MATERNAL MORTALITY REVIEW COMMITTEE

ABSTRACTOR MANUAL

Version 4

Enhancing Reviews and Surveillance to Eliminate Maternal Mortality

MATERNAL MORTALITY REVIEW INFORMATION APP

CONTENTS

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INTRODUCTION

As a record abstractor for a Maternal Mortality Review Committee (MMRC), you play a key role in helping save lives. The MMRC program carefully chose you with confidence in the high caliber of work you do and will produce. As an abstractor, your expertise and skills are closely tied to the quality of information that is presented to the review committee, and ultimately to the accuracy of identified issues and recommendations for improvement. Abstraction can be challenging, highly rewarding work.

"The purpose of reviewing pregnancy-related deaths is to gain insight into the medical and social factors that lead to such events in order to decrease such deaths in the future."

Berg, Danel, Atrash, Zane, Bartlett (Editors). ***Strategies to Reduce Pregnancy-Related Deaths: from Identification and Review to Action*** (2001) [i]

Abstraction is a task that requires many skills. You must know what information to look for, how to record it, where to find it, and when to record it. Both medical and non-medical records may be difficult to interpret, and key information is often written as is appropriate to a specific context. Therefore, it is important to have a basic understanding of the significance of changes in vital signs, reported symptoms, cascading events, and documentation of the escalation of care measures, as well as the nuances of social determinants of health. Noting the timing of recognition and response to key issues will help you develop a comprehensive case narrative. In addition to the technical skills and knowledge required for the task of abstraction, abstractors must have the interpersonal, diplomatic, and technical skills to acquire records from real people and online records warehouses. You are the outward face of the review program. You represent the MMRC and hold a great deal of responsibility in ensuring the protection and confidentiality of the information you gather. Therefore, it is of utmost importance to demonstrate professionalism and have a full understanding of the authority and/or legislative parameters under which the committee operates. You should receive initial and ongoing training regarding appropriate practices.

Abstraction requires searching through a record for data pertinent to a secondary use. Abstraction can include categorizing, coding, transforming, interpreting, summarizing, and calculating the data. The abstraction process results in a summary of information.

Nahm. **Data Accuracy in Medical Record Abstraction** (*2010*) [ii]

Abstractor experiences vary widely but have at least one thing in common: abstraction can be difficult – both emotionally draining and professionally challenging. Whatever your situation may be, you are not alone. While self-care is a significant ongoing necessity, you and fellow abstractors can expect to be supported by the MMRC and other staff. Understanding your supervisory structure and identifying a support network are important prerequisites for knowing where to turn when you have questions, concerns, or when you need emotional support to help process your experiences as an abstractor.

As a successful abstractor, you play an individual role in the greater effort of preventing maternal mortality. Though abstraction is challenging and carries many responsibilities, remember that yours is a noble pursuit: your contribution helps save lives, keep families together, and strengthen communities.

GUIDELINES FOR ABSTRACTION

The Goal of Abstraction

Your goal as an abstractor is to comprehensively gather pertinent information in order to accurately capture the events of a person's life leading up to and including death. Autopsy, medical examiner, and other investigative reports are also of critical importance to informing the review. Some committees also abstract information from news articles, social media accounts, and other public resources.

The abstraction process is like piecing together a puzzle to reveal the full picture. While it is not uncommon for some pieces to be missing, the goal is to gather enough pieces to understand the overall picture of a person's life and death. Information from vital statistics, medical and non-medical records, and informant interviews may not match, and this is okay. You are there to record the information, not to interpret it or make it match.

Overview of Abstractor Duties

The art of abstraction comes with specific requirements. While abstraction processes and responsibilities vary state to state, some primary features for successful abstraction include:

- **Receiving deaths identified within scope of review** from a program coordinator and abstracting in a timely manner
- **Contacting and building relationships with hospitals and other types of facilities** and arranging access to medical and non-medical records for deaths assigned for abstraction (this responsibility may be shared with a program coordinator
- **Reviewing records** filling out appropriate abstraction forms, writing a case narrative, and providing additional information based on clinical documentation in the records
- **Gathering information** from other types of facilities if needed
- **Data Entry** of information into MMRIA including development of case narrative for committee review
- **Attending** review committee meetings and possibly assisting with facilitation of case review
- **Assisting with Data Entry** of Committee Decisions into MMRIA (pending jurisdictional policies)
- **Staying up to date on the MMRIA system and best practices for abstraction** by attending monthly Abstractor and Coordinator Office Hours and MMRIA User Meeting (MUM) sessions

Information to Seek

Key questions will help you find and use the right information. Many sources of information may be available to you in your abstraction work. Your ability to identify the most pertinent information is the first step in producing high quality abstractions to assist the MMRC. When abstracting, keep in mind the key decisions that the MMRC make about each death:

1. **Was the death pregnancy-related?**	4. **What were the contributing factors to the death?**
2. **What was the underlying cause of death?**	5. **What specific and feasible recommendations for action should be taken to prevent future deaths?**
3. **Was the death preventable?**	6. **What is the anticipated impact of those actions if implemented?**

Any information encountered in records that can help a committee answer these questions should be abstracted. Priority data elements for reviewing a maternal mortality include:

- **Autopsy reports**
- **Coroners' or medical examiners' reports**
- **Medical history**: personal pre-pregnancy history and family history
- **Obstetric history**: previous pregnancies, complications, and risk factors
- **Prenatal care:** weight; height; pre-pregnancy BMI; gestational age of entry; prenatal visits attended and missed; referrals made; provider and type of clinic; vital signs; diagnostic studies and labs; provider comments
- **Labor and delivery**: date/time; place; maternal, trauma, and/or neonatal level of care of the delivery facility; chief complaint; nursing and medical assessments; orders; medications; vitals; labs and diagnostic studies; timing of assessments; treatments; diagnoses; delivery information including treatments, labs, consultations, and complications

Note that the underlying cause of death listed on the death certificate may not reflect the underlying cause of death as determined by the committee. Contributing factors often overlap; therefore, keep an open mind.

- **Postpartum**: vital signs; complications; discharge instructions, including medications, referrals, and follow-up visits
- **Hospitalizations**: inpatient visits during pregnancy and postpartum
- **Other office visits**: all outpatient visits during pregnancy and postpartum
- **Social and environmental**: additional factors not captured under demographics, such as substance use disorder treatment or referrals to social services; notes on care coordination; evidence of mental health screening, referrals, and/or treatment; notes on access to care, housing, and transportation; involvement of Child Protective Services; Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) applicant or recipient; notes on Prescription Drug Monitoring System; notes on Violent Death Reporting System; court records; first responder notes; or information from other sources pertaining to social or physical determinants of health
- **Demographics:** age; marital and education status; race/ethnicity; type of insurance; employment status

Less commonly available pieces of information that are extremely beneficial to the committee include:

- **Other care**: details on any other care received from ancillary sources, if available; mental health counseling; social services, reproductive life counseling preceding sentinel pregnancy or other primary care/specialist visits other than obstetric referrals that precede the pregnancy or occur within the year postpartum. Other care may be identified via access to Medicaid claims data, Prescription Drug Monitoring Programs, Home Visiting Programs, etc.
- **Informant interviews of family, friends, or personal supports** interviews can help to fill in gaps of information; to capture the decedent's perceptions regarding the care sought, offered,

and received; to shed light on reasons for missed appointments or non-adherence to treatment regimens; and, in cases of injury deaths, to determine suicidality. Additionally, publicly available information and social media may shed additional light on their life and the tragic events that led to their death. A helpful resource is the Informant Interview Guide for Maternal Mortality Review Committees which can be accessed at www.cdc.gov/erasemm.

Information to Record

Without certain fundamental data, committees cannot perform valid reviews. When sorting through all the information available in records, be sure to capture these key pieces of information:

- **Underlying cause of death:** You will find this listed on the death certificate. Key clinical factors to pay attention to can be inferred from the cause of death
- **Vital signs and labs**: These are important indicators of health status. Look for vital signs and labs collected during prenatal care, hospital admissions, outpatient visits, and postpartum care
    - For persons with extensive hospital records, you may need to select the most pertinent vital signs and labs to decrease the volume of information abstracted. Use your knowledge and experience to prioritize vital signs and labs collected. This may be upon hospital entry, at critical times (such as when condition begins to deteriorate), and at death
    - Associate vital signs and labs with corresponding dates and times
- **Healthcare provider responses**: Note the date and time of abnormal vital signs and labs, as well as providers' subsequent response or treatment
- **Changes in physiological status**: Provide clear benchmarks for identifying changes
- **Social context and environment**: Seek out details that help illuminate the circumstances in which the person lived. These include employment status, marital status, economic stability, and access to care and transportation

- **Nursing progress notes and flow charts**: These contain valuable information regarding the flow of events and patient response
- **Diagnostic studies and procedures**: These are critical sources of information, so be sure to note date, time, and response to any abnormal results
- **Care providers' recognition and response to subtle changes in a patient's status**: The ability to tease out documented information of *the relationship between changes in patient condition and provider responses to those changes* is a critical component of abstracting
- **Missing data**: Noting gaps in available information will help you when you are writing the case narrative and cannot remember whether it was there or not
- **Bias or discrimination**: Noting documentation in records or information shared through informant interviews that are associated with discrimination or racism

A core question on the MMRIA Committee Decisions Form is whether discrimination contributed to the death. Further, contributing factors may be documented including discrimination, interpersonal racism, and structural racism. Definitions for each term are included on the print version of the MMRIA Committee Decisions Form. The abstractor is responsible for viewing the available evidence through an objective but informed lens. Understanding how bias, discrimination, and racism influence outcomes of health events differently across different groups will foster your ability to identify these factors. [iii]

- Pay particular attention to key words, phrases and situations in records received such as the following:
- symptoms attributed to substance use that do not correspond to recognized symptoms of substance use or withdrawal and/or repeat mention of drug use
- multiple emergency department, urgent care, or primary care provider visits for similar complaints in a short period

Additionally, be sure to note any of the following:

- **Patient complaints**
- **Patient responses to treatments**
- **Changes to a patient's mental status**

When Enough Information is Enough

If what happened is not clear to you as an abstractor, it will probably not be clear to the committee. You have the responsibility to make sure the information you bring to the committee is as accurate and as comprehensive as possible. Without complete information, suggested recommendations may be misdirected. However, records can be hundreds or thousands of pages long and patients usually have multiple care encounters, making it difficult for the abstractor to decide what information is important to capture. Try to identify the information that will assist the MMRC. Again, keep in mind the key decisions that the committee needs to make and aim to provide adequate information in order for the committee to address them:

1. **Was the death pregnancy-related?**
2. **What was the underlying cause of death?**
3. **Was the death preventable?**
4. **What were the contributing factors to the death?**
5. **What specific and feasible recommendations for action should be taken to prevent future deaths?**
6. **What is the anticipated impact of those actions if implemented?**

LOCATION AND SOURCES OF INFORMATION FOR ABSTRACTION

On-site vs. Off-site Record Abstraction

The MMRC will need to decide if abstractors will go out into the field to obtain information or if information will be requested and sent to a specified location for abstractor review.

