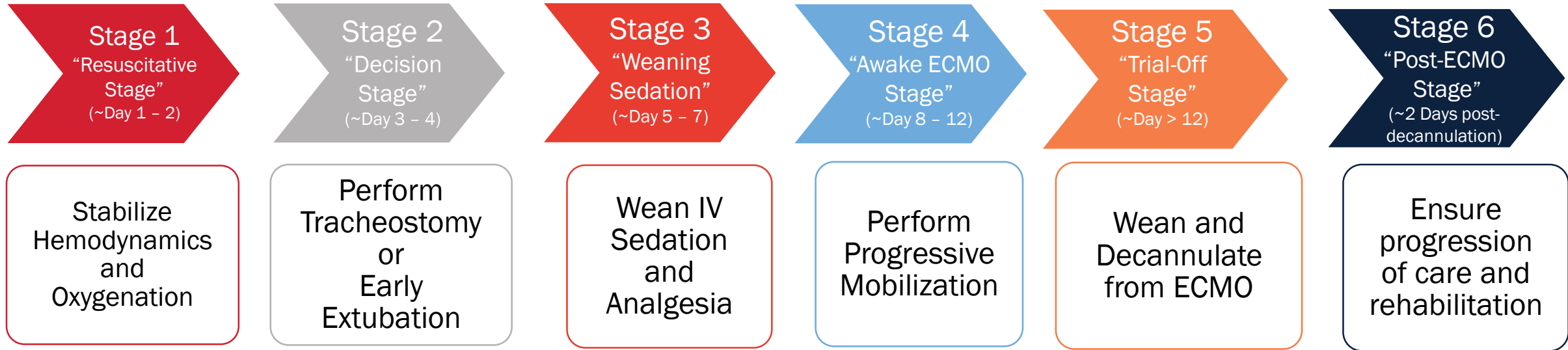


# VV ECMO Expected Progression

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# VV ECMO EXPECTED PROGRESSION - STAGES



# VV ECMO EXPECTED PROGRESSION - STAGES

Stage 1

“Resuscitation Stage”

(~Day 1 – 2)

# STAGE 1 – Resuscitation Stage (~Day 1 – Day 2)

## Goal:

- Stabilize any metabolic, oxygenation and hemodynamic derangements

## Focus:

- Optimize ECMO settings to improve oxygenation and CO2 removal
- Establish rest vent settings
- Optimize sedation
- Turn off nitric oxide and paralytic

# STAGE 1 – Resuscitation Stage (~Day 1 – Day 2)

## IV SEDATION AGENT (PICK ONLY ONE):

- Propofol
- Precedex
  - Do not use if patient on paralytic

## IV PAIN AGENT (PICK ONLY ONE):

- Morphine
- Hydromorphone

## PRN IV SEDATION/PAIN MEDICATIONS:

- Ativa IVP (only for 1<sup>st</sup> 24hrs)
- Hydromorphone IVP
  - Preferred if patient is on renal failure
- Morphine IVP q2h IVP
  - Preferred if patient is not in renal failure

# STAGE 1 – Resuscitation Stage (Day 1 – Day 2)

## SCHEDULED PO MEDICATIONS

- Acetaminophen
- Oxycodone
- Quetiapine (monitor QTC q4h)
- Gabapentin
  - Adjust dosing for AKI
- Propranolol

## PRN PO MEDICATIONS

- None

# STAGE 1 – Resuscitation Stage (Day 1 – Day 2)

## VENT SETTINGS:

- PCV
- RR 10
- Pi 10 cmH<sub>2</sub>O
  - Vt should not exceed 4-6ml/kg IBW
- PEEP 15
  - May decrease PEEP to 10 if patient has a PTX with continuous leak
- FiO<sub>2</sub> 40%
  - Goal to maintain SpO<sub>2</sub> > 85%\*\*

**\*\* DO NOT TOUCH VENT \*\***

Clinical worsening of oxygenation or CO<sub>2</sub> elimination should be addressed by adjusting the level of ECMO support and not changing the ventilator settings.

