Assessing and Addressing Drug and Material Anesthesia Waste: A Quality Improvement Project at the VA Portland Health Care System (VAPORHCS)

Oregon Health and Science University

NURS 703: DNP Project

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Problem Description

Healthcare expenditure in the United States (US) is a constantly growing and costly endeavor for the American economy, as evidenced by the $3.8 trillion spent by the US on healthcare in 2019, accounting for 17% of the gross domestic product for the nation (CMS, 2020). Healthcare cost reduction is a priority topic, with the term 'waste' referring to various organizational and physical expenses (Shrank, 2019). Operating rooms (ORs) across the US are a prime opportunity to reduce physical waste. Surgeries are responsible for 25% of all physical hospital waste, with anesthesia responsible for 25% of OR waste (Axelrod et al., 2015). Efforts to reduce anesthetic waste include quality improvement projects to directly change anesthesia provider practice through new policies (Ammanuel, 2020; Jankowski et al., 2019) or to indirectly change practice by increasing provider awareness of waste and its cost (Gordon, 2020; Heiman, 2021; Yeoh et al., 2020). To date, neither quality improvement project has been implemented at the Veterans Affairs Portland Healthcare System (VAPORHCS) to assess the waste generated by its anesthesia department.

Available Knowledge/Background

According to the American Society of Anesthesiologists (ASA), diligent preparedness is a cornerstone and standard of care for anesthesia safety. Preparedness requires having medications (e.g., phenylephrine, succinylcholine, ephedrine) and airway supplies (e.g., endotracheal tubes or ETTs) opened and prepared before starting an anesthetic case. However, many of these prepared items go unused and account for significant preventable waste (Axelrod et al., 2015). Commonly wasted items belong to two broad categories: medications and supplies. Examples of over-preparedness include observational studies finding the cost of unused anesthetic drugs accounting for up to 30% of the total medication cost of each anesthetic (Weinger, 2001) and that wasted anesthetic drugs represented 46% of the total drug cost of one hospital's anesthesia cases (Chaudhary et al., 2012). Regarding wasted airway supplies, another study assessed the cost of opened and unused ETTs amounting to $4092 per week, or over $200,000 annually (Denny, 2019). Cost-saving measures have arisen from attempts to identify the causes of waste. Despite numerous studies measuring operating room or surgical team waste, few studies assess the effects of anesthesia-specific methods to curtail waste generation. One approach to minimizing drug or airway supply wastage during room setup is to standardize the

practice of preoperative anesthesia cart setup, thus eliminating provider-to-provider variance and potential for waste without sacrificing safety (Faircloth, 2013). Another method to reduce anesthetic waste involves preoperative airway setup recommendations combined with targeted education to expand provider awareness of waste (Denny, 2019).

Rationale

The Institute for Health Care Improvement (IHI) Model for Improvement (MFI) and Plan-Do-Study-Act (PDSA) methodologies guides the inquiry into diminishing anesthesia waste. The MFI framework exists to identify the aims of change, measures of change, and potential interventions before implementing PDSA (Langley, 2009). PDSA cycles employ small-scale testing of interventions and subsequent adaptation of interventions over multiple cycles to develop a fit-for-purpose solution to meet the VAPORHCS aims (Taylor et al., 2014). The project methods and findings were reported using the Standards for Quality Improvement Reporting Excellence: SQUIRE 2.0 guidelines (Ogrinc et al., 2016).

Specific Aim

Identify and estimate the quantity and cost of VAPORHCS anesthetic waste by March 2022. Educate the VAPORHCS anesthesia staff about their baseline waste and provider practice and reassess for a reduction in the frequency of overall waste and of specific anesthetic items by May 2022.

Context

The VAPORHCS is a large acute-care medical center located in Portland, Oregon. The VAPORHCS contains fourteen operating rooms with six non-operating room sites, allowing for the completion of over thirty-three thousand surgical procedures between January 2015 and October 2020. Surgical specialty services offered at VAPORHCS include cardiology, ENT, general surgery, gastroenterology, gynecology, interventional radiology, neurosurgery, ophthalmology, orthopedics, plastic surgery, podiatry, pulmonology, thoracic, transplant, urology, and vascular surgery. The intraoperative anesthesia team, consisting of staff CRNAs, physician anesthesiologists, SRNAs, and anesthesia residents, assume responsibility for this broad assortment of cases. VAPORHCS hospital

leadership supports QI through auxiliary departments such as Research and Development, Nursing Professional Services, and the Evidence-Based Practice Committee.

