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The Forrest and The Trees: Critical Issues for the Critically-Ill COVID Patient

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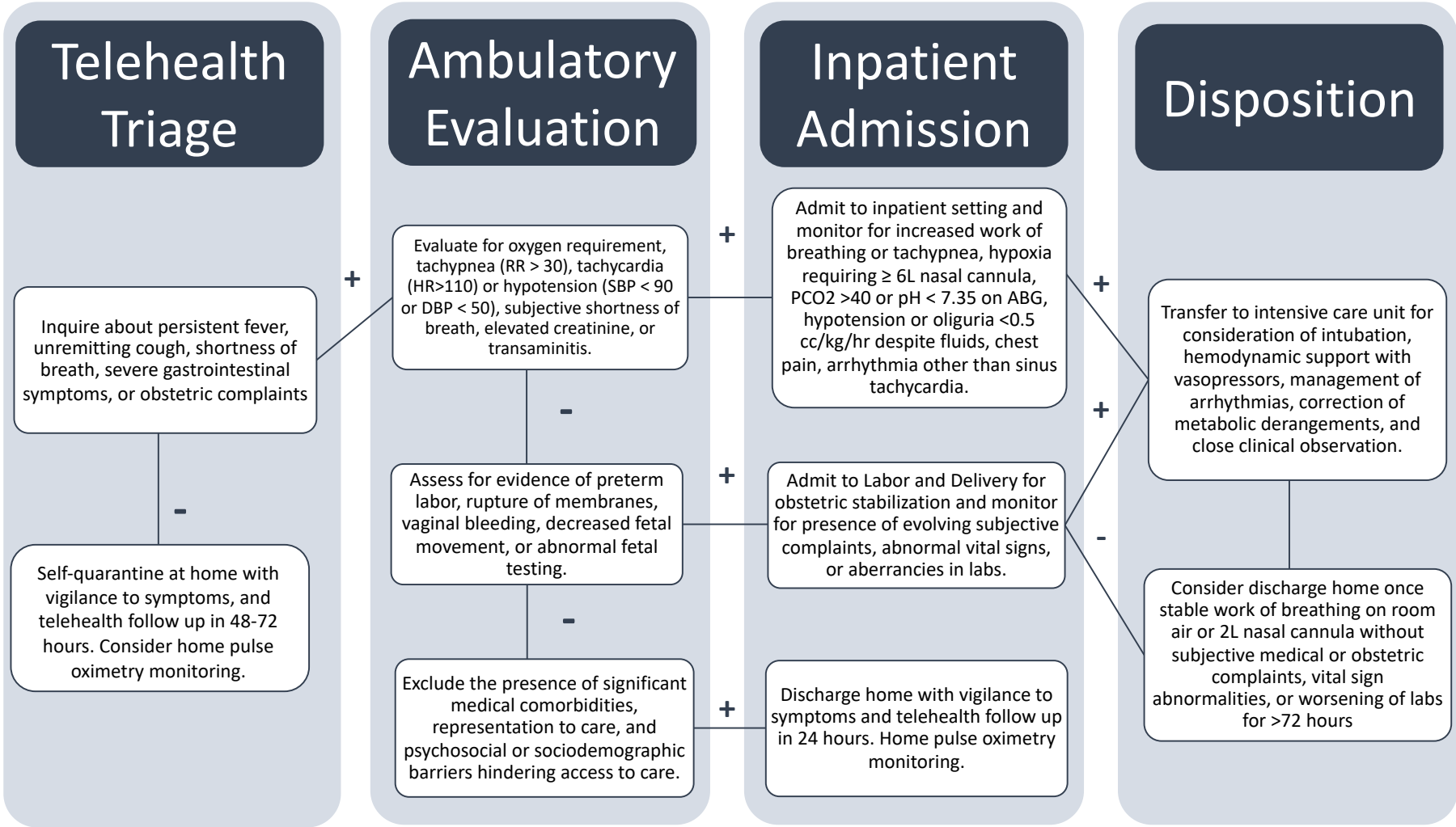
Some Critical Issues

- Critical care in the COVID era is stressful
  - Understanding of disease is emerging
  - Standards of care are modified
- Critical care for pregnant patients is always stressful
  - Physiology is altered and evidence is lacking
  - Maternal-fetal dyad adds layer of complexity
- Standards of care are emerging and accountability is lacking placing at-risk populations at even greater risk

