

Surgical Smoke Evacuation at Walter Reed National Military Medical Center: Ensuring Ready Reliable Surgical Procedures by Implementing an Evidence-Based Bundle

MAJ Jehna Larivee BSN, RN, CNOR, USA, AN; Maj Danielle Lawton MSN, APRN, AGCNS-BC, CNOR, USAF, NC;
 LCDR Erin Macdonald MSN, APRN, AGCNS-BC, CNOR, USN, NC; LTC Ashlea Richmond MBA, BSN, RN, CNOR, USA, AN
 Daniel K. Inouye Graduate School of Nursing, Uniformed Services University of the Health Sciences, Bethesda, MD

Significance of the Problem

- Surgical smoke exposes perioperative staff and patients to live viruses, infectious bacteria, carcinogenic chemicals, and biohazardous materials
- Daily exposure equates to smoking **30** unfiltered cigarettes
- **500,000** U.S. healthcare workers are exposed to surgical smoke annually
- **Smoke evacuation is recommended by:**
 - The Joint Commission (TJC)
 - Centers for Disease Control and Prevention (CDC)
 - National Institute for Occupational Safety and Health (NIOSH)
 - Occupational Safety and Health Administration (OSHA)
 - American Medical Association (AMA)
 - American College of Surgeons (ACS)
 - Association of periOperative Registered Nurses (AORN)
 - Association of Surgical Technologists (AST)
- Consensus of these organizations is the use of smoke evacuation systems at the surgical site is the most effective mitigation strategy to reduce risk
- Despite substantial hazards and low compliance, only **20** states require surgical smoke evacuation and **16** of **83** Military Treatment Facilities are smoke-free. Walter Reed National Military Medical Center wants to join this elite group and become smoke-free and nationally recognized



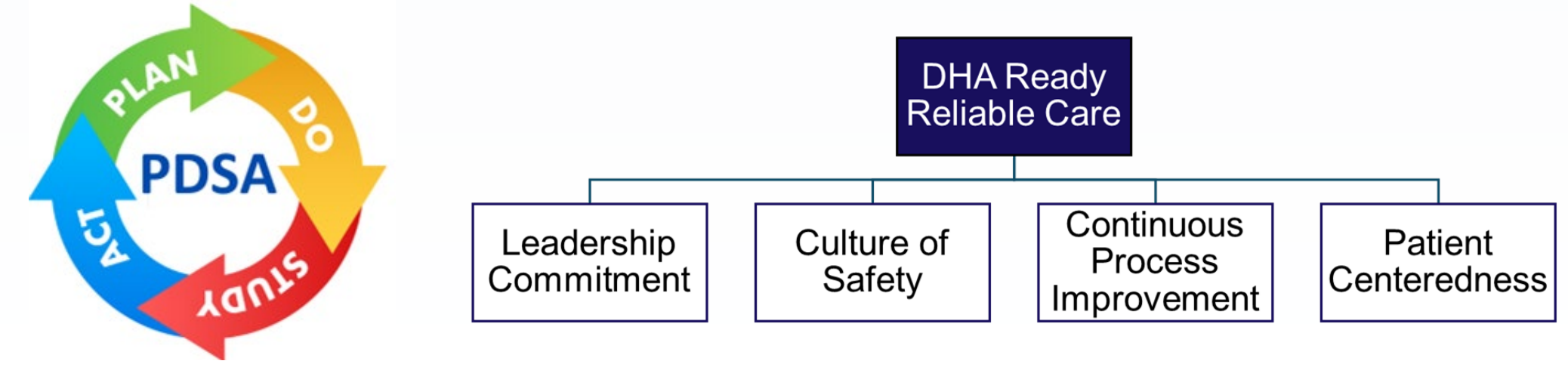
Purpose

For perioperative personnel at WRNMMC does the implementation of an evidenced-based smoke evacuation bundle compared to baseline smoke evacuation knowledge increase the compliance of smoke evacuator usage in the operating room over a 12-month period?

