

Clinical Question:

In adult and pediatric emergency department patients, which non-invasive, objective, bedside procedure is best for identification of acute hypovolemia?

Problem:

Determining whether a patient has suffered a significant acute loss of fluid, blood or otherwise, is a high priority and guides initial resuscitative measures. Standard vital signs such as blood pressure, heart rate, and respiratory rate are influenced by factors other than volume loss and may not reflect fluid volume accurately. Researchers have evaluated other indices and technologies for use at the bedside for this purpose. These include orthostatic vital signs (OVS), pulse pressure (PP), shock index (SI), variations of SI, peripheral perfusion index (PPI), passive leg raising (PLR), heart rate over pulse pressure (ROPE), stroke volume variation, and ultrasound. Of these, OVS, PP, SI and variations of SI have been studied extensively and are easily performed in the emergency department (ED) by emergency nurses with no special equipment

Description of Decision Options/Interventions and the Level of Recommendation		
Orthostatic Vital Signs		
Procedure	After the patient assumes a standing position, measure orthostatic vital signs after one minute. (Witting et al., 1994; Yadav et al., 2016)	C
	There is insufficient evidence to make a recommendation about how long the patient should rest in a supine position prior to measuring orthostatic vital signs. (Lance et al., 2009)	IE
Interpretation	Orthostatic vital signs lack the sensitivity to reliably detect volume losses of 450 ml or less. (Baraff & Schriger, 1992; Witting et al., 1994)	C
	When measuring lying-to-standing orthostatic vital signs, one or more of the following findings may indicate intravascular volume loss: <ul style="list-style-type: none"> • Decrease in diastolic blood pressure greater than 10 mmHg • Increase in heart rate greater than 20 beats per minute (Baraff & Schriger, 1992; Witting et al., 1994)	C
	There is insufficient evidence as to whether moderate to severe lightheadedness (requiring leaning or lying down) may constitute a positive test. (Witting et al., 1994)	IE
	There is insufficient evidence to determine whether sitting-to-standing tests require different positivity criteria from lying-to-standing tests. (Witting & Gallagher, 2003)	IE
Pediatric and Adolescent Population	There is insufficient evidence appears in the literature to make recommendations about orthostatic vital signs in the pediatric and adolescent population with fluid volume alteration	IE
Pulse Pressure		
	A narrowed pulse pressure correlates with acute blood loss requiring transfusion in trauma patients. (Priestley et al., 2019; Warren et al., 2019; El-Menyar et al., 2018; Morrison et al., 2012)	B
	A narrowed pulse pressure is an early indicator of acute blood loss. (Priestley et al., 2019; Warren et al., 2019; Yadav et al., 2016)	B
	There is insufficient evidence to define pulse pressure cutoff values that indicate a high risk of active hemorrhage. (Priestley et al., 2019)	IE
	There is no evidence regarding the utility of pulse pressure assessment in children.	NE
Shock Index		
Adults with Injuries	A pre-hospital Shock Index ≥ 0.9 correlates with acute blood loss requiring transfusion (Day et al., 2016; McNab et al., 2012; Vandromme et al., 2011; Wang et al., 2019)	B
	A Shock Index ≥ 0.8 or ≥ 1.0 correlates with acute blood loss requiring transfusion in the presence of blunt or penetrating trauma. (DeMuro et al., 2013; ; El-Menyar et al., 2019; Joseph et al., 2018; Morrison et al., 2012; Mutschler et al., 2013; Rau et al., 2016; Schroll et al., 2018)	B
	A Shock Index > 0.8 correlates with acute blood loss requiring transfusion regardless of co-existing traumatic brain injury. (El-Menyar et al., 2018; Fröhlich et al., 2016; Joseph et al., 2018)	C
	There is insufficient evidence for the Respiratory Rate Adjusted Shock Index (RASI) as an indicator for acute blood loss requiring transfusion with blunt or penetrating trauma. (Caputo et al., 2017)	IE
	There is insufficient evidence for the Reverse Shock Index (RSI) as an indicator of acute blood loss requiring transfusion with blunt or penetrating trauma. (Lai et al., 2016)	IE
	There is insufficient evidence about the ability of SI to differentiate between minor and major injury. (Paladino et al., 2011)	IE

Description of Decision Options/Interventions and the Level of Recommendation

Shock Index (cont.)

Older Adult with Injuries	There is insufficient evidence to specify a Shock Index cut-off indicating acute blood loss requiring transfusion. (DeMuro et al., 2013; El-Menyar et al., 2018)	IE
Children with Injuries	A Shock Index > 0.9 correlates with acute blood loss requiring transfusion in children > 1 year old with <i>blunt trauma</i> . (Acker et al., 2015; Linnaus et al., 2017; Nordin et al., 2018)	B
	An elevated age-adjusted Shock Index correlates with and outperforms Shock Index in detecting acute blood loss requiring transfusion in children with <i>blunt trauma</i> . (Acker et al., 2015; Linnaus et al., 2017; Nordin et al., 2018; Strutt, et al., 2019)	B
	There is insufficient evidence that a Shock Index > 0.9 is an indicator for acute blood loss requiring transfusion in children > 1 year old with <i>penetrating trauma</i> . (Nordin et al., 2018)	IE
	There is no evidence to specify a Shock Index cut-off as an indicator for acute blood loss in children with co-existing <i>traumatic brain injury</i> . (Acker et al., 2015; Nordin et al., 2018)	NE
Healthy Young Adults	There is insufficient evidence for Shock Index as an indicator of acute blood loss. (Pasquier et al., 2019)	IE
Women in Postpartum	A Shock Index ≥ 0.8 correlates with acute blood loss requiring transfusion in women with postpartum hemorrhage. (Borovac-Pinheiro et al., 2017; Kohn et al., 2019; Nathan et al., 2015; Nathan et al., 2016; Sohn et al., 2018)	B

A	Level A (High)	Based on consistent and good quality of evidence; has relevance and applicability to emergency nursing practice.
B	Level B (Moderate):	There are some minor inconsistencies in quality of evidence; has relevance and applicability to emergency nursing practice.
C	Level C (Weak)	There is limited or low-quality patient-oriented evidence; has relevance and applicability to emergency nursing practice.
NR	Not Recommended	Based upon current evidence.
IE	Insufficient Evidence	Insufficient evidence upon which to make a recommendation.
NE	No Evidence	No evidence upon which to make a recommendation.

Access the full clinical guideline at: <https://www.ena.org/docs/default-source/resource-library/practice-resources/cpg/hypovolemiacpg.pdf>