurement.
10. After a few seconds the unit will beep again to indicate completion.
11. Dispose of protective sheath in clinical waste bin.
12. Thank patient.
13. Record temperature.

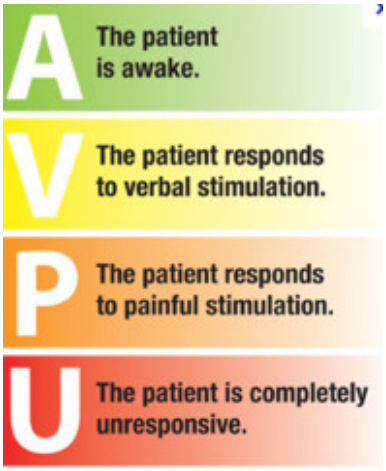


AVPU Scale

By the end of this section you should be able to:

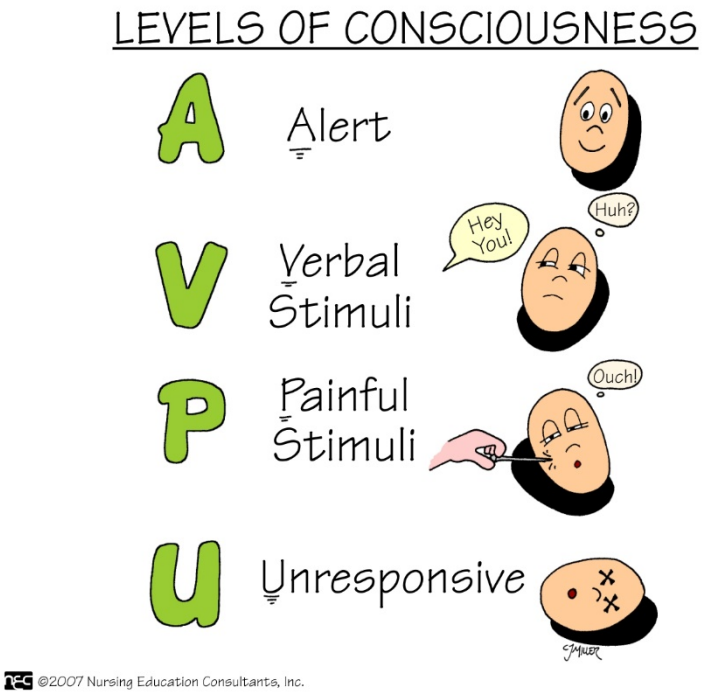
- Assess and record the patient's level of consciousness using AVPU.

AVPU Scale is a simplification of the Glasgow Coma Scale (explained in the next section) to assess a patients level of consciousness. AVPU stands for Alert, Voice, Pain and Unresponsive. The patient will fall into one of these four categories. Only 'Alert' is normal. (14)



Method

1. Alert – the patient is fully awake, although they may be confused. Their eyes are open spontaneously, they will respond to voice and have coordinated motor function.
2. Voice – the patient will respond to voice by opening eyes or sounds (i.e. moans and groans).
3. Pain – the patient will respond to a pain stimulus (i.e trapezius squeeze or fingernail bed squeeze) by opening eyes, sounds or flexion/extension of a limb.
4. Unresponsive – the patient will give no response to voice or pain.
5. Record either A, V, P or U on the chart.



Level of Consciousness	Alert													3													Alert
	V / P / U																										V / P / U

Glasgow Coma Scale

By the end of this section you should be able to:

- Assess and record the patient's level of consciousness using the Glasgow Coma Scale.
- Understand the differences between Glasgow Coma Scale and Glasgow Coma Score.

Glasgow Coma Scale (GCS) is the most widely recognised measure of consciousness developed in 1974. GCS provides a simple, reliable measure of a patient's conscious level. It was created to be used alongside other assessments of neurological function. It uses three different behavioural responses; motor, verbal, and eye. (15) There are 4 grades for eye opening response, 5 for verbal and 6 for motor. The lowest grade available is 1 which represents no response, with the highest number being the least stimulus required. The scale is judged on the patient's best response for each component. It should be recorded as a breakdown of these components, e.g. Eyes: open spontaneously 4, Verbal: confused speech 4, Motor localising to pain 5, GCS 13.

