

GOING GREEN IN LABOR AND DELIVERY: ASSESSING KNOWLEDGE AND  
IDENTIFYING BARRIERS AND FACILITATORS TO RECYCLING  
IN OBSTETRIC OPERATING ROOMS AND ON THE  
LABOR AND DELIVERY UNIT

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### **Dedication and Acknowledgements**

Thank you to my fantastic family and friends, who always supports and encourages me daily! I love you guys more than the world!

### Abstract

**Background:** Appropriate segregation of waste can enormously impact hospital finances. Specifically, the amount of waste produced and the number of wasted resources impact hospital systems' financial stability. **Purpose:** This quality improvement project has four primary purposes: 1) To identify existing barriers to recycling as perceived by the operating room and labor and delivery staff; 2) to identify existing facilitators to recycling as perceived by the operating room and labor and delivery staff; 3) to explore what will be needed to develop and implement a recycling and waste stream management protocol in the labor and delivery unit and operating room; 4) to develop a recycling and waste stream management protocol along with educational guidelines for the staff on the labor and delivery unit and the obstetrical operating room. **Methods:** A Mixed-methods approach explored waste management streams, recycling knowledge, and facilitators' barriers toward recycling. Data was collected through an anonymous online survey and a focus group interview session. **Results:** Multiple areas of reducing what is used were highlighted by streamlining supplies, reducing the number of supplies opened that are not needed, reducing the amount of energy used by turning off lights, streamlining preference cards, and reducing the number of items pulled for a case opened, unused, and thrown away. **Recommendations and Conclusion:** Rethinking and education are the most significant conclusions drawn from this project. Education on the cost impact supplies have on the hospital's financial resources should be incorporated into the yearly learning modules and the new hire orientation.

## Background and Significance

Greening, the Operating Room (OR) is a new movement sweeping the area of operative services. The lack of waste stream management for recycling and segregation is a significant obstacle to disposing of waste in the operating room. The literature review uncovered multiple articles on implementing a recycling program and several advantages. Healthcare costs increase sharply, and the perioperative environment is of particular interest. The facts show that operating rooms combined with labor and delivery suites account for approximately 70% of hospital waste (Rigante et al., 2017).

This statistic paints an unbalanced and very concerning picture. Operating rooms generate 42% of the hospital's revenue and 70% of its waste while supporting a supply cost of 56% of the total OR budget (Babu et al., 2018). Appropriately segregating waste can have significant financial impacts on hospital costs. Operating room waste is typically generated from disposable surgical supplies, personal protective equipment, drapes, and plastic wrappers. One study suggested that recycling surgical towels, gowns, table covers, stainless steel basins, and Mayo stand covers can save around \$12,600 (Wyssusek et al., 2017).

United States academic medical centers use approximately 2 million pounds (\$15 million) of disposable medical supplies (Babu et al., 2019). We can compare the waste generated by hospitals to general waste in our homes, which is recyclable. The World Health Organization reports that 80% of healthcare waste is non-contaminated solid waste (Hubbard et al., 2017). This non-contaminated waste is a significant cost expense to healthcare facilities when misclassified as hazardous waste for disposal. Hazardous waste is costly for the hospital to dispose of, and its cost is calculated by weight. Non-contaminated waste is not considered dangerous and is disposed of in landfills, therefore less costly. Multiple studies demonstrated

the lack of knowledge for segregating waste. Healthcare providers can forge a new path and engage in stewardship of resources in the labor and delivery unit and operating room.

### **Purpose**

This Doctor of Nursing Practice Capstone Project aims to identify the barriers and facilitators to recycling in Obstetric operating rooms and the labor and delivery unit as perceived by certified registered nurse anesthetists (CRNAs), registered nurses (RNs), and surgical scrub technicians (SCTs). Would creating waste management and recycling protocol in conjunction with educational guidelines promote acceptance, knowledge, and sustainability for recycling in the operating room instead of the current waste stream management and segregation? The project has four primary purposes: 1) To identify existing barriers to recycling as perceived by the operating room and labor and delivery staff; 2) to identify existing facilitators to recycling as perceived by the operating room and labor and delivery staff; 3) to explore what will be needed to develop and implement a recycling and waste stream management protocol in the labor and delivery unit and operating room; 4) to develop a recycling and waste stream management protocol along with educational guidelines for the staff on the labor and delivery unit and in the labor and delivery operating room.

### **Review of Current Evidence**

Hospitals produce approximately thirty pounds of waste for each patient per day; this results in ten billion dollars annually in disposal costs (Martin et al., 2017). There are several "green" initiatives to reduce healthcare waste and costs in the operating room. To create and develop improvement strategies, participating staff must first identify barriers to recycling in greening the operating room. Prior research has explored this topic and found a significant



correlation between employees' personal beliefs about the importance of recycling and their efforts to sustain the recycling program (Azouz et al., 2019).

A literature search using CINAHL, MEDLINE, PubMed, and Google Scholar was executed using the following terms and keywords in varying combinations: Health professionals educating, recycling, attitudes, sustainability, environmental sustainability, cost savings, waste disposal, quality improvement, obstetrics, labor and delivery, barriers to recycling, waste disposal in the operating room, standards, guidelines, and green programs. A total of thirty-six articles were discovered dating from 1994 through 2020.

After excluding articles older than 2016, the list was narrowed to nineteen articles, of which only fifteen were relevant to the project. The main themes of these fifteen articles were: Anesthesiologists' views and attitudes toward recycling in the OR, a systematic review of the literature, gaps, and barriers to recycling in the OR, the ability to create OR packs with fewer instruments to reduce waste, theory of health care professionals actively participating in recycling programs, specific articles on recycling for anesthesia equipment, reusable versus single-use items, and a review of a pilot study.

