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| **Supplemental Appendix: McMaster PICU Practice Guidelines for Early Mobilization in Critically ill Children**  **1. Contraindications and Precautions to Mobilization in Critically ill Children** | |
| **Contraindications (Not safe to mobilize, bed repositioning only)** | |
| Hemodynamic Instability | * Hypotension (blood pressure persistently below patient’s target causing end-organ hypoperfusion) * Ongoing need for fluid resuscitation and/or escalation in vasoactive medication * Suspected/confirmed acute unstable or uncontrolled arrhythmia * Evidence of cardiac tamponade (untreated) * Acute cardiac ischemia (symptomatic and/or confirmed ECG changes) – not resolved * Acute systemic or pulmonary hypertensive crisis – not resolved and/or requiring IV anti-hypertensive therapy |
| Respiratory Instability | * Acute, impending respiratory failure, ongoing escalation in respiratory support, and/or endotracheal intubation is anticipated within the next 4 hours * Escalating intravenous bronchodilator, intravenous or inhaled pulmonary vasodilator therapy within last 4 hours   Note: (stable titration and or weaning of respiratory support and FiO2 requirements even if high, are not absolute contraindications to mobilization) |
| Neurological Instability | * Evidence of, or high suspicion for acute cerebral edema, or active management of elevated ICP with CPP not within target range * Sudden, unexplained acute deterioration in level of consciousness * Active uncontrolled seizures, or refractory status epilepticus exacerbated by active or passive mobilization activity (documented) |
| Surgical | * Uncontrolled major, active bleeding * Unstable or unstabilized pelvic or spinal fracture * Acute surgical emergency |
| **Precautions (special care, resources and attention is required during mobilization of these patients):** | |
| Cardiovascular | * Patients receiving vasoactive infusion(s): Stable or weaning doses of vasoactive agents is *not* an absolute contraindication to mobilization. There is no consensus agreement on threshold doses for which mobilization is contraindicated, hence each case should be discussed on case by case basis, with consideration of individual patient and combination of vasoactive drug(s). * Systemic or Pulmonary hypertension |
| Respiratory | * Patients receiving invasive or non-invasive mechanical ventilation * Patients with accessory muscle use and high oxygen requirements (i.e. FiO2 over 0.5) * Status post airway reconstructive surgery or fresh tracheostomy * Prone positioning during mechanical ventilation |
| Neurological/Neurosurgical | * Status post craniectomy * External ventricular drain/intracranial pressure monitor in situ * Acute spinal cord injury * Patients who are on neuromuscular blockers or present with acute muscle paralysis |
| Orthopedic /Musculoskeletal | * Strict spinal precautions in place (inline immobilization required) * Limb fractures, osteopenia * Joint laxity, hypotonicity or spasticity, specific regional/joint considerations |
| Other | * Invasive lines/catheters in situ * Continuous renal replacement therapy * Specific requirements/instructions following surgery e.g. status post skin grafts/muscle flaps, open abdomen, risk of wound dehiscence (note: these patients may have head of bed elevated and in-bed limb mobility as long as dressing seal or wound integrity can be maintained) * Visceral organ injury (e.g. high grade liver or splenic laceration) * Uncontrolled agitation and or pain, confusion, or delirium * Bleeding Diathesis * Risk of postural hypotension/autonomic dysreflexia |

IV: intravenous

ECG: electrocardiogram

CPP: cerebral perfusion pressure

**2. Definitions of Mobility and Non-mobility interventions in Critically ill Children**

*Passive*: no effort by patient

*Assisted*: some active participation by patient and with help of a therapist or assistant

*Active*: some active participation (full to partial) by the patient with or without help of therapist

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| **Intervention** | **Description** |
| **Non-Mobility** | |
| Bed Repositioning only | Activity restricted to passive position changes in bed |
| Respiratory or “chest physiotherapy” | Physical methods to improve: ventilation and V/Q matching, breathing mechanics, respiratory muscle strength and airway secretions clearance – e.g. chest wall vibrations, percussion techniques, manual facilitation of chest wall movement, manual or ventilator hyperinflation, deep breathing exercises (including blowing bubbles and incentive spirometry), and inspiratory muscle training |
| Passive Range of Motion and Stretching exercises | Therapist moves joints and stretches muscles through their full available range of motion to prevent or correct tightening of muscles or joints, which could lead to contracture formation. |
| **Mobility** | |
| Active range of motion and stretching exercises  (“AROM” or “AAROM”)  Strengthening exercises | Active movement of patient’s limbs through available range of joint motion. These movements can be independently done by patient (active ROM; “AROM”), active stretching (patient uses opposing muscle group to stretch affected group), or the patient may need assistance in order to complete the full available joint range (active-assisted ROM; “AAROM”)  Exercises to place load on muscles in order to achieve greater muscle strength. e.g by a patient actively moving a weak limb against gravity; by the therapist providing manual graded resistance to movement; by applying tension to cycling on the ergometer. |
| Neurodevelopmental play: | Goal directed activities to maintain or improve fine and gross motor development, muscle strength, thoracic mobility, coordination and balance for infants and developmentally delayed children. |
| Mobility device (e.g. In-bed cycling): | Activities done with a device that facilitates functional limb movement, range of motion and strengthening e.g. cycle ergometer. May be active or passive, and executed in the supine patient. May be conducted in lower or upper limbs. |
| Bed Mobility | Functional activities done while patient is recumbent in bed, but require the active participation of the patient; e.g. active or active- assisted repositioning in bed; rolling from side to side; and bridging (i.e. supine with pelvic or hip lifts), does not involve moving out of bed or over the edge of the bed. |
| Transfers:  Transfer from lying to sitting at edge of bed  Transfer from bed to/from chair  Transfer from Sitting to/from standing | These activities may be active or passive, may occur with varying degrees of caregiver assistance and supervision, or may be performed independently.  Sitting at of bed, with or without caregiver support as needed.  Transfers from bed to chair, wheelchair or a neuro-chair, using mechanical lift, sliding board, caregiver assistance through patient pivoting, stepping or shuffling to the chair/wheelchair or commode.  The patient is able to get from sitting to/from standing with supervision or assistance. |
| Sitting Tolerance | Patient tolerates transfers from bed to a bedside chair or wheelchair, and is able to tolerate sitting tilted or upright, for periods of time (i.e. for at least 30 minutes). |
| Crawling | Crawling with/without assistance |
| Pre-gait activities | Exercises prior to ambulation, conducted with or without assistance e.g. moving from seated to a standing position, weight shifting from foot to foot, stepping in place, and sideways stepping. |
| Ambulation | Walking away from bed or chair (i.e. on each foot) with or without assistance from a therapist or a gait aid (e.g. walker). |
| Activities of daily living | e.g. face washing, oral hygiene, dressing. May occur with varying degrees of caregiver assistance. |

ROM range of motion, AROM active range of motion, AAROM active assisted range of motion, V/Q ventilation/perfusion

Adapted with permission from: Choong K, Canci F, Clark H, Hopkins RO, Kudchadkar SR, Lati J, et al. Practice Recommendations for Early Mobilization in Critically ill Children. Journal of Pediatric Intensive Care. 2017; 00:1-12.