Management of tMCS in the ICU

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Tyler VanDyck, MD
Cardiothoracic Intensivist
Medical Director of ECMO Services
Interim Co-Director, Division of Surgical Critical Care
Assistant Professor of Medicine & Emergency Medicine

Disclosures

None relevant to this presentation

Objectives

Overview of tMCS Devices

Assessing adequacy of support

Destination Planning

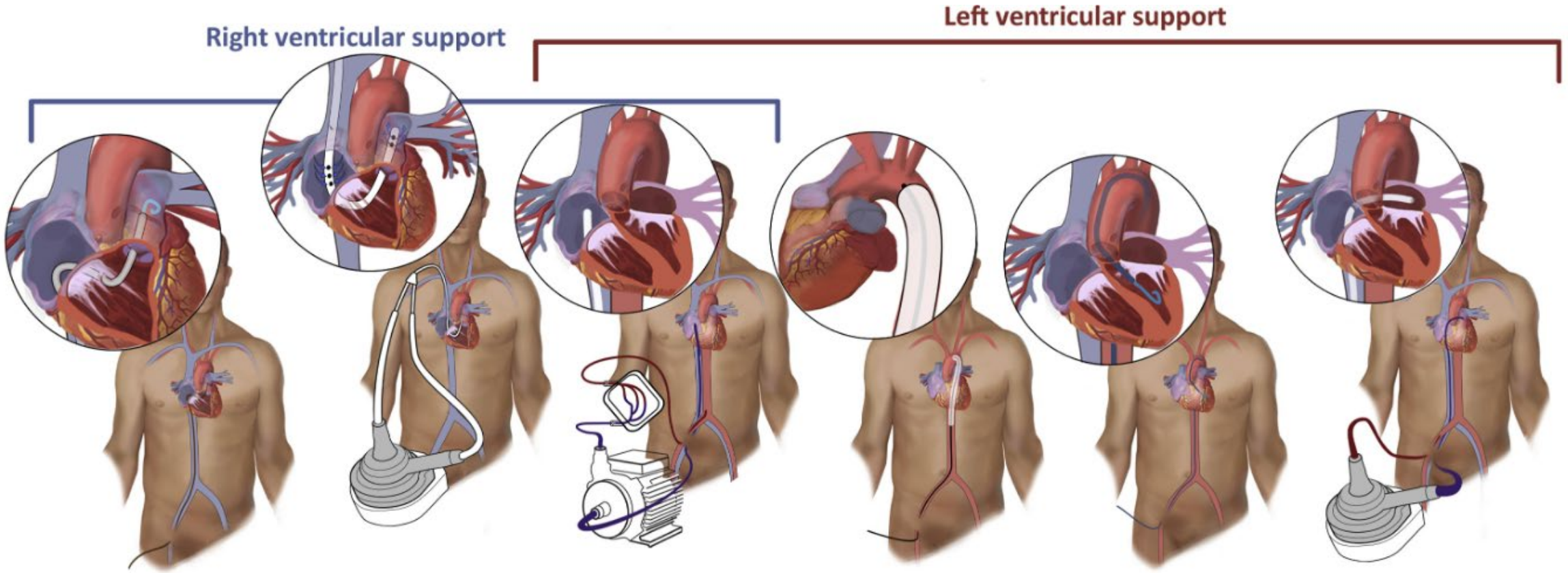
Common Complications

Will Not Discuss

Specific Escalation/De-escalation Algorithms

Choosing a Device

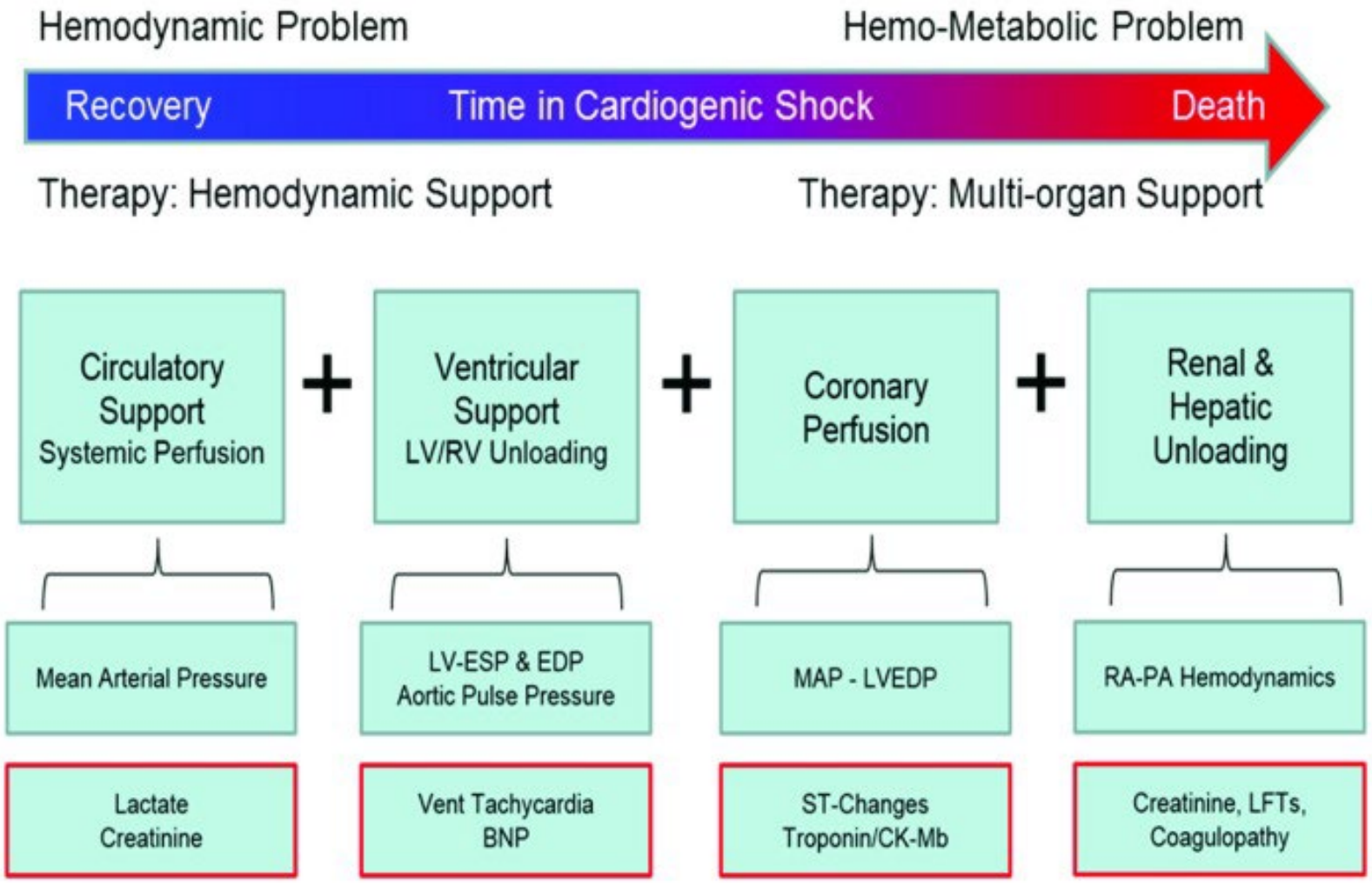
Spectrum of MCS Devices



	Impella RP	TandemHeart RA-PA	VA-ECMO	IABP	Impella (2.5, CP, 5.0, 5.5)	TandemHeart LA-FA

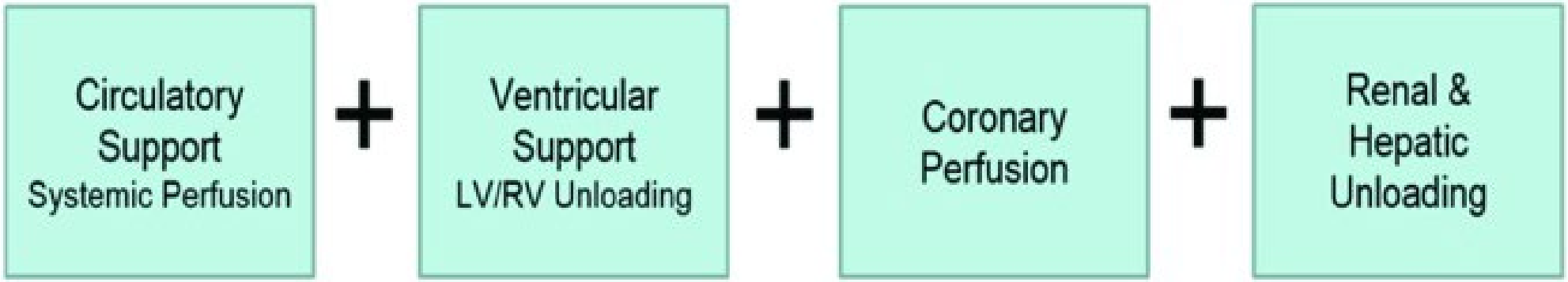
Tehrani et al. 2020. JACC: Heart Failure 8(11): 879-891