### **Greatest Barriers**

Multiple studies have demonstrated barriers to implementing recycling and waste segregation campaigns in the operating room. The most significant barriers include the need for more knowledge or proper information. Many staff must be aware of OR recycling programs (McGain et al., 2012). Several studies show that more than 70% of general OR waste has the potential to be recycled (Wyssusek et al., 2016). There are different waste streams in the operating room and labor and delivery unit. The four categories identified in the literature are solid waste or landfill, regulated medical waste, pharmaceutical waste, and recyclable waste

(Martin et al., 2017). The lack of knowledge on separating and managing these waste streams significantly impacts disposal management costs, proper waste segregation, and involvement with staff participating in recycling programs. Red Bags are intended to dispose of contaminated body fluids and cost the hospital to dispose of them appropriately. Waste disposed of in "red bags" is inappropriately segregated 90% of the time, including vent tubing, suction tubes, IV bags, foley bags, foley catheters, masks, casts, splints, urinals, bedpans (Azouz et al., 2019). These misconceptions cause a sharp increase in costs for the hospital. Twenty percent of medical waste accounts for recyclable plastics disposed of in a landfill, such as clean blue OR towels, sterile soft polypropylene plastic wrappers for OR tools, sterile ridged plastic containers, plastic pour bottles, and electrocautery cords (Azouz et al., 2019). These items have the potential to be recycled as opposed to accumulating in a landfill if employees have the knowledge to do so.

Waste segregation and recycling knowledge and education can significantly lower hospital waste disposal costs. A waste management initiative launched in 2009 at a large hospital demonstrated that 21,5000kg of OR general waste was incorrectly labeled as clinical waste (Wyssusek et al., 2016). After introducing the waste segregation program, the following audit discovered that approximately 7,000 kilograms of OR waste were disposed of incorrectly, translating to an average savings of \$5,790.00 per month for the hospital (Wyssusek et al., 2016). Education is beneficial for all staff to clarify any confusion regarding proper waste stream management and segregation. Staff uncertainty regarding the recyclability of material and equipment hinders progress and sustainability, and forward movement cannot occur.

The second most significant barrier to implementing a recycling program and education regarding waste segregation was not negative staff attitudes; instead, several studies discovered

that a lack of support from leadership contributed significantly to sustainability. Only 12.6% of respondents reported that hospital leadership encouraged sustainability practices (Ard et al., 2016). A common theme observed through the literature was that OR staff needed more support from leadership regarding education to understand the financial benefits of becoming engaged in this process.

### **5Rs of Going Green**

The literature review revealed a phenomenon known as the 5Rs. The 5Rs refer to the thought process of going green in the OR: reduce, reuse, recycle, rethink, and research. Several examples are scattered throughout the literature on reducing medical waste in the OR. The reduction includes both waste of resources and the amount of waste produced. Reducing the amount of waste generated in the first place can go a long way in mitigating the large amounts of waste generated daily in hospitals.

#### ***Reduce***

Operating rooms are substantial areas of energy consumption. The cost for hospitals to meet energy needs is approximately 25% of the total operating expenses, which averages between \$8.8 and \$10 billion annually in energy (Wyssusek et al., 2019). Reducing energy consumption by completely closing computers and turning off lights and other operating room equipment could significantly impact the hospital budget.

Reducing waste is also seen in wasted supplies, accounting for up to 20.1% of the total cost allocated to surgical supplies (Guetter et al., 2018). Limiting the number of materials brought to the OR in anticipation of needing an instrument and then opening the items to be ready if required contributes to waste. This must be thrown away in the OR once opened, even if it is clean and unused. Opening an entire operating room when a mother is having trouble

delivering and could be coming to the OR, perhaps does deliver, not requiring a cesarean section. The supplies are discarded and disposed of as waste supporting the statistic that "ORs and labor-delivery suits account for over 50% of all hospital waste" (Guetter et al., 2018). Simple interventions can help reduce resources and go a long way toward lowering hospital OR costs.

### *Reuse*

The healthcare industry has moved from reusable to disposable products, creating considerably more waste. With the introduction of universal precautions standards in 1987 and the increased awareness of infectious diseases, HIV and Hepatitis, a movement started to treat most medical waste as infections (Guetter et al., 2018). The trend to move to single-use products began growing. An example of an unnecessary disposable product would be blood pressure cuffs (Beloeil & Albaladejo, 2021). They are wrapped in plastic and disposed of after each patient. Blood pressure cuffs that are reusable would significantly reduce waste in operating rooms and labor and delivery suits. Also, disposable surgical linens can contribute to hospital waste. One hospital reduced waste by 23,000kg and saved \$60,000 by changing to reusable surgical gowns over 12 months (Wyssusek et al., 2019)

The life-cycle analysis (LCA) calculation is practical when considering single-use or disposable products in the hospital setting. "This cost assumes a life cycle or eco-footprint that extends from purchase to disposal in a waste container" (Denny et al., 2019, p.477). The reality is that most products labeled "single-use" are marked by the manufacturer, not the Food and Drug Administration (Denny et al., 2019). The business side of this transaction would benefit the manufacturer by increasing sales. Many companies producing single-use items are also recovering after patient use, reprocessing them, and selling the products back to the hospital at a

discount (Denny et al., 2019). Yet another example of how single-use devices benefit the manufacturer and not the cost to patients or hospitals.

### ***Recycle***

Recycling links the 5Rs to going green in the operating room, and the recycling concept requires all staff's buy-in to sustain the process. Multiple studies have recorded the barriers to recycling as inadequate knowledge or information, lack of support from the administration, and negative attitudes hospital staff hold toward this process. Studies indicate that between 21% and 25% of OR waste is recyclable with no increase in cost (Wyssusek et al., 2019).

### ***Rethink***

Rethinking is a step in the 5R process. When we rethink daily routines, single-use products, and waste segregation, we simultaneously promote and protect healthcare costs and the environment. Reviewing waste stream management hinges on education and training staff regarding appropriate waste segregation. Education and training can decrease waste by 6.5% each month (Beloil & Albaladejo, 2021). Education programs can occur during staff hours, and the cost is minimal to implement.

### ***Research***

The final R in the 5Rs found in the literature would be researching, and research is a great launching point for Doctorate-prepared nurses as we move forward. The research depends on finding new alternatives, evaluating interventions to determine the benefits, and cost-benefit analysis of equipment and processes.

## **Summary of Literature Synthesis**

The types of research most popular on this topic included: pilot studies, narrative reviews of the literature, multiple quantitative studies measuring waste in the OR, and qualitative studies

describing attitudes towards recycling. Each study brought light to recycling and "greening" the operating room. Multiple studies carried the same or very closely related themes. The 5 "Rs," waste segregation, lack of knowledge by staff, focus on physicians and anesthesia providers, and substantial cost savings were related themes. Most research viewed that OR recycling can often save rather than cost money for the hospital system.

