

**The Impact of Perioperative Workflow on Endoscopy Time Out Adherence**

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### Abstract

**Problem:** A mid-sized community hospital endoscopy center was cited for lack of adherence to intraoperative timeouts on internal review. Identified factors contributing to nonadherence were “distractions” and “personnel engaged in other activities”. Lack of time out adherence reduced endoscopy patient safety, as evidenced by a near miss event involving a difficult airway, and impacted system reputation through potential loss of Joint Commission on Accreditation of Healthcare Organization (JCAHO) recognition. Preventable patient harm and JCAHO accreditation loss impose direct costs on the hospital through legal fees, potential fines, and tarnished reputation. **Purpose:** The purpose of this quality improvement project was to increase time out adherence amongst providers administering anesthesia in the endoscopy center. The project implemented an evidenced-based, research supported practice change by instituting an anesthesia time out policy with fixed, efficient, interdependent workflows aimed at practice standardization amongst endoscopy staff, and measured time out compliance. **Methods:** The initiative was implemented over a 15-week period in the Fall of 2024, impacting on average 10 patients per day, 68 patients per week, and 272 patients per month. The project structure goal comprised the creation of a standardized time out policy. The project’s process goals involved education on policy implementation and adherence to endoscopy time outs. Adherence to endoscopy time outs was measured weekly using the Endoscopy Time Out Adherence Measurement Tool. **Results:** Pre-intervention endoscopy time out adherence recorded a median of 62.5%, while post-intervention endoscopy time out adherence recorded a median of 100%. **Conclusions:** Intraoperative time out adherence amongst endoscopy anesthesia providers is attainable. A 100% time out adherence rate was achieved in eight out of 15 weeks. Consistent fulfilment of this goal rests on reliable workflow execution and resolution of evolving barriers.

*Keywords:* time out, adherence, surgical safety checklist, workflow, endoscopy

### **The Impact of Perioperative Workflow on Endoscopy Time Out Adherence**

Studies indicate surgical safety checklists remain useful in decreasing iatrogenic errors and reducing patient harm (Abbott et al., 2018; Rothman et al., 2016). Although welcomed, these reductions have not eliminated all 29 “never events”, such as wrong site surgery, wrong patient surgery, and retained foreign objects (*Never Events*, 2019). Time outs, brief pauses in all activity, occur before anesthesia, before surgical incision, and before patients leave the operating room (*Tool and Resources*, n.d.). Further inquiry has demonstrated surgical safety checklists are susceptible to user reliability (Freundlich et al., 2020; Rothman et al., 2016). These findings support the installment of efficient, interactive (Levy et al., 2023) surgical safety checklist time outs in which additional benefit may be derived from a forced-function system (Rothman et al., 2016). Checklist time out enhancements aim to provide structured, consistent, time out workflow processes to reduce variation and promote satisfactory adherence.

#### **Problem**

Intraoperative time outs at a mid-size community hospital endoscopy center, were cited for lack of adherence. On audit, identified factors contributing to nonadherence were “distractions” and “personnel engaged in other activities”. Lack of time out adherence reduced endoscopy patient safety, as evidenced by a near miss event involving a difficult airway and impacted system reputation through potential loss of Joint Commission on Accreditation of Healthcare Organization (JCAHO) recognition. Preventable patient harm and JCAHO accreditation loss impose direct costs on the hospital through legal fees, potential fines, and tarnished reputation.

A root cause analysis isolated patient acuity, time out workflow, and fast work pace as important causes contributing to the endoscopy practice problem as shown in Figure 1. Patient

acuity and fast work pace are largely unamenable factors, while time out workflow remained adaptable to creative solutions. Considering this, time out workflow was identified as the primary root cause to be addressed. The purpose of this quality improvement (QI) project was to successfully adapt time out workflow to the unique needs of endoscopy, providing structured, consistent, time out processes to reduce variation and support satisfactory adherence amongst anesthesia providers in endoscopy.

### **Specific Aims and Available Knowledge**

This quality improvement project aimed to increase time out adherence amongst providers administering anesthesia in endoscopy; by adapting time out workflows to the unique needs of endoscopy, a goal of 100% time out adherence was set. To precisely research the clinical practice problem under examination, a population, issue of interest, comparison of interest, and outcome (PICO) question was constructed: In endoscopy centers, how do consistent time out workflows, compared to variable time out workflows, impact endoscopy time out adherence amongst anesthesia providers? Subsequently, a review of literature was completed to ascertain evidenced-based solutions aimed at increasing time out adherence in endoscopy regarding workflow.

The literature search was conducted using the PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases applying the specific Boolean search phrases ("endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow"). In total, 11 articles were evaluated according to the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide (2017) yielding overall evidence of Level 3 B, demonstrating a satisfactory level of research available and of good quality. High-level, evidence-based literature regarding

endoscopic surgical safety checklists, endoscopic time outs, and endoscopic workflows are limited (Kelly & Baar-Daley, 2022; Bitar et al., 2021; Mason et al., 2018; Raphael et al., 2019). As endoscopic procedural complexity evolves, due to increasing technological advancements, and older patients become more routine cases because of improved longevity, increased compliance with tools designed to mitigate perioperative adverse events will become progressively more important in supporting endoscopic patient safety (Matharoo et al., 2015). Endoscopic units present unique work environments encompassing high caseloads, continual time pressure, and quick discharges. Therefore, surgical safety checklist solutions should be efficient, and custom tailored to each units' distinctive workflows (Kelly & Baar-Daley, 2022; Bitar et al., 2021; Gillespie et al., 2016; Gitelis et al., 2017). Exacting, strong level, evidenced-based literature is lacking in this clinical niche; however, more robust, systematic reviews of heterogenous associated studies, support scientific results presented by lower-level evidence offering validated generalizability (Borchard et al., 2012, Gilhooly et al., 2019, Liu & Mehigan, 2021, Rakoff et al., 2018). Following this comprehensive literature review, the recommendation was to proceed with a structured, consistent, customized time out workflow aimed at practice standardization amongst endoscopy staff. Appendix A provides an evidence search, Appendix B Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) schematic, Table 1 evidence review table, and Table 2 evidence appraisal and synthesis.

### **Rationale**

The Promoting Action on Research Implementation in Health Services (PARIHS) framework was chosen to guide this project due its maturation and balanced emphasis on evidence, context, and facilitation constructs (Kitson et al., 1998). Teaching hospital obligations and the revolving influx of new trainees remained unique contextual factors requiring focus for

correct project facilitation at this QI site; additionally, clinical experience is valued evidence requiring careful examination. Some clinical effectiveness agendas assume evidence level to be the most critical factor for successful project adoption. However, research results remain indecisive as to which construct (context, evidence, facilitation) contributes most to successful evidence-based QI implementation, therefore all three constructs have equivalence within the PARIHS framework (Kitson et al., 1998). Since workflow was identified during root cause analysis as the most adaptable factor contributing to time out nonadherence, the PARIHS framework, depicted in Figure 2, supported anesthesia time out policy implementation with its equalized approach to evidence (i.e. evidenced-based surgical safety checklist time outs with standardized workflows) and contextual culture (i.e. using one-to-one communication tactics to reference the anesthesia time out policy and visual aid to improve compliance following low adherence weeks).

## **Methods**

### **Context**

This healthcare QI context consisted of a mid-size community teaching hospital. The endoscopy center resided within, contained five rooms, and had a dual pre-operative / post-anesthesia care unit bay. The PARIHS framework itemizes implementation context into three unique sub-elements: culture, leadership, and evaluation (Kitson et al., 2008). At this practice site, culture comprised patient-centered care, utilizing best practices, and emphasis on continued learning. Leadership was supportive and engaging. Frequent rounding during surgical procedures and trimonthly academic conferences were the norm. Evaluation, defined as empirical assessment of effectiveness, was routinely conducted by leadership. This was observed through audits and timely updates of various ongoing organizational processes informed by practice. The

validated tool, Context Assessment Index (CAI), was utilized to assess site context (McCormack et al., 2009). This site scored 91% on culture, 86% on leadership, and 91% on evaluation (*Caainstrumentpack.Pdf*, n.d.). Averaging these individual scores, computed an overall context score of 89%; this score indicated responsiveness to practice change in the setting of the proposed QI project. The pre-implementation process flowchart shown in Figure 3, and the desired process flowchart depicted in Figure 4, illustrate the workflow root cause and evidence-based intervention of standardized time out initiation, interdependent verbal participation, and consistent utilization of a visual aid. Evidence has shown structured, consistent, customized time out workflows reduce variation and support satisfactory time out adherence amongst perioperative staff across a variety of surgical settings (Kelly & Baar-Daley, 2022; Bitar et al., 2021; Gillespie et al., 2016; Gitelis et al., 2017).

### **Interventions**

With acceptance to change confirmed, evidenced-based interventional goals were constructed as shown in the Appendix C GANTT timeline. The specific, measurable, achievable, relevant, time-bound (SMART) goal format was chosen. One structure goal, and two process goals were created.

The SMART structure goal was specified as follows: by end of summer 2024, endoscopy and anesthesia leadership will implement an anesthesia time out policy with fixed, efficient, interdependent workflows aimed at practice standardization amongst endoscopy staff. The project lead was responsible for initiating this goal, working in close collaboration with the clinical site representative (CSR), the chief certified registered nurse anesthetist (CRNA), and endoscopy assistant manager acting as project stakeholders. Strategies and tactics to achieve this structure goal included one-to-one discussions on progress and detailing academic research

findings with change leaders (Bingham & Main, 2010). The two process goals were specified as follows: within two weeks of project implementation 100% of anesthesia providers will be educated on the policy change, and following policy education an anesthesia provider time out adherence rate of 100% in endoscopy will be achieved. The project lead was responsible for educating anesthesia providers on the policy. Additionally, the project lead was accountable for constructing valid measures with an actionable measurement plan. The project CSR and chief CRNA assisted in championing change and monitoring adherence. Strategies and tactics to achieve these two process goals included sharing information in a public manner, identifying and preparing change champions, building a coalition, mandating change, and promoting adaptability (Bingham & Main, 2010; Powell et al., 2015). Anticipated contextual elements involved the sub-elements of culture, leadership, and evaluation. These sub-elements were assessed individually and collectively using the validated CAI tool scoring strong context for change. Due to project time constraints, limited data, and lack of site request, an outcome goal was not assessed.

