Early Recognition of Perinatal Sepsis

Anabel Segovia

Fresno Pacific University

Nursing 740

Dr. Chris Patty

Acknowledgements

I chose Dr. Chris Patty for my committee chairperson who has been very helpful in guiding my research project. Dr. Patty provided useful and important information vital to help form my research, formulate research question, understand data, identify literature through research process, and examine methodologies to improve the quality of my research.

The committee I selected had the essential characteristics vital to the different components of my research. For a mentor I chose Stephanie Watson who has been an important support person. She is an experience person in the field of women perinatal services, she is very knowledgeable and caring, which makes her a great mentor. As a content expert I chose nurse midwife Julie Medina CNM who works with the population chosen for my research. She has helped guide me with the essentials to comprehend my project, and gather important literature pertinent to my project.

Lastly, I would like to thank the faculty of Fresno Pacific University, whose support and confidence in this program was a motivator in my success. I would also like to praise my Lord for giving me strength, knowledge, skills and perseverance to complete this program. A very special thank you to my family for the amazing support and encouragement through this entire journey, love you all.

TABLE OF CONTENTS

Abstract

Sepsis is a serious and often fatal clinical symptom that is often overlooked, resulting from infection. Patient demographics, risk factors, and infections leading to sepsis is needed to comprehend sepsis, prevention, early recognition, and treatment strategies. The risk of neonatal infection in the perinatal period among women with maternal infections is high. Early onset remains one of the most common causes of neonatal morbidity that goes unforeseen. Perinatal infections include those found in the bloodstream, amniotic fluid, urinary tract, group beta strep positive (GBS +), premature rupture of membranes (PROM) and stillbirths.

Keywords: perinatal, sepsis, maternal/child, neonatal screening, early-onset sepsis

Chapter 1: Introduction

The perinatal patient can appear to be in a good state of health, deceptively well before a rapid deterioration to sepsis. Compliance is an early goal directed towards treating before, during and after the initial recognition of infection or sepsis has been identified. Therefore early recognition of perinatal sepsis is crucial. Implementation of physician orders, professional nursing education in the perinatal period can decrease the incidence of sepsis significantly. Safe and effective medication administration along with early recognition and management is the most effective means. Early treatment of sepsis, severe sepsis, or septic shock with quantitative resuscitation has been shown to improve patient outcomes, as has early treatment with antibiotics, however, to attain the greatest benefit from these therapies, sepsis must be identified as early as possible in its course (Society of Critical Care Medicine, 2013). The goal is to keep the perinatal patient healthy.

Problem Statement

Maternal sepsis is the leading cause of preventable maternal death, accounting for 15% of all maternal deaths worldwide (Acosta & Knight, 2013:Bamfo 2013). The loss of a mother and her newborn baby is a preventable outcome and identifying sepsis is integral to overall patient safety. Failure to recognize and manage early warning signs is a major contributor to the prevention of these deaths (Chan et al.,2013). Pregnant mothers are more at risk or vulnerable in infection and susceptible to serious complications (Medeiros et al., 2012). All healthcare providers should have regular training and education in early recognition of sepsis, signs, symptoms and the need for prompt assessment and treatment to prevent the rapid progression of sepsis(Chan et al., 2013).

Incidence of maternal sepsis in the United States has had no significant change in pre-deliveries, and the rate of post-delivery sepsis increased 148% in the previous years (AWHONN, 2016). Prevention is key to successful outcomes, in identifying sepsis which may be difficult to recognize in early perinatal patients. Sepsis is a serious and often fatal clinical syndrome, resulting in infection. Patient demographics, risk factors, early recognition and management of treatment are important factors to consider. The CDC, in partnership with other organizations launched a comprehensive campaign to demonstrate that prevention of infections that can cause sepsis, early recognition of sepsis, is imperative to patient safety. Sepsis is rare in pregnancy, and 0.3 -0.6% are pregnant (Barton & Sibai, 2012). Other contributing factors that can increase perinatal changes include: advanced maternal age, obesity, placental abruption, placental abnormalities, assisted reproductive technology (ART), and emerging infections. Others include preterm labor, fetal infection, and preterm delivery.

Purpose

Though the early recognition and management of perinatal sepsis decrease sepsis or mortality in these individuals, neonatal infection in the first week of life is associated with maternal infection and colonization. High quality studies are needed to determine whether targeting treatment of maternal infections or colonization, and/or prophylactic antibiotic treatments to newborns of high risk mothers, may prevent a significant number of early onset neonatal sepsis (Walters, et al. 2011).

Implementation of a standard workflow, multidisciplinary team, education, and treatment options should all be considered. Along with possible drug interactions, adherence to guideline and other potential complications. Therefore, I will be conducting an integrative literature review exploring the early recognition of sepsis in the perinatal period.

CHAPTER 2: LITERATURE REVIEW

According to the literature sepsis is one of the top four causes of maternal mortality; pregnant women are more vulnerable to infection and serious complications (Chan et.al. 2015). Implementation of protocols for early recognition of sepsis should be adopted by facilities and staff education is a must. The preferred method of treatment retrieved from the article reviews is that the method of choice for treatment is the broad spectrum antibiotics, along with repeat lab work such as the lactate levels, CBC, and CRP. The first 24 hours in the treatment for sepsis is a critical time.

