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Alternatives in Magnesium Sulfate Treatment Courses: An Investigation of Physician Prescribing Behaviors

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Alternatives in Magnesium Sulfate Treatment Courses: An Investigation of Physician Prescribing Behaviors

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by

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Abstract

Problem: The gold standard for managing preeclampsia in the postpartum patient is 24-hours of magnesium sulfate as this is the time the patient is most susceptible to experiencing a seizure (American College of Obstetricians & Gynecologists, 2013). However, these patients are at an increased risk for experiencing adverse health outcomes, as well as interruptions in maternal-infant bonding due to the mother requiring a higher level of care.

Methods: A one group pretest-posttest design was conducted to gain a better understanding of the current practice while also assessing the willingness of physicians to change prescribing behavior after receiving the research-based education.

Results: During the study period, 49 obstetric providers agreed to participate in the study. There was no statistically significant difference between survey results regarding likelihood to prescribe a reduced course of magnesium sulfate ($p=.821$). However, there was a statistically significant difference seen between the perception that 24-hours of magnesium sulfate is necessary to manage preeclampsia ($p=.020$) and the theory that patients with preeclampsia without severe features could benefit from an abbreviated treatment course ($p=.012$).

Implications for Practice: While data results do not indicate an immediate change in the prescribing of magnesium sulfate, physicians expressed interest in continued efforts to study this topic. There is an opportunity to improve patient safety by standardizing patient education. Additionally, a discrepancy was noted between the physicians' perceptions of the postpartum acuity of the preeclamptic patient. Bridging the gap between nursing and

providers ensures that providers have a reasonable expectation of the postpartum

experience.

Introduction

Preeclampsia is a leading cause of maternal morbidity and preterm labor contributing

to 9%-26% of life-threatening maternal outcomes globally (Townsend, O'Brien, Khalil,

2016, p. 79). The American College of Obstetricians and Gynecologists (2013) defines

preeclampsia as a blood pressure higher than 140/90 on two separate accounts at least

four hours apart in a previously normotensive woman after 20 weeks' gestation and

proteinuria (p. 4). Preeclampsia can also be diagnosed with hypertension after 20 weeks'

gestation in the absence of proteinuria, but with signs of multiple organ involvement

resulting in thrombocytopenia, renal insufficiency, and impaired liver function (ACOG,

2013, p. 4). The American College of Obstetricians and Gynecologists (2013) has

identified magnesium sulfate infusions to be the gold standard in preventing seizures in

patients with preeclampsia (2013, p. 6). However, prolonged durations of magnesium

sulfate is shown to increase the risk of blood clots due to increased time to ambulation,

increased risk of urinary tract infections related to the duration of indwelling catheter, and

interrupting of maternal-infant bonding due to the mother needing higher-level care

resulting in the delay in breastfeeding (Maia, Katz, Neto, Caiado, Azevedo & Amorim,

2014, p. 260). Traditionally, preeclampsia is treated with a magnesium sulfate infusion

for the first 24-hours after delivery since that is the period the patient is most susceptible

to experiencing seizures related to high blood pressures (Maia et al., 2014, p. 260).

However, current literature suggests that a 12-hour treatment course of magnesium

sulfate can be as practical as a 24-hour treatment course in preventing seizures in low-risk

preeclamptic patients (Anjum, Goel, Sharma, Mohsin, & Garg, 2016, p. 68; Kashanian,

Koohpayehzadeh, Sheikhansari, Barapour, Sahraian, & Asadolla, 2016, p. 2282; Maia et al., 2014, p. 260).

This project took place within the obstetric (OB) department on a sizeable academic campus located in the city. The majority of patients cared for on these units come from low-income, underserved areas of St. Louis (Barnes-Jewish Hospital, 2017). Demographically, this community is primarily black accounting for 96.8% of its residents (Statistical Atlas, 2015). There is data to support that when compared to Caucasians, African Americans are at higher risk of experiencing preeclampsia (Breathett, Muhlestein, & Gulati, 2014, p. 886). In addition to race other risk factors include "women who are …primigravida, have multiparous pregnancy, prior history of preeclampsia, aged 35 years or older, and those who have existing chronic hypertension, diabetes, chronic kidney disease, obesity, or connective tissue disorder" (Breathett, Muhlestein, & Gulati, 2014, p. 887).

Anjum et al. (2016) acknowledge the financial impact this treatment has on not only the medical facility but also the patient (p. 71). Knowing the financial strains faced by this patient population a change in the protocol can result in benefits for the patient financially, as well as physiologically. Prescribing an abbreviated treatment course of magnesium sulfate could result in effectively preventing seizures in low-risk postpartum patients with preeclampsia while also improving clinical outcomes, increasing patient satisfaction, and reducing treatment costs. Recognizing that changing magnesium treatment time from 24-hours to 12-hours would be a significant change in practice, assessing the physicians' willingness to change prescriptive behavior will be a critical first step to what could develop into a larger research project for the future. The purpose

of this project is to determine whether implementation of a research-based educational session for OB physicians, to discuss new knowledge related to abbreviated magnesium sulfate treatment of preeclampsia in postpartum patients, results in the participating OB physicians' willingness to change the current practice of prescribing magnesium sulfate infusion for a 24-hour period to an abbreviated 12-hour period in preeclamptic postpartum patients.

Review of Literature

A thorough database search was conducted including PubMed, CINAHL, and Scopus. The search was limited to the five-year period from 2012-2017, to reflect the most current and relevant literature. Search words included magnesium sulfate, randomized controlled trials, meta-analysis, preeclampsia, postpartum, infusions, drug administration schedule, puerperal disorders, treatment outcome, postnatal care, postpartum care, bed rest, and duration. Inclusion criteria included randomized controlled trials. Additionally, articles that were not peer-reviewed, scholarly articles with nonpertinent titles and abstracts, as well as articles that were not available in full-text were excluded.

