ANW OBSTETRIC INTENSIVE CARE PROGRAM

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Co-Director ANW Obstetric Intensive Care Program
Abbott Northwestern Department of Critical Care Medicine
Maternal Feta/Critical Care Medicine
Minnesota Perinatal Physicians

Mission

- Patients who are at risk to develop critical care complications
- Patients currently with evidence of critical illness
- Patients who are hemodynamically unstable
- Goal was for unique designated Critical Care Unit to provide specialized intensive care medicine to safeguard the most optimal outcome for mothers and newborns

Goal

- Critical Care ICU solely dedicated to critical obstetric illness
- Collaboration with already comprehensive high-risk perinatal services and transfer program
- Ultimately to make a significant difference in the lives of our antenatal/postnatal mothers with critical complications of pregnancy

GOAL

- MODEL OF THE ONLY UNIT WITHIN THE MIDWEST REGION DEDICATED SOLELY TO CRITICAL CARE OBSTETRIC ILLNESS
- 24/7 One Call Transfer to the Unit
- Collaboration with our team as well as neonatal physicians/APRN's/Pediatric surgical team within the MBC/MWFCC/Minneapolis + St Paul Children's to provide the most advanced treatment therapies available to ensure optimal outcome for mother/fetus/newborn as the central focus

GOAL

- Patient care, teaching, and research efforts to provide and improve state of the art care of critically ill obstetric patients will remain the central focus to enhance and optimize their care and serve as a model for future generations of mothers and babies

Background

- Recent case series suggest between 0.1% and 0.8% of obstetric patients are admitted to “traditional ICU”
- Risk of death ranges from 2% to 11%, mortality substantially higher than the maternal mortality ratio in the developed world
- In addition, 1-2% pregnant patients receive critical care outside of a traditional ICU but within dedicated obstetric care unit
- Overall estimates 1-3% of pregnant women require critical care services

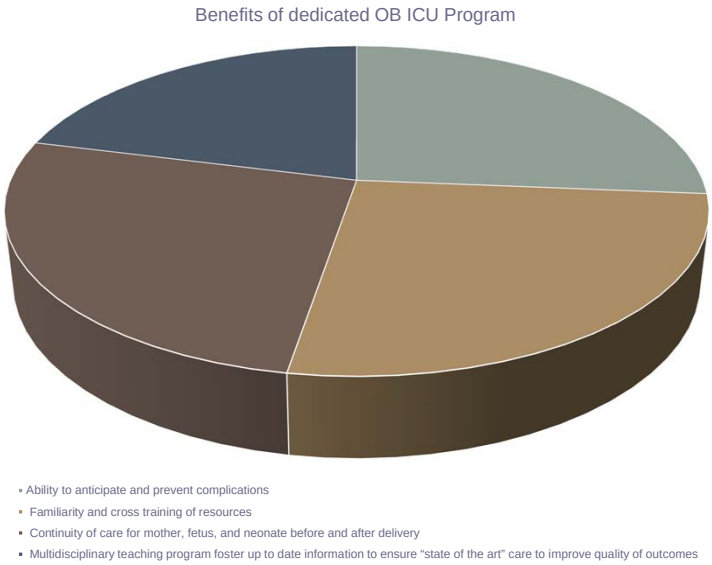
Background

- Unique Hemodynamic and other physiologic adaptations that occur in pregnancy poses exceptional challenges in this patient population
- Knowledge of these physiologic adaptations and specific pregnancy-related disorders is mandatory for optimal management
- Dedicated Obstetric ICU is designed to fit this need and bridge the critical care delivery from traditional ICU units.

Correlation of adaptive changes in pregnancy to critical care therapeutics

Adaptive anatomic and physiologic changes occur in all organ systems to maintain homeostasis in mother and developing fetus

These are accentuated in multi-fetal pregnancies where demand on other wise “healthy organ systems” may increase 2-5 fold



Cause of Death in Obstetric Patients in ICU

- Hypertensive disease: 26%
- Respiratory (pneumonia, AFE, ARDS, PE): 20%
- Cardiac (Eisenmenger's complex, MI/arrhythmia/cardiomyopathy): 12%
- OB Hemorrhage: 10%
- CNS Hemorrhage: 7%
- Infection/Sepsis: 8%
- Malignancy: 6%