## PROGRESSIVE MOBILITY:

- PROM / AROM
- Utilize WAVE bed

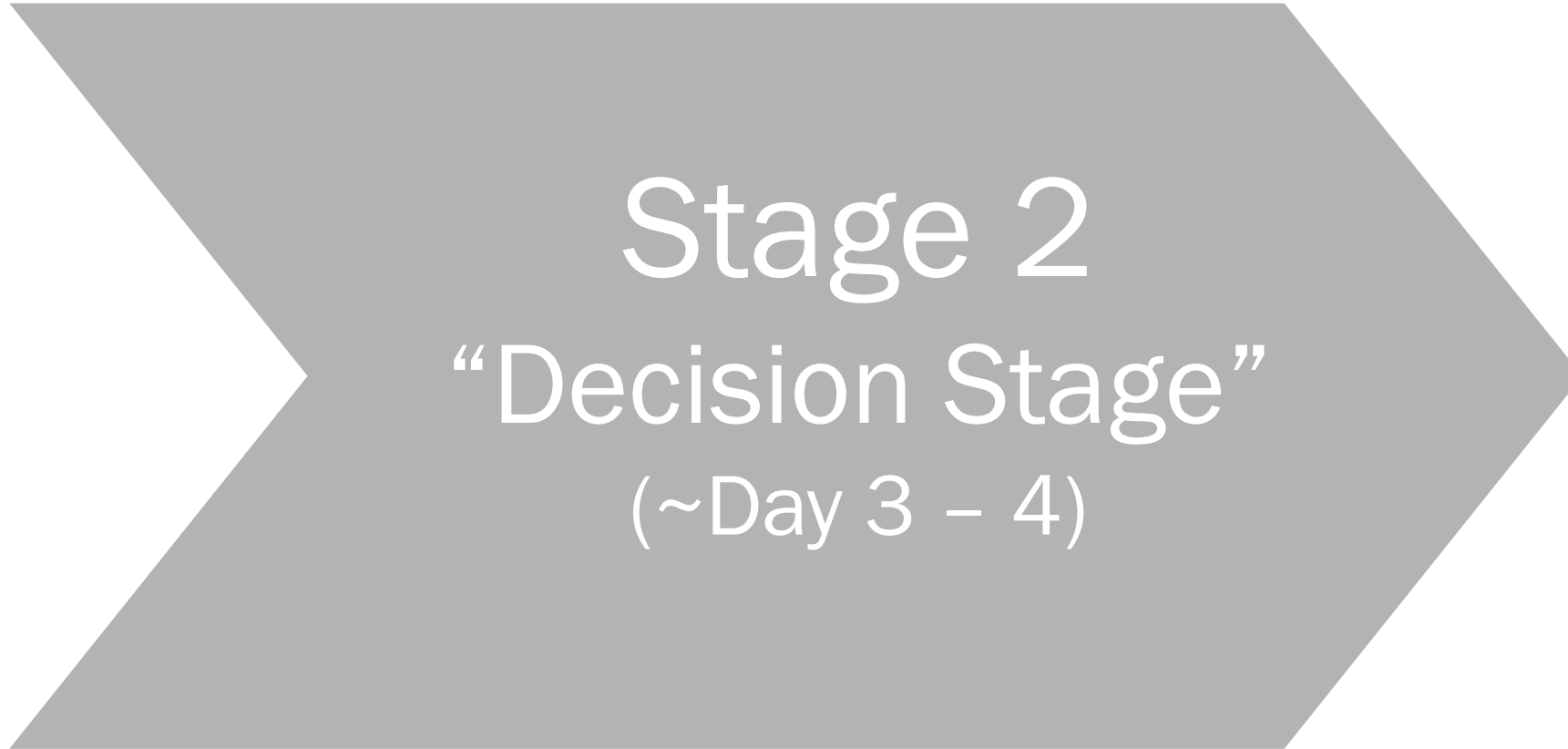
## NUTRITION:

- Start “trickle” tube feeds (HOLD if no BS)
- Start BOWEL regimen

## DIURESIS:

- No diuresis first 24 hours
- Start Lasix drip protocol after 24 hours and no ECMO flow issues
  - GOAL I&O = NET EVEN (first 24 hours)

# VV ECMO EXPECTED PROGRESSION - STAGES





# STAGE 2 – Decision Stage (~Day 3 – Day 4)

## Goal:

- Perform tracheostomy

OR

Pursue early extubation on ECMO

## Focus:

- Perform tracheostomy if:

- On MCV for 5 days or greater

OR

- On high ECMO Support

- Flows > 4LPM, FiO<sub>2</sub> > 80%, Sweep > 4

AND

- Expected ECMO run is going to be greater than 5 days

- If not candidate for tracheostomy then pursue early extubation on ECMO

# STAGE 2 Decision Stage (Day 3 – Day 4)

## IV SEDATION AGENT (PICK ONLY ONE):

For Tracheostomy:

