Lab 7 – Article Review: Experiment

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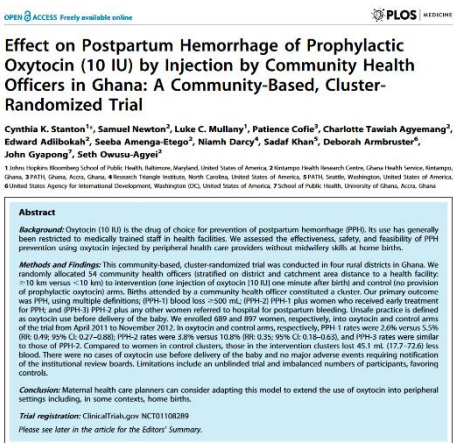
Formatting Requirements

- Please submit your lab report as a **pdf** to Gradescope.
- When you upload to Gradescope, please **match pages** with the **question number**.
- Be sure that all **group members** are **added** in your submission to Gradescope (click view/edit group on the top right of the page once shown your final submission after matching pages).

Assignment Overview

- In this assignment, you will be reading and summarizing key points from the article titled: "Effect on Postpartum Hemorrhage of Prophylactic Oxytocin (10 IU) by Injection by Community Health Officers in Ghana: A Community-Based, Cluster-Randomized Trial."
- The goal of this lab is to identify the aims of this study, the design, the statistical results, and the claims they are making from those results.



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Effect on Postpartum Hemorrhage of Prophylactic Oxytocin (10 IU) by Injection by Community Health Officers in Ghana: A Community-Based, Cluster-Randomized Trial

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Abstract

Background: Oxytocin (10 IU) is the drug of choice for prevention of postpartum hemorrhage (PPH). Its use has generally been restricted to medically trained staff in health facilities. We assessed the effectiveness, safety, and feasibility of PPH prevention using oxytocin injected by peripheral health care providers without midwifery skills at home births.

Methods and Findings: This community-based, cluster-randomized trial was conducted in four rural districts in Ghana. We randomly allocated 54 community health officers (stratified on district and catchment area distance to a health facility: ≥10 km versus <10 km) to intervention (one injection of oxytocin [10 IU] one minute after birth) and control (no provision of prophylactic oxytocin) arms. Births attended by a community health officer constituted a cluster. Our primary outcome was PPH, using multiple definitions: (PPH-1) blood loss ≥500 mL; (PPH-2) PPH-1 plus women who received early treatment for PPH; and (PPH-3) PPH-2 plus any other women referred to hospital for postpartum bleeding. Unsafe practice is defined as oxytocin use before delivery of the baby. We enrolled 689 and 897 women, respectively, into oxytocin and control arms of the trial from April 2011 to November 2012. In oxytocin and control arms, respectively, PPH-1 rates were 2.6% versus 5.5% (RR: 0.49; 95% CI: 0.27–0.88); PPH-2 rates were 3.8% versus 10.8% (RR: 0.35; 95% CI: 0.18–0.63), and PPH-3 rates were similar to those of PPH-2. Compared to women in control clusters, those in the intervention clusters lost 45.1 mL (17.7–72.6) less blood. There were no cases of oxytocin use before delivery of the baby and no major adverse events requiring notification of the institutional review boards. Limitations include an unblinded trial and imbalanced numbers of participants, favoring controls.

Conclusion: Maternal health care planners can consider adapting this model to extend the use of oxytocin into peripheral settings including, in some contexts, home births.

Trial registration: ClinicalTrials.gov NCT01108289

Please see later in the article for the Editors' Summary.

Tips for reading research articles

- You won't understand a lot of what is being said in this article, and that's ok! Focus instead on making sense of the study's primary aims, the general design, and the contribution
- Whenever you see a term used multiple times, but aren't sure what it is, take a few seconds and search it online!
- **Abstracts** are great at helping you pull out key details. You should read this first, then at various stages of reading the rest of the paper, come back and read it again!
- Once you have finished working on all questions, come back to the beginning and revise/enhance your answers based on the new knowledge you gained later!

Acknowledgment

- Thanks to Laura Le and others at the University of Minnesota School of Public Health! This lab is an adaption from an assignment that they wrote and kindly shared with me.

Read the Abstract and the Introduction sections on pages 1-2. *(If needed, you may also check out the Editor's Summary on the last page!)*

Question 1 (6pts): Briefly discuss the **aims** of this study.

a) What is the response variable? *(suggested 1-2 sentences)*

Postpartum blood loss in pregnant women(Use the blood loss to categorize individuals into different PPH outcomes based on specific thresholds of blood loss.)

b) What were the treatment/control factors being compared? *(suggested 1-2 sentences)*

Treatment: women received one injection of oxytocin (10 IU) one minute after giving birth.
Control: no provision of prophylactic oxytocin.

c) In your own words, what question are the researchers trying to answer with this study?

If using oxytocin injected by peripheral health care providers without midwifery skills at home births is effective, safe and feasible of preventing PPH.

d) *Why* was this study conducted? What is the potential significance of this study's findings? *(suggested 2-3 sentences)*

The safe use of oxytocin could offer an effective solution to reduce maternal deaths from postpartum hemorrhage, which is a major cause of maternal mortality. This will contribute to progress in achieving global maternal health goals particularly in low-income and remote areas.