LOCATION OF ABSTRACTION	STRENGTHS	CHALLENGES
ON-SITE REVIEW	○ No wait for records to be transmitted, saving time ○ Increased potential for higher quality abstraction ○ Ability to view a comprehensive record ○ Ability to identify and seek out additional providers or places to obtain information ○ Possible glimpse into the facility and systems of care ○ No need to store records at home office or host agency	○ Cost of abstractor time and travel ○ Protection and security of information while travelling
OFF-SITE REVIEW HEALTH RECORDS DELIVERED TO ABSTRACTOR	○ Decreased expenses for abstractor travel	○ May receive abbreviated and/or incomplete records sent by facility ○ Incomplete fulfillment of records request

LOCATION OF ABSTRACTION	STRENGTHS	CHALLENGES
		○ Issues with electronic transmission of records i.e., encrypted file access key expiration ○ Need for secure receipt and storage of personal identifiable information ○ Decreased ability to seek out potential additional providers or places to obtain information ○ Potential receipt of bulky hard copy records that require extensive storage space – consider additional costs

Sources of Information for Abstraction

While statutes and authorities under which an MMRC operates vary state to state, places where information may be gathered may be restricted. Barring any legislative limitations indicated by your MMRC, you can gather information from as many of the following sources as possible and feasible.

- **Vital records**: death certificates, birth certificates, fetal death certificates
    - Information on a death certificate provides demographic information and descriptive information on cause, place, and time of death.
    - Examples of information on a standard infant birth certificate include demographic information on biological parent(s), prenatal care entry, number of visits, birth weight, Apgar scores, gestational age, complications, and name of birth hospital.
- **Prenatal records**
    - These records are typically sent by 36 weeks to the delivery facility; therefore, end of pregnancy visits may be missing.
    - You may need to request full records or make an on-site visit to the prenatal clinic.
- **Hospital records** including all outpatient and inpatient stays during pregnancy/postpartum period, and notes on social services
- **Outpatient clinic records** including preconception/family planning clinics, primary care, or abortion centers
- **Autopsy reports and findings** from hospital, coroner, or medical examiner
- **Police/investigative reports**
- **Medical transport records** including timing, notes, vitals, or treatments
- **Personal interviews** with providers, family, or friends
- **Medicaid claims data**

- **Hospital discharge data**
- **Prescription Drug Monitoring Programs**
- **Home Visiting Programs**
- **Drug Treatment Centers**
- **Women, Infants, and Children (WIC) Programs**
- **Child Protective Services**
- **Social media platforms**

Tips for Abstracting On-site

Organize and secure your equipment before going out. Information should always be locked in a file cabinet or lockbox when not in use. Consider using a locked briefcase for transporting your supplies. Never leave completed records loose in your car; keep them locked in the trunk.

- **Carry official identification** such as a badge or business card to foster professionalism.
- **Know your authority and limits** when abstracting, and do not use your authority outside the scope of the MMRC to access medical information. You are under the authority of the project and no other employing agency
- **Remove identifiers** based on your committee's specific guidelines. MMRC-specific record identification coding systems should be kept secure to avoid public access and linking of names or facilities
- **Keep activities and employment times separate** if you also work for another organization. Do not identify name or stories of decedents, discuss your abstracting activities, or share the names of providers and/or facilities with coworkers from your "day job"
- **Be aware** that facilities store and archive records in a variety of systems and places

- Determine if a facility requires a security agreement for an abstractor to access the electronic medical record (EMR)
- Determine a location for record review, i.e., are records stored on-site or at an alternate location?

Tips for Abstracting Off-site

Use methods that reduce the burden of distance. Though on-site abstraction often provides more information and can give a fuller picture of the events leading to a person's death, you may choose to pursue abstraction off-site. If you do, you may find it useful to set up an electronic hub, such as a SharePoint site, through which providers can securely submit records.

TIMING OF ABSTRACTION

Determine the Best Time Frames

For recommendations to maximize relevance and effectiveness, record abstraction should take place as soon as feasibly possible following a death. Unless your jurisdiction mandates that facilities report maternal mortality at the time of death, you may not be able to abstract a record until a year after the terminal event.

The MMRC should establish protocols and procedures for the consistent and reliable identification and selection of cases and establish time frames for abstraction and case review. Deaths that are undergoing medicolegal or other investigative review may have to be placed on hold until such reviews are complete. The MMRC should establish a policy and procedure for circling back to deaths that have been placed on hold and should consider documenting such barriers to accessing records.

ABSTRACTION PROCEDURES

Understand Your Role and Responsibilities

Your committee should have clearly defined procedural steps guiding the entire process for collection and synthesis of information. Using a standardized case abstraction tool, like the one built into MMRIA, helps to ensure consistent and complete data collection. Your committee may provide sample scripts for you to use to introduce yourself and your work and to request specific information. Scripts allow you to have a consistent message and help foster cooperation between you and the facilities and providers you contact.

In addition, policies must be developed to guide you in approved methods of communication and specific sharing of identified information. For example, although the MMRC is considered confidential and anonymous, you must initiate the records request using identified information. You must fully understand your legal authority and restrictions on sharing such identified information with others. For example, the cause of death on a death certificate may be considered confidential information in your state and therefore should not be shared by you with facility staff.

Make Contact

The first contact is an opportunity to establish a good working relationship. Your program should develop an official memo or letter of introduction that describes your purpose, mission, authority, and need for cooperation from medical facilities and providers in the MMRC process. The letter should ensure the privacy, confidentiality, and protection of all those participating in delivery and receipt of information. The program may create a standard record letter that references statutory authority and emphasizes that all records are held in strict confidentiality and are not subject to subpoena. The practice of reiterating that the records are used only as necessary to carry out the committee's statutory obligations through a standard letter and sample script allows for a consistent message. Often it is helpful to include a deadline for response, such as within five days of the request.

Medical facilities frequently require the use of secure email or fax for the transmission of any identified information. Your program should provide you with official language for submitting death information and records requests to facilities and providers which references the authority the MMRC uses to operate. Letters may be distributed to hospitals, addressed to the Chief Executive Officer, Chief Nursing Officer and/or health information managers (HIM). Keep a copy of the letter with you when abstracting in the field, in the event that the authority or purpose for abstraction is questioned, particularly when abstracting in settings outside of a hospital.

If your program has authority to access private provider or clinic records, contact the clinic office manager to establish communication. After obtaining the name of a contact person and a secure line of communication, send your request for approval to abstract records.

In the official letter outlining your authority, include a request for records. Be specific about which records you wish to access and how you wish to access them. If you plan to go on-site, propose a date and time for doing so. Be clear on dates, time frames, and types of records needed. Some facilities may not archive nursing notes or Labor and Delivery notes in the main medical record. Clearly specifying the need to review each source of information will increase the likelihood of gaining access to each record. Be sure to include clear instructions on how and where to send the requested records as well as a point of contact for any questions.

RECORD REQUEST EXAMPLE:

Please review the attached letter of authority. I am an MMRC abstractor requesting to review all records for *(insert name of decedent)* _____ (DOB)_____from *(specify time frame if desired)* _____ *(or delete if desiring ALL records.)* Please send the following records:

□ Prenatal Care Record	**Outpatient/Inpatient Records Including:**
□ Autopsy Report	□ Hospital Coding Summary/Face Sheet
□ Informant Interviews	□ Physician Orders
□ Medical Office Visit (Notes, labs, medications)	□ Progress Notes
□ Medical Transport Records	□ Nursing Flow Sheets/Notes
□ Investigations	□ Medication Administration
□ Other:	□ Blood Products Administered
	□ Operative Reports
	□ Labs/Diagnostic Studies
	□ Discharge Summaries
	□ Other Hospital Records:

Follow Up After Initial Contact

- **Place a follow-up call** to the initial contact to ensure your request was received and to determine if records will be available
- **Remember to establish a contact person** including name and direct phone number, and always try to get a backup name and phone number if the key contact person is away
- **Confirm the date and time** you have scheduled for record review is acceptable
- **Identify potential barriers** and, if you face resistance, try to address the following questions:
    - Does the facility require more information?
    - Is the delay due to need for legal/risk management review?
- **Be patient and cordial** and offer to send more information or reschedule your date/time
- **Be sensitive** to provider grief
- **Be careful** not to burn bridges as facilities may agree to your request if pressure is reduced
- **Document** any unsuccessful attempts at record retrieval in the case narrative

Develop a Case Narrative

At some point, the abstraction is complete, and the information gathered needs to be summarized. The case narrative should be succinct but provide enough detail to present an easily understood story. Formatting the key information into a narrative story with a chronological flow of events promotes ease of reading and reviewing by the committee members. Remember the goal is to tell the story of the causes and contributors to the death in a compelling manner that balances the personal, human elements with the clinical. Use inclusive and non-stigmatizing language and if possible, avoid the use of acronyms abbreviations, or medical terms. If not possible to avoid, be sure to spell out and/or explain in plain language any use of acronyms, initials, and other clinical terminology and define each one when first used. Humanize the story, avoid victim-blaming framing and be sure to document any such framing in medical or social service records using quotations.

The following are some tips to writing case narratives:

- **Use reference materials,** as you may find it helpful to have access to a variety of reference materials for assistance in using medically appropriate terminology:
    - Drug (medication) handbook
    - Medical dictionary
    - Nursing or medical reference books
- **Acknowledge** that you, as all people do, approach your work through a lens of previous professional and personal experience. Strive to be objective and prevent personal bias from impairing your objectivity
- **Use a storytelling method which engages emotion, fosters empathy, and allows the decedent's voice to be heard:**
    - Keep it factual but descriptive
    - Have a strong beginning and ending (open and close with humanizing descriptors that engages readers and fosters empathy)
    - Make the narrative personal yet not identifying
    - Tie together relevant details that are relatable and lead to listener engagement and) decision making
- **Integrate informant interview summaries** into your narrative to form a cohesive story. Weaving informant interview elements throughout your narrative where applicable helps to provide deeper context to the individuals life. Having both the clinical and person perspective within the narrative, gives the committee comparative context necessary for decision making.
- **Write events in chronological order** to help the committee understand the timing of events around the person's death
- **Provide the relevant de-identified abstracted records to your committee in addition to the case narrative**. Case narratives are meant to supplement the full set of data that you have abstracted, not to replace it

  - Dissemination of case narratives at least two weeks ahead of a meeting allows facilitators time to consider how to guide complex discussions and committee members ample time to prepare for efficient and effective discussions
  - Many find it helpful to distribute narratives electronically through secure, password protected systems, or via the Committee Member role in MMRIA. It is important to develop a secure and consistent procedure for sharing information in advance
  - Arriving to the review meeting prepared, honors the life of the person and allows for the best use of precious meeting time

- **Use a standardized format for presenting all case narratives**
  - Narrative templates built into MMRIA help guide the development of the story and promote a standardized format for reviewing
- **Check your work** for accuracy and spelling and consider having another abstractor, administrator, or committee member review the narrative prior to dissemination to the full committee
- **Access additional resources** posted on Review to Action

SELF-CARE

Caring for Mothers Begins with You

Abstracting mortality records can be physically, mentally, and emotionally exhausting. Abstractors may experience the emotional trauma of reviewing loss after loss. Individuals who staff MMRCs, especially abstractors and analysts, may experience grief symptoms from continually reviewing courses of events that lead to a death. This is known as **vicarious trauma**, the cumulative results of repeated exposure to traumatized people or, in the instance of abstractors and other MMRC members, the trauma of repeated reviews of death.