Hemodynamic Support Equation



Esposito and Kapur 2017. F1000Res 6: 737

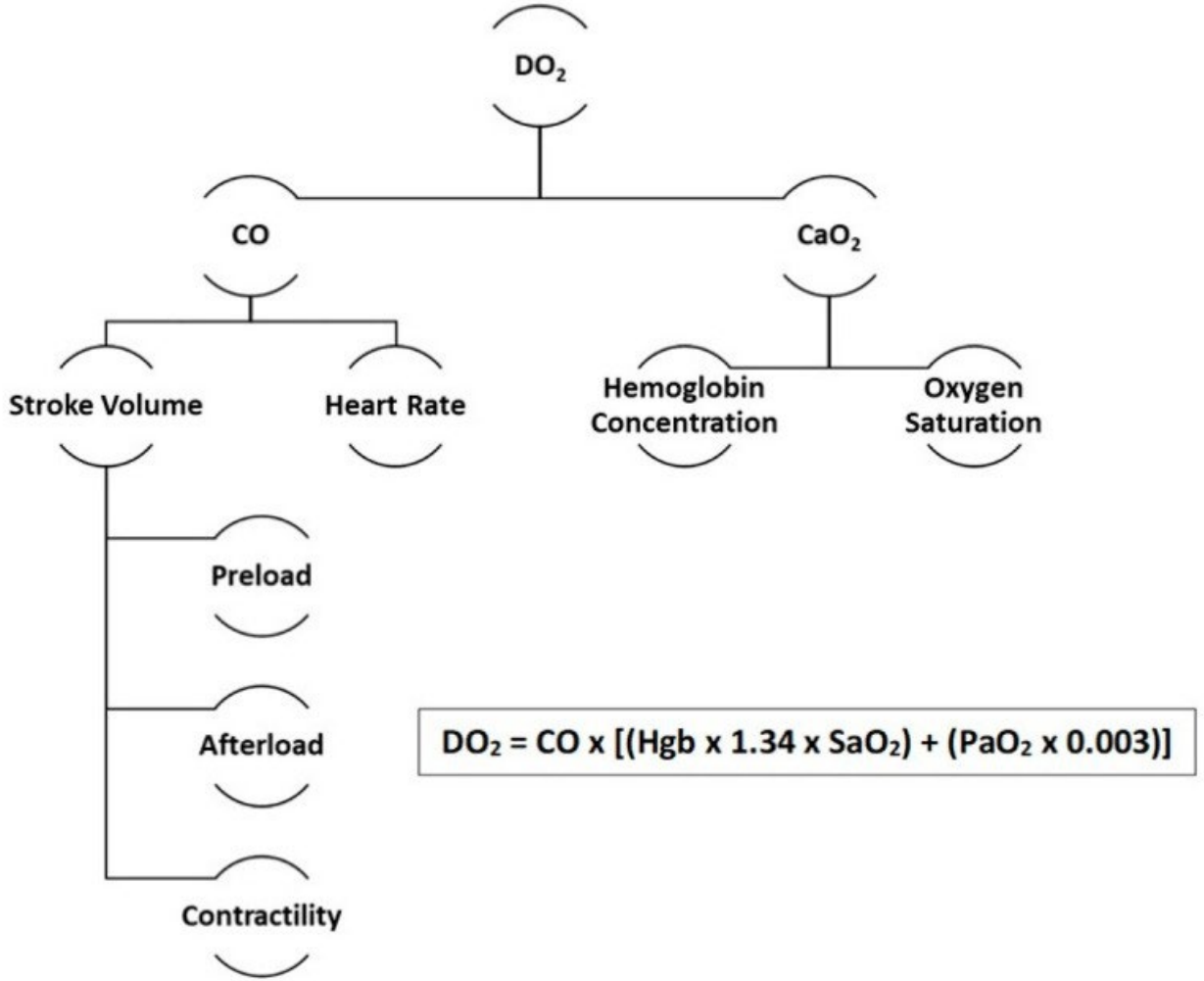
Choosing the Right Therap(ies)



IABP	+	+ (LV)	+	Neutral
Tandem Heart	++	+/- (LV)	++	Neutral
Impella CP/5.5	++	+ to +++ (LV)	++	Neutral
pVA ECMO	++	-- (LV) / ++(RV)	++	+