Skim the "Methods" section (especially the first couple sections)

Question 2 (4pts): Briefly discuss the experimental design of this study

a) What does it mean when the authors say they used "cluster randomization" in this study? What constitutes a "cluster," and how would we distinguish that from the unit of observation in this study? *(suggested 2-3 sentences)*

In this study, "cluster randomization" means that they randomly assigned groups of births attended by individual community health officers (CHOs) to receive oxytocin or not, instead of randomly assigning each delivering woman individually. Each group of births attended by a CHO is considered a "cluster." The unit of observation in the study is a woman.

b) Why did the researchers choose to randomize at the cluster level rather than at the unit of observation level? *(suggested 2-3 sentences)*

They chose to randomize at the cluster level so that each individual CHO was given a constant set of responsibilities, thereby simplifying the training and reducing the likelihood of inadvertent cross-over. They could maintain more control over the administration of oxytocin and avoid potential mixes between individuals.

Question 3 (6pts): Let's consider the study's internal validity (ability to draw causal claims) regarding the effects of oxytocin

a) Focus first on Table 1, which compares the 682 women who received oxytocin versus the 887 women in the control group. Would you say that these groups are quite similar and balanced, or are there any systematic demographic differences that stand out to you?

I think these groups are quite similar and balanced because each subgroup has similar proportion of constituents.

b) Focus next on Table 2. Would you say that the procedures followed for births under each condition are similar and balanced, or are there any systematic differences in the situations/protocols followed under each condition that stand out to you?

I would say that the procedures are similar and balanced.

c) On page 12 in the first full paragraph, the authors address some possible differences. Do either of these differences seem to threaten the effects found from oxytocin?

The differences do not seem to significantly threaten the effects. 1. Delayed blood-loss measurement by control CHOs: This delay could potentially lead to an underestimate of blood loss in the control group. However, if the delay had an impact, it would likely underestimate the effectiveness of oxytocin. 2. More frequent referrals by oxytocin group CHOs: The higher rate of referrals in the oxytocin group could be due to the exclusion of a larger pool of women with difficult deliveries. But the data from hospital records did not indicate a higher risk of PPH among the referred women in the oxytocin group, which suggests that the effects of oxytocin were not significantly threatened by this difference.

Look at Table 3

Question 4 (5pts): What might we learn from Table 3?

a) Briefly explain how the values in the percentage column are being calculated. *(suggested 1-2 sentences)*

The "Percentage" column is calculated by Percentage=Cases/N. The "Relative Risk" is calculated by the proportion of cases in "Oxytocin" group divided by the proportion of cases in "Control" group.

b) The value 1.000 in this table is actually a typo! Based on the data reported in this table, what should that number actually be?

0.163

c) For which outcome comparisons are we confident in concluding that oxytocin is likely reducing the risk for? What might you use as evidence to make that claim? Note: there is no *objective* benchmark for making this decision, so just be clear how *you* are making that decision! *(suggested 2-3 sentences)*

If I set the significant level to be 0.05, then for PPH-1, PPH-2, PPH-3, the confidence intervals of Relative Risk do not include 1 and p-values are less than 0.05. That means we are very confident in concluding that oxytocin is likely reducing the risk using the outcome in these 3 groups.

Look at Table 4

Question 5 (4pts): What might we learn from Table 4?

a) How might you interpret what the value 1.309 is representing in context?

That represents the proportion of cases in treatment group divided by the proportion of cases in control group. It means that the risk of stillbirth increases in the "Oxytocin" group.

b) Would you say there is strong evidence that oxytocin is likely increasing the risk for stillbirth or any other adverse effect here?

There isn't strong evidence because the p-values are 0.22, 1.00, 0.72, 0.44, which are relatively large. We are not confident to say oxytocin increases the risk for stillbirth or any other adverse effect.

Question 6 (6pts): In biomedical research, the "number needed to treat" (NNT) measures how many people would need to be treated before you would expect one adverse effect to be avoided. For example, if the

absolute risk in the treatment group is 1% (0.01) and the absolute risk in the comparison group is 3% (0.03), then the number needed to treat is 1 / (0.03 – 0.01) = 1/0.02 = 50.

a) In Table 3, what is the NNT before we expect to ***prevent*** one case of **PPH-3** as a result of oxytocin?

1/(0.111-0.041)=14

b) In Table 4, we are instead focusing on possible adverse effects of oxytocin. What is the NNT before we expect to ***inflict*** one case of **stillbirth** as a result of oxytocin?

1/(0.021-0.016)=200

c) How might you compare the benefit of oxytocin in preventing PPH-3 to the risk of oxytocin in inflicting a stillbirth? There is no *objective* answer to this question, but you should use the statistical results as an important consideration in making this risk-benefit comparison!

I think the benefit of oxytocin is more important because one case of PPH will be prevent by only treating 14 people. But only one case of stillbirth occurs in 200 people who receive Oxytocin.

Read the last 4 paragraphs of the "Discussion" section

Question 7 (4pts): Briefly describe the contributions this article made.

a) Briefly summarize the primary finding of this article. What "answer" might they give to the research question you wrote up in Question 1?

This article's main finding is that using oxytocin administered by peripheral healthcare providers without midwifery skills effectively reduces the risk of postpartum hemorrhage during home births. In response to the research question about oxytocin's effectiveness, safety, and feasibility in preventing PPH, the study concludes that it is a positive and practical approach.

b) Why might the findings of this study be limited in practice for birth care to the broader population being targeted?

The cost considerations associated with oxytocin in Uniject may limit the generalizability of the study's findings to a broader population. While it is anticipated that oxytocin in Uniject may become more affordable, it could still pose challenges in regions with limited healthcare resources and budget constraints.