### **Measures**

The measure of the structure goal for this QI project comprised the creation of a standardized time out policy. The measure source involved departmental policy creation, with the metric being policy implementation. It was calculated using nominal statistics (policy created: yes or no). The process goal, education on policy implementation, comprised education as the measure and attestation data as the measure source. The metric entailed percentage of anesthesia providers educated and was calculated by dividing the number of anesthesia providers educated by total number of anesthesia providers eligible. The measure, adherence to endoscopy time outs, was an additional process goal. The measure source was the implementation/completion of the endoscopy time out protocol, and the metric was the elemental

anesthesia time out components. Adherence was calculated by dividing the number of correctly completed time outs by the total number of time outs surveyed.

The structure goal, standardized time out policy, and process goal, education on policy, were collected after implementation, while the process goal, adherence to endoscopy time out protocol, was collected daily using the Endoscopy Time Out Adherence Measurement Tool. This tool, displayed in Appendix D, was created in Research Electronic Data Capture (REDCap) platform, and distributed as a quick response (QR) code for completion by anesthesia providers. Collected data were evaluated weekly. To ensure inclusion and intervention equity, eligible individuals included all pediatric and adult patients undergoing procedural anesthesia in endoscopy, and anesthesia providers administering anesthesia in endoscopy. Exclusion criteria included all pediatric patients and adult patients receiving procedural anesthesia in the general operating room (GOR), as well as anesthesia providers administering procedural anesthesia in the GOR.

### **Analysis**

Data analysis comprised weekly reviews, investigating changes over time utilizing a run chart as the quality improvement project progressed. Seen in Figure 5, the run chart x-axis measured time in weeks and the y-axis measured endoscopy time out policy adherence by percentage. Shifts, trends, runs, and astronomical data points were assessed to properly analyze common cause and special cause variations (Lloyd, 2018). No shifts or trends occurred; however, three runs were present. Week one and week two survey records reflected baseline data. After implementation of the process goal, education on policy, post-intervention data demonstrated an appreciable median increase. Strategic fact sheet placement, PowerPoint media, and in person instruction were tactics utilized to encourage new policy adoption. Change

champions assisted in building a coalition, supporting mandated change, and promoting new workflow adaptability bolstering week five, week six, and week eight. No feedback limited week 11 and week 14 process of care; however, one-to-one communication supported week 12 and week 15. Tabular notes located at the base of the run chart detail informed weeks, highlighting significant events or influencing factors. Data collection terminated December 10, 2024. Project limitations included inability to educate all anesthesia providers, lack of survey completion, variability in individual provider survey interpretation, and generalizability to other settings.

### **Ethical Considerations**

Ethical concerns for this QI project encompassed the principles of beneficence, nonmaleficence, autonomy, and justice. Preceding project implementation, the Human Research Protections Office (HRPO) of the University of Maryland School of Medicine (UMSOM) Institutional Review Board was contacted to receive a non-human subjects research determination (UMSON, 2024). The project lead completed Health Insurance Portability and Accountability Act (HIPAA) and Collaborative Institutional Training Initiative (CITI) coursework and maintained these certifications until project completion as shown in Appendix C GANTT timeline. Conflicts of interest were guarded against and disclosed if any arose. Lastly, data were acquired by staff submitting QR code surveys at each shift's end and stored securely on HIPAA compliant REDCap servers. Privacy and confidentiality protection comprised not collecting patient identifiers and allowing providers to use their personal electronic device in a secure location. Survey records were accessed through a virtual private network, using two factor authentication, thereby offering appropriate confidentiality protection to healthcare related information.

### **Results**

The initiative was implemented over a 15-week period in the Fall of 2024, impacting on average 10 patients per day, 68 patients per week, and 272 patients per month. The structural outcome goal for policy creation was met. Outcomes for the process goal, education on policy implementation, reflect 70% of eligible providers were educated. Run chart results, displayed in Figure 5, demonstrate pre-intervention endoscopy time out adherence recorded a median of 62.5%, while post-intervention endoscopy time out adherence recorded a median of 100%. This 37.5% increase occurred over seven weeks beginning with week three and peaking on week nine.

The Endoscopy Time Out Adherence Measurement Tool, derived from the World Health Organization surgical safety checklist resources (*Tool and Resources*, n.d.), consisted of three survey questions aimed at measuring adherence and totaled 79 records for review. Question one: *Were pre-anesthesia time out items verified without reliance on memory?* resulted in a visual aid being used 88.6% of the time and no visual aid 11.4% of the time. Question two: *Which team members verbally participated during each item on the pre-anesthesia time out?* resulted in the circulator registered nurse participating 100% of the time and anesthesia provider participating 96.2% of the time. Question three: *Did the entire team stop all other activity for a few moments during the pre-anesthesia time out?* resulted in the entire team stopping 92.4% of the time and a team member being distracted 7.6% of the time. Graphical representation of these results are depicted in Figure 6, Figure 7, and Figure 8.

### **Discussion**

In agreement with existing literature, key findings indicate time out adherence in endoscopy is achievable (Bitar et al., 2021). No near misses were reported throughout the time out adherence audits, and time out adherence median increases suggest communication improved through coordinated workflow processes. Targeted education regarding the near miss event

involving a difficult airway and communicating the value of standardized anesthesia time outs assisted with anesthesia provider time out adherence (Rakoff et al., 2018; Matharoo et al., 2015). The personnel impact was minimal as staff were already familiar with surgical time outs, albeit conducting unstandardized time outs, lacking anesthesia time out emphasis. As for system impact, the cost for this QI was negligible; time out posters and electronic resource creation were crafted using available office technology equipment. Consultation with non-endoscopic units facilitated lateral transfer of existing surgical safety checklist aids offering enhanced sustainability and further spread adoption.

Echoing findings from Freundlich et al (2020), overall time out adherence remained high throughout the project, but exact compliance can be elusive. The endoscopic theatre is dynamic, fast moving, with periodic interruptions inviting workflow disruptions. Additionally, individual provider survey interpretation may have revealed imprecision in project design as to what constituted time out adherence varied amongst individual providers when utilizing the Endoscopy Time Out Adherence Measurement Tool. This interpretive variability may have influenced the low nonadherence rates observed during week 11 and week 14.

### **Conclusion**

Intraoperative time out adherence amongst anesthesia providers is attainable within the endoscopy center setting. The process goal, anesthesia provider time out adherence rate of 100%, achieved realization eight out of 15 weeks. Consistent fulfilment of this goal rests on reliable execution of the time out workflow. Periodic evaluation and effective resolution of evolving barriers is required to maintain complete intraoperative time out adherence amongst anesthesia providers in endoscopy.

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**Table 1**

*Evidence Review Table*

Citation #1: (Bitar et al., 2021)					Level: III A
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>The purpose of this study was to evaluate the degree of successful checklist application in endoscopy units and review the evidence of its influence on the culture of safety.</p>	<p><b>Type &amp; Design:</b> Systematic review of observational studies and narrative synthesis</p>	<p><b>Sampling technique:</b> Systematic review</p> <p><b>Eligible Participants:</b> observational studies that used a gastrointestinal endoscopic checklist.</p> <p><b>Setting:</b> Endoscopy units</p> <p><b>Excluded:</b> Studies conducted during simulation, and studies limited to sign-in or sign-outs</p> <p><b>Accepted:</b> 671 unique studies identified. 664 did not meet inclusion criteria. Remaining 7 Studies accepted.</p> <p><b>Control:</b> observational studies that used a gastrointestinal endoscopic checklist.</p> <p><b>Intervention:</b></p>	<p><b>Control Protocol:</b> “all observational studies that used a gastrointestinal endoscopic checklist. In this context, a checklist was defined as a set of key safety items concerning the patient’s identity, particularity and the procedure that were verbally verified and shared with the whole team before the procedure with the aim of decreasing AEs and increasing patient safety.”</p> <p><b>Intervention Protocol:</b> Unspecified</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> Adherence rate to GI checklist; barriers and facilitators to checklist implementation; effect on commitment to safety culture</p> <p><b>DV Measure:</b> staff viewpoint using narrative synthesis methodology; team communication</p>	<p><b>Statistical results:</b> In five of seven studies analyzed checklist adherence rates post-intervention varied for both nurses (84% to 96%) and physicians (66% to 95%). Clinical outcomes, except team communication, were not reported in most of the studies.</p> <p><b>Conclusions:</b> Checklist implementation is possible on endoscopy units when considering contextual facilitators and barriers. Evidence supporting measurable effects from checklist implementation, except perceived communication increase, is sparse and necessitates further analysis.</p>

