Defining a Critical Care Obstetrics (CCOB) Population: From Risk Stratification to Patient Outcomes

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Background & Hypothesis

- Critical care admissions in pregnant and postpartum women have increased over time, with pooled intensive care unit (ICU) admission rate of 1.6% worldwide. (1)

- Though scoring systems, such as the Maternal Comorbidity Index, predict severe maternal morbidity, there are no established care guidelines for the escalation of care without ICU admission. (2)

- Very few centers in the US have a dedicated obstetric-ICU to provide tailored and specific care to the sickest pregnant and peripartum patients.

- We created standardized admission criteria for the most medically complex obstetric patients as well as a Critical Care Obstetrics (CCOB) designation flag in the electronic medical record (EMR).

- This designation prompts enhanced care: closer nursing coverage, multidisciplinary rounding, and remote telemetry monitoring in our labor and delivery (L&D) high-risk unit.

- There are two patient populations: planned CCOB and unplanned CCOB; the purpose of this study is to characterize these patient populations and to better understand their clinical outcomes

Study Design and Methods

- In 2023, a working group of obstetricians, nurses, and anesthesiologists defined criteria for CCOB designation at our institution

    - Planned (chronic comorbidities) – antepartum designation through multidisciplinary discussion
    - Unplanned (acute conditions) – intra or postpartum designation

- Starting in May 2024, patients meeting the criteria had "CCOB" added to their EMR problem list (EPIC)

- A chart review for all CCOB cases between May and December 2024 was completed

- Characteristics and outcomes between the planned CCOB and unplanned CCOB patients were compared and statistically analyzed

Figure 1: Conditions for CCOB Designation

Neurological Conditions:
- Encephalopathy
- Acute stroke (Ischemic or non-ischemic)
- Acute seizure disorder (status epilepticus)
- Neurological lesion (mass or aneurysm) requiring close monitoring
- Eclampsia

Psychiatric Conditions
- Acute psychiatric illness
- Substance use disorder (history of SUD/OUD, acute intoxication, withdrawal, or the need for enhanced postpartum pain management)

Cardiac Conditions:
- NYHA: II or mWHO II or CARPREG II
- Hypertensive Disorders requiring antihypertensive infusions or invasive monitoring
- Arrythmias requiring monitoring or recent cardioversion

Respiratory Conditions:
- Respiratory disease with new or increasing oxygen requirement
- Asthma exacerbation; status asthmaticus
- Pulmonary embolism
- Acute chest (SSC)

Kidney failure:
- Acute kidney injury, ESRD, or new dialysis requirement
- Transplant at risk of kidney dysfunction

Liver failure or metabolic decompensation:
- Acute liver injury, cirrhosis, or acute fatty liver disease of pregnancy
- Hypoglycemia or DKA

Bleeding/ Coagulation:
- Placental abruption with associated coagulopathy
- Disseminated intravascular coagulation (DIC)
- Peripartum hemorrhage with associated shock
- Placental accreta spectrum (PAS) disorder

Sepsis or Infection:
- Septic shock
- Clinical condition requiring invasive monitoring or central access for care
- Clinical condition deemed appropriate for CCOB by the care team

Other:
- Any patient that the Obstetric or Anesthesiology teams determine requires CCOB care

Significant Results:
(Planned CCOB vs. Unplanned CCOB)

- Hispanic: 28% vs 50%

- Gestational age at admission: 36 + 5 vs. 32 + 1

- Gestational age at delivery: 37+1 vs. 33+5

- Cardiac indication: 64% vs. 13.3%

- Bleeding indication: 4% vs. 36.7 %

- Sepsis indication: 2% vs. 23.3%

- General Anesthesia: 6.3% vs. 32.1%

- ICU Admission: 4.2% vs. 23.3%

- NICU Admission: 52% vs. 78.6%

- Postpartum hemorrhage: 20.8% vs. 50%

- Quantitative blood loss (mL): 665.6 vs. 1665

- Units of blood products transfused: 0.18 vs. 3.76

- Patients receiving blood products: 10.42% vs. 56.67%

- High- Risk unit length of stay (hours): 39.8 vs. 62.8

Table 1. Patients' characteristics and outcomes according to planned versus unplanned CCOB designation