- Same as STAGE 1

For Early Extubation:

- Begin STAGE 3 (“Wean Sedation”)

## IV PAIN AGENT (PICK ONLY ONE):

For Tracheostomy:

- Same as STAGE 1

For Early Extubation:

- Begin STAGE 3 (“Wean Sedation”)

## PRN IV SEDATION MEDICATIONS:

- Same as STAGE 1
- Ensure PRN Ativan is discontinued

# STAGE 2 – Decision Stage (Day 3 – Day 4)

## SCHEDULED PO MEDICATIONS

- Same STAGE 1
- Add Melatonin at night

## PRN PO MEDICATIONS

- Add Oxycodone PRN breakthrough pain/agitation

# STAGE 2 – Decision Stage (Day 3 – Day 4)

## VENT SETTINGS:

- Same as STAGE 1

## PROGRESSIVE MOBILITY:

- PROM / AROM
- Bed in chair position BID
- Utilize WAVE Bed

## NUTRITION:

- Advance tube feedings as tolerated
- Adjust BOWEL regimen based on output

## DIURESIS:

- Continue Lasix drip protocol
  - Goal I&O = 1 to 1.5 L negative per day

# VV ECMO EXPECTED PROGRESSION - STAGES

Stage 3

“Weaning Sedation”

(~Day 5 – 7)

# STAGE 3 – Weaning Sedation Stage (~Day 5 – Day 7)

## Goal:

- Wean IV sedation to off

## Focus:

- Attempt Spontaneous Breathing Trials (SBTs)

# STAGE 3 – Weaning Sedation Stage (~Day 5 – Day 7)

## SEDATIVE AGENT (PICK ONLY ONE):

- Off Propofol
- Continue Precedex at low dose

## PAIN AGENT (PICK ONLY ONE):

- Off narcotic drips

## PRN SEDATION MEDICATIONS:

- Same as STAGE 2
- Add Haldol IVP

## CONSIDER

- Zyprexa IV or PO PRN
- Clonidine PO PRN

# STAGE 3 – Weaning Sedation Stage (~Day 5 – Day 7)

## SCHEDULED PO MEDICATIONS

- Same STAGE 2

## PRN PO MEDICATIONS

- Same as STAGE 2
- Add Clonidine PO

## FOR SUSTAINED HTN & TACHYCARDIA

- Cardene drip for SBP > 150
- Esmolol drip for HR > 100
  - Only if elevated CO is interfering with oxygenation



# STAGE 3 – Weaning Sedation Stage (~Day 5 – Day 7)

## VENT SETTINGS:

### For Tracheostomy Patients:

- Perform Recruitment Maneuvers
  - Change ventilator to recruitment settings
  - Attempt for 20min every 4 hours

### For Early Extubation Patients:

- Perform SBT
  - Begin with High CPAP trials (PS 20/PEEP10) and continue to walk down to PS 5/PEEP 5 as tolerated to extubate.

### For Both Patients:

- Monitor for HARD STOP Criteria continuously
- Rest at Night

## PROGRESSIVE MOBILITY:

- PROM / AROM
- Tilt patient as tolerated QID
- Utilize Vital Go Tilt table

## NUTRITION:

- Advance tube feedings as tolerated / Swallow study for extubated patients to determine diet
- Adjust BOWEL regimen based on output

## DIURESIS:

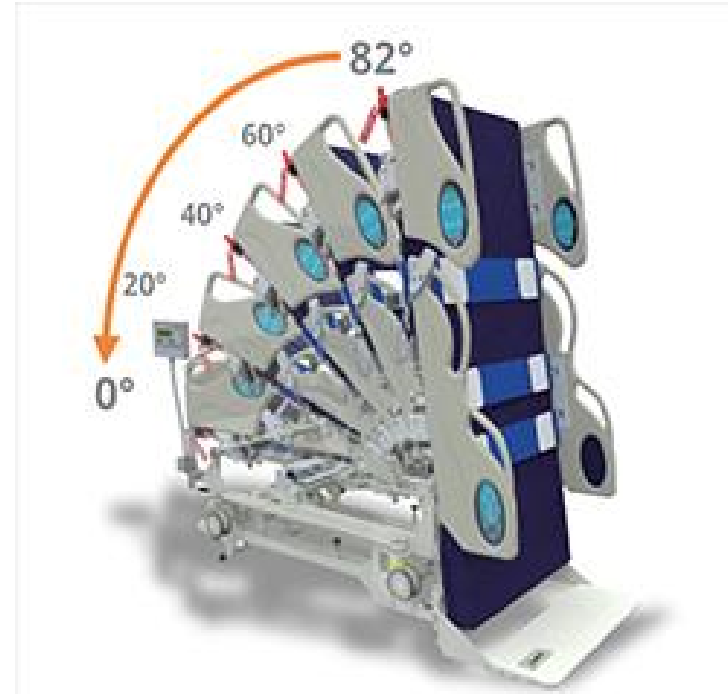
- Continue Lasix drip protocol
  - Goal I&O = Even to -500ml (based on patient condition)