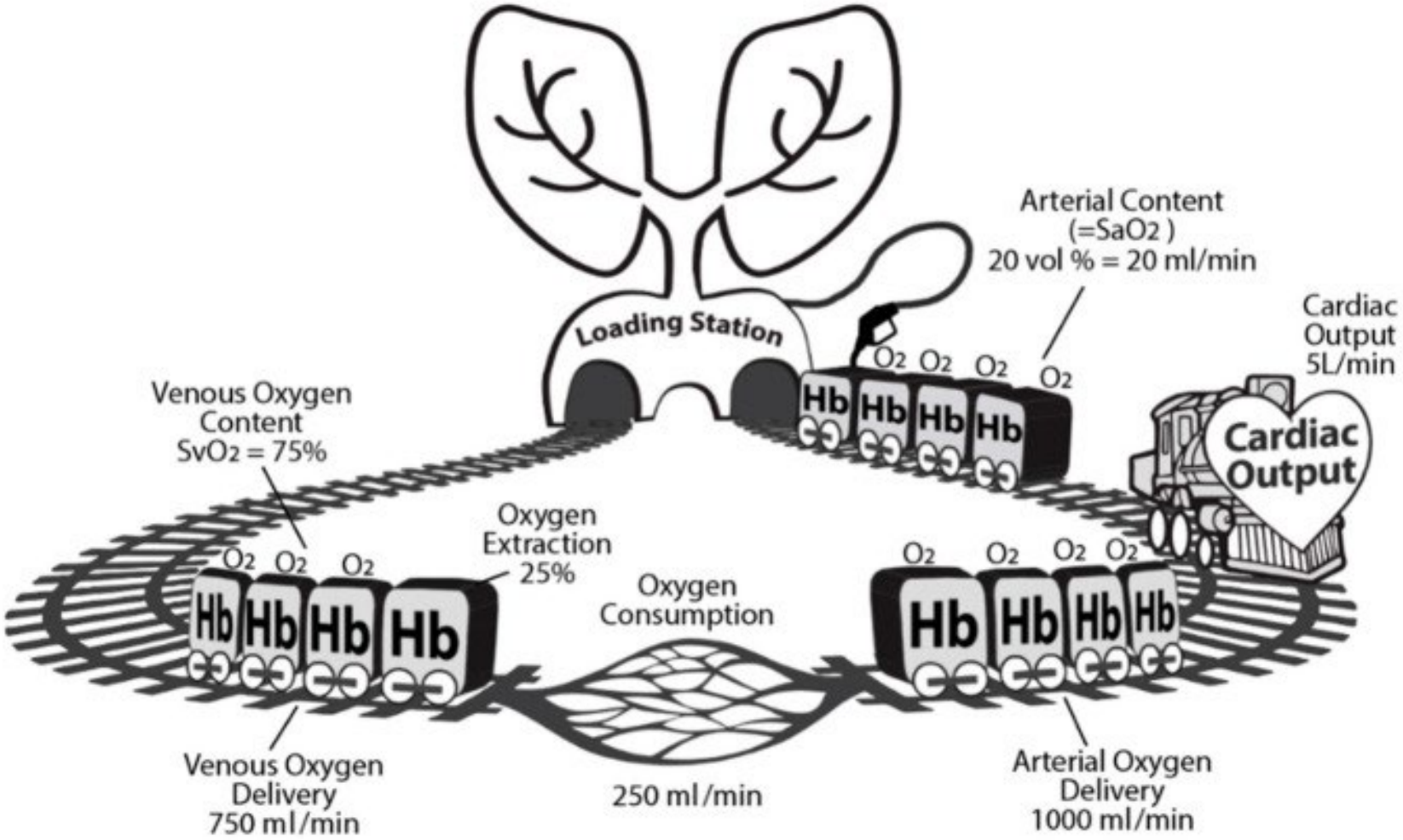
Assessing Adequacy of Support

Determinants of Oxygen Delivery



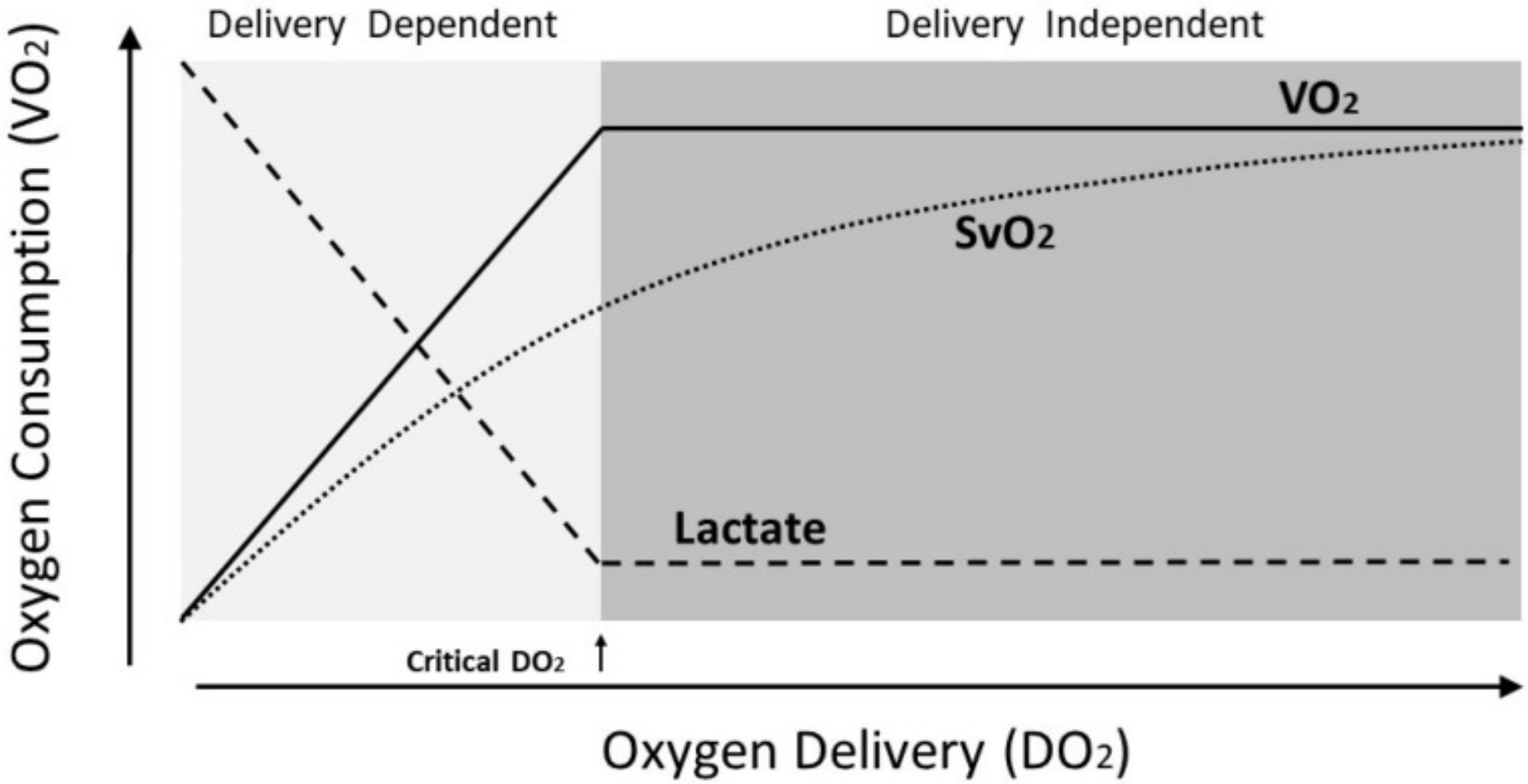
Russell et. al. 2020 *J Clin Med*

Oxygen Supply & Demand



Russell et. al. 2020 *J Clin Med*

Oxygen Supply & Demand



Russell et. al. 2020 *J Clin Med*

Optimizing Supply & Demand

- Addressing Low Supply:
  - Use device to achieve Flow Index > 2-2.2, MAP >65-70
    - Minimize vasopressors as able
  - Remember hemoglobin and oxygen saturation
    - Optimal Hgb goal > 8 ?