The primary concern was postpartum patients with preeclampsia treated with magnesium sulfate remaining on strict bed rest. On the postpartum unit at Barnes-Jewish Hospital, it was once expected that these patients remain on strict bed rest for multiple reasons. Having preeclampsia predisposes patients to become eclamptic, or having seizures. Patients with preeclampsia are kept on seizure precautions while on a magnesium sulfate infusion requiring oxygen and suction to be readily available. Furthermore, magnesium sulfate acts as a smooth muscle relaxer placing these patients at

risk for falls (Murray & McKinney, 2010, pp. 637-638). As of recently, physicians were

beginning to allow patients on magnesium sulfate to leave the patient care unit without

nurse supervision, and without oxygen and suction readily available. Unfortunately, there

was no literature available to support the need for strict bed rest for patients treated with

magnesium sulfate which resulted in a change in search strategies to address this problem

from a different perspective. Further concerns for patients treated with magnesium sulfate

is the length of time with a Foley catheter, which increases the risk for urinary tract

infections, the period to ambulation, and length of time to maternal-infant bonding (Maia

et al., 2014, p. 260). Utilizing these critical concerns as search strategies introduced the

topic of abbreviated treatment courses of magnesium sulfate in preventing seizures in

postpartum women with preeclampsia.

There is currently no standard recommendation for the length of time a patient

with preeclampsia should be treated with magnesium sulfate to prevent seizures (Anjum

et al., 2016a, p. 68). However, preeclampsia is traditionally treated for the first 24-hours

after delivery because that is the period the patient is most at risk for experiencing

(Anjum et al., 2016a, p. 68; Darngawn, Jose, Regi, Bansal, & Jeyaseelan, 2012, p. 237;

Maia et al., 2014, p. 260). Throughout the literature, several approaches were taken

regarding reducing treatment time. Chama, Geidam, Bako, Mairiga & Atterwahmie

(2013) was unique in that the preferred method of administration was by intramuscular

injection (IM) and utilized the Pritchard method (p. 131). The Pritchard method involves

the patient receiving an initial loading dose of 4 grams of magnesium sulfate by

intravenous (IV) infusion along with a 5-gram magnesium sulfate IM injection into each

buttock then followed by an additional 5-gram magnesium sulfate IM injection in each

buttock, alternating sides, every four hours until the 24-hour mark is reached (Chama et al., 2013, p. 132). Chama et al. (2013) argued that a shortened course of magnesium sulfate would be as efficient as the standard Pritchard method at preventing seizures (p. 131). A reduced course included the loading dose of 10 mg IV magnesium sulfate followed by only two magnesium sulfate IM injections into each buttock four hours apart (Chama et al., 2013, p. 132). It was determined that this shortened treatment course was as useful as the Pritchard method in preventing seizures in the first 24-hours after delivery (p=0.684) while also exhibiting similar "maternal and perinatal outcomes" and reducing the total dose of magnesium sulfate by more than 40%" (Chama et al., 2013, p. 133).

Previous research has shown that the loading dose of magnesium sulfate alone could be useful in preventing seizures in the first 24-hours after delivery (Anjum et al., 2016a, p. 68; Anjum, Rajaram, & Bano, 2016, p. 983). However, a theme of reducing treatment time to 6-hours was more common. Anjum et al. (2016b) compared patients receiving the traditional 24-hour treatment course to patients who received an abbreviated 6-hour treatment course of magnesium sulfate. Study groups were found to be comparable with no statistically significant differences in demographic or clinical characteristics (Anjum et al., 2016b, p. 984). Moreover, neither group exhibited seizures after completion of treatment (Anjum et al., 2016, p. 984). There was no difference between study groups concerning perinatal or neonatal outcomes (Anjum et al., 2016, p. 985). However, statistically significant differences were seen in the intervention group regarding maternal outcomes as illustrated by decreases in the dose of magnesium sulfate given Group A 15.1 ± 5.4, Group B 42.3 ± 7.3; $p<0.001$) time with a Foley catheter

(Group A 11.3 ± 5.1, Group B 38.3 ± 7.3; $p<0.001$), and hours of monitoring (Group A 11.1 ± 4.7, Group B 38.4 ± 7.2; $p<0.001$) (Anjum et al., 2016, p. 985). Darngawn, Jose, Bansal & Jevaseelan (2012) did similar work in reducing treatment time from 24-hours to 6-hours (p. 237). The intervention group experienced a reduction in magnesium sulfate administration, as well as reduced mean time spent receiving nursing care (23.00 versus 70.13 minutes, $P<0.001$ (Darngawn et al., 2012, p. 237-238). Vigil-De Garcia, Ramirez, Duran & Quintero (2017) also tested a 6-hour treatment course; however, their study required that patients receive less than 8-hours of magnesium sulfate treatment before delivery (p. 1). Comparable to other studies examining the 6-hour treatment time no differences were found between the study groups regarding the incidence of eclampsia (Vigil-De Garcia et al., 2017, p. 3). It was also suggested that a minimum dose of 14-grams of magnesium sulfate versus the 32-gram dose administered during the traditional 24-hour treatment is as effective in preventing seizures (Vigil-De Garcia, 2017, p. 5).