Source: Cantwell R, Clutton-Brock T, Cooper G, et al. 2011

Dedicated Team: multidisciplinary experts

- 24/7 Critical Care Intensivists
- 24/7 Critical Care/Surgical MFM Specialists
- Invasive/Non-invasive cardiology including acute/chronic heart failure team
- ICU trained and cross coverage team of obstetric nurses all ALCS certified
- State of the art facilities with current up to date technology/monitoring (mother and fetus) including:
  - Point of care focused ultrasound/echocardiography with immediate non-invasive hemodynamic monitoring
  - Immediate availability of invasive hemodynamic monitoring
  - ECMO (V/A and VV)

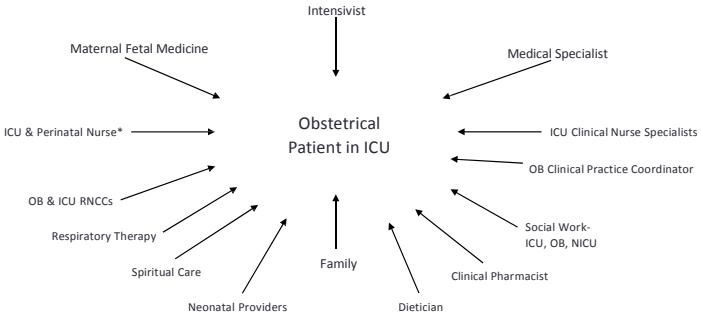
Dedicated Team: multidisciplinary experts

- Collaborative team of subspecialists:
  - Pediatric Cardiology
  - Pediatric Cardiology subspecialized in the management of adults with corrected congenital heart lesions
  - Urology/Nephrology
  - Anesthesia team specially trained in the critical care management of obstetric patients with life threatening maternal cardiac disease
  - Oncology specialists
  - Cardiothoracic/Vascular Surgery 24/7 immediate availability

Dedicated Comprehensive Medical Services

- Respiratory Therapy (RCAT)
- All current modes of ventilator therapy tailored to patient needs and underlying respiratory compromise
- Adult/Neonatal ECMO
- Transfusion experts for complications of massive transfusion therapy with ROTEM integration
- Continuous remote cardiac telemetry as needed

ANW Critical Care/OB Partnership Model



*Team Nursing (ICU/OB RN Partnership)

1. Key interactions for optimal patient care
   a. Bedside shift report (ICU & OB RN at bedside)
   b. Multidisciplinary rounds (MDRs) (11am PB2000, ? H4100/4200)
2. OB RN assigned to ICU patient
   a. Come to ICU for bedside shift report with ICU RN
   b. Care Team huddles throughout shift (need to further define when, how often)

Supportive Consultants

- NICU-NNP & Neonatology
- Lactation Consultant
- Subspecialties

Benefits of obstetric dedicated ICU not realized by traditional ICU setting

- Intensive care personnel dedicated and trained in the observation and organization of the unit allows for prevention of complications and early recognition and treatment of complications
- Familiarity and cross training of resources of both invasive/non-invasive monitoring will provide prompt, rational treatment of hemodynamically unstable patients
- Continuity of care for mother, fetus, and neonate will be improved before and after delivery

Benefits of obstetric dedicated ICU not realized by traditional ICU setting

- Multidisciplinary teaching program will foster up to date information for residents/fellows/attending's to ensure “state of the art” care to improve quality of outcomes, in particular those rare complications of pregnancy that will need transfer to our quaternary center
- Provide a broad spectrum of patients in which research in the area of hemodynamic compromise related to pregnancy can be maintained and contributions to the literature may be ensured to provide insight into evidence based critical care management

Integrated program/patient profiles

- Quaternary center of referral for > 5000 deliveries/year (MBC)
- Referral base for metropolitan and more broadly, instate/outstate within the Midwest region
- Growth potential for the program likely to increase exponentially
- No existing Midwest Regional Center for the critically ill obstetric patient exists in current format to bridge the outpatient/inpatient clinical expertise
- Integrated outpatient program with **M**aternal **O**bstetric **M**edical and **S**urgical complications of pregnancy subspecialty clinic (MOMS)

