Mobilizing Patients on ECMO

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Daily activity maintains physical function
Consequences of Prolonged Bed Rest

- Bed sores, venous thrombosis
- Muscle atrophy
- Profound ICU acquired weakness
- Deconditioning (Weaning)
- Poor long term outcomes QOL
Early Mobility
Helene Campbell

- 21 y.o. lung Tx recipient raising awareness for organ donation
What about our ECLS patients?
ECLS: The Past

- 1 to 3 patients per year
- Sedated, unresponsive
- PROM (not femoral)
- Rehab began after removal of ECLS (weeks to months)
ECLS: Today

- Up to 3 to 5 ECMO patients any given week, 1 or 2 participating in active rehab

- Some are awake, liberated from MV, ambulating on treadmill or hallway, up in chair 2-6 hrs
ECLS Mobility

- 46 y.o. male
resp failure, rupt abdo abscess, ARDS
req. VV ECMO via R IJ Avalon

- Marching on spot, t/f chair
Types of ECLS

- VV ECMO - CO₂, O₂
- VA ECMO - CO₂, O₂, Hemodynamic
- NovaLung - CO₂
- HemoLung - CO₂ *New
Cannula Types

- Single
  - Typically req’s femoral

- Bi-caval (Avalon)
  - Position critical
  - Allows mobility
Cannulation Sites

- Central (open chest procedure)
- Internal Jugular
- Subclavian (No shoulder flex/abd)
- Femoral (No hip flexion, no sitting)
ECMO Device

- Display monitor
- Blender/gas sweep
- Pump console
- Centrifugal pump
- Oxygenator
- Heat exchanger
VV ECMO Circuit via R IJ Avalon
Not all ECMO patients are appropriate for early mobility

- Depends on circumstances of their admission
- LOC, ability to participate
- Physical condition, capability, activity tolerance
- General medical stability
- Stable on ECMO (hemodynamic, pO₂, pCO₂, no bleeding)
- Goals of care
Guidelines for Mobility
(any ICU patient)

- Awake, obeys commands, adequate strength
- Cardiac stability
  - HR 50 - 140 bpm
  - No serious arrhythmias or MI in past 24 hrs
    (Trops trend down)
- Hemodynamically stability
  - SBP 80 - 180 mmHg
  - MAP > 65 mmHg
  - Low dose inotropes, stable trend
- No significant bleeding past 24 hrs
  - Plt > 20, INR < 3, afebrile T<39°C
Guidelines for Mobility
(any ICU patient)

• Respiratory stability - (?mech vent)
  • Resting FiO₂ < 80 - 90% (any room to increase FiO₂?)
  • pO₂ > 60 mmHg
  • pCO₂ < 80 mmHg (exception: gradual acclimatization)
  • pH > 7.25
  • RR < 40 bpm

• Other factors
  • Anxiety
  • N+V
  • Delirium
ECMO Variables

- Flow 0 - 5 (10 lpm EXCEPTIONAL)
- Gas Sweep 0 - 10 (CO₂ elimination)
- ACT levels 160 - 180 sec
- Trend over past 12 - 24 hrs
Procedure

- Plan mobility session (think about contingency plans)
- Assemble personnel
- Set-up room
- Minimize and clear lines + tubes
- Designate roles for each team member:
  - MD available on standby
  - PT manages patient
  - Perfusionist manages ECMO circuit and cannula
  - RN manages IV poles, tubing, bed, chair or guards the patient
- Mobilize in stages (HOB, Dangle, Stand, Step etc)
Walk in Hallway
Room Set-up

- Treadmill positioned perpendicular to bed
Case 1

- 47 y.o. female end-stage COPD emphysema VV ECMO via R IJ bridge to transplant
Case 1

- 47 y.o. female end-stage emphysema
- VV ECMO via R IJ bridge to transplant
Case 1

- Up in chair 2-6 hrs/day
Case 2

- 22 y.o. male prev DLTx deteriorating, placed on VV ECMO via R IJ Avalon as bridge to re-transplantation

- Ambulating daily on treadmill and up in chair
Case 2

• 22 y.o. male prev DLTx deteriorating, placed on VV ECMO via R IJ Avalon as bridge to re-transplantation

• Ambulating daily on treadmill and up in chair
Case 3 • 29 y.o. male on VV ECMO via R subclavian cannula x 3 months before re-transplantation
Case 3 • 29 y.o. male on VV ECMO via R subclavian cannula x 3 months before re-transplantation
Case 3

- Petal bike
  5-10 mins/day
Case 3

- Discharge - going home and ambulatory!
Case 3

- Enjoying life again!

Halloween and Charity Cycling Event
Case 4 • 44 y.o. female VA ECMO via R femoral cannula
Case 4

- 44 y.o. female VA ECMO via R femoral cannula
Case 5

- 36 y.o. female ARDS
Case 5

- 36 y.o. female ARDS
- VV ECMO via R IJ Avalon
- $pO_2 = 54$ mmHg
- Blood oozing at every site
- Hemoptysis
- Never stable on ECMO
Case 5

- PROM, NMES
- Rehab post ECMO
Case 5

- Home after 8 weeks
Case 5

- Visiting MSICU ten months later
Case 6

- Rehab after 5 weeks on ECMO and complete bed rest
Case 6

- Rehab after 5 weeks ECMO and complete bed rest
Conclusion

- Earlier you start the better, weakness becomes worse prolonged bed rest
- Need good team dynamics, collaboration
- Proper screening and troubleshooting select candidates
- Exercise tolerance may vary day to day
- Mobilizing ECLS patients can be done safely

- Thank you!