**APPENDIX 2: Motomed Letto 2 Cycling Protocol**

Cycling will be performed for **45 minutes per session** using the Motomed Letto 2 cycle.

**How to Detect Active Cycling (all criteria are required to occur simultaneously):**

1. Active cycling time will be displayed on screen
2. While patient is actively cycling, there is a moving bike icon on the screen
3. While patient is actively cycling, actual cycling speed displayed on screen is greater than the default setting of 10 or 25 rpm

***Training will occur in 3 Phases according to the 3 Steps below:***

**I: ASSESSMENT PHASE** (*10 minutes*):

1. Using the following **Initial Settings**:

Spasm control: off; Default speed: 10 rpm

1. Initial gear setting: 0 (this is default gear)
2. Vigorously verbally encourage the patient to cycle – the goal is to maximize the duration that the patient spends actively cycling.
3. At the end of 10 minute interval, determine the ***duration of active cycling***
4. if ***>5 minutes,*** move to ***Active Interval 1 [Step IIA (2)]***.
5. if ***<5 minutes***, move to ***Assisted Interval 1 [Step IIB (2)]***.

**IIA: ACTIVE INTERVALS** (*3 intervals of 10 minutes* each; *30 minutes total*):

1. Vigorously verbally encourage the patient to actively cycle during all intervals.
2. **Active Interval 1** (*10 minutes*): Select the gear
3. Start at Gear 1 If today is the first day of the intervention ***OR***
4. Start at Gear 1 If the highest gear achieved for >5 minutes in one interval on the prior day’s intervention was **<2 *OR***
5. *Start at one gear lower than the highest gear achieved for* >5 *minutes in one interval* on the prior day’s intervention when the **highest gear achieved was >3** (i.e. Yesterday patient cycled at gear 5 for 6 minutes, today patient starts at gear 4)
6. At the end of 10 minute interval, determine *duration of active cycling* during this interval using this calculation:

**Cumulative Active Cycling Minutes at MINUS Cumulative Active Cycling Minutes**

**end of *current* interval at end of *prior* interval**

1. If the duration of active cycling is:
2. ***>5 minutes***, move to ***Active Interval 2*** [***Step IIA (5)***].
3. ***<5 minutes****,* move to ***Assisted Interval* *2-A*** [***Step IIB (3)***].
4. **Active Interval 2** (*10 minutes*): *Increase the Gear by 1* for and repeat step (3). If the duration of active cycling is:
5. ***>5 minutes***, move to ***Active Interval 3-A*** [***Step IIA (6)***],
6. ***<5 minutes****,* move *to* ***Assisted Interval 3-A*** [***Step IIB (5)***]
7. **Active Interval 3A** (*10 minutes*): Increase the Gear by 1 and repeat step (3).
8. **Active Interval 3B** *(10 minutes)*: Select the gear
9. Start at Gear 1 If today is the first day of the intervention ***OR***
10. Start at Gear 1 If the highest gear achieved for >5 minutes in one interval on the prior day’s intervention was **<2 *OR***
11. *Start at one gear lower than the highest gear achieved for* >5 *minutes in one interval* on the prior day’s intervention when the **highest gear achieved was >3** (i.e. Yesterday patient cycled at gear 5 for 6 minutes, today patient starts at gear 4)

**IIB:** **ASSISTED INTERVALS** (*3 intervals of 10 minutes* each; *30 minutes total*):

1. Vigorously verbally encourage the patient to actively cycle during all intervals
2. **Assisted Interval 1** (*10 minutes*):
3. Increase speed to 25 RPM with Gear set at 0
4. Do not assess for active cycling
5. Move to ***Assisted Interval 2-B [Step IIB (5)]***
6. **Assisted Interval 2-A** *(10 minutes):*
	1. Keep speed at 10 RPM
	2. Decrease gear by 1.
7. Determine duration of active cycling [as defined in ***Step IIA (3)*** above]. If duration of active cycling is:
	* 1. **>5 minutes**, move to **Active Interval 3-A** [***Step IIA (6)***]
		2. **<5minutes**, move to **Assisted Interval 3 A** [***Step IIB (6)***]
8. **Assisted Interval 2-B** (*10 minutes*):
9. Decrease speed to 10 RPM
10. Keep gear at 0.
11. Determine duration of active cycling [as defined in ***Step IIA (3)*** above]. If duration of active cycling is:
	* 1. **>5 minutes**, move to **Active Interval 3-B** [***Step IIA (7)***]
		2. **<5minutes**, move to **Assisted Interval 3B** [***Step IIB (7)***]
12. **Assisted Interval 3A**  (*10 minutes*):
	1. Decrease Gear by 1
	2. If already at Gear 0, then increase speed to 25 RPM
13. **Assisted Interval 3B** *(10 minutes)*:
	1. **Increase speed to 25 RPM with Gear set at 0.**

**III: COOL DOWN Phase** (*5 minutes*):

* 1. Revert to Initial Settings (spasm control off; 10 RPM, gear set at 0).
	2. Encourage slow-paced active cycling.