This waste reduction is outlined in several articles and accomplished in the following ways: source reduction, purchasing fewer supplies, management and control measures that guide hospital product use, waste segregation before disposal, and recycling or reuse of products. Participation in each area mentioned above requires staff buy-in from the point of waste generation to deliver recyclables to the appropriate authorities. The first step to collaborating and reaching a buy-in with most staff is to assess where we are, starting with the team's attitudes, barriers, and improvements, including physicians and non-physicians. We can all serve as good stewards and leaders of our resources and champion the waste reduction process. Once barriers and facilitators are recognized, a waste-stream management program can be developed based on suggestions from the study and past successful implementations from the literature. Education for staff specific to the facility can also be developed based on the identified barriers, attitudes, perceptions, and current knowledge to promote success.

### **Gaps in the Literature**

Several studies in the literature represent the main operating rooms for waste-cutting measures and waste stream management while simultaneously discussing that the biggest waste center for the hospital can be labor and delivery units. This gap in the literature makes a case to look specifically at Obstetrical Operating rooms and labor and delivery units together. Many

specialties have representation throughout the literature regarding waste streams, but labor and delivery units need more representation.

Multiple studies examining barriers and attitudes to recycling and waste stream management involve physicians, and only one study in the United States looked at physicians and non-Physicians. My research will explore a gap to identify barriers and facilitators of recycling among physicians and non-physicians. These findings strongly support my opinion that all staff needs to identify the obstacles and facilitators to implementation.

Barriers and facilitators to recycling are key concepts throughout my literature search. These concepts show a significant gap in identifying barriers and facilitators to form an action plan and educational programs. This project would fill that gap by identifying barriers and facilitators in labor & Delivery units and ORs, then formulating an action plan and educational information.

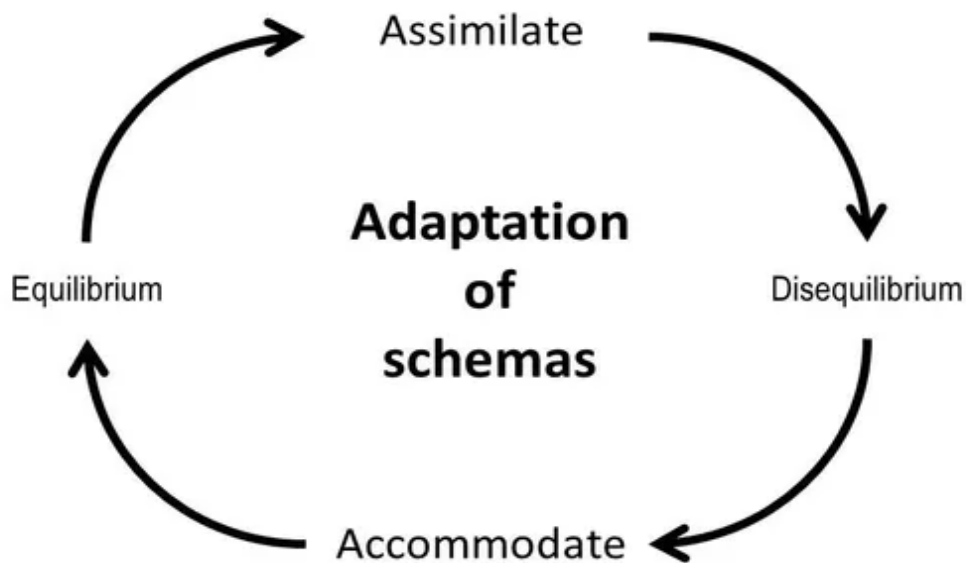
### **Theoretical Model**

The learning theory by Piaget on cognitivism is an appropriate theoretical model to address the way people think and the effects on their behavior. I hope to gather information regarding employees' views in the operating room on waste and recycling. How each person feels about this topic will ultimately drive the success or failure of this venture. Many behavioral theories agree that those working together learn better than those working independently (Pan et al., 2022). This viewpoint will forge the path to gaining acceptance from the staff and create an environment where everyone works together to create less waste in the operating room through waste stream management or recycling, thus cutting costs for the hospital. Piaget's theory of cognitive development is an upward step toward adaptation through assimilation and accommodation (Scott & Cogburn, 2022). Accommodation will be the behavior to focus on in

this study. Within Piaget's theory of cognitive development, accommodation is the tendency of an organism to modify behavior and learn a new skill (Scott & Cogburn, 2022). This will focus on changing the waste stream management in the labor and delivery unit and operating room, modifying employees' behavior to comply and produce sustainability.

### Figure 1

#### *Piaget's theory of cognitive development*



*Note.* Figure 1 demonstrates the assimilation and accommodation process of Piaget's theory of Cognitive Development (McLeod, 2022).

### Methods

The project consisted of myself, a Certified Registered Nurse Anesthetist, and a Director of Anesthesia services to serve as the site liaison. A Mixed-methods approach explored waste



management streams, recycling knowledge, and facilitators' barriers toward recycling. Data was collected through an anonymous online survey and a focus group interview session. The survey was open for three weeks to complete. Data was analyzed, and a focus group discussed the results. After reviewing the survey results, waste is multifaceted in the OR. There are many ways to reduce waste from excessive waste in electricity, supplies, and even pharmaceutical drugs. Based on the surveys, most recommended increased education and time within the day to segregate waste streams appropriately. Through identifying the problem, the solution to implement appropriate education for electricity, glove disposal, linen usage, proper linen disposal, number of straws allotted to each room needs to be identified. This is a limitation of the study as each problem was not individually discussed to eliminate waste in the OR. However, the project's aim was achieved by identifying waste in the OR from staff.

## **Design**

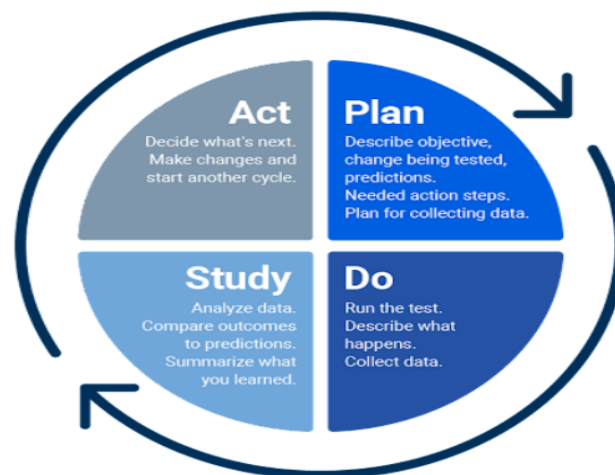
The design I used was a QI project. When using a QI project, the data collected is used to guide clinical outcomes and facilitate change to better patient care and safety. This QI project aims to determine the barriers and facilitators to reducing waste in the labor and delivery unit and obstetrical ORs.

