

1. Introduction.

- 1.1 Clinical Observations are essential in assessing for Acute Limb Compartment Syndrome, (ALCS), to prevent and observe for neurovascular impairment and early recognition of compartment syndrome.
- 1.2 ALCS is a potentially serious complication of acute injuries and orthopaedic interventions. Failure to diagnose and treat can lead to ischaemia, necrosis, amputation of the limb and rhabdomyolysis.
- 1.3 Clinical observations and early recognition of the signs and symptoms are paramount to diagnosis in conscious patients.
- 1.4 This guideline has been updated, in line with the British Orthopaedic Association, (BOA) and the RCN revised guidelines, (2014), with the implementation of a new chart.

2. Scope.

- 2.1 This guideline applies to all trauma patients, who have sustained an acute injury and therefore all nursing and medical staff employed by UHL, who assess and document information on ALCS observation chart.
- 2.2 Overall accountability for accurately recording ALCS observations lies with the registered nurse. However, taking of the observations, may be delegated to other members of the healthcare team, such as Nursing Associates; ONLY Trauma HCAs who have undertaken further training, within orthopaedics and achieved competency by LCAT assessment.
- 2.3 This chart is **NOT** to be used if a patient has undergone revascularisation. Vascular patients are excluded from this guideline. Any vascular information required, will need to be addressed to the Vascular team at GGH. Vascular patients require the **Foot Pulse Chart** to monitor circulation to the affected limb.
- 2.4 If a patient is admitted to ICU with multiple traumas, please refer to ICU observation chart.

3. Definition.

- 3.1 Compartment syndrome is the result of increased pressure within a muscle compartment, resulting in compromised perfusion of the tissues and leading to a potential ischaemia of the limb.
- 3.2 Acute compartment syndrome can develop in any part of the body that has a muscle compartment, with little or no capacity for tissue expansion.
- 3.3 ALCS is a true orthopaedic emergency. Failure to diagnose and treat in a timely manner can result in ischaemia, necrosis, neurological deficit, amputation of the limb and rhabdomyolysis.
- 3.4 Complications can occur very quickly and its effects can be irreversible within a few hours.

4. Which Patients Require ALCS Monitoring.

- 4.1 Patients who have:
 - a. an acute limb injury
 - b. Prolonged use of a tourniquet in theatre
 - c. Compartment trauma – direct injury to compartments
 - d. Post Trauma Orthopaedic surgery or procedure

- e. Haematoma formation in limbs
- f. Insect/ animal/ human bites
- g. Crush injuries – include lying on a limb for a long duration
- h. Bleeding and clotting disorders
- i. Thermal injury – including hypothermia and burns

4.2 Please note that:

Patients admitted with spinal fractures will **NOT** need ALCS observation done. They will require **neurological observations** done, which is documented on the ASIA chart. The ASIA chart is used predominately with the spinal patients, to detect any impairments with motor function. Due to the complexity of spinal patients this chart is more detailed to ascertain what level the spinal impingement or issues are. However, if they have **multiple injuries** and this includes fractures elsewhere, then they will require a chart for each injured limb.

Patients with hip fractures are **not** at high risk of ALCS unless there are other risk factors.

4.3 Other factors to consider in assessing whether a patient requires ALCS observations:

Treatments or interventions listed below, are suggestive of being high risk for ALCS with an injury

- a. Patient has a cast/splint in situ
- b. Spinal anaesthetics and nerve blocks
- c. Compression bandages in situ
- d. Traction, slings in use

5. Monitoring

- 5.1 Ensure the affected limb is circled on the chart and use a separate chart for each injured limb.
- 5.2 Tick whether the patient has had a nerve block or has a cast, traction or tight bandaging.
- 5.3 ALCS observations to be monitored hourly for the first 24 hours, then 4 hourly for the next 24 hours. However, if any concerns are noted at any point, revert back to hourly monitoring.
- 5.4 A second chart will be needed to provide a minimum of 48 hours monitoring.
- 5.5 ALCS observations can be discontinued after 48 hours unless the patient requires further surgery, in which case staff will revert back to hourly observations or any complications arise.