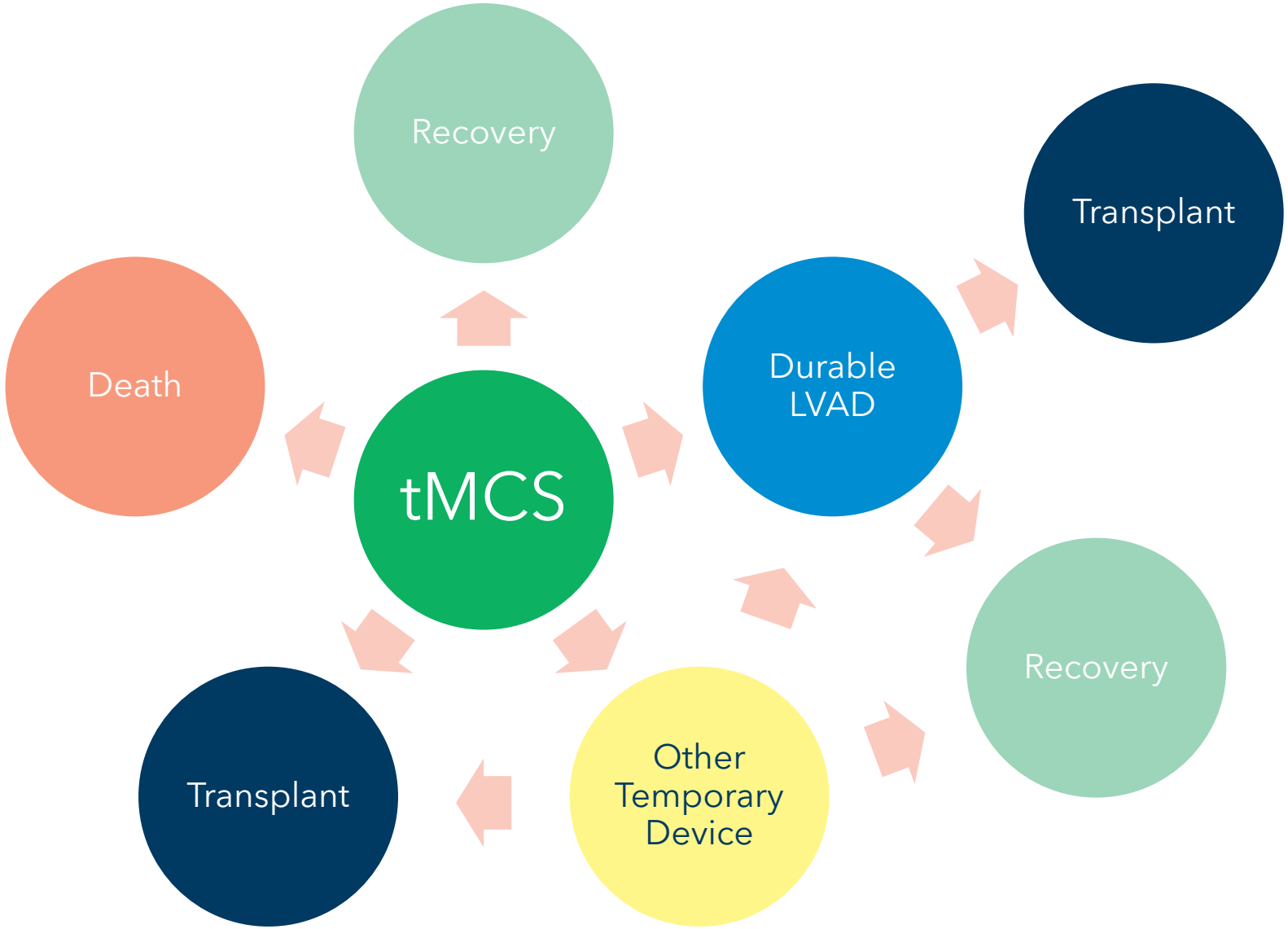
- Addressing High Demand:
  - Control anxiety/agitation → appropriate use of medication
  - Treat fever
  - Control work of breathing → utility of noninvasive/invasive ventilation

Assessing Supply & Demand

- Check SVO2 and Lactate q 4-6h
  - Both reflect balance of supply and demand
  - Goal SVO2 > 50-65%
  - Goal Lactate < 2
    - Lactate clearance by 24h important mortality predictor

- Other Monitoring
  - LFT's
  - Creatinine, Urine Output
  - Skin Temperature / Mottling

Destination Planning


Recovery
Transplant
Death
Durable LVAD
tMCS
Recovery
Transplant
Other Temporary Device

Promoting Recovery

- Revascularization strategy (if applicable)
- Unloading
  - Echocardiography for evidence of "smoke"/thrombus/distention
  - Maintain pulsatility (>10 mmHg) or utilize pVAD
- Decongestion
  - Goal CVP < 12
  - Goal PAD < 22, PCWP < 15
  - Diuresis or Ultrafiltration

Assessing Recovery

- Utilize tMCS until:
  - Hemodynamics have stabilized (minimal ongoing vasoactive infusion requirements)
  - End organ dysfunction is improving
  - Volume status is optimized

  (or)

  - A serious complication arises requiring earlier assessment

- Have an escalation / de-escalation algorithm

Planning Other Exits

- Start multidisciplinary LVAD/transplant evaluation early
  - Importance of **Shock Team** and Level 1 Shock Centers
- Consider Comorbidities and Social Factors
- Daily reassessment of progress

Prepare for the Worst

- Involve palliative care from the start
  - Facilitates rapport and discussing the severity of illness and potential outcomes
  - Shared decision-making