Creating a Standard of Care

- Issues
  - Provider comfort with critical care / pregnancy is variable
  - Clinical care includes management of patient and provider
  - Clinical operations detract from clinical care
- Stakeholders
  - ICU Physicians and Nurses
  - OB Care Providers and Nurses
  - Consultants, Anesthesiologists, and ED Physicians
- Resources
  - Standardize processes but individualize care
  - Integrate multidisciplinary perspectives

Standardize Process for Evaluation



Facilitate Interdisciplinary Education

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Quick Tips for Intensivist Caring for the Critically-Ill Pregnant Patient

Organ System	Pregnancy Considerations	Clinical Pearls
Neurologic	Common sedatives and paralytics safe in pregnancy (avoid NSAIDs)	Variability in the fetal heart rate tracing will decrease with maternal sedation or paralysis
Pulmonary	Baseline physiology is compensated respiratory alkalosis to facilitate dissociation of oxygen from maternal to fetal compartment at placental interface.	Titrate ventilation closer to normal pH if possible as opposed to permissive hypercapnea tolerated in ARDS.
	Oxygenation targets classically set at >95% with little data to support.	Variability in fetal heart rate can be helpful signal of adequate oxygenation
	Respiratory mechanics with decreased functional residual capacity and increased minute ventilation due to increased tidal volume.	Decreased FRC leaves little reserve favoring early intubation.
		Consider erring towards higher side of 6-8 cc/kg as peak pressures allow. May need more PEEP due to limited diaphragmatic excursion
		Consideration of delivery in conjunction with OB team to improve maternal oxygenation in late third trimester cases.
Cardiovascular	Normal physiology of increased cardiac output, decreased systemic vascular resistance	Check baseline blood pressures from clinic visits to suggest target BPs, can titrate MAPs to fetal variability
	Compression of the uterus on the IVC limits preload after 20 weeks	Position in lateral position where possible, consider role of position change in hypotension

Promote Bidirectional Education

Parameter	Description	Target in ARDS
Tidal Volume (TV)	Volume delivered by ventilator with each breath	4-8 cc/kg predicted body weight
Respiratory Rate (RR)	Number of breaths per minute delivered by ventilator	Minimal RR required to match baseline minute ventilation (MV) which is elevated in pregnant women (MV = TV x RR)
Plateau Pressure (P_{plat})	Pressure applied to small airways and alveoli measured by an inspiratory pause on the ventilator	$P_{plat} \leq 30$ cm H_20 to prevent volutrauma. May need to decrease tidal volume to achieve desired P_{plat}.
Positive End-Expiratory Pressure (PEEP)	Pressure applied to mitigate end-expiratory alveolar collapse and atelectrauma	PEEP applied in combination with FiO_2 to achieve desired oxygenation of PaO2 55 to 88 mmHg or SpO2 >/=95%
Fraction of Inspired Oxygen (FiO_2)	Fraction of oxygen delivered by ventilator (room air is .21)	

Provide Clarity in Communication

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OB Clinical Team

Clinician*	Contact	Indication
Senior OB Resident	Pager 32074	Routine Questions Change in Clinical Status†
OB Attending	Pager 13212	Obstetric or Medical Emergencies Clinical Concerns
Labor and Delivery Nurse in Charge	Pager 11382	Coordinate Fetal Monitoring or RN Support Notification of Emergent Cesarean Delivery
Code Blue OB Team	STAT Line	Spontaneous Vaginal Delivery Maternal Cardiac Arrest
Maternal-Fetal Medicine Attending	Pager 38557	Non-Emergent Clinical Concerns