Project Design

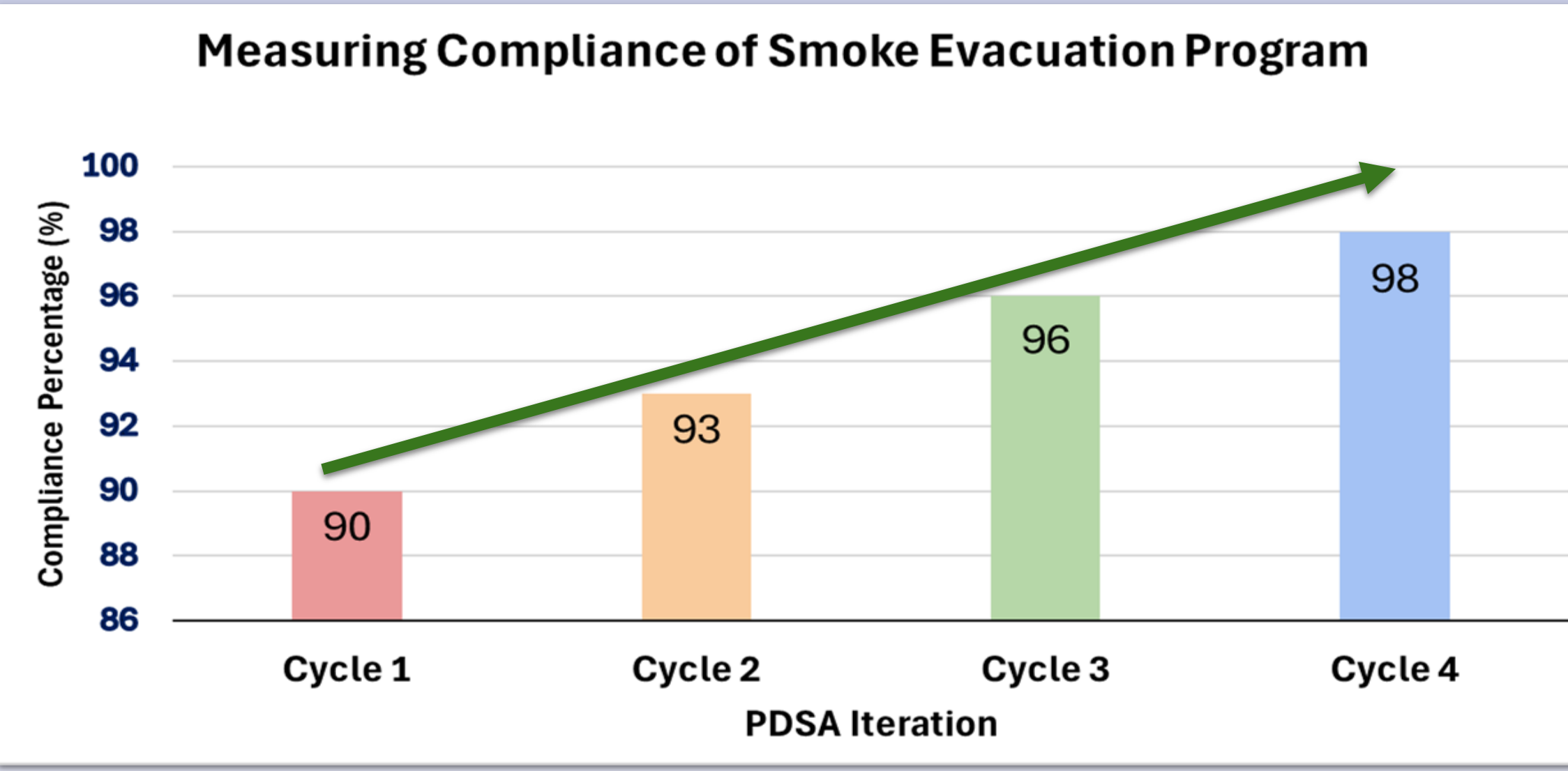
- This project used the AORN Go Clear™ smoke evacuation compliance audit tool as the foundation to assess compliance with the use of smoke evacuation devices within the operating room
- An evidence-based bundle: committee development, interdisciplinary education, competency creation and assessment, policy review, environmental engineering assessment, and logistical standardization were all included in the design process
- Plan-Do-Study-Act (PDSA): Quality Improvement (QI) framework used for conducting audit/feedback cycles
- Assessment of compliance with smoke evacuation procedures included:
 - 20 operating rooms
 - 4 iterative PDSA cycles over a 12-month period (Jan - Dec 2025)
 - Feedback provided to stakeholders after each iteration
- Defense Health Agency (DHA) Ready Reliable Care: enhances the occupational environment for perioperative personnel and optimizes patient care