Integrated program/patient profiles

- Seamless program to enhance the overall quality of care with improved outcomes to provide the “only dedicated Center of Excellence in this area” within our region
- Integrated relationship with Midwest Adult Congenital Cardiac Center (MACC)
  - Program Dedicated to the care of patients with corrected/palliative congenital heart diseas with Minneapolis Heart Institute (MHI) Children’s Heart Clinic (Children’s Hospital of Minnesota)
- Measurable outcomes for the most seriously ill and at risk for critical illness:
  - LOS
  - Morbidity
  - Mortality
  - Readmission to ICU

Overview of obstetric critical illness by organ system

- Hypertensive disorders (acute/chronic hypertensive emergencies)
- Morbidly adherent placenta complexities (integrated into the Center of Excellence for the diagnosis and surgical management of abnormal placentation within the Mother Baby Center)
- Corrected/acquired maternal congenital heart disease (CHD)
- Endocrine crises:
  - Diabetic Ketoacidosis
  - Thyroid storm
  - Adrenal crises

Overview of obstetric critical illness by organ system

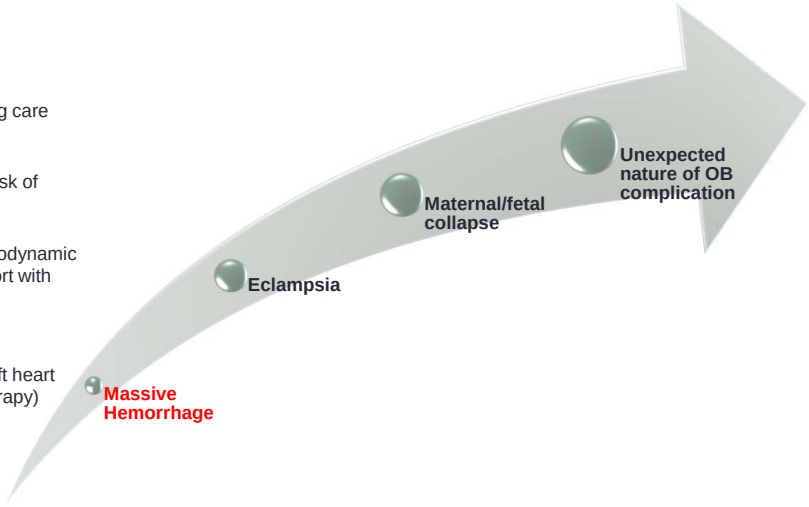
- Infectious disease complicated by:
  - Severe sepsis
  - Septic shock
  - Multisystem end organ dysfunction/failure
- Renal disease
  - Acute Kidney Injury (AKI)
  - Chronic Kidney Disease (CKD)
  - End Stage Renal Disease (ESRD)
  - Continuous/intermittent renal replacement therapy (CRRT)/Dialysis

Overview of obstetric critical illness by organ system

- Complicated chemical dependency: Withdrawal
- Thromboembolism/Pulmonary embolism/amniotic fluid anaphylaxis
- Oncology
- Neurologic
  - CVA/Neuro thromboembolic emergency
  - Seizure disorders
  - Eclampsia and sequelae

Overview of Criteria for OB ICU Admission and D/C

- Patients requiring intensive nursing care and titrated patient care 24/7
- Patients with Acute Respiratory Failure/intubation or at imminent risk of requiring ventilator support/airway management
- Requiring advanced invasive hemodynamic monitoring and/or CV organ support with vasoactive therapy (inotropes/vasopressors)
- Intracranial pressure monitoring
- Advance cardiac support (Right/left heart Cath/cardioversion/arrhythmia therapy)
- Coma
- Multisystem end organ failure



Condition Specific indications for OB ICU Program Transfer

- Condition
- **Physiologic or diagnosis criteria**
- **Amniotic fluid embolism**
  - Suspected embolism
- **Acute respiratory insufficiency/Distress**
  - -Persistent tachypnea >30 AND
  - O2 saturation persistently <92% on room air.
  - -Rapid response called for acute respiratory distress.
  - -Pulmonary edema confirmed imaging modality other than portable chest x-ray.
  - -pulmonary embolism (known or suspected)
- **Congenital or acquired cardiac condition**
  - Conditions requiring critical care- acquired valve disease, endocarditis, cardiomyopathy, peripartum related to substance abuse.
- **Diabetic ketoacidosis (DKA)**
  - Diagnosis of DKA at any gestational age
- **HTN in pregnancy**
  - Eclampsia

