

Optimization of Oxytocin Dosing During the Intraoperative Period: Rule of Three's

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### Abstract

**Problem and Purpose:** Due to the lack of national guidelines for intraoperative oxytocin administration, anesthesia providers utilize various oxytocin dosing regimens during cesarean deliveries to attain uterine tonicity and prevent postpartum hemorrhage (PPH). Large, unregulated oxytocin infusions result in high serological levels of oxytocin that cause significant hemodynamic instability. The literature has demonstrated similar efficacy with less adverse side effects when using smaller and regulated oxytocin regimens, like the “Rule of Three’s”. The “Rule of Three’s” provides a systematic approach to obtain uterine tonicity through small intravenous oxytocin boluses and an infusion. The purpose of this Quality Improvement (QI) project is to develop a Clinical Practice Guideline (CPG) for intraoperative oxytocin administration among the cesarean population at a tertiary Baltimore hospital.

**Methods:** The first project phase began with the formation of a stakeholder team to design and formulate a CPG based upon an extensive literature review. The proposed CPG underwent quality review utilizing the AGREE II tool. After preliminary approval from the chief anesthesiologist (MDA), a formal presentation was conducted discussing the CPG and current evidence based oxytocin management. CPG feedback was anonymously collected through the Practitioner Feedback Questionnaire (PFQ) and revisions were made based upon the data collected. Final approval was then received from the chief MDA for institutional use. All data was analyzed using inferential and correlational statistics.

**Results:** The CPG achieved a 93% rating for overall quality based upon the AGREE II tool, which translates to a high quality CPG that would be recommended for clinical use. The PFQ (n=12) results indicated an overall 80.7% agreement among the questionnaires for CPG’s quality, acceptance of recommendations, applicability of recommendations, comparative value, and outcome variables.

**Conclusion:** Based upon the AGREE II tool and PFQ results, practitioners regarded the CPG as high quality with a high acceptance of recommendations into clinical practice. Limitations of the QI project includes the resistance from anesthesia providers to change current practice and lack of generalizability. Thus, the next phase of this project includes reducing these institutional barriers to sustain a practice change in order to reduce the incidence of PPH, quantitative blood loss and use of secondary uterotonic agents.

### **Introduction**

In 2014, postpartum hemorrhage (PPH) accounted for 30% of obstetric maternal deaths secondary to uterine atony (Weeks, 2014). The literature has recommended intravenous (IV) oxytocin administration following cord clamping and fetus delivery to prevent PPH and uterine atony, but dosing regimens are inconsistent within the literature (Stephens & Bruessel, 2012). Thus, anesthesia providers are utilizing different dosing regimens, including: an unregulated oxytocin infusion, multiple oxytocin boluses, or the newly proposed “Rule of Three’s” method (Stephens & Bruessel, 2012).

The “Rule of Three’s” is an evidence-based algorithm used to achieve uterine tonicity among the cesarean population. Once cord clamping and fetus delivery has occurred, the algorithm instructs anesthesia providers to administer a slow bolus of 3 international units (IU) of IV oxytocin and to begin a maintenance oxytocin infusion at 3 IU per hour (Kovacheva et al., 2016). At every 3 minute interval, the obstetrician will conduct uterine tone assessments to determine whether the anesthesia provider should administer additional IV oxytocin boluses (up to a total of 3) or secondary uterotonic agents to attain adequate uterine tone. Secondary uterotonic agents that can be used when oxytocin fails to achieve uterine tonicity include Methylergonovine (Methergine), Carboprost (Hemabate), or Misoprotol (Cytotec) (Tsen & Balki, 2010; Evensen, Anderson, & Fontanie, 2017). Additionally, it is recommended to continue the maintenance oxytocin infusion into the postoperative period to maintain uterine tone (Kovacheva et al., 2016). Due to the lack of a standardized protocol at this facility, this Doctoral of Nursing Practice (DNP) QI project focused on determining the best evidence-based intraoperative oxytocin dosing regimen to use in order to develop a comprehensive oxytocin CPG for use among elective and non-elective, non-emergent cesarean deliveries.

### **Literature Review**

To develop the CPG, a literature review was conducted to determine the best practices for intraoperative oxytocin administration. Using University of Maryland, Baltimore HS/HSL OneSearch database and the keywords “oxytocin” and “cesarean delivery”, a total of 381 articles were returned. From the 381 articles, seven randomized controlled trials (RCTs) and a systematic review were used to determine the best intraoperative oxytocin dosing regimen. Based upon these studies, three recurrent themes appeared within the literature when discussing intraoperative oxytocin administration during cesarean deliveries: hemodynamic side effects of oxytocin, the use of a smaller oxytocin bolus, and an oxytocin bolus followed by an infusion.

To determine the most effective intraoperative oxytocin administration regimen, the hemodynamic side effects of oxytocin must be examined. When oxytocin was given as either a bolus or infusion, Svanström et al.(2008) found parturients in both groups to experience transient hypotension, tachycardia, ST depression and elevations in spatial ST change vector magnitude. Researchers concluded these side effects could lead to myocardial ischemia in patients with underlying cardiovascular disease (Svanström et al.,2008). Thus, Svanström et al. (2008) recommended smaller and slower oxytocin boluses or infusions to mitigate these cardiovascular effects. In 2009, McLeod, Munishankar, MacGregor, and Murphy discovered no statistical differences in cardiovascular side effects when a parturient received a 5 IU IV oxytocin bolus followed by either a 30 IU oxytocin or placebo infusion. However, McLeod et al. (2009) observed a smaller reduction in hypotension and tachycardia when oxytocin boluses were administered slowly. A subsequent RCT by Bhattacharya, Gosh, Ray, Mallik, and Laba (2013) found statistical significance in heart rate and mean arterial pressures when administering a 3 IU oxytocin bolus compared to a 3 IU oxytocin infusion. Thus, Bhattacharya et al. (2013) concluded

slower oxytocin administrations would help mitigate the incidence of hemodynamic instability that occur with rapid oxytocin administration. From these studies, researchers concluded the administration of oxytocin at a slower and more controlled rate would help mitigate oxytocin's cardiovascular side effects.

Additionally, the literature demonstrated similar uterine tonicity and less hemodynamic instability when using smaller and regulated IV oxytocin boluses compared to large, unregulated oxytocin infusions. In 2010, Butwick, Coleman, Cohen, Riley and Carvalho determined uterine tonicity can be achieved with an oxytocin bolus ranging from 0.5-3 IU without significant differences in hypotension and tachycardia. When larger oxytocin boluses ( $\geq 5$  IU) were administered, it resulted in a greater incidence of hypotension among parturients (Butwick et al., 2010). Similar results occurred in 2008 when Sartain, Barry, Howat, McCormack and Bryant examined the effects of a 2 IU versus 5 IU oxytocin bolus. The 2 IU oxytocin bolus resulted in adequate uterine tone with significantly less adverse side effects compared to a 5 IU oxytocin bolus (Sartain et al., 2008). Thus, both studies demonstrated the need to reduce the amount of oxytocin administered to parturients as smaller units of oxytocin achieve similar results with less hemodynamic instability.