Eye Opening Response

- 4 = Open spontaneously
- 3 = Open to speech
- 2 = Open to pain
- 1 = Not opening

Verbal Response

- 5 = Normal speech/orientated
- 4 = Confused speech/disorientated
- 3 = Inappropriate words
- 2 = Incomprehensible sounds (moaning/groaning)
- 1 = No verbal response

Motor Response

- 6 = Obeying commands
- 5 = Localising to pain
- 4 = Normal flexion to pain
- 3 = Abnormal flexion to pain
- 2 = Extending to pain
- 1 = No motor response

Scale vs Score

The Glasgow Coma **SCALE** relates to the three different components of behavioural response and the description in words. The Glasgow Coma **SCORE** refers to the numerical value applied to each of these descriptions. (16) The score was established for research use, and not clinical use. However, the convenience of adding up each score to give a total score became popular. By adding up to create a total, clinicians have a rough idea of how the patient is doing, but it is not as informative as the scale. A score of 12, could be E4, V5, M3 or E3, V3, M6, both very different on the scale. The scale is best for the management of an individual patient compared to the score which is better used in research. (16) However, in clinical practice, both GC Scale and GC Score will be used interchangeably. It is recommended that only the SCALE be used, however, it can be done with individual numbers, i.e. E4, V4, M5, but not with a total summative SCORE.

Correlation with Severity of Injury

In the context of a head injury:

Glasgow Coma **SCORE**	
14-15	Mild brain injury
9-13	Moderate brain injury
3-8	Severe brain injury

Important:
A patient is said to be in a coma with a GCS of less than 8. If a patient has a GCS of <8 then they may not be able to protect their own airway and in certain circumstances appropriate management steps may need to be taken to secure the airway.

Method

1. **Check:** Start by checking to identify factors that may interfere the assessment of GCS. Some examples include language barriers, hearing loss, intubation or sedation.

2. **Observe:** Start with passive observation.

Stand and watch the patient for a short time. Here you are exerting no stimulus. If they have their eyes open and are talking then grade the verbal response and ask them to obey a simple command to check the motor score.

3. **Stimulate:**

Eye Opening Response

- 4 = Open spontaneously – Will be observed in passive observation.
- 3 = Open to sound – Eyes will open when talking to the patient.
- 2 = Open to pain – Apply a painful stimulus by squeezing the trapezius muscle.
- 1 = No response.

Verbal Response

Ask the patient to give you three pieces of information i.e. their name, their location and the month.

- 5 = Normal speech/orientated – If the patient is orientated, they will get all three correct.
- 4 = Confused speech/disorientated – If any one of the three are incorrect, the patient is confused.
- 3 = Inappropriate words – The patient's response will lack structure or sentences.
- 2 = Incomprehensible sounds – The patient is moaning/groaning with no words.
- 1 = No response.

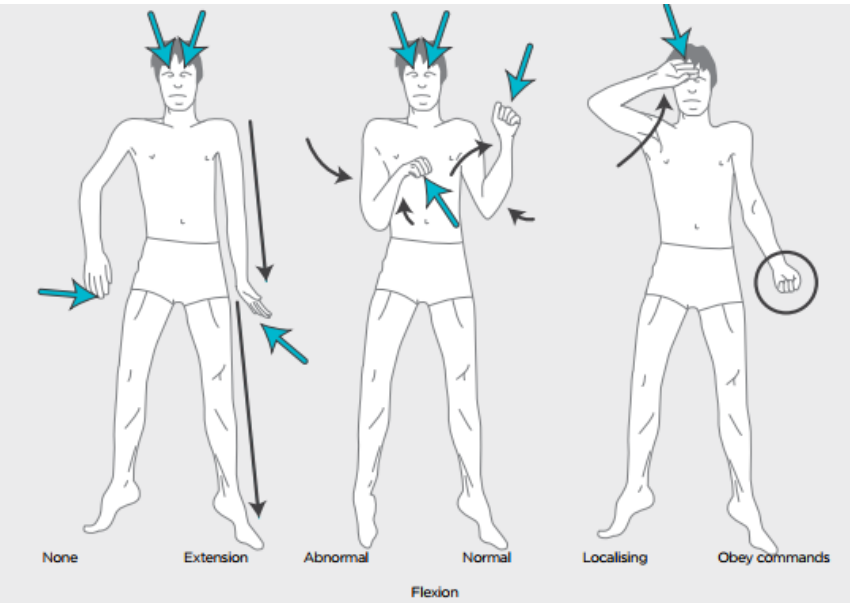
Motor Response

The Motor score is a bit more complex, this is not so much a passive observation but an active test which records the patient's response to your stimulus. If there is disparity between right and left, then take the higher score i.e. best motor response.

- 6 = Obeying commands – Ask the patient to perform a simple task (e.g. "raise up both of your arms" or "squeeze my fingers"). If they are paralysed (e.g. from a stroke) on one side, they will be unable to squeeze your fingers with that hand. Use the best motor response. Other requests such as 'open your mouth' or 'blink' are possible – but do not ask a patient to nod or shake his head until you've cleared their cervical spine in the context of neck trauma.
- 5 = Localises to pain – Exert a painful stimulus (trapezius muscle squeeze/sternal rub). The observation is positive if the patient localises the source of pain and tries to push your hand away.

