Magnesium Sulfate in relation to Preeclamptic Postpartum Mother’s Blood Pressure

Megan Lihs

Nebraska Methodist College

Mentor: Dr. Valerie Anderson
Clinical Partner: Nancy Murray
Date of Submission: July 11, 2019
### Table of Contents

Overview .................................................................................................................. 5  
Background ............................................................................................................ 5  
Problem Statement ................................................................................................. 7  
Purpose Statement ................................................................................................ 7  
Outcomes ............................................................................................................... 7  
Review of the Literature ......................................................................................... 7  
Theoretical Framework ............................................................................................ 10  
Organizational Assessment ..................................................................................... 11  
Methodology ......................................................................................................... 11  
  Setting .................................................................................................................. 11  
  Sampling .............................................................................................................. 12  
  Implementation Procedures .................................................................................. 13  
  Measurement Instrument(s) ............................................................................... 14  
  Ethical Considerations ....................................................................................... 14  
  Data Analysis .................................................................................................. 15  
Conclusion ............................................................................................................ 20  
References ............................................................................................................. 21  
Appendix ............................................................................................................... 23  
  Appendix A ....................................................................................................... 23  
  Appendix B ....................................................................................................... 24  
  Appendix C ....................................................................................................... 34
List of Tables

Table 1 (Paired Samples Statistics) ................................................................. 17
Table 2 (Paired Samples Test) ...................................................................... 17
Abstract

Magnesium sulfate is often used from the onset of labor and during the postpartum period to stabilize maternal blood pressure. Because little is known about magnesium sulfate, there is a concern that allowing mothers to pump or breastfeed while receiving this medication may place additional stress on the mother’s body. The purpose of this project was to determine whether preeclamptic postpartum mothers receiving magnesium sulfate who initiated breast-pumping within 1-4 hours post-delivery experienced elevated blood pressures, as evidenced by a rise above 140/90 mm Hg. A retrospective chart review of mothers who delivered in 2017, received magnesium sulfate, required immediate separation, and initiated pumping within 1-4 hours of birth was conducted. Blood pressure pre and post-pumping were recorded and analyzed using a data collection tool that was then inputted into the Statistical Packages for the Social Sciences (SPSS) software. Thirty-six patients were included. Findings suggest that systolic blood pressure pre and post-pumping were statistically decreased while no significance for diastolic blood pressure pre and post-pumping was noted. Of the participants, 12 (33%) of the 36 patients had blood pressures higher than the systolic blood pressure range of 140. Moreover, 24 patients (67%) maintained blood pressures under the range of 140 systolic mm Hg. Additionally, 5 of the 36 patients (13.8%) had diastolic blood pressures over 90 mm Hg while 31 (86%) of the mothers-maintained blood pressures under 90 mm Hg. Lower systolic blood pressure was noted in this study. Delaying pumping in postpartum mothers warrants further investigation. Larger, comparative studies need to be performed before routine encouragement of early pumping in postpartum mothers receiving magnesium sulfate is recommended as a standard of care.

Keywords: Postpartum mothers, Postnatal mothers, Magnesium Sulfate, Intravenous Magnesium
Magnesium Sulfate in Relation to Preeclamptic Postpartum Mother’s Blood Pressure

Preeclampsia is an obstetric multisystem hypertensive disorder that affects 5% to 8% of pregnancies worldwide and is a significant source of maternal mortality. Annually, preeclampsia accounts for 50,000-60,000 deaths worldwide (Gathiram & Moodley, 2016). Eclampsia is a worsening condition of pre-eclampsia characterized by seizures that are often prevented with the use of magnesium sulfate. Magnesium sulfate is commonly used in laboring women who have been diagnosed with preeclampsia (Norwitz, 2017). Infants are often separated from preeclamptic mothers who are receiving magnesium sulfate to prevent additional health stressors, including elevated maternal blood pressure (Norwitz, 2017). This project explored whether pumping while receiving magnesium sulfate adversely affects maternal health, thus prompting the question does early pumping initiation for mothers receiving magnesium sulfate have any effects on maternal blood pressure post-pumping.

Overview

Background

According to Amaral, Wallace, Owens, and LaMarca (2017), preeclampsia is defined as blood pressure greater than 140/90 mm Hg during the second half of pregnancy. This hypertensive disorder of pregnancy has been shown to contribute to preterm and low birth babies. Standard treatment options for preeclampsia include the administration of hydralazine with labetalol in conjunction with magnesium sulfate to prevent maternal seizures, and ultimately delivery of the baby (Amaral et al., 2017). For years, magnesium sulfate has been the drug of choice in preeclamptic mothers. Nemani, Dasari, Mudadla, and Balla (2018) reported that the most common maternal side effects of magnesium sulfate include nausea and vomiting, hot flashes, lightheadedness, blurred vision, and muscular weakness among preeclamptic women. Magnesium sulfate has also been shown to have side effects in the neonate. According
to Jacquemyn, Zecic, Van Laere, and Roelens (2015), neonatal side effects include a higher risk of respiratory suppression, hypotonia, absent peripheral reflexes, and even coma secondary to maternal magnesium sulfate administration.