# HARD STOP CRITERIA



- Sustained HR > 150 bpm
- MAP < 65 mmHg
- Sustained SpO2 < 85%
- Plat Pressures > 30 mmHg
- Minute Ventilation > 15l/min

# WAVE Bed vs Vital Go



**Stage 1**  
“Resuscitation Stage”  
(~Day 1 – 2)

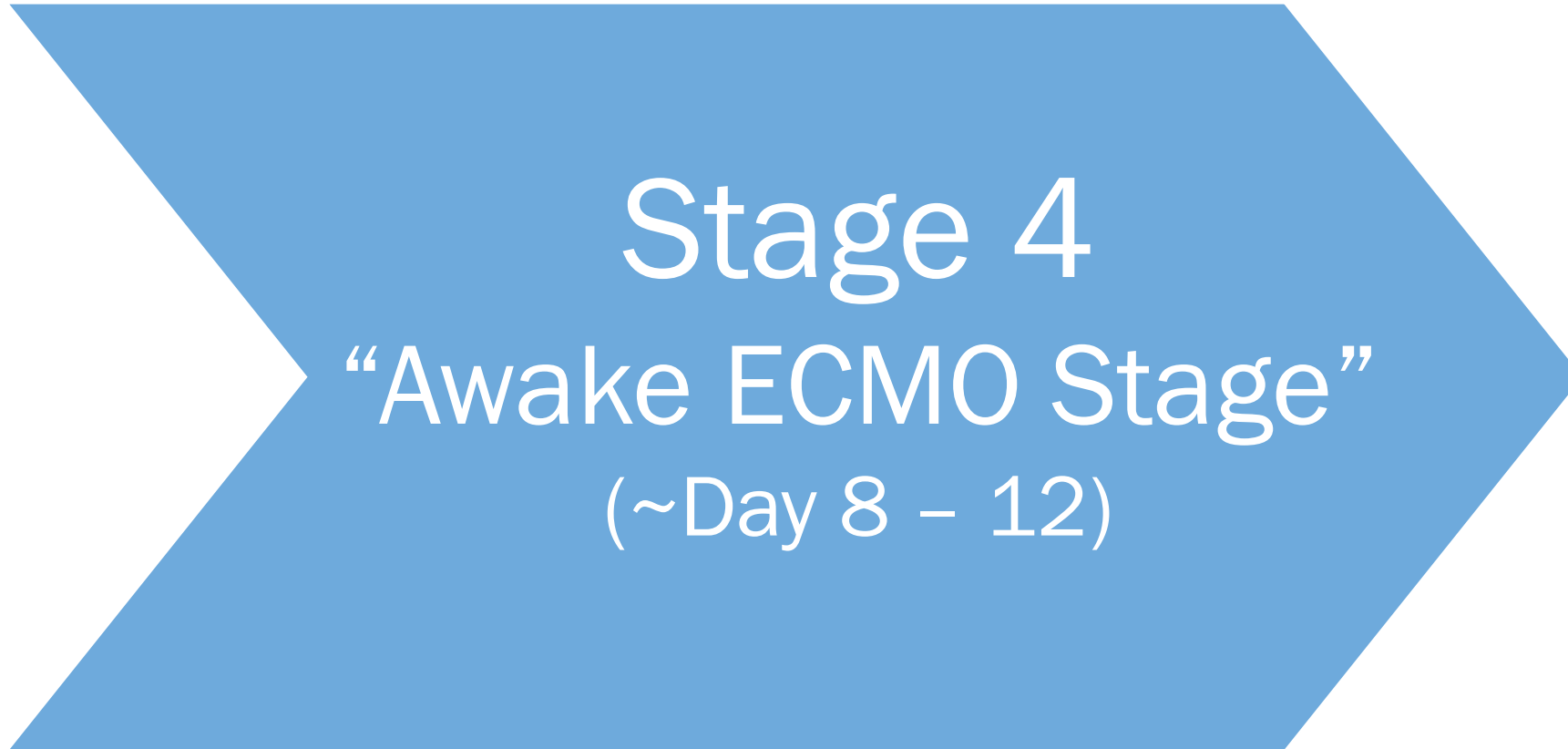
**Stage 2**  
“Decision Stage”  
(~Day 3 – 4)