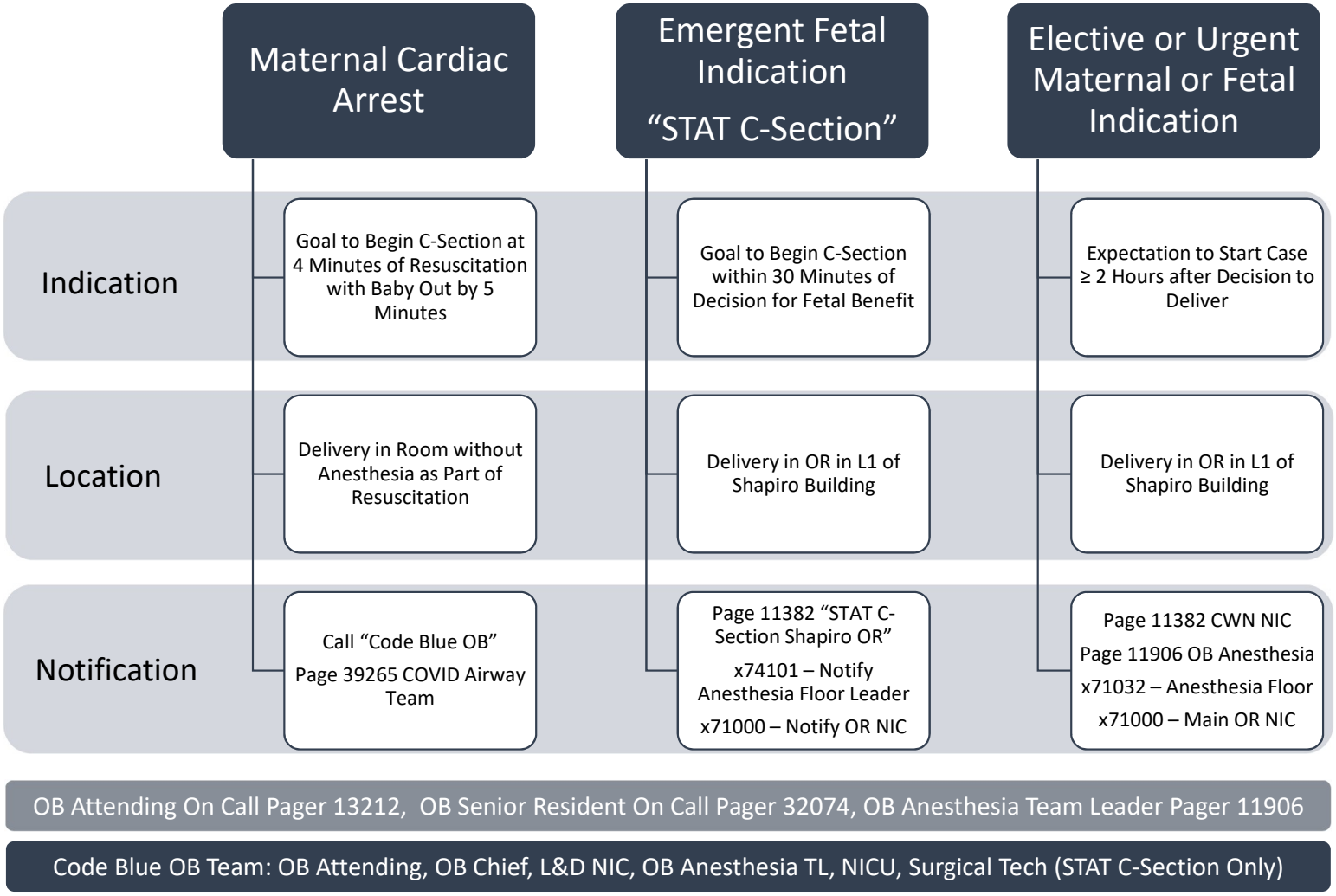
*Clinicians all carry virtual pagers and are in house 24/7. The MFM Attending is on home call at night and weekends.
†Adopt a low threshold to call OB with any questions, concerns, or change in clinical status.