Magnesium sulfate is used during the onset of labor and in the postpartum period to stabilize maternal blood pressure. During the postpartum period, infants are often separated after birth to prevent maternal stressors and infant complications (Norwitz, 2017). According to Cordero, Valentine, Samuels, Gianne, and Nankervis (2012), breast-pumping mothers who receive magnesium sulfate could experience an increase in blood pressure, resulting in additional stress on the mother’s body. Delayed pumping initiation commonly occurs in practice as a result.

Addressing the relationship between the use of magnesium sulfate and delayed breast-pumping initiation is essential. The timing of breast-pumping initiation has been shown to impact overall milk supply, neonate health, and the mother’s ability to provide nutrition. According to Edmond et al. (2006), delayed breastfeeding initiation leads to an increase in neonatal mortality with a 2.4-fold increase in the risk of neonate death. The timing of breast-pumping initiation is significant as one considers the negative impact on mother and baby.

The target population observed in this project included preeclamptic postpartum mothers at a Midwest hospital who experienced immediate maternal-infant separation, initiated breast-pumping within 1-4 hours post-delivery, and received a magnesium sulfate infusion post-delivery. Stakeholders included attending obstetricians, staff nurses, clinical nurse specialists, postpartum mothers, clinical nurse educators, lactation specialist, and members of the patient safety committee.
**Problem Statement**

It was evident in the literature that many obstetricians felt it was unsafe for mothers to initiate early breast-pumping while receiving magnesium sulfate. Specifically, obstetricians feared maternal BP would increase post-pumping. After a thorough review of the literature, it was apparent that limited data exists surrounding the effects of pumping while receiving magnesium sulfate on maternal blood pressure. The decision to delay breast-pumping interrupts the mother’s ability to provide breast milk for the baby. Without early pumping initiation, there are risks to the long-term milk supply.

**Purpose Statement**

The purpose of this project was to determine whether preeclamptic postpartum mothers receiving magnesium sulfate and who initiated breast-pumping within 1-4 hours post-delivery experienced elevated blood pressures, as evidenced by a rise above 140/90 mm Hg.

**Outcomes**

The outcome of this project was to determine impact of breast-pumping within 1-4 post-delivery on blood pressure in preeclamptic mothers receiving magnesium sulfate.

**Review of the Literature**

A comprehensive review of the literature was conducted. The literature review was narrowed down by searching in CINAHL, PUBMED, and Cochrane databases. The exclusion criteria included articles that focused on eclampsia in postpartum patients and mothers that chose not to breastfeed or pump. The inclusion criteria focused on the effects of magnesium sulfate within the neonate population, the highest level of evidence, and fixated around postpartum mothers that received magnesium sulfate. Screening consisted of research articles that were written in English and were written in the past six years (see Appendix A for search strategies).
The search yielded seven articles that were used to develop the capstone project further (see Appendix B for literature review).

Rundell and Pancha (2017) discussed the use of magnesium sulfate as a neuroprotector in pregnancy-related illnesses to prevent strokes. Maternal complications while receiving magnesium sulfate included respiratory depression, cardiac arrest, hot flashes, loss of deep tendon reflexes, suppression of heart rate, and diaphoresis (Rundell & Pancha, 2017).

Existing research found that obstetricians feared maternal side effects surrounding the use of magnesium sulfate. Lotufo, Parpinelli, Osis, Surita, Costa, and Cecatti (2017) conducted a qualitative study that found obstetricians who feared to prescribe magnesium sulfate were most concerned about the possibility of maternal cardiorespiratory arrest. Obstetricians voiced ethical concerns as not enough knowledge was known in treating the side effects of magnesium sulfate (Lotufo et al., 2017).

 Mothers are often separated from their newborns at birth and discouraged from pumping because of obstetrician concerns. Preeclamptic mothers commonly receive magnesium sulfate for an additional 24 hours following delivery and are encouraged to rest in a quiet low-stimuli environment (Cardona, Simoncelli, Sexton, & Raines, 2017). During this time pumping is often delayed, interrupting breast milk supply for the newborn. Spatz et al. (2016) found women who pumped one hour post birth produced significantly more milk at three weeks when compared to those who began pumping 6 hours post birth.

Separating a mother from the newborn at birth may limit a mother’s ability to provide sufficient amounts of breast milk. Cordero et al. (2012) conducted a study that looked at 149 women who received magnesium sulfate and intended to breastfeed following delivery. Cordero et al. (2012) found these participants successfully initiated breastfeeding despite initial
separation. Cordero et al. (2016) conducted another study where maternal factors delayed initiation of breastfeeding. Findings suggest that during the first hour following birth, a lack of mother-infant contact was predictive of initiation failures. The odds of initiation failure were 2.3 times higher among women who chose to use both breast milk and formula. Cordero et al. (2016) recommended the development of specific programs to decrease initiation failures.

**Obstetricians’ Perception**

Limited research was found surrounding obstetricians’ perceptions of early breast-pumping initiation in mothers receiving magnesium sulfate. Lotuto et al. (2017) conducted a study that centered specifically around obstetrician concerns when prescribing magnesium sulfate. The study concluded obstetricians felt unprepared to deal with complications from prescribing magnesium sulfate and voiced concerns about potential lawsuits. Lotuto et al. (2017) found that ordering magnesium sulfate evoked feelings of fear and insecurity in the intensive care unit. These perceptions may have led to delayed breast-pumping initiation.