Theoretical Framework

Patricia Benner's Clinical Wisdom in Nursing Practice will be the theoretical framework that will be followed. Benner's work focused on understanding of perceptual acuity, clinical judgement, skilled know how, ethical comportment, and ongoing experiential learning. Benner's original domains and competencies of nursing practice are derived from clinical situations, interviews, and observations of nurses in actual practice (American Journal of Nursing, 1991). This framework applies to this study, for the following reason: it applies to clinical judgement, recognition and skills needed to recognize and manage sepsis. The five steps involved are 1.) Novice, 2.) Advanced Beginner, 3.)Competent, 4.) Proficient, 5.) Expert. These steps are all needed in order to begin to advance in clinical nursing practice and reach the level to be able to fully recognize the first sign of perinatal sepsis. The significance of this theory is that these levels reflect a movement from past, abstract concepts to past, concrete experiences. Each step builds from the previous one as these abstract principles are expanded by experience, and the nurse gains clinical experience. This theory has changed the perception of what it means to be

an expert nurse. The expert is no longer the nurse with highest paying job, but the nurse who provides the most exquisite nursing care (Benner, 1982).

"Sepsis" is one of the most common diagnoses made, the signs of sepsis are nonspecific, and inflammatory responses of noninfectious origins mimic those of perinatal sepsis. The challenges for clinicians are A) identifying neonates with sepsis and initiating antimicrobial therapy quickly, B) identifying "high-risk" and "healthy" appearing neonates with clinical signs not requiring treatment, C) discontinuing antimicrobial therapy when ruled out. Evidence based approach to diagnosing, recognition and management of sepsis as defined by the National Institute of Child Health and Human Development.

A synthesis of eleven studies were gathered and used to gather information in perinatal sepsis which included the mother and neonate before and after birth. With improved technology, obstetrical management and evidence based practices, early onset of neonatal sepsis might be becoming less frequent. However, it is one of the most common causes of neonatal mortality in neonates if not caught and treated early.

Reviews

A population based cohort study that focused on maternal and neonatal infections in a low risk population published by the Maternal and Child Health, 2009, the study sought out laboring women without maternal, fetal or placental complications and delivered without incident. This included perinatal concerns such as low birth weights, route delivery and if any birth trauma to mother or neonate was present. A total of 308,841 mother-newborn pairs were followed from 26 hospitals and of these pairs 4,009 (1.3%) had or developed some sort of neonatal infection (Korst, et. al, 2009). This is a rather large cohort study that revealed some valid information on the development of perinatal infections, obstetrical management stemming

from primarily neonatal group beta strep (GBS) infection that has remained untreated. The results also revealed that the recognition and management of the perinatal pairs the infections was seen more in nulliparous (first time mother) women.

The results measured in a large population based cohort study lead to valid results in which it demonstrated the recognition and management of perinatal sepsis. Care was not consistent and 1.3% of women developed a perinatal infection that might of lead to sepsis if not treated. Locally this study can help identify the gaps that have been missed in the recognition and management of perinatal infections. The structure, recognition of identifying neonatal infections is crucial to establish an improved practice, protocols of the obstetrical patients.

A global systematic review and meta-analysis on the risk of early-onset neonatal infection with maternal infection cause a significant proportion of death in the first week of life, with little being known of the risk factors and pathways of transmission for early onset. The shared relationship between mothers and their newborns lead to common risk factors and etiologies of infectious disease (Chan et. al., 2013). Eighty-three studies were included, in which seven studies (8.4%) were from settings that were high in mortality. The study looked at the contributing factors that cause neonatal infections, as defined by author, such as bacteremia/sepsis, pneumonia, meningitis and GBS+ mothers, in which approximately 23.4% of neonatal deaths occurred worldwide yearly (Chan et.al., 2013).

This is a large number of maternal and neonatal deaths caused by not identifying early onset infections. Amniotic fluid, chorioamnionitis and bacteremia were additional sources of transmission from mother to fetus that were identified in the study. The results of this study demonstrate validity; it shows the increased amount of neonatal mortality that remains is still very high. The results are consistent with contributing factors recognizing perinatal sepsis. The

recognition of early onset infections are still being missed, we live in a high resource setting. The study can help locally, by trying to develop better strategies for prevention, early diagnosis of sepsis, neonatal antibiotic treatment to reduce mortality to better understand how neonates are acquiring these infections.

Another study that was done in London, UK in 2010, was a randomized control trial that studied the efficacy and safety of early diagnosis and treatment of Procalcitonin in the newborn infant suspected of having sepsis. The study also relied on the use of lab work and blood cultures. Term to near term infants were chosen with suspected sepsis in the first three days of life, presenting with respiratory distress or septicemia. A total of 800 infants were studied in a time frame of three years (2003-2006) in the Netherlands. Many of the newborns with nonspecific symptoms underwent diagnostic studies and treatment was initialed before the presence or symptoms of sepsis have been proven. When results were received within a 48-72 hour period, then it was decided on whether to continue treatment or discontinue it. In an era of multidrug resistance, it is mandatory to avoid unnecessary use of antibiotics to treat uninfected infants (Stocker, et. al, 2010).