Researchers further examined whether the use of an oxytocin bolus followed by an infusion was an effective means of maintaining uterine contractility after achieving uterine tonicity. In 2011, Sheehan et al. discovered that a slow 5 IU IV oxytocin bolus followed by a controlled oxytocin infusion reduced the use of secondary uterotonic agents. Sheehan et al.(2011) postulated the initial oxytocin bolus produced uterine venous constriction and the infusion provided continuous uterine contractility. Similarly, Stephens and Bruessel (2012) found a 3 IU IV oxytocin bolus followed by a 5- 10 IU per hour infusion reduced the rates of

PPH when administered to non-elective cesarean deliveries. Non-elective cesarean deliveries often required a higher oxytocin dose secondary to the down regulation of oxytocin receptors at the uterus (Stephens & Bruessel, 2012). A subsequent RCT conducted by Kovacheva, Soens and Tsen (2016) concluded no statistical differences in uterine tone assessments, oxytocin side effects, blood loss, and hematocrit levels pre- and post- cesarean delivery between the “Rule of Three’s” regimen and an unregulated oxytocin infusion. Thus, Kovacheva et al. (2016) concluded the “Rule of Three’s” protocol was an evidence-based approach that minimized cardiovascular side effects as a result of using less oxytocin. Though the dosing differed among the three studies, the results revealed the efficacy of a regulated and low dose oxytocin bolus and infusion (less than 10 IU per hour) in achieving uterine tonicity.

In conclusion, the literature supported the administration of oxytocin at a smaller and controlled rate during elective and non-elective cesarean deliveries as unregulated, large doses of oxytocin have shown to cause adverse cardiovascular effects. Researchers confirmed uterine tone can be achieved with 0.5-3 IU of oxytocin, but 3 IU of oxytocin achieves uterine tonicity within elective and non-elective cesarean deliveries (Butwick et al., 2008; Sartain et al., 2008; Kovacheva et al., 2012; Bhattacharya et al., 2013). Furthermore, McLeod et al. (2009), Sheehan et al. (2011), and Stephens et al. (2011) concluded that an oxytocin bolus followed by an infusion reduced the use of secondary uterotonic agents and incidence of PPH without causing significant hemodynamic changes. Since the “Rule of Three’s” technique incorporated these elements into one standardized approach, it was determined that the “Rule of Three’s” was the best intraoperative oxytocin administration method and served as the recommendation for intraoperative management for the overall oxytocin CPG. The evidence table can be found in Appendix A.

### **Theoretical Framework**

The Lewin's Change Model was utilized as the theoretical framework to guide this QI project. The model postulated that through examining varying "forces" and individual behaviors that influence a situation, change can occur through diminishing or strengthening these "forces" (Shirey, 2013). For change to occur, it must undergo three distinct phases, which include: the "unfreezing", "moving or transition", and "refreezing" stage (Shirey, 2013). During the "unfreezing" stage, problems, barriers, and cultural attitudes were identified and potential resolutions were developed (Shirey, 2013). Within this institution, the lack of a standardized oxytocin protocol for cesarean deliveries resulted in various intraoperative dosing practices among anesthesia providers. Therefore, data was collected on the different practices, institutional barriers were identified, and a QI project team was mobilized. Next, according to Lewin, the "moving or transition" stage consisted of the implementation phase, which in this project consisted of four CPG development phases. The development phases consisted of: 1) CPG development, CPG quality review through the AGREE II tool; 2) preliminary approval from the chief MDA; 3) CPG dissemination, provider feedback through the PFQ; and 4) final CPG approval from chief MDA for institutional use. For a successful "transition", the "refreezing" stage must occur to stabilize the new "practice" within the institution (Shirey, 2013). Therefore, existing barriers or "forces" must be eliminated in order for "equilibrium" to be reached (Shirey, 2013, p.70). Prior to CPG approval, the stakeholder team further educated the anesthesia department through disseminating newly published oxytocin literature and a public endorsement from the Society of Obstetric Anesthesia and Perinatology (SOAP) for the "Rule of Three's". These efforts were made in hope to reduce resistance and promote a practice change.

### **Methods**

For this QI project, a comprehensive oxytocin CPG was developed for use by anesthesia providers at a tertiary hospital center in Baltimore, MD. CPG development occurred in four phases. The first phase involved conducting an extensive literature analysis to determine the best practices in regards to oxytocin management. The three subtopics that were examined within oxytocin management include oxytocin's hemodynamic side effects and intraoperative and postoperative oxytocin management. These three topics were divided among three DNP Nurse Anesthesia students to thoroughly examine and determine specific recommendations. Following the literature review, a stakeholder team was formed, which consisted of the three DNP students and two certified registered nurse anesthetists (CRNAs). Once a draft CPG was developed, the stakeholders assessed the quality of the CPG using the AGREE II tool and made revisions based upon these results. The second phase consisted of receiving preliminary approval from the chief MDA prior to CPG dissemination. Following approval, the DNP students presented the current literature findings in regards to oxytocin management and the proposed CPG to the anesthesia department at a weekly anesthesia meeting. At the conclusion of the presentation, a PFQ was distributed to the practitioners and anonymously collected from all members in attendance. Additional CPG revisions were made based upon the PFQ feedback before receiving final acceptance by the chief MDA for institutional use.

Data was collected through the use of the AGREE II tool and PFQ. The AGREE II tool was established to assess the quality of a CPG (Brouwers et al., 2010). This 23-item tool examined six domains of a CPG, which include: Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity of Presentation, Applicability, and Editorial Independence (Brouwers et al., 2010). Each item is scored based upon a 7-point Likert Scale and summed to designate a total domain score (Brouwers et al., 2010). This total domain score is then scaled as a

percentage of the maximum possible score for that particular domain (Brouwers et al., 2010). The domain scores are then used to determine whether revisions need to be made to strengthen lower scoring domains or to improve higher scoring domains to increase the overall quality of the CPG. The AGREE II tool can be referenced in Appendix C.

The PFQ contained 23 questions evaluating provider adoption beliefs (Brouwers et al., 2004). The questions within the PFQ examined the CPG's scientific quality, methodological rigor, implementation and applicability of the guideline, and acceptability of recommendations (Brouwers et al., 2004). The PFQ used a 3-point Likert scale with answers ranging from "strongly agree" to "strongly disagree". The responses from the PFQ provided insight on whether or not the CPG recommendations would facilitate a practice change. Additional questions were added to collect demographic information in regards to the provider's years of experience and job title (i.e. CRNA or MDA). A sample PFQ can be referenced in Appendix D.

All collected data underwent statistical analysis using inferential and correlational statistics within Microsoft Excel and was shared with the stakeholder team, chief MDA, and University of Maryland (UMB) School of Nursing's faculty advisor. To protect confidentiality and data security, the project received approval from the UMB's Institutional Review Board (IRB) for a Non-Human Subjects Research. Furthermore, personal identification data was not collected and all data was destroyed at the conclusion of the project.

### **Results**

Within phase 1 of the CPG development, stakeholders analyzed the CPG's quality utilizing the results from the AGREE II tool. The overall calculated domain scores for scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, editorial independence and overall quality/ recommendation for use were 90%, 89%, 90%, 94%,

97%, and 93%, respectively. These results demonstrated a high quality CPG with highly recommended evidence-based practices for clinical use based upon the highest scoring domains of applicability and overall quality. Due to the lower domain scores among stakeholder involvement and scope and purpose, the DNP students revised the CPG to clearly define the target CPG users and incorporated additional literature to further support CPG recommendations. The AGREE II tool results can be found in Table 1. Additionally, when reviewing the reliability and validity of the AGREE II tool, it received a Cronbach alpha coefficient score of 0.64 to 0.88 and met high validity scores for face, construct and criterion measures (Brouwers et al., 2010).

Following CPG dissemination, the PFQ results demonstrated a high quality CPG with highly recommended clinical practices, but low applicability to the institution's clinical practice. A total of 12 questionnaires (n=12) were collected, which consisted of an 86% response rate from the anesthesia department. By dividing the total number of "strongly agree" responses by the total number of items (n=22), the total percentage of agreement for each questionnaire was 80.7% with a standard deviation of 10.8. The percentage of agreement for subscales of interest based upon the domains assessed by the PFQ are as followed: 96%, 76%, 27%, 88%, and 86% for quality (items 2-7), acceptance of recommendations (items 8, 9,11,12,16,17), applicability of recommendations (reverse scored: items 10, 13, 14, 15), comparative value (items 18, 19) , and outcome variables (items 21,23), respectively. To determine whether the provider type and completion of the PFQ were independent of one another, a chi-square analysis was conducted. The results revealed an acceptance of the null hypothesis that the provider type and completion were not dependent upon one another ( $t=0.08$ ,  $p<0.05$ ). Refer to Figure 2 through 5 and Table 2 for further PFQ results and PFQ item percentages, respectively.