**Impact of Delayed Breastfeeding Initiation**

Breastfeeding is essential in providing adequate nutrition to the neonate. Spatz et al. (2015) suggest that maternal milk is vital in protecting infants from various infections, seizures, and late-onset seizures, and it is imperative for mothers to initiate early pumping. Early breastfeeding initiation was found to be associated with reduced risk of neonate mortality when initiated within the first hour of birth (Khan, Vesel, Bahl, & Martines, 2015). Spatz et al. (2015) found that women who pumped at one hour post-delivery compared to those who pumped at 6 hours produced more amounts of milk at three weeks post-delivery. These findings support early pumping initiation.
Summary

Early breast-pumping initiation is essential in promoting overall neonatal health and positive maternal outcomes. The literature revealed many obstetricians felt insecure in prescribing magnesium sulfate and allowing for early breast pumping. The need for more education and protocols was evident. More research needs to be conducted to determine the influence of pumping on maternal blood pressure. This capstone project is one means of examining this impact.

Theoretical Framework

This project utilized the Clinical Scholar Model. The model was selected because it questions practices at the point of care (Melnyk & Fineout-Overholt, 2015). The Clinical Scholar Model was created to educate direct care providers and guide an evidence-based project. The use of this model encourages employee reflection surrounding patient safety concerns. Once a concern is identified, then the significance, stakeholders, outcomes, feasibility, cost, and risks are determined. External and internal evidence are analyzed and synthesized into complete and incomplete evidence. Once the evidence has been synthesized, results are analyzed to determine if there is a need to change current processes. The results are then disseminated to promote positive patient outcomes (Melnyk & Fineout-Overholt, 2015).

The Clinical Scholar Model worked well for this project because a patient safety concern was identified at the point of care. Staff recognized a connection between delayed pumping initiation and postpartum mothers receiving magnesium sulfate. The Clinical Scholar Model facilitated challenging current practices within the organization. The model prompted a need to gather evidence surrounding the inquiry, leading to the clinical question driving this capstone project.
Organizational Assessment

The project was appropriate for the Midwest hospital because stakeholders recognized a need to explore barriers of early pumping initiation in postpartum mothers receiving magnesium sulfate. This organization subscribed to evidenced-based practice and was supported by senior leadership and staff nurses. At the staff level, there was support and engagement for research and a desire to implement findings. Research dissemination within this organization was supported through publications, presentations, and poster presentations.

Readiness to change within the organization was evident by staff support of the project and adaptability amongst the organization. A significant barrier included opposing physician viewpoints regarding the impact of early pumping initiation on postpartum mothers receiving magnesium sulfate. The project risks and unintended consequences were limited, given the project retrospectively looked at existing data.

Methodology

Setting

The project was conducted at a local Midwestern hospital focusing on women’s healthcare. This Midwestern hospital had achieved Magnet status, which is a distinguished award that recognizes health care organizations that provide quality patient care. Services offered included obstetrical, gynecological, high-risk maternity, surgery, lactation, neonatal intensive care, outpatient imaging and laboratory, and emergency services. The hospital consisted of five floors, with one level dedicated to labor and delivery. The labor and delivery floor was often used to care for postpartum mothers who received magnesium sulfate. The hospital is located west of the metropolitan area and was utilized by many surrounding communities. There are 112 beds at this Midwest hospital; 18 beds are dedicated for labor and delivery.
Sampling

A convenience sample was utilized from an audit conducted by the clinical nurse specialist at this Midwest hospital. The inclusion criteria included preeclamptic mothers who had immediate maternal-infant separation, initiated pumping within 1-4 hours post-delivery, and received magnesium sulfate and labetalol post-delivery. It is commonly the protocol to co-preserve labetalol with patients receiving magnesium sulfate for preeclampsia in this health system. Exclusion criteria included participants that did not receive magnesium sulfate, did not require immediate separation from the infant, were administered magnesium sulfate for other reasons than preeclampsia, and who did not initiate pumping within 1-4 hours post-delivery.

Extrinsic variables that could have influenced the interpretation of the results included patients who received other medications in addition to the magnesium sulfate, including the co-prescribed labetalol, patients who had chronic hypertension prior to pregnancy, patients who were diagnosed with pre-eclampsia in other pregnancies, magnesium sulfate dosage, patients who had a history of gestational hypertension, and patients who had co-existing diagnoses such as diabetes or obesity. Variables that were taken into consideration in this project included the gestational age, maternal age, and ethnicity.

The project coordinator interacted with the lactation nurse at this local Midwest hospital who was responsible for collecting unit data on magnesium sulfate usage among breastfeeding mothers. Retrospective chart reviews were conducted from 2017. The lactation nurse served as clinical support by guiding the project coordinator through the patient charts that met the inclusion and exclusion criteria. There was no direct patient contact required.
Implementation Procedures

Pre-Data Collection

The project coordinator met with clinical stakeholders, including the lactation nurse, to get overall feedback and concerns. The project coordinator submitted the capstone project proposal to the Institutional Review Board (IRB), and an informed consent waiver was granted since the project utilized a retrospective chart review. The lactation nurse within the organization created a list of patients that met the inclusion criteria. The list originated from a convenience sample of mothers who delivered in 2017, received magnesium sulfate, required immediate separation, and initiated pumping within 1-4 hours of birth.