Trauma stewardship is a foundation for creating a self-care or wellness culture within organizations and committees. Trauma stewardship "refers to the entire conversation about how we come to do this work, how we are impacted by our work, and how we subsequently make sense of and learn from our experiences…By talking about trauma in terms of stewardship, we remember that we are being entrusted with people's stories and their very lives. We understand that this is an honor as well as a tremendous responsibility…We are required to develop and maintain a long-term strategy for ourselves such that we can remain whole and helpful to others even amidst their greatest challenges." [iv]

Self-care suggestions for abstractors include:

- **Increase knowledge** about vicarious trauma
- **Accept and acknowledge** that all team members face stress from reviewing maternal mortality cases
- **Find a trusted supervisor or co-abstractor** if you need to confide in someone. It is important for your committee to have a system in place to support you when you need to debrief
- **Understand** that abstracting can be a lonely work experience because of the need to uphold confidentiality. You may feel sad and want to talk to friends, family, or coworkers about the decedent, but remember you need to **maintain confidentiality** and cannot discuss individual case narrative information

- **Take short breaks** to stretch and consider exercises to decrease muscle aches and eyestrain
- **Visit the** Review to Action **website**, which provides grief support, and grief resources for family, friends, health professionals, and review committee members

Most significantly, abstracting for maternal mortality can be an emotionally draining process. We say this not to discourage but to help set expectations. After all, you are bravely looking directly at a subject that most people strive to avoid. Be as mindful of your own emotional state, and of taking care of yourself, as you are in your abstraction work. Also, be confident that you are capable. Recall that the MMRC, with these challenges in mind, carefully evaluated your skills, expertise, and capabilities, and chose you as an abstractor.

Finally, remember the "why" of your work: you are searching through the dark of untimely deaths to help find a guiding, life-saving light of hope for future mothers. Remember that the weight of this hope is not solely on your shoulders. You are connected to a greater effort and are part of the network of all those working to improve and save the lives of mothers.

A Final Note

You are a critical contributor to a stream of health-system improvements that benefit mothers and communities. Know that your work is helping to save lives – real people, real lives. You are keeping a family together and ensuring that a child has a parent.

Thank you.

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APPENDIX A: ABSTRACTING MODULES BASED ON CAUSE OF DEATH

Introduction to Cause of Death and Chronic Disease Modules

Abstractors are responsible for obtaining information that is as complete as possible to help the review committee determine if gaps in assessment, care, or services existed. It is important for the abstractor to bring at least a minimum data set of information to the review team. Without an understanding of the series of social and medical care events, it can be difficult for the review team to make valid recommendations for action to change systems of care. Records can be a few pages or thousands of pages long, often consisting of multiple providers encounters and multiple care locations. All of this can challenge the abstractor to find information that will be meaningful for the review committee.

Modules are structured in a framework consisting of **definition and other common terms, timing and risk factors, signs and symptoms, treatments, labs and medications, and autopsy findings.**

The following abstraction modules are based on the common causes of maternal mortality and diseases in the United States. The modules represent a framework to guide abstraction for Maternal Mortality Review Committees (MMRC). Each module was developed from a review of nursing and medical literature, national and international maternal mortality reports, CDC maternal mortality review data tools, national perinatal quality collaboratives, and maternal safety toolkits. Modules are structured in a framework consisting of **definition and other common terms, risk factors, associated characteristics, timing, signs and symptoms, treatments, diagnostics, labs and medications, and autopsy findings.**

The modules are intended to assist and guide the abstractor while abstracting records. It is beyond the scope of these modules to reference all descriptive information and treatments for each cause of death

and disease. The modules are not intended to replace other reference sources the abstractor may be using. Over time, as each MMRC progresses, additional information may be requested by the review team for specific cause of death scenarios. The abstractor can then personalize the modules as needed. Additionally, as knowledge of disease processes and care treatments evolve, additional content can be added to update the modules to incorporate new standards of care.

CAUSE OF DEATH MODULES

1. Amniotic Fluid Embolism
2. Anesthesia Complications
3. Cardiomyopathy
4. Cardiovascular Deaths
5. Cerebrovascular Accident
6. COVID-19
7. Hemorrhage
8. Homicide
9. Hypertensive Disorders
10. Infection
11. Motor Vehicle Crashes
12. Overdose
13. Suicide
14. Thrombotic Embolism

Chronic Disease Modules

Four abstracting modules were developed for *chronic diseases* that the abstractor may encounter.

1. Diabetes: Type I, II, and Gestational
2. Seizure Disorders
3. Sickle Cell Disease
4. Systemic Lupus Erythematosus

Definitions

Cause of death: identification of the assigned determination of why the mother died

Chronic disease: persistent, long-lasting illness

Other Names: identification of similar diagnosis that may be noted

Risk Factors/Associated Characteristics/Timing

- **Risk Factors:** an aspect of personal behavior or lifestyle, or an environmental exposure, or an existing or newly occurring health condition that is associated with an increase in the occurrence of a particular disease, injury, or other health condition
- **Associated Characteristics:** personal characteristics of a person or group (e.g., age, sex, race/ethnicity, residence, and occupation) demographic information that is used to characterize patients or populations
- **Timing:** identification of health status or conditions associated with increased risk across four time periods for women of reproductive age *(Important information to search for in records):*
    - Medical History: personal and/or family conditions that can influence health status
    - Prenatal: from conception to labor (antepartum)
    - Labor and Delivery: onset of uterine contractions, ends with delivery of placenta (intrapartum)
    - Postpartum: period after delivery of placenta up to one year

Signs and Symptoms: the observed and reported descriptions of a person's response to an illness

Treatment/Diagnostics/Labs/Medications

- **Treatment:** identification of psychological, surgical, or medical management
- **Diagnostics:** procedure used to identify a characteristic feature of a condition
- **Labs:** identification of fluid or tissue that is obtained for clinical studies
- **Medications:** identification of commonly used drugs

Autopsy: description of examination and pathology of postmortem organs and tissues; often includes tests to look for the presence and concentration of drugs that may have contributed to death

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AMNIOTIC FLUID EMBOLISM

DEFINITION

Amniotic fluid embolism (AFE) is a catastrophic complication unique to the obstetric patient characterized by the triad of acute hemodynamic and respiratory compromise accompanied by disseminated intravascular coagulation. The pathophysiology appears to involve an abnormal maternal response to fetal tissue exposure associated with breaches of the maternal-fetal physiologic barrier during parturition. This response and its subsequent injury appear to involve activation of proinflammatory mediators similar to that seen with the classic systemic inflammatory response syndrome.

Other name: Anaphylactoid syndrome of pregnancy

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Operative delivery (vaginal or cesarean), placenta previa, placenta accreta, and abruption, or situations where the exchange of fluids between maternal and fetal compartments is more common, cervical lacerations, uterine rupture, eclampsia, polyhydramnios, multiple gestations, and dilation and curettage.

Associated Characteristics: Advanced maternal age

Timing:

- **Medical History:** N/A
- **Prenatal:** amnioinfusion, amniocentesis, cerclage removal, placenta previa, preeclampsia, abortion, blunt abdominal trauma
- **Labor and Delivery:** induction with prostins, forceps, vacuum, intrauterine pressure catheter cesarean section, precipitous labor, meconium-stained fluid, manual removal of placenta
- **Postpartum:** clinical onset during labor or within 30 minutes of delivery of the placenta

- DIC/hemorrhage should follow, not precede, the cardiorespiratory collapse.

SIGNS / SYMPTOMS

Sudden shortness of breath, restlessness, feeling of panic, feeling cold, nausea, vomiting, cyanosis, increased heart rate, hemorrhage, decreased blood pressure (BP), hypoxia, sudden cardiovascular collapse (pulseless electrical activity, asystole, ventricular fibrillation, or pulseless ventricular tachycardia), early right ventricular failure followed by left ventricular failure, altered mental status, seizures in absence of other causes, DIC, pulmonary edema, sudden cardiovascular and respiratory collapse with coagulopathy, endotracheal tube (ETT) suddenly filled with massive amounts of fluid

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Respiratory support: oxygen, face mask, bag and mask, intubation; fluid resuscitation, intravenous fluids, blood products, cardiopulmonary resuscitation (CPR), massive transfusion protocol, hemostatic resuscitation, venoarterial extracorporeal membrane oxygenation (VA EMCO), uterotonics and clinical criteria, operative vaginal delivery, or emergency delivery/perimortem cesarean section

Diagnostics: Early transthoracic echocardiogram (TTE), electrocardiogram (EKG), chest x-ray (CXR), ventilation/perfusion (V/Q) scan, computed tomography (CT) scans, ultrasonography including lower extremity, lung and abdominopelvic ultrasonography

Labs: Arterial blood gases, coagulation studies, complete blood count (CBC) with platelets, serum electrolytes, blood urea nitrogen (BUN), creatinine, calcium, magnesium, phosphate, liver function tests, Troponin-I, brain natriuretic peptide, INR, activate partial thromboplastin time, fibrinogen

Medications: Advanced cardiac life support (ACLS) medications

AUTOPSY

Prompt perimortem autopsy is important in sudden and unexpected cardio-respiratory collapse. Diagnosis of amniotic fluid embolism (AFE) is often one of exclusion, no definite test for AFE. On postpartum

autopsy – lungs congested, airless with petechial hemorrhages on pleural surfaces; fetal cells and debris may be found in pulmonary vasculature.

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ANESTHESIA COMPLICATIONS

DEFINITION

Arrest shortly after administration of anesthetic. Types: local, epidural, spinal and general, patient-controlled analgesia, and nitrous oxide. Patient is considered to be under anesthesia care until fully conscious, and vital signs are stable.

Other names: Anesthesia toxicity, aspiration, drug reaction/anaphylaxis, malignant hyperthermia, esophageal intubation, failed tracheal intubation, high spinal/epidural, multiple attempts intubation, respiratory failure during anesthesia

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Substance use disorder, obesity, recent food/water intake, allergic reaction, toxicity, administration of halogenated anesthetic gasses and/or the depolarizing muscle relaxant succinylcholine.

Associated Characteristics: advanced maternal age

Timing:

- **Medical History:** obesity, small larynx, comorbidities (asthma, heart, liver diseases), venous thromboembolism (VTE) risk, a family or personal history of malignant hyperthermia (hyperthermia reaction) to anesthesia
- **Prenatal**: preeclampsia, hemorrhage
- **Labor and Delivery:** emergency cesarean section with recent oral intake puts patient at risk for aspiration with intubation, cardio-pulmonary arrest after anesthetic administration, general anesthesia, full stomach at delivery, ill pregnant patient, acute anaphylaxis, hemorrhaging, topping off epidural analgesia, maternal hyperthermia

- **Postpartum:** opiate toxicity, hemorrhage, preeclampsia/eclampsia, postoperative respiratory failure, bronchospasm on extubating, spinal headache

SIGNS / SYMPTOMS

Hypotension, decreased breathing after spinal placed, tachycardia, bradycardia, acidosis, hypoxia, hypoxia after intubation, hypoxemia, negative CO_2 color, changes in skin color, mental status changes, cardiac arrest, breathing difficulties after anesthetic administration or reversal of anesthetic, agitation, nausea, vomiting, dizziness, drowsiness, loss of consciousness

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Cricothyrotomy, respiratory support including intubation and ventilation, arterial line, blood products

Diagnostics: Bronchoscopy, chest x-ray (CXR) for tube placement

Labs: Arterial blood gases, lactate, intraoperative laboratory measurements

Medications: Vasopressors, opiates, anesthetic drugs, advanced cardiac life support (ACLS) medications, Fentanyl, bronchodilators, Lipid emulsion, Naloxone to reverse sedation, types of medications used for epidural or spinal.

AUTOPSY

Gastric contents in lungs, description placement of ETT and CVL, toxicology reports. Pathology report of lungs, heart, and brain.

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CARDIOMYOPATHY

DEFINITION

Cardiomyopathy is a dysfunction of the cardiac muscle that impairs its ability to pump blood. There are two basic types of cardiomyopathy: dilated and hypertrophic. Dilated cardiomyopathy can result from alcohol, drugs, genetics, myocarditis, and the unique condition of peripartum cardiomyopathy. Hypertrophic cardiomyopathy most commonly results from genetic causes.

Peripartum dilated cardiomyopathy is a **diagnosis of exclusion**, classically defined as onset of cardiac failure. Characterized by left ventricular systolic dysfunction on echocardiogram.