## ***Translational Framework***

The Framework that will support this project is the Plan-Do-Study-Act (PDSA). This cycle provides a structure for changes to quality improvement and is widely accepted in healthcare (Taylor et al., 2014). Using the PDSA method, I followed a four-stage cycle approach to adapt to changes in waste management. First, in the planning phase, I identified the barriers and facilitators to recycling in obstetric operating rooms and labor and delivery units at a

suburban hospital and what suggested changes to the current waste disposal routine. The next phase following this plan is the “DO” portion (Taylor et al., 2014). I actively carried out the surveying method to collect information, held focus groups on this topic, and analyzed the data. Once assembled, I entered the study phase of this framework and started exploring the data to summarize what areas could be improved upon in the waste management streams. After sites were identified, a change protocol was constructed and discussed among leadership. Initiating the final phase of this framework includes decreasing the waste in the operating room through education and waste stream management. This consisted of the staff’s thoughts on the facilitators and barriers to the topic. Once this was studied, I created a plan to institute this in the labor and delivery operating room that would be obtainable for staff and sustainable for the future.

**Figure 2**



PDSA Cycle

***PDSA Cycle***

*Note.* Figure 2 shows the PDSA cycle as outlined in the Six Sigma process (“PLAN, DO, STUDY, ACT (PDSA),” n.d.)

### ***Population and Setting***

A non-probability convenience sample of nurses who work at a large hospital in the southeastern United States was investigated. The sample population will work in a high-volume, high-risk labor and delivery unit and obstetrical operating room. Nurse Anesthetists, RNs, and SCTs were surveyed to identify barriers and facilitators to recycling in obstetric operating rooms and the labor and delivery unit. This area operates 24 hours a day, seven days a week, and all staff on each shift were invited to participate. This group consists of both men and women of various ages and ethnicities. Most of the literature for review concentrated primarily on general operating room suites. Given that the labor and delivery units and obstetrical operating rooms account for most waste in the hospital environment, I chose to focus on this area. Inclusion criteria was any CRNA, RN, or CTS employed by the hospital in the labor and delivery unit or operating room. Exclusion criteria include any float team personnel or travel nurses.

Following Institutional Review Board (IRB) study approval, a recruitment email was sent to the hospital providers, inviting them to participate in this project (Appendix A). Recruitment will occur through email correspondence and posters placed throughout the labor and delivery units (Appendix B). The primary investigator was on-site during personal shift hours to encourage voluntary participation. Questions are always welcome, and contact information is provided in the recruitment email.

### **Project Implementation**

The information collected from the survey and focus groups was analyzed. A strategy was tailored from the study results to fit the hospital's labor and delivery unit and operating room suits to decrease waste and encourage recycling. A plan of action, literature and education tools

were developed to promote knowledge and encourage acceptance. This action plan was developed along with recommendations for the interventions needed.

### *Instruments*

The online survey questions can be found in Appendix C. Demographic data was questioned first, addressing age, sex, experience in years, and job title. Content-related questions are rated on a Likert scale corresponding to agree strongly, agree, neutral, disagree, and strongly disagree. Open-ended questions are last to allow for suggestions and comments. Once the online survey is complete, a focus group will discuss the results and recommendations. All questions were focused on waste stream management and attitudes toward recycling in the workplace and at home.

### *Timeline and Critical Milestones*

Task	Mar 2021	April 2021	May 2021	Jun 2021	Jul 2021	Aug 2021	Sept 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022
Submit to IRB		x	x	x											
Recruiting subjects Develop/administer surveys & focus groups.						x	x	x							
Education & evaluation of project outcomes							x	x	x						
Preliminary data analysis & appointment with Professor Mittal								x	x						
Create an education plan and write up data analysis									x	x	x				
Write report											x	x	x	x	
DNP Graduation															x

***IRB approval***

Following Institutional Review Board (IRB) study approval, a recruitment email was sent to the hospital providers, inviting them to participate in this project (Appendix A). Recruitment occurred through email correspondence and posters placed throughout the labor and delivery units (Appendix B). The primary investigator was on-site during personal shift hours to encourage voluntary participation. Several steps were taken to protect identities. Those who voluntarily participated in the survey are blinded, and the survey remains anonymous, discounting any potential bias. The participants' identities were protected through the secure web-based survey. No data was or will be shared within the survey website other than the responses, and all data collected will be terminated within three years of collection by the survey. Questions are always welcome, and contact information was provided in the recruitment email.

***Data Collection***

Survey data was collected using a survey format as an anonymous online survey. A secure web-based company, Survey Monkey®, was the online questionnaire tool to allow participants anonymity by blocking the identifying IP addresses, URLs, and email addresses. Employees wishing to participate in the project were asked to access the Survey Monkey® link in the recruitment email. Instructions were provided to participants, and consent was inferred by the participant voluntarily participating in the study. No individual data or PHI was shared with the primary investigator or the faculty advisor.

The data collected and stored is kept confidential in SurveyMonkey®. This is a secure server to be accessed only by the primary investigator via a username and password. The data was exported to an excel file format stored on the primary investigator's computer and password

protected. After three years, the excel data file will be deleted from the primary investigators' personal computer. Once the project is completed, the data stored on Survey Monkey® will be destroyed by the survey. Additionally, aggregate data will be held in a UNCG-specific box site that will only be accessible by the PI and faculty advisor. This data will be deleted once the project is complete and disseminated the findings.

### **Data Analysis**

The survey consisted of three parts. First, the demographic information was detailed in a bar chart to illustrate the makeup of study respondents. Questions one through five on the survey pertain to the sample's demographics. Questions six through twelve are core questions about how respondents feel about recycling and waste stream management. This section aims to find the barriers and facilitators to recycling at home and its correlation to being willing to recycle and performing appropriate waste stream segregation at work. A McNemar's analysis via excel software was performed on this section of the data to determine if there is a correlation between recycling at home and willingness to continue that trend at work. This was calculated on questions five and six of the survey responses.