		Unspecified <b>Power Analysis:</b> Unspecified  <b>Study homogeneity:</b> Very diverse regarding methodology, context, and outcomes			
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Citation #2 (Borchard et al., 2012)						Level: III B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions	
<p>“Systematic literature review was conducted to assess the effectiveness of, compliance with, and critical factors for the implementation of safety checklists in surgery”</p>	<p><b>Type &amp; Design:</b> “Systematic literature review”</p>	<p><b>Sampling technique:</b> Systematic review</p> <p><b>Eligible Participants:</b> “Studies were included if they empirically investigated the effectiveness of surgical safety checklists, staff compliance with, or critical factors for implementation of the safety checklist in surgery.”</p> <p><b>Setting:</b> Surgical environments</p> <p><b>Excluded:</b> “Studies were excluded from the review if they examined only parts of checklists, for example, studies regarding the effectiveness of the team briefing or correct surgical site marking”</p> <p><b>Accepted:</b> “4997 citations, of which 84 articles were chosen for full-text review. Finally, 22 articles were included in this review”</p> <p><b>Control:</b> Varied by study</p> <p><b>Intervention:</b></p>	<p><b>Control Protocol:</b> Varied by study</p> <p><b>Intervention Protocol:</b> Varied by study</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> “Effectiveness of surgical safety checklists, staff compliance with, or critical factors for implementation of the safety checklist in surgery.”</p> <p><b>DV Measure:</b> “To be able to compare qualitative and quantitative studies with wide heterogeneity, for example, in research design, metrics, and populations, Nagpal et al<sup>36</sup> developed an assessment criteria of the study quality based on the available recommendations (The details of the assessment criteria are available at: <a href="https://links-lww-com.proxy-hs.researchport.umd.edu/SLA/A57">https://links-lww-com.proxy-hs.researchport.umd.edu/SLA/A57</a>).”</p>	<p><b>Statistical results:</b> “With the use of checklists, the relative risk for mortality is 0.57 [95% confidence interval (CI): 0.42–0.76] and for any complications 0.63 (95% CI: 0.58–0.67). The overall compliance rate ranged from 12% to 100% (mean: 75%) and for the Time Out from 70% to 100% (mean: 91%).”</p> <p><b>Conclusions:</b> “Checklists are effective and economic tools that decrease mortality and morbidity. Compliance of surgical staff with checklists was good overall. Further research in particular relating to implementation is needed.”</p>	

		Varied by study  <b>Power Analysis:</b> Unspecified  <b>Study homogeneity:</b> Diverse			
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Citation #3 (Gilhooly et al., 2019)						Level: III B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions	
<p>“This scoping review looked both at the compliance of implementation of care bundles and their constituent elements.”</p>	<p><b>Type &amp; Design:</b> “Scoping review”</p>	<p><b>Sampling technique:</b> Scoping Review</p> <p><b>Eligible Participants:</b> “Published quantitative studies (any study that generated numerical data on the fidelity of care bundle use) that explicitly referred to a care bundle and included a definition of the elements of the bundle, a description of how the care bundle was implemented (a method or technique designed to enhance adoption of a “clinical” intervention”</p> <p><b>Setting:</b> Acute hospitals</p> <p><b>Excluded:</b> “Papers describing care bundles implemented outside acute hospitals were excluded, as were articles about bundles delivered solely in intensive care units or which involved obstetric, palliative or neonatal care. Conference abstracts, letters and editorials were also excluded.”</p> <p><b>Accepted:</b> “28,692 articles from our initial</p>	<p><b>Control Protocol:</b> Varied by study</p> <p><b>Intervention Protocol:</b> Varied by study</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan..</p>	<p><b>Dependent Variable:</b> “Compliance of implementation of care bundles and their constituent elements.”</p> <p><b>DV Measure:</b> “Study quality was assessed using the Downs and Black checklist.”</p>	<p><b>Statistical results:</b> “Negative associations were found between the number of elements in a bundle and compliance (Spearman’s rho = - 0.47, non-parallel cohort and - 0.65, prospective cohort studies), and between the complexity of elements and compliance (<math>p &lt; 0.001</math>, chi-squared = 23.05).”</p> <p><b>Conclusions:</b> “Care bundles with a small number of simple elements have better compliance rates. Standardised reporting of implementation strategies may help to implement care bundles into clinical practice with high fidelity.”</p>	

		<p>searches. After screening titles and abstracts, we identified 348 articles of relevance, which were subsequently retrieved for full-text data extraction. Ninety-nine papers reporting quantitative studies were included in the final analysis.”</p> <p><b>Control:</b> Varied by study</p> <p><b>Intervention:</b> Varied by study</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Diverse</p>			
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Citation #4 (Gillespie et al., 2016)					Level: III A
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>The purpose of this study was to systematically evaluate concerns around workflow that effect the surgical teams ability to use the Surgical Safety Checklist</p>	<p><b>Type &amp; Design:</b> Qualitative Study utilizing observational audit</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> “80 nurses, anaesthetists and surgeons working across 10 surgical teams”</p> <p><b>Setting:</b> 550 bed, Large tertiary facility in Queensland, Australia</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> “33 interviews were conducted with 70 participants in 10 focus groups and 23 individual interviews. Participants included 55 nurses, 11 physicians and four healthcare consumers”</p> <p><b>Control:</b> Unspecified</p> <p><b>Intervention:</b></p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Single center population</p>	<p><b>Control Protocol:</b> Unspecified</p> <p><b>Intervention Protocol:</b> process map to illustrate patient flow at high-risk points through the perioperative suite based on data derived from an observational audit and qualitative interviews</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> Domain with categorical recognition</p> <p><b>DV Measure:</b> Analysis of field notes and interview transcripts</p>	<p><b>Statistical results:</b> Unspecified</p> <p><b>Conclusions:</b> Workflow constitutes the one of the greatest challenges to checklist use in surgery. Work environment processes should be conducive (compliment or facilitate) to the competition of checklists.</p>

Citation #5 (Gitelis et al., 2017)					Level: III A
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>“The aim of this study was to increase communication between operating room (OR) staff and facilitate best practices during the normal workflow of nurses, anesthesia providers, and operating surgeons. The purpose of this study was to examine the influence of an electronic Surgical Safety Checklist (SSC) on adherence and patient safety.”</p>	<p><b>Type &amp; Design</b> Retrospective cohort study</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> Unspecified</p> <p><b>Setting:</b> NorthShore University HealthSystem</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> Unspecified</p> <p><b>Control:</b> Pre-rollout EHR, paper SSC compliance</p> <p><b>Intervention:</b> SSC integration into EHR</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Single health system population (4 hospitals)</p>	<p><b>Control Protocol:</b> July and October 2013, an anonymous observer was randomized to different ORs to evaluate the compliance rate of paper WHO SSC. Compliance was defined as 100% completion and documentation of the first column of the WHO SSC before the induction of anesthesia.</p> <p><b>Intervention Protocol:</b> June 2014, an electronic audit was performed to assess the compliance rate of the electronic SSC from data residing in the EHR (n= 1,037). At this same time, a second round of randomized OR observations were also performed and lasted throughout the summer 2014 (n= 50). In September 2014, perioperative risk events, such as consent issues, incorrect counts, wrong site, and wrong procedure were compared before and after the electronic SSC rollout.</p> <p><b>Treatment Fidelity:</b></p>	<p><b>Dependent Variable:</b> Post-rollout SSC EHR compliance rate for first column of SSC, identified surgical risk events, and hospital wide quality indicators</p> <p><b>DV Measure:</b> Anonymous randomized observation audits pre-rollout</p> <p>Electronic audits post SSC EHR implementation + anonymous randomized observation audits</p>	<p><b>Statistical results:</b> Compliance increased from 48% (n = 167) to 92% (n = 1,037; P &lt; .001) after the SSC was integrated into the electronic health record. Surgeons (91% vs 97%; P &lt; .001), anesthesiologists (89% vs 100%; P &lt; .001), and nurses (55% vs 93%; P &lt; .001) demonstrated an increase in compliance. A comparison between risk events in the pre- and post-rollout period showed a 32% decrease (P &lt; .01).</p> <p><b>Conclusions:</b> Large amounts of data suggest SSC reduce operating room mistakes; however, little information is known on how to implement SSC most successfully. After SSC EHR implementation, compliance increased from 48% to 92%. Also, adverse perioperative events were reduced significantly after integration.</p>

			Met. No stated deviation from initial plan.		
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Citation #6 (Kelly & Baar-Daley, 2022)					Level: V B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>“The authors wanted to assess whether the use of an endoscopy safety checklist improves clinical documentation compliance by addressing gaps that may pose safety risks for safe patient outcomes. The goal was to encourage clear and consistent team communication, including the patient through the use of the checklist.”</p>	<p><b>Type &amp; Design:</b> Quality improvement project using Plan Do Study Act cycles</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> Unspecified</p> <p><b>Setting:</b> Two endoscopy units; general and advanced endoscopy at a 673-bed academic medical center, located in Boston, Massachusetts</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> Unspecified</p> <p><b>Control:</b> Pre-intervention audit of 201 procedural patient charts during the month prior to the implementation of the endoscopy specific checklist</p> <p><b>Intervention:</b> Endoscopy-specific checklist</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Single hospital population (2 units)</p>	<p><b>Control Protocol:</b> The procedural team conducted a pre-intervention audit of 201 procedural patient charts during the month prior to the implementation of the endoscopy-specific checklist. The team noted 18 missing reports. Gastrointestinal procedural records, including but not limited to endoscopy and colonoscopy, were examined and audited for completeness.</p> <p><b>Intervention Protocol:</b> After pre-intervention data collection, the checklist tool was piloted over a 10-day period. Post-intervention data were collected in two parts. An audit of 120 procedural charts was conducted to verify compliance with checklist utilization and checklist completion. Next, a comprehensive chart audit was performed. The same 120 procedural charts were reviewed to confirm that all items verified as completed</p>	<p><b>Dependent Variable:</b> Physician documentation completeness and legibility, Nursing assessment, Improved communication by staff.</p> <p><b>DV Measure:</b> Anonymous randomized observation audits pre-rollout.  Electronic audits post SSC EHR implementation + anonymous randomized observation audits</p>	<p><b>Statistical results:</b> “Areas with most significant improvement were related to consent completeness (33.5%) and legibility (37.5%) and both nursing and physician assessment pre-procedure. Pre-procedure checklist completion refers to the nursing-assessment portion, which saw a 27.1% improvement and the pre-procedure assessment refers to the physician assessment, including the American Society of Anaesthesiologists (ASA) score and airway assessment, which improved by 28.8%.”</p> <p><b>Conclusions:</b> The use of an endoscopy safety checklist improved clinical documentation compliance, addressing documentation gaps that may pose safety risks for patient outcomes. It also aimed to enhance the healthcare team's communication facilitated by the use of the safety checklist pre-endoscopy procedures. Pre-procedural checklists are effective</p>