Organizing Framework



Project Results

Project dates: Jan - Dec 2025
Project aim: To assess the implementation of surgical smoke evacuation compliance and interdisciplinary education within the operating room at WRNMMC
Improvement: Smoke evacuation compliance increased by **8%**




Analysis of Results

Cycle Objectives	Project Results	Findings	Causative Factors	Recommendations
PDSA Cycle 1 Dates: 6 Jan-14 Feb 2025				
<ul style="list-style-type: none"> • Conduct gap analysis • Pre-audit observations • Stakeholder engagement • Committee development 	<ul style="list-style-type: none"> • Devices available <ul style="list-style-type: none"> - 35 Stryker Neptunes - 5 Airseal insufflation devices - 4 Megadyne table top devices • Limited knowledge on smoke evacuation devices 	Audit dates: 15-24 Jan 2025 90% Compliant -Required: 30 -Used: 27 -Not Used: 3	<ul style="list-style-type: none"> • Unfamiliarity with smoke evacuation devices • Dissolved smoke evacuation committee 	<ul style="list-style-type: none"> • Reinstate committee to continue smoke evacuation program • Reinforce smoke evacuation education
PDSA Cycle 2 Dates: 15 Feb-08 Apr 2025				
<ul style="list-style-type: none"> • AORN Go Clear education • Surgeon AORN waiver • Audit 	<ul style="list-style-type: none"> • 38% Increase in AORN Education compliance • 3% Increase with smoke evacuation compliance 	Audit dates: 24 Feb-14 Mar 2025 93% Compliant -Required: 106 -Used: 99 -Not Used: 7	<ul style="list-style-type: none"> • Staff not provided dedicated time to complete AORN Go Clear education modules • Limited knowledge on use of laparoscopic smoke evacuation 	<ul style="list-style-type: none"> • Provide education on smoke evacuation devices and equipment • Implement competencies for perioperative staff
PDSA Cycle 3 Dates: 19 May-14 Aug 2025 *AORN GO CLEAR Audit*				
<ul style="list-style-type: none"> • Laparoscopic smoke evacuation education • Equipment education • Competency initiation 	<ul style="list-style-type: none"> • 77% Increase for competency for OR nurses • 37% Increase in competency for OR technicians • 3% Increase with smoke evacuation compliance • 100% waiver compliance 	Audit dates: 19 May-08 Aug 2025 96% Compliant -Required: 547 -Used: 523 -Not Used: 24	<ul style="list-style-type: none"> • Influx of surgical residents • Influx of new perioperative staff • No current competency • Logistical challenges with resupply 	<ul style="list-style-type: none"> • Competency creation for OR nurses and technicians • Competency assessment for all perioperative staff
PDSA Cycle 4 Dates: 02 Sep-12 Dec 2025				
<ul style="list-style-type: none"> • Competency continuation • Sustainment/validation audits • Apply for AORN Go Clear award • Transfer smoke evacuation program responsibilities 	<ul style="list-style-type: none"> • 2% Increase with smoke evacuation compliance • 82% Increase for competency for OR nurses • 51% Increase in competency for OR technicians • Application submitted 03 Nov & awarded 05 Nov 2025 	Audit dates: 10 Sep-15 Oct 2025 98% Compliant -Required: 103 -Used: 101 -Not Used: 2	<ul style="list-style-type: none"> • Consistent rotation of staff shifts • Military movement cycles 	<ul style="list-style-type: none"> • Continue competency completion • Continue sustainment audit to ensure compliance • Continue with Smoke evacuation committee • Triennial AORN Go Clear recertification