Data Collection

The data collection began by completing a retrospective chart review on each identified participant and inputting this data into the SPSS spreadsheet. The variables recorded included maternal age, weeks in gestation, ethnicity, pre-pumping systolic blood pressure, pre-pumping diastolic blood pressure, post-pumping systolic blood pressure, post-pumping diastolic blood pressure, pre-pumping blood pressure time stamp, post-pumping blood pressure time stamp, minutes elapsed between pumping and blood pressure, duration of pumping, time of birth, minutes elapsed between pumping and delivery, days of gestation, and whether the patient took medications aside from the protocol of labetalol and the magnesium sulfate infusion.

Post-Data Collection

The data was analyzed by the statistician and this project coordinator to determine significance. Each participant’s blood pressure was analyzed pre and post-pumping; significance was determined by an elevated blood pressure greater than 140/90 post-pumping. Other variables
that were analyzed included demographics such as age, weeks of gestation, and race to determine if these factors had any bearings on how blood pressure responded post-pumping.

**Measurement Instrument(s)**

A data collection tool for this project was created by the project coordinator to evaluate the identified variables. No reliability or validity was established using this tool as it was designed specifically for this project. Maternal variables for the project included age, weeks in gestation, ethnicity, pre-pumping systolic blood pressure, pre-pumping diastolic blood pressure, post-pumping systolic blood pressure, post-pumping diastolic blood pressure, pre-pumping blood pressure time stamp, post-pumping blood pressure time stamp, minutes elapsed between pumping and blood pressure, duration of pumping, minutes elapsed between pumping and delivery, days of gestation, and if the mother received other medications aside from the protocol of labetalol and the magnesium sulfate infusion. A data field regarding patient medications was recorded. Patients with a binary value of “0” did not take other medications in addition to the magnesium sulfate and the labetalol. Patients with a binary value of “1” received additional medications outside of magnesium sulfate and labetalol. Patient anonymity was maintained by randomly assigning numbers to protect confidentiality. The project coordinator inputted data collected into an SPSS worksheet.

**Ethical Considerations/Protection of Human Subjects**

IRB approval was obtained from Nebraska Methodist College and the affiliated health system prior to initiation of the capstone project. Patient privacy was maintained by keeping a separate SPSS document containing patient data on a password-protected computer to ensure there was no unauthorized access. This list was coded and corresponded with a number assigned on the SPSS data spreadsheet. Keeping the list of patient demographics separate from the data
spreadsheet was crucial in maintaining confidentiality. The statistician received the SPSS list containing no patient identifiers. The data was then recorded and saved on a password-protected computer.

Health Insurance Portability and Accountability Act (HIPAA) and Standards of Care regulations were followed to protect patient privacy as no personal identifiers were recorded within the data spreadsheet. The project coordinator did not have any identified conflicts of interest professionally or personally, that may have impacted the study. Objectivity was maintained by working with the lactation nurse at the Midwest hospital. Working with the lactation nurse ensured that only select patient charts were accessed and research activities were conducted appropriately. Only the lactation nurse and the project coordinator had access to the data spreadsheet and the separate list of patient identifiers. Research data is kept for three years post completion of this project. The data is destroyed by deleting the files using a commercial software application that is designed to remove all data from the storage device.

Data Analysis

Collected data was analyzed in SPSS® using inferential statistics. A dependent samples t-test was conducted to analyze blood pressure since it was a continuous variable.

A regression analysis was run to determine if other variables had any bearing on the blood pressure changes. The statistician reviewed data to ensure accuracy and to ensure the testing analysis was used for the project. This project coordinator reviewed the data entry to ensure accuracy and precision.
Results

After considering the inclusion and exclusion criteria, 53 patients had preeclampsia, received magnesium sulfate, and pumped post-delivery in 2017. Of the 53 patients, 14 (32%) were excluded. Of the excluded participants, 11 of the 14 participants pumped past the time window of 1-4 hours. Moreover, three of the excluded participants pumped before 1-4 hours; this left 36 patients.

Demographic data and clinical characteristics varied in the 36 patients. The age of patients ranged anywhere from 21-41 years of age, with the mean age of 31.22 years (standard deviation [SD] 5.3). The mother’s gestational weeks completed ranged from 24.6- 40.1 weeks with a mean number of 31.98 weeks (SD 3.6) or 224.89 days of gestation (SD 24.08). The minutes elapsed between births and pumping ranged from 77-218 minutes post birth, with a mean of 156.91 minutes (SD 40.5). Of the participants, 28 (78%) were white, two (5.6%) African American, three (8.3%) Hispanic, and two (5.6%) participants had an unknown ethnicity.

Using a dependent samples t-test, pre-pumping systolic and diastolic blood pressure were used to compare post-pumping systolic and diastolic blood pressure, as shown in Table 1.
Table 1  
*Paired Samples Statistic*

<table>
<thead>
<tr>
<th>Pair</th>
<th>Variable</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepumping_Systolic_BP</td>
<td>141.92</td>
<td>36</td>
<td>14.472</td>
<td>2.412</td>
</tr>
<tr>
<td></td>
<td>Postpumping_Systolic_BP</td>
<td>137.33</td>
<td>36</td>
<td>14.965</td>
<td>2.494</td>
</tr>
<tr>
<td>2</td>
<td>Prepumping_Diastolic_BP</td>
<td>81.11</td>
<td>36</td>
<td>8.458</td>
<td>1.410</td>
</tr>
<tr>
<td></td>
<td>Postpumping_Diastolic_BP</td>
<td>80.81</td>
<td>36</td>
<td>10.105</td>
<td>1.684</td>
</tr>
</tbody>
</table>

Note: N = number of participants.