			<p>on the endoscopy safety checklist matched with all item entries located within the patient clinical procedural record. There was one missing report.</p> <p><b>Treatment Fidelity:</b> Questionable. “This institution uses a paper procedural record including history and physical and nursing documentation. The medical records team collect and scan into the permanent electronic patient record team collect. Because of this manual exercise, some medical charts may not have been available at time of audit to include in this analysis due to scanning delays.”</p>		<p>tools to mitigate patient harm during endoscopy procedures as this pilot demonstrated.</p>
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Citation #7 (Liu & Mehigan, 2021)						Level: III B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions	
<p>“The focus of this systematic review is to identify and synthesize the evidence for effectiveness of interventions to increase compliance with the World Health Organization Surgical Safety Checklist (SSC) for adult surgery.”</p>	<p><b>Type &amp; Design:</b> Systematic review of qualitative studies and quantitative studies</p>	<p><b>Sampling technique:</b> Systematic review</p> <p><b>Eligible Participants:</b> relevant literature published between January 1, 2008 and July 8, 2020</p> <p><b>Setting:</b> OR personnel or any type of surgical procedure for patients aged 18 years or older</p> <p><b>Excluded:</b> “literature reviews, book chapters, conference proceedings, dissertations and theses, letters or editorial opinions, pediatric surgery, and non-English language articles. We also excluded studies that did not explore or examine any interventions, strategies, or approaches aimed at enhancing implementation of or compliance with the WHO SSC checklist.”</p> <p><b>Accepted:</b> 24 studies met the inclusion criteria for the systematic review</p> <p><b>Control:</b> Unspecified</p>	<p><b>Control Protocol:</b> Varied by study</p> <p><b>Intervention Protocol:</b> Varied by study</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> Increased compliance with the World Health Organization Surgical Safety Checklist (SSC) for adult surgery</p> <p><b>DV Measure:</b> Mixed Methods Appraisal Tool) version 2018—a critical appraisal tool that is designed for the appraisal of systematic reviews</p>	<p><b>Statistical results:</b> “Despite a lack of common outcome measures, all quantitative and mixed-methods study results showed a significant positive effect on SSC compliance. A few researchers reported nonsignificant or negative changes in certain aspects with the interventions. We were not able to perform a formal meta-analysis with statistical pooling of results across studies because of the absence of both a uniform mode of intervention and standardization of outcome measures.”</p> <p><b>Conclusions:</b> “Using checklists can enhance patient safety in the perioperative area. After reviewing 24 studies related to implementation of the SSC, we found that all of the quantitative interventional studies showed improvement in some outcome measures. However, we determined that there is no standard definition of compliance related to</p>	

		<p><b>Intervention:</b> “All of the identified articles described the intervention or facilitators to enhance WHO SSC compliance or successful implementation”</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Diverse</p>			<p>completing the checklist.”</p>
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Citation #8 (Mason et al., 2018)					Level: V B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>The overall aim of this project was to develop and implement the Local Safety Standards for Invasive Procedures (LocSSIP) in the endoscopy department at UHB. Our SMART aim and the focus of this project was to ensure completion of the standard safety checklist (SSC) in 100% of patients, as directed by NHS England,1 following development of the LocSSIP after a 12-month period. To ensure quality was maintained, our aim was to ensure compliance scores of &gt;80% after 12 months.</p>	<p><b>Type &amp; Design:</b> Pilot study utilizing PDSA framework</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> Unspecified</p> <p><b>Setting:</b> University Hospitals Bristol NHS Foundation Trust (UHB) a large teaching hospital (3 endoscopic centers and 2 remote sites, i.e. operating rooms and ICU’s performing endoscopies)</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> Unspecified</p> <p><b>Control:</b> Data collected prospectively for ‘completion score’</p> <p><b>Intervention:</b> Introduce a LocSSIP and safety checklist to the endoscopy department</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b></p>	<p><b>Control Protocol:</b> Data were collected prospectively for ‘completion score’, ‘full completion score’ and the ‘compliance score’ to gain baseline data following design of the checklist and to compare outcomes following our interventions.</p> <p><b>Intervention Protocol:</b> Planned a period of independent observation within the endoscopy department at the Bristol Royal Infirmary over a 2-week period, 2 months after implementation of the safety checklist</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> Ensure completion of the SSC in 100% of patients, as directed by NHS England, following development of the LocSSIP after a 12-month period</p> <p><b>DV Measure:</b> A ‘compliance score’ was therefore developed and implemented to assess the quality and attention levels of team members after its implementation. A ‘completion score’ documents that the SSC has been performed. Points are then deducted from this initial score for not fully completing the checklist and for incorrect timing of the checklist, forming a ‘full completion score’. Inattention is measured at time out, and categorised as mild (any team members completing a small task), moderate (talking to a colleague) or severe (not present). This inattention score is then deducted from the ‘completion score’ to give an overall ‘compliance score’.</p>	<p><b>Statistical results:</b> In 2016, ‘time out’ checks were completed in 100% of cases, but full completion was only observed in 68%. ‘Sign out’ checks were completed in 91% of cases, with full completion in 71%. In 2017, ‘time out’ checks were completed in 100% of cases, with full completion in 85%. ‘Sign out’ checks were completed in 100% of cases, with full completion in 91%. The composite score for compliance in 2016 was 57% increasing to 90% in 2017. In conclusion, stronger department</p> <p><b>Conclusions:</b> Early on in the development of the project, it became clear that simply adding in a checklist into the existing procedures of the endoscopy unit would lead to poor compliance. We learnt that understanding the</p>

		<p>Single department within health system</p>			<p>complete patient journey through the department and how the unit functioned meant that a tailored approach was required. While this was a slight departure from the standard checklists seen in other parts of the hospital, it proved to be far more effective. Our project demonstrates the initial development and implementation of LocSSIP within one department of our organisation. The scoring systems developed to assess quality of its implementation are transferrable to other departments implementing LocSSIPs, and it is hoped that some of our experiences may help other departments who are at differing stages of implementation.</p>
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Citation #9 (Matharoo et al., 2015)					Level: V B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>“The aim of this quality improvement programme was to assess compliance with the endoscopy safety checklist, factors affecting this and measures to optimise compliance.”</p>	<p><b>Type &amp; Design:</b> Quality improvement program using PDSA framework</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> Unspecified</p> <p><b>Setting:</b> “Wolfson Unit for Endoscopy at St Mark’s hospital in London UK. A tertiary referral and endoscopy-training centre conducting approximately 14,000 procedures annually.”</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> Unspecified</p> <p><b>Control:</b> “Baseline compliance data was prospectively collected for 199 patients.”</p> <p><b>Intervention:</b> “Unit wide team communication highlighting the effectiveness of the checklist, Posters and hospital-wide NHS computer screensavers to</p>	<p><b>Control Protocol:</b> “Checklist compliance was prospectively evaluated for consecutive patients undergoing an endoscopic procedure during a seven-day period.”</p> <p><b>Intervention Protocol:</b> “After a four-month interval, 151 patient checklists were evaluated following improvement interventions.”</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> “Compliance with the endoscopy safety checklist, factors affecting this, and measures to optimise compliance.”</p> <p><b>DV Measure:</b> “Checklist compliance audit by assessing medical records for: Section of checklist completed (Time out / Sign out / Both), Procedure time (AM or PM), Grade and gender of the endoscopist, Admission type: elective or inpatient.”</p>	<p><b>Statistical results:</b> “Post-intervention, there was a significant increase in the percentage of checklists fully completed: from 53% to 66% p = 0.021 (figure 2). There was a statistically significant decrease in the number of checklists left blank post intervention - from 10% to 2% p=0.03 (figure 2)”</p> <p><b>Conclusion:</b> “The implementation of a simple, standardised checklist involving the whole multidisciplinary team performing the procedure has rectified this variability in standards. This quality improvement strategy in a large centre illustrates the challenges of implementing a checklist despite a thorough educational and feedback plan. However, this process also demonstrates that</p>

		<p>remind users to complete the checklist, Mandating the use of the checklist as part of hospital policy, Email to all staff from the hospital chief executive highlighting the importance of checklist use for endoscopic procedures, Senior nursing team briefed and invited to motivate existing nurses and ensure appropriate training of new nurses / agency staff, Registrar (trainee) focused training formalised in endoscopy specific unit induction, Prospective observations of endoscopy teams and real time feedback on checklist use.”</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> One endoscopy unit at one hospital</p>			<p>continued re-assessment and targeted feedback coupled with senior leadership can lead to successful outcomes; the proportion of checklists fully completed significantly increased and the number of unused checklists diminished within a four month period.”</p>
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Citation #10 (Rakoff et al., 2018)						Level: III B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions	
<p>“This study aimed to determine the effect of customized training versus standard readily available training on surgical safety checklist (SSCL) compliance and comprehension.”</p>	<p><b>Type &amp; Design:</b> single-center, prospective study</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> “54 OT staff were enrolled in the study (n = 28, standard training; n = 26, customized training). There was no difference in the composition of staff in each group—physicians (6 in each group), nurses (19 and 17, respectively), and perfusionists (3 in each group).”</p> <p><b>Setting:</b> “cardiothoracic and vascular surgery department”</p> <p><b>Excluded:</b> Non-department staff</p> <p><b>Accepted:</b> “The standard training group completed 135 surgeries for a 9-week period. The customized training group completed 109 surgeries for a 6-week period.”</p> <p><b>Control:</b> standardized training group</p>	<p><b>Control Protocol:</b> “Standard training consisted of readily available WHO training materials consisting of a 20-minute PowerPoint presentation, videos depicting how to do the SSCL in different scenarios, and training posters.”</p> <p><b>Intervention Protocol:</b> “Customized training materials consisted of a PowerPoint presentation, video, and posters. A 20-minute presentation was modified from the original WHO presentation with pictures of the local OT environment and local terminology. An SSCL training video was developed in English but modified to include the local checklist that is actually used at our institution, used local terminology (e.g., OT versus operating room), and was filmed in one of the department's OTs with department staff as</p>	<p><b>Dependent Variable:</b> “Surgical safety checklist (SSCL) compliance and comprehension.”</p> <p><b>DV Measure:</b> “Comprehension was assessed by a written exam after each training program. Verbal and written compliance with the SSCL was measured within the operating theater by trained observers.”</p>	<p><b>Statistical results:</b> “We observed a total of 244 surgeries for SSCL compliance. Comprehension of the didactic material provided in the training programs was higher in the customized versus the standard training group (75% versus 30%; <math>P &lt; 0.0001</math>). Verbal compliance was higher in the customized versus standard training groups (87% versus 49%; <math>P &lt; 0.0001</math>). Written compliance was 100% for both the customized and standard training groups.”</p> <p><b>Conclusions:</b> “A customized training program improves verbal compliance and comprehension among health care workers when implementing an SSCL, compared with standard readily available training.”</p>	