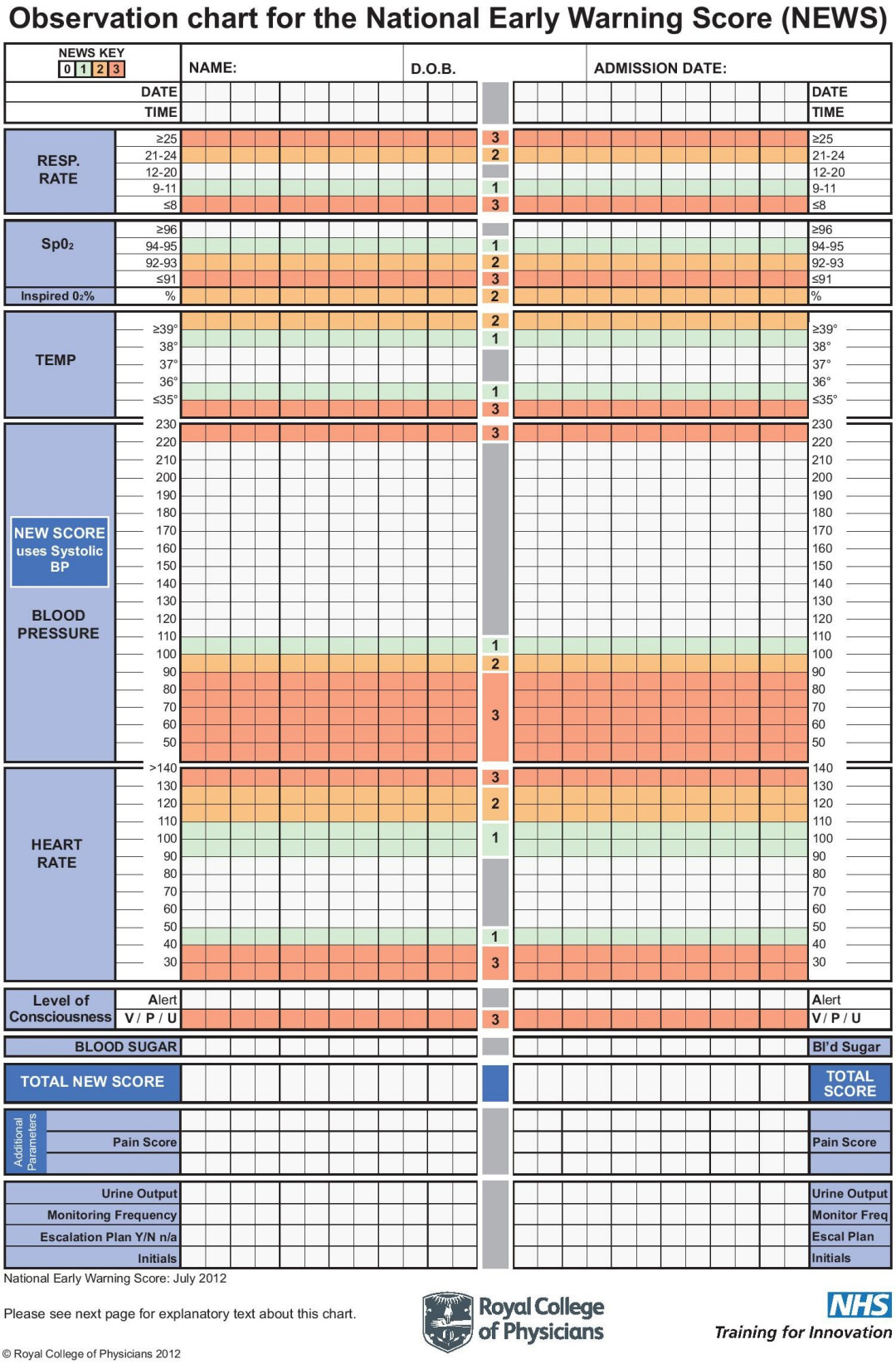
The next three grades (4, 3 and 2) require a stimulus at the end of an extremity, usually arm. This may be done with nailbed pressure using a pen.

- 4 = Normal flexion to pain – Withdraws from pain and pulls limb away from stimulus.
- 3 = Abnormal flexion to pain – The patient flexes arms and wrists and pulls them into their chest – decorticate posture. It does take a bit of experience to distinguish between normal and abnormal flexion.
- 2 = Extension to pain – The paint extends limbs in response to the stimulus – decerebrate posture.
- 1 = No motor response – No response to pain.



4. **Rate:** Record the GCS on the NEWS Chart.