Other Names: Peripartum cardiomyopathy, postpartum cardiomyopathy

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Tobacco use, alcohol use disorder, methamphetamine use, high blood pressure, family history of cardiomyopathy, heart failure, or sudden cardiac arrest, disease or condition that can lead to cardiomyopathy (coronary heart disease, heart attack, viral infection), diabetes, other metabolic diseases, severe obesity, diseases that can damage the heart (hemochromatosis, sarcoidosis, amyloidosis); preeclampsia

Associated Characteristics: Advanced maternal age (>30)**,** dilated cardiomyopathy is more prevalent among Non-Hispanic Black persons, hypertrophic cardiomyopathy among children and young adults may show no symptoms, yet they are at high risk of sudden cardiac death

Timing:

- **Medical History:** obesity, immune disorders, alcohol use disorder, cocaine or methamphetamine use, muscle conditions, multiple pregnancies, spitting blood, sleep apnea, diabetes, diseases that can damage the heart (hemochromatosis, sarcoidosis, or amyloidosis), coronary ~~heart~~ artery disease or heart attack, connective tissue disease and other types of autoimmune disease,

endocrine diseases (thyroid conditions, diabetes), infections in the heart muscle, family history of hypertrophic cardiomyopathy or sudden cardiac arrest

- **Prenatal:** obesity, preeclampsia, hypertension
- **Labor and Delivery:** obesity, hypertension, preeclampsia
- **Postpartum:** obesity, preeclampsia, hypertension, prolonged swelling after delivery

SIGNS / SYMPTOMS

Shortness of breath with activity or when lying flat, trouble breathing, limitations with physical activity, cough, respiratory/flu-like symptoms, fatigue, syncope, swollen neck veins, swelling extremities, palpitations, fluid in the lungs, atrial fibrillation, echocardiogram ejection fraction less than 50%, pleural effusions, cardiomegaly, pulmonary venous congestion, arrhythmia, cardiac arrest, sudden cardiac death

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Respiratory support, referral to consultants: maternal fetal medicine, cardiology, anesthesiologist, transfer to higher level of care within facility or to outside facility, low salt diet, automated external defibrillator (AED)/pacemaker placement, preconception counseling, access to family planning services, community referral for medications, intake and output, evaluation for heart transplant, education on risks of future pregnancies, early follow-up postpartum appointment for history cardiac symptoms, documentation education to seek care for symptoms

Diagnostics: chest x-ray (CXR), electrocardiogram (EKG), echocardiogram (ECHO)

Labs: Beta natriuretic peptide (BNP or pro-BNP), cardiac enzymes, arterial blood gases, lactic acid

Medications: ACE inhibitors (prior to pregnancy), beta blockers, diuretics, anticoagulants, Digoxin

AUTOPSY

Enlarged heart, dilated cardiomyopathy, hypertrophic cardiomyopathy, fibrosis, referral to cardiac pathologist

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CARDIOVASCULAR DEATHS (EXCLUDING CARDIOMYOPATHY)

DEFINITION

There is a broad range of deaths included in this category. Normal changes in pregnancy include increased heart rate, plasma volume, increased cardiac output, decreased blood pressure, depressed fibrinolytic activity, and slight cardiomegaly that put pregnant and postpartum persons at risk.

Other names: Aortic dissection, arrhythmic death, cardiac arrest, cardiac failure, cardiomegaly, conduction defects, coronary ischemic heart disease, dissection of coronary arteries, infarction, ischemic heart disease, myocardial fibrosis, myocardial infarction, myocarditis, mitral stenosis, pulmonary hypertension, spontaneous coronary artery dissection, sudden adult death syndrome (SADS), sudden unexpected cardiac death, valvular disease (both congenital and acquired)

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Obesity, cocaine use, IV drug use, substance use disorder, tobacco use, high blood pressure, elevated blood cholesterol levels, diabetes mellitus, physical inactivity, Connective tissue diseases (e.g., Marfan syndrome, Ehlers-Danlos syndrome).

Associated Characteristics: Non-Hispanic Black persons, individuals age > 40 years, chronic hypertension, obesity

Timing:

- **Medical History**: Diabetes, obesity, cardiomegaly, chronic kidney disease, seizures, high cholesterol, asthma, Marfan syndrome, connective tissue disorders, hypertension, congenital heart disease, pulmonary hypertension, rheumatic heart disease, mitral valve prolapse, family history of heart disease, thrombophilia, previous pregnancy history of gestational diabetes, gestational hypertension, preeclampsia, or pregnancy-induced hypertension

- **Prenatal:** Obesity, preeclampsia, gestational diabetes, poor prenatal care, known cardiac disease, substance use disorder and alcohol use disorder, chronic hypertension
- **Labor and Delivery:** Bleeding, sepsis, emergency cesarean section, fluid overload
- **Postpartum:** Obesity, infection, hypertension signs and symptoms

SIGNS / SYMPTOMS

Severe chest pain, jaw, or back pain, radiating chest pain, ripping or tearing pain in chest/back, agitation, nausea, vomiting, tachypnea, tachycardia, acidosis, syncope, shortness of breath, bleeding, heart failure, epigastric pain, respiratory symptoms, wheezing, murmur, palpitations, crackles in lower lobes, cyanosis, low oxygen saturation, pulmonary edema, enlarged heart, hypertension, chest x-ray with edema/congestion, generalized edema in face, fingers, feet, legs

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Referral to cardiologist, cardiopulmonary resuscitation (CPR) (bystander or in hospital): note timing initiation chest compressions, external defibrillation, positioning change to left side, emergency cesarean section (document timing), automated external defibrillator (AED), initiation rapid response, transfer to higher level of care (within facility or to an outside facility)

Diagnostics: Echocardiogram (ECHO), electrocardiogram (EKG), computed tomography (CT), pulmonary angiogram, chest x-ray (CXR), coronary angiography, transesophageal echocardiogram (TEE)

Labs: Cardiac enzymes (serial), Troponin levels, CPK, CPK-MB, increased serum lactase, arterial blood gas, electrolytes

Medications: Vasopressors, diuretics, hypertensive medications, cardiac medications

AUTOPSY

Cardiac size description and weight in grams, presence interstitial fibrosis, changes in pulmonary vasculature c/w pulmonary hypertension, documentation of coronary arteries, ventricle thickness, pathology of cardiac muscle, description of all cardiac valves, vegetation on mitral (or other) valve, presence of cardiac hypertrophy, dissection of coronary arteries, aneurysm and/or dissection of aorta, coronary artery occlusion, aneurysm or thrombosis of coronary arteries, renal pathology, lung pathology. Also, check for toxicology. Genetic testing for arrhythmogenic genes.

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CEREBROVASCULAR ACCIDENT (NOT ASSOCIATED WITH HDP)

DEFINITION

Loss of neurological function caused by sudden loss of blood flow to brain.

Other names: Arteriovenous malformation (A-V malformation), cerebral artery thrombosis, cerebral infarction, cerebral ischemia, cerebral venous sinus thrombosis, hemorrhagic stroke, hypertensive encephalopathy, intracerebral hemorrhage, intracranial hemorrhage, ischemic stroke, ruptured aneurysms, subarachnoid hemorrhage, transient ischemic attack (warning or “mini-stroke”)

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Previous stroke or transient ischemic attack, high blood pressure, high cholesterol, heart disease, diabetes, sickle cell disease, tobacco use, alcohol use disorder, obesity, physical inactivity, and certain types of birth control, vascular aneurysm, vascular malformation

Associated Characteristics: Advanced maternal age, African American persons have the highest rate of death due to stroke and an increased prevalence for higher blood pressure, stroke is the third leading cause of death among Hispanic persons

Timing:

- **Medical History:** Atrial fibrillation, alcohol use disorder, hypertension, diabetes, history of a close relative with stroke, obesity, hormonal contraception, migraines, anticoagulants, cardiac dysrhythmias, previous stroke, arteriovenous malformation (A-V malformation)
- **Prenatal:** Hypercoagulable state of pregnancy, sudden death first trimester, dehydration, hypertension
- **Labor and Delivery:** Stress of labor, postdates
- **Postpartum:** Immobility, obesity, hypertension

SIGNS / SYMPTOMS

Sudden weakness or numbness in face and extremities, especially on one side of the body, loss of vision, difficulty speaking, sudden severe headache, dizziness, changes in neurological status, sudden confusion, trouble speaking or difficulty understanding speech, nonreactive pupils, tachycardia, tachypnea, nausea, vomiting, acute hypertension, seizure activity, hemiparesis, eye pain with blurred vision

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Time to treatment is crucial. Airway and ventilatory support, consults neurology, neurosurgery, transfer within facility or outside to higher level of care, surgery to evacuate bleeding, Burr holes, external ventriculostomy drains, palliative care, blood products: packed red blood cells, fresh frozen plasma (FFP), cryoprecipitate, intake and output

Diagnostics: Stroke evaluation, neurologic exam, rapid computed tomography (CT) scan electrocardiogram (EKG), echocardiogram (ECHO), magnetic resonance imaging (MRI), , arteriography, electroencephalogram (EEG)

Labs: Urine and serum toxicology, complete blood count (CBC), electrolytes, coagulation studies, liver enzymes

Medications: Antithrombotic therapy such as Recombinant tissue plasminogen activator (tPA) with Aspirin as soon as possible, Labetalol and other antihypertensive to gradually decrease BP, Mannitol, DDAVP, anticonvulsant drugs

AUTOPSY

Disruption brain pathology, toxicology

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COVID-19

DEFINITION

Disease caused by the novel Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV 2)

Other Names: SARS-CoV-2

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Pre-existing medical co-morbidities such as pregnancy state**,** obesity, diabetes, hypertension, cardiovascular disease, asthma; close contact with confirmed and/or suspected cases; preeclampsia/eclampsia, unvaccinated status

Associated Characteristics: Advanced maternal age, race and ethnicity (racial and ethnic minority groups)**,** social drivers of health (poverty, insurance, transportation, childcare, employment, education, housing, etc.)

Medical Diagnosis: Pneumonia, upper respiratory infection, ARDS, acute asthma exacerbation, infectious process, inflammatory process, coronary artery thrombosis, deep vein thrombosis (DVT), pulmonary embolus (PE), myocarditis, pericarditis, arrythmias, heart failure, influenza, sepsis, cardiovascular collapse, ischemic stroke, multisystem inflammatory syndrome (MIS), multiple organ dysfunction

Timing:

- **Medical History:** Pre-pregnancy history of diabetes, chronic hypertension, cardiovascular disease, asthma, BMI ≥ 30
- **Prenatal:** Gestational age at time of diagnosis, preeclampsia, other hypertensive, or cardiac conditions, DVT, preterm labor, delay or withholding of treatment options due to pregnancy state, access to care issues due to fear or lack of available services, include if care provided in person or via telehealth
- **Labor and Delivery:** Emergent delivery due to worsening of condition, delivery to improve respiratory status or mother's condition

- **Postpartum:** Unable to access care due to quarantine/isolation or lack of childcare, readmission to hospital. Exposure due to family and friend support /visitation of newborn

SIGNS / SYMPTOMS

Fever, chills, cough, chest tightness/pain, shortness of breath or difficulty breathing, headache, body aches, muscle pain/myalgia, fatigue, new loss of taste or smell, tachycardia, arrythmia, sore throat, rhinorrhea (runny nose) or congestion, nausea, vomiting, diarrhea

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Quarantine/isolation, oxygen supplementation, mechanical ventilation, invasive ventilation, prone positioning, extracorporeal membrane oxygenation (ECMO), admission to Intensive Care Unit (ICU), intra-aortic balloon pump, percutaneous ventricular assist device

Diagnostics: Chest x-ray or chest CT showing lung infiltrates or consolidation (typically bilateral-posterior lung involvement) may be described as “ground glass appearance”, electrocardiogram (ECG), echocardiography