With the onset of the Coronavirus pandemic starting in 2019, the subsequent cancelation of elective surgeries, and the reorganization of staff responsibilities to aid the intensive care unit, VAPORHCS was unable to pursue an assessment of their anesthetic waste. During these two years, senior anesthesia department leaders showed interest in root-cause analysis of supply chain issues, environmental impact, and potential cost-savings measures related to assumed excessive anesthetic waste. With pre-COVID surgical volume and staffing resuming in 2022, VAPORHCS renewed attention to evaluating anesthetic waste.

Intervention

The planned intervention was to establish a baseline collection of anesthetic waste, followed by staff education and a post-education collection of waste. Communication between the Chief Anesthesiologist, Chief CRNA, anesthesia technician manager, and CRNA Educator and authors defined the timeline and method of both waste collections. The first PDSA cycle, a baseline collection of anesthetic waste, was a 10-day Monday- Friday assessment beginning in March 2022. Anesthesiologists and CRNAs responded to an email survey to assess practice preferences in early April 2022. Two-part staff education occurred in late April 2022 as follows:

1. A live online presentation for all staff members regarding:
    a. Categorize the first collection items by waste type, frequency, and cost.
    b. Emphasize the most frequently wasted and most expensive wasted items
    c. Compare provider practice survey opinions to actual waste.
    d. Discuss opinions about the collection and survey results.
2. Laminate cards with the collection’s most frequently wasted and most expensive wasted items and position on each anesthesia supply cart.

The second PDSA cycle, a post-education collection of anesthetic waste, was another 10-day Monday- Friday assessment conducted in May 2022.

Both PDSA collections involved the cooperation of anesthesia technicians and SRNAs for data collection. Anesthesia technicians collected all medications and supplies removed from the anesthesia carts while turning over the anesthesia workspace for subsequent procedures. SRNAs categorized the collected items at the end of each weekday. SRNAs measured and analyzed the quantity of open and unused items as preventable anesthetic waste. They did not record the quantity of opened and partially used medications or supplies.

Study of the Intervention + Measures

The primary outcome measures were 1) quantity of wasted anesthetic medications and supplies over the ten-day collection period and 2) cost of wasted anesthetic medication and supplies, extrapolated to annual cost estimates. The intervention process measure assessed the difference in cost and quantity of medications and supplies before and after staff education. A balancing measure we could not account for was the increase in anesthesia technician workload to collect waste after each case. A balancing measure we attempted to address was identifying provider opinions of wasteful practice before making practice recommendations.

Analysis

Quantitative data was accumulated by the authors between February 28, 2022, to March 11, 2022, for cycle one and May 2-13, 2022, for cycle two. The quantitative data obtained during PDSA cycle one was entered into Microsoft Excel spreadsheets and data were summarized into pie and column charts. Qualitative survey responses to Likert-type questions were subdivided into themes and represented by bar graphs. These graphics were utilized during the educational intervention. Retrospective case completion and cancelation data was obtained to compare sample homogeneity. Mann-Whitney U Tests were used to assess for statistical differences between PDSA cycle one and two average waste cost and quantity, see figures… A p-value of <0.05 was considered significant.

Ethical Considerations

Ethical considerations involved ensuring HIPAA compliance during waste materials collection. This was accomplished by ensuring the materials were free of patient identifying information, removing patient labels from syringes or vials, and ensuring the omission of patient or case information as case numbers were tracked during data collection intervals. All data SRNAs

collected remained free from patient identifiers, all survey results were randomized and anonymized, and all data were stored in password-protected, multi-factor-authenticated documents and spreadsheets accessible only by the study's authors. Survey data collected from anesthesia staff at VAPORHCS was collected anonymously.

The authors have no conflicts of interest to report. The project was determined not to be human research by the OHSU Institutional Review Board (IRB) (Appendix E: OHSU IRB Memo for STUDY00023906). It was also determined by the Portland VA's IRB to meet their definition of a QI project and was not designated as research (Appendix D: Portland VA IRB Application). The authors would like to acknowledge the burden borne by the anesthesia technical staff as they collected waste anesthesia materials throughout the study periods and express their gratitude for their assistance.