Lines of Effort	Baseline Compliance	End Result
Smoke evacuation committee development	Not active	Active
Smoke evacuation policy	100%	100%
Smoke evacuation device incorporation into surgical packs	0% (initiated in 2024)	97%
AORN Go Clear online education modules	54%	92%
Surgeon/Anesthesia AORN waiver completion	0%	100%
Laparoscopic smoke evacuation education	0%	24%
ULPA filter education	Unknown	31%
OR circulator competency assessments	0%	82% (ongoing)
OR technologist's competency assessment	0%	51% (ongoing)
Transfer of smoke evacuation responsibilities	Not active	Active

WRNMMC Recognized with the AORN Go Clear Award® for Leadership in Smoke-Free Surgery



Organizational Impact

Ready Reliable Care Outcomes
Leadership Commitment
<ul style="list-style-type: none"> • Stakeholder engagement and support promotes smoke evacuation compliance • Leadership support financially supports the use of smoke evacuation devices protecting perioperative staff and patients
Culture of Safety
<ul style="list-style-type: none"> • Smoke evacuation competency incorporation for perioperative staff/ new initial orientation competency update • Surgeon and anesthesia support promotes a culture of safety • Smoke evacuation committee meetings with staff SMEs identified
Continuous Process Improvement
<ul style="list-style-type: none"> • Incorporation of continued smoke evacuation compliance audits facilitates sustainment • AORN Go Clear award sustains commitment to providing a smoke free operating room • Annual smoke evacuation training will promote continuous process improvement and ensure all new perioperative staff understand the benefits of smoke evacuation
Patient Centeredness
<ul style="list-style-type: none"> • Enhancing smoke evacuation compliance protects perioperative patients from surgical smoke exposure minimizing SSI risk, preventing port-site metastasis, and reducing the harmful effects of surgical smoke exposure • Effective smoke evacuation practices promote optimized patient outcomes

Future Directions for Research and Practice

- Continued compliance of smoke evacuation in the operating room, safeguarding from surgical smoke exposure, and providing high-quality patient care
- WRNMMC received AORN Go Clear Award for recognition
- Investment in continuous evidence-based training and standardize smoke evacuation equipment
- DHA policies or clinical practice guidelines for smoke evacuation, including documentation in MHS Genesis, should be integrated to further promote and sustain smoke-free Military Treatment Facilities

"The authors would like to acknowledge our DNP Project Mentors: Dr. Laura Taylor, Dr. Kenneth Romito (Senior Mentor), Dr. Christy Mitchell, and Dr. Elena Brown, for their support, guidance, and assistance. Their time, effort, and dedication to this project is appreciated more than words can express. Additional gratitude is expressed for LTC Angela Howell, Dr. Shirley Jones, and HM1 Elizabeth Stack who initiated the implementation and cultural change needed for this project to be a success."

"The views expressed in this poster are those of the authors and do not necessarily reflect the official policy or position of the Uniformed Services University of the Health Sciences, the Department of War, or the United States government."

DHA Ready Reliable Care: Defense Health Agency. (n.d.). Ready Reliable Care. Accessed 18 September 2025 from https://dha.mil/About-DHA/Ready-Reliable-Care.
 Plan-Do-Study-Act: Melnyk, B. M., & Fineout-Overholt, E. (2019). Evidence-based practice in nursing & healthcare - a guide to best practice (Fourth edition.). Wolters Kluwer.

QR for lit review or Ref list here