Lastly, the three open-ended questions allow all respondents to express how they see waste in the labor and delivery unit and obstetric operating rooms. The focus group's responses to these questions are used to discuss ways to improve waste stream management and decrease waste to increase revenue. The answers are displayed in a word cloud format. These ideas are used to compile a plan for moving forward and instituting a protocol for decreasing waste and streamlining supplies. This information will guide the development of course materials to be implemented during new employee orientation to manage the education of waste and supply management.

## Results

### Evaluate Outcomes

The labor and delivery unit and obstetrical operating room personnel were invited to participate in an online survey via Survey Monkey®. A link to join the survey was sent via email to 142 employees. Sixty-two survey responses were received and analyzed using qualitative and descriptive statistics. The initial first four questions were related to demographic data and can be reviewed in Table 1. Responses were mainly collected from female RNs between the ages of 25 and 44. Interestingly, most of the respondents, at 18 total or 29.03%, have worked for the organization for over 20 years.

**Table 1**

Demographics	# of Responses (%)
<b>Age</b>	
18-24 years	1 (1.64%)
25-34 years	18 (29.51%)
35-44 years	17 (27.87%)
45-54 years	11 (18.03%)
55-64 years	11 (18.03%)
>65 years	3 (4.92%)
<b>Gender</b>	
Male	1 (1.61%)
Female	61 (98.39%)
Nonbinary	0 (0%)
Transgender	0 (0%)
Self-description	0 (0%)
<b>Current Position</b>	
CRNA	10 (16.39%)
RN	46 (75.41%)
Surgical Scrub Tech	5 (8.20%)
<b>Tenure at Facility</b>	
Less than 6 months	3 (4.84%)
1-2 years	2 (3.23%)
3-4 years	6 (9.68%)
5-9 years	14 (22.58%)
10-14 years	6 (9.68%)
15-19 years	6 (9.68%)
>20 years	18 (29.03%)

Questions 5 and 6 on the survey were analyzed using McNemar’s test to determine if recycling at home affected recycling in the operating room. The null hypothesis is there is no difference in the proportion of people who recycle at home or in the OR. The alternate hypothesis is a difference in the proportion of people who recycle at home or in the OR. In our problem,  $p = 0.424 > 0.05$  (using the exact p-value), which means that we do not have evidence to conclude that the proportion of people who recycle at home is statistically significantly different from those who recycle in the OR. This data is calculated in the following table.

**Table 2**

**Case Processing Summary**

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
	Home_recyl1 * OR_recyl1	62	100.0%	0	0.0%	62

**Home\_recyl1 \* OR\_recyl1 Crosstabulation**

		OR_recyl1				Total	
		No		Yes		N	%
Home_recyl1		N	%	N	%		
	No	41	82.0%	5	41.7%	46	74.2%
	Yes	9	18.0%	7	58.3%	16	25.8%
<b>Total</b>		50	100.0%	12	100.0%	62	100.0%

**Chi-Square Tests**

	Value	Exact Sig. (2-sided)
McNemar Test		<b>.424<sup>a</sup></b>
N of Valid Cases	62	

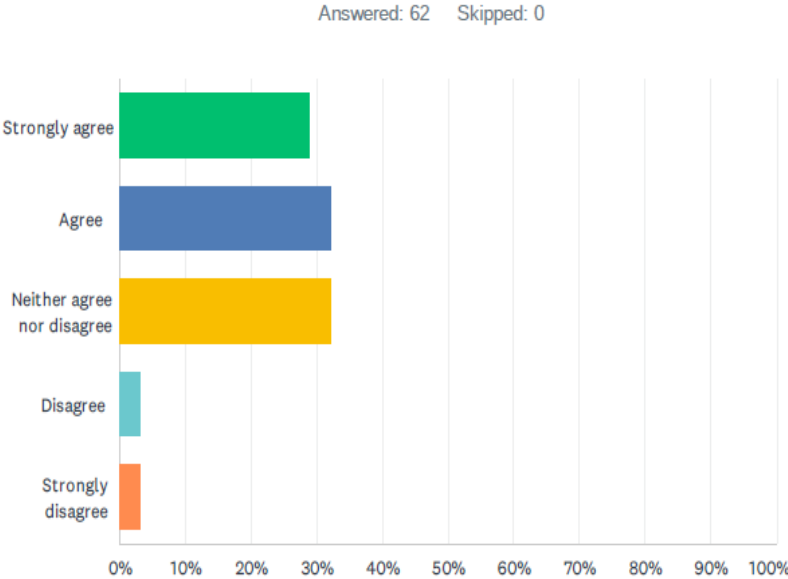
a. Binomial distribution used.



Question 7 on this survey was interested in the general concern for waste generated in the operating room and the labor and delivery units. This was formulated on a 5-point Likert scale. The categories of strongly agree 29.03%, agree 32.26%, and neutral 32.26% were all within a few points of one another, as demonstrated in graph one. The good news is that most people are concerned about the waste generated in their units.

**Graph 1**

**Q7 I am concerned about the amount of waste generated in the Labor and Delivery unit and in the Operating room.**



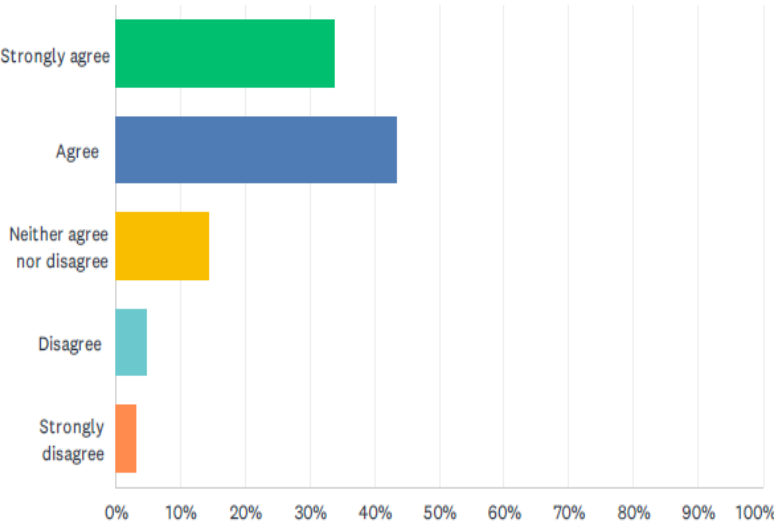
ANSWER CHOICES	RESPONSES	
Strongly agree	29.03%	18
Agree	32.26%	20
Neither agree nor disagree	32.26%	20
Disagree	3.23%	2
Strongly disagree	3.23%	2
<b>TOTAL</b>		<b>62</b>

