

**Penn State College of Medicine
Continuing Education**

**Expanding ECMO Horizons: Shock and Temporary
Mechanical Circulatory Support**

Friday, Nov. 14, 2025

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**Any names or ages used on the upcoming slides are fictitious
and not referring to an actual patient.**



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Early Mobilization and Collaborative Care of the ECLS Patient

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Benefits of Early Mobility/Activity in the ICU

- Reduced intensive care unit-acquired weakness (ICU-AW)
 - Bilateral symmetrical limb weakness and/or neuromuscular weakness
 - Occurs within first 10 days of ICU admission, onset as early as day 2 in the ICU
- Enhanced cognitive and functional recovery
- Improved muscle strength
- Decreased delirium

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Benefits of Early Mobility/Activity in the ICU

- Decreased duration of mechanical ventilation
- Decreased ICU and hospital length of stay
- Decreased mortality rate
- Improved post-ICU quality of life
- Reduced post-intensive care syndrome (PICS)

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What Does the Research Say?

- Studies have found that it is feasible and safe to deliver rehabilitation to patients on ECMO support (Wells et al., 2018)
- There are low incidences of complications and major events during exercise with patients on ECMO support (Kourek et al., 2022)
- Patients have improved functional outcomes when PT/OT is initiated within 8 days of VV ECMO cannulation (Cerier et al., 2023)






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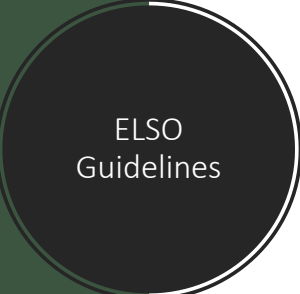
What Does the Research Say?

- Despite the benefits of ambulation protocols, an international survey showed only 20% of the 209 transplant centers worldwide used a protocol to support ECMO mobilization practices (Obreja et al., 2025)
- Due to this variability of ECMO ambulation protocols being reported, this is an area of a knowledge gap, and an opportunity for a quality improvement initiative (Obreja et al., 2025)

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ELSO GUIDELINE FOR REHABILITATION ON ECMO

Staged Rehabilitation or Mobilization Protocol for Patients on ECMO						
Stage	Patient Description	Activity	Equipment	Progress	Regress	Examples
0 PASSIVE Bed level Activity/ Passive Sitting or Standing	<ul style="list-style-type: none"> • Patient not fully awake, unable to follow commands consistently • Patient unable to lift UE/LE against gravity and unable to assist with movement in bed 	<ul style="list-style-type: none"> • Bed level AAROM/PROM • Rolling • Limb positioning • Extremity edema control • Long sitting • Dependent transfer to seated surface (overhead lift/lateral slide) • Passive Standing on tilt bed/table 	<ul style="list-style-type: none"> • Cardiac Chair • Airway clearing device • Positioning slings • Mechanical lifts • Standing Bed/Tilt Table 	<p>PROGRESS TO STAGE 1 I.E.</p> <ul style="list-style-type: none"> • Patient Tolerates Stage 0 Activity (Bed mobility and Passive Sitting/standing) • Demonstrates initiation of motor tasks • Follows safety commands 	<p>REASSESS STAGE 0 IN 24 HOURS I.E.</p> <ul style="list-style-type: none"> • Patient does NOT tolerate Stage 0 Patient intolerant of any stimulation 	
1 ACTIVE Sitting	<ul style="list-style-type: none"> • Patient awakens to voice or physical stimulation. • Follows basic motor and safety commands inconsistently. 	<ul style="list-style-type: none"> • Sitting edge of bed/Dangling • Supine or Sitting UE/LE exercise • Sitting balance activities • Mechanics of breathing • Postural Re-education • Dependent transfer to seated surface (overhead lift/lateral slide) 	<ul style="list-style-type: none"> • Cardiac Chair • Thera-band/Free Weights • Incentive spirometer • Airway clearing devices • Stationary bike • Leg Press Table • Positioning slings • Mechanical lifts 	<p>PROGRESS TO STAGE 2 I.E.</p> <ul style="list-style-type: none"> • Patient Tolerates Stage 1 Activity (Active Sitting) • Able to sit unsupported >10 seconds 	<p>REASSESS STAGE 1 IN 24 HOURS</p> <p>REGRESS TO STAGE 0 I.E.</p> <ul style="list-style-type: none"> • Patient does NOT tolerate Stage 1 Activity 	
2 ACTIVE Static Standing	<ul style="list-style-type: none"> • Patient awakens to voice or physical stimulation. • Follows basic motor and safety commands. 	<ul style="list-style-type: none"> • Functional sit to stand transfer • Standing (static) balance activities • Squat/Stand-Pivot Transfer to Bedside Chair • Mechanics of breathing • Postural Re-education 	<ul style="list-style-type: none"> • Tilt Table/standing bed • Bedside Chair • Thera-band/Free Weights • Incentive spirometer • Airway clearing devices • Standing Assist Devices 	<p>PROGRESS TO STAGE 3 I.E.</p> <ul style="list-style-type: none"> • Patient Tolerates Stage 2 Activity (Static Standing) • Able to stand with/without assist device >10 sec. 	<p>REASSESS STAGE 2 IN 24 HOURS</p> <p>REGRESS TO STAGE 1 I.E.</p> <ul style="list-style-type: none"> • Patient does NOT tolerate Stage 2 Activity 	
3 ACTIVE Dynamic Standing	<ul style="list-style-type: none"> • Patient awake and alert. • Follows all motor and safety commands consistently. 	<ul style="list-style-type: none"> • Transfer training • Pre-gait activities • Standing (dynamic) balance activities- Weight shift/marching • Standing UE/LE exercise at EOB or using lift table/standing bed • Transfer from bed to chair • Mechanics of breathing • Postural Re-education • Standing Assist Devices 	<ul style="list-style-type: none"> • Tilt Table/standing bed • Bedside Chair • Thera-band/Free Weights • Incentive spirometer • Airway clearing devices • Standing Assist Devices 	<p>PROGRESS TO STAGE 4 I.E.</p> <ul style="list-style-type: none"> • Patient Tolerates Stage 3 Activity (Dynamic Standing) • Able to complete pre-gait activities with/without assist device >30 seconds 	<p>REASSESS STAGE 3 IN 24 HOURS</p> <p>REGRESS TO STAGE 2 I.E.</p> <ul style="list-style-type: none"> • Patient does NOT tolerate Stage 3 Activity 	
4 ACTIVE Ambulation	<ul style="list-style-type: none"> • Same as above 	<ul style="list-style-type: none"> • Gait training • Standing (dynamic)Balance activities • Standing UE/LE Exercises • Standing on tilt table/standing bed with progression to gait training 	<ul style="list-style-type: none"> • Tilt Table/standing bed • Bedside Chair • Thera-band/Free Weights • Standing Assist Devices 	<p>INCREASE TIME/DISTANCE OF AMBULATION AND DECREASE ASSIST I.E.</p> <ul style="list-style-type: none"> • Patient Tolerates Stage 4 Activity (Gait) 	<p>REASSESS STAGE 4 IN 24 HOURS</p> <p>REGRESS TO STAGE 3 I.E.</p> <ul style="list-style-type: none"> • Patient does NOT tolerate Stage 4 Activity 	