6. Pain

- 6.1. Patients who have had spinal anaesthetic, nerve blocks or epidurals may not be able to report pain. The pain section should **not** be used where the patient has an impaired ability to report pain.
- 6.2 Pain out of proportion to the injury/treatment and on passive movement are the key clinical findings for compartment syndrome.
- 6.3 To undertake passive movement of fingers and toes; place fingers underneath the appropriate digit and gently extend. Any increase in pain may indicate development of compartment syndrome and to be recorded appropriately on the chart
- 6.4 Changes in pulse, sensation and skin colour are late indicators of neurovascular compromise and therefore, are not to be relied upon to diagnose compartment syndrome. They can be recorded as part of the well limb assessment.
- 6.5 A total pain score of 5 or above, an individual pain parameter score of 3 or a clinical concern should be escalated immediately to a clinician, as per trust guidelines, emphasising the severity and worsening of pain. These should be documented with the actions taken within the nursing documentation and medical notes.

7. Compartment Pressure Monitoring.

7.1 Tick if applicable, whether a compartment monitor is unavailable or not clinically indicated. This is to be undertaken by medical staff, who have had the training and achieved competency with the consultant or registrar.

7.2 Pressure monitors can be found in theatre 4 at LRI. If unavailable speak to the consultant for advice.

7.3 If continuous monitoring in situ, recording of pressure to be undertaken hourly and documented on the chart by medical staff.

7.4 Intermittent monitoring, recording of pressures is under the direction of the lead clinician. This must be documented on the ALCS chart and in the medical notes.

7.5 Intercompartmental pressure readings that are greater than 40 or a delta pressure that equals less than 29 should be escalated immediately to Registrar or consultant or the on call out of hours.

8. Well Limb Assessment.

8.1 Check for a pulse if able, consider casts and document accordingly.

8.2 Check the sensation of the affected limb, checking all areas of the limb and document findings. Spinal anaesthetic should wear off in 4-6 hours and nerve blocks in 12-24 hours. If reduced sensation after this timescale, escalate concerns to the clinician and document.

8.3 Check the skin colour against the unaffected limb, as able. Check the capillary refill which should take less than 3 seconds.

8.4 Any abnormalities in the assessment should be escalated immediately to the clinician and documented.

9. Consent.

9.1 Verbal consent to undertake the observations should be obtained where possible from the patient with capacity or a nominated carer and this should be documented in the patient's notes.

9.2 In the event there is any doubt, regarding capacity or competence, this should be assessed by the Patient's medical team and documented in the medical notes. If necessary an independent language interpreter should be used for this process.

10. Education and Training.

10.1 ALCS training will be co-ordinated by the Nursing Orthopaedic Trauma team to ensure best practice guidelines, teaching packages and competencies remain contemporary, centralised and disseminated accordingly.

10.2 Each clinical area that utilises ALCS chart will have a nominated cascade trainer that links in with the Nursing Orthopaedic Trauma team.

10.3 The cascade trainer will ensure all new starters to the clinical area receives training (via cascade teaching package) and competency assessment on ALCS.

10.4 All competency assessments will be recorded on an LCAT form (attached as an appendix). An electronic scanned copy will be held on the individuals file by the ward manager and the staff member to keep a copy for their professional portfolio.

10.5 Trained nurses should be reassessed every 3 years and the Orthopaedic HCAs should be reassessed annually.

10.5 Training is on HELM and is titled Acute Limb Compartment Syndrome.

11. Monitoring Compliance

Practice will be audited against these standards in order to monitor and improve practice. This will take part after a years pilot.

Key Performance Indicator	Method of Assessment	Monitoring Lead	Frequency	Reporting arrangements
All patients with an ALCS or suspected ALCS will have a chart	Audit	Sharon Chesterton/Matrons	Annual	
ALCS chart completed as per guidelines in a timely manner.	Audit	Sharon Chesterton/Matrons	Annual	
Reduction of RCA where ALCS chart not completed.	Audit	Sharon Chesterton/Matrons	Annual	

12. Supporting References

<https://www.rcn.org.uk/professional-development/publications/pub-004685>

<https://www.boa.ac.uk/standards-guidance/boasts/trauma-boasts.html>

13. Key Words

Acute Limb Compartment Syndrome; Well Limb Assessment; Neurovascular Observations

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Sharon Chesterton Discharge Liaison Nurse	Executive Lead Chief Nurse
Details of Changes made during review: New observation chart Timing of observations	

Acute Limb Compartment Syndrome Observation Chart

Patients at risk

- Tibial, forearm or high-energy distal radius fractures.
- Orthopaedic injury/intervention combined with known coagulopathies/patient taking anticoagulants.
- Crush injuries.
- High impact trauma, including open fractures.