In addition to exploring the benefits of a 6-hour treatment course, preceding scholars have examined the effectiveness of a less extreme reduction in treatment time to 12-hours. Anjum et al. (2016a) compared study groups who received the traditional 24-hour treatment course of magnesium sulfate and the abbreviated 12-hour course (p. 68). Researchers found that there was no statistically significant difference between study groups regarding clinical and demographic characteristics (Anjum et al., 2016a, p. 69). Neither group exhibited seizures or toxicity after the completion of treatment; however, the control group receiving the traditional 24-hours of magnesium sulfate experienced ten seizures after two hours of therapy (Anjum et al., 2016a, p. 69). However, statistically significant differences were seen between the two groups when considering the

secondary outcomes including length of hospital stay (Study group: 5.3 ± 0.8 days,

Control group: 7.5 ± 1.5 days; P<0.001) and days with a Foley catheter Study group: 19.6

± 2.5 hours, Control group: 31.5 ± 3.2 hours, P<0.001)(Anjum et al., 2016a, p. 70). The

group who received the 24-hour treatment course was shown to have received a higher

dose of magnesium sulfate (Study group: 23.2 ± 2.8 grams; Control group: 34.9 ± 3.2

grams; P<0.001) when compared to the intervention group (Anjum et al., 2016a, p. 70).

Maia et al. (2014) also examined a 12-hour treatment course to the 24-hour treatment

course and observed similar results. All study participants received an IV infusion of

magnesium sulfate at 1-gram per hour for the first 12-hours after delivery (Maia et al.,

2014, p. 261). Once the initial 12-hours had passed the infusion was discontinued for

participants in the intervention group while the control group continued to receive the

magnesium sulfate for the full 24-hours (Maia et al., 2014, p. 261). Similar to preceding

studies, the reduced treatment time of 12-hours was as effective in preventing seizures

during the first 24-hours after delivery (Maia et al., 2014, p. 261). Additionally, the

magnesium sulfate did not need to be restarted for the incidence of eclampsia (Maia et

al., 2014, p. 261). Along with participant treated adequately for the prevention of

seizures, there was also a substantial reduction in the time participants had a Foley

catheter (14.3 hours vs 25.3 hours; P<0.001), time to ambulation (18.8 hours vs 25.8

hours; P<0.001), and time to bond with baby (29.6 hours vs 35.0 hours; p=0.03) (Maia et

al., 2014, p. 263). With the reduction in time to have contact with the baby, there could

be an improvement in the "likelihood of establishing breastfeeding" (Maia et al., 2014, p.

263).

Kashanian et al. (2016) performed a similar study in investigating the effectiveness of a shortened treatment time of magnesium sulfate for 12-hours as compared to 24-hours for patients with severe preeclampsia (p. 2282). Baseline demographic and clinical characteristics were similar between both groups (Kashanian et al., 2016, p. 2283). Laboratory values including AST, ALT, alkaline phosphatase, hemoglobin, platelet count, BUN, and creatinine before and after treatment were compared between both groups and no significant difference was observed (Kashanian et al., 2016, p. 2283). In addition to comparing laboratory values, researchers also compared both groups for the incidence of side effects often associated with magnesium sulfate treatment and the transition to eclampsia including "flushing, nausea and vomiting, head lightness, headache, blurred vision, and epigastric pain" (Kashanian et al., 2016, p. 2286). There was no significant difference seen between the two groups concerning the adverse effects (Kashanian et al., 2016, p. 2286).

El-Khayat, Atef, Abdelatty, & El-semary (2016) compared all three methods, the loading dose alone, the abbreviated 12-hour course and the 24-hour course, in their capability of preventing seizures in patients with preeclampsia (p. 154). All three groups exhibited no statistically significant difference in baseline demographic and clinical characteristics (El-Khayat et al., 2016, p. 155).There was also no statistically significant difference in blood pressure, the incidence of hemorrhage, and type of delivery (El-Khayat et al., 2016, p. 155). Additionally, there were no statistically significant differences seen in neonatal outcomes between the three groups, including "prematurity, IUGR, perinatal death and NICU admission (El-Khayat et al., 2016, p. 155). In considering the primary outcome of eclampsia, there was no statistically significant

difference found between the three groups (El-Khayat et al., 2016, p. 155). There was, however, statistically significant differences noted between the three groups when considering the incidence of flushing, an adverse effect of magnesium sulfate treatment (El-Khayat et al., 2016, p. 155). Researchers concluded that following a protocol that requires a *loading dose only* would require "less maternal monitoring for urine output and blood pressure" (El-Khayat et al., 2016, p. 158).

Many of these studies shared comparable primary outcome measures that focused on the incidence of seizure activity or the recurrence of seizures. However, there was more variability seen in the secondary outcome measures which put the spotlight on clinical characteristics such as laboratory findings, participant recovery, maternal and neonatal outcomes, reports of pain, and time spent on monitoring by healthcare staff. The strength of these studies lies in the study design. Each study discussed was a randomized controlled trial. While most were single-blinded, El-Kayat et al. (2016) managed to maintain a double-blinded investigation adding to its strength (p. 154). The primary limitation of research investigating the effectiveness of an abbreviated treatment course of magnesium sulfate in preventing seizures in patients with preeclampsia is the sample size. Sample sizes of the previously mentioned studies ranged from 98 participants to 284 participants. Maia et al. (2014) recognized that larger sample sizes would be needed to observe the frequency of eclampsia in patients with a reduced treatment time of magnesium sulfate (p. 263). Specifically, the involvement of multiple facilities and upward of 18,000 participants would be necessary to have sufficient power to make a recommendation for practice change (Maia et al., 2014, p.263). Another limitation of these studies was the lack of measurement tools involved to standardize reportable data.

Darngawn et al. (2012) was the only study that made mention of an established measurement tool, the Wong-Bake pain scale, to standardize the participants' reports of pain (p. 238). Maia et al. (2014) utilized a Likert scale to measure the participant's satisfaction with the care she receiving (p. 261). All other studies relied merely on self-report from participants.

The Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP) will be utilized to implement this project. The JHNEBP Model relies on "practice, education, and research" as its pillars for professional nursing (Dearholt & Dang, 2012, p. 34). "The 18-step JHNEBP process occurs in 3 phases and can be simply described as Practice question, Evidence, and Translation (PET)" (Dearholt & Dang, 2012, p. 42).The JHNEBP Model walks the professional nurse through the process of implementing change within their organization, "provides tools for process and critique, including question development, evidence rating scale, and research and non-research evidence appraisal" (Schaffer, Sandau, & Diedrick, 2013).

Method

Design

The overall approach of this project will be that of change implementation. The primary goal will not be implementing the change itself but assessing the willingness of physicians to change current practice. A quality improvement design was utilized to evaluate the effectiveness of the intervention. Each group of physicians was presented the same survey, and no randomization occurred. A one group pretest-posttest design was conducted to determine if the research-based education had an impact on the physicians' willingness to change current practice.

Setting

This project took place on a sizable academic medical campus located in the city, as well as the offices of private physician groups. Conference rooms were utilized as arranged with administrative assistants and the physicians themselves.

Sample

A convenience sample of obstetric physicians that care for patients at Barnes-Jewish Hospital served as the sample population. The experience level of the physicians ranged from residents, year one through year four, fellows, attending physicians, and nurse practitioners. There are roughly 32 obstetric residents. In addition to the residents, there are two laborists, four Women's Health Nurse Practitioners (WHNP) and several groups of private attending physicians. The goal was to have at least 30 providers in the sample population.

Approval Processes

Since project work took place at Barnes-Jewish Hospital, a project proposal was submitted to the Department of Research's Protocol Review Committee. Because the proposed study methods do not include Barnes-Jewish Hospital team members who fall under the purview of Patient Care Services, it was not necessary to participate in the Proposal Review Committee process. Additionally, an application was submitted through the University of Missouri-St. Louis Internal Review Board and the study was deemed exempt. Risks to participants included slight discomfort if personal views were challenged in the group discussion. Ethical considerations were centered around protecting the confidentiality and anonymity of participants. While there is always a risk of breach of confidentiality, every effort to preserve privacy was maintained. No names

were written on the surveys and only identified by a prewritten number. Care was taken

to ensure that responses remained confidential by having physicians place their responses

in blank envelopes. Participation was voluntary and implied consents acknowledged with

the receipt of the surveys.

Procedures

Providers caring for obstetric patients at Barnes-Jewish Hospital were enrolled

between March 22, 2018, and May 22, 2018. A physician champion was identified to

help organize appropriate meeting times, as well as ensure the educational material was

suitable for presenting to the providers. Before the educational sessions, packets were

made for each participant that included the implied consent form, a brief synopsis of the

evidence as well as the surveys taken before and after the presentation. An unspecified

number of meetings were planned with each session not lasting longer than 30 minutes.

Providers were contacted to schedule time for the primary investigator to present the

research-based educational sessions where evidence that supports the possible change in

practice from treating preeclampsia with 24-hours of magnesium sulfate to reduced time

of 12-hours was presented. Each provider received an information sheet, and their survey

completion implied their understanding of the research and consent to participate (see

Appendix C). Physicians were asked to complete a questionnaire before and after the

presentation. Physicians were not required to include their name on the surveys, and they

were left in an unmarked envelope to preserve anonymity and left in a specified location.

Data Collection/Analysis

Self-reported questionnaires were administered to providers before the session

and then immediately after to determine if the research-based educational session had an

impact on the providers' willingness to change the current prescribing of magnesium

sulfate treatment courses. Both the pre-test survey and the post-test survey had nine

questions which were identical. Both pre-test and post-test survey's asked the physicians

to identify what level provider they are with choices being resident, fellow, attending, or

nurse practitioner. The questionnaires were brief and focused on the providers prior

knowledge of magnesium sulfate treatment courses, if the session introduced new

information, beliefs on various concepts of care of the preeclamptic patient, and if the

evidence presented encouraged them to change prescribing behaviors (see Appendices A

and B for examples of surveys). A paired t-test using SPSS version 24 (IBM, Armonk,

NY, USA) was anticipated to be utilized to determine if there is a statistically significant

difference between the willingness to change practice before and after the intervention.

Furthermore, a Chi-square test was utilized to determine if any association existed

between provider level and change in variables.

A manual chart review of patients receiving magnesium sulfate between December 15,

2016, through December 21, 2,018 was conducted with the assistance of the clinical

pharmacist. Extracted data from a hospital computer included the date of the prescribed

medication to note the frequency of prescription, the level of the provider prescribing the

medication to gain an understanding of who is most frequently ordering the medication

and the duration of the treatment. Because special privileges were necessary to access

Centricity GE, additional data to determine the duration of treatment was unable to be

obtained. Identifiable data was not utilized or recorded. Data was entered and analyzed

on a spreadsheet. That list was used to determine the dates of treatment to identify the

frequency of magnesium sulfate ordering for preeclampsia as well as the provider level.

Results

A manual chart review of physician orders of magnesium sulfate for postpartum

preeclampsia resulted in a total of 811 orders, which averages 16 orders per week. Of

those 811 orders, 93% of them were entered by OB residents with the majority of the

ordering being completed by second-year and fourth-year residents. The remaining 7% of

orders represented fellows, nurse practitioners, laborists, service attending physicians,

and private service attending physicians. The OB residents are primarily responsible for

entering orders for patients' which explains the high percentage of magnesium sulfate

orders completed by residents. The majority of preeclampsia diagnoses are made on the

antepartum unit where second-year residents reside, while the fourth-year residents are

chief residents who primarily manage the treatment plans on all obstetric patients.

Understanding of the residents' rotation helps to explain the distribution of medication

orders.