Results were significant in comparing systolic blood pressure pre and post-pumping as the p-value equals .018, as shown in Table 2. However, no significance was determined for diastolic blood pressure pre and post-pumping, as evidenced by a p-value of .862.

Table 2  
*Paired Samples Test*

<table>
<thead>
<tr>
<th>Pair</th>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>Lower 95% Confidence interval of the Difference</th>
<th>Upper 95% Confidence interval of the Difference</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepumping_Systolic_BP</td>
<td>4.583</td>
<td>11.031</td>
<td>1.838</td>
<td>.851</td>
<td>8.316</td>
<td>2.493</td>
<td>35</td>
<td>.018</td>
</tr>
<tr>
<td></td>
<td>Postpumping_Systolic_BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Prepumping_Diastolic_BP</td>
<td>.306</td>
<td>10.474</td>
<td>1.746</td>
<td>-3.238</td>
<td>3.849</td>
<td>.175</td>
<td>35</td>
<td>.862</td>
</tr>
<tr>
<td></td>
<td>Postpumping_Diastolic_BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. DF= degrees of freedom. T=T statistic Significant at the p <0.05 level.

A regression analysis was run to determine whether blood pressure was influenced by the mother’s age, ethnicity, other medications, and length of gestation. No statistically significant predictor was present when comparing the difference in systolic and diastolic blood pressure. Of the participants, 12 (33%) of the 36 patients had blood pressures that were higher than the
systolic blood pressures of 140. Additionally, 24 participants (67%) maintained systolic blood pressures under 140 systolic mm Hg. Of the 36 patients, five (13.8%) had diastolic blood pressures over 90 mm Hg, while 31 (86%) of the mothers-maintained blood pressures under 90 mm Hg.

Discussion

Findings suggest that systolic blood pressure was statistically significantly lower when comparing pre and post-pumping blood pressures. The diastolic blood pressure change pre and post pumping was not statistically significant. The findings of this project were significant and suggest that pumping does not pose a direct risk in increasing maternal blood pressure. As noted through the literature review, breast feeding is found to improve overall neonatal health and maternal outcomes. This project’s results is good news for women who wish to breast feed as early breast pumping results in significantly more milk productions for mothers throughout the early breast feeding.

Limitations

There were several project limitations identified. One limitation was that the project analyzed a small sample size as there were only 36 participants. Additionally, the project looked at a subset of patients in a specific geographical area that may not be generalizable to other regions of the country. Other limitations to consider were the different variations of medications the mothers received outside of magnesium sulfate as well as prior obstetric and health history. This limitation includes the co-prescribed labetalol which likely impacted blood pressure readings pre and post breast-pumping. Another project examining blood pressure changes in women on magnesium sulfate but not labetalol is recommended. Lastly, while blood pressure was the focus of this project, it is important to identify that magnesium sulfate is used post-
delivery in preeclamptic women for the prevention of seizures. An outcome related to seizures would have been appropriate to include. No women in this project suffered a seizure during the post-delivery recovery period.

**Plan for Sustainability**

The plan for sustainability included providing the organization with tools needed to maintain this evidenced-based project. There was a limited cost associated in sustaining this project, which included paid time for the lactation nurse to assist. To promote sustainability, the lactation nurse educated primary stakeholders of the project findings. Results were also shared with team leaders to influence current policy practices. Findings were disseminated using a poster presentation.

**Implications for Practice**

Breast-pumping is often delayed due to provider fears and immediate maternal-infant separation; this may lead to disruption of lactogenesis. Providers caring for mothers receiving magnesium sulfate post-delivery should consider allowing mothers to pump within 1-4 hours post birth, as the findings from this project suggest there are no adverse effects on maternal blood pressure post pumping. Furthermore, this project found a small but statistically significant decrease in systolic blood pressure following pumping. Healthcare providers need to provide clear and consistent messages to preeclamptic mothers about the importance of pumping in relationship to neonatal health. Additionally, nursing staff should encourage mothers to pump and record results after delivery. Finally, the organization should consider changing policies and procedures to decrease delayed pumping initiation for mothers receiving magnesium sulfate post-delivery and increase consistency among providers.
Conclusion

This project helped to address the gap of delayed breast-pumping initiation in postpartum mothers receiving magnesium sulfate. While receiving magnesium sulfate maternal systolic blood pressure pre and post-pumping statistically decreased while the diastolic blood pressure remained unchanged. Delaying pumping in postpartum mothers warrants further investigation. More comparative studies need to be performed before encouraging early pumping in postpartum mothers receiving magnesium sulfate.
References


Appendix A

Search Strategies:

In post-partum mothers receiving magnesium sulfate does pumping increase the postpartum mother’s blood pressure significantly or greater within 2 hours after pumping compared to post-partum mothers that did not receive magnesium sulfate?

Search Completed in CINAHL plus with full text database (C) and PubMed database (P).