SARS-CoV-2 Infection Testing: Document the test type (molecular/PCR, antigen/rapid/home test, antibody/serological) and specimen (nasal, saliva, blood), location that testing was done, date/time administered, date/time result documented and/or individual notified

- **Molecular Test** (PCR, nucleic acid amplification test, RT-PCR, LAMPT test): Detects virus genetic material (gold standard for detecting current virus)
- **Antigen Test** (rapid test, RTD): Detects specific proteins on surface of virus
- **Antibody Test** (serological test): Detects antibodies to the virus in the past (not good for immediate diagnosis)
- **Genotyping for variant**

Labs: CBC (lymphocytopenia, thrombocytopenia, leukocytosis or leukopenia); C-Reactive Protein ±10mg/L; Comprehensive Metabolic Panel (CMP)- particularly elevated liver enzymes (AST and ALT);

elevated D-dimer; prolonged PT, PTT and INR, elevated cardiac biomarkers, elevated procalcitonin; blood and sputum cultures

***Medications:** Medications prescribed as well as over the counter medications administered in a clinic setting or at home. Medications may include Z-pack/Azithromycin, Vitamin D, Zinc, Steroids, Fluvoxamine, Remdesivir, Dexamethasone or other corticosteroids, Tocilizumab, Baricitinib, Anticoagulation drugs, Monoclonal antibodies, Convalescent plasma, Paxlovid, Hydroxychloroquine, Ivermectin, other…

***COVID-19 Vaccination:** Note the type of vaccine administered, describe location if available. Include documentation of date/time administered, effectiveness or any side effects noted

EDUCATION / COUNSELING

Look for and include any instructions provided to individual/family regarding timing and results of testing, test results, treatments, recommended quarantine, isolation, vaccination (if applicable) and how/when to access follow-up care.

AUTOPSY FINDINGS

Include the cause(s) of death listed in medical examiner or coroner (ME/C) records: COVID-19 reported as immediate or underlying cause of death by the ME/C; COVID-19 suspected at autopsy or decedent was suspected to have COVID-19; COVID-19 reported elsewhere in the chain of causes of death but not the immediate or underlying cause of death. Findings may indicate cause of death being related to co-morbid conditions and associated characteristics listed above such as thromboembolic disease, alveolar damage, diabetic nephropathy, and liver injury

- **Lungs**: Enlarged in volume and mass yet compressed and airless, exudative and proliferative diffuse alveolar damage (DAD) with hyaline membrane formation and edema (typical finding in ARDS), inflammatory cell infiltration and small vessel congestion, interstitium infiltrated by lymphocytes, and pneumocytes manifested cytopathic changes (multinucleated syncytial cells),

occlusive thrombi in pulmonary artery branches and veins, fibrin deposits on the pleura and lower lobes

- **Brain:** Diffuse hypoxic and focal ischemic lesions and possible infarctions
- **Liver:** Large basophilic structures in sinusoidal endothelium, steatosis with focal hemorrhages
- **Lymph Nodes:** Increase immunoblastic-like cells
- **Peripheral Vascular:** Microangiopathy with thrombosis alongside the relatively high prevalence of deep vein thrombosis, most cases showing fibrin (a fibrous, non-globular protein involved in the clotting of blood) and/or platelet thrombi, or clots, to varying extents
- **Cardiovascular:** Diffuse ischemic injuries and possible myocardial infarction
- **Hematologic:** Blood clots in multiple other organ systems mostly brain, kidney, and liver (reflects endothelial damage as an underlying process and activation of the coagulation cascade)

TIMELINES

Include state or local specific timelines for shutdowns, mask mandates, social distancing policies, vaccination availability as a reference in the narrative. National timelines are available at https://www.cdc.gov/museum/timeline/covid19.html

ADDITIONAL COVID-19 RESOURCES AVAILABLE ON THE MMRIA SHAREPOINT TO GUIDE ABSTRACTION

- **COVID-19-Pandemic-Related Data Elements**: describes pandemic-related information to abstract and how to document that information within the existing MMRIA database.
- **Pregnancy-Relatedness Criteria for Pregnancy-Associated Deaths due to COVID-19**: guides MMRCs when determining pregnancy-relatedness for deaths with COVID-19 as the underlying cause of death.

- **Contributing Factors to Consider for Deaths during the COVID-19 Pandemic**: lists example scenarios related to the pandemic along with ideas of how to capture contributing factors using the existing classes on the Committee Decisions Form.

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DIABETES: TYPE I, II, AND GESTATIONAL

DEFINITION

Metabolic disease

Type I: Diabetes caused by deficiency in pancreas islet beta cells; usually onset suddenly at a young age

Type II: Insulin resistance

Gestational Diabetes: (GDM) Glucose intolerance that begins during pregnancy and resolves after pregnancy

Other names: Diabetes mellitus, pregestational diabetes

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Type 1: Family history (parent or sibling with type 1 diabetes), Type 2: Prediabetes, overweight/obesity, family history (parent or sibling with type 2 diabetes), sedentary lifestyle (active less than 3 times a week), history of gestational diabetes or given birth to a baby over 9 pounds, polycystic ovary syndrome (PCOS)

Associated Characteristics: Type 1: More likely to develop as a child, teen, young adult, increased prevalence among Non-Hispanic White persons. Type 2: Persons 45 years or older, Increased prevalence among Non-Hispanic Black, Hispanic/Latino American, American Indian, or Alaska Native, Pacific Islander and Asian American persons.

Timing:

- **Medical History:** Gestational diabetes (GDM) in prior pregnancy, obesity, history delivering infant greater than nine pounds, polycystic ovarian disease, immobility, hypertension, kidney disease, retinopathy, chronic hypertension, family history of diabetes, impaired glucose metabolism, hospitalization for diabetic ketoacidosis or hyperglycemic coma

- **Prenatal:** Unstable glucose levels, macrosomia, higher risk for cesarean section, gestational hypertension, preeclampsia, eclampsia, obesity, congenital anomalies, miscarriage, stillbirth, preterm delivery, preeclampsia, polyhydramnios, vaginal infections, urinary tract infections, ketoacidosis, hypoglycemia, fetal hyperinsulinemia, need for medications
- **Labor and Delivery:** Birth trauma, shoulder dystocia, stillbirth, dehydration, immobility
- **Postpartum:** Preeclampsia, hemorrhage, infections, obesity, cardiovascular disease, access to health care

SIGNS / SYMPTOMS

Irritability, sweating, nervousness, blurred vision, headache, tired, tachycardia, numbness or tingling in hands or feet, hyperglycemia, glycosuria, very hungry, very thirsty, increased urination, low blood sugar, loss in weight without trying, very dry skin, sores that heal slowly, more infections than usual

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Adjustments to insulin doses, nutritional counseling, calorie restricted diet, management by specialty care maternal-fetal medicine, neurologists, endocrinologist, ophthalmologist, nutritionist, self-monitoring blood glucose levels, nutritional counseling, preconception counseling, education on importance control of hypoglycemia and hyperglycemia in pregnancy, exercise therapy, increased prenatal visit monitoring

Diagnostics: Ultrasound for fetal growth surveillance and monitoring; retinopathy screening

Labs: HgA1c, electrolytes and random glucose, three-hour glucose tolerance testing 24-28 weeks gestation, baseline renal function studies, urine testing for glucose, protein, ketones, urine cultures, and thyroid function

Medications: Metformin, Glyburide, insulin, Vitamin D

AUTOPSY

Postmortem glucose and insulin levels, pathology and weight heart, brain, liver, and renal pathology

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HEMORRHAGE

DEFINITION

Episode of bleeding that compromises tissue or organ perfusion. Defined as a cumulative blood loss of greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process. Transfusion of four or more units of red blood cells.

Other names: Hemorrhagic shock, hypovolemic shock

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Prolonged labor, chorioamnionitis, atonic uterus (prolonged use of oxytocin, high parity, chorioamnionitis, general anesthesia), over-distended uterus (twins or multiple gestation, polyhydramnios, macrosomia), fibroid uterus (multiple uterine fibroids), uterine inversion (excessive umbilical cord traction, short umbilical cord, fundal implantation of the placenta), episiotomy (operative vaginal delivery), cervical/vaginal/perineal lacerations (precipitous delivery), uterine rupture, retained placenta (succenturiate lobe), placenta accreta (previous uterine surgery, incomplete placenta at delivery), preeclampsia, Disseminated Intravascular Coagulation (DIC), inherited clotting factor deficiency (von Willebrand, hemophilia), severe infection (fever, sepsis), placental abruption, amniotic fluid embolism, crystalloid replacement, therapeutic anticoagulation (thromboembolism treatment), multiple gestation, pre-pregnancy BMI> 40. Hematocrit < 30, Platelet count < 50,000

Associated Characteristics: Advanced maternal age, Non-Hispanic Black persons, refusal of blood transfusion

Timing:

- **Medical History:** Blood coagulation disorders, previous uterine incision, previous cesarean section, prior uterine surgery, multiple gestation, ~~greater than four vaginal births~~ five or more prior births, hypertension, history of previous postpartum hemorrhage, uterine fibroids

- **Prenatal:** Spontaneous or induced abortion, placenta previa, accreta, increta, percreta, ectopic or ruptured ectopic pregnancy, abruptio placentae, abdominal trauma, large uterine fibroids, polyhydramnios, macrosomia
- **Labor and Delivery:** Induction or augmentation of labor, prolonged or precipitous labor, uterine overstimulation, lacerations genital tract, morbidly adherent placenta, morbid obesity, uterine inversion
- **Postpartum:** Retained placenta fragments, retained products of conception (POC), retroperitoneal hematoma, infection

SIGNS / SYMPTOMS

Hemoperitoneum, tachycardia, hypotension, abdominal pain, abdominal tenderness, one-sided abdominal pain, diarrhea, vomiting, shortness of breath, boggy uterus, bleeding from surgical or puncture sites, spitting blood, descriptions of vaginal bleeding (include trickle, gush, clots), oliguria, displaced uterus after bladder emptied, changes in vital signs: hypoxia, oxygen saturation less than 95%, sustained tachycardia, fainting

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Documented patient counseling on hemorrhage risks and use blood products in emergency, consent refusal for blood products, documentation consent to alternatives; documentation hemorrhage risk assessments done prenatal, L&D admission and prior to delivery and postpartum, ultrasound and/or MRI documentation of placental site, documentation of cesarean section incision, hemostasis in cesarean section operative (OR) report, massive transfusion protocol (MTP), fundal massage, activation rapid response system, documentation quantification blood loss, escalation of care, uterine artery ligation, embolization, interventional radiology, cell saver, consultants: such as obstetric (OB) oncology, interventional radiologist (IR), trauma surgeon, anesthesia, vascular surgeon, hematology, Bakri balloon, B-lynch suture, increased documentation of frequency of vital signs, respiratory support including

intubation, x2 large bore intravenous catheters prior to surgery, exploratory laparotomy, hysterectomy, readiness and use, blood products packed red blood cells, fresh frozen plasma (FFP), platelets, cryoprecipitate

Diagnostics: Ultrasound, MRI

Labs: Beta hCG (quantitative and serial serum qualitative), type and screen/cross for blood products, complete blood count (CBC), prothrombin time (PT), partial thromboplastin time (PTT), d-dimer, fibrinogen, blood type, antibody screen, arterial blood gases, note serial hemoglobin or hematocrit values.

Medications: Oxytocin, Cytotec, Misoprostol, Methergine, Hemabate, Prostins, vasopressors, advanced cardiac life support (ACLS) medications

AUTOPSY

Pale organs, abdominal trauma, bruising, hemoperitoneum (blood in abdominal cavity), cervical tears, source of bleeding, rupture of fallopian tubes, placenta pathology.