In the present quality improvement project, a convenience sample of 49 providers

was surveyed. Among those 49 providers, 26 were residents, 5 were fellows, 15 were

attendings, and 3 were nurse practitioners (see appendix D). A paired-samples t-test was

used to determine whether there was a statistically significant mean difference between

survey answers after participants listened to an educational presentation (see Appendix

E). Statistically significant differences were observed regarding the disruptive role a 24-

hour course of magnesium sulfate plays in breastfeeding and maternal-infant bonding

$(M=.878, SD=1.130, t=5.437, p=.000)$ and the necessity of the patient to have a Foley

catheter allowing nursing to adequately monitor for magnesium sulfate toxicity $(M=.571,$

SD=1.258, t=3.179, *p*=.003). While there was a change in the perception that patients should be kept on strict bedrest while receiving this high-risk medication, it was not statistically significant (M=-.102, SD=.368, t=-1.943, *p*=.058). A Fisher's Exact test was conducted between provider level and the belief that a patient should remain on bedrest for the duration of treatment. There was no statistically significant association between provider level and idea that a patient should stay on bedrest for the duration of treatment, (*p*=.066) (see Appendix F, Figure 1).

There was a significant difference in the scores for the necessity for patients to receive a full 24-hours of magnesium sulfate (M=-.347, SD=1.011, t=-2.401, p=.020) and if patients with stable preeclampsia could benefit from an abbreviated magnesium sulfate course (M=.449, SD=1.209, t=2.600, p=.012). While providers appeared to be more accepting of an abbreviated treatment course of magnesium sulfate in managing patients with preeclampsia, there was not a statistically significant difference seen in the providers' willingness to prescribe a 12-hour course of magnesium sulfate (M=0.41, SD=1.258, t=.227, p=.821). Because the mean difference was not statistically significant, we can reject the alternative hypothesis and accept the null hypothesis.

A chi-square test for association was conducted to determine if there were any differences in willingness to change prescribing behavior between residents and attendings. The data was analyzed for both pretest and posttest surveys. A response of "unsure" was considered to be a "no" for this analysis. All expected cell frequencies were greater than five for pretest results. There was no statistically significant association between provider level and willingness to prescribe a reduced treatment course on the pretest, $x^2(1) = .360, p = .548$ (see Appendix F, figure 2). Posttest results exhibited an

expected cell frequency of four in which case a Fisher's Exact test was conducted. Again, there was not a statistically significant association noted between provider level and willingness to prescribe a reduced treatment course, $p = .064$ (see Appendix F, figure 3). While attending physician responses remained consistent pretest and posttest, an unexpected increase in the number of resident physicians unwilling to change their prescriptive behavior was observed posttest. These results suggest that while the education presented had an impact on the providers ability to understand various implications experienced by patients receiving 24-hours of magnesium sulfate, ultimately providers are not yet committed to prescribing reduced treatment courses of magnesium sulfate (see Appendix G).

Discussion

This study revealed that there was no statistically significant difference in the willingness of the providers to prescribe a reduced treatment course of magnesium sulfate for postpartum patients with preeclampsia ($p=.821$) . However, there was a statistically significant difference noted between the providers concerning the belief that postpartum magnesium sulfate could be reduced from the traditional 24-hour treatment course ($p=.020$). Providers also responded well to the notion that patients that present with preeclampsia without severe features could, in fact, benefit from an abbreviated treatment course ($p=.012$). This lack of correlation highlights that while providers are open to the concept of a reduced treatment course, they are not yet committed to a change in treatment plan.

This study began with the primary investigator's concern for patient safety while they were being allowed out of bed and off the hospital unit while receiving this high-risk

medication infusion. Additionally, these patients were lacking a Foley catheter, which decreases the ability of the nurse to monitor for magnesium sulfate adequately. It is imperative to strictly monitor the patient's urine output to ensure that they have adequate diuresis (30 mL/hr) as oliguria (>30 mL/hr) leads to the buildup of magnesium sulfate leading to toxicity (Murray & McKinney, 2010). If a patient is allowed off the hospital unit without a Foley catheter, the nurse is unable to monitor their urine output. While there was a statistically significant difference observed in the providers belief that a patient should have a Foley catheter while being treated with magnesium sulfate ($p=.003$), there was no difference noted in their belief that these patients should remain on strict bedrest until treatment is complete ($p=.058$).

From discussions had with providers after the presentations, the primary investigator noticed a range of opinions regarding the management of these patients. Overall, most of the attending physicians were unaware that patients with preeclampsia treated with magnesium sulfate were being allowed off the unit with the infusion running; furthermore, they were unaware that these same patients were without a Foley catheter. Resident physicians are primarily responsible for managing the care of these patients throughout their hospital stay with the guidance of the attending physicians which could explain the lack of awareness. At the time of the completion of this study, there has been recent communication with a Maternal-Fetal Medicine (MFM) physician that there are changes to come regarding managing postpartum patients with preeclampsia receiving magnesium sulfate. Additionally, the Director of the Residency Program communicated the same sentiment to the resident physicians. Further discussion with the Washington University Obstetric Physician group highlighted that these patients requiring a higher

level of care are included in the nurses assignment of six to eight patients, including mothers and newborns. It became clear that the obstetric providers were unaware of the acuity level of the postpartum nursing assignments as they were only aware that these patients received one-to-one care on the labor and delivery unit.

An opportunity exists to standardize patient education through their journey from labor and delivery to the postpartum unit. As stated above, since these patients receive one-to-one care from the labor and delivery nurse there is more opportunity for the patient to be taken to see their baby in the neonatal intensive care unit (NICU) by their nurse, as well as receive closer monitoring. The labor and delivery staff, nursing and providers, lead these patients to expect the same level of care when they transfer to the postpartum unit without consideration to the staffing differences as well as increased acuity. As this project comes to an end work is in progress to update current nursing policies that address the management of care of patients receiving magnesium sulfate. Additionally, patient education is being standardized to ensure these patients expectations are managed and safety ensured throughout their stay. It is the plan of the primary investigator to collect additional data to determine if patients receiving magnesium sulfate present to the postpartum unit with Foley catheters and remain on strict bedrest after presenting to the obstetric providers.