The eighth question on this survey is one of my favorite points. I feel that if waste management and cost containment could be part of hospital orientation and a yearly refresher course for staff, it would keep this movement at the forefront of everyone’s minds and make this venture more sustainable. Respondents agreed strongly, 33.87%, and agreed with this 43.55%. The results for this question are listed below in Graph two.

**Graph 2**

**Q8 Waste management, recycling or cost containment should be part of the hospital orientation?**

Answered: 62 Skipped: 0



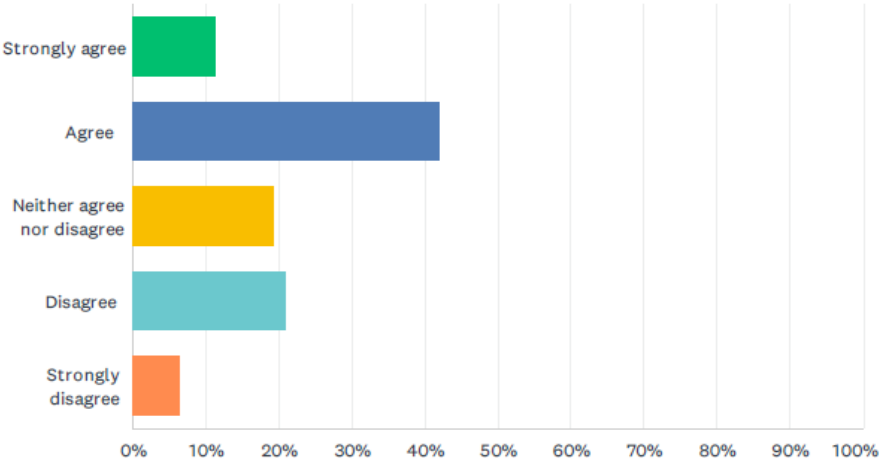
ANSWER CHOICES	RESPONSES	
Strongly agree	33.87%	21
Agree	43.55%	27
Neither agree nor disagree	14.52%	9
Disagree	4.84%	3
Strongly disagree	3.23%	2
TOTAL		62

Most respondents agreed (41.94%) that they regularly see waste disposed of improperly in contaminated waste containers. Graph three illustrates the responses collected. This point emphasizes that the hospital pays for improperly disposing of contaminated waste. If noncontaminated waste is disposed of improperly in these containers, it will increase the cost for the hospital. Once employees are educated on this phenomenon, proper waste segregation could occur and, in turn, decrease the cost of contaminated waste disposal.

**Graph 3**

**Q9 I see regular waste disposed of in contaminated waste containers frequently.**

Answered: 62 Skipped: 0



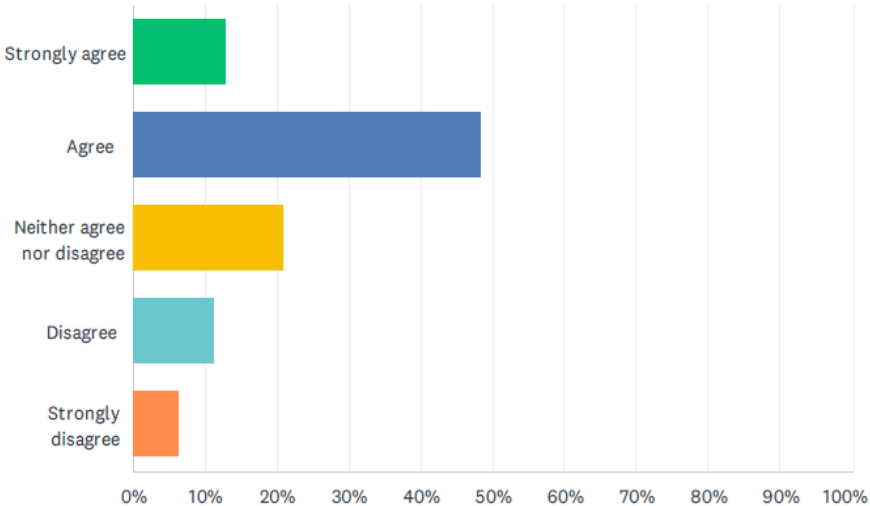
ANSWER CHOICES	RESPONSES	
Strongly agree	11.29%	7
Agree	41.94%	26
Neither agree nor disagree	19.35%	12
Disagree	20.97%	13
Strongly disagree	6.45%	4
TOTAL		62

Most respondents agreed 48.39% with question 10 that there is time in the unit to dispose of waste properly. This question was relevant to discern whether time was a factor in waste stream management. The five-point Likert scale shows the results in graph four of how the respondents felt about this topic.

**Graph 5**

Q10 We have time to dispose of waste properly and/or recycle.