Condition Specific indications for OB ICU Program Transfer

- **HTN in pregnancy**
  - Preeclampsia with sever features with any of the following:
  - SBP ≥160 mmHg and/or DBP ≥ 110 mmHg; 2 severe BP values SBP ≥160 mmHg or DBP ≥ 110 mmHg taken 15-60 minutes apart unresolved within 1 hour with appropriate antihypertensive therapy
  - Need for antihypertensive infusion
  - Maternal neurologic changes or possible stroke
  - Acute kidney injury/anuria or <500mL output in 24 hours · Acute fatty liver
  - HELLP syndrome with platelets <50,000, AST/ALT >2 SD above median, evidence of hemolysis with or without hypertension
  - Pulmonary edema
- **Severe hemorrhage**
  - -Blood loss of 2500mL or more at delivery and/or immediate postdelivery period (2hours), with hemodynamic instability
  - -Massive transfusion protocol blood product replacement (or 4 or more units PRBCs)
  - Disseminated intravascular coagulopathy
- **Sepsis**
  - Septic shock
  - Severe sepsis and repeat lactate is the same or higher, or if vital signs are not improving in the first 2-3 hours during delivery hospitalization.

Criteria for admission

Cardiac

High probability of MI
Hemodynamically unstable
Arrhythmias
Congestive heart failure
Pacing requirement
Urgent/Emergent hypertensive crises with/without evidence of end organ failure
HELLP Syndrome
Eclampsia

Pulmonary

Compromised gas exchange
At risk for impending respiratory failure (Asthma/Pneumonia/Pulmonary edema)
Requirement for minute-minute monitoring of vital signs (suspected/confirmed PE) or need for aggressive pulmonary physiotherapy

Neurologic

Eclampsia
Seizure from known or unknown cause
Known prior neurologic event that places current maternal well being in jeopardy

Criteria for admission

Chemical dependency

Need for frequent neurologic assessment

Need for continuous pulmonary/cardiac monitoring that is at risk for hemodynamic instability

Gastrointestinal

UGI/LGI bleeding requiring transfusion therapy

Hepatic failure:

- AFLP
- TTP/HUS
- Hepatorenal Syndrome

Pancreatitis

Endocrine

DKA

Thyrotoxicosis/Storm

Complicated parathyroid/calcium metabolism

Congenital metabolic disorders

Criteria for admission

- **Surgical**
  - Severe hemorrhage requiring MTP
    - Morbidly adherent placenta
    - PPH
    - Peripartum hysterectomy that requires close monitoring/fluid resuscitation
- **Renal**
  - Unstable AKI
  - Chronic Kidney Disease/unstable
  - CRRT
  - Plasmapheresis

Criteria for admission

- **Sepsis/Septic shock**
  - Hypotensive
  - Decreased oxygen delivery/elevated Lactate levels
  - Gram negative/positive bacteremia
  - Vasopressor
  - Multisystem end organ dysfunction/failure
- **Miscellaneous**
  - SLE crisis (Lupus Nephritis/Cerebritis)
  - Sickle Cell Crisis (Sickle lung disease)
  - Thrombotic microangiopathies
  - Trauma
  - Thermal and electrical injury

ANW Mother Baby Center 2016
Maternal Early Warning Signs Identification, Notification, Evaluation and Escalation Checklist

Maternal Early Warning Signs

- Temp: < 96.8 F (36C)or >100.4 F (38C)
- Pulse: persistent maternal HR <=50 or >120
- Respiratory rate (RR): <10 or >24
- BP: Systolic <90 mmHg or >=160 mmHg
  - Diastolic <45 or >=105
- SaO2 < 95%
- Oliguria:<35 mL for 2 hours, or <0.5 mL/Kg/hr for 2 hours

Provider bedside evaluation:
If provider evaluation is non diagnostic or the abnormal VS or S/S are felt to reflect normal physiology for that patient, a plan for subsequent patient monitoring, re-notification, and re-evaluation plan should be communicated and documented by the provider.