**Stage 3**  
“Weaning Sedation”  
(~Day 5 – 7)

**Stage 4**  
“Awake ECMO Stage”  
(~Day 8 – 12)

**CALL FREEDOM MEDICAL TO ORDER BOTH BEDS**  
**817-751-6959**

# VV ECMO EXPECTED PROGRESSION - STAGES



# STAGE 4 – Awake ECMO Stage (~Day 8 – Day 12)

## Goal:

- Continue Progressive Mobility Protocol

## Focus:

- Mobilize patient out of bed
- Start minimizing PO sedation

# STAGE 4 – Awake ECMO Stage (~Day 8 – Day 12)

## SEDATIVE AGENT (PICK ONLY ONE):

- Off all sedation agents

## PAIN AGENT (PICK ONLY ONE):

- Off Narcotic drips

## PRN SEDATION MEDICATIONS:

- Same as STAGE 3

# STAGE 4 – Awake ECMO Stage (~Day 8 – Day 12)

## SCHEDULED PO MEDICATIONS

- Same STAGE 1
- Add PO antihypertensive of choice for consistent HTN

## PRN PO MEDICATIONS

- Same as STAGE 3

## IF STILL ON CARDENE OR ESMOLOL DRIPS CONSIDER ADDING PRN:

- Hydralazine IVP q4h PRN SBP > 150
- Metoprolol IVP q4h PRN HR > 120
  - Only if elevated CO is interfering with oxygenation

# STAGE 4 – Awake ECMO Stage (~Day 8 – Day 12)

## VENT SETTINGS:

### For Tracheostomy Patients:

- Continue Recruitment Maneuvers
  - Change ventilator to recruitment settings.
  - Attempt for 20min every 4 hours
- Consider t-bar trials
- Monitor for HARD STOP Criteria continuously
- Rest on PCV at night

### For Extubated Patients:

- Follow RT Protocol for oxygen management

## PROGRESSIVE MOBILITY:

- PROM / AROM
- Tilt patient as tolerated QID
- OOB to Chair
- Utilize Vital Go Bed

## NUTRITION:

- Advance tube feedings as tolerated
- Regular diet for extubated patients (per ST)
- Adjust BOWEL regimen based on output

## DIURESIS:

- Continue Lasix drip protocol as needed
  - Goal I&O = Even to -500ml



# STAGE 4 – Awake ECMO Stage (~Day 8 – Day 12)

## RT Protocol for Extubated Patients on VV ECMO

- Extubate to nasal CPAP/BiPAP or Airvo and wean as tolerated to nasal cannula
  - LIMIT FIO2 to NO MORE THAN 40% (unless patient has an oxygenation emergency)

### Patient with significant secretions:

- Add AeroBiKa and MetaNeb with Albuterol and Atrovent

### Patient without significant secretions:

- Use IPPB or VersaPAP with Albuterol and Atrovent
  - May use without just NS as well
  - Do not use if patient has PTX

Consider CPAP at night to rest

# VV ECMO EXPECTED PROGRESSION - STAGES

Stage 5  
“Trial Off Stage”  
(~Day > 12)

# STAGE 5 – Trial-Off Stage (~Day > 12)

## Goal:

- Wean and decannulate from ECMO

## Focus:

- Begin ES Driven Weaning Protocol
- Begin weaning PO sedation regimen

# STAGE 5 – Trial-Off Stage (~Day > 12)

## SEDATIVE AGENT (PICK ONLY ONE):

- Off all sedation agents

## PAIN AGENT (PICK ONLY ONE):

- Off narcotic drips

## PRN SEDATION MEDICATIONS:

- Stop IV PRN Sedation regimen

# STAGE 5 – Trial-Off Stage (~Day 12)

## SCHEDULED PO MEDICATIONS

- Same STAGE 4
- Begin weaning PO Sedation Regimen

## PRN PO MEDICATIONS

- Same as STAGE 4

# STAGE 5 – Trial-Off Stage (~Day 12)

## VENT SETTINGS:

### For Tracheostomy Patients:

- Continue Recruitment Maneuvers
  - Change ventilator to recruitment settings
  - Attempt for 20min every 4 hours
- Consider t-bar trials
- Monitor for HARD STOP Criteria continuously
- Rest on PCV at night