		<p><b>Intervention:</b> Customized training group</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> Similar</p>	<p>the actors.”</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>		
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Citation #11 (Raphael et al., 2019)					Level: V B
Purpose or Hypothesis	Type of Evidence and Research Design	Sample (population, size, setting)	Intervention Procedures	Primary Outcome/Measures	Results Conclusions
<p>The purpose of this study was to evaluate the degree of successful checklist application in endoscopy units and review the evidence of its influence on the culture of safety.</p>	<p><b>Type &amp; Design:</b> “single-center, prospective, pilot study”</p>	<p><b>Sampling technique:</b> Purposeful</p> <p><b>Eligible Participants:</b> Unspecified</p> <p><b>Setting:</b> “Endoscopy unit at a tertiary care academic medical center”</p> <p><b>Excluded:</b> Unspecified</p> <p><b>Accepted:</b> Unspecified</p> <p><b>Control:</b> “Baseline TOP compliance rates”</p> <p><b>Intervention:</b> “Video cameras with offsite monitoring installed in each procedure room in our endoscopy”</p> <p><b>Power Analysis:</b> Unspecified</p> <p><b>Study homogeneity:</b> One endoscopy unit at one hospital</p>	<p><b>Control Protocol:</b> “Baseline TOP compliance rates were audited with RVA over a 2-month period.”</p> <p><b>Intervention Protocol:</b> “A multidisciplinary quality improvement team reviewed the data, identified barriers to the TOP, and implemented actionable items in January 2017) (i.e designation of time out leader, visual indication of the time out, development of an endoscopy-specific checklist, TOP education and disclosure of RVA).</p> <p><b>Treatment Fidelity:</b> Met. No stated deviation from initial plan.</p>	<p><b>Dependent Variable:</b> TOP compliance rates</p> <p><b>DV Measure:</b> TOP compliance audits</p>	<p><b>Statistical results:</b> “The mean TOP compliance rate significantly improved from baseline (95.3% vs 69.6%; 95% confidence interval, 22.4-29.3; P &lt; .0001). Additionally, the improvement was maintained throughout the entire postintervention observation period.”</p> <p><b>Conclusions:</b> “TOP compliance rates significantly improved in our endoscopy unit through the use of RVA and implementation of 4 actionable items. Future studies should evaluate the reproducibility of this method in other endoscopy units.”</p>

**Table 2**

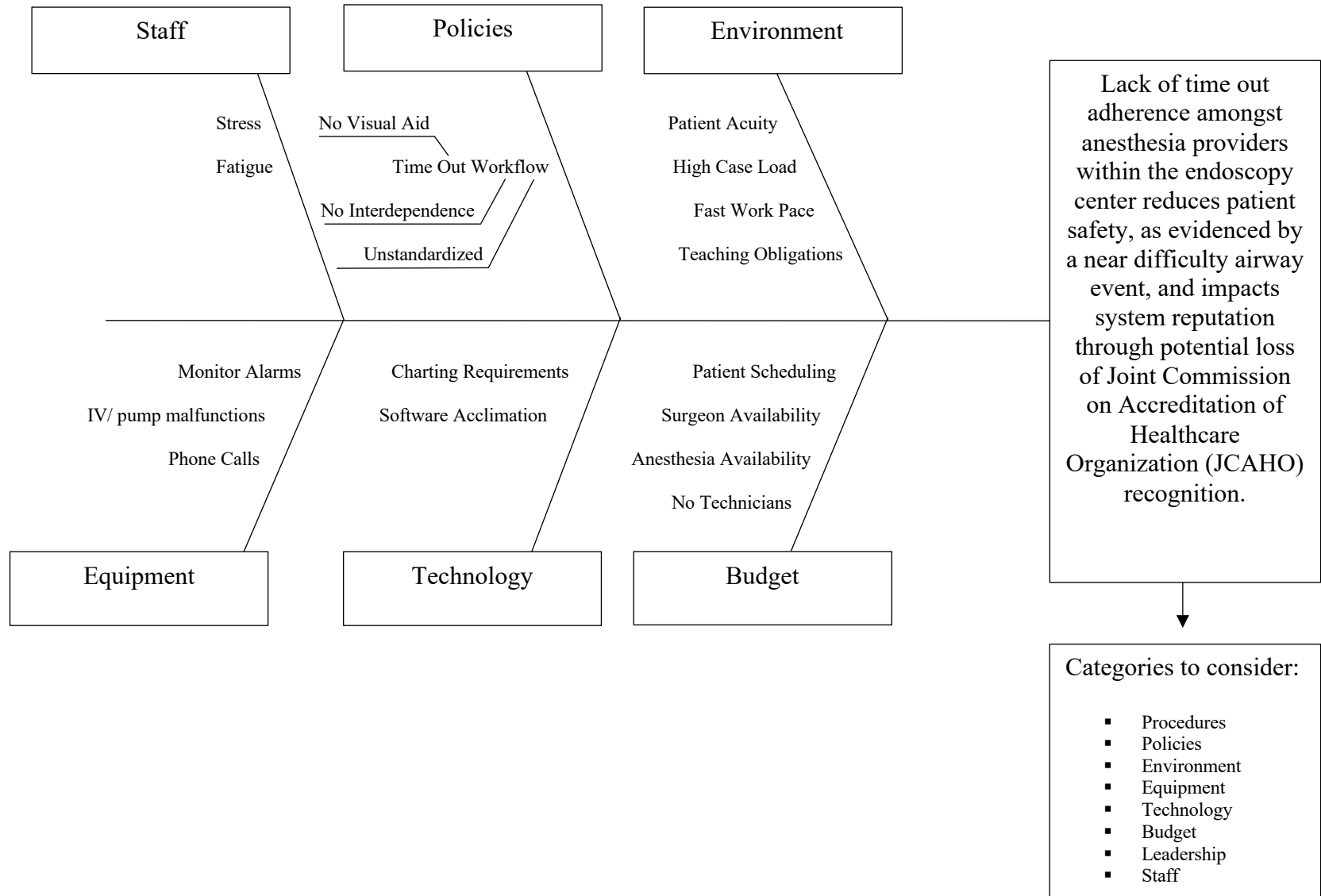
*Evidence Appraisal and Synthesis*

<b>PROJECT TITLE: The Impact of Perioperative Workflow on Endoscopy Time Out Adherence: A Quality Improvement</b>			
<b>PICO:</b> In endoscopy centers, how do consistent time out workflows, compared to variable time out workflows, impact endoscopy time out adherence amongst anesthesia providers?			
<b>JHNEBP Model Level</b>	<b>Total Number of Sources</b>	<b>Quality Rating and Author of each study</b>	<b>Synthesis of Findings</b>
<b>Level I</b> Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis			Reviewed studies agree that high level evidence-based literature regarding endoscopic surgical safety checklists, endoscopic time outs, and endoscopic workflows are limited (Kelly & Baar-Daley, 2022; Bitar et al., 2021; Mason et al., 2018; Raphael et al., 2019).  As endoscopic procedural complexity evolves, due to increasing technological advancements, and older patients become more routine cases because of improved longevity, increased compliance with tools designed to mitigate perioperative adverse events will become progressively more important in supporting endoscopic patient safety (Matharoo et al., 2015).  Endoscopic units present unique work environments encompassing high caseloads, continual time pressure, and quick discharges. Therefore, surgical safety checklist solutions should be efficient, and custom tailored to each units’ distinctive workflows (Kelly & Baar-Daley, 2022; Bitar et al., 2021; Gillespie et al., 2016; Gitelis et al., 2017).  Exactng, strong level, evidenced-based literature is lacking in this clinical niche; however, more robust, systematic reviews of heterogenous associated studies, support scientific results
<b>Level II</b> Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis			
<b>Level III</b> Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without meta-synthesis	3 Systematic Reviews (Bitar et al., 2021, Borchard et al., 2012, Liu & Mehigan, 2021)  1 Scoping Review (Gilhooly et al., 2019)  1 Qualitative Study (Gillespie et al., 2016)  1 Cohort Study (Gitelis et al., 2017)	A (Bitar et al., 2021) B (Borchard et al., 2012) B (Liu & Mehigan, 2021) B (Gilhooly et al., 2019)  A (Gillespie et al., 2016)  A (Gitelis et al., 2017)	

	1 Quantitative Study (Rakoff et al., 2018)	B (Rakoff et al., 2018)	presented by lower-level evidence offering validated generalizability (Borchard et al., 2012, Gilhooly et al., 2019, Liu & Mehigan, 2021, Rakoff et al., 2018).
<b>Level IV</b> Opinion of respected authorities and/or reports of nationally recognized expert committees/ consensus panels based on scientific evidence			
<b>Level V</b> Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence	2 QI projects (Kelly & Baar-Daley, 2022; Matharoo et al., 2015)  2 Pilot Studies (Mason et al., 2018, Raphael et al., 2019)	B (Kelly & Baar-Daley, 2022) B (Matharoo et al., 2015)  B (Mason et al., 2018) B (Raphael et al., 2019)	
<b>Quality Rating w/ rational and Recommendation</b> Evidence averages to Level III B. The provided literature demonstrates pertinent studies valuable to finding solutions to the workflow practice problem under investigation. Considering the cost of failing to act, the merger of higher-level evidence with the provided endoscopic specific evidence, offers sufficient scientific weight to justify practice modification.			