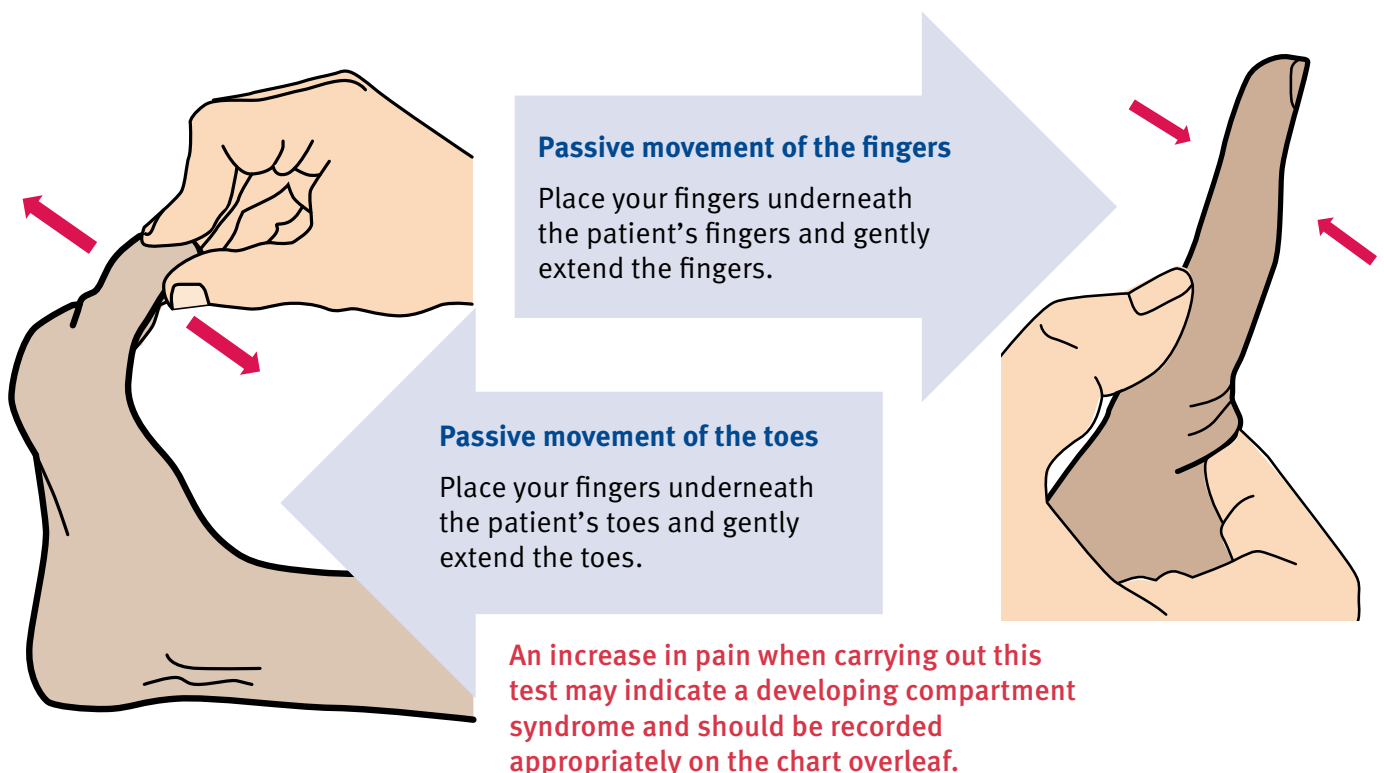
Monitor hourly for the first 24 hours. From 24 to 48 hours monitor 4 hourly. However, if suspicions arise at any point revert back to hourly monitoring.

Other patients may be monitored following individual assessment. In particular, consider the risk from newly applied traction, a restrictive cast or a tight circumferential bandage which does not allow for swelling. Patients who start reporting pain out of proportion to the injury/treatment, especially on passive movement, should also be considered for monitoring.

Pain out of proportion to the injury/treatment and pain on passive movement of the muscles of the involved compartment are the key clinical findings.

Patients who have had an anaesthetic nerve block or epidural may not be able to report the pain associated with compartment syndrome. In addition the 'pain' section should not be used in situations where the patient has an impaired ability to report this symptom, for example, when the patient is unconscious.

Changes in pulse, sensation and skin colour are late symptoms of neurovascular compromise and should not be relied upon to diagnose compartment syndrome. However, these may be recorded as part of a 'well limb' assessment.



A second chart will be required to provide a minimum of 48 hours monitoring.