When reviewing the written PFQ feedback, anesthesia providers desired additional steps to the intraoperative oxytocin dosing algorithm to guide the use of secondary uterotonic agents if needed. Furthermore, anesthesia providers questioned the necessity to change current practice if the American College of Gynecologists and Obstetricians (ACOG) has not recommended a specific intraoperative oxytocin dosing regimen. As a result, additional literature was found to address these concerns before final submission and approval from the chief MDA. Within the final oxytocin CPG, secondary uterotonic agents like Methylergonovine (Methergine), Carboprost (Hemabate), and Misoprostol (Cytotec) were added to the intraoperative management portion for when oxytocin fails to achieve uterine tonicity (Hessen et al., 2019). The anesthesia department also received supplemental literature supporting the recommendations discussed in the CPG, which included: a newly released literature consensus statement and public endorsement from the SOAP supporting the use of the “Rule of Three’s” for intraoperative oxytocin administration (Hessen et al., 2019; “Clinical Practice FAQs”, n.a.). These additional steps were taken in order to reduce resistance among anesthesia practitioners, gain further buy-in for CPG use, and ensure sustainability without monetary burdens. The CPG and decision making algorithm can be referenced in Appendix B and Figure 1, respectively.

### **Discussion**

The oxytocin CPG was approved by the chief MDA for institutional use after incorporating the revisions based upon the AGREE II tool and PFQ results. The literature supported the utilization of the “Rule of Three’s” regimen as it optimizes intraoperative oxytocin dosing while reducing hemodynamic instability. However, without endorsements from national organizations, some anesthesia providers at this institution are hesitant to incorporate these practices, which was evident by the PFQ feedback. To promote practice change, the literature

supports the need to develop and examine the effects of a universally accepted protocol for the administration of uterotonic agents during cesarean deliveries (Heesen et al., 2019). Therefore, by developing this oxytocin guideline, future DNP projects at this institution can examine patient outcomes like quantitative blood loss, use of secondary uterotonic agents, the incidence of adverse side effects, and costs saving measures. From the data collected, it will help gain further buy in from anesthesia providers to utilize the practice recommendations and meet long term project goals of achieving 80% CPG utilization.

Additional project limitations include the CPG's generalizability and only receiving expert opinions from anesthesia providers. Future studies must evaluate the effects of utilizing this protocol for various cesarean populations before it can be generalized to all cesarean deliveries. In addition, expert review from other specialty experts like obstetricians will help reduce bias and help further strengthen the protocol.

Strengths of this project include the use of current, high quality evidence, a stakeholder team that consisted of anesthesia practitioners, utilization of highly valid and reliable assessment tools, and promotion of communication between providers. All three DNP students involved in this project utilized Level IA and IIA evidence published within the last ten years to develop the recommendations for the oxytocin CPG. The CPG was evaluated by providers whom frequently care for the obstetric population. The AGREE II tool and PFQ are highly reliable and valid tools. The CPG recommendation for frequent uterine tone assessments promotes an increase in communication between the obstetrician and anesthesia providers, which may reduce the incidence of adverse outcomes.

### **Conclusion**

Through this QI project, the CPG aimed to address the institutional structures and processes of increasing practitioner knowledge in regards to current evidence-based oxytocin management and introduce an intraoperative oxytocin administration guideline in hopes to standardize practice among anesthesia providers at this institution. By utilizing the “Rule of Three’s” for intraoperative oxytocin administration, anesthesia providers reduce the incidence of the hemodynamic instability while achieving uterine tonicity. Through continuous uterine tone assessments, anesthesia providers and obstetricians monitor and openly communicate with one another to determine if necessary steps need to be made to ensure uterine tonicity is achieved and reduce the incidence of PPH. The overall oxytocin CPG serves as an initial step towards standardizing an oxytocin administration protocol for cesarean deliveries at this institution.

In order to ensure sustainability and use of the CPG, continued efforts were suggested to ensure ease of accessibility, reduce medication costs, and examine institutional and patient outcomes. By working with the information technology (IT) department, the clinical site representative and chief MDA will collaborate to publish the CPG on the intranet for ease of access. In addition, the medication infusion equipment currently hinders providers from pre-programming and administering oxytocin boluses; therefore, a future QI project would focus on working with the pharmacy and IT department to pre-program this setting. By allowing this feature, it may reduce possible medication administration errors. To reduce additional barriers identified during CPG dissemination, pre- and post-CPG implementation outcomes will be examined to determine if there are significant differences in quantitative blood loss, use of secondary uterotonic agents and the incidence of adverse side effects. These findings will be presented to the anesthesia department at a later date to further re-educate staff and continue to gain buy-in for this particular guideline.

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Table 1. *AGREE II Tool Results*

Summary of Domain Scores							
	Scope and Purpose						90%
	Stakeholder Involvement						89%
	Rigor of Development						90%
	Clarity of Presentation						94%
	Applicability						97%
	Editorial Independence						97%
	Overall Guideline Assessment						93%
		Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4	Appraiser 5	Total
Scope and Purpose	Item 1	7	6	6	7	7	33
	Item 2	7	6	6	6	7	32
	Item 3	7	6	6	6	7	32
	Total	21	18	18	19	21	97
	Obtained Scores						97
Calculated Domain Scores							90%
Stakeholder Involvement	Item 4	7	6	6	6	7	32
	Item 5	7	6	6	6	7	32
	Item 6	6	6	6	6	7	31
	Total	20	18	18	18	21	95
	Obtained Scores						95
Calculated Domain Scores							89%
Rigor of Development	Item 7	7	6	7	7	7	34
	Item 8	7	6	7	7	7	34
	Item 9	7	5	6	6	6	30
	Item 10	7	6	6	6	6	31
	Item 11	6	6	6	6	6	30
	Item 12	6	6	6	6	6	30
	Item 13	6	5	6	6	6	29
	Item 14	6	5	6	6	6	29
	Total	52	45	50	50	50	247
Obtained Scores							247
Calculated Domain Score							90%
Clarity of Presentation	Item 15	7	6	7	7	7	34
	Item 16	7	6	7	7	7	34
	Item 17	7	6	7	6	6	32
	Total	21	18	21	20	20	100
	Obtained Score						

	Calculated Domain Scores						94%
Applicability	Item 18	7	5	7	7	7	33
	Item 19	6	5	7	6	7	31
	Item 20	6	5	7	6	7	31
	Item 21	6	5	7	6	6	30
	Total	25	20	28	25	27	125
	Obtained Scores						125
	Calculated Domain Scores						97%
Editorial Independence	Item 22	6	7	7	7	7	34
	Item 23	6	7	7	7	7	34
	Total	12	14	14	14	14	68
	Obtained Score						68
	Calculated Domain Scores						97%
Overall Guideline Assessment	7	6	7	7	6	33	
	Calculated Domain Score						93%

Table 2. *PFQ Item Frequency Results*  
**Practitioner Feedback Questionnaire**

**Are you an Anesthesiologist or CRNA ?**

MDA (n=4, 33.33%)

CRNA (n= 8, 66.66%)

**How many years have you been practicing?**

Less than 5 = 3

5 to less than 10= 2

10 to less than 15= 1

15 less than 20= 3

20 less than 25= 1

25 less than 30= 2

For each item, please check off the box that most adequately reflects your opinion.