**POPULATION/PROBLEM**

**POPULATION**
- Post-partum Mothers
  - 1,431 (C)
  - 6762 (P)
- Postnatal mother
  - 52 (C)
  - 646 (P)

**PROBLEM**
- Magnesium Sulfate
  - 802 (C)
  - 6734 (P)
- Intravenous Magnesium
  - 843 (C)
  - 2006 (P)

**INTERVENTION**
- Pumping
  - 3,657 (C)
  - 15001 (P)
- Breastfeeding
  - 34,958 (C)
  - 35522 (P)

**EXCLUSION CRITERIA**
- Formula fed, eclampsia not related to PICO

**INCLUSION CRITERIA**
- Highest level of evidence; Key focus is on Mother's who have received magnesium sulfate

**PRACTICAL SCREENS**
- Research Article; English-language; Human; 6 years old or never (2012-2018)

All combined using “OR”
- 138 (C)
- 7318 (P)

All combined using “OR”
- 2,515 (C)
- 7680 (P)

All combined using “AND”
- 24,845 (C)
- 2023 (P)

All combined using “AND”
- 1,508 (C)
- 460 (P)

Final Keepers
- 7
Appendix B

Literature Review

PICOT: “In preeclamptic postpartum mothers at a Midwest hospital who experienced immediate maternal-infant separation post-delivery and initiated breast-pumping within 1-4 hours post-delivery while receiving intravenous magnesium sulfate, did maternal BP change significantly pre and post-pumping as evidenced by normal blood pressure as defined by the Midwest hospital policy as anything below 140/90.”

<table>
<thead>
<tr>
<th>Citation/ Level of Evidence</th>
<th>Participant s/Setting/ Sample size</th>
<th>Purpose/ Background</th>
<th>Methods/ Design &amp; Limitation s</th>
<th>Findings/Summary Strengths/Weakness</th>
<th>Applicability to Own Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demirici, J., Schnella, M., Glasser, M., Bodnar, L., &amp; Himes, K. P. (2018). Delayed Lactogenesis II and potential utility of antenatal milk expression in women developing late-onset preeclampsia: a case series. BMC Pregnancy and Childbirth, 18, 68. <a href="http://doi.org/10.1186/s12884-018-1693-5">http://doi.org/10.1186/s12884-018-1693-5</a></td>
<td>The sample was limited to 4 case study participants. All trial participants were recruited randomly with evident exclusion and inclusion criteria. Participants in the United States conducted the study.</td>
<td>To explore women whom, develop preeclampsia and the possibility of suboptimal breastfeeding rates.</td>
<td>The study was drawn from an ongoing randomized controlled trial. All trial participant s were recruited randomly with evident exclusion and inclusion criteria. The study was conducted from participants in the United States. Moreover, collected data from pregnancy</td>
<td>Strengths: Included multiple data tools such as electronic medical records, surveys, and antenatal logs. Weakness: doesn’t clearly define what survey was used and how the data was used within the medical record.</td>
<td>This article supports my research because it states the gap in healthcare that needs to be addressed by explicitly focusing on preeclampsia women and how it related to suboptimal breastfeeding rates.</td>
</tr>
</tbody>
</table>

Level II Evidence: Randomized controlled trial-controlled pilot Study (According to Melnyk Model)
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Study Description</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Relevant to Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lotufo FA, Parpinelli MA, Osis MJ, Surita FG, Costa ML, Cecatti JG (2017)</td>
<td>Obstetrician’s risk perception on the prescription of magnesium sulfate in severe preeclampsia and eclampsia: A qualitative study in Brazil.</td>
<td>To describe the obstetrician’s perception of possible reasons for underutilizing magnesium sulfate to treat preeclampsia/eclampsia.</td>
<td>Study is based on a phenomenological reference by semi-structured interviews and open-ended discussions with obstetricians of the public healthcare system in primary care units (PCU) and referral maternity hospitals (RMH), in a southeaster Brazilian city.</td>
<td>Strengths: did an excellent job identifying the need to examine obstetricians’ feeling and perceptions by investigating the daily practice and how it is important to understand these perceptions to manage hypertensive episodes and skill development properly. Weaknesses: study is not generalized and refers to the population in the southeast of Brazil. This Study is essential for my research topic because it reviews the perceptions of obstetricians and how they view using Magnesium Sulfate.</td>
</tr>
<tr>
<td>Vigil-De Gracia, P., Ramirez, R., Durán, Y., &amp; Quintero, A. (2017). Magnesium sulfate for six vs. twenty-four hours post-delivery in patients who received magnesium.</td>
<td>The study did conduct a random selection using a computerized program while sealed envelope for the results of the randomization.</td>
<td>The purpose is to compare the benefits of Mg for 24 hours postpartum versus six hours postpartum in.</td>
<td>The study conducted was a randomized, open study conducted at three teaching hospitals in Panama. Weaknesses included.</td>
<td>Strengths: the study shows that after starting infusion and receiving treatment with Mg for less than eight hours before birth, continuing the Mg for 24 hours postpartum is no better than. This information is vital as it implied using magnesium sulfate for less time, thus encouraging earlier breast-pumping versus using magnesium sulfate for a more extended period.</td>
</tr>
<tr>
<td>Name</td>
<td>Institution/Description</td>
<td>Research Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spatz, D. L. (2015).</td>
<td>The Center for Fetal Diagnosis and Treatment (CFDT) at the Children’s Hospital of Philadelphia</td>
<td>“Postpartum women should receive education and support to pump early and often so that they can reach their personal breastfeeding goals and optimize outcomes for their infants.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The student interns entered the following data points into an Excel database: mother’s name, mode of birth, time between birth and first pump (or breastfeed), number of pumping sessions per 24-hour period during the SDU stay, and the time to the first pump is the most critical variable that can be addressed through family education and staff education and training.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This study was important for my research as it identified how critical it is to pump after birth to establish milk supply.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The time to the first pump is the most critical variable that can be addressed through family education and staff education and training.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Almost all of the vaginal birth mothers are pumping within 1–2 hours after birth (approximately 95%). Before the initiation of the project, vaginal birth mothers were pumping within 3–4 hours, and cesarean</td>
<td>Weaknesses include not factoring other maternal factors such as magnesium sulfate dosage, thus leaving the potential for bias.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recommendations from the study were that using Magnesium sulfate for less than six hours showed the same results than 24 hours, thus increasing the earlier onset of ambulation and breastfeeding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patients who received the drug for less than eight hours before birth.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Furthermore, the sample size was large, thus preventing bias as there were 248 participants while a total of 143 received magnesium sulfate for 24 hours postpartum the other 141 received magnesium sulfate for six hours postpartum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level of Evidence: level II - a randomized study (According to Melnyk Model)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Just maintaining it for six hours postpartum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postpartum women should receive education and support to pump early and often so that they can reach their personal breastfeeding goals and optimize outcomes for their infants.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level of evidence: Level IV a continuous quality improvement project (According to Melnyk Model)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-hour milk production for each day before maternal discharge from the SDU, and number of pumping sessions. The mother or family complete the pump log. Pumping data collected from the pump logs was analyzed separately for vaginal birth mothers and cesarean surgery mothers. For each group, meantime (in hours) to first pump, mean number of pumping sessions per 24-hour. Women who had a vaginal birth who did not pump within 2 hours of birth were identified as outliers, mothers within five hours. A dramatic improvement in the SDU pumping initiation times for cesarean mothers was noted after the first year of the CQI project; the average time to pump was nine hours in 2010 and subsequent years decreased to within 4–5 hours. On average, there were nine outliers (including both vaginal births and cesarean surgeries) identified monthly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and women who had a cesarean surgery were identified as outliers if they did not initiate pumping within 4 hours of birth.