Answered: 62 Skipped: 0



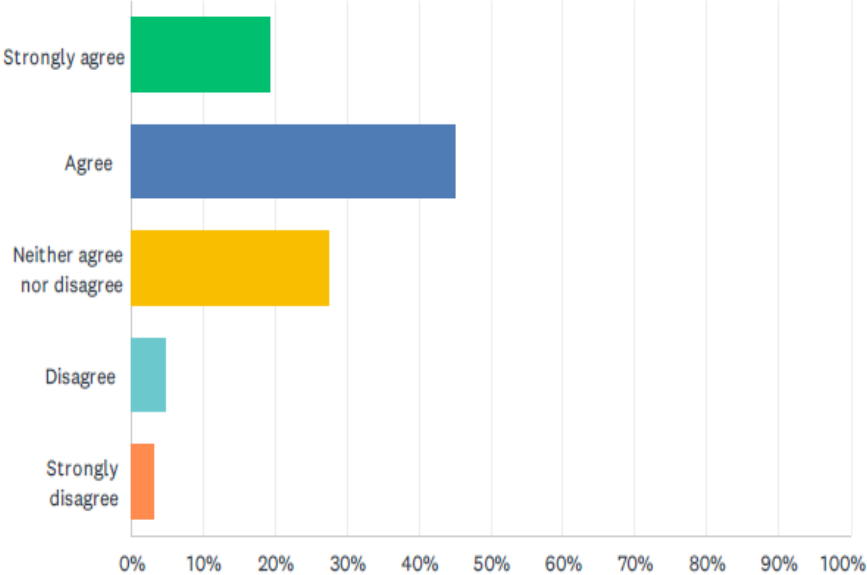
ANSWER CHOICES	RESPONSES	
Strongly agree	12.90%	8
Agree	48.39%	30
Neither agree nor disagree	20.97%	13
Disagree	11.29%	7
Strongly disagree	6.45%	4
TOTAL		62

Question eleven confirmed that staff does believe that if waste streams were improved, the hospital would see cost savings. This was a favorable agreement with 48.39% of the respondents. See graph number five for the distribution of answers.

Graph 5

### Q11 Improving hospital waste stream management would be cost effective?

Answered: 62 Skipped: 0



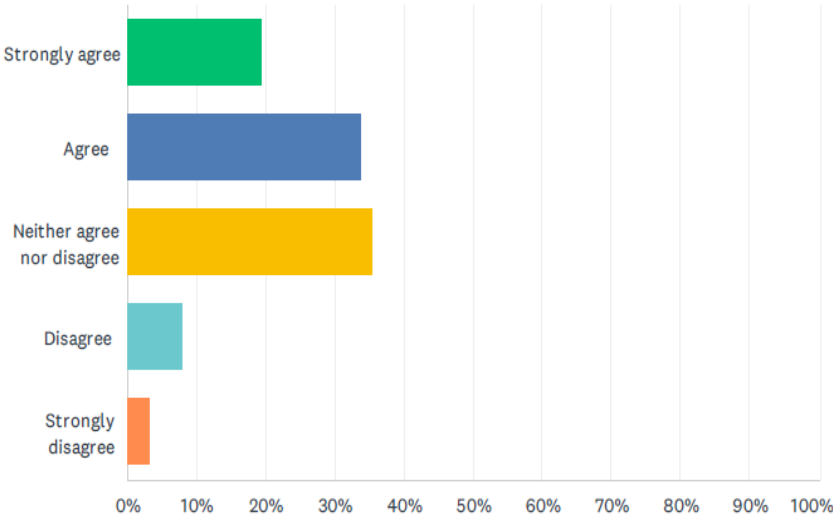
ANSWER CHOICES	RESPONSES	
Strongly agree	19.35%	12
Agree	45.16%	28
Neither agree nor disagree	27.42%	17
Disagree	4.84%	3
Strongly disagree	3.23%	2
TOTAL		62

The twelfth question was the most exciting data revealed through this questionnaire. Twenty-one (33.87%) respondents agreed there was much waste in their department. In contrast, an almost equal number of respondents, 22 (35.48%), disagreed with the fact that there is much waste in their department. This splits the viewpoints between how much waste respondents perceive in their department. Graph number 6 illustrates these viewpoints.

**Graph 6**

Q12 I see a lot of waste in my department.

Answered: 62 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	19.35%	12
Agree	33.87%	21
Neither agree nor disagree	35.48%	22
Disagree	8.06%	5
Strongly disagree	3.23%	2
TOTAL		62

The last three questions on the survey are open-ended and allow the responders to identify areas in their own words regarding waste. This section brought multiple new sites into light regarding waste. A medication waste example illustrated was that a 10 ml ampule is dispensed for each spinal anesthetic placed, and only 0.1 ml is used for the procedure. This generates a waste of 9.9 ml of medication for each neuraxial drug placed. The following word cloud in figure 3 demonstrates additional topics discussed in the open-ended questions displayed in a word cloud.

**Figure 3**



*Note.* Topics discussed in survey.

## **Focus Group**

A focus group discussion was held on a weekend shift to discuss the survey results and determine how everyone felt regarding waste in the department. This group consisted of nine females from all areas of the department surveyed. The general discussion was pro-recycling and reduction of waste. The concept of energy usage was discussed regarding leaving all lights and equipment in unused rooms. This happens across all unit areas twenty-four hours a day, seven days a week. Several group members commented on how they would not let this happen in their homes while paying the electricity bill.

Lots of discussion occurred around single-use items. Specifically, disposable towels, laryngoscope blades, monitor straps, blood pressure cuffs, and drapes. The usage of these items can be found to be used multiple times on the same patient when transferring from one area to another. These disposable items only sometimes follow with the patient; therefore, a second or third is needed to care for the patient. Along with the single-use items, many comments were made regarding how supplies should be streamlined. A strong example is that the operating room packs for labor and delivery are prepackaged with a blue drape and sponges. The hospital has recently switched to a new clear drape and tagged sponges for identification. This leads to a situation where the surgical pack is opened, and the old drape and sponges are thrown into the trash and replaced with the new drape and sponges—resulting in duplication of supplies and waste for each obstetrical operating room case.

## **Identify Barriers to Success**

Barriers to the focus groups discussed included insufficient time within a busy nursing unit, education on packaged equipment that could be reused, streamlining supplies, and labeled bins within the operating room that are both used for trash rather than the respective waste and



recycling as listed. Duplication of supplies were used on patients throughout the length of stay. The survey was used as an outlet to deflect other issues going on within the unit. Other items discussed include linen usage and straws for Styrofoam cups thrown out throughout the day.

### **Strengths to Overcome Barriers**

Strengths to overcome barriers include identifying the problems listed and finding solutions for each issue. The strengths include open communication between team members, honesty within survey results, and thoughts that were received through the open-ended questions on the survey. However, the project did not plan for these specific problems, as those working within the unit have identified issues. This opens a gateway for future projects and future studies that can be done to better the hospital system. This was the goal of the QI project to find ways to identify and eliminate waste in the OR.