	Yes	No	Unsure
1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.	12 (100%)	0 (0%)	0 (0%)
If you answered “No” or “Unsure”, there is no need to answer or return this questionnaire. If you answered “Yes”, please answer the questions below and return to SRNAs			
	Strongly agree	Neither agree or disagree	Strongly disagree
2. The rationale for developing a guideline is clear.	12 (100%)	0 (0%)	0 (0%)
3. There is a need for a guideline on this topic.	9 (75%)	2 (16.67%)	1 (8.33%)
4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline.	12 (100%)	0 (0%)	0 (0%)
5. I agree with the methodology used to summarize the evidence included in this draft guideline.	12 (100%)	0 (0%)	0 (0%)
6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence.	12 (100%)	0 (0%)	0 (0%)
7. The draft recommendations in this report are clear.	12 (100%)	0 (0%)	0 (0%)
8. I agree with the draft recommendations as stated.	12 (100%)	0 (0%)	0 (0%)
9. The draft recommendations are suitable for the patients for whom they are intended.	12 (100%)	0 (0%)	0 (0%)
10. The draft recommendations are too rigid to apply to individual patients.	8 (66.67%)	1 (8.33%)	3 (25)
11. When applied, the draft recommendations will produce more benefits for patients than harms.	10 (83.33%)	2 (16.67%)	0 (0%)
12. The draft guideline presents options that will be acceptable to patients.	11 (91.67%)	1 (8.33%)	0 (0%)
13. To apply the draft recommendations will require reorganization of services/care in my practice setting.	9 (75%)	2 (16.67%)	1 (8.33%)
14. To apply the draft guideline recommendations will be technically challenging.	6 (50%)	2 (16.67%)	4 (33.33%)
15. The draft guideline recommendations are too expensive to apply.	6 (50%)	1 (8.33%)	5 (50%)
16. The draft guideline recommendations are likely to be supported by a majority of my colleagues.	10 (83.33%)	1 (8.33%)	1 (8.33%)
17. If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.	10 (83.33%)	2 (16.67%)	0 (0%)
18. The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual	11 (91.67%)	0 (0%)	1 (8.33%)

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practice. (If they are the same as current practice, please tick NA).  
 NA

---

19. When applied, the draft guideline recommendations will result in better use of resources than current usual practice. (If they are the same as current practice, please tick NA). NA <input type="checkbox"/>	11 (91.67%)	1 (8.33%)	0 (0%)
20. I would feel comfortable if my patients received the care recommended in the draft guideline.	12 (100%)	0 (0%)	0 (0%)
21. This draft guideline should be approved as a practice guideline.	9 (75%)	2 (16.67%)	1 (8.33%)
22. If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.	12 (100%)	0 (0%)	0 (0%)
23. If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.	12 (100%)	0 (0%)	0 (0%)

---

Adapted from: Brouwers, M.C., Graham, I.D., Hanna, S.E., Cameron, D.A., & Browman, G.P. (2004). Clinicians' assessments of practice guidelines in oncology: The CAPGO survey. *International Journal of Technology Assessment in Health Care*, 20(4),