The results of this study are valid; this large sample demonstrated the use of unnecessary treatment in patients suspected of having sepsis. Many newborns were started on a treatment plan of antibiotics of procalcitonin, in which the majority is “suspected” of having sepsis. The results of the study showed that with the number of patients a difference between mean antibiotic therapy duration and the discontinuance of antibiotics, 80% had a good outcome. The other 20% were reinfected or had a devastating result.

The benefit of this study to help locally is that the study had possible limitations to the use of unnecessary use of antibiotics in the newborns. But the use of antibiotic in an infant with

little to no risk of sepsis and not discontinuing antibiotics could be a potential danger of acquiring a drug resistance, which can then result in a recurrent infection and mortality.

An article review published by Pediatrics and Neonatology on early to late infections in newborns, synthesized the incidence, risk factors, clinical manifestations and method of diagnosing and treatment in neonatal infections. The review compared early onset sepsis (1-7th day of life) to late onset sepsis (7th day of life) in newborns. The risk factors associated with both early and late onset were maternal factors such as premature delivery, prolonged rupture time, low socioeconomic status, and maternal infection. Neonatal factors were innate immune response, prematurity, low birth weight, jaundice and apgar score at birth. Both requiring serum markers and cultures to diagnosis if infection was present. This article is valid in the sense that it compares the early and late onset of sepsis, the risk factors, manifestations and treatment options. As compared to the previous studies, the results show that neonatal sepsis continues to be an important cause of morbidity and mortality worldwide, due to the lack of adequate preventative and therapeutic strategies in settings Cortese, et.al., 2015).

Locally, this article can help raise aware and prevention to correct neonatal sepsis. Recommendation of guidelines remains to be done and perfected in order to minimize the neonatal mortality rates worldwide. The presence of signs and symptoms suggestion of any sepsis should be identified immediately in order correctly treat the sepsis.

A systematic review and meta-analysis that focused on neonatal infections that cause a significant amount of deaths in the first week of life related to maternal infection or colonization in the perinatal period. The review included a total of 122 studies in which 7 studies (5.7%) were from a high risk neonatal setting. The study revealed the prevalence of bacterial vertical transmission amongst mother and child. Early onset lab work was collected in order to confirm

sepsis, which revealed a 17.2% (95%CI 6.5-27.9) colonization of infection. Contributing infections were those with premature rupture of membranes, preterm premature rupture of membranes, prolonged rupture of membranes, group B streptococcus (GBS) which increased the likelihood of infection.

Infections are one of the three major causes of neonatal mortality and account for approximately a quarter of newborn deaths in the first month of life. Neonatal infections are acquired horizontally (from environment) or vertically (from mother) (Chan, et.al., 2015). The results show a valid study, the random effects used on the meta-analysis weighed the mean estimates across the 95% CI for a prevalence of vertical transmission coming from the mother.

In order for these result to help locally, developing research priorities, and prevention strategies need to be developed in order to understand the infections and how they are acquired more from the mother than environmentally. Definitely more studies are needed in order to accurately narrow down the prevalence of early onset sepsis in newborn that are at risk.

Another systematic review and meta-analysis conducted in Sao Paulo, Brazil consisted with the screening for group B streptococcus (GBS) in pregnant women. This infection is associated with neonatal sepsis, death, meningitis and pneumonia in the perinatal period according to the review. A total of 1477 studies were identified of which 97 were selected and 8 met the criteria for this study. The studies included showed incidence of neonatal sepsis caused by GBS and the preferred intervention. The results included a valid evaluation for neonatal sepsis in which four of the studies compared screening to non-screening (n= 64324) and a controlled group (n=37098). This result demonstrated a significant difference between the two groups and a CI of 95% in favor of the controlled group.

Upon reading the result of this systematic review, it would help locally by means of suggesting universal screening to all women in the third trimester of their perinatal course. The identification of GBS and receiving treatment prior to delivery can promote for good outcomes. The two above systematic reviews yielded similar results in which GBS was an identifying factor.

A definitive diagnosis of intrauterine/neonatal sepsis as a cause of stillbirth requires positive blood cultures obtained in examination. This diagnosis is presented via a case report from the Journal of Perinatology, 2010. The case report focused on laboratory results, pathology, histopathology and medical records at a women's hospital in Rhode Island. The subject being studied was a 30 year old female that was 17 weeks pregnant with twin, developed sudden fever, chills, abdominal pain and premature rupture of membranes. After an imminent delivery of non-vial twins she was diagnosed with chorioamnionitis, GBS+, and was treated with antibiotics. This case showed a classic case of infection in the early perinatal period and recognition of infection along with other lab results, wasn't enough to avoid early delivery.

The results of this study are invalid, and the result demonstrate a classic recognition of perinatal sepsis in the mother. The development of the infection was consistent with common predisposing factors contributing to sepsis. Locally this helps the community with the recognition, signs and symptoms associated with sepsis. With the collection of lab results, pathology and histopathology, this was not enough to validate sepsis in this case study. The validity is low for a single case study.