### **Discussion**

The review of current evidence highlighted six main areas relating to barriers and facilitators to waste stream management and cost containment. Knowledge was the most significant barrier discussed throughout the review of the literature. This was also a large area mentioned in the survey's open-ended questions multiple times in this quality improvement project. It is both a barrier and facilitator to managing and segregating waste. Respondents still determined what was to be disposed of and requested education on the proper process.

The five Rs were discussed in the review of current evidence. This involves reducing, reusing, reinking, rethinking, and researching. All these elements can be illustrated throughout the survey respondents' comments. Multiple areas of reducing what is used were highlighted by streamlining supplies, reducing the number of supplies opened that are not needed, reducing the

amount of energy used by turning off lights, streamlining preference cards, and reducing the number of items pulled for a case opened, unused, and thrown away.

Reusable supplies are crucial to reducing waste. Many comments about using disposable laryngoscopes, blood pressure cuffs, monitoring straps, disposable towels, and disposable drapes are much waste in the labor and delivery units. These items are available in multiple-use selections and would significantly reduce the waste generated.

Recycling is a component that could be more generally focused on in the operating room or labor and delivery. The review of current evidence suggests that multiple items can be recycled in the operating rooms. The survey respondents were aggregable with recycling if they had the education and opportunity.

Rethinking is the most significant area that contributes to this change in practice. Rethinking how things are done and used can significantly decrease costs. One highlighted example from the discussion of this project seems to be the amount of linen taken into patients' rooms and left unused. Multiple cups and straws taken to patients during their stay is a way to rethink practices, resources, and daily routines. Research and quality improvement projects will continually reshape how we use resources and conserve supplies to increase cost and sustainability.

### **Conclusion**

Future recommendations for a practice-based change will hinge on Piaget's theory of cognitive development and fall under the accommodation category, the ability for behavior to be modified and a new skill learned. This would occur through education and modifying the employees' behavior to comply with reducing waste and produce sustainability for this endeavor. Furthermore, a change protocol needs to be discussed with leadership on the efficacy of the

PDSA framework to support this quality improvement project and move change forward.

Education programs on waste reduction, cost, and resource conservation should become a yearly educational module. This framework should also be integrated into new employee orientation.

The leaders of the obstetrical unit were the primary stakeholders in this change.

Resources need to be inventoried for duplication and reduction plans. Once the items are identified as such, a plan needs to be in place to reduce resources and dissemination of education.

Research shows that education and training can decrease waste by 6.5% each month (Beloeil & Albaladejo, 2021). Education on cost and resource reduction will be most beneficial for change and sustainability.

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## Appendix A

### Recruitment Script

Dear Labor and Delivery team members,

I am a Certified Registered Nurse Anesthetist and a post-master's Doctor of Nursing Practice (DNP) student at the University of North Carolina Greensboro School of Nursing. I am asking you to participate in my DNP project by completing this 15-question survey which should take approximately 3 minutes.

This email includes an information sheet about the study and details that by beginning the survey, the participant gives their consent, participation is voluntary, that the participants may withdraw at any time, and that there are no incentives or monetary gifts for completion of the survey. This email will include a link to Survey Monkey for the electronic questionnaire. Your name or other identifying information will not be requested on the survey.

This Doctor of Nursing Practice Capstone Project aims to identify the barriers and facilitators to recycling in Obstetric operating rooms and the labor and delivery unit as perceived by certified registered nurse anesthetists, registered nurses, and surgical scrub technicians. Would create waste management and recycling protocol in conjunction with educational guidelines promote acceptance, knowledge, and sustainability for recycling in the operating room instead of the current waste stream management and segregation? The project has four primary purposes: 1) To identify existing barriers to recycling as perceived by operating room and labor and delivery staff; 2) to identify existing facilitators to recycling as perceived by operating room and labor and delivery staff; 3) to explore what will be needed to develop and implement a recycling and waste stream management protocol in the labor and delivery unit and operating room; 4) to develop a recycling and waste stream management protocol along with educational guidelines for the staff on the labor and delivery unit and in the labor and delivery operating room.

Your responses will remain anonymous, and participation in this survey is entirely voluntary. You may opt to quit the study at any time or select "decline to answer" any question. Consent for this study will be given when you begin the survey. Your participation will not in any way impact your employment with Cone Health. A summary of the data will be presented to the UNC Greensboro School of Nursing Faculty as a partial requirement for program completion.

Thank you for your time.

Angela Rickelton, CRNA

Please direct all questions or concerns related to this survey to:

Principal Investigator: [amdraugh@uncg.edu](mailto:amdraugh@uncg.edu)

## Appendix B

### Posters for QI project





## Appendix C

### Survey Questions

Proposed questions for SurveyMonkey® on Going green in Labor and Delivery

1). What is your age?

a. <30 years b. 30-45 years c. 46-60years d. 61-75years e. > 75

2). What is your gender?

a. Male b. Female c. nonbinary d. Transgender e. self-description \_\_\_\_\_

3). What best describes your current position?

a. CRNA b. RN c. Surgical scrub technologist d. tech

4). How long have you worked at this facility?

a. Less than a year b. 1-5 years c. 6-10years d. more than ten years

5). Do you recycle at home?

a. never b. sometimes c. often e. always

Core questions:

6). I feel it is a reasonable request to recycle in the Operating room.

a. strongly agree b. Disagree c. Neutral d. Agree e.strongly agree

7). I am concerned about the amount of waste generated in the Labor and Delivery unit and in the Operating room.

a. strongly agree b. Disagree c. Neutral d. Agree e.strongly agree

8). Waste management, recycling or cost containment should be part of the hospital orientation?

a. strongly agree b. Disagree c. Neutral d. Agree e. Strongly agree

9.) I see regular waste disposed of in contaminated waste containers frequently.

a. strongly agree b. Disagree c. Neutral d. Agree e. Strongly agree

10). We have time to dispose of waste properly and/or recycle.

a. strongly agree b. Disagree c. Neutral d. Agree e. Strongly agree

11). Improving hospital waste stream management would be cost effective.

a. strongly agree b. Disagree c. Neutral d. Agree e. Strongly agree

12). I see a lot of waste in my department

a. strongly agree b. Disagree c. Neutral d. Agree e. Strongly agree

13) In your own words please identify areas of waste you see in your department.

14). In your own words please identify ways you feel improvements can be made regarding waste.

15). In your own words please feel free to add anything you would like that was not discussed in this survey regarding waste and waste stream management.