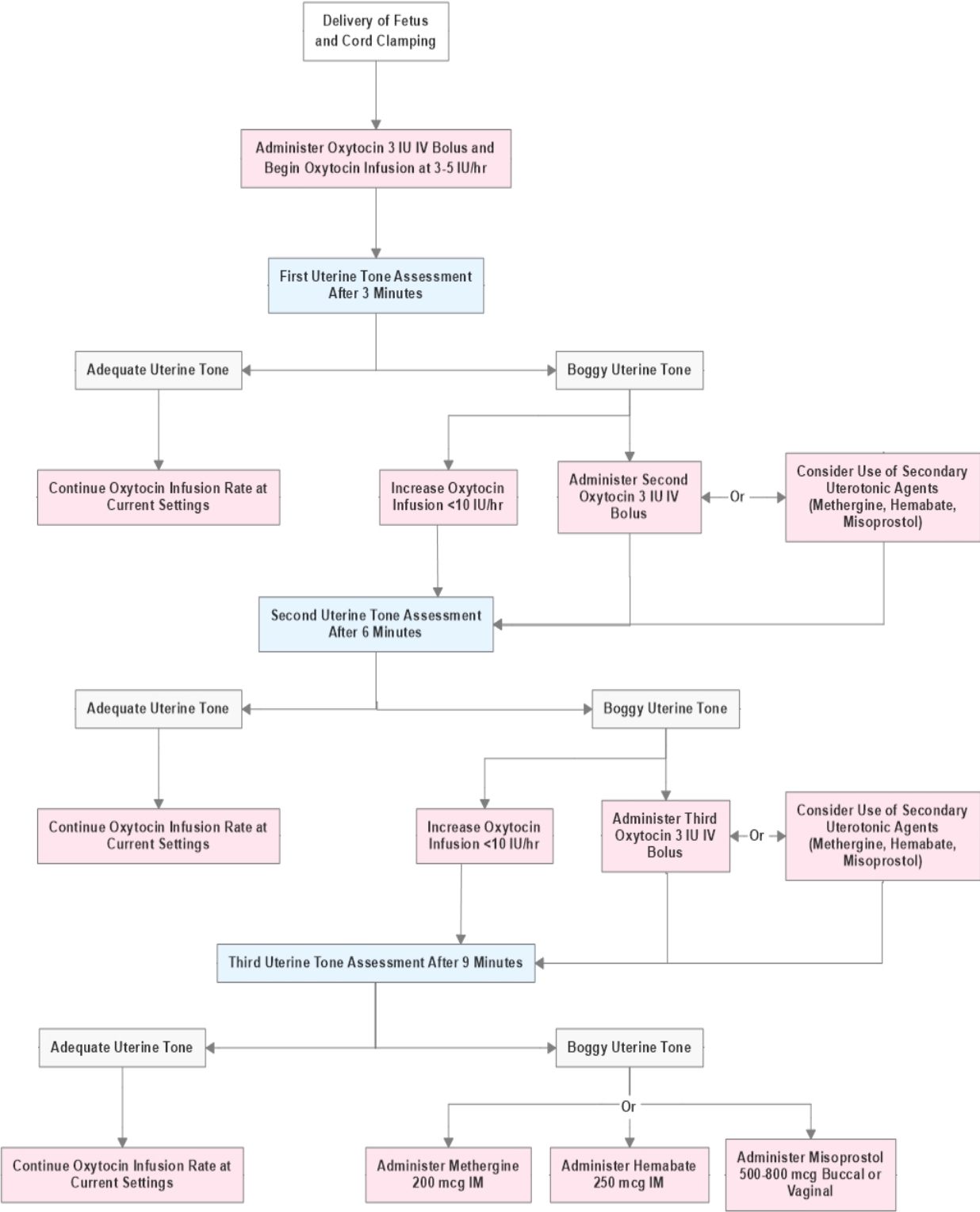


Figure 1. Intraoperative Oxytocin Administration Algorithm

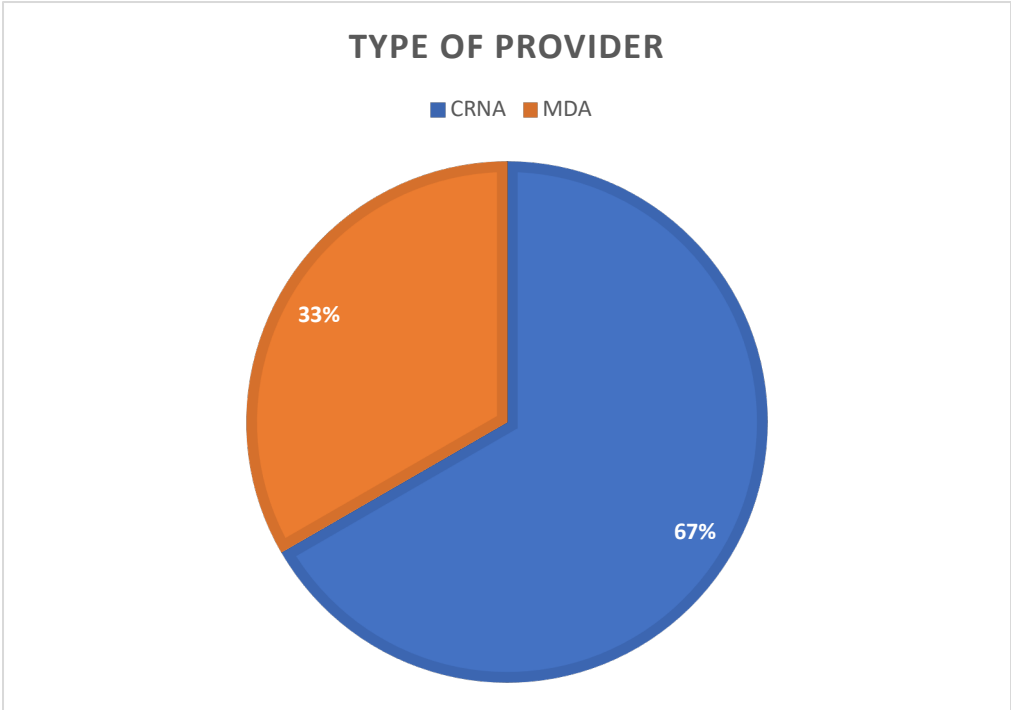


Figure 2. *PFQ: Type of Provider*

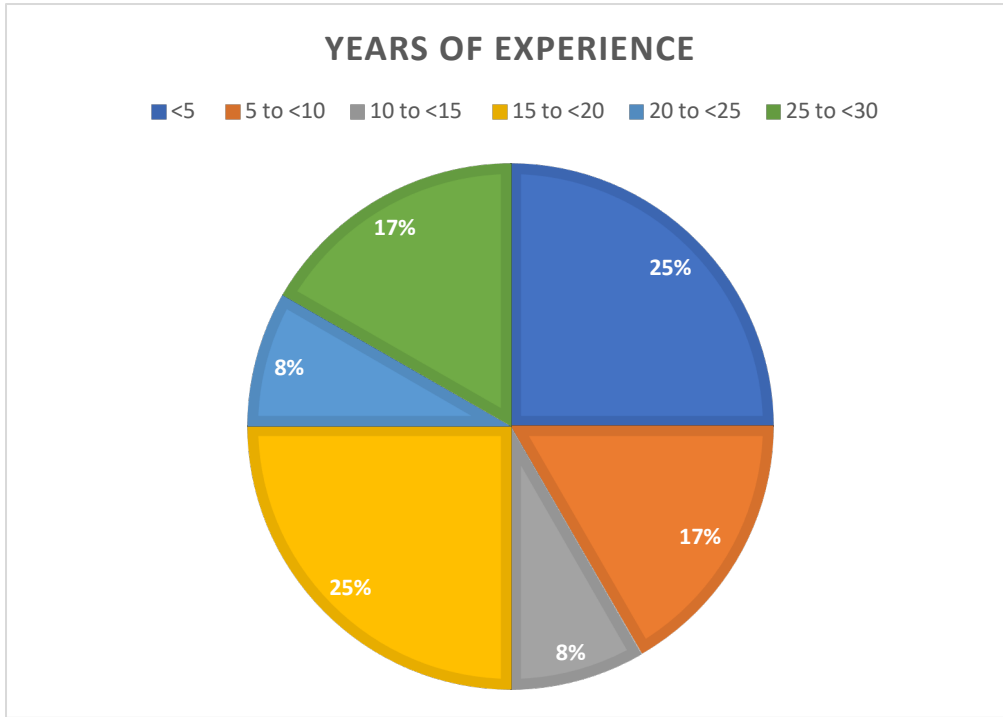


Figure 3. *PFQ: Anesthesia Provider Years of Experience*

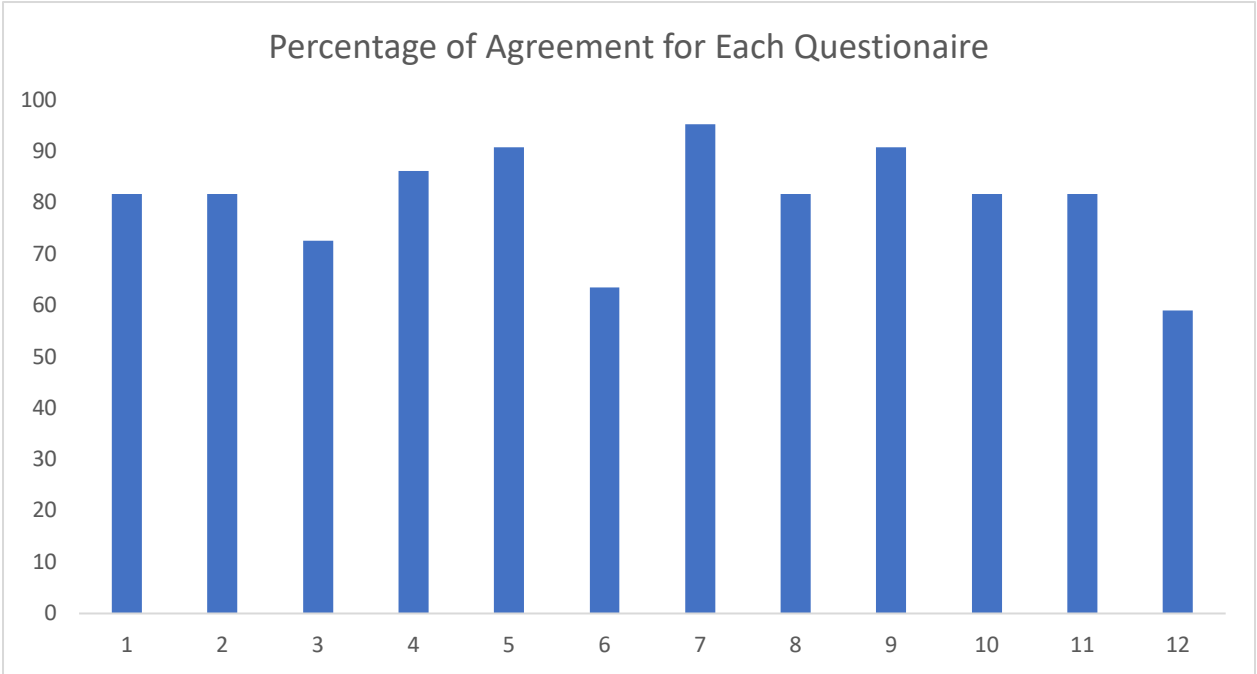


Figure 4. *Percentage of Agreement for Each PFQ Questionnaire (n=12)*

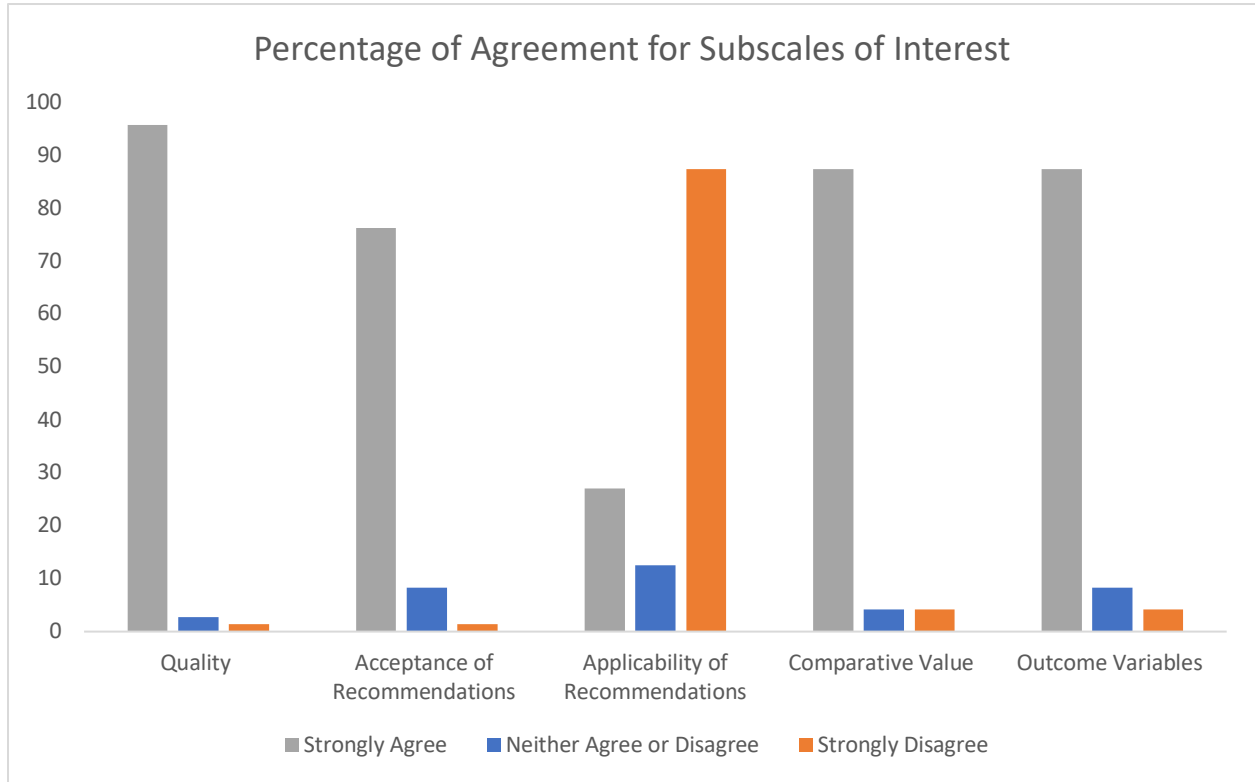


Figure 5. *PFQ's Percentage of Agreement for Subscales of Interest*

Appendix A

Evidence Review Table

Author, year	Study objective/ intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
<p>Study 1</p> <p>Butwick, Coleman, Cohen, Riley, &amp; Carvalho, 2010</p>	<p>To determine the minimum effective dose of oxytocin in 50% (ED50) and 95% (ED95) of patients undergoing elective cesarean delivery with spinal anesthesia</p>	<p>Randomized, Double Blind, Placebo Controlled, Dose Ranging Study</p> <p>Inclusion Criteria: ASA I or II, Age: 18-40 years of age, singleton pregnancy, and elective cesarean delivery with Pfannensteil incision</p>	<p>N= 74 healthy termed patients undergoing elective cesarean delivery (Term: <math>\geq</math> 37 weeks)</p> <p>Group 1: 0 Units (placebo) Group 2: 0.5 Units Group 3: 1 Units Group 4: 3 Units Group 5: 5 Units</p>	<p>1) Primary Outcome: Adequate or inadequate uterine tone at 2 minutes after administration of initial oxytocin dose</p> <p>2) Secondary Outcomes: Uterine tone score, intraoperative blood loss, number of rescue doses of oxytocin, side effects of oxytocin and hematocrit values before and 30 minutes after the completion of the cesarean delivery</p>	<p>Butwick et al. (2010) found that adequate uterine tone can be achieved in elective cesarean deliveries with spinal anesthesia with 0-3 units of oxytocin. However, individuals who received no oxytocin are at a higher incidence of needing supplemental oxytocin after two minutes. In addition, Butwick et al. (2010) found that at higher oxytocin bolus doses (5 units), there were higher incidences of hypotension whereas there was no difference in hypotension or tachycardia among participants within the 0.5 -3 unit of oxytocin group.</p> <p>Due to the small sample size, Butwick et al. (2010) could not observe between group differences. Thus, it calls for future larger samples to determine if there are between group differences.</p>	<p>II B</p>
<p>Study 2</p>	<p>To determine if the proposed oxytocin dosing within the “Rule of Three’s”</p>	<p>Randomized, Double Blinded Study</p>	<p>N= 60 patients</p>	<p>1) Primary outcome: Total amount of oxytocin</p>	<p>1) Kovacheva et al. (2016) found no statistical significance between either group when assessing uterine tone at 3 minutes, 6</p>	<p>II B</p>