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HOMICIDE

DEFINITION

Any killing of one human being by another. Homicides are a leading cause of pregnancy-associated deaths. Intimate partner violence (IPV) is a pattern of assaultive and coercive behaviors perpetrated by someone who is, was, or wishes to be involved in an intimate or dating relationship. The aim of these behaviors is to establish and maintain control by one partner over the other. Abuse may be physical, emotional, and/or sexual, and may include stalking or psychological aggression. Pregnant and postpartum women who experience IPV are at increased risk for homicide. Abuse of a pregnant woman may happen for first time during pregnancy. Two out of three pregnancy-associated homicides are perpetrated by a current or former intimate partner.

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: History of intimate partner violence (IPV), recent separation from partner

Associated Characteristics: Homicide victims represent all socioeconomic and demographic backgrounds but are more prevalent among individuals who are <25 years old, Non-Hispanic Black and Hispanic persons, unmarried, uninsured, and/or who have completed less than 12 years of education

Timing:

- **Medical History:** History of IPV; past obstetric history may include teen pregnancy, therapeutic, spontaneous, or elective termination, pregnancy loss, low birthweight and preterm birth, reproductive coercion, tobacco use, substance use disorder, alcohol use disorder, history of soft tissue injuries, lacerations, fractures, sexually transmitted infections (STIs), recurrent urinary tract infections (UTIs), depression, anxiety, post-traumatic stress disorder (PTSD), homelessness
- **Prenatal:** History of IPV or assault-related trauma, overuse of health services, especially emergency room visits, intimate partner always accompanies patient (speaking for her and hovering during health visit), use of restraining orders, criminal record/incarceration of partner,

partner not supportive of pregnancy, breakup of relationship with father of baby, stressful life events, new onset of IPV or increased severity from before pregnancy, delayed or no prenatal care, missed appointments, homelessness

- **Labor & Delivery:** See Prenatal and Postpartum sections
- **Postpartum:** Low birthweight infant; new onset of IPV or increased IPV from before or during pregnancy; homelessness

SIGNS / SYMPTOMS

Signs of IPV may include: unexplained trauma/injuries such as injuries to eyes, nose, jaw, teeth, pelvis, abdomen, breasts; bruises, fractures, lacerations; co-morbid conditions include: tobacco use, alcohol and substance use disorder, mental health conditions such as depression, anxiety, post-traumatic stress disorder (PTSD), and medical disorders such as headaches, hypertension, asthma, chronic pain syndromes, hearing loss, fibromyalgia, irritable bowel syndrome, pelvic pain, recurrent UTIs, STIs, HIV; unintended pregnancy, poor pregnancy outcomes such as low birthweight infant and preterm birth. Human trafficking has been associated with homicide; many victims are women and girls living in an unsafe environment or situation, lack U.S. citizenship, have body tattoos or branding of symbols, bar codes, or other pseudonyms indicative of trafficking.

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Referral for IPV program services, mental health and substance use disorder screenings, counseling, and treatment

Diagnostics: Document IPV counseling and screenings

Medications: Treatment for co-morbid conditions

Labs: Toxicology - alcohol and/or substance use disorder in decedent and perpetrator

AUTOPSY

Physical findings may include indication of blunt force trauma, petechia on neck, previous scars or injuries Autopsy reveals method of death (gunshot, blunt/sharp force, strangulation, drowning); police report and investigator scene investigation at site of death are usually included in the medical examiner record. These reports include circumstances at scene of homicide and may also involve interviews with witnesses and family/friends of decedent. Also look for previous scars and injuries on autopsy

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HYPERTENSIVE DISORDERS

DEFINITION

A condition in which the blood pressure (BP) is noted greater than 140 mm Hg systolic or 90 mm Hg diastolic on three separate readings several weeks apart. Diagnosis of hypertensive disorders in pregnancy may be done based on readings 4 hours apart in a previously normotensive woman. Present in 50% of all pregnancies and is a major cause of maternal mortality and morbidity globally. Systolic BP > 160 mm Hg systolic or 110 mm Hg diastolic is a medical emergency and requires urgent effective treatment.

Classification of Hypertensive Disorders of Pregnancy

- **Chronic Hypertension:** Documentation BP >/= 140 mm Hg systolic and/or 90 mm Hg diastolic, prior to 20 weeks gestation. Use of medication for hypertension prior to pregnancy
- **Superimposed Preeclampsia:** Occurs in patients with chronic hypertension and may include sudden increase proteinuria, BP, HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome, headache, epigastric pain, scotomata
- **Gestational Hypertension**: BP >/= 140 mm Hg systolic or >/= 90 mmHg diastolic without proteinuria presenting after 20 weeks in pregnancy
- **Preeclampsia:** BP >/= 140 mm Hg systolic or >/= 90 mm Hg diastolic after 20 weeks gestation with proteinuria 300 mg or higher in 24-hour urine OR protein/creatinine ratio of 0.3 or more or >/= 2+ per dipstick (if no other method available),
    - With new-onset hypertension in the absence of proteinuria (gestational hypertension), preeclampsia is diagnosed with presence of signs/symptoms or lab abnormalities (see Severe Preeclampsia below)
- **Severe Preeclampsia:** One or more of the following criteria in presence of preeclampsia

- BP >/= 160 mm HG systolic or 110 mm HG diastolic (two values obtained 15 -60 minutes apart)
- New-onset visual and cerebral complaints (headache, blurred vision)
- Impaired liver function: elevated blood concentration of liver transaminases (liver function tests) ≥ 2 times normal values
- Renal insufficiency (Creatinine more than 1.1mg/dL or doubling of the serum creatinine concentration in the absence of other renal disease)
- Pulmonary edema
- Platelets less than 100,000
- Right upper quadrant pain

- **Eclampsia:** Tonic-clonic, focal or multifocal seizures in a pregnant woman with gestational hypertension or preeclampsia
- **HELLP Syndrome:** One of the more severe forms of preeclampsia. Includes hemolysis, elevated liver enzymes, and low platelets. Most cases occur in 3rd trimester, but 30% occur postpartum.
- **Hypertensive Emergency:** Can occur in prenatal or postpartum period. defined as an acute-onset, severe systolic hypertension >/= 160 mm hg, and/or severe diastolic hypertension >/=110 mm hg or both, persistent for 15 minutes or longer.
- **Atypical Preeclampsia:** Occurs at < 20 weeks gestation or more than 48 hours after delivery. Diagnosis by occurrence of severe preeclampsia criteria without proteinuria or elevated BP
- **Late Postpartum Eclampsia:** > 48 hours after delivery up to four weeks postpartum. For 63% of affected pregnancies there was no documentation of a previous hypertensive diagnosis. The most common presenting symptom is headache.

Other common names: Adult respiratory distress syndrome (ARDS), cardiac failure, cerebral edema, cerebral hemorrhage, cerebral infarction, encephalopathy, hemorrhage/disseminated intravascular coagulation (DIC), hemorrhagic stroke, hepatic failure infarction, hypertensive encephalopathy,

intracranial hemorrhage, mild preeclampsia, multiorgan failure, placental abruption, pregnancy induced hypertension, preexisting essential hypertension, stroke, subcapsular hemorrhage, subcapsular hematoma,

thrombotic stroke

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Physical inactivity, obesity, cocaine use, alcohol use disorder, tobacco use, methamphetamine use, genetics, family history), nonadherence with treatment, cesarean delivery, postpartum hemorrhage, preeclampsia, gestational diabetes, placental abruption, myocardial infarction, pulmonary edema, renal insufficiency and failure, obesity, stroke, poor perinatal outcomes (low birth weight, preterm birth)

Associated Characteristics: Individuals with their first pregnancy, Teens and women of advanced maternal age may have higher incidence, people who are non-Hispanic Black, Hispanic, Asian, Pacific Islander, American Indian or Alaska Native develop high BP more so than people who are Non-Hispanic White

Timing:

- **Medical History**: Hypertension on/not on medication, previous cerebral vascular accident, preexisting diabetes, obesity, renal disease, previous history of preeclampsia, sleep apnea, renal artery stenosis, obesity, documentation of hypertension 12 weeks postpartum after last pregnancy, systemic lupus erythematosus, family history of hypertension
- **Prenatal:** Inadequate prenatal care, delay in diagnosis**,** acute fatty liver of pregnancy, abruptio placentae, stroke, HELLP syndrome, oligohydramnios, intrauterine fetal growth restriction (IUGR), weight gain of more than five pounds in a week, hypertension after 20 weeks gestation, severe IUGR with non-reassuring fetal monitoring, proteinuria, subcapsular hepatic hematoma, decreased fetal movement

- **Labor and Delivery:** Non-reassuring fetal heart tones, pulmonary edema, abruption, mode of delivery determined by condition cervix, fetus gestational age, fetal presentation, hemorrhage, DIC, BP stabilization prior to delivery or intubation, multiorgan failure
- **Postpartum:** Headache, blurred vision, fluid retention, shortness of breath

SIGNS / SYMPTOMS

Persistent BP >/= 160 mm Hg systolic and/or >/= 110 mm Hg diastolic, headache, epigastric pain, nausea, vomiting, complaints of visual disturbances such as spots or blurry vision, generalized edema, change in level of consciousness, hyperreflexia of deep tendon reflexes, shortness of breath, oxygen saturation less than 95%, pulmonary edema, rales, rhonchi, wheezing, decreased urine output < 30 ml/hour or < 500 cc in 24 hours, complaints of chest pain, bleeding, tonic-clonic seizure, complaints “I just don’t feel right,” liver capsule distention, cardiomegaly

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Arterial line placement, seizure precautions, airway support and management, monitoring for pulmonary edema, blood product transfusion, transfer to higher level of care within or outside facility, consultants: anesthesiologist, critical care subspecialists, maternal fetal medicine neurology, neonatology, cardiology, hematology, neurology, home BP monitoring, increase in surveillance visits, ongoing assessment at antepartum unit, hospitalized for fetal surveillance, plan for early delivery, antihypertensive prescriptions, discharge education warning signs to include shortness of breath and headache, blurred vision, community resources for follow-up or assistance with medications, access to medications, referral to OB in ER, early postpartum follow up 3-7 days if medications used during labor, 7-14 days with no medication, note documentation BP at discharge

Diagnostics: Monitoring fluid intake and output, fetal surveillance: Non-Stress Test (NST) Biophysical Profile (BPP) which includes an NST and assessment of fetal movement, tone, breathing and heart rate, amniotic fluid volume and assessment fetal growth, radiologic imaging such as computed tomography

(CT) scans or computed tomography (CT) angiogram, Magnetic Resonance Imaging (MRI) for encephalopathy, chest x-ray (CXR)

Labs: Liver enzymes may be elevated due to liver injury look for ALT, AST, uric acid, bilirubin levels, serum creatinine, abnormal peripheral hemolysis, magnesium levels, proteinuria >/= 300 mg protein in 24-hour urine, dipstick 1+, serum amylase, lipase, ammonia, abnormal coagulopathy, elevated PT/PTT, placenta pathology, low platelets

Medications: Antihypertensives: Include date/time, dose and vital sign response. Look for documentation of antihypertensive medications within 60 minutes of persistent BP >/= 160 mm Hg systolic and/or >/=110 mm Hg diastolic. Oral Nifedipine is often given first if no IV access. Other medications: IV Labetalol, Hydralazine, Esmolol, Propofol, magnesium sulfate for seizure prevention, Benzodiazepines or Dilantin for recurrent seizures. Medications: low dose aspirin prenatally, corticosteroids for fetal lung maturation before 33 6/7 weeks gestation

AUTOPSY

Look at cerebral pathology, intracerebral hemorrhage, encephalopathy. Also, pathology uterus, placenta, liver, lungs, heart, and kidneys.