### For Extubated Patients:

- Same as STAGE 4 (follow RT protocol)

## PROGRESSIVE MOBILITY:

- PROM / AROM
- Tilt patient as tolerated QID
- OOB to Chair
- Marching in place or ambulating in ICU
- Utilize Vital Go Bed

## NUTRITION:

- Advance tube feedings as tolerated
- Regular diet for extubated patients (per ST)
- Adjust BOWEL regimen based on output

## DIURESIS:

- Stop Lasix drip
  - Diuresis as needed with Lasix IV or PO

## STAGE 5 – Trial-Off Stage (~Day 12)

### ES DRIVEN SWEEP OFF TRIAL PROTOCOL

- Patient Criteria:
  - 40% Vent FiO<sub>2</sub> while on VV ECMO
  - Vt ≥ 4ml/kg
  - pH > 7.30
- ECMO Criteria:
  - ECMO FiO<sub>2</sub> < 30%
  - ECMO Sweep < 2
- If patient meets both criteria then..
  - Turn off sweep gas
  - Increase FiO<sub>2</sub> on Vent to 50% (wean as tolerated)
  - Increase RR on ventilator as needed

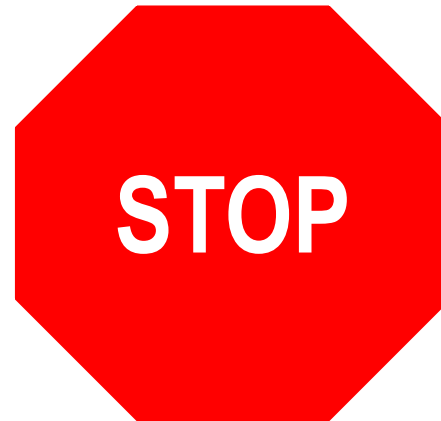
### Successful Trial after 4 hours of no sweep gas and...

- Patient ABG with
  - SpO<sub>2</sub> > 90
  - PaO<sub>2</sub> > 60
  - pH > 7.30
- Ventilator Settings with
  - FiO<sub>2</sub> ≤ 50%
  - RR < 20
  - PEEP < 12
  - Plateau pressures < 30 mmHg
  - Minute Ventilation < 15 l/min
- Patient Mean Arterial Pressure > 65 mmHg

## STAGE 5 – Trial-Off Stage (~Day 12)

- Perform ES Driven Weaning Protocol daily at 0700 (after AM ABG is obtained) based on specified criteria
- Continuously monitor for HARD STOP criteria during trial
- If failed attempt return to previous ECMO and Ventilator settings

### HARD STOP CRITERIA



- Sustained HR > 150 bpm
- MAP < 65 mmHg
- Sustained SpO<sub>2</sub> < 85%
- Plat Pressures > 30 mmHg
- Minute Ventilation > 15l/min



# VV ECMO EXPECTED PROGRESSION - STAGES

Stage 6

“Post-Decannulation  
Stage”

(~2 days post decannulation)

# STAGE 6 – Post ECMO Stage (~2 days post-decannulation)

## Goal:

- Ensure progress of care and rehabilitation

## Focus:

- Continuous rounding by ECMO Team at least 2 days post-decannulation to prevent setbacks that could lead to ECMO recannulation.

# STAGE 6 – Post ECMO Stage (~2 days post-decannulation)

Continuous rounding by ECMO Team focusing on:

- Monitoring volume status

- Prevent volume overload

- PT progress and rehabilitation

- Frequent check-in's with PT to discuss progress

- Further sedation and ventilator weaning

- Ensure long acting narcotics/anti-psychotic agents are being weaned / discontinued
- Watching progression on ventilator weaning

- Secondary infection prevention

- Assessing ECMO Incisions / Wounds
- Monitor labs and other signs of infections

- Discharge planning or placement

- Inpatient Rehab / LTAC / Home



# Medical City Healthcare