<p>Kovacheva, Soens, &amp; Tsen, 2016</p>	<p>algorithm provides adequate uterine tone in women undergoing elective cesarean delivery with spinal anesthesia in comparison to standard oxytocin infusion protocol (continuous infusion of 20 to 40 units of oxytocin)</p>	<p>Inclusion Criteria: ASA I or II, 18-40 years of age, singleton pregnancy, elective cesarean delivery with a Pfannenstiel incision with spinal anesthesia</p>	<p>Rule of Three" group (treatment)= 30  Continuous infusion group (standard of care group) = 30 patients</p>	<p>required to achieve adequate uterine tone  2) Secondary Outcomes: Time of oxytocin dose administration and adequate uterine tone, visual analog score (VAS) of uterine tone, requirement of supplemental uterotonic agents, maternal blood pressure, maternal heart rate, side effects of oxytocin, vasopressor use, hematocrit values, and blood loss</p>	<p>minutes, 9 minutes and 12 minutes (p=1.00, p=0.20, p=1.00, p=1.00), respectively. 2) Kovacheca et al. (2016) found no differences between the rule and standard group when examining the side effects of oxytocin administration (ex. flushing: p=0.30, nausea/ vomiting: p = 1.00, EKG changes: p= 1.00, all side effects: p= 0.77). 3) In addition, there was no statistical significance between either group in regards to blood loss and change in hematocrit pre and post cesarean delivery (p= 0.62, p= 0.57), respectively.  Conclusion: Kovacheca et al. (2016) concluded that the "Rule of Three's" algorithm provides an evidence- based approach in achieving adequate uterine tone with minimal cardiovascular side effects.</p>	
<p>Study 3  Stephens &amp; Bruessel, 2012</p>	<p>To determine the optimal dose of oxytocin to be administered to achieve adequate uterine tone among mothers who undergo elective cesarean delivery or laboring mothers who require cesarean delivery</p>	<p>Systematic Review  Inclusion: Five articles examining women receiving oxytocin during an elective cesarean delivery and two articles examining women who</p>	<p><u>Elective Cesarean Delivery (5)</u> Median (N)= 55 Range (N)= 40-80  <u>"Laboring" Cesarean Delivery (2)</u> Munn et al. (2001) N= 321  Balki et al. (2006) N= 30</p>	<p>Primary Outcome: 1) Optimal dose to achieve adequate uterine tone 2) Side effect profile seen in elective and "laboring" cesarean deliveries</p>	<p>From this systematic review, Stephens and Bruessel (2012) found differences in the ED90 for mothers undergoing elective and non-elective cesarean deliveries. It is postulated that mothers who have been receiving a continuous infusion of oxytocin to induce labor require a higher dose of oxytocin due to the down regulation of oxytocin receptors at the uterus. As a result, when laboring mothers require a cesarean delivery due to the failure to progress, oxytocin requirements will be higher due to the desensitization of receptors to the drug. Thus, they may require supplemental uterotonic agents to obtain adequate uterine tone. In addition, Stephens and Bruessel (2012) found that 3 IU of oxytocin followed by a 5-10 IU/hr infusion for</p>	<p>I A</p>