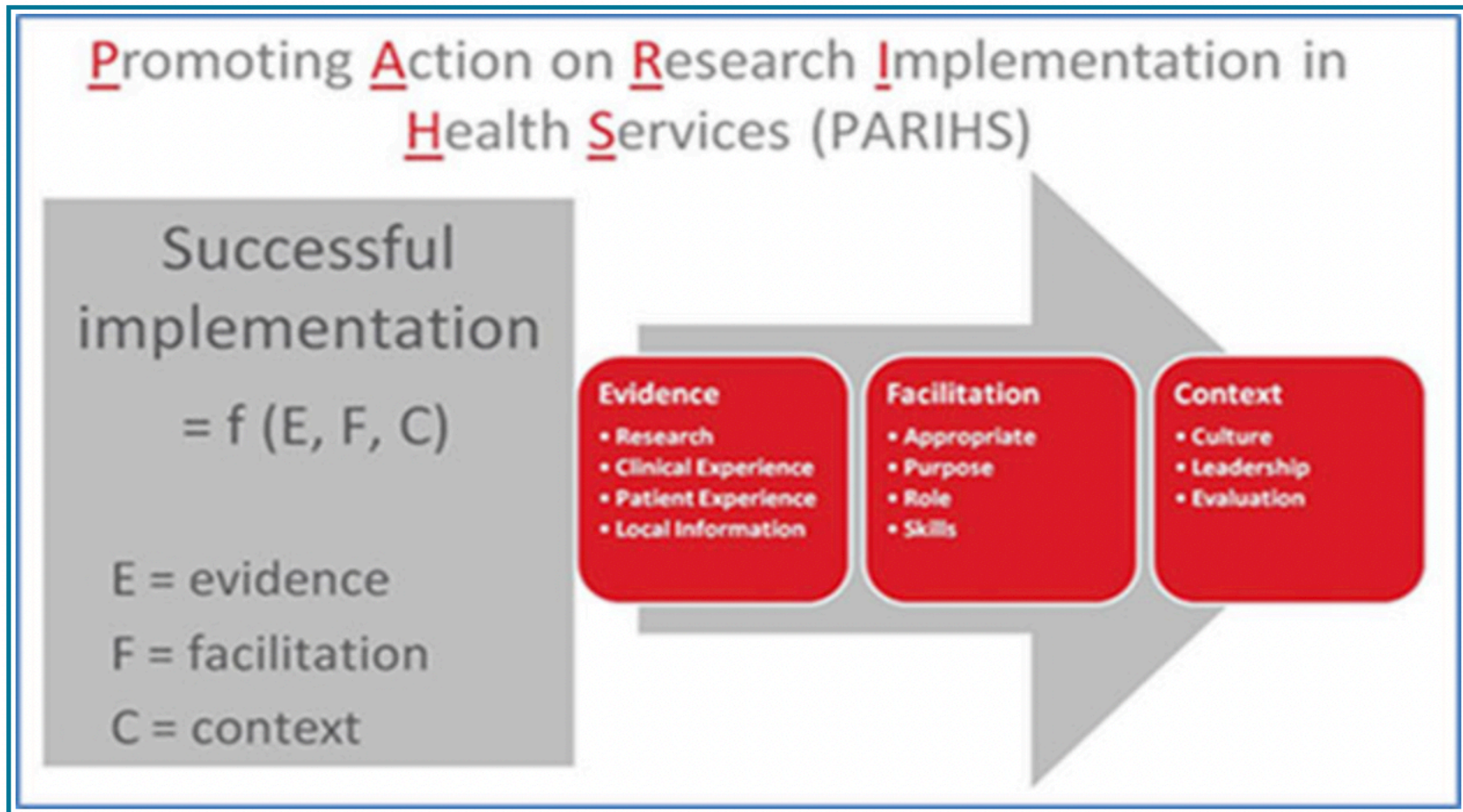
**Figure 1**

*Endoscopy Center Time Out Nonadherence Root Cause Analysis Fishbone Diagram*



**Figure 2**

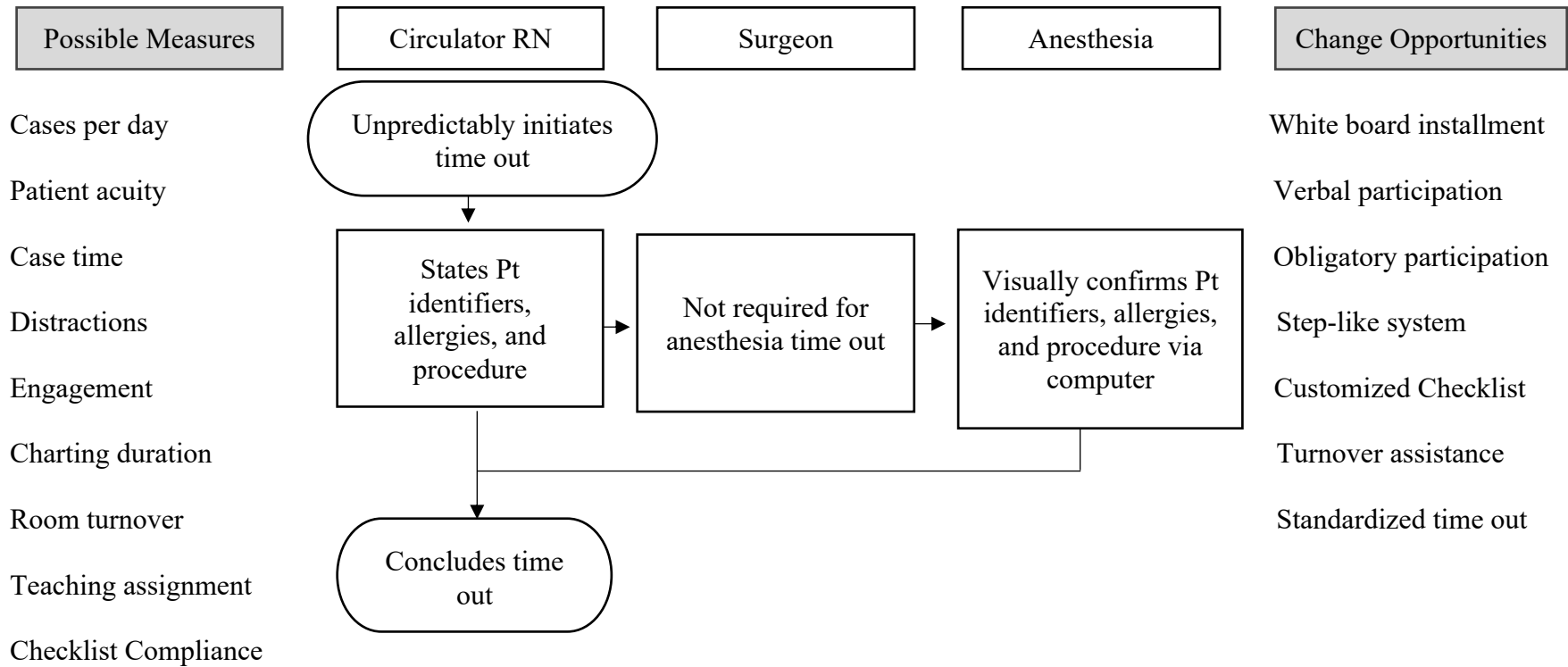
*Promoting Action on Research Implementation in Health Services Framework*



(Kitson et al., 2008)

**Figure 3**

*Anesthesia Time Out Flowchart of the Pre-Implementation Process in the Endoscopy Center*