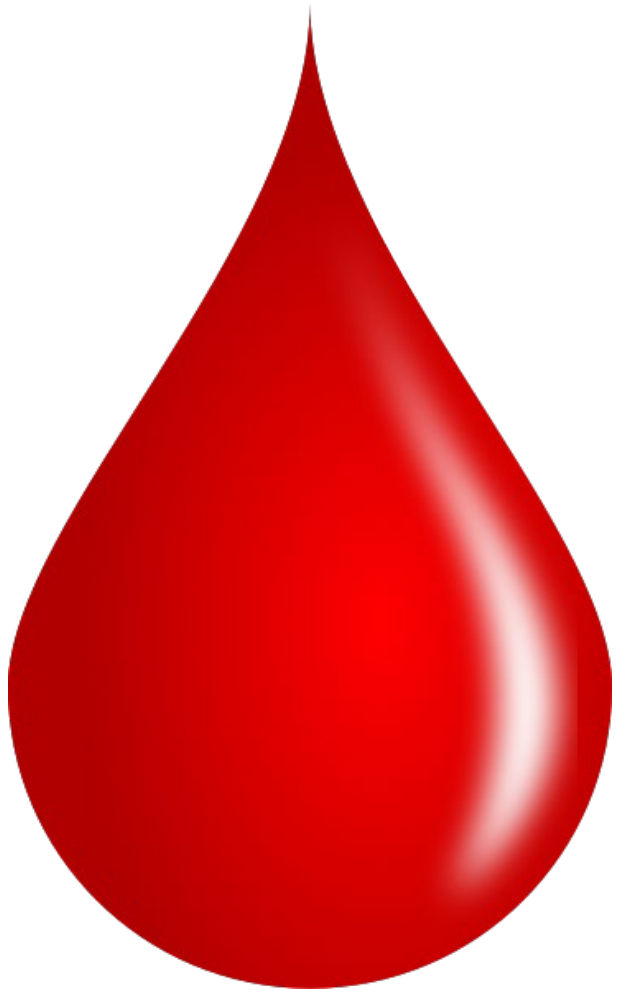
- Consider a transition to comfort measures when…
  - Ongoing aggressive support strategy not compatible with goals of care
  - Lack of expected recovery and no option for durable device or transplant
  - Nonrecoverable complications / futility