Risk assessment in neonatal early onset sepsis: A prospective cohort study in which early onset sepsis remains a potentially fatal condition if not recognized or treated. The study of 601

mother/infant pairs born at 34 weeks to term gestation in which 85 infants got cultured and resulted positive. 23% of the infant's mothers receive intrapartum antibiotics to treat predisposing infections in which GBS was the highest variable. The results are valid in which the results show that, currently the incidence of GBS specific early onset has declined to a 0.3 -0.4 cases per 1000 live births and overall has declined to 0.8-1.0. The shows a significant drop in the early recognition and treatment in infants who have a higher risk of acquiring an infection.

Locally this helps to identify those mothers colonized and are at risk for progression of sepsis whether symptomatic or asymptomatic. Clinicians must assess the risk of infection, management and treatment of choice in order to better care for these infants. Efficacy of intrapartum maternal antibiotic therapy and postnatal newborn therapy is still a huge. Adherence to antibiotic treatment and protocols help to minimize those potential gaps in care.

The next study was a retrospective cohort study of infants born at >35 weeks gestation was evaluated for early onset sepsis in which half of the infants received antibiotics. This study was conducted in a women's hospital in Boston, MA. The focus was on antibiotic prophylaxis to prevent Group B streptococcus (GBS) infection which is a common perinatal infection. The results of the study revealed a significant decrease in the incidence of both GBS infections transmission and early neonatal sepsis. The study observed a significant 40% decrease in the overall results with basis screening of the mothers. The results of the study are valid in which it demonstrated a significant drop in the prevention of early onset sepsis in neonates with the use of intrapartum antibiotics to treat the infections. The study also incorporated CDC guidelines 2010, and incorporated the use of an algorithm to better assess and treat sepsis.

Locally the study helps local to view and improve approaches to identify asymptomatic infants at risk for early onset sepsis, decrease antibiotic exposure and evaluation of treatment.

The use of antibiotic and the outcomes achieved are significant to continue enhancing practices and resources.

Lastly, a retrospective descriptive study from the Brazilian Journal of Nursing performed a study of newborns in the neonatal intensive care unit (NICU), the goal was to identify the type of sepsis that had affected the newborns with low birth weights or had had invasive procedures suspected of causing infection. A total of 49 infants were studied and a total of 35 of the infants were diagnosed with sepsis. According to the article it stated, "In Brazil, over 60% of child deaths occur in the neonatal period, and sepsis is a major cause." That would be 6 out of 10 infants, which is an alarming number of infants having sepsis.

The results of the study indicated that neonatal sepsis between the years of 2008-2012, 71.4% (n=35) demonstrated early sepsis and 16.3 % (n=8) had early to late sepsis and 12.5 (n=6) had late sepsis. This study ran a course of 4 years total given that only a small amount of infants were studied it gave valid results. The result demonstrated a significant difference between the two groups, in which early sepsis was identified. Those infants had a higher risk of acquiring sepsis, from an invasive procedure or transmission from mother.

These results help locally, we have so many small communities here in our valley and these mothers go deliver in small rural hospitals like the one reported in the study. Exposure of bacteria to these infants increases the risk of infection due to their already susceptible immune system. By managing practices and holding everyone accountable for clean technique or sterility to decrease the incidence of sepsis in these infants is significant.

Even though we know that perinatal sepsis continues to be a huge challenge to recognize, treat and manage it remains as one of the top three reasons why infants are lost to sepsis on a day to day basis. The entire literature review article revealed that the early onset recognition was the

first step in fighting sepsis and that mothers with predisposing issues were at an even higher risk of the development of the infections. Early recognition, lab work, pathology and antibiotics are the front line recommendations for the treatment of sepsis, diagnosis will be within a 48-72 hour period after cultures have been received. Group B streptococcus was the biggest variable in 6 out of the 10 reviews, the reviews pointed out that mothers who presented with this infection had the infants with the greatest incidence of sepsis. Prevention is key to sepsis, but it may be difficult to identify early in pregnant women, particularly those in labor, communication strategies and strong interdisciplinary teamwork is needed (AWHONN, 2016).

Changes that still need to occur and develop are the need to refine sepsis protocols, procedure, and algorithms to help guide and follow. Adherence to management and treatment regimens to be followed by clinicians to achieve optimal outcomes, which tends to be a challenge between rich countries and second or third world countries in which resources are limited. The overall goal that needs to be achieved is the decrease rates of neonatal sepsis with the early recognition, management and treatment available.

Although modes of transmission for neonatal infection have been delineated, efforts to prevent most of these infections have not been met with success. There are currently no markers for early diagnosis of sepsis, which is a gap in the area of research.