Conclusion

While obstetric providers seem to be open to the idea of an abbreviated treatment course of magnesium sulfate, they are not yet comfortable with changing their prescriptive behavior. Given this fact, further research is necessary to show the clinical benefits of an abbreviated treatment course of magnesium sulfate. This study highlights

that the management of care for postpartum patients with preeclampsia receiving

magnesium sulfate can be improved. While not necessarily indicated by survey results,

providers are now aware of the risk these patients are at for experiencing adverse health

outcomes due to being allowed off the unit and not having a Foley catheter throughout

treatment time.

      Work to standardize patient education is being done so that staff on labor and

delivery and postpartum are providing the same information to the patients to manage

their expectations throughout their stay. Dissemination of staff education will occur at the

annual Women & Infant's Skills Day in conjunction with a presentation by the clinical

pharmacist on medication information for magnesium sulfate. Creating a partnership with

the Washington University Obstetric Physicians, as well as the Maternal-Fetal Medicine

Physicians, could help fill the gaps in the perception of the nursing care provided on the

postpartum unit for the patients on magnesium sulfate. Follow-up is expected to occur

with Maternal-Fetal Medicine as a physician with the Washington University Obstetric

group found that this study would make an exceptional Fellow project. Continued efforts

with Maternal-Fetal Medicine could help provide the additional research to support

further a reduced treatment course of magnesium sulfate for patients receiving

magnesium sulfate.

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Appendix A

Postpartum Magnesium Sulfate Prescribing Pre-Survey

Physician Level (please circle)

Resident   Fellow   Attending   Nurse Practitioner

1. Are you aware of the current evidence that suggests that for some patients a reduced treatment time could be as effective as the traditional 24-hour course?

    Yes   No

2. Should patients get out of bed while receiving magnesium sulfate infusions?

    Yes   No

3. Patients receiving magnesium sulfate are at risk for experiencing a hemorrhage.

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly unlikely | | | | Strongly likely |

4. Treatment with magnesium sulfate should follow a 24-hour treatment course

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly agree | | | | Strongly disagree |

5. Patients presenting with stable preeclampsia could benefit from an abbreviated magnesium sulfate treatment course

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly agree | | | | Strongly disagree |

6. Patients on magnesium sulfate must have an indwelling catheter in place to ensure accurate urine output

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly agree | | | | Strongly disagree |

7. Breastfeeding and maternal-infant bonding are interrupted for patients being treated with magnesium sulfate

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly agree | | | | Strongly disagree |

8. Patients receiving magnesium sulfate are at risk for falls.

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly agree | | | | Strongly disagree |

9. How likely are you to prescribe a reduced treatment time of magnesium sulfate (12-hours)

    | 1 | 2 | 3 | 4 | 5 |
    | Strongly unlikely | | | | Strongly likely |

Appendix B

Postpartum Magnesium Sulfate Prescribing Post-Survey

Physician Level (please circle)

Resident   Fellow   Attending   Nurse Practitioner

1. Are you aware of the current evidence that suggests that for some patients a reduced treatment time could be as effective as the traditional 24-hour course?

   Yes   No

2. Should patients get out of bed while receiving magnesium sulfate infusions?

   Yes   No

3. Patients receiving magnesium sulfate are at risk for experiencing a hemorrhage.

1	2	3	4	5
Strongly unlikely				Strongly likely

4. Treatment with magnesium sulfate should follow a 24-hour treatment course.

1	2	3	4	5
Strongly agree				Strongly disagree

5. Patients presenting with stable preeclampsia could benefit from an abbreviated magnesium sulfate treatment course.

1	2	3	4	5
Strongly agree				Strongly disagree

6. Patients on magnesium sulfate must have an indwelling catheter in place to ensure accurate urine output.

1	2	3	4	5
Strongly agree				Strongly disagree

7. Breastfeeding and maternal-infant bonding are interrupted for patients being treated with magnesium sulfate.

1	2	3	4	5
Strongly agree				Strongly disagree

8. Patients receiving magnesium sulfate are at risk for falls.

1	2	3	4	5
Strongly agree				Strongly disagree

9. How likely are you to prescribe a reduced treatment time of magnesium sulfate (12-hours)

1	2	3	4	5
Strongly unlikely				Strongly likely

Appendix C

College of Nursing

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University
of Missouri
St. Louis

Informed Consent for Participation in Research Activities
Alternatives in Magnesium Sulfate Treatment Courses: An Investigation of Physician Prescribing Behaviors

HSC Approval Number _____

Principal Investigator _____Erin Williams, BSN, RNC-MNN_____   PI's Phone Number __314-223-7929__

Why am I being asked to participate?

You are invited to participate in a research study about exploring the benefits of alternative treatment courses for magnesium sulfate and physician willingness to change prescribing behavior conducted by Erin Williams, graduate student at the University of Missouri-St. Louis and Barnes-Jewish Hospital. You have been asked to participate in this research because you are a practicing obstetric physician and may be eligible to participate. We ask that you read this form and ask any questions you may have before agreeing to be in the research. Your participation in this research is voluntary. Your decision whether to participate will not affect your current or future relations with the University or Barnes-Jewish Hospital. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

What is the purpose of this research?

The purpose of this research is to examine alternative treatment courses of magnesium sulfate infusions for low-risk patients with preeclampsia and determine the willingness of physicians to change prescribing behavior.

What procedures are involved?

If you agree to participate in this research, you can expect:

➢ You will be asked to answer questions on a survey, listen to an educational presentation, and then answer questions on another survey.