Protocol at HMC

- Early PT and OT orders on all ECMO patients
- Adapted ELSO Staged Rehabilitation/Mobilization Protocol for Patients on ECMO
- Stages 0-4

ECMO Mobility Stage 0

PASSIVE

Bed level activity

PATIENT DESCRIPTION

- Not fully awake
- Unable to follow commands
- Unable to assist with movement in bed

ACTIVITY

- Bed level AAROM/PROM
- Bed level ADLs
- Rolling
- Limb positioning
- Edema control
- Gradual HOB elevation
- Begin verticalization

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ECMO Mobility Stage 1

ACTIVE

Sitting

PATIENT DESCRIPTION

- Awakens to voice or physical stimulation
- Follows basic commands inconsistently

ACTIVITY

- Bed in chair position
- Sitting EOB
- Seated ADLs
- Supine or seated exercises
- Dependent transfer to chair
- Progress verticalization

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ECMO Mobility Stage 2

ACTIVE

Static standing

PATIENT DESCRIPTION

- Awakens to voice or physical stimulation
- Follows basic commands

ACTIVITY

- Sit to stand transfers
- Static standing activities
- Squat/stand pivot transfer to chair & commode
- Progress verticalization

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ECMO Mobility Stage 3

ACTIVE

Dynamic standing

PATIENT DESCRIPTION

- Awake and alert
- Follows all commands consistently

ACTIVITY

- Stand pivot transfers with RW
- Pre-gait activities
- Dynamic balance activities
- ADLs in standing
- Standing exercises

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ECMO Mobility Stage 4



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Protocol at HMC

- Staff required to initiate **active** mobility (Stages 1-4)
 - Rehab professional (PT and/or OT) – must be present during 1st attempt OOB
 - Competent ECMO RN
 - Advanced ECMO RN
 - RT
 - Provider – must be available on unit or at bedside

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Team Roles

- PT – addresses LE strength, balance, gait-training, functional mobility
- OT – addresses UE strength, cognition, vision, emotional regulation, positioning, functional activity and mobility
- RN- Address mobility status on rounds, ensure cannulation site is stable (no bleeding/sutures intact), determine patient specific STOP criteria with APP(MAP >65, FLOW > 3), prepare patient with any pre-medications and explaining expectations to minimize anxiety, and coordinate/collaborate with multidisciplinary team (PT/OT, APP, RT, ECMO Champion)
- EVERYONE - ensures patient safety and stability as they gradually increase upright activity/mobility through closed loop communication and continual patient assessment!

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Considerations Prior to Mobility

- Discuss mobility status on rounds (“which mobility stage are we at today?”)
- Determine patient specific STOP criteria and establish STOP protocol
- Ensure patient readiness for upright mobility/activity participation
- Acknowledge movement restrictions based on cannulation site

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Concluding Thoughts

- Redefining HMC's protocol for early activity/mobility with ECMO patients
- Advocating for early therapy orders to reduce lapses in care and improve functional outcomes
- Multidisciplinary approach to ensure patient safety and stability through progression of ECMO mobility stages

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References

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