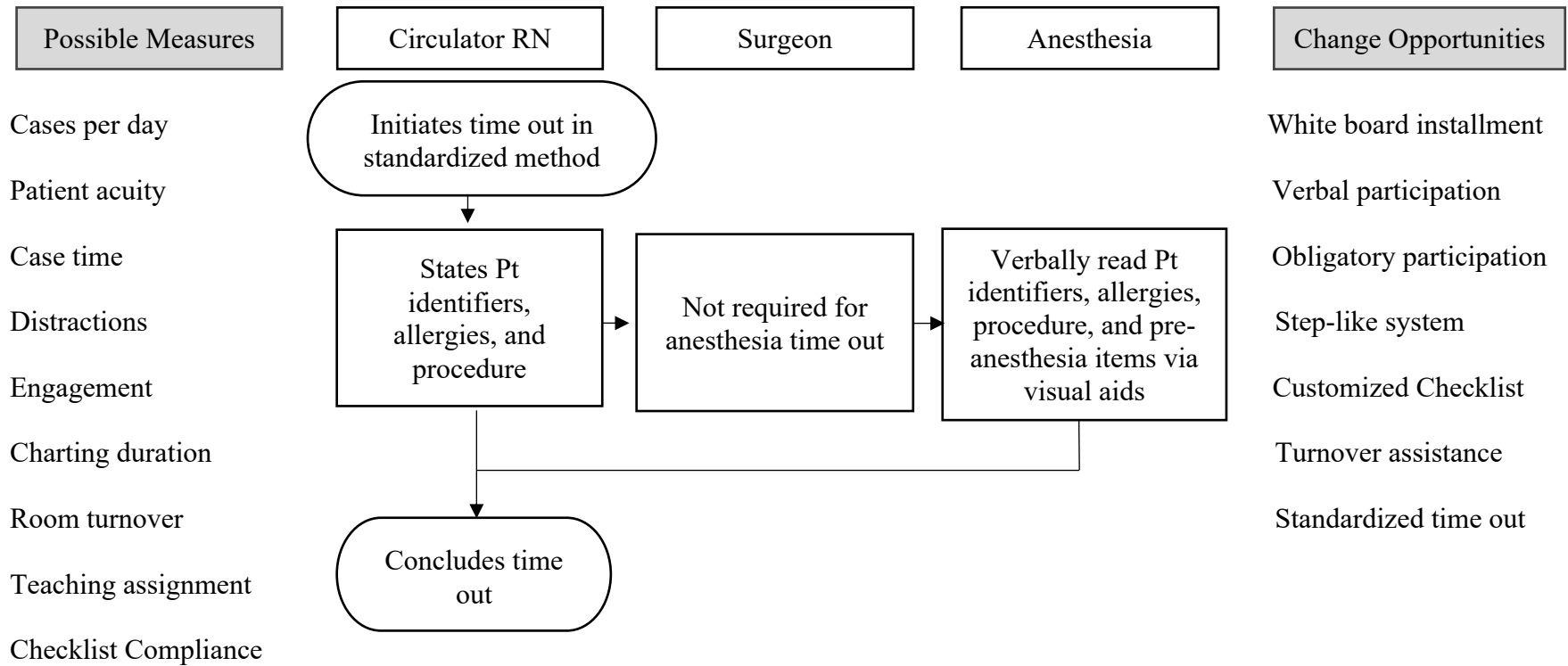


**Key:**

Oval- start or end of the process | Rectangle- step in the process | Flow Lines- show the progression of steps and their connection

**Figure 4**

*Anesthesia Time Out Flowchart of the Desired Process in the Endoscopy Center*

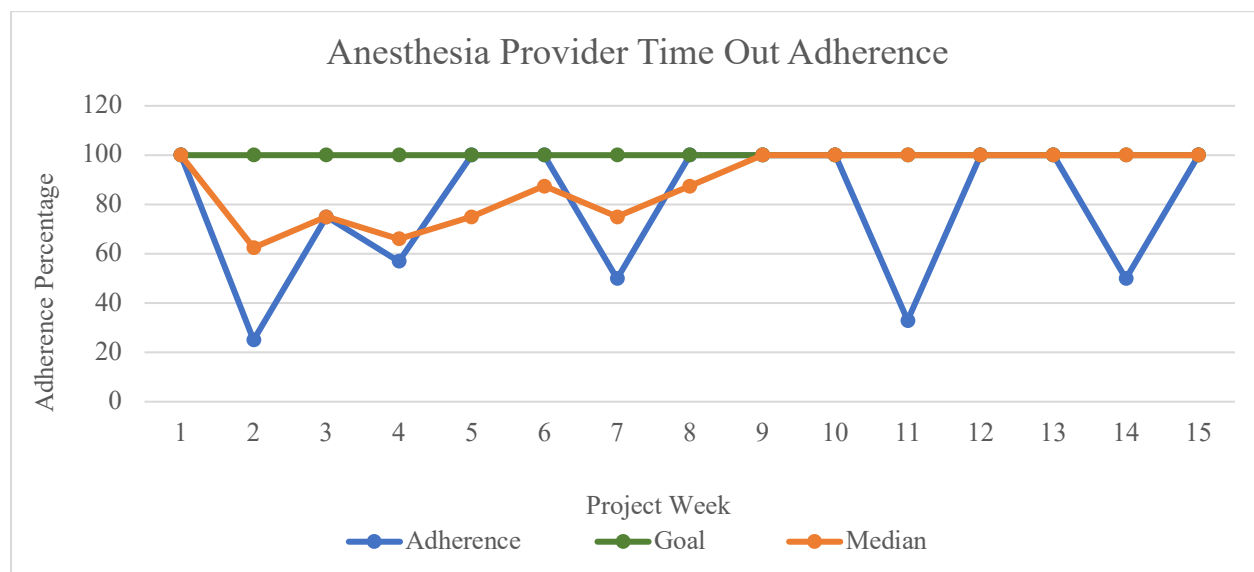


**Key:**

Oval- start or end of the process | Rectangle- step in the process | Flow Lines- show the progression of steps and their connection

**Figure 5**

*Endoscopy Center Time Out Adherence Weekly Run Chart*



*Note.* Run chart represents anesthesia provider time out adherence during 15-week quality improvement period with pre-implementation baseline data and post-implementation interventions detailed below.

**Pre-Implementation**

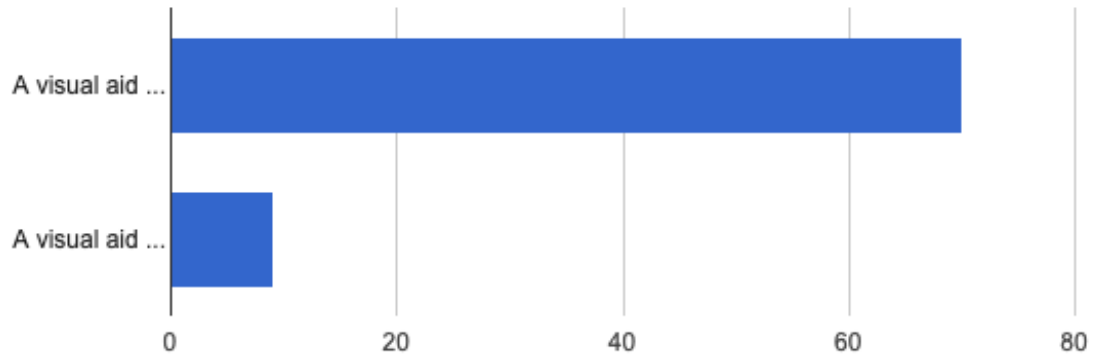
<b>Week 1</b>	Baseline Data: Project lead observed
<b>Week 2</b>	Baseline Data: Non project lead observation

**Post-Implementation**

<b>Week 3</b>	Staff Education: New policy posted
<b>Week 4</b>	One to One Communication: Visual aids
<b>Week 5</b>	Electronic Resource: Fact sheets posted
<b>Week 6</b>	One to One Communication: Anesthesia safety
<b>Week 7</b>	One to One Communication: Time pressure
<b>Week 12</b>	One to One Communication: Adherence
<b>Week 15</b>	One to One Communication: Adherence

**Figure 6**

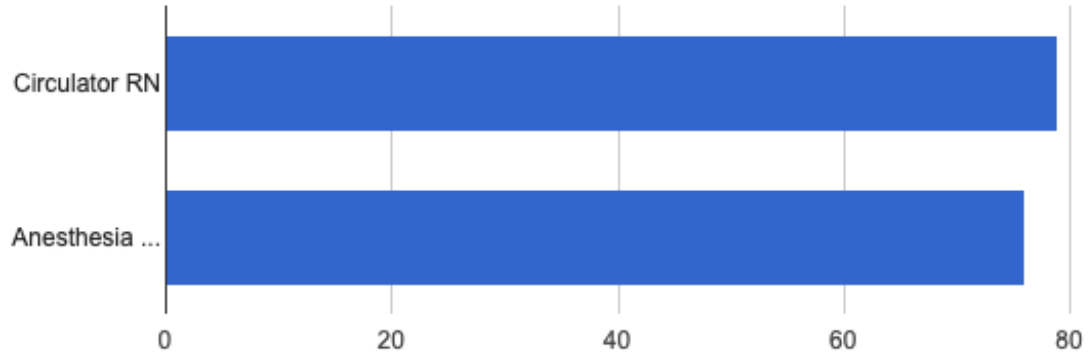
*Survey question one: Were pre-anesthesia time out items verified without reliance on memory?*



*Note.* A visual aid was used (70, 88.6%), A visual aid was not used (9, 11.4%).

**Figure 7**

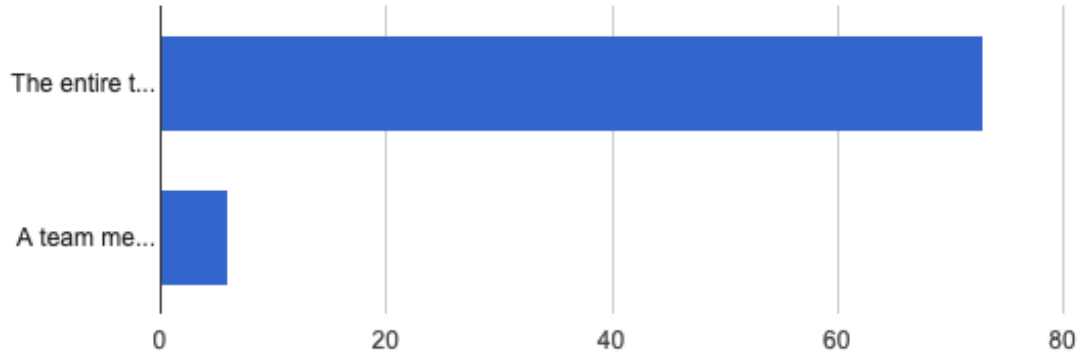
*Survey question two: Which team members verbally participated during each item on the pre-anesthesia time out?*



*Note.* Circulator RN (79, 100.0%), Anesthesia Provider (76, 96.2%).

**Figure 8**

*Survey question three: Did the entire team stop all other activity for a few moments during the pre-anesthesia time out?*



*Note.* The entire team stopped (73, 92.4%), A team member(s) was distracted (6, 7.6%).