Level of evidence: Level III- Controlled study without randomization (According to Melnyk Model)

The sample and setting surround the topic of failure to initiate breastfeeding.

To ascertain demographic and clinical factors associated with breastfeeding initiation failure among women with HROB conditions who intended to breastfeed.

The study population is comprised of 89 women with diabetes (DM), 57 who were receiving treatment for substance abuse (SA), 51 women diagnosed with miscellaneous (MISC) conditions and 32 with history of preterm labor/delivery (PTL/D). Intention to breastfeed exclusively or in combination with formula (breastfed/FF) was ascertained prenatally.

Of all women, 59% initiated any breastfeeding. Intention to breastfeed/FF, lack of mother-infant contact during the first hour following birth and limited lactation consultation were predictive of initiation failure.

The odds of initiation failure were 2.3 times higher among women who wished to breastfeed/FF as compared to those who wished to breastfeed exclusively.

Women from the SA group had lower rates of initiation failure than the other three HROB groups.

This article is important in my study as it focuses on the importance of breastfeeding initiation and how there is an increase in failure amongst those who had other health-related conditions.
Breastfeeding was considered initiated if, at discharge, ≥50% of their infant feedings were maternal milk. Statistics include chi-square, Wilcoxon’s, and logistic regression (p<0.05).

| Cordero, L. G. (2012). Breastfeeding in women with severe preeclampsia. Breastfeeding Medicine, 7(6), 457-63. | Mother’s affected by severe preeclampsia (SP) who because of magnesium sulfate treatment are separated from their infants in the immediate postpartum period. This study examined feeding practices and factors associated with breastfeeding initiation in 281 women with severe preeclampsia and their 200 late-preterm and 81 term infants. | SP was diagnosed according to established clinical and laboratory criteria. Infant feeding preference was ascertained on admission to labor and delivery. Variables known to influence breastfeeding initiation, including maternal age, smoking, obesity, and racial and educationa | Mother’s received magnesium sulfate for 24 hours following delivery. Of 281 infants, 54% were admitted to the neonatal intensive care unit (NICU). All mothers and infants survived. On admission, 149 women intended to breastfeed, 73 intended to feed formula, and 59 were undecided. At discharge, 144 (51%) of all these mothers had successfully initiated breastfeeding. | This article focuses on the population of mother’s affected by severe preeclampsia and how breast milk is affected. |
MAGNESIUM SULFATE IN POSTPARTUM MOTHERS

1 characteristics were assessed

76% were successful, and logistic regression analysis showed that intention to breastfeed was the most significant predictor of breastfeeding initiation.

During the first 24 hours postpartum, 78% of infants receiving well-baby care, and 4% of those admitted to the NICU visited with their mother once. Among women who intended to breastfeed, successful breastfeeding initiation involved 85% of infants receiving routine well-baby care and 69% of those admitted to the NICU.


Level of evidence I- Systematic Review (According to Melnyk Model)

The sample and setting surround Preterm labor and prevention and management.

Spontaneous preterm delivery is the leading cause of neonatal morbidity in the United States and is the most common reason for hospitalization.