Results/Discussion

Between February 28 and March 11, 2022, before the educational intervention, anesthetic waste was collected from 184 surgical cases, resulting in 66 wasted medications amounting to $263.81 and 180 wasted anesthetic supplies amounting to $260.24. The authors discussed PDSA cycle one results with anesthesia department stakeholders to select critical discussion points for the educational intervention. A 30-minute Microsoft Teams meeting of the VAPORHCS anesthesia department occurred on April 21, 2022, to present the key findings. The laminated cards posted on each anesthesia cart addressed the reduction of wasted ephedrine and IV pump cassette tubing, the medication and anesthetic supply with the highest cost burden (12% and 14% of PDSA cycle one cost, respectively), and 10ml normal saline flushes, the most frequently wasted medication (22% of PDSA cycle one medication). PDSA cycle two, a post-intervention collection of anesthetic waste from 216 surgical cases, occurred between May 2 and May 13, 2022, resulting in 46 wasted medications amounting to $290.94 and 116 wasted anesthetic supplies amounting to $72.49.

This DNP project generated a baseline assessment of anesthetic medication and supply waste at VAPORHCS. The project aimed to reduce overall waste quantity and cost by applying an educational intervention within the anesthesia department (Denny, 2019). PDSA cycle two results found a statically significant decrease in the average daily quantity of anesthetic supply waste. PDSA

cycle two results did not recognize a significant decrease in the average daily cost or quantity of medication waste or daily cost of anesthetic supplies.

Summary

This DNP project assessed the baseline of anesthetic waste at VAPORHCS between February 28 and March 13, 2022. Using the Model for Improvement, we planned two PDSA cycles. The first cycle accumulated baseline data and informed the objectives for waste reduction. Before implementing the second cycle, the project employed practice recommendations and provider education to reduce anesthetic medication and supply waste cost and quantity (Denny, 2019). Our second PDSA cycle assessed the efficacy of the recommendations and education to influence provider practice and reduce waste at VAPORHCS. The average daily quantity of anesthetic waste significantly decreased post-intervention, leading to cost savings.

Interpretation

We conclude that practice recommendations and provider education significantly decrease the average daily quantity of anesthetic waste. In line with our aims, we saw a reduction in the overall frequency of wasted medications and supplies and a reduction in the four most frequently wasted items from PDSA cycle one. Our data do not show a direct correlation between the intervention and a significant reduction in the cost of anesthetic waste. We recognize that the wide range of individual medication and supply costs considerably impacts the collection cost. For example, although 30% fewer medications were wasted in PDSA cycle one, the average cost of PDSA cycle two medications was 50% more expensive than in cycle one. Most notably, two wasted medications in PDSA cycle two accounted for 57% of the total waste cost of the collection. Despite failing to reach a significant reduction in waste cost based on test statistics, we estimate our intervention education saves roughly $5000 in anesthetic waste per year at VAPORHCS.

The collection results share similarities to another study measuring anesthetic waste before and after an educational intervention. Specifically, we found a single 30-minute educational presentation before the start of a second waste collection and the use of laminated information cards insufficient to influence practice changes to significantly reduce total anesthetic waste cost (Denny, 2019). Quarterly continuing education efforts highlighting recent and most relevant wasted items are

likely keys to achieving practice change and this waste reduction aim. Before waste collection and the intervention, stakeholders identified that anesthesia providers at VAPORHCS highly value the individuality of preparedness. We confirmed this impression with our post-intervention data collection. Further insight into provider attitudes on safe practice may be necessary to generate a significant culture change and an overall reduction in preventable waste.

Limitations

The primary limitation of this study was the small sample size which limited greater generalizability of the results. Short collection periods led to small collection totals from which it was difficult to draw statistical significance except in one comparison arm. Other limits to the generalizability included the inability to control for case variables such as the type of anesthetic administered (e.g., monitored anesthesia care versus general anesthesia) and the lack of anesthesia support staff which could have facilitated an extended collection period. Limitations to the study's internal validity included the inability to control for surgical case type, the power of one or two uncommonly expensive medications (e.g. dexmedetomidine or vasopressin) to skew collection cost data, and variations in provider practices surrounding waste generation. For example, an anesthesia provider may have thrown away waste before it could be collected by a technician). Certain biases may have affected the study's validity as well, including possible omitted variable bias occurring during the second selection cycle when anesthesia providers modified their waste generation practices having been forewarned of the collection period, possible author bias governing the definition and interpretation of various terms such as "acceptable waste" or even "waste" in general (e.g. the acceptability of opening a 1 mL vial of vasopressin in order to only use 0.1 mL of that vial).