Suggestions for Notification of Change in Clinical Status‡

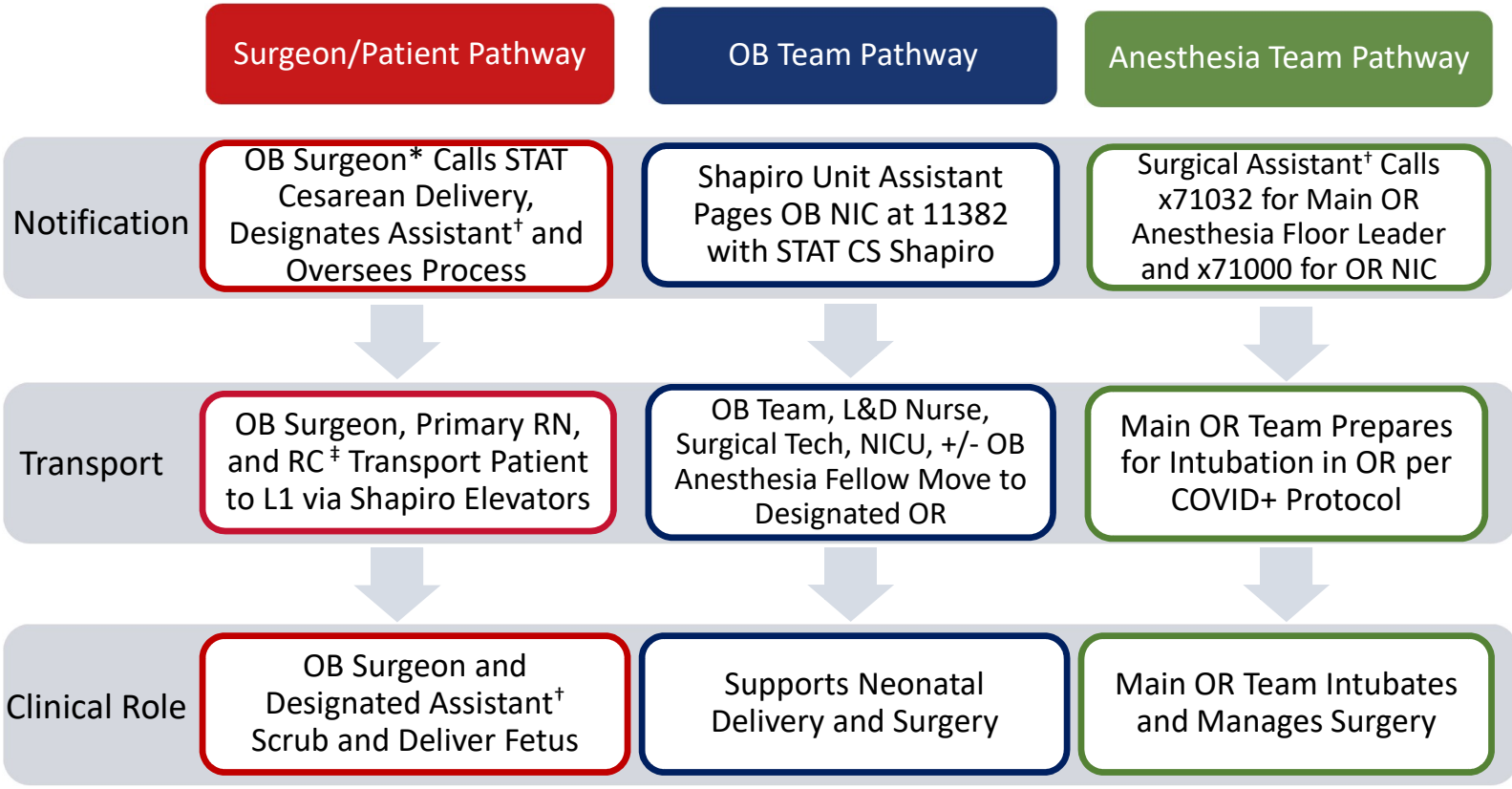
Clinical Change	Suggested Target§
Increasing oxygenation requirement	SpO_2 > 95% or PaO_2 > 70 mmHg
Worsening ventilation	pCO_2 < 45 and pH > 7.35
Increasing vasopressor requirement	MAP > 65
Worsening acidemia	pH > 7.35
New onset hypertension with SBP > 160 or DBP > 100	
New onset tachycardia (possible sign of labor) or arrhythmia	
Unexplained increase in sedation requirement based on RASS or BIS (possible sign of labor)	
Obstetric issues such as vaginal bleeding or leakage of amniotic fluid	

‡This list is not exhaustive but includes scenarios that may benefit from multidisciplinary management or could warrant increased fetal monitoring.
§These targets are far from absolute and are designed as a starting point from which to individualize care.

Emphasize Critical Pathways



Ensure Contingency Plans are Accesible



*OB Surgeon includes OB Attending, MFM Fellow, and Senior or Chief Resident.