Maternal Signs/Symptoms:

- Visual changes
- Epigastric pain, upper right quadrant pain
- Absent DTR's on magnesium sulfate
- Agitation
- Patient with preeclampsia reporting a non-remitting headache or shortness of breath
- Significant bleeding (weigh blood loss) or suspected internal bleeding (see PPH checklist and move to OR if >1500 cc blood loss and not resolved);
  - persistent maternal tachycardia
  - abdominal pain or distention
  - hypotension
- Concern for infection with abnormal VS (temp and RR as above, Pulse >110, and/or WBC >15 or < 4)
- MAP <70 (Mean arterial pressure = 1/3 pulse pressure + diastolic)
- Severe abdominal pain
- Hypertensive emergency (follow order set) not controlled within 1 hour, provider to the bedside.

Notify provider. Provider reassess within 1 hour if s/s not resolved

- **Notify Community Charge and Team Lead RN**

- **Notify provider, prompt beside evaluation, & document assessments, interventions, and communications (urgent concerns call OB Hospitalist)**

Rapid Response (Code Blue as indicated), Call OB Hospitalist, and Anesthesia and notify primary provider.

- Chest Pain
- Suspected Sepsis
- Shortness of breath
- Unresponsiveness
- Change in neuro status including;
  - Confusion
  - Focal neuro deficits
  - Seizure
  - Suspected stroke
- Unwitnessed fall or fall with suspected injury
- Concern for maternal stability

Resources

- Designated Critical Care bed system within newly designed Critical Care Unit
- Seamless continuity with Neonatal team
- Dedicated nursing/cross cover with special expertise in critical obstetric illness
- ACLS/Antepartum FHR monitoring expertise
- In room 24/7 availability of multi-channel hemodynamic monitor assessment
- Point of Care Ultrasound expertise for
  - Extended Focused Assessment with Sonography for Trauma (eFAST)
  - ECHO
  - Aorta/IVC
  - Intra-abdominal
  - DVT/vascular access

Technical Resources

Multi-Channel Hemodynamic monitors

Arterial hemodynamics

CVC Hemodynamics

- SvcO2
- $C\bar{v}o2$
- Shunt Fraction
- Oxygen

Delivery

Cardiac Output (CI/SI)

Ventilators/fetal monitors/ultrasound

All ventilator modes capability

24/7 RCAT

24/7 availability for secure airway

Fetal monitors for antepartum/intrapartum need

Delivery

Specific birthing beds for vaginal delivery

Capability for immediate C/S (Critically ill patient/fetal compromise/Peri-Mortem)

Staffing Resources

- Lines of communication that go directly to lab personnel/blood bank in setting of Massive Transfusion Protocols (MTP)
- Dedicated Critical Care Pharmacy
- RCAT
- Multidisciplinary Intensivists including
  - Medical
  - Surgical
  - Cardiac
  - ECMO

Staffing Resources

- MFM/Critical Care OB Specialist/Intensivist specialist as C—Directors of the dedicated ICU
- Minimum of 10 obstetric/cross cover RN/(APRN's) to assure at least one available for each bed in unit (24/7)
- All RN's/APRN's would have ≧ 2 years of intrapartum care experience or cross cover intensive care training
- Teaching:
  - MFM/Critical Care fellows/Medicine residents to be part of staffing resources and ongoing educational opportunities provided by staff will be MAJOR FOCUS of education while assigned to unit

Staffing Resources

- All nurses to have ability to attend CME's for obstetric intensive care:
  - Adaptive changes in pregnancy that potentially impact critical illness
  - Annual OB ICU course commitment that also includes simulation to maintain up to date skills set
  - Formal hemodynamic monitor training
  - Ventilator management therapy
  - Cross cover training in the medical ICU of the L/D nursing team to fill resource requirements with all certified ACLS

Measurable Milestones/Benefits

- Close and direct bedside critical care:
  - Problems detected earlier
  - Complications averted/prevented
- Subtle changes in maternal/fetal condition not always reflected in patient notes: "Can only be detected by serial observation at the bedside"
- Complex/Continuity of care will be readily organized within single dedicated Obstetric ICU
- OB team will gain knowledge and expertise in hemodynamic monitoring
- Reduce need to transfer patient "off service" to individuals who do not possess same knowledge base of the unique physiologic and hemodynamic variables attributable to pregnancy (pre/post delivery

Measurable Milestones/Benefits

- Training and maintaining up to date critical care knowledge
- Ensuring state of the art care across the system which can be measured in CME/simulation and advancing similar knowledge based criteria and performance
- Improved educational opportunities for residents and fellows, who DO NOT have that availability within their academic training programs
- Each of the above HIGHLIGHT the unique opportunity for MBCSL/Critical Care Medicine partnership to provide that training and to be the “premier” provider for the program