Conclusion

Healthcare expenditures continue to rise in the United States, and hospitals seek ways to identify and reduce unnecessary waste. Anesthesia departments contribute roughly 25% of the total waste generated by operating rooms and are, therefore, the targets of studies and interventions seeking to reduce healthcare costs. This quality improvement project identified the baseline degree of waste generated at the VAPORHCS, implemented a multifaceted interventional strategy, and generated statistically significant reductions in the daily quantity of wasted anesthetic medications. Meaningful,

though not statistically significant, reductions were also seen in daily waste cost and quantity for medications and materials, with targeted items experiencing great improvements. Because pervading practice cultures surrounding waste were also addressed, a more generalizable conversation was created concerning core concepts such as “acceptable waste” to increase the sustainability of practice changes at the VAPORHCS. Given the usefulness of this intervention, further investigations are indicated to identify additional areas for waste reduction. Further PDSA cycles might seek to address and reduce the incidence of low-frequency, high-cost waste events.

References

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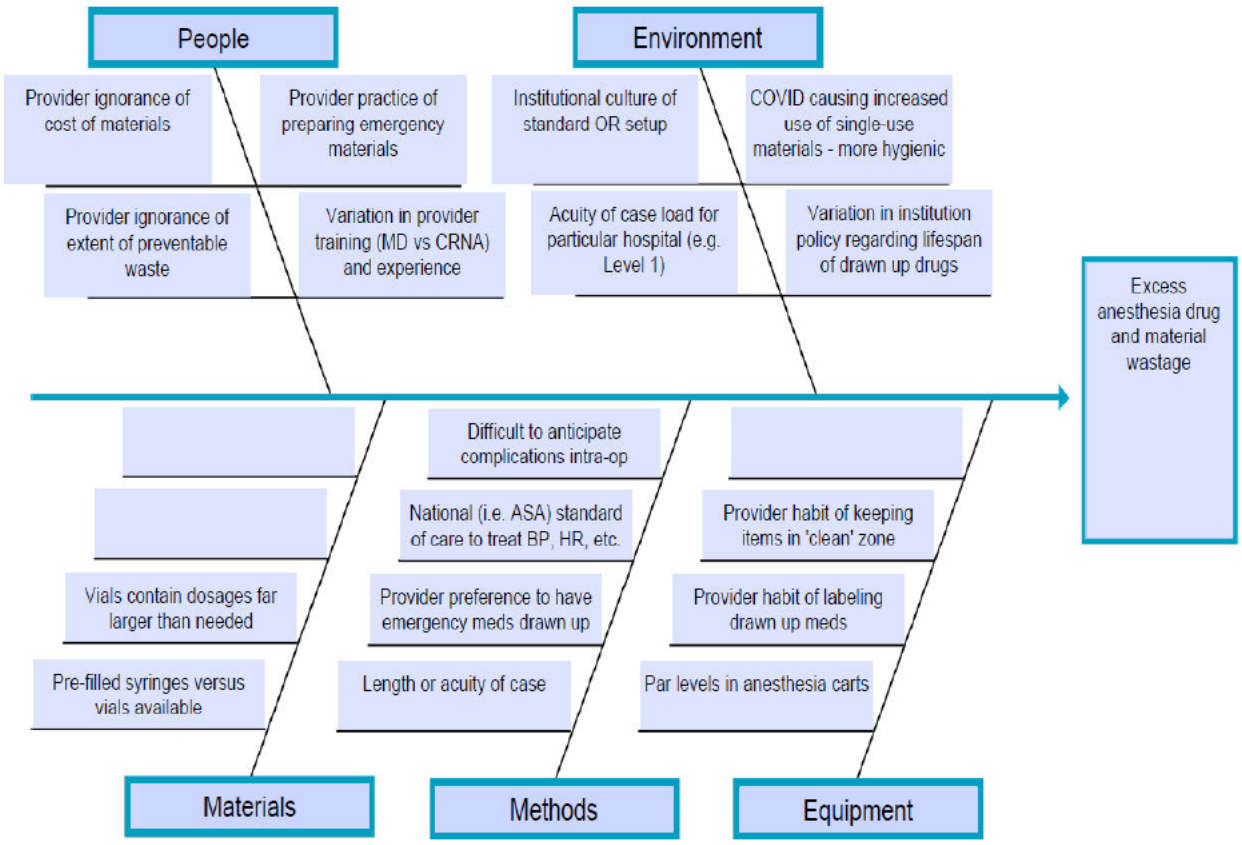
Appendix A