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INFECTION

DEFINITION

Caused when microorganisms invade body tissues. The altered immune state of pregnancy can make women more susceptible to infection, and infections may also take a more severe course. Documentation of an infection may be noted as *community- or hospital-acquired*; take note of this as it can impact the review committee's recommendations.

Other names: AIDS, bacteremia, sepsis, community acquired sepsis, COVID-19, Group A streptococcal sepsis, H1N1, HIV, influenza, meningitis, multiorgan failure, pneumococcus, pneumonia, postpartum pelvic infection, puerperal sepsis, necrotizing fasciitis, SARS-CoV-2, septic abortion, septic shock, toxic shock syndrome

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Weakened immune system, exposure to COVID-19 virus, cesarean delivery, delivered multiples (twins, triplets, etc.), pre-labor rupture of membranes, prolonged labor, multiple vaginal examinations, obstetrical maneuvers, anemia, primiparity, operative delivery, endometriosis, chorioamnionitis, unvaccinated against a particular virus or bacteria, IV catheters/surgical incisions (providing entryway for infection), underlying medical conditions (diabetes, cancer, organ transplantation), chronic diseases, certain medications (antibiotics, steroids, certain cancer fighting medications), lifesaving medical treatments and procedures (urinary catheters, tubes, surgery), obesity, substance use disorder, alcohol use disorder

Associated Characteristics: Immediate postpartum or post-abortion, teens and individuals with advanced maternal age, lack of (private) insurance, medical racism rendering non-Hispanic Black women at higher risk of developing maternal sepsis

Timing:

- **Medical History:** Termination of pregnancy, miscarriage, sickle cell disease, obesity, BMI > 30, HIV, immunodeficiency states, history IV drug use, asthma, bronchitis, diabetes, pneumonia
- **Prenatal:** Respiratory illness with negative/positive flu swabs, urinary tract infections, prolonged rupture of membranes, positive Group B Streptococcus, late or no prenatal care, preterm birth, flu-like illness, genital tract infection at time of rupture of membranes, gestational age of occurrence, positive HIV, increasing risk in third trimester of pregnancy
- **Labor and Delivery:** Traumatic vaginal delivery, retrovaginal fistula, cesarean section, chorioamnionitis, peritonitis, preterm delivery, fetal tachycardia
- **Postpartum:** Cesarean section wound infection, uterine infection, abnormal vaginal odorous discharge, necrotizing mastitis, heart valve endocarditis

SIGNS / SYMPTOMS

Pelvic pain, fever, malaise, abnormal vaginal discharge, abnormal odor in vaginal discharge, severe abdominal pain, enlarged uterus, cough, low temperature, shortness of breath, tachycardia, inflamed genital area, persistent vaginal bleeding, drainage incision, sore throat, low platelets, mastitis, shock, renal failure, respiratory distress , disseminated intravascular coagulation (DIC), multiorgan failure, body aches, chills, syncope, pulmonary edema/congestion, pleural effusions, loss of taste and/or smell

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Intravenous fluid bolus, bronchoscopy, fetal surveillance, oxygen and respiratory support, referral to multiple consultants, infectious disease, higher level of care (within facility and/or to an outside facility), purified protein derivative (PPD), anti-viral medication, ventilation

Diagnostics: Chest x-ray (CXR), CT scan, ultrasound

Labs: Sepsis screen, complete blood count (CBC), C-reactive protein (CRP), blood cultures, lactate, throat culture, placental cultures, cervical cultures, vaginal cultures, arterial blood gases, HIV, viral load, rapid OIA for flu, RT-PCR, lactic acid, liver function, fluorescent antibody screen, D-Dimer, antigen and antibody tests for specific infection. Cultures may be positive for *E. Coli, Enterobacter aerogenes, Proteus vulgaris, Hemolytic Streptococci, Staphylococci, Clostridium Perfringens* (be sure to note the pathogen)

Medications: Antibiotics, antifungals, antivirals, immunoglobins (Note: look for timing when medications ordered and administered, especially relative to the timing of the diagnosis of sepsis; note which medications were administered.)

AUTOPSY

Check for identification of organisms or source of infection. Bacterial/viral cultures of uterus, blood, lung, meninges, and spleen. Documentation of disseminated infections, necrotizing fasciitis, chorioamnionitis, funisitis in placenta/cord, local inflammation, peritonitis, endomyometritis, retained products of conception

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MOTOR VEHICLE CRASHES

DEFINITION

Motor vehicle crash death to a passenger, driver, or pedestrian.

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: substance use disorder, alcohol use disorder, speeding, driving distracted (such as using a cell phone or texting), not using seat belts, adverse weather conditions

Associated Characteristics: N/A

Timing:

- **Medical History:** Visual impairment or any condition that could cause loss of consciousness while driving
- **Prenatal:** Improper use of or failure to use seat belt
- **Labor and Delivery:** N/A
- **Postpartum:** Failure to use seat belt, substance use disorder, alcohol use disorder

SIGNS / SYMPTOMS

Maternal injuries from trauma, hypoxia, signs of shock, hemorrhage, documentation of misuse of seat belt, presence or absence of seat belt use, fetal tachycardia, abruption

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Multidisciplinary trauma management, fetal surveillance and monitoring, perimortem cesarean section, resuscitation, blood products, oxygen, ventilatory support, blood products

Diagnostics: Chest x-ray (CXR), computed tomography (CT) scans

Labs: Complete blood count (CBC), arterial blood gas (ABG), toxicology

Medications: Advanced Life Support (ACLS) Medications such as atropine, epinephrine, vasopressin, dopamine, dobutamine, vasodilators, morphine sulfate, calcium channel blockers

AUTOPSY

Description trauma, investigation included use/non-use of seat belt, domestic issues, and/or toxicology studies

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OVERDOSE

DEFINITION

Injury to the body (poisoning) that happens when a drug is taken in excessive amounts. An overdose can be fatal or nonfatal. Accidental drug-related deaths are those in which the underlying cause was organ failure or accidental drug overdose, and where there was no evidence that the death was intentional.

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Substance use disorder, traumatic childhood experiences, loss of family members, history of physical abuse, history of sexual abuse, history of human trafficking, childhood environment where drugs were prevalent, stress, lack of social support, interpersonal conflict with partners, mental health conditions, history of PTSD, isolation from parenting alone, residence location (women who live in rural areas are at higher risk compared to women in non-rural areas), geographic location (opioid prescription rates are highest in East South-Central states and lowest in Middle Atlantic states), homeless, unemployed, lack of transportation, partner or family with a substance use disorder, history of recent incarceration

Associated Characteristics: Single, teen/young adult, recent incarceration can impact tolerance and contribute to overdose post-release

Timing:

- **Medical History**: Anxiety, depression, psychiatric hospitalizations or treatment, prior suicide attempt, family history of suicide or suicide attempt, history of trauma, substance use disorder, termination of pregnancy, referral to child protection, unwanted pregnancy, chronic pain, hepatitis C, HIV-positive
- **Prenatal**: Late entry to care, missed appointments, substance use disorder in pregnancy, documentation of depression and anxiety symptoms, Edinburgh Postnatal Depression Scale

(EPDS) screening positive, inadequate support systems, sudden onset of symptoms during the last few weeks of pregnancy, statements of inadequacy, adjustments to grief/loss, delusional beliefs about her health, reduction of prescribed medication during pregnancy, domestic violence, financial difficulties, interpersonal conflict, stillbirth, miscarriage, frequent visits emergency room with complaints pain (migraines, abdominal pain, back pain) with negative work up, requests for prescription pain meds, chronic pain

- **Labor and Delivery**: Pain control management difficulties in labor and immediate postpartum
- **Postpartum**: Inadequate support systems, depression, woman with previous mental health conditions, substance use disorder, admission for psychiatric services after delivery, stressful life events, suicidal ideation, birth trauma, mental health care, separation from newborn

SIGNS / SYMPTOMS

Anxiety, erratic behavior, lethargy, agitation, unexplained physical illnesses, depression, behavioral disturbances, changes in sleep or appetite, substance use disorder, hypoxia, complaints pain despite pain medication in absence of other factors

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Referral pain management, referral for behavioral risk health assessment (especially related to trauma, childhood abuse, sexual assault, domestic violence or trafficking), referrals to social services, psychiatric care, community resources, screening perinatal depression, assessment family support systems, inpatient hospitalization, screening, brief intervention, and referral to treatment (SBIRT), medication-assisted treatment (MAT), opioid agonist treatment (OAT), psychotherapy, screening for infectious disease comorbidities (e.g. HIV, STIs, hepatitis B, hepatitis C), mental health conditions, and other substances

Diagnostics: Substance use assessment

Labs: Toxicology, electrolytes, complete blood count (CBC), arterial blood gas (ABG), lactic acetate, urinalysis

Medications: Antidepressants, antipsychotics, antianxiety, mood stabilizers, anti-epilepsy, stimulants/ADHD, medications to sleep, Naloxone, illicit drugs

AUTOPSY

Diagnosis of overdose made by autopsy includes circumstances surrounding event and methodology. Descriptions needle marks, tracks. Coroner, medical examiner history may include family/friends interview statements. Toxicology identifies substance use disorder

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SEIZURE DISORDERS

DEFINITION

Convulsion caused by abnormal electrical discharge activity in the brain. No specific pathological cause is found in majority of cases.

Other Names: Epilepsy, sudden unexplained death with epilepsy

RISK FACTORS / ASSOCIATED CHARACTERISTICS/TIMING

Risk Factors: Lack of preconception planning, emotional stress, pulmonary embolism, cerebrovascular event, heart disease, alcohol use disorder, sleep deprivation, altered medication dosage adherence or absorption,

Associated Characteristics: Increased risk of mortality during labor, delivery and postpartum; preterm delivery, stillbirth

Timing:

- **Medical History:** Epilepsy, head trauma, alcohol use disorder with history of epilepsy, sleep deprivation, non-adherence to anticonvulsant medications
- **Prenatal:** Anticonvulsant dosage adjustments (increased plasma volume in pregnancy increases effects of drug metabolism), nausea and vomiting impacting medication absorption**,** non-adherence to anticonvulsants and reasons, intrauterine growth restriction, neural tube defect or other birth defects, maternal hypoxia and fetal distress with seizure occurrence, alcohol use disorder, sleep deprivation, falls and injury caused by seizure, preterm labor, stillbirth, change in frequency and duration of seizures
- **Labor and Delivery:** Management of anticonvulsant therapy in labor, higher risk for cesarean section

- **Postpartum:** Adjustments of anticonvulsant therapy (based upon physiological changes from pregnancy to postpartum to avoid toxicity

SIGNS / SYMPTOMS

Loss of consciousness, spasms one side of body, tonic-clonic movements of extremities, amnesia of event, aura, tongue laceration, urinary and fecal incontinence, syncope, maternal hypoxia

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Documentation of preconception counseling and pregnancy risks of anticonvulsants, documentation adjustment anticonvulsants in pregnancy, airway management, referrals to neurologist, amniocentesis, chorionic villus sampling

Diagnostics: MRI, CT scan, fetal growth monitoring

Labs: Levels of therapeutic medication

Medications: Folic acid prior to pregnancy, Dilantin, Phenobarbital, Valproic acid, Carbamazepine, Topiramate, Gabapentin, Tegretol

AUTOPSY

Signs of gastric aspiration in the lungs; brain and heart pathology; toxicology

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SICKLE CELL DISEASE

DEFINITION

Autosomal recessive disorder with abnormality in hemoglobin gene, hgSS or hgSC, that causes chronic anemia due to increased frequency of breakdown of red cells. The red blood cells are sickle-shaped and with hypoxia are easily damaged, causing painful tissue damage.