† OB Assistant Designated from list of surgeons above based on available resources.

‡Transport team includes ICU fellow and respiratory therapist for intubated patients.

Develop A Multidisciplinary Care Plan

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Vaginal Delivery / Induction Planning Checklist for Critically-Ill Patients

Last Updated: _____ **Date/Time for Next Update:** _____

Suggested Participants: OB Care Provider, OB Nursing, ICU Care Provider, ICU Nursing, OB Anesthesia, Neonatology

Clinical Question	Response	
Active Critical Care Issues		
Indication for Induction/Delivery		
Maternal Medical / Surgical History		
Candidate for Vaginal Delivery	Yes	No
Last Ultrasound for Presentation	Date:	Findings:
Last Vaginal Exam	Date:	Exam:
Prior Vaginal Delivery	Yes	No
Prior Cesarean Delivery	Yes	No
Need for Neuraxial Analgesia	Yes	No
Anticoagulation Plan		
Current IV Access		
Consented for Cesarean	Yes	No
Consented for Hysterectomy	Yes	No
Surrogate Decision Maker		
Fetal Issues		
Gestational Age		
Last Estimated Fetal Weight		
Last Betamethasone Administration		
Need for GBS Prophylaxis	Yes	No
Need for Magnesium Infusion	Yes	No
Labor Planning		
Need for Cervical Ripening	Yes	No
Need for Oxyctocin Challenge	Yes	No
Plan for Cervical Ripening	Cook Balloon	Misoprostol
Plan for Oxytocin during Ripening	Yes	No
Continuous Monitoring During Ripening	Yes	No
Plan for Fetal Scalp Electrode	Yes	Routine Indications
Plan for Intrauterine Pressure Catheter	Yes	Routine Indications
Concerns about Early Amniotomy	Yes	No
Modified Oxytocin Titration	Yes	No

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Delivery Planning		
Plan for Patient Positioning		
Plan for Forceps-Assisted Delivery	Yes	Routine Indications
Risk for Shoulder Dystocia	Yes	No
Plan to Delay Cord Clamping	Yes	No
Plan to Collect Cord Blood	Yes	No
Plan to Collect Cord Gases	Yes	No
OB Attending for Delivery	Name:	Pager:
OB Assistant for Delivery	Name:	Pager:
Time to Call OB in House	Beginning of Induction	Active Labor
Time to Call OB to ICU	Active Labor (6 cm)	Full Dilation
Plan for Updating NICU Attending		
Hemorrhage Planning		
Most Recent CBC	H/H:	Platelets:
Most Recent Coagulation Studies	INR/PTT:	Fibrinogen:
Candidate for Methergine	Yes	No
Candidate for Hemabate	Yes	No
Candidate for Tranexamic Acid	Yes	No
Need for Crossmatched Blood in ICU	Yes	No
Candidate for Interventional Radiology	Yes	No
OR for Hemorrhage Management	OR1 (Hybrid with IR)	OR 7/8 (Surgical)
Additional Delivery Planning		
Additional Contingency Plans	Yes	No
Additional Personnel Needed	Yes	No
Outstanding Clinical Questions	Yes	No
Time for Next Huddle Discussed	Yes	No
Notes		

Clinical Care and Clinical Operations

- Standardized processes but individualized care
  - Protocols, tip sheets, and checklists minimize error
  - Augment but not replace clinical care
  - Promote platform for routine debriefs
- Integrate multidisciplinary perspective
  - Leave space for providers to contribute
  - Champion the process in addition to the outcome
  - Ensure resources available to all and feedback is heard
- Combine clinical care and clinical operations
  - Improves pathway for future patients
  - Ensures some standard of care where none exist

Gratitude and a Reminder

Intensive Care Unit	Skills and Services	Labor and Delivery
Hemodynamic Monitoring	Continuous Assessment	Fetal Monitoring
Vasopressors	Medication Titration	Pitocin
Code Status	Goals of Care	Prenatal Diagnosis
Cardiopulmonary Arrest	Crisis Management	Obstetric Hemorrhage
End of Life	Family-Centered Care	Life's Beginning
Complex and Urgent	Decision Making	Complex and Urgent

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Available soon at covidprotocols.org