Project Timeline

	Dec	Jan	Feb	Mar	Apr	Jun
Finalize project design and approach (703A)	X					
Complete IRB determination or approval (703A)	X					
PDSA Cycle 1 (703B)			X	X		
PDSA Cycle 2 (703B)					X	
Final data analysis (703B)					X	
Write sections 13-17 of final paper (703B)						X
Prepare for project dissemination (703B)						X

Appendix B

Cause and Effect Diagram



Appendix C

Sample Survey

Occupation	CRNA, Anesthesiologist, Resident	
Years of Providing Anesthesia	< One Year, 2-5 Years, 5-10 Years, >10 Years	
Do you consistently draw up the following medication before starting an OR case? *** Web survey to involve each medication as an individual question		
Relaxant: - Rocuronium - Succinylcholine - Vecuronium	Yes - %	No - %
Emergency Meds: - Atropine - Ephedrine - Epinephrine - Glycopyrrolate - Phenylephrine - Vasopressin	Yes - %	No - %
Do you prefer:	Pre-filled syringes	Drawing up medications

Appendix D

IRB Application

VA Portland Health Care System (VAPORHCS)
Institutional Review Board (IRB)
CHECKLIST: QUALITY ASSURANCE OR IMPROVEMENT (QA/QI) OR RESEARCH?

Instructions: In accordance with VHA Handbook 1058.05, "VHA Operations Activities[1] That May Constitute Research", VAPORHCS employees may conduct certain operations activities which may or may not constitute research. Whenever the research versus non-research status of an operations activity may be in question, a determination of the status must be made.

Please submit this form to the VAPORHCS Research Office by sending a scanned, signed copy to pvamc-irb@va.gov or via fax to 503-273-5152. Please reference the VHA Operations Activities that May Constitute Research decision tree for an overview of how a decision between research and non-research activities is determined.

Project Title: Drug and Material Waste at VAMC	
Responsible Project Lead: Reynaldo Calaro DNAP CRNA	**Email**: Reynaldo.Calaro@va.gov
Department: Anesthesia Department	**Role/Title**: Clinical Coordinator
Are VAPORHCS Medical Center nurses members of the project team? *If yes, once a determination is made, a copy of this signed form will be sent to the Evidence Based Practice Nursing Committee*	☐ YES ☑ NO

CONDITIONS TO BE CONSIDERED FOR DETERMINATION OF RESEARCH VS. NON-RESEARCH OPERATIONS		
NOTE: If answers to questions 1 through 11 are marked **"TRUE"** the project is more than likely not research. *For answers that are marked "false," please provide an explanation in the text fields below regarding how this project may still be QA/QI or contact pvamc-irb@va.gov for guidance.*	**TRUE**	**FALSE**
1) The project is designed and/or implemented for internal VA purposes in support of the VA mission(s).	☑	☐
2) The findings are designed to be used by and within VA (or by entities responsible for overseeing VA).	☑	☐
3) The project is not designed for the purpose of contributing to generalizable knowledge.[2]	☑	☐
4) The project is not designed to produce information that expands the knowledge base of a scientific discipline (or other scholarly field).[2]	☑	☐
5) The project is not funded or otherwise supported as **research** by the Office of Research and Development (ORD) or any other entity (including the Center for Healthcare Equity Research and Promotion [CHERP] or the VISN 4 Competitive Pilot Project Funding [CPPF] program).	☑	☐
6) The project does not involve administration, dispensing and/or use of any drugs, devices and/or biologics.	☑	☐
7) The project does not involve design characteristics typically reflective of research, e.g.: • Double-blind interventions • Use of placebo controls • Prospective patient-level randomization to clinical interventions not tailored to individual benefit	☑	☐