	Planned CCOB	Unplanned CCOB	P value
Total Number	50	30	N/A
Delivered at this time, n	48 (96%)	28 (93.3%)	0.59
Maternal age (years)	32.06 ± 6.48	31.96 ± 6.82	0.95
Body Mass Index (kg/m^2)	30.43 ± 7.34	32.017 ± 8.32	0.44
Nulliparous, n	14 (28%)	12 (40%)	0.32
Race/ethnicity			
Black, n	12 (24%)	6 (20%)	0.67
White, n	16 (32%)	4 (13.33%)	0.06
Hispanic, n	**14 (28%)**	**15 (50%)**	**0.04**
Other, n	8 (16%)	5 (16.67%)	0.93
Gestational age at admission (weeks)	**36 +5 ± 3.72**	**32+1 ± 5.69**	**<0.001**
Gestational age at admission, n			
18-24 weeks, n	1 (2.1%)	2 (6.67%)	0.31
24-30 weeks, n	**2 (4.17%)**	**8 (26.67%)**	**0.004**
30-37 weeks, n	14 (29.17%)	12 (40%)	0.32
37-40 weeks, n	**31 (64.6%)**	**7 (23.3%)**	**0.0004**
Postpartum Admissions, n	0 (0%)	1 (3.33%)	0.2
Gestational age at delivery (weeks)	**37+1 ± 3.00**	**33+5 ± 4.34**	**<0.001**
Preeclampsia, n	**3 (6.25%)**	**7 (23.33%)**	**0.028**
Diabetes, n	8 (16%)	4 (13.33%)	>0.990
CCOB diagnosis			
Neurological, n	7 (14%)	4 (13.3%)	0.999
Psychiatric, n	4 (8%)	2 (6.7%)	0.999
Cardiac, n	**32 (64%)**	**4 (13.3%)**	**<0.001**
Respiratory, n	5 (10%)	4 (13.3%)	0.64
Renal, n	2 (4%)	4 (13.3%)	0.12
Hepatic or metabolic, n	0 (0%)	2 (6.7%)	0.06
Bleeding or DIC, n	**2 (4%)**	**11 (36.7%)**	**<0.001**
Sepsis or infection, n	**1 (2%)**	**7 (23.3%)**	**0.002**
Mode of delivery (for the 48 planned and 28 unplanned CCOB patients who delivered)			
Cesarean delivery	26 (54.17%)	20 (71.43%)	0.1375
Anesthesia for labor and/or cesarean delivery (for the 48 planned and 28 unplanned CCOB patients who delivered)			
Combined spinal-epidural, n	36 (75%)	20 (71.4%)	0.73
Spinal, n	10 (20.8%)	3 (10.7%)	0.26
General anesthesia, n	**3 (6.3%)**	**9 (32.1%)**	**0.003**
ICU admission‡	**2 (4.2%)**	**7 (23.3%)**	**0.01**
Vasoactive medication (infusion), n‡	8 (16.7%)	7 (23.3%)	0.47
NICU admission, n	**25 (52%)**	**22 (78.6%)**	**0.02**
Fetal demise, n	0 (%)	2 (7.14%)	0.06
Postpartum hemorrhage, n	**10 (20.8%)**	**14 (50%)**	**0.008**
Quantitative blood loss at delivery (mL)	**665.6 ± 532.5**	**1665 ± 2013**	**0.002**
Patients receiving blood product transfusion, n	**5 (10.42%)**	**17 (56.67%)**	**<0.001**
Amount of blood products transfused (units) ‡	**0.18 ± 0.606**	**3.76 ± 7.532**	**0.002**
Hospital length of stay (days)‡	7.06 ± 8.75	9.43 ± 14.55	0.37
High-Risk unit stay (hours)‡	**39.83 ± 48.87**	**62.83 ± 44.03**	**0.039**

Conclusion and Discussion

- The CCOB designation was implemented to standardize our approach to managing medically complex obstetric patients throughout pregnancy and the immediate postpartum period, with the goal to provide enhanced care in our high-risk unit.

- This preliminary analysis demonstrates that unplanned CCOB patients are more critically ill and require higher resource utilization.

- Dedication of obstetric critical care resources is necessary to care for this patient population.

- Future work will include standardization of care expectations for the CCOB patient population.

- This novel approach to high-risk obstetric patient identification might serve as a model for other institutions.

1. Critical care admissions and outcomes in pregnant and postpartum women: a systematic review. *Intensive Care Med*. Dec 2024;50:1983-993.
2. Bateman BT, Mhyre JM, Hernandez-Diaz S, et al. Development of a comorbidity index for use in obstetric patients. *Obstet Gynecol*. Nov 2013;122(5):957-965.