Beyond What the Eye Can See: Verifying Surgical Instrument and Endoscope Cleanliness with Adenosine Triphosphate Technology

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Background and Significance

- Contaminated surgical instruments and endoscopes pose serious health complications for patients in the form of surgical site infections (SSIs) and are a causative factor in the upsurge seen in financial costs for healthcare organizations.
  - ✓In 2015, there were 687,000 healthcare-associated infections (HAIs) in the US, of which 110,000 to 300,000 were SSIs.
  - ✓SSIs account for 20% of HAIs with a risk of a 2 to 11-fold increase in mortality. SSIs are the costliest type of HAI estimated at $3 billion per year and $20,000 per readmission.
  - ✓It is estimated that 40-60% of SSIs are preventable. Decreasing contamination rates of surgical instruments is critical to mitigating the risk of SSIs.
  - ✓Surgical instruments and endoscopes can harbor bioburden, serving as a reservoir and medium for the transmission of highly infectious pathogens.
  - ✓Adenosine triphosphate (ATP) molecules within bioburden are undetectable to the naked eye making it difficult to detect when performing manual cleaning.
  - ✓Cleaning practices and visual detection of bioburden is dramatically impeded by lumens, crevices, coils, and today's design complexity in both surgical instruments and endoscopes.
  - ✓According to national guidelines, the monitoring of manual and mechanical cleaning should be done as part of quality assurance.
  - ✓Malcolm Grow Surgical Center (MGSC) verifies the endoscope manual cleaning process through protein testing however, they do not utilize any quality assessment tools to verify the manual cleaning process of instruments.
- Use of ATP technology provides an objective measure to verify instrument cleanliness and identify gaps in manual cleaning quality and practices, helping to decrease SSI risks and support a medically ready force.

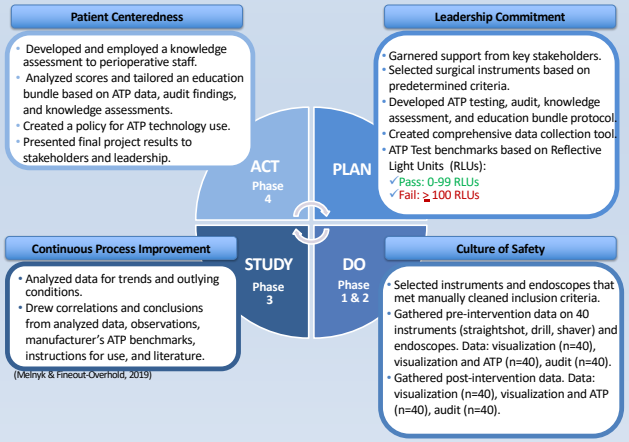
Purpose

Among manually cleaned surgical instruments and endoscopes at MGSC, how do audits and ATP testing with visual assessment compared to visualization alone increase bioburden detection and identify gaps in the cleaning process?

Project Design and Organizing Framework

Plan-Do-Study-Act Model:

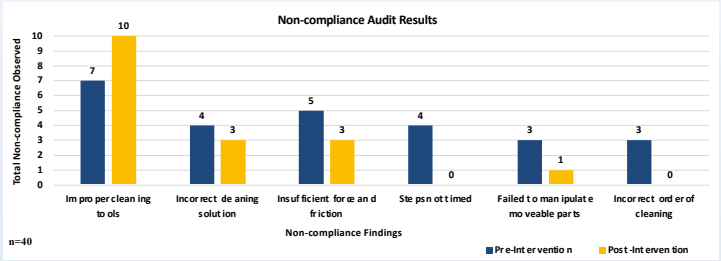
Piloting Change Through Ready Reliable Care Principles



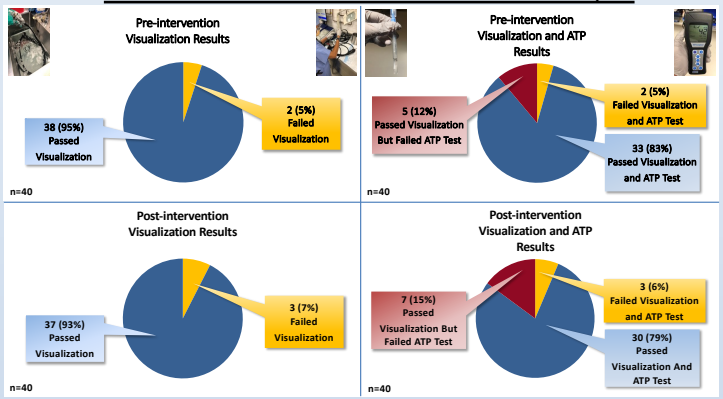
(Melnyk & Fineout-Overhold, 2019)