➢ It will take about 35 minutes to complete the survey, listen to the presentation, and answer the second survey.

Approximately 50 participants may be involved in this research at Barnes-Jewish Hospital.

What are the potential risks and discomforts?

There may be a slight risk of discomfort if personal views are challenged in the group discussion. There is also risk of breach of confidentiality regarding study participation, however, every effort to preserve confidentiality will be maintained.

Are there benefits to taking part in the research?

There are no direct benefits for you participating in this study. However, this research will offer feedback to the researcher on how physicians perceive different treatment courses of magnesium sulfate in treating preeclampsia. The results may help the researcher understand prescriptive behavior.

Appendix C (continued)

What about privacy and confidentiality?

Surveys will not contain names and will be identified only by a letter at the upper left corner to maintain anonymity. Surveys will be given as a packet to each participant at the time of the educational session. The pre- and post-survey will be differentiated by color and participants will be instructed which survey to complete at the appropriate time. The surveys will be turned in as one packet to a predetermined location away from the principal investigator. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your identity will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain confidentiality of your data. In addition, all data will be stored on a password-protected computer and/or in a locked office.

What are the costs for participating in this research?

There is no cost for participating in this research.

Will I be paid for my participation in this research?

There is no form of payment for your participation in this study.

Can I withdraw or be removed from the study?

Your participation is voluntary and you may choose not to participate in this research study or to withdraw your consent at any time. You may choose not to answer any questions you do not want to answer. You will NOT be penalized in any way should you choose not to participate or withdrawn.

**Who should I contact if I have questions?**

The researcher conducting this study is Erin Williams. You may ask any questions you have now. If you have questions later, you may contact the researcher at 314-223-7929.

What are my rights as a research subject?

If you have any questions about your rights as a research subject, you may call the Chairperson of the Institutional Review Board at (314) 516-5897.

I have read this consent form and my completion of this survey implies my understanding and consent to my participation in the research described above.

Appendix D
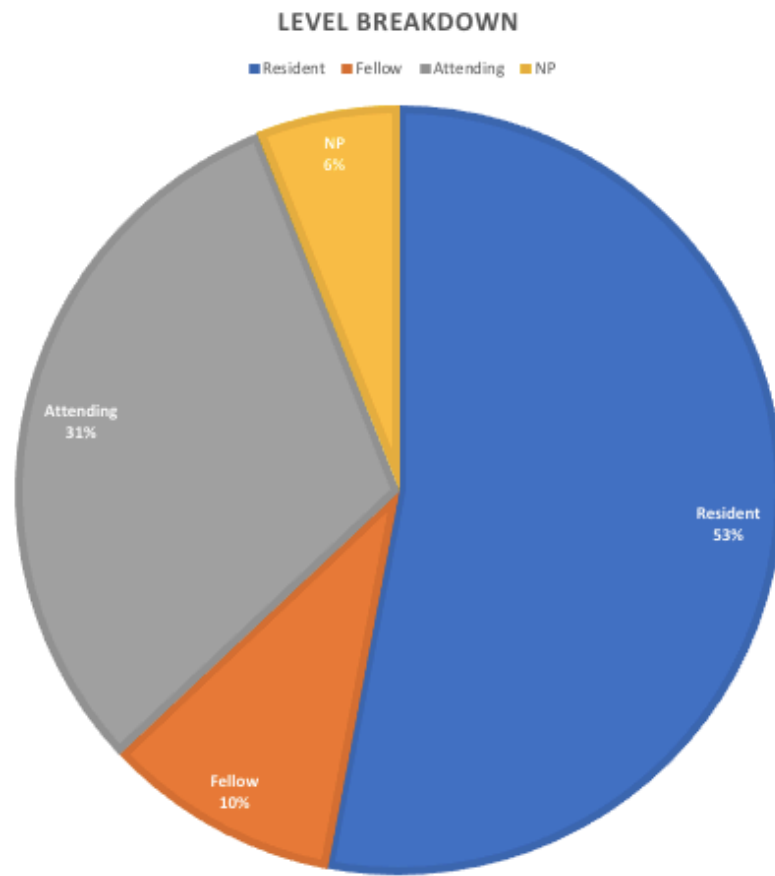
Figure 1: Sample population by provider level

Appendix E

Paired Samples Test

| | | Paired Differences | | | | | | | |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | t | df | Sig. (2–tailed) |
					Lower	Upper			
Pair 1	Lit_pre – Literature_post	.224	.422	.060	.103	.346	3.728	48	.001
Pair 2	Bedrest_pre – Bedrest_post	-.102	.368	.053	-.208	.004	-1.943	48	.058
Pair 3	Hemorrhage_pre – Hemorrhage_post	-.082	.534	.076	-.235	.072	-1.071	48	.290
Pair 4	Treatment_pre – Treatment_post	-.347	1.011	.144	-.637	-.056	-2.401	48	.020
Pair 5	Stable_pre – Stable_post	.449	1.209	.173	.102	.796	2.600	48	.012
Pair 6	Catheter_pre – Catheter_post	.571	1.258	.180	.210	.933	3.179	48	.003
Pair 7	Breastfeeding_pre – Breastfeeding_post	.878	1.130	.161	.553	1.202	5.437	48	.000
Pair 9	Falls_pre – Falls_post	.245	.855	.122	-.001	.490	2.006	48	.051
Pair 10	Reduced_pre – Reduced_post	.041	1.258	.180	-.320	.402	.227	48	.821

Table 1: Paired t-test results for survey responses. *P* values less than .05 were considered significant.