**Assessment Phase**

* ***Gear 0***
* ***Speed: 10 RPM***
* ***10 minutes***

***Vigorously verbally encourage the patient to actively cycle during each interval***

**Active Cycling >5 minutes?**

**minutes?**

**NO**

**YES**

**Assisted Interval 1**

* ***Gear 0***
* ***Speed: Change to 25 RPM***
* ***10 minutes***

***10 minutes***

**Active Interval 1**

* ***Gear: See below for Starting Gear\****
* ***10 minutes***

**Active Cycling >5 minutes?**

**minutes?**

**NO**

**Do not assess for active cycling**

**minutes?**

**YES**

**Assisted Interval 2-B**

* ***Gear 0***
* ***Speed: Change to 10 RPM***
* ***10 minutes***

***10 minutes***

**Active Interval 2**

* ***Gear: Increase Gear setting by 1***
* ***10 minutes***

**Assisted Interval 2-A**

* ***Gear: Decrease Gear setting by 1***
* ***10 minutes***

**Active Cycling>5 minutes?**

**minutes?**

**Active Cycling >5 minutes?**

**minutes?**

**Active Cycling >5 minutes?**

**minutes?**

**NO**

**NO**

**NO**

**YES**

**YES**

**YES**

**Assisted Interval 3-B**

* ***Gear 0***
* ***Speed: Change to 25 RPM***
* ***10 minutes***

**Active Interval 3-A**

* ***Gear: Increase by 1***
* ***10 minutes***

**Active Interval 3-B**

* ***Gear: See below for Starting Gear\****
* ***10 minutes***

**Assisted Interval 3-A**

* ***Gear: Decrease by 1***
* ***If already at Gear 0, Change to 25 RPM***
* ***10 minutes***

**Cool Down Interval**

* ***Gear 0***
* ***Speed: 10 RPM***
* ***5 minutes***

**\***Starting Gear:

If today is the first day of the intervention, use Gear 1; Otherwise:

|  |  |
| --- | --- |
| Highest gear achieved >5 min. during a completed 10 min. active interval on prior day | Starting gear |
| < 2 | 1 |
| > 3 | 1 gear lower than highest gear achieved\*\*  |

(i.e. \*\*Yesterday patient cycled at gear 5 for 6 minutes, today patient starts at gear 4)

|  |
| --- |
| **SAFETY TO COMMENCE / CONTINUE IN-BED CYCLE ERGOMETRY EXERCISE SESSION****\*\*If any condition below is present for >15 minutes duration within the 2 hours prior to a cycling session, the session should not be started at that time. If any condition, below, occurs during cycling session, the session should be stopped.** |
| **Heart Rate** | 1= HR <50 beats/minute2= HR >140 beats/minute3= And/or develops new arrhythmia (including new onset atrial fibrillation) |
| **Other Cardiovascular** | 1= New onset chest pain of potential cardiac origin2= Presence of extracorporeal membrane oxygenation (ECMO) or intra-  aortic balloon pump (IABP) |
| **Blood Pressure** | 1= MAP <65 mmHg or below target MAP level (whichever is lower)2= MAP >120 mmHg or above target MAP level (whichever is higher)4= Patient requires 1 vasopressor at >50% of maximum dose or ≥2  vasopressors at 40% of maximal dose5= A clinically important increase in vasopressor dose 6= Patient becomes pale/sweaty or requests to stop due to feeling unwell |
| **Respiratory** | 1= Fi02 >0.82= PEEP >15 cmH203= SpO2 falls >10% below resting level or <85% of target level for >60  seconds |
| **Other Reason** | 1= New diagnosis of a pulmonary embolus or deep vein thrombosis in leg  without therapeutical anti-coagulation for >36 hours2= Assessed by medical staff as approaching imminent death or withdrawal  of medical treatment 3= Temperature >41˚C or <34˚C4= Muscle inflammation (e.g., rhabdomyolysis, myositis, neuroleptic  malignant syndrome, or serotonin syndrome)5= Pressure ulcer (grade 3 or 4) in body region in contact with cycle 6= Lactate >3.0 mmol/L that is unexplained and not decreasing7= Creatine kinase >400 U/L that is unexplained and not decreasing8= Platelets <20,000/mm3 unless approved by ICU medical staff9= Infusion or bolus dosing of neuromuscular blocking agent |