Literature Review Matrix

Table 1:

Author	Year Published Country	Variables: Independant & Dependant	Study Design & Evidence Level	Sample Size	Analysis & Results	Limitations
Korst, Fridman, Friedlich, Lu, Reyes, Hobel, Chavez, Gregory.	Sept 2005 USA	Poor obstetric practices. Maternal and neonatal infections.	Population based Cohort Study IV	308,841 Mother and newborn	Hospital level risk factors such as hospital associated neonatal infections. Focused on potential indicators of infections.	Limitation of obstetrical practice patterns and effects in newborns.
Chan,Lee Baqui, Tan, Black.	July 2013 USA	Early onset neonatal sepsis. Risk of neonatal infections.	Global Systematic Review and Meta Analysis I	83 Studies	Neonatal infection in the first week of life and it's association of maternal infection.	Targeting treatment of maternal infections and treat with antibiotics.
Stocker, Hop, MC Van Rossum.	Dec. 2010 London, UK	Nonspecific clinical presentation Early diagnosis and treatment of sepsis.	Random Intervention Study II	800 Infants	All newborns are suspected to have a bacterial infection and are treated with antibiotics.	Unneeded use of antibiotics.Can develop resistant bacteria.

Cortese, Scicchita, Gesualdo, Filanino, Giorgi, Schettini, Laforgia, Ciccone.	Dec. 2015 Italy	Early onset of sepsis. Late onset of sepsis.	Article Review VII	Low birth weight preterm infants ranging from 1-5/ 1000 live births.	Lack of preventative and therapeutic strategies increases the risk of neonatal sepsis. Achieve the correct prevention of neonatal sepsis.	Time and mode of infection needs to be determined in order diagnose and treat causative factors.
Chan, Lee, Baqui, Black.	Feb. 2016 USA	Neonatal deaths in first week of life. Maternal infection or colonization.	Systematic Review and Meta Analysis I	122 Studies	Prevalence of newborns with neonatal infections exposed from maternal infections. GBS colonization of bacteria.	Limited data on intrapartum antibiotic use. Different measures, exposures and outcomes of lab confirmation
Matoso, Shapiro, De Paepe, Gundogan	Nov. 2010 Providenc e, RI USA	Amniotic fluid bacterial infection. Intrauterine/N eonatal sepsis.	Case Report VII	30 year old women	A case of intrauterine GBS sepsis, resulting in a fetal demise. Bacteria identified in vasculature of placenta.	Cannot define or exclude the spread of infection through the mother. Requires further study.
Taminato, Fram, Torinoni, Belasco, Saconato, Barbosa.	Nov-Dec 2011 Sao Paulo, Brazil	Universal screening of antibiotics. Are Prophylactic antibiotics	Systematic Review and Meta Analysis I	1477 Studies 97 Selected	Studies addressed the incidence of neonatal sepsis caused by GBS. Rates decreased 10-	Universal screening will be required in order to decrease the incidence of

		safe and effective.			15% with use of antibiotics.	neonatal sepsis.
Mukhopadhyay, Puoplol.	Dec. 2012 USA	Clinical signs of neonatal infection. Nonspecific or absent signs of infection.	Literature Review V	601 Mothers and infants < 34 weeks.	Maternal and infant clinical characteristic, infant lab work values, used to identify newborns at risk and deliver antibiotic to prevent sepsis.	Large undefined impact on healthcare, maternal/ infant social development and long term health outcomes.
Mukhopdhyay, Eichenwal, Puoplol	July 2012 USA	Asymptomatic infants >35 weeks. Postnatal antibiotic exposure.	Retro Cohort Study IV	7226 Infants	Improvement is needed to identify Asymptomatic infants who are at risk for early onset sepsis and decrease unnecessary antibiotic use.	Local care practices and resources for neonatal early onset sepsis evaluations are needed.

Medeiros, Alves, Valete, Paiva, Rodrigues, Souza	Dec 2016 Brazil	Types of sepsis in newborns. Low birth weights and/or invasive procedure	Retrospective descriptive study IV	49 infants	35 of the 49 infants diagnosed with early to late sepsis. Most frequent procedures were IV starts,	The study concluded that the infants that were of lower weight had the higher incidence of sepsis.

					central catheters and assisted ventilation.	

Chapter 3: Methodology

Search Methods

Using several databases such as PubMed, CINAHL, Evidence-Based Data or Journals, google scholar, UpToDate, Cochrane and the Fresno Pacific University library will all be sources in which reviews will be searched for. The reviews will focus on the relevance of early recognition and management of perinatal sepsis and will be within the last recent five to ten years. MESH terms searched are: perinatal sepsis, management, early signs, and neonates. Over 125 articles populated and a filter within a 5 years span and full text was chosen and narrowed them down to 54, out of which 11 were extracted. The search will not be limited to just the United States, but will include literature review from other countries as well. Excluded publications were discussions of the topic, newspaper articles, and editorials.

Design of Study

The proposed study will use an integrative review approach for multiple neonatal infections that can cause neonatal sepsis. Whittemore and Knafl's (2005) framework will be incorporated into the review. This approach was chosen to synthesis the data that will be extracted from the various studies that will be used to answer a research question. Issues related to the specifying question to the review a process, searching the literature, evaluating the data from primary and secondary sources, analyzing and presenting the results will all be integrate. Other criteria that are incorporated into Whittemore and Knafl's framework include credibility, authenticity, criticality and integrity, which are essential to qualitative reviews.