Results

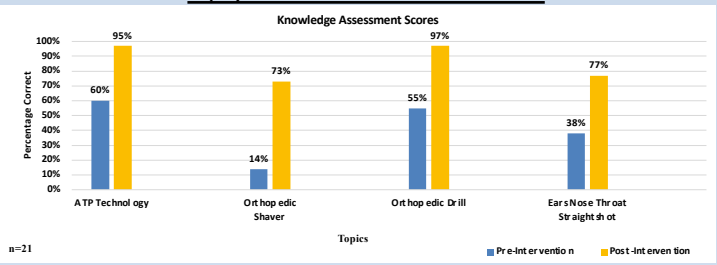
Phase 1: Performed Manual Cleaning Audits



Phase 2: Visualized and Tested 20 Instruments and 20 Endoscopes



Phase 3: Administered Knowledge Assessment Among Perioperative Staff, Employed Education Bundle and Reassessed



- Educational content focused on knowledge and practice gaps identified from Phase 1, 2, and 3.
- 91% of perioperative staff participated in a multimodal education bundle consisting of three visual cues, four simulations, six staff briefings, and six electronic notifications.
- The duration of the education bundle lasted three months.
- Knowledge and performance were commonly explored when reassessing outcomes.

Analysis of Results

Phases	Project Results	Findings	Causative Factors	Recommendations for Improvement
Phase 1 Manual Cleaning Audits	**35% decrease** in manual cleaning non-compliance.	Audits revealed critical step non-compliance and marked variances in manual cleaning.	Unfamiliarity with manufacturer and national guidelines.	Incorporate quarterly audits and implement solutions for identified gaps for a proactive approach.
Phase 2 Visualization and ATP Tests	**17 contaminated instruments** identified through visualization and ATP tests which **avoided $340K** in readmission costs.	The addition of ATP technology identified more contaminated instruments than visualization alone and confirmed visual inspection results on failed instruments.	Reliance on visual inspection and failure to utilize adjunct technology to assess instrument cleanliness.	Purchase additional visual aids and ATP technology to enhance bioburden identification.
Phase 3 Knowledge Assessment, Education Bundle and Reassess	**34% increase** in staff knowledge after implementing the education bundle.	Knowledge assessment recognized targeted education and training topics. Education bundle provided a multimodal approach in delivering content.	Minimal knowledge on instrument decontamination. Currently, there is no identified education and training program focused on manual cleaning.	Continually assess staff knowledge and develop and adjust education and training topics based on identified gaps.

Organizational Impact

Medical Personnel

- Staff engagement through the education bundle attributed to competency maintenance.

Military Treatment Facility (MTF)

- Incorporating Ready Reliable Care principles in this project's design supported improvements in healthcare delivery related to instrument cleaning verification.
  - ✓Leadership Commitment: Leadership support in efforts to validate cleaning processes contributed to the achievement of the Joint Commission accreditation.
  - ✓Culture of Safety: Policy updates and purchase of ATP technology displayed commitment to safe practices.
  - ✓Continuous Process Improvement: The incorporation of recurrent audits established a quality feedback loop leading to innovative solutions.
  - ✓Patient Centeredness: Increasing critical step compliance with manual cleaning instruments and endoscopes supported MHS beneficiaries by minimizing SSI risks.

Defense Health Agency (DHA)

- The underlying framework for change used in this project supported the focus elements of the Quadruple Aim.
  - ✓Better Care: Adopting technology such as ATP testing provides users with reliable, rapid, and objective data mitigating SSIs, leading to improved surgical outcomes.
  - ✓Better Health: Provided highly-reliable medical care through a culture of embracing solutions by following national guidelines and evidence-based practice.
  - ✓Increase Readiness: Education and training focused on knowledge gaps builds a ready medical force across the Military Health System (MHS).
  - ✓Lower Costs: Performing ATP tests costs less than the cost of treating SSIs.

Implications for Future Practice

Collaborate with DHA leadership to:

- Disseminate project results, impact, and evidence-based recommendations for standardizing manual cleaning on endoscopes and instruments.
- Monitor performance metrics such as identified contaminated instruments through ATP technology and hospital readmissions for SSIs.
- Create and integrate a standardized program and policy to support the use of ATP technology for verifying instrument cleanliness across the MHS enterprise.
- Continue surveillance on performance metrics related to contaminated instruments after manual cleaning to support continuous process improvement.

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