The Impact of Implementing an Obstetric Co-Morbidity Scoring System during Delivery Admissions on Maternal Morbidity

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Introduction

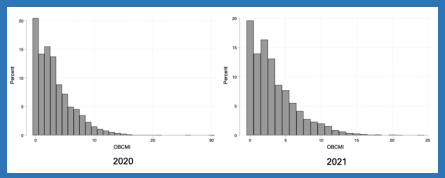
- Severe maternal morbidity in the U.S. has increased significantly over the past decade during delivery admissions
- The goal of this project is to implement an obstetric co-morbidity index (OB-CMI) as standard of care on the labor and delivery unit at the Hospital of the University of Pennsylvania (HUP) for all patients over a one-year period and then to assess the impact on the incidence of a maternal morbidity composite variable compared to a one-year pre-implementation time period

Methods

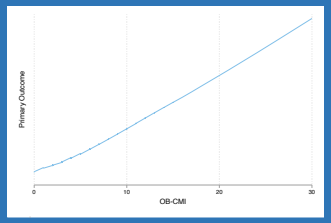
- **Prospective hybrid implementation-effectiveness study**
- OB-CMI implemented during the one-year period from January 1, 2021 – December 31, 2021 and compared to the one-year period from January 1, 2020 – December 31, 2020
- OB-CMI calculated for all patients on admission and documented in the medical record

Implementation of an OB-CMI scoring system for delivery admissions did not reduce the rate of the primary maternal morbidity outcome composite

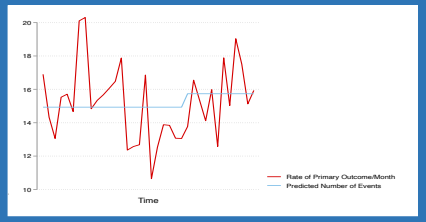
Distribution of OB-CMI Scores by Year



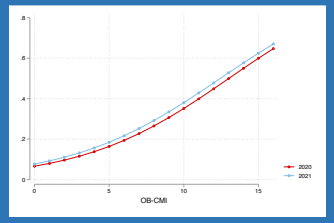
Risk of SMM by OB-CMI Score



Time Series of Primary Outcome, 2019 - 2021



Predicted Probability of the Primary Outcome by OB-CMI Score



Primary Composite Maternal Morbidity Outcome & Secondary Outcomes Compared between Pre-implementation and Post-implementation Periods

	Pre-implementation (2020) N = 4,150	Post-implementation (2021) N = 4,047	P Value
Primary Composite Outcome	573 (13.8%)	639 (15.8%)	**0.01**
Components of Primary Outcome			
Endometritis	24 (0.6%)	51 (1.3%)	**< 0.01**
Postpartum hemorrhage	237 (5.7%)	239 (5.9%)	0.71
Blood product transfusion	180 (4.3%)	196 (4.8%)	0.27
Hysterectomy	5 (0.1%)	5 (0.1%)	0.97
Venous thromboembolism	0 (0)	0 (0)	--
Postpartum length of stay ≥ 5 days	239 (5.8%)	315 (7.8%)	**< 0.01**
ICU admission	17 (0.4%)	28 (0.7%)	0.08
30-day readmission	51 (1.2%)	47 (1.2%)	0.78
Other Secondary Outcomes			
CDC SMM	247 (6.0%)	260 (6.4%)	0.37
CDC SMM without Transfusion	84 (2.0%)	103 (2.5%)	0.11
Joint Commission SMM Criteria	28 (0.7%)	39 (1.0%)	0.15

Adjusted Analysis of Clinical Effectiveness of OB-CMI Score Implementation on Primary & Secondary Outcomes

	Adjusted OR*	95% Confidence Interval	P Value
Primary Composite Outcome	1.18	0.96 – 1.45	0.12
Components of Primary Outcome			
Endometritis	2.40	1.19 – 4.85	**0.02**
Postpartum hemorrhage	1.07	0.80 – 1.42	0.66
Blood product transfusion	0.92	0.66 – 1.29	0.64
Hysterectomy	0.67	0.08 – 5.53	0.71
Postpartum length of stay ≥ 5 days	1.31	0.96 – 1.77	0.09
ICU admission	1.30	0.38 – 4.49	0.68
30-day readmission	0.92	0.48 – 1.76	0.80
Other Secondary Outcomes			
CDC SMM	0.85	0.63 – 1.15	0.30
CDC SMM without Transfusion	0.86	0.51 – 1.47	0.59
Joint Commission SMM Criteria	0.98	0.37 – 2.57	0.96

*Model adjusted for OB-CMI score and the interaction between cohort year and OB-CMI score

Methods cont.

- Primary maternal morbidity outcome composite = ≥ 1 of the following during the delivery admission: endometritis, postpartum hemorrhage (defined as estimated blood loss > 1L), blood product transfusion, venous thromboembolism, hysterectomy, ICU admission, length of postpartum stay ≥ 5 days, or 30-day readmission
- Secondary outcomes included alternate maternal morbidity definitions: (1) The Joint Committee definition [blood transfusion ≥ 4 units or ICU admission] and (2) CDC definition of severe maternal morbidity [SMM] based on ICD-10 codes
- Secondary implementation outcomes: intervention fidelity, acceptability, perceived impact
- Multivariable logistic regression model evaluating cohort year [as a proxy for intervention], OB-CMI score, and the interaction between cohort year and OB-CMI score was utilized to compare the dichotomous primary outcome

Results

- 4,150 patients were included in the pre-implementation cohort (2020) and 4,047 patients in the post-implementation cohort (2021)
- No significant differences in baseline demographics, obstetric characteristics, co-morbidities, median OB-CMI score, or percent of patients with an elevated OB-CMI score ≥ 6 between the two groups
- Multiple sensitivity analyses were conducted, including by OB-CMI score bracket and excluding patients with the highest risk co-morbidity conditions, and there were no changes in the overall study findings
- Implementation metrics:
  - OB-CMI documentation fidelity reached saturation at 65% and huddle documentation fidelity at 80%, by the study midpoint

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