Common Complications

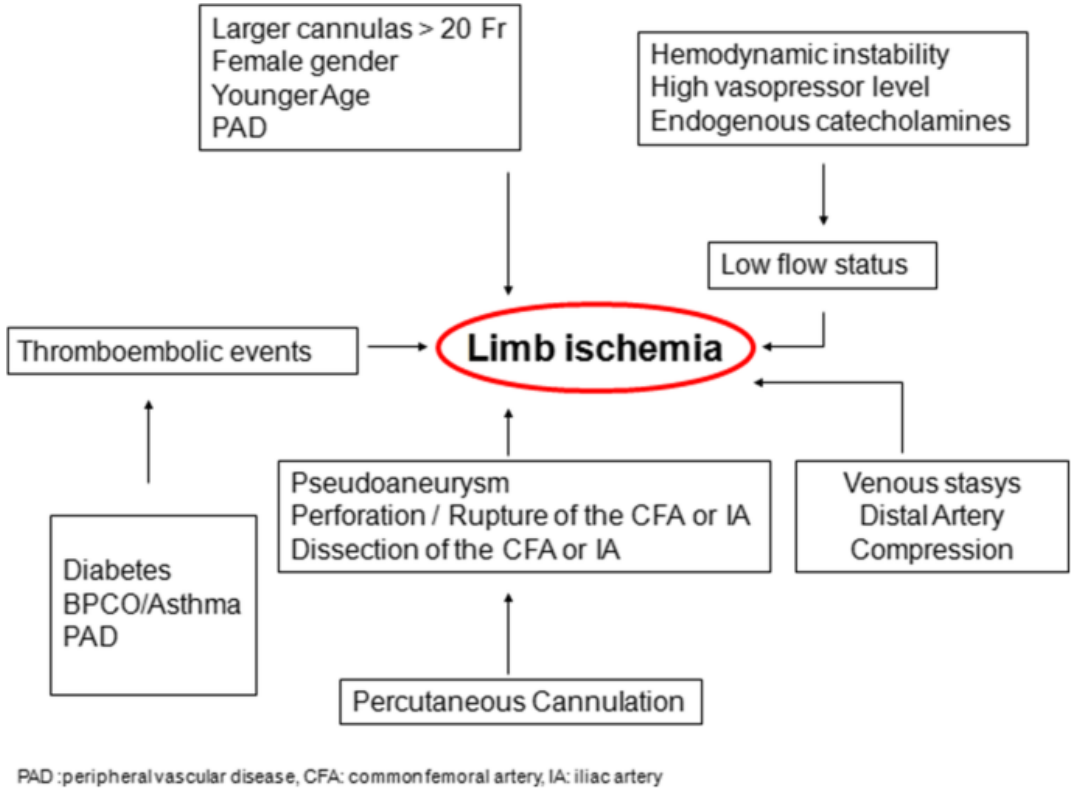
Bleeding & Thrombosis

- Multiple Etiologies of Bleeding
  - Cannulation Site Bleeding
  - Cannulation Complications
  - Coagulopathy (Therapeutic, Consumptive, Acquired von Willebrand's, HIT)
  - GI Bleeding
- Multiple Thrombotic Complications
  - Stroke
  - Limb Ischemia
  - Device Failure

➢ Requires careful use of Anticoagulation/Antiplatelet Agents

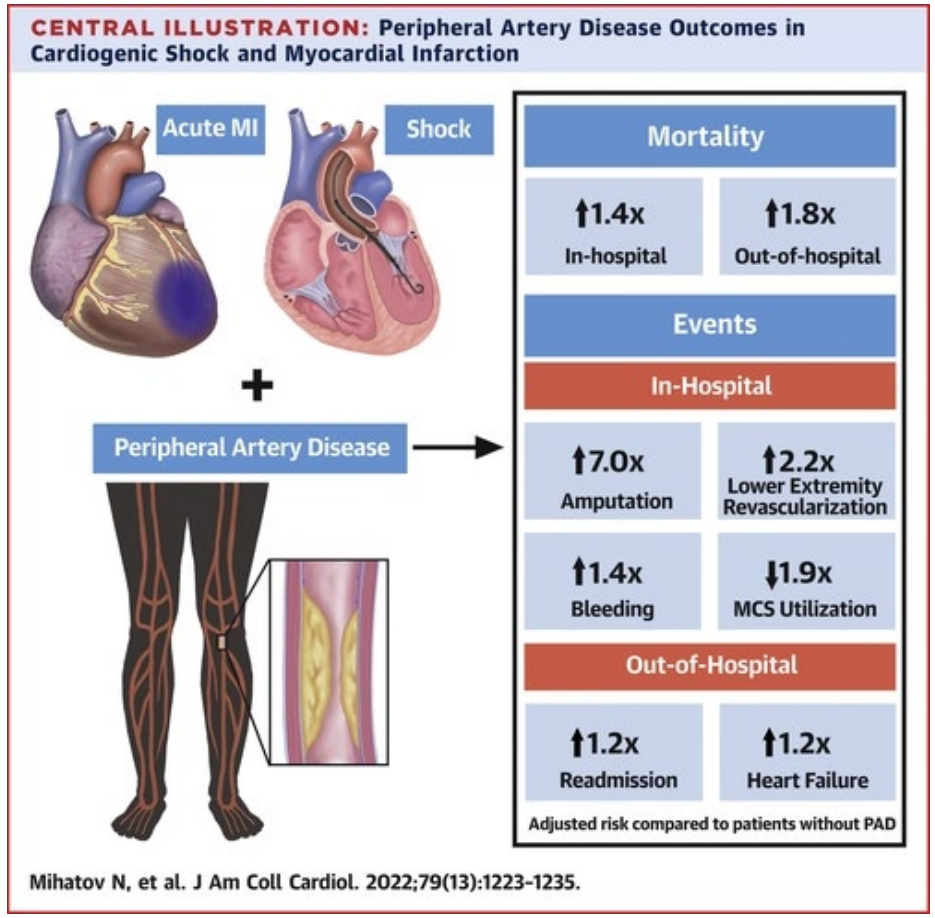


Limb Ischemia



PAD :peripheral vascular disease, CFA: common femoral artery, IA: iliac artery

Bonicolini et al. 2019 *Critical Care*



- Consider proactive antegrade perfusion practices, especially in PAD
- Modify support strategy early when ischemia occurs

ICU-related Complications

- Deconditioning
- Ventilator-associated pneumonia
- Delirium
- Pressure ulcers
- Malnutrition

➢ Importance of Early Extubation & Early Mobility

➢ “Pre-habilitation”

Takeaways

- Tailor therapy based on “hemodynamic support equation”
- Monitor adequacy of support with multiple modalities
  - Labs, hemodynamics, physical exam
- Keep the destination in mind
- Proactively identify and manage complications

Thank You

Tyler VanDyck, MD
Cardiothoracic Intensivist
Medical Director of ECMO Services
Interim Co-Director, Division of Surgical Critical Care
(412) 910-4723
Tyler.VanDyck@ahn.org