There is no specific setting for this study, geographically all countries will be used to gather information related to the topic and not limited to a specific time frame. A survey will be

conducted with local clinicians on neonatal sepsis, recognition, treatment and management, this will hopefully reveal if clinician follow a protocol for sepsis. A total of 20 literature review articles will be included in the final project.

The studies that are being utilized for this review will focus on the early recognition of perinatal sepsis (neonates and mothers in perinatal period). Perspective from providers on management, treatment guidelines, long term risk, causes of perinatal infections and recognition of septic signs and symptoms and any long term effects.

Data Analysis/Evaluation

The literature review will be conducted to evaluate current issues related to early recognition of perinatal sepsis. The articles were analyzed and evaluated with the use of the CASP (Critical Appraisal Skills Programme) tool. The three broad issues that are considered in this appraisal are 1. Are the results of the study valid? 2. What are the results? 3. Will the results help local? Other methodology that will pull from the literature review matrix will also be used to help with the data analysis.

Chapter 4: Results

The research reviewed a total of 11 articles for this project. The articles that were researched evaluated the early recognition of sepsis in the perinatal period. Implementation of the following characteristics was followed to help determine the severity of sepsis. Is an infection possible or suspected? Does the patient have any of the following: Pneumonia, urinary tract infection, acute abdominal infection, meningitis, soft tissue infection, pyelonephritis, wound infection or chorioamnionitis.

Next, does the patient exhibit two or more of the following: 1.) Temperature >38.0C/100.4 F, 2.) Heart rate >110, 3.) Respiration>24. Lastly, Does the patient exhibit organ dysfunction (not associated with chronic conditions), evidenced by the following: Hypotension (SBP<90, MAP<65 or SBP decreased >40 points from baseline), acute respiratory failure, platelet count <100,000, urine output <0.5 ml/kg/hr, lactate > 2 mmol/L. The literature shows that multiple variables affect the prompt recognition and identification of perinatal sepsis. Education with early recognition of sepsis in the perinatal period and immediate treatment decreases the incidence of sepsis.

The articles that were reviewed are summarized in Table 1. As the literature review indicates, will the early recognition in the perinatal period decrease sepsis or mortality in these individuals. Neonatal infection in the first week of life is associated with maternal infection and colonization and associated with the highest mortality period. The studies suggest difference between early onset and late onset sepsis recognition. High quality studies were reviewed to determine whether targeting treatment of maternal infections or colonization, and/or prophylactic antibiotic treatments to newborns of high risk mothers, may prevent a significant number of early onset neonatal sepsis (Walters, et al. 2011).

Severe sepsis with acute organ dysfunction has a mortality rate of up to 40%, which increases to 60% if septic shock develops (Royal College of Obstetricians and Gynecologists, 2012). The Sepsis in Obstetrics Score (S.O.S) was created by modifying validated scoring systems in accordance with recognized physiologic changes of pregnancy. “The Sepsis in Obstetrics Score is a validated pregnancy-specific score to identify risk of ICU admission for sepsis with the threshold score of 6 having a negative predictive value of 98.6%.” A score less than 6 rules out the need for ICU admission (Albright et. al., 2014). The obstetrics score focuses on the maternal temperature, systolic blood pressure > 90, heart rate <= 90, and respiratory rate, O2 saturation> 92%, white blood count (range 5.7 - 16.9), % immature neutrophils<10%, and lactic acid < 4 mmol/L. This tool has been very useful in helping identify women who are at high risk of perinatal sepsis.

Chapter 5: Discussion

The purpose of this study was to review literature relevant to early recognition of sepsis in the perinatal period. The findings of the literature review support the current efforts to decrease the morbidity and mortality during the perinatal period.

Neonatal sepsis is the leading cause of pediatric mortality worldwide, and 20% of related deaths are associated with late, improper treatment and recognition. Medical professionals have the ability recognize sepsis early using a combination of behavioral and physiologic cues observed in the perinatal period. Closing the knowledge gap related to years of experience and practice setting is crucial to early recognition of sepsis. Future researchers should examine whether these cues were present before sepsis diagnosis and establish immediate interventions to decrease progression. This will allow for the implementation of ab early warning system for sepsis.

Limitations

A limitation of this study was to find articles that concentrated specifically to the United States. The majority of the research studies were from other countries. The literature review served as a developmental starting point for this research project.

Some of the sample sizes were too small which made the validity to low for a single case study. Other studies included too many variables that made the study invalid for this project.

Implications for Nursing Practice/Conclusion

Implementation of a standard workflow, multidisciplinary team, education, and treatment options should all be considered. The purpose of this project is to provide information regarding the early recognition, treatment of sepsis. Along with possible drug interactions, adherence to protocols and guidelines. Efforts to promote early recognition among healthcare providers may

help reduce the testing and diagnosing of perinatal sepsis much sooner. These tools can be used in practice today to decrease morbidity and mortality in the perinatal period.

Further research in early recognition of perinatal sepsis is still warranted, it will provide a set of actionable criteria for identification of women with possible severe maternal infection and maternal sepsis.