Criteria for OB ICU Admission

- Successful epidemiologic evaluation of any particular disease has several prerequisites:
  - Condition should be accurately defined
  - Measurable outcomes of interest
  - Systematic way of data collection or surveillance that allows measurement of the outcomes of interest and associated risk factors
- Epidemiologic evaluation of critical illness associated with pregnancy has met with mixed success on all these accounts

Criteria for OB ICU Admission

- Focus traditionally based on the well-defined outcome of maternal mortality in order to identify illnesses or conditions that might lead to maternal death
- Maternal mortality in US 11.5/100,00 live births
- Tracking maternal death may not be best way to assess pregnancy-related critical illness
- “Death represents only the tip of the iceberg, the size of which is unknown”

Criteria for OB ICU Admission

- Each of several conditions complicating pregnancy (preexisting or complicated by pregnancy) can and are associated with significant complications that have the potential for serious morbidity, disability, and mortality
- Stage which condition becomes severe enough to be classified as critical illness has not been clearly defined
- More helpful to consider critical illness as IMPENDING, DEVELOPING, or ESTABLISHED organ dysfunction, that can lead to long-term morbidity or death
- Allows flexibility as conditions can deteriorate quickly

Criteria for OB ICU Admission

- Specific surveillance systems to track severe complications of pregnancy NOT associated with maternal mortality are lacking
- Most women suffering from critical illness in pregnancy will spend some time in an ICU setting
- Cases are described as “near miss” mortality cases
- 2/3 of maternal deaths occur in WOMEN WHO NEVER REACH and ICU

ICU Mortality of Obstetric Patients and Prediction by APACHE II score

- APACHE II Scores of 10-14 should correlate with and ~ 15% mortality rate in patients admitted to ICU without preceding surgery and ~ 7% admitted following surgery
- ICU mortality in the “all obstetric admissions” was 2.3% (APACHE II-10.9) and in non-obstetric cohort was 14.7% (APACHE II-13.7)
- Second study in same group mortality was 3.2% in “currently pregnant” group (APACHE II -12), 1.7% in “recently pregnant” group (APACHE II-10.4) and 11% in the non-obstetric group (APACHE II-13.3)

Intensive Care and National Audit Research Centre (ICNARC). Female admissions (aged 16-50 years) to adult, general critical care units in England, Wales, and Northern Ireland, reported as "currently pregnant" or "recently pregnant." 1 January 2007 to 3 December 2007
Harrison DA, Penny JA, etal. Critical Care. 2005:9:s25

IMPACT

- APACHE II scores over predict mortality in the obstetric ICU population
  - Possible explanations:
    - Hypertensive disease of pregnancy and hemorrhage account for the majority of ICU admissions
    - Each can cause significant physiologic derangements (leading to higher APACHE II scores) but are relatively self-limited when supportive and urgent operative care is provided
    - Adaptive changes in physiologic parameters in pregnancy WOULD BE DEEMED abnormal by APACHE II scoring criteria
    - Combined, adaptive physiologic parameters at presentation are relatively out of step with clinical course
  - Argues for new/unique scoring system for obstetric ICU patients

Cause of death in Obstetric Patients in ICU

- Hypertensive disease: 26%
- Respiratory (pneumonia, AFE, ARDS, PE): 20%
- Cardiac (Eisenmenger's complex, MI/arrhythmia/cardiomyopathy): 12%
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Cantwell R, Clutton-Brock T, Cooper G, et al. Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer 2006-2008
Eighth Report of the Confidential Enquiries into Maternal Deaths in the UK. BJOG. 2011; 118 (supp 1): 1-203

Admission criteria to Dedicated ICU

Important to recognize that BOTH the pregnant patient with deteriorating health status secondary to comorbid medical conditions and the healthy pregnant patient that is unstable from obstetric complications may equally benefit from care in the ICU

Aggressive management in a DEDICATED OBSETRICAL ICU vs ”general ICU” of this patient population, combined with their overall better health status, YIELD LOWER MORBIDITY AND MORTALITY RATES

Overview of obstetric critical illness by organ system

- Post surgical complications of pregnancy
  - Sepsis
  - DIC
  - Massive Transfusion Protocol (MTP)
- Organ transplant/complications of immunosuppression therapy
- Respiratory disease:
  - ARDS
  - Acute Lung Injury (ALI)
  - Status asthmaticus