		received oxytocin after laboring and requiring a cesarean delivery			laboring mothers who undergo a cesarean delivery was effective in reducing the rates of postpartum hemorrhage. Lastly, the review concluded that larger RCTs need to be conducted in order to investigate the best practice on oxytocin delivery, oxytocin bolus or bolus with infusion.	
Study 4 Sheehan et al. (2011)	To determine the efficacy of an oxytocin infusion after administering an oxytocin bolus among mothers who undergo cesarean delivery	Randomized, Double Blinded Controlled Trial  Inclusion Criteria: Healthy singleton pregnant mothers	N= 2058  Bolus Only = 1025 (Slow bolus of oxytocin 5 IU over 1 minute followed by a placebo infusion that consisted of normal saline)  Bolus and Infusion =1033 (Slow bolus of oxytocin 5 IU over 1 minute followed by a 40 IU oxytocin in 500mL)	Primary Outcome 1) Major obstetric hemorrhage (blood loss > 1000mL) 2) Use of supplemental uterotonic agent  Secondary Outcome 1) Blood Loss 2) Change in Hemoglobin and packed cell volume 3) Severe anemia 4) Need for blood transfusion 5) Side effects of Oxytocin 6) Length of stay	Sheehan et al. (2011) concluded that when an oxytocin bolus was followed by an oxytocin infusion, it helped reduce the need for uterotonic agents; however, the rates of major obstetric hemorrhage does not change (p<0.001). In addition, Sheehan et al. (2011) concluded there was a reduction in the need of supplemental uterotonic agents because the initial oxytocin bolus allows for venous constriction at the uterus and the oxytocin infusion provides a continuous means of maintaining uterine contractility. However, researchers also found differences in the incidence of major obstetric hemorrhaging events when examining the level of experience in providers. Thus, the protocol of administering an oxytocin bolus followed by an infusion may be beneficial among patients who undergoing a cesarean delivery by an inexperienced provider. Since this study was done in Ireland, the current practice differs from the current guidelines practiced in the United States. Thus, researchers were unable to incorporate a separate study cohort to determine the effects of the current US guidelines for oxytocin administration as it does not follow the Royal College of Obstetricians and Gynecologists recommendations.	II A
Study 5 Bhattacharya, Ghosh, Ray, Mallik, & Laha (2013)	To examine the hemodynamic effects and uterine tone when utilizing 3 IU of oxytocin as a bolus or as an infusion	Randomized, Double blinded, Controlled trial	N= 80 parturient undergoing an elective cesarean delivery with spinal anesthesia  Bolus Group= 40	Primary Outcome 1) Hemodynamic effects- heart rate, mean arterial pressure (MAP), arrhythmias	When Battacharya et al. (2013) examined the hemodynamic effects of an oxytocin bolus or oxytocin infusion, there was statistical significance among the patients' heart rate and mean arterial pressure after 30 seconds since administration. Battacharya et al. (2013) found that within both groups, uterine tone was	II B

		Inclusion Criteria: ASA I and II, 20-30 years of age, elective cesarean delivery undergoing spinal anesthesia	Infusion Group = 40	2) Uterine contraction 3) Adverse Effects – chest pain, flushing, nausea and vomiting	adequately achieved. However, Battacharya et al. (2013) concludes that a slow oxytocin infusion over 5 minutes provides adequate uterine tone with less side effects. Previous studies have shown that rapid boluses of oxytocin cause adverse hemodynamic effects; thus, Battacharya et al. (2013) recommends further studies be conducted in order to determine the optimal speed to administer an oxytocin bolus without producing adverse hemodynamic effects.	
Study 6 Sartain, Barry, Howat, McCormack, & Bryant (2008)	To determine whether a smaller oxytocin bolus (2 units) will provide adequate uterine tone and less hemodynamic effects in comparison to a larger oxytocin bolus (5 units)	Randomized, Double blinded trial	N= 80 parturients undergoing elective cesarean delivery with combined spinal anesthesia  Patients were randomized to either receive 2 (N=40) or 5 IU (N=40) of oxytocin as a bolus over 5-10 seconds	1) Uterine Tone 2) Supplemental uterotonic agents 3) Side effects – Nausea and Vomiting 4) Hemodynamic effects – heart rate and mean arterial pressure	Sartain et al. (2008) concluded that smaller doses of oxytocin (2 units) provide less hemodynamic side effects (ex. increase in heart rate and decrease in mean arterial pressure) for a shorter period of time. In addition, Sartain et al. (2008) concluded that smaller doses are just as effective as larger doses of oxytocin as their study demonstrated no statistical differences in uterine tone at timed assessments. Thus, the current practice of administering larger doses of oxytocin is outdated as smaller doses are just as effective. Lastly, Sartain et al. (2008) stated precautions need to be taken when administering oxytocin to individuals with pre-existing cardiac disease as these hemodynamic effects may have adverse reactions.	II B
Study 7 McLeod, Munishankar, MacGregor, & Murphy (2009)	To determine the hemodynamics effects when patients receive a 5-unit oxytocin bolus followed by a placebo infusion or a 30 IU of oxytocin infusion during an elective cesarean delivery	Randomized, Double blinded study  Inclusion Criteria: Elective cesarean delivery and 18-45 years of age	N= 74  Placebo infusion= 35 Oxytocin infusion= 39	Hemodynamic effects following a 5-unit bolus and an infusion of placebo solution or oxytocin	McLeod et al. (2009) found no differences in the hemodynamic effects between the two groups (ex. heart, rate, systolic blood pressure, diastolic blood pressure, cardiac index, and systemic vascular resistance index). McLeod et al. (2009) attributed the return to the patients' hemodynamic baseline in both groups to the regression of the spinal anesthesia. In addition, McLeod et al. (2009) observed that when the oxytocin bolus was administered slowly, they did not see the drastic reductions in blood pressure and increases in heart rate. Thus, McLeod et al. (2009) conclude that a slow 5-unit	II B

					bolus followed by oxytocin infusion does not cause significant hemodynamic changes.	
Study 8 Svanström, Biber, Hanes, Johansson, Naslund, & Balfors (2008)	To determine the hemodynamic effects of oxytocin and methylergometrine administration during cesarean section	Randomized, double blind study	N= 50  Oxytocin (10 IU IV) N=20  Methylergometrine (0.2mg IV) N=20  Control N= 10 (healthy, nonpregnant, non-anesthetized who received “wide open infusions” of oxytocin)	Hemodynamic effects following oxytocin or methylergometrine administration	Svanström et al. (2008) found that women who received oxytocin whether as a bolus or wide-open infusion had transient decreases in blood pressure, increase in heart rate, ST depression and an elevation in spatial ST change vector magnitude (STC-VM). This is particular concern because the combination of hypotension, tachycardia and coronary vasoconstriction may lead to myocardial ischemia in patients who may have no underlying cardiac disease. Therefore, the use of large oxytocin bolus doses is no longer recommended as there has been two reports of cardiac death in 1997-1998 due to the administration of 10 units of oxytocin during cesarean delivery. On the other hand, participants who received methylergometrine had a “significant increase in arterial pressure” but no effects in regards to heart rate and STC-VM (Svanström et al., 2008, p.686). In conclusion, Svanström et al. (2008) recommends for smaller and slower bolus administration or a controlled infusion of oxytocin during the third stage of labor to prevent PPH and uterine atony.	II B

## Appendix B

### Oxytocin Administration Clinical Practice Guideline

#### PURPOSE

To implement an evidence based Clinical Practice Guideline (CPG) for oxytocin administration after the delivery of the fetus and cord clamping during elective and non-elective cesarean deliveries for use by anesthesia providers

#### BACKGROUND

Cesarean deliveries increase the risk for uterine atony and postpartum hemorrhage. Thus, oxytocin is recommended as the “gold standard” to reduce the incidence of uterine atony and postpartum hemorrhage. Once exogenous oxytocin is administered, it will bind to the oxytocin receptors at the uterus and cause uterine contractions. Uterine contractility decreases the incidence of bleeding after the delivery of fetus and cord clamping. However, the lack of a national standard for oxytocin administration has resulted in variability of oxytocin dosing and administration methods (i.e. bolus or infusion) by anesthesia providers at a local Baltimore community hospital. In order to decrease variability and create a standardized practice, a clinical practice guideline will be developed and implemented. The clinical practice guideline is not applicable to emergent cesarean deliveries (i.e. placenta abruption).