Table 2: Projected Timeline

Activity	July 2017	Aug	Sept	Oct	Nov	Dec	Jan. 2018	Feb	Mar	April	May-Oct	Dec
Project started	X											
Literature Review	X											
Committee selection		X										
Present project to committee			X									
Create survey					NA							
Distribute survey						NA						
Data collection							X	X	X	X		
Data Analysis										X	X	
Presentation												X

References

Acosta, C., Kurinczuk, J. Lucas, Nuala, D.L., Tuffnell, D. Sellers, S. Knight, M. (2014). Severe maternal sepsis., 2011- 2012: *A National Case-Control Study.*

Albright CM, et al., (July, 2014). The sepsis in obstetrics score: a model to identify risk of morbidity from sepsis in pregnancy. *Am J Obstetrics and Gynecology*. (1):39.e1-8. Doi: 10.1016/j.ajog.2014.03.010. Epub 2014 Mar 12.

AWHONN (2014). Code sepsis: *Development of a sepsis protocol for the obstetric patient*. Retrieved from https://awhonn.comfex.com/awhonn/2014

Bacterial Sepsis in Pregnancy RCOG Green-top Guideline No. 64a. Royal College of Obstetricians and Gynecologists, 2012. Retrieved from https://www.rcog.org.uk/globalassets/documents.guidelines/gtg_64a.pdf

Benner, P. (1982). From novice to expert. *American Journal of Nursing*, 82 (3),402-407.

Center for Disease Control (2017). Retrieved from https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html

Chan, J.G., Lee, A., Baqui, A., Tan. J., Black, R. (2013). Risk of early-onset neonatal infection with maternal infection or colonization: *A Global Systematic Review and Meta-Analysis.* PLOS Med

Chan, J.G., Lee, A., Baqui, A., Tan. J., Black, R. (2015). Prevalence of early-onset neonatal infection among newborns of mother with bacterial infection or colonization: *A Systematic Review and Meta-Analysis.*

Cortese, F., Scicchitano, P., Gesualdo, M., Filaninno, A., De Giorgi, E., Schettini, F., Laforgia, N., Ciccone, M. (2015). Early and late infections in newborns: Where

do we stand? A Review. *Pediatric and Neonatology*; Vol. 57, 265-273.

Henderson, V. (1999). The nature of nursing: *American Journal of Nursing*. New York, NY: National League of Nursing Press.

Korst, LM., Gregory, KD., Gornbein, JA., (2004). Elective primary cesarean delivery: *Accuracy of Administrative Data. Paediatric Perinatal Epidemiol*. 18(2):112-119

Maternal and Child Health Journal (September, 2005). Vol. 9, No. 3. DOI: 10.1007/s10995-005-0006-6.

Matoso, A., Shapiro, S., DePaepe, M., Gundogan, F. (2010). Placental intravascular organisms: A Case Report. *Journal Of Perinatology.*

Medeiros, F., Alves, V.H., Valete, C.O.S., Paiva, E., Rodrigues, D., Souza, R. (2012). Invasive care procedures and neonatal sepsis in newborn with very low birth weights: A Retrospective Descriptive Study. *Brazilian Journal of Nursing*; Vol. 15 (4): 704-712.

Mukhopadhyay, S., Puopolo, K.M. (2012). Risk assessment in neonatal early onset sepsis. *Department of Newborn Medicine*, Vol. 36(6); 408-415.

Mukhopadhyay, S., Eichenwald, E.C., Puopolo, K.M. (2012). Neonatal early-onset sepsis evaluations among well appearing infants: Projected Impact of Changes in *CDC Guidelines. DOI 10.1038/ip.2012.96*

Rebmann,T. (2005). Severe acute respiratory syndrome. *J Perinat Neonat Nurs*., Vol. 19(4); 332-345. LIppincott Williams & Wilkins, Inc.

Stocker, M., Hop, C.J.W., Rossum, A. (2010). Neonatal procalcitonin intervention study (NeoPics): Effect of procalcitonin-guided decision making on duration of antibiotic

therapy in suspected neonatal early-onset sepsis: *A Multi-Center Randomized Superiority and Noninferiority Intervention Study.*

Retrieved from: https://www.ncbi.nlm.nih.gov/pmc

Taminato, M., Fram, D., Silva Belasco, A., Torioni, M.R., Saconato, H., Barbosa, D. A. (Dec. 2011). Screening for group B streptococcus in pregnant women: A Systematic Review and Meta-Analysis. *Departamento de Medicina*: Universidad Sao Paulo, Brazil.

Tyer-Viola, Lynda A.Boettiger, Michele Hagan, Joseph et al. (June 2017). Early recognition of neonatal sepsis by nurses. *Journal of Obstetric, Gynecologic & Neonatal Nursing* , Volume 46 , Issue 3 , S50 - S51

Early Recognition of Perinatal Sepsis
Fresno Pacific University

Anabel Segovia, RN, BSN

Abstract

Sepsis is a serious and often fatal clinical symptom that is often overlooked, resulting from infection. Patient demographics, risk factors, and infections leading to sepsis is needed to comprehend sepsis, prevention, early recognition, and treatment strategies. The risk of neonatal infection in the perinatal period among women with maternal infections are high. Early onset remains one of the most common cause of neonatal morbidity that goes unforeseen. Perinatal infections include those found in the bloodstream, amniotic fluid, urinary track, group beta strep positive (GBS+), premature rupture of membranes (PROM) and stillbirths.