VA Portland Health Care System (VAPORHCS)
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8) The proposal includes provisions to ensure that the safety, rights, and welfare of patients and staff are appropriately protected as applicable.[3]	☑	☐
9) The project is **not** intended to meet the requirements set forth by a masters program (or other university level degree program) that requires "research" be conducted.	☑	☐
10) The activity **will not be** supplemented or modified before, during, or after implementation in order to produce information to expand the knowledge base of a scientific discipline or scholarly field of study or otherwise contribute to generalizable knowledge.	☑	☐

PROJECT DESCRIPTION
Reason for Project ☑ Locally initiated ☐ Mandated by ☐
In the following fields, please provide enough information about the proposed project that a reviewer understands why and how the work will be performed. Please define all acronyms.
Objectives(s): *What is the purpose of the project? What are the issues/questions being addressed and why?* **This project shall identify and address the wasting of medications and materials by anesthesia providers in operating rooms from January to June of 2022.**
Methodology: *How will the work be conducted and where? Who will be involved? Please be detailed in how the work will be conducted including data collection and analyses.* **We are Doctor of Nursing Practice (DNP) students at OHSU in the Nurse Anesthesia program and are working with Reynaldo Calaro, our DNP Project advisor and clinical coordinator, to implement an improvement science project in the operating rooms at VAMC during the period of time between January and June of 2022. In our project, we hope to first ascertain the quantity of items commonly wasted at the end of each surgery (e.g. certain medications, breathing tubes and adjuncts) by spending one week working in concert with anesthesia technicians to collect and catalogue these items between surgeries. We shall then distribute a short survey to anesthesia providers to gauge awareness of the issue of these commonly wasted items. Our primary intervention shall be a short educational presentation to the anesthesia providers describing the background of the problem, identifying the most commonly wasted items and the current extent of the waste, and finally requesting a change in practice whereby fewer items shall be wasted. Additionally, we shall place laminated cards on each anesthesia cart in the operating rooms which summarizes the new changes to workflow practices. After the intervention, we shall again spend one week collecting and cataloguing these same wasted medications and items, and will compare pre- versus post-intervention figures to evaluate the efficacy of our intervention. The quantitative data collected will represent quantities of items collected and categorized by the study authors, responses on Likert scale survey questions distributed to anesthesia providers, and responses to closed-ended questions. These data shall be collected via Qualtrics software, stored and analyzed in Microsoft Excel and Qualtrics as applicable, and shall not contain any identifiable information. Qualitative data in the form of responses to survey questions shall be organized by theme and sub-theme into tables and/or bar graphs as appropriate. All data shall be stored in password-protected databases, accessible only by the study authors.**

VA Portland Health Care System (VAPORHCS)
Institutional Review Board (IRB)
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Impact/Significance: *What will be done with resulting information?* **We shall complete this improvement science intervention in fulfillment of our DNP requirements, and shall write a paper and give a presentation upon completion of the project. This information will be shared with our nurse anesthesia program as well as the general DNP program for final review.**

Signature of Responsible Project Lead[4]: REYNALDO D CALARO 992817 Digitally signed by REYNALDO D CALARO 992817 Date: 2021.12.08 07:49:58 -08'00' Date: _____

Print Name of Responsible Project Lead: Reynaldo Calaro

For projects that involve using/collecting data from sites other than those covered by the VAPORHCS

1. *If the project is being* ***conducted/coordinated*** *at a site other than the VAPORHCS:*

   Signature of Medical Center Director:_____ Date: _____

2. If your project includes obtaining data or participation from VA sites other than those covered by the VAPORHCS you must request approval from the facility director(s) prior to initiating the project at those facilities.

FOR VAPORHCS IRB OFFICE USE ONLY BELOW THIS LINE

VAPORHCS ACOS/R&D Determination:
Note: The VAPORHCS ACOS/R&D has been designated by the VA Portland Health Care System Director and the VISN20 Network Director to serve as the individual who will evaluate and document the determination for projects conducted at the following VISN20 facilities: Alaska, Spokane, Walla Walla, Roseburg, and White City.

☑ **Not Research**. The ACOS/R&D has determined that based on the responses above and the proposed project description approval by an IRB or other review committee is not needed. The project is considered to be non-research VHA operations activity. If the results of this project are presented or published they cannot be presented as research, nor does it have research approval.

☐ **Research Project**. As designed this project requires review by an IRB or other appropriate review committee *prior* to initiation. Please refer to the VAPORHCS R&D website for guidance.

☐ Additional information is needed to make a determination. See comments below.