None specified

When used in specific at-risk populations, magnesium sulfate provides neuroprotection and decreases the incidence of cerebral palsy in preterm infants.

A 2009 Cochrane review revealed that antenatal magnesium sulfate therapy

This article was useful in my capstone project as it relates to magnesium sulfate and how its effects neonates and maternal complications.
MAGNESIUM SULFATE IN POSTPARTUM MOTHERS

During pregnancy in women at risk of preterm delivery substantially reduced the risk of cerebral palsy in their infants.

Because magnesium sulfate can cause maternal complications (e.g., respiratory depression, cardiac arrest), following institutional protocols are suggested for determining appropriate use.

| Freitas, N. A., Santiago, L. T., Kurokawa, C. S., Meira Junior, J. D., Corrente, J. E., & Rugolo, L. M. (2018). Effect of preeclampsia on human milk cytokine levels. The Journal of Maternal-Fetal & Neonatal Medicine, 50-52. | In total, 228 mothers were studied and divided into two groups matched by gestational age: PE (n equals 114) and normotensiv e (control, n equals 114). | Preeclampsia (PE) is a systemic inflammatory disease, and its effect on human milk immune compone nts is poorly understoo d. | This was a prospectiv e observatio nal study involving mother’s diagnosed with PE and with singleton pregnancy with no fetal malformati on. The mean gestational age was 36 weeks. Increased IL-1 and IL-6 levels and reduced IL-12 levels in the colostrum were detected in PE, while in the mature milk, the IL-6 and IL-8 levels were lower than those of the control group. | This study can be related to my Capstone project because it proves how breastmilk may be affected by preeclampsia. |

Level of evidence: VI- a prospective observational qualitative study (According to Melnyk Model)
<table>
<thead>
<tr>
<th>Author/Study</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>This was a cross-sectional observational study of 100 eclampsia patients and their neonates. The objective of this study was to assess the safety of low-dose magnesium sulfate regimen in neonates of eclamptic mothers treated with this regimen. This was a cross-sectional observational study of 100 eclampsia patients and their neonates. Loading dose and maintenance doses of magnesium sulfate were administered to patients by a combination of intravenous and intramuscular routes. Maternal serum and cord blood magnesium levels were estimated. Neonatal outcome was assessed. Bradycardia was observed in 18 (19.15%) of the neonates, 16 (17.02%) of the neonates were diagnosed with hypotonia. Pearson Correlation Coefficient showed Apgar scores decreased with increase in cord blood magnesium levels. Unpaired t-test showed lower Apgar scores with increasing dose of magnesium sulfate. The Chi-square/Fisher's exact test showed a significant increase in hypotonia, birth asphyxia, and intubation in the delivery room, Neonatal Intensive Care Unit (NICU) care requirement, with increasing dose of magnesium sulfate. (P ≤ 0.05).</td>
<td></td>
</tr>
<tr>
<td>Ying, L. (2016). Breastfeeding intention, initiation, and duration among Hong Kong Chinese</td>
<td>The population-based sample consisted of 2098 women in the second To estimate the breastfeeding intention, initiation, and Three different A prospectively longitudina l study The rates of artificial feeding and breastfeeding were 41.1% and 58.9%, whereas breastfeeding This study is important for my Capstone project because it evaluates factors of what makes breastfeeding successful.</td>
</tr>
</tbody>
</table>
women: A prospective longitudinal study. *Journal of Women’s Health Care.*

Level of evidence: VI-a prospective longitudinal qualitative study (According to Melnyk Model)

trimester of pregnancy was recruited with a systematic sampling method.

duration rate; identify the reasons to initiate and wean breastfeeding and explore predictors of breastfeeding duration. sets of self-administered questionnaires were used to measure the breastfeeding intention, initiation, and duration, demographic, socio-economic, obstetric, complications of pregnancy, and intrapartum variables at three-time points. Reasons for initiating and weaning breastfeeding, the formal and informal supportive resources of participant during breastfeeding were collected at the three separate time points.

intention and initiation rates were 85.3% and 67.0%, respectively.

The breastfeeding duration rates were 11.1%, 10.3%, 10.7%, and 26.7%, for the ‘within <1 week’, ‘1–3 weeks’, ‘>3–6 weeks’ and ‘>six weeks’ groups.

The common reasons for initiating breastfeeding were that breastfeeding is beneficial for both the baby (89.8%) and mother (39.7%).

Reasons for weaning breastfeeding were insufficient breast milk (32.7%), tiredness, and fatigue (39.7%) and returning to work (29.6%). (p<0.001) and early breastfeeding within the first hour (p<0.0001) were more likely to have longer breastfeeding than their counterparts.
Appendix C

Data Collection

<table>
<thead>
<tr>
<th>Mother’s Coded Number</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s weeks’ Gestation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Pre-Pumping Systolic BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Post-pumping Diastolic BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Post-pumping Systolic BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Post-pumping Diastolic BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Pre-BP Time-Stamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Post-BP Time Stamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Pumping Time Stamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Minutes Elapsed between Pumping and Post-pumping BP?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Minutes Elapsed between Pumping and Pre-Pumping BP?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s Duration of Pumping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is patient on other medications outside of magnesium sulfate and labetalol?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Born</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minutes between birth and pumping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s number of gestational days</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>