Patient details	
Name:	
Hospital no.:	
Date of birth:	

Circle affected limb and select options			
Nerve block or epidural	<input type="checkbox"/>	Left leg	Left arm
Cast/traction/tight bandaging	<input type="checkbox"/>	Right leg	Right arm
A separate chart must be used for each limb being assessed			



			Date	Example																									
			Time																										
The primary symptom is pain on passive extension.	Pain	Pain at rest	0 – None	●																									
			1 – Mild																										
			2 – Moderate																										
			3 – Severe																										
		Passively extend the fingers or toes of the affected limb (see images on front of chart).	Pain on passive movement	0 – None	●																								
				1 – Mild																									
				2 – Moderate																									
				3 – Severe																									
		Pain not controlled by regular and appropriate analgesia is a key clinical finding.	Pain since last analgesia	0 – No pain/has improved	●																								
				2 – Is the same																									
				3 – Has worsened																									
				Initial		EX																							
Time next observation due			1hr																										
Score			2																										

A total pain score of 5 or above, an individual pain parameter score of 3, or a clinical concern should be escalated immediately to the responsible clinician as per trust guidelines, emphasising the severity and/or worsening nature of the pain.

	Pressures	(DBP) – (IPR) = Delta pressure	Tick if applicable:	Compartment monitor not available	Compartment monitor not clinically indicated																								
			Diastolic blood pressure (DBP)	70																									
			Intracompartmental pressure reading (IPR)	15																									
			Delta pressure	55																									
			Difference ≥30	●																									
			Difference ≤29																										
			Intracompartmental pressure reading greater than 40 or Delta pressure equal/less than 29 should be escalated immediately to the responsible clinician as per trust guidelines.																										

	Neurovascular status	Pulse (with/without doppler)	Present	●																								
			Reduced in volume or rate since last assessment																									
			Not present																									
		Sensation	Normal	●																								
			Abnormal/has changed from last assessment																									
Skin colour	Normal, responsive capillary refill	●																										
	Pallor and/or slow/absent capillary refill																											
Any abnormal neurovascular status observations should be escalated immediately to the responsible clinician as per trust guidelines.																												
Initial			EX																									

Assessment For Neurovascular Observations MSS

LCAT Assessors Recording Form:

Your Name Skill		Date	Your Signature	
Competence Category	Positive Features	Weakness / Omissions		Score
Communication and working with the patient	<p>Assess patient's psychological needs and Mental Capacity before, during and after procedure.</p> <p>Introduce self to patient and/or carer.</p> <p>Gain valid and on-going consent.</p> <p>Uses appropriate strategies for gaining trust and reducing anxiety.</p> <p>Checks patient understands the method.</p> <p>Works with patient to gain on-going co-operation</p>			<input type="text"/>
Safety	<p>Checks patient's identity prior to starting the procedure.</p> <p>Troubleshoots difficulties that may arise.</p> <p>Monitors patients' safety throughout.</p> <p>Escalate to NIC or medical team if concerns remain</p>			<input type="text"/>
Infection Control	<p>Demonstrates appropriate hand hygiene in accordance with the five moments</p> <p>Wears appropriate PPE</p> <p>Decontaminates equipment appropriately before and after use</p> <p>Disposes of waste according to policy and tidies bed-space/clinical area as appropriate</p>			<input type="text"/>
Procedural Competence	<p>Accurately undertakes Neurovascular observations.</p> <p>Demonstrate what is normal for patient.</p> <p>Demonstrate they can accurately assess for abnormalities.</p> <p>Demonstrate how to accurately document.</p> <p>Demonstrate when to escalate and who to</p>			<input type="text"/>

Assessment For Neurovascular Observations MSS

<p>Team working</p>	<p>Demonstrates limitations of own skill, competence or knowledge Demonstrates understanding of their responsibilities in being delegated the task of Neurovascular assessment Understands their role and actions once Neurovascular assessment is obtained Communicates any concerns to the appropriate person clearly and effectively Escalates concerns regarding patient's general condition and/or Neurovascular assessment to RN immediately Leaves patient zone and clinical area clean and tidy Knowledge of interventions required to stabilise the patient and prevent further deterioration</p>		<div style="background-color: #003366; color: white; padding: 10px; text-align: center;"> <input style="width: 50px; height: 20px; background-color: white; border: 1px solid white;" type="text"/> </div>
<p>Particular Strengths/weakness</p>			<div style="background-color: #003366; color: white; padding: 10px; text-align: center;"> <p>Total Score</p> <input style="width: 50px; height: 20px; background-color: white; border: 1px solid white;" type="text"/> </div>
<p>Specific strategies for Improvement</p>			

Assessors Name.....Assessors Signature.....Date.....