ACOS/R&D or IRB Analyst Comments:

VA Portland Health Care System (VAPORHCS)
Institutional Review Board (IRB)
CHECKLIST: QUALITY ASSURANCE OR IMPROVEMENT (QA/QI) OR RESEARCH?

VAPORHCS ACOS/R&D Signature. _____ _____

Reference:

VHA Handbook 1058.05: VHA Operations Activities That May Constitute Research

[1]Examples of operations activities include activities designed for internal VA purposes, including routine data collection and analysis for operational monitoring, evaluation and program improvement purposes, VHA system redesign activities, patient satisfaction surveys, case management and care coordination, policy and guidance development, benchmarking activities, Joint Commission visits and related activities, medical use evaluations, business planning and development such as cost-management analyses, underwriting, and similar activities.

[2]Any change made before, during, or after implementation that results in an intent to expand the knowledge base of a scientific discipline or scholarly field of study, or otherwise contribute to generalizable knowledge, constitutes research and must be submitted to an IRB or other pertinent review committee.

[3]Potential risks (including physical, psychological, social, financial, privacy, and confidentiality, and other foreseeable risks) associated with non-research operations should be evaluated and appropriate protections established to mitigate them.

[4]Please note it is the responsibility of this individual and/or each VA author and coauthor (in cases of publication) to retain a copy of this form signed by the ACOS/R&D for a minimum of 5 years after publication and in accordance with any applicable records retention schedules. A copy will also be retained by Research Service and Quality & Performance Service.

Appendix E

Letter of Support from Clinical Agency

Date: *12/07/2021*

Dear Giordan Dolan Umipig and Christopher Lennard,

This letter confirms that I, Reynaldo Calaro, allow Giordan and Christopher (OHSU Doctor of Nursing Practice Students) access to complete his/her DNP Final Project at our clinical site. The project will take place from approximately 01/03/2022 to 06/10/2022.

This letter summarizes the core elements of the project proposal, already reviewed by the DNP Project Preceptor and clinical liaison (if applicable):

- **Project Site(s)**: Veterans Affairs Medical Center
- **Project Plan: Use the following guidance to describe your project in a <u>brief</u> paragraph.**
    - Identified Clinical Problem: The clinical problem being addressed is the magnitude of medications and materials (e.g. breathing tubes and accessories) being wasted by anesthesia providers in operating rooms.
    - Rationale: By utilizing the Model for Improvement (MFI) and Plan Do Study Act (PDSA) methodologies, we imbue our intervention with the rationale whereby identifying waste shall expose areas of practice in which small changes may lead to cost savings.
    - Specific Aims: Our project shall identify and describe the degree of preventable drug and material waste and shall utilize educational interventions to reduce said waste by at least 25% by June 10, 2022.
    - Methods/Interventions/Measures: Our outcome measures shall be the quantity of collected medications and materials on two separate occasions, both before and after our primary intervention, that being a short educational session for anesthesia providers which shall identify the magnitude of the problem and describe suggested practice changes to reduce waste of these items.
    - Data Management: The quantitative data collected will represent quantities of items collected and categorized by the study authors, responses on Likert scale survey questions distributed to anesthesia providers, and responses to closed-ended questions. These data shall be collected via Qualtrics software, stored and analyzed in Microsoft Excel and Qualtrics as applicable, and shall not contain any identifiable information. Qualitative data in the form of responses to survey questions shall be organized by theme and sub-theme into tables and/or bar graphs as appropriate. All data shall be stored in password-protected databases, accessible only by the study authors.
    - Site(s) Support: The study site shall agree to allow the authors entry into the operating rooms during the period of time in two separate weeks between cases in which anesthesia technicians are engaged in duties pertaining to disposal of waste and preparation for the next surgery. The site shall also agree to allow for the distribution of two short surveys to anesthesia staff as well as daily email reminders of clinical practice changes after the educational intervention.

- Other: N/A

During the project implementation and evaluation, Giordan Dolan Umipig and Christopher Lennard will provide regular updates and communicate any necessary changes to the DNP Project Preceptor.

Our organization looks forward to working with this student to complete their DNP project. If we have any concerns related to this project, we will contact Giordan Dolan Umipig and Christopher Lennard and Reynaldo Calaro (student's DNP Project Chairperson).

Regards,

DNP Project Preceptor