Appendix F

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.776[a]	1	.052		
Continuity Correction[b]	2.422	1	.120		
Likelihood Ratio	4.331	1	.037		
Fisher's Exact Test				.066	.055
Linear-by-Linear Association	3.684	1	.055		
N of Valid Cases	41				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.51.

b. Computed only for a 2x2 table

Table 1: Association between provider level and belief that patients' should remain on bedrest

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.360[a]	1	.548		
Continuity Correction[b]	.067	1	.796		
Likelihood Ratio	.357	1	.550		
Fisher's Exact Test				.734	.395
Linear-by-Linear Association	.352	1	.553		
N of Valid Cases	41				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.12.

b. Computed only for a 2x2 table

Table 2: Pretest association between provider level and willingness to change prescribing behavior

Chi-Square Tests

|	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.742[a]	1	.029		
Continuity Correction[b]	3.282	1	.070		
Likelihood Ratio	4.635	1	.031		
Fisher's Exact Test				.064	.036
Linear-by-Linear Association	4.626	1	.031		
N of Valid Cases	41				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.02.
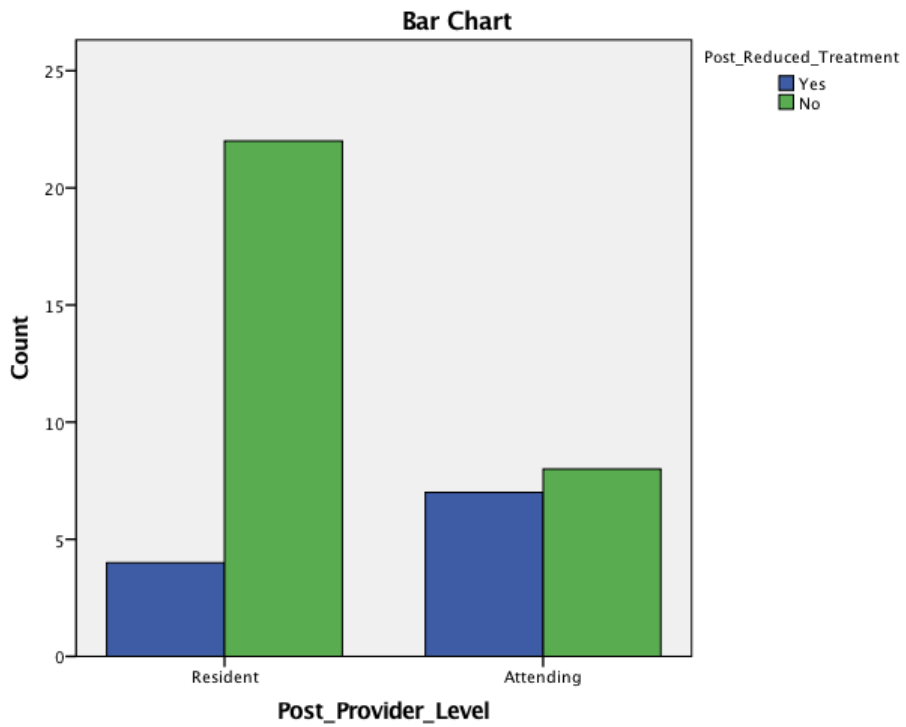
b. Computed only for a 2x2 table

Table 3: Posttest association between provider level and willingness to change prescribing behavior

Appendix G
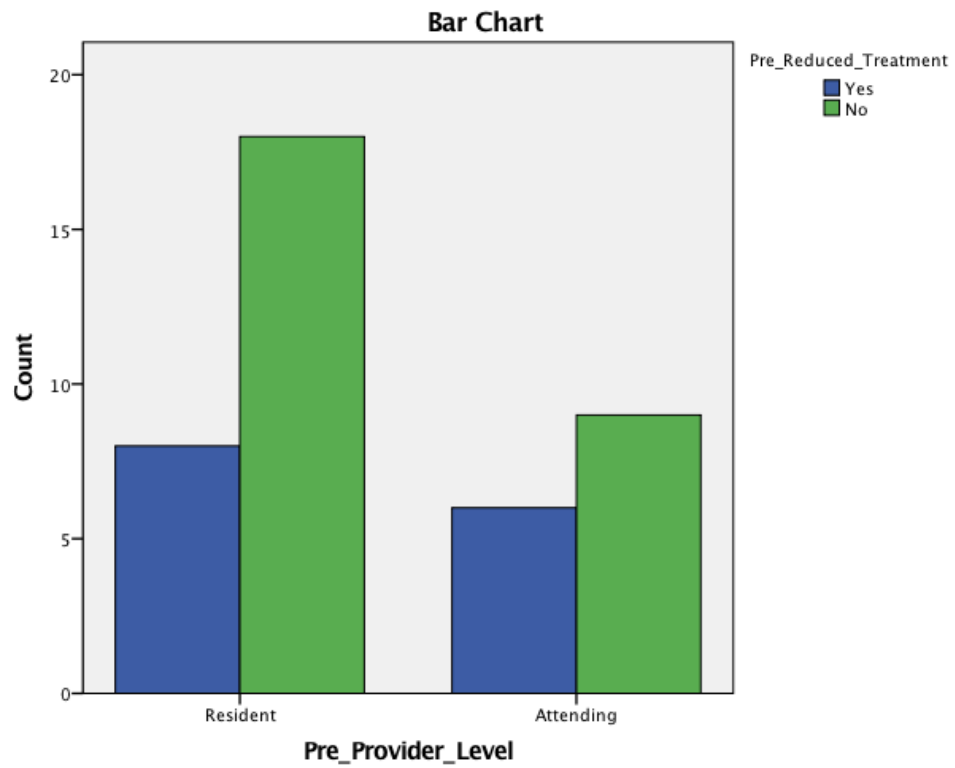
Graph 1: Provider level and willingness to change prescriptive behavior pretest

Graph 2: Provider level and willingness to change prescriptive behavior posttest