VITAL SIGNS

Blood Pressure

SBP = Systolic Blood Pressure
DBP = Diastolic Blood Pressure

1. CDE Variable	SBP: Admission systolic blood pressure DBP: Admission diastolic blood pressure
2. CDE Definition	Systolic and diastolic blood pressure
3. Recommended instrument for assessment	Units are mmHg
4. Description of measure	Systolic/diastolic blood pressure (numerical).
5. Permissible values	Systolic: 50-200 (0-300) Diastolic: 30-150 (0-300) *The range presented represents the range of plausible values. Values outside this range may be queried. The numbers given between brackets, represent the range of possible values, including extreme situations. Values outside these ranges, will be queried immediately.*
6. Classification: Basic / Intermediate / Advanced	***Admission to ER***: identical ***In-hospital:*** **Basic**: we recommend recording blood pressure on a daily basis as the 'most representative' value for this period. We do not advocate calculating the mathematical average of multiple measurements, but prefer rather the value most representative of this 'daily' period. In addition, we recommend scoring the lowest blood pressure values obtained over this period. **Intermediate / advanced**: in the ICU environment we recommend recording blood pressure on an hourly basis.
7. Procedure	Record blood pressure from the blood pressure monitor or measure manually by sphygmanometry. When hourly values are documented, we recommend to take readings at a fixed time point, for example the last minute of the hour. Exclude values which may be influenced by artefacts.

8. Comments / Special instructions:
Mean arterial blood pressure (MABP) may be calculated as (SBP + 2 x DBP) / 3.
In order to permit more accurate calculation of cerebral perfusion pressure, we recommend zeroing the arterial catheter at the level of the foramen of Monro.
Cerebral perfusion pressure (CPP) is defined as MABP-ICP.

9. Rationale / justification:
The injured brain is often not able to pressure autoregulate normally, adequate perfusion may be more dependent on perfusion pressure; lower blood pressure and low perfusion pressure can aggravate ischaemic damage to the injured brain whilst conversely a high blood pressure may lead to increased intracranial pressure and carries an increased risk of neurogenic lung edema. Hypotensive episodes before and after admission adversely affect outcome. In patients with severe traumatic brain injury, routine calculation of the cerebral perfusion pressure on an hourly basis is recommended.

10. References:

Management and prognosis of severe traumatic brain injury, J Neurotrauma 2000;17:591-595.

Butcher I, Maas AI, Lu J , et al. Prognostic value of admission blood pressure in traumatic brain injury: results from the IMPACT study. *J Neurotrauma.* Feb 2007;24(2):294-302.

Murray GD, Butcher I, McHugh GS, et al. Multivariate prognostic analysis in traumatic brain injury. *J Neurotrauma*. Feb 2007;24(2):329-377.

VITAL SIGNS

HR = Heart Rate

1. CDE Variable	HR = Admission heart rate
2. CDE Definition	Heart rate
3. Recommended instrument for assessment	Beats per min
4. Description of measure	Numerical
5. Permissible values	40-250 (0-300) *The range presented represents the range of plausible values. Values outside this range may be queried. The numbers given between brackets, represent the range of possible values, including extreme situations. Values outside these ranges, will be queried immediately.*
6. Classification: Basic / Intermediate / Advanced	Basic: on admission and daily Intermediate and advanced: record values each hour. We recommend to take readings at a fixed time point, for example the last minute of the hour.
7. Procedure	Record heart rate from monitor or by counting pulse rate
8. Comments / Special instructions: N/A.	
9. Rationale / justification: Heart rate may be altered by trauma in a couple of ways. Tachycardia may indicate volume depletion, pain or stress, and higher heart rates have been found in patients that do not survive traumatic injuries. Bradycardia may be seen with elevated intracranial pressure.	
10. References: *Shoemaker WC, Bayard DS, Botnen A*, et al. Mathematical program for outcome prediction and therapeutic support for trauma beginning within 1 hr of admission: a preliminary report. *Crit Care Med*. Jul 2005;33(7):1499-1506 *Agrawal A, Timothy J, Cincu R*, et al. Bradycardia in neurosurgery. *Clin Neurol Neurosurg*. Apr 2008;110(4):321-7	

Recommended time for assessment:
All versions: on admission.
Basic: daily, as required by protocol.
Intermediate / advanced: record hourly values as long as intensive monitoring is clinically indicated.

VITAL SIGNS

SaO2 = Oxygen Saturation

1. CDE Variable	SaO2 AvSaO2 = Average daily oxygen saturation LowSaO2 = Lowest daily oxygen saturation
2. CDE Definition	oxygen saturation (the percent of haemoglobin that is fully combined with oxygen in arterial blood)
3. Recommended instrument for assessment	% saturation
4. Description of measure	Numerical.
5. Permissible values	75-100 (0-100) *The range presented represents the range of plausible values. Values outside this range may be queried. The numbers given between brackets, represent the range of possible values, including extreme situations. Values outside these ranges, will be queried immediately.*
6. Classification: Basic / Intermediate / Advanced	Basic: record the oxygen saturation on a daily basis as the most representative value for this period; additionally please record the lowest value for oxygen saturation monitored. Intermediate/advanced: record lowest and highest values of SaO2 per 24 hour period
7. Procedure	Record value from pulse oximeter, or from arterial blood gas analysis; check unknown if information is not available
8. Comments / Special instructions: Pulse oxymetry may be less reliable in patients in shock. Arterial blood gas analysis is then preferred.	
9. Rationale / justification: Even short durations of hypoxia adversely affect outcome.	
10. References: *Murray GD, Butcher I, McHugh GS, et al*. Multivariable prognostic analysis in traumatic brain injury. *J Neurotrauma.* Feb 2007;24(2):329-377. *Brain Trauma Foundation, American Association of Neurological Surgeons (AANS), Congress of Neurological Surgeons (CNS), AANS/CNS Joint Section on Neurotrauma and Critical Care*: Guidelines for the management of severe traumatic brain injury. I. Blood pressure and oxygenation. J Neurotrauma 2007; 24 (Suppl 1): S7-S13.	

Recommended time for assessment: On admission and daily as required by protocol.