## Appendix A

### Evidence Search

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Query box

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Search	Actions	Details	Query	Results	Time
#4	...	>	Search: ("operative" OR "surgical" OR "surgery") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND (systematicreview[Filter])	85	11:30:30
#3	...	>	Search: ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow")	38	11:30:03
#2	...	>	Search: ("Endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence")	44	11:29:33
#1	...	>	Search: ("Endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow") - Schema: all	0	11:29:01

Searching: CINAHL Plus with Full Text [Choose Databases](#)

Suggest Subject Terms

Select a Field (optional)

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AND  Select a Field (optional)

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#### Search History/Alerts

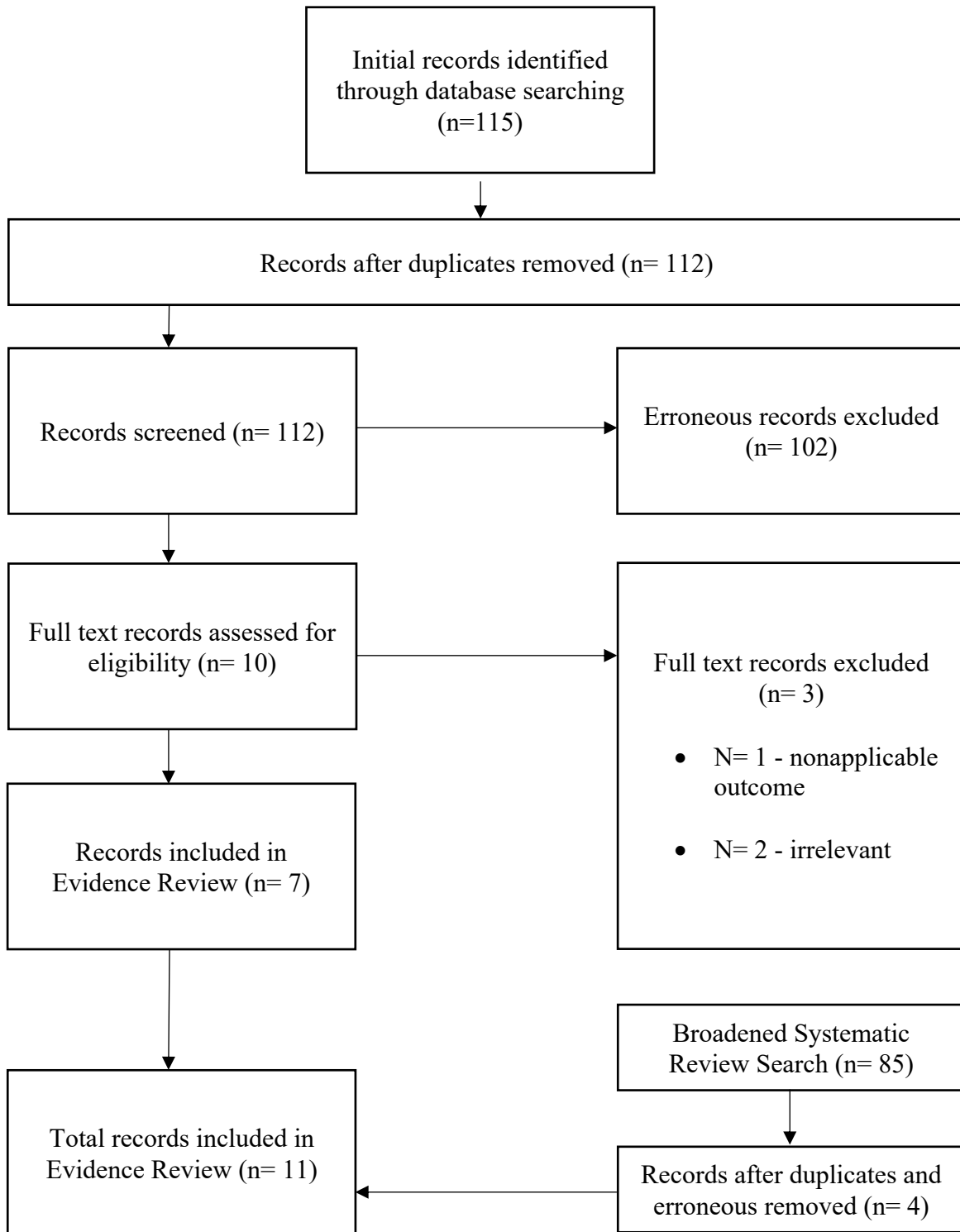
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Select / deselect all

Search ID#	Search Terms	Search Options	Actions
<input type="checkbox"/> S4	("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results</a> (20) <a href="#">View Details</a> <a href="#">Edit</a>
<input type="checkbox"/> S3	("Endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results</a> (13) <a href="#">View Details</a> <a href="#">Edit</a>
<input type="checkbox"/> S2	("Endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results</a> (0) <a href="#">View Details</a> <a href="#">Edit</a>
<input type="checkbox"/> S1	("Endoscopy" OR "gastrointestinal") AND ("time out" OR "timeout" OR "checklist") AND ("compliance" OR "adherence") AND ("workflow" OR "work flow").	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results</a> (0) <a href="#">View Details</a> <a href="#">Edit</a>

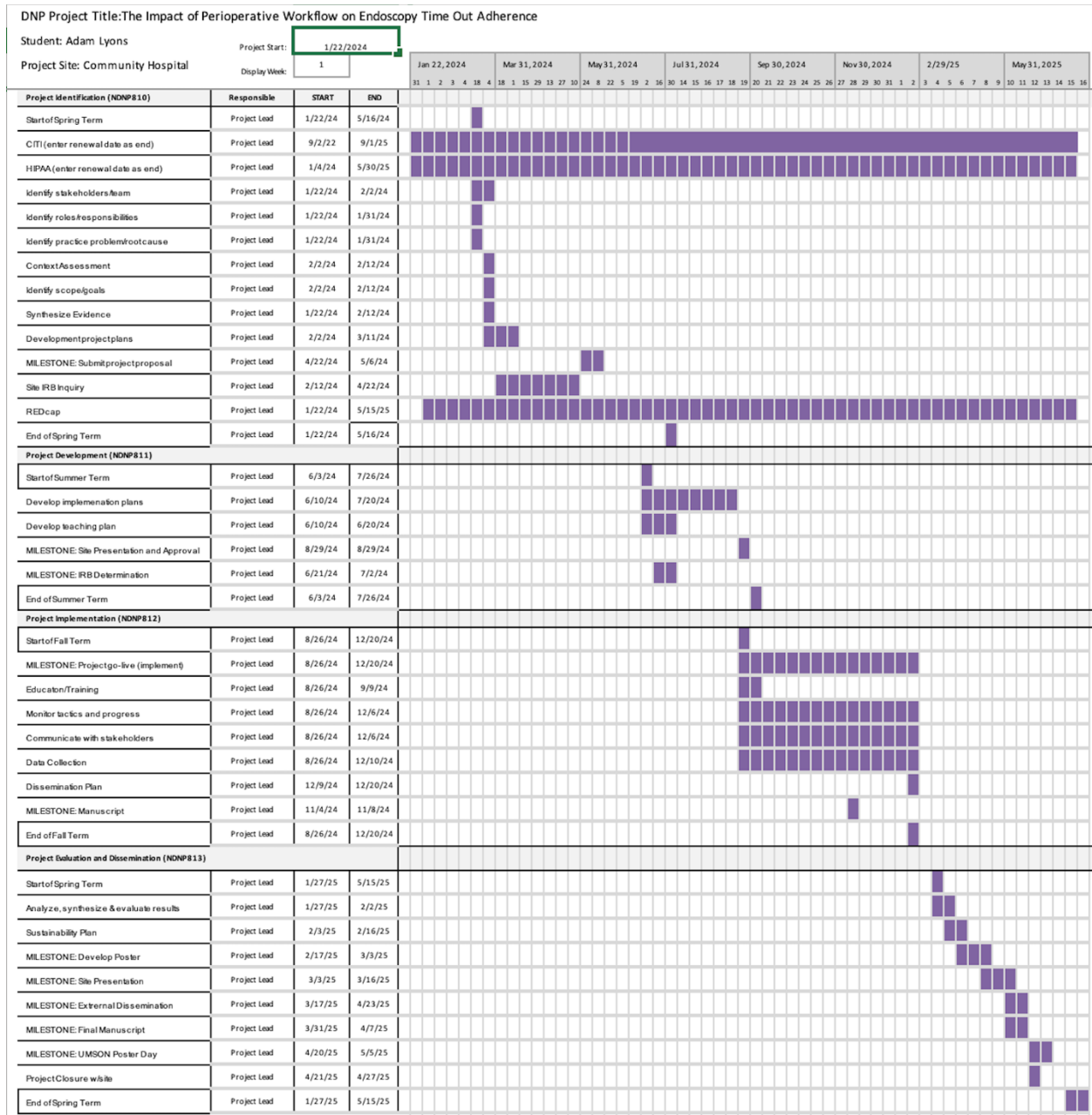
**Appendix B**

*PRISMA*



### Appendix C

#### GANTT Timeline



**Appendix D**

*Endoscopy Time Out Adherence Measurement Tool*

*The Impact of Perioperative Workflow on Endoscopy Time Out Adherence: A Quality Improvement*

Page 1

**Endoscopy Time Out Adherence Measurement Tool**

Please read and complete the following 3 questions

1. Were pre-anesthesia time out items verified without reliance on memory?

- A visual aid was used
- A visual aid was not used

2. Which team members verbally participated during each item on the pre-anesthesia time out? (Select all that apply)

- Circulator RN
- Anesthesia Provider

3. Did the entire team stop all other activity for a few moments during the pre-anesthesia time out? (The surgeon may not have to be present for the pre-anesthesia time out)

- The entire team stopped
- A team member(s) was distracted

*(Tool and Resources, n.d.)*