Introduction

Though the early recognition and management of perinatal sepsis decrease sepsis or mortality in these individuals, neonatal infection in the first week of life associated with maternal infection and colonization. Implementation of a standard workflow, multidisciplinary teams, education and treatment options should all be considered and explored. The information will be abstracted from an in depth literature review in perinatal sepsis.

Methodology

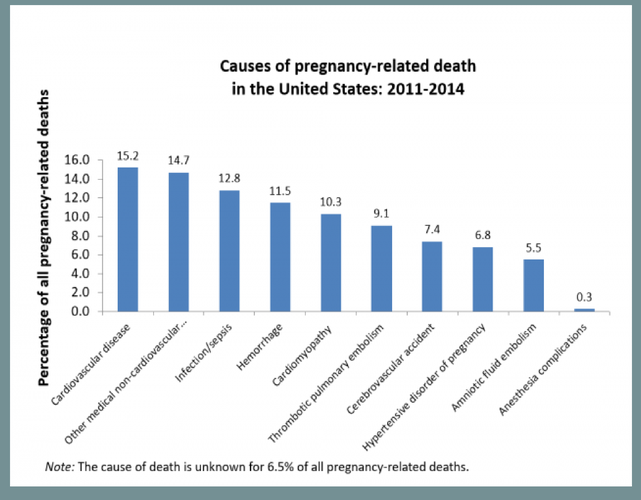
Due to the physiology of pregnancy, literature reviews were screened for the perinatal population. The data collected focused on the synthesis and information of perinatal sepsis . With improved technology, obstetrical management and evidence base practices , early onset and detection of perinatal sepsis might become less frequent.

High quality studies were needed to determine whether targeting recognition and treatment of maternal infections for high risk mothers were identified early.

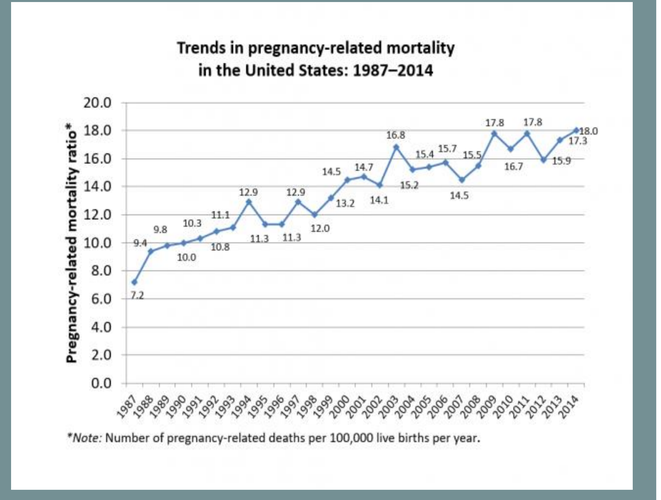
Preferred method of treatments retrieved from reviews were early lab work (lactate, complete blood count and complete reactive protein) , along with antibiotic treatment within the first 24 hours.

Results

- Early recognition and treatment of maternal sepsis will improve survival, decreased length of hospital stays. (Barton & Sibai, 2014).
- Pregnancy related deaths in the United States are 3rd due to infection or sepsis (CDC).
- Over the last 15 + years we see the trend continues to trend upwards. The graph below shows trends in pregnancy related to mortality related to the number of pregnancy per 100,000 births.
- Goal is to reduce infections with available resources and interventions.
- According to literature sepsis is one of the top four causes of maternal mortality, pregnant women are more vulnerable to infections and serious complications (Chan et. Al., 2015).



Note: The cause of death is unknown for 6.5% of all pregnancy-related deaths.



Note: Number of pregnancy-related deaths per 100,000 live births per year.

Clinical Implications

- **Providers play a crucial role in the clinical assessment and early recognitions of perinatal sepsis.**
- **Collaboration between educators, staff, clinical practices to increase the knowledge of perinatal sepsis.**
- **Application of the Sepsis in Obstetrics Score (S.O.S), for early identification of perinatal sepsis.**
- **Use of standard work approach adopted into healthcare to reduce variation in care and errors.**
- **All perinatal staff trained on early recognition and management of maternal sepsis.**

Discussion

Further research in early recognition of perinatal sepsis is still warranted, it will provide a set of actionable criteria for identification of women with possible severe maternal infection and maternal sepsis. Efforts to promote early recognition among providers may help reduce sepsis much sooner.

References.

- Barton, J. and Sibai, B. (2014). Severe sepsis and septic shock in pregnancy. Obstetrics & Gynecology,
- Centers for Disease Control and Prevention (2014). Pregnancy Mortality Surveillance System.
- Chan, J.G., Lee, A., Tan.J., Black, R.,(2015). Prevalence of early onset neonatal infection.