Lisa Kirkland, MD, lead intensivist, Abbott Northwestern Hospital

William Wagner, MD, obstetric and surgical intensive care specialist, Minnesota Perinatal Physicians and Abbott Northwestern Department of Critical Care Medicine

Abbott Northwestern launches first Obstetric Intensive Care Program in the region

Lisa Kirkland, MD, and William Wagner, MD, co-directors of the Obstetric Intensive Care Program

Obstetric care is becoming more complex due to changes in the patient population. These changes include increased maternal age, a higher incidence of obesity and related chronic illnesses, and the presence of acquired or congenital diseases that are treatable, but may pose significant risks during pregnancy. As a result, many maternal and fetal medicine specialists have been advocating for dedicated programs to provide critical care for obstetric patients.

Later this year, Abbott Northwestern Hospital is launching the first such program in the Midwest: the Obstetric Intensive Care Program. It builds on the hospital's existing high-risk perinatal (provided by Minnesota Perinatal Physicians) and intensivist services; its collaboration and strong partnership with the Midwest Fetal Care Center and neonatology services of Children's Minnesota; and its wide range of specialty and subspecialty expertise.

The program also highlights Abbott Northwestern's capabilities and role as a regional quaternary care center. For example, last year, Minneapolis Heart Institute® valve specialists performed one of the country's first transaortic valve replacement (TAVR) procedures in a pregnant patient. This is the type of patient for whom the new Obstetric Intensive Care Program is designed.

It is estimated that 1-3 percent of pregnant women require critical care services. Currently, these women are admitted to a traditional Intensive Care Unit (ICU), or they receive critical care within a dedicated obstetric care unit. Both the pregnant patient with deteriorating health status secondary to comorbid medical conditions and the healthy pregnant patient whose condition is unstable due to obstetric complications may benefit from care in the Obstetric Intensive Care Program (see sidebar). These patients face exceptional challenges because of the unique hemodynamic and other physiologic adaptations that occur in pregnancy. Medical and nursing teams require specialized knowledge to understand these adaptations as well as pregnancy-related disorders.

The Obstetric Intensive Care Program will help us better integrate the processes and people that are needed to manage these patients. The complex nature of their care will be more readily organized within the program, and the resources that it

brings together will enhance bedside critical care. That helps us to detect problems earlier and minimize or avoid complications.

Our multidisciplinary team includes:

- 24/7 critical care intensivists
- 24/7 critical care/surgical maternal fetal medicine specialists
- invasive/non-invasive cardiologists
- acute/chronic heart failure specialists
- cross-trained intensive care and obstetric nurses with special expertise in critical obstetric illness
- subspecialists:
  - pediatric cardiologists, including those who treat adults with corrected congenital heart lesions
  - urologists and nephrologists
  - anesthesia team with special training in critical care management of obstetric patients with life-threatening maternal cardiac disease
  - oncology specialists
  - cardiothoracic and vascular surgeons.

The hospital has also invested in state-of-the-art facilities with the latest technology and monitoring for the mother and fetus including:

- point of care ultrasound/ echocardiography with immediate non-invasive hemodynamic monitoring
- immediate availability of invasive hemodynamic monitoring
- veno-venous (VV) and veno-arterial (VA) extra corporeal membrane oxygenation (ECMO).

In addition to providing direct patient care, we are designing our program to have strong outreach and research components. Through services like curbside consulting and Telehealth, we can partner with primary care providers and community hospitals to help most patients get the care they need in their own communities, while building systems that allow for rapid diagnosis, transfer and treatment of critically ill patients.

The Obstetric Intensive Care Program will also present a unique opportunity for multidisciplinary teaching, providing residents, fellows and attending physicians with state-of-the-art training, while also making it possible to collect data and design research studies focused on hemodynamic compromise and other obstetric critical care challenges. Our goal is to provide optimal patient care while also enhancing and improving our care through teaching and research.

Obstetric critical illness by organ system

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- Neurology
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  - seizure disorder
  - eclampsia and sequelae

ABBOTT NORTHWESTERN HOSPITAL

Obstetric Intensive Care Program

24/7 One Call Transfer

612-863-1000

Thankyou for allowing me to participate in this fabulous learning experience

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