NEWS Chart



Observation chart for the National Early Warning Score (NEWS)

NEWS KEY 0 1 2 3	NAME:	D.O.B.	ADMISSION DATE:
DATE			DATE
TIME			TIME

RESP. RATE	≥25	3	≥25
	21-24	2	21-24
	12-20		12-20
	9-11	1	9-11
	≤8	3	≤8
$Sp0_2$	≥96		≥96
	94-95	1	94-95
	92-93	2	92-93
	≤91	3	≤91
Inspired 0_2%	%	2	%
TEMP	≥39°	2	≥39°
	38°	1	38°
	37°		37°
	36°	1	36°
	≤35°	3	≤35°
NEW SCORE uses Systolic BP BLOOD PRESSURE	230	3	230
	220		220
	210		210
	200		200
	190		190
	180		180
	170		170
	160		160
	150		150
	140		140
	130		130
	120		120
	110		110
	100	1	100
	90	2	90
	80	3	80
	70		70
	60		60
	50		50
HEART RATE	>140	3	140
	130		130
	120	2	120
	110		110
	100	1	100
	90		90
	80		80
	70		70
	60		60
	50		50
	40	1	40
	30	3	30
Level of Consciousness	Alert		Alert
	V / P / U	3	V / P / U
BLOOD SUGAR			Bl'd Sugar
TOTAL NEW SCORE			TOTAL SCORE
Additional Parameters			
Pain Score			Pain Score
Urine Output			Urine Output
Monitoring Frequency			Monitor Freq
Escalation Plan Y/N n/a			Escal Plan
Initials			Initials

National Early Warning Score: July 2012

Please see next page for explanatory text about this chart.

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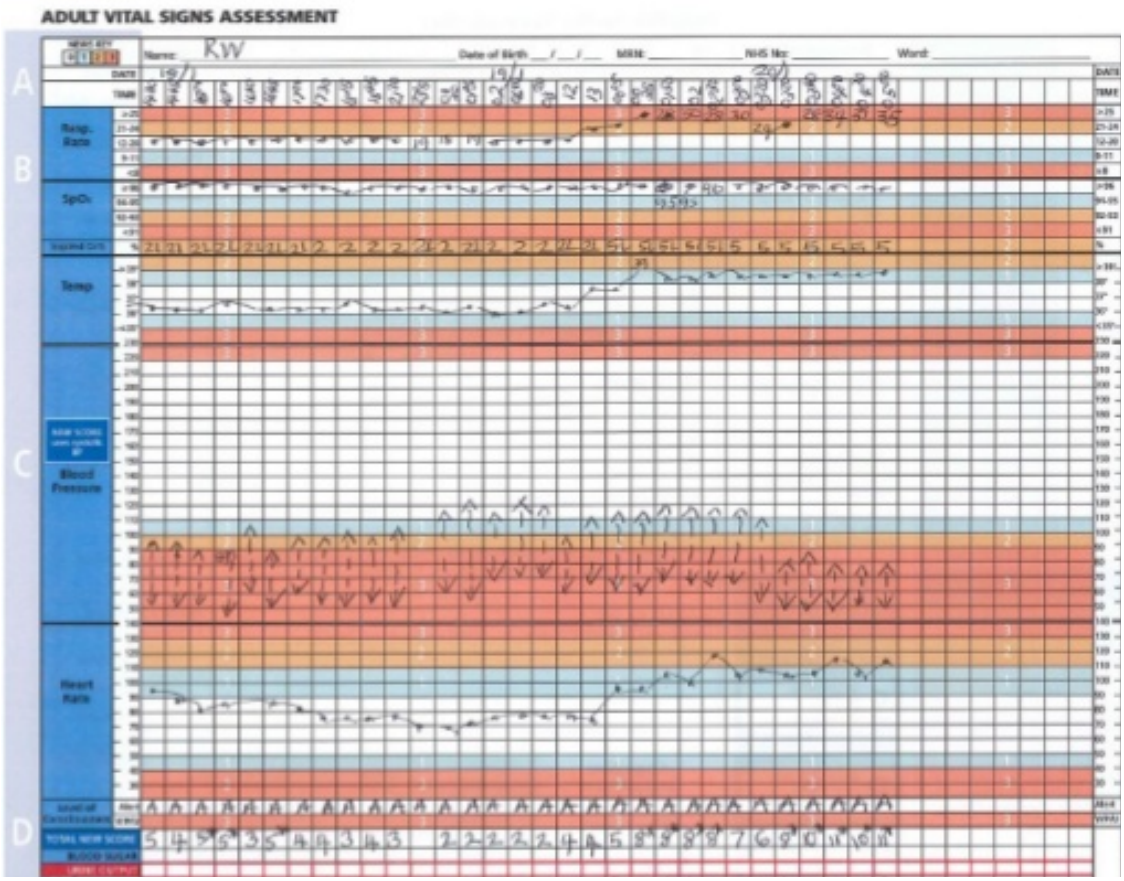
Example NEWS Chart

Here is an example of how each section of the NEWS chart should be filled in.



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