#### IMPLEMENTATION

##### Preoperative Recommendations

1. Refer to Figure 1 for “Rule of Three’s” Oxytocin Administration Algorithm
2. Protocol will be applied to all mothers who are undergoing cesarean delivery: elective and non-elective (i.e. failure to progress or descend after Pitocin induction, urgent cesarean delivery required due to non-reassuring fetal heart tones or loss of variability)
3. Prepare Oxytocin Bolus syringe
  - a. One Oxytocin Vial: 10 IU/ mL
  - b. Reconstitute three 10mL syringes: Oxytocin 3 IU with 10 mL of sterile 0.9% Normal Saline (final concentration of Oxytocin 0.3 IU/mL)

**OR**

  - c. Reconstitute one 10ml syringe: Oxytocin 10 IU with 10 mL of sterile 0.9% Normal Saline (Oxytocin 1 IU/mL)
4. Pre-program the Alaris Infusion Pump
  - a. Starting Infusion Rate: Oxytocin 50 milliunits/min (~ 3 IU/ hr)
  - b. Acceptable titration range to achieve adequate control of uterine tone: 50-166 milliunits/min (~5-10 IU/hr)

##### Intraoperative Recommendations

1. Delivery of Fetus and After 30 seconds of delayed cord clamping→ Administer first bolus dose of Oxytocin 3 IU IV over 45 seconds and begin oxytocin infusion at 50 milliunits/min (~3 IU/ hr)
2. First Uterine Tone Assessment (after three minutes since oxytocin administration): ask obstetrician “how is the uterine tone?”

- a. If response is “good” → continue oxytocin infusion into perioperative period and follow postoperative recommendations
- b. If response is “boggy” →
  - i. Administer second bolus dose of Oxytocin 3 IU over 45 seconds  
**AND**
  - ii. Discuss administration of additional uterotonic agents (ex. Methergine 200mcg IM, Hemabate 250mcg IM, Misoprostol 500- 800 mcg Buccal or Vaginal)
  - iii. Titrate Oxytocin infusion to no more than 166 milliunits/min (~10 IU/hr)
  - iv. What is the current estimated blood loss?
- c. Monitor for Oxytocin hemodynamic side effects
3. Second Uterine Tone Assessment (after three minutes since first oxytocin administration): ask obstetrician “how is the uterine tone?”
  - a. If response is “good” → continue current oxytocin infusion rate into perioperative period and follow postoperative recommendations
  - b. If response is “boggy” →
    - i. Administer a third dose of Oxytocin 3 IU over 45 second  
**AND**
    - ii. Discuss and consider use of additional uterotonic agents (ex. Methergine 200 mcg IM, Hemabate 250 mcg IM, Misoprostol 500-800 mcg Buccal or Vaginal)
    - iii. Monitor for Oxytocin hemodynamic side effects
    - iv. What is the current estimated blood loss?
4. Third Uterine Tone Assessment (after three minutes since second oxytocin bolus administration): ask obstetrician “how is the uterine tone?”
  - a. If response is “good” → continue oxytocin infusion into perioperative period and follow postoperative recommendations
  - b. If response is “boggy” → Discuss with obstetrician and use additional uterotonic agents to obtain adequate uterine tone (ex. Methergine 200 mcg IM, Hemabate 250 mcg IM, Misoprostol 500-800 mcg Buccal or Vaginal)
    - i. What is current estimated blood loss?
    - ii. What is the hemodynamic status of the patient (stable versus unstable)?
    - iii. Was this patient on Oxytocin for trial of labor prior to cesarean section? If so, consider there is a down regulation of receptors and refer to Appendix B for additional uterotonic medications and dosing.
    - iv. Does obstetrical hemorrhage protocol need to be activated? If so, communicate with team and refer to Appendix B to follow the institution’s Obstetrical Hemorrhage Protocol

### **Postoperative Recommendations**

1. Continue Oxytocin infusion (concentration of 30 IU/500 mL of lactated ringers) at the infusion rate maintained during the cesarean section. May titrate dose based on patient response, but not to exceed 10 U over a 4-hour period.
2. L&D RNs will:

- i. Obtain initial assessment of uterine tone and vaginal bleeding assessment upon admission to the PACU
- ii. Immediately notify anesthesia and obstetrical providers of inadequate uterine tone or excessive postpartum bleeding
- iii. Determination will be made by anesthesia and obstetrical team if the administration of additional uterotonic agents will be needed or obstetrical hemorrhage protocol needs to be activated



Strongly Disagree Strongly Agree  
 Comments:

8. The criteria for selecting the evidence are clearly described.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

9. The strength and limitations of the body of evidence are clearly described.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

10. The methods for formulating the recommendations are clearly described.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

11. The health benefits, side effects, and risks have been considered in formulating the recommendations.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

12. There is an explicit link between the recommendations and the supporting evidence.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree

13. The guideline has been externally reviewed by experts prior to its publication.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

14. A procedure for updating the guideline is provided.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly Disagree Strongly Agree  
 Comments:

---

**Domain 4. Clarity of Presentation**

15. The recommendations are specific and unambiguous.

1	2	3	4	5	6	7
---	---	---	---	---	---	---



Strongly  
Disagree

Strongly  
Agree

Comments:

23. Competing interests of guideline development group members have been recorded and addressed.

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Strongly  
Disagree

Strongly  
Agree

Comments:

**Overall Guideline Assessment**

For each question, please choose the response which best characterizes the guideline assessed:

1. Rate the overall quality of this guideline

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Lowest  
possible  
quality

Highest  
Possible  
quality

2. I would recommend this guideline for use.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Yes	Yes, with modifications	No

Notes:

## Appendix D

### Practitioner Feedback Questionnaire

Are you an Anesthesiologist or CRNA ? \_\_\_\_\_ How many years have you been practicing? \_\_\_\_\_

For each item, please check off the box that most adequately reflects your opinion.

1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unsure <input type="checkbox"/>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------	--------------------------------	------------------------------------

If you answered “No” or “Unsure”, there is no need to answer or return this questionnaire. If you answered “Yes”, please answer the questions below and return to SRNAs.

	Strongly agree	Neither agree or disagree	Strongly disagree
2. The rationale for developing a guideline is clear.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. There is a need for a guideline on this topic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I agree with the methodology used to summarize the evidence included in this draft guideline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The draft recommendations in this report are clear.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I agree with the draft recommendations as stated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. The draft recommendations are suitable for the patients for whom they are intended.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. The draft recommendations are too rigid to apply to individual patients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. When applied, the draft recommendations will produce more benefits for patients than harms.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. The draft guideline presents options that will be acceptable to patients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. To apply the draft recommendations will require reorganization of services/care in my practice setting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. To apply the draft guideline recommendations will be technically challenging.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. The draft guideline recommendations are too expensive to apply.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. The draft guideline recommendations are likely to be supported by a majority of my colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual practice. (If they are the same as current practice, please tick NA). NA <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. When applied, the draft guideline recommendations will result in better use of resources than current usual practice. (If they are the same as current practice, please tick NA). NA <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I would feel comfortable if my patients received the care recommended in the draft guideline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. This draft guideline should be approved as a practice guideline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Adapted from: Brouwers, M.C., Graham, I.D., Hanna, S.E., Cameron, D.A., & Browman, G.P. (2004). Clinicians' assessments of practice guidelines in oncology: The CAPGO survey. *International Journal of Technology Assessment in Health Care*, 20(4), 42