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Both parents have either sickle cell disease (two sickle cell genes) or sickle cell trait (one sickle cell gene)

Associated Characteristics: Individuals with ancestors from sub-Saharan Africa, Spanish-speaking regions in the Western Hemisphere (South America, the Caribbean, and Central America), Saudi Arabia, India, and Mediterranean countries (Turkey, Greece, and Italy). Noting that race and self-identified ethnicity are poor proxies for genetics since self-identification with a specific race/ethnicity may be incompatible with genetic ancestry.

Timing:

- **Medical History:** Frequent hospitalizations for crisis
- **Prenatal:** Preeclampsia, pulmonary infarction, congestive heart failure, sickle cell crisis, urinary tract infections, chronic anemia, hypoxia, stillbirth, preterm delivery, increased episodes of painful crisis
- **Labor and Delivery:** Fluid overload, dehydration, cesarean section
- **Postpartum:** Endometritis, sepsis, acute sickle cell crisis

SIGNS / SYMPTOMS

Pallor, fatigue, weakness, jaundice, vascular hypoxia, infarction, severe pain abdomen, joints, extremities, fever, chest pain

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Preconception healthcare (including family planning counseling), supplemental oxygen and respiratory support, blood product transfusions, hydration with intravenous fluids, consultants maternal fetal medicine, hematology, transfer to a higher-level of care within or outside of facility

Diagnostics: Echocardiogram, Serial ultrasounds to monitor fetal growth

Labs: Hemoglobinopathy testing including hemoglobin electrophoresis, complete blood count (CBC), reticulocyte count, blood cultures, urinalysis

Medications: Low dose aspiring for preeclampsia reduction, Narcotics for pain control, ~~iron,~~ folic acid, antibiotics

AUTOPSY

Organ pathology, Splenic infarcts, myocardial infarction, lung infarcts, vascular thrombosis, multiorgan failure

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SUICIDE

DEFINITION

Suicide is death caused by injuring oneself with the intent to die. A suicide attempt is when someone harms themselves with any intent to end their life, but they do not die as a result of their actions.

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Family history of suicide, family history of childhood abuse and neglect, personal adverse childhood experiences, personal history of trauma, previous suicide attempt(s), history of mental health conditions (particularly clinical depression), history of alcohol or substance use disorder, feelings of hopelessness, impulsive or aggressive tendencies, cultural and religious beliefs (e.g., belief that suicide is noble resolution of a personal dilemma), local epidemics of suicide, isolation, barriers to accessing mental health treatment, loss (relational, social, work, or financial), physical illness, easy access to lethal means

Associated Characteristics: Age (second leading cause of death for persons 10-34 years of age; fourth leading cause of death among persons 35-54 years of age); highest rates across the lifespan occur among Non-Hispanic White and Non-Hispanic American Indian/Alaska Native persons, other groups disproportionately impacted include military personnel, veterans, workers in certain occupational groups (e.g., art, entertainment, design, medical, sports), sexual minority youth, not seeking help due to the stigma attached to mental health conditions and substance use disorders or to suicidal thoughts, past pregnancy losses or children placed in DCS custody (pregnancy then can be a trigger related to fear of failure or hope that it will be different this time and then if not or if it is can be a trigger) lack of a support system or inadequate support system; homelessness; transportation issues; unemployment

Timing:

- **Medical History:** Anxiety, depression, bipolar, schizophrenia, aggravation of underlying mental health condition(s), psychiatric hospitalizations or treatment, prior suicide attempt, substance use

disorder, obsessive compulsive disorder, termination of pregnancy, family history of bipolar disorder, depression or psychosis after childbirth, referral to child protective services, unwanted pregnancy, intimate partner violence, unrelated medical condition

- **Prenatal:** Depression, anxiety symptoms, documented depression on Edinburgh Postnatal Depression Scale (EPDS) screening, inadequate support systems, sudden onset mental health symptoms last few weeks of pregnancy, statements of inadequacy, grief/loss, delusional beliefs about health, substance use disorder, reduction or stopping prescribed antidepressants or mental health medications during pregnancy, intimate partner violence, suicidal ideation
- **Labor and Delivery:** (See prenatal section)
- **Postpartum:** Inadequate support systems, depression six weeks following delivery, previous mental health conditions, substance use disorder, admission for psychiatric services after delivery, delay of prescribed medications, stressful life events, suicidal ideation, birth trauma

SIGNS / SYMPTOMS

Anxiety, hopelessness, lethargy, agitation, lack of self-care, unexplained physical illnesses, depression, behavioral disturbances, changes in sleep or appetite, substance use disorder, cessation of psychiatric medications, frequently missed appointments, increased isolation

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Referral for behavioral risk health assessment and community resources, social services, psychiatric care, assessment family support systems, hospitalization

Diagnostics: Screening perinatal and postpartum depression

Labs: Toxicology

Medications: Antidepressants, antipsychotics, antianxiety, mood stabilizers, anti-epilepsy, stimulants/ADHD, medications to sleep, opiates

AUTOPSY

Diagnosis suicide made by autopsy. Coroner, medical examiner history may include family/friends interview statements, suicide letter may have been written. Toxicology identifies substance use disorder. Circumstances surrounding event, mechanism

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SYSTEMIC LUPUS ERYTHEMATOSUS

DEFINITION

Chronic autoimmune inflammatory disease of the connective tissue that can attack multiple organ systems and present periodically as flare-ups. Is due to activation of T cells and B cells, antibodies that attack individual cells.

Other names: Lupus, SLE

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Family history of SLE, overwork, sleep deprivation, stress, close exposure to fluorescent or halogen light, sun exposure, infection, injury, ceasing lupus medications, other types of medication, diet, high blood pressure, chronic kidney failure, lung disease, heart failure, kidney disease, history of preeclampsia

Associated Characteristics: Non- Hispanic Black, Asian, American Indian/Alaska Native, and Hispanic persons

Timing:

- Medical History: Documentation flares/exacerbations, miscarriage, preeclampsia, preterm delivery, antiphospholipid syndrome, hypertension
- **Prenatal:** Preterm labor, intrauterine growth restriction, preeclampsia, hypertension, proteinuria, documentation of a flare six months prior to conception, premature rupture membranes, renal flare, urinary tract infection, diabetes
- **Labor and Delivery:** Increased chance of cesarean section due to maternal complications
- **Postpartum:** Exacerbation of symptoms, chronic vascular changes, renal disease

SIGNS / SYMPTOMS

Skin rash, fatigue, weakness, fever, malaise, joint pain, proteinuria, sun or light sensitivity, oral ulcers, arthritis, lung problems, heart problems, kidney problems, seizures, psychosis, blood cell and immunological abnormalities, anemia, chest pain, hair loss, memory problems, eye disease

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Preconception counseling and family planning, referral to maternal-fetal medicine, hematology, rheumatology, infectious disease, transfer to higher level of care within or outside facility, increased visits for monitoring during prenatal and postpartum care

Diagnostics: Serial ultrasounds to monitor fetal growth

Labs: Platelets, proteinuria, autoantibodies, renal and cardiac labs, PT, INR, PTT, fibrinogen, CBC, blood culture, antiphospholipid antibodies, ANA, anticardiolipin antibody, liver function tests, urinalysis, 24-hour urine for creatinine clearance and total protein

Medications: Immunosuppressant medications prior to pregnancy, prednisone, Hydroxychloroquine, anticoagulation during pregnancy with heparin and or aspirin

AUTOPSY

Note lungs, kidneys, cardiac pathology. Look for documentation myocarditis, interstitial inflammation

THROMBOTIC EMBOLISM

DEFINITION

Sudden obstruction of a blood vessel by a thrombus. Deaths may be described as a collapse.

There is an increased risk of thrombosis in pregnancy due to a hypercoagulability state which is normal in pregnancy. Thrombotic embolisms can occur at any time in prenatal or postpartum period. Deep vein thrombosis (DVT) occurs when blood clots that have formed in the deep veins of legs or other areas break off and go to the lungs.

Other names: Deep vein thrombosis, embolism-non-cerebral, pulmonary embolism

RISK FACTORS / ASSOCIATED CHARACTERISTICS / TIMING

Risk Factors: Family or personal history of blood clots or a blood clot disorder, prolonged immobility (especially due to bed rest during pregnancy or recovery after delivery), cesarean delivery, complications of pregnancy and childbirth, long-term medical conditions (heart or lung conditions, diabetes), multiple gestation pregnancy, use of hormonal fertility treatments, overweight or obesity, tobacco use, extended periods of time sitting (four hours or more, especially legs crossed), previous VTE, preeclampsia with fetal growth restriction, antithrombin deficiency, Factor V Leiden or G20210A mutations, blood transfusion, postpartum infection, systemic lupus erythematosus, sickle cell disease, protein C or S deficiency

Associated Characteristics: Advanced maternal age

Timing:

- **Medical History:** Thromboembolism, family history of thromboembolism, antiphospholipid antibody syndrome, Protein C or S deficiency, Factor V Leiden, systemic lupus erythematosus, heart disease, sickle cell disease, sickle cell syndrome, varicose veins, diabetes, obesity, BMI > 35, operative delivery, hypertension, immobility, estrogen containing hormonal contraceptives,

hyperemesis, dehydration, injury lower extremities causing venous stasis, previous history of miscarriage, multiparity, pelvic inflammatory disease, cancer or cancer therapy, mechanical heart valves

- **Prenatal:** Immobility, obesity, hyperemesis, diabetes, injury lower extremities with venous stasis, dehydration, systemic lupus erythematosus, tobacco use, hypertension, abdominal surgery, non-adherence to anticoagulant medication
- **Labor and Delivery:** Cesarean delivery and factors listed in Prenatal section
- **Postpartum:** Cesarean delivery, obesity, recent history of miscarriage or termination of pregnancy, diabetes, bedrest, immobility for at least 1-week antepartum, delayed ambulation, no sequential compression devices (SCDs) used, infection, trauma, postpartum hemorrhage with surgery

SIGNS / SYMPTOMS

Sudden shortness of breath, tachypnea with respirations more than 24, low blood pressure, anxious, panic, cough, sudden chest pain, tachycardia, redness, pain, swelling, warmth of extremities, pain in ribs with breathing, dull chest pain, sudden cough with blood, collapse, syncope, low blood pressure, PEA (pulseless cardiac electrical activity)

TREATMENTS / DIAGNOSTICS/ LABS / MEDICATIONS

Treatments: Pulse oximetry, arterial blood gas, sequential compression device (SCDs), anti-embolic stockings, venous filter, respiratory support: nasal cannula, mask, intubation, thrombectomy, referrals to hematologist, higher level of care within or to outside facility, interventional radiologist

Diagnostics: Computed tomography (CT) scan, computed tomography (CT) angiogram chest, electrocardiogram (EKG), doppler ultrasound lower extremities, chest x-ray (CXR), chest ultrasound, ventilation/perfusion (V/Q) scan, magnetic resonance imaging (MRI)

Labs: Complete blood count (CBC), prothrombin time (PT)T, partial thromboplastin time (PTT), international normalized ration (INR), D- dimer, fibrinogen, platelets

Medications: Chemical thromboprophylaxis, anticoagulation medication therapy: Heparin, Warfarin (Postpartum), Lovenox, Enoxaparin, Dalteparin, Tinzaparin, tissue plasminogen activator (tPA). Note: anticoagulation in prenatal period may be suspended before delivery and restarted after delivery to minimize bleeding complications (note this timing)

AUTOPSY

Identification of source of emboli, description of leg and pelvis veins, documentation of fresh or organizing clot in vessels, inflammation of genital tract, microscopic findings of clots in vessels

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