A NEEDS ASSESSMENT REGARDING A FIRE RISK ASSESSMENT CHECKLIST

IN THE OPERATING ROOM

by

Margie Huna Aram

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Margie Huna Aram, titled A Needs Assessment Regarding a Fire Risk Assessment Checklist in the Operating Room and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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SIGNED: Margie Huna Aram
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DEDICATION

I dedicate this project to the memory of my father, Samandar Nikfekr, who first taught me the value of education and prepared me to face the challenges with faith and humility. Thank you for being my greatest example. I miss you every day Dad!

I would also like to dedicate this work to my daughter, Lia, who had to suffer through my frustration, and lack of quality time. May you realize that nothing is impossible as long as you set your goals, work hard, and most of all believe in yourself. I love you with all my heart!
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ABSTRACT

**Background:** A surgical fire in the operating room (OR) is a devastating hazard that carries the weight of high morbidity and mortality. Through acknowledgment of fire risks among all OR team members, proper education, and training, as well as effective communication, a surgical fire in the OR is a preventable medical error. The addition of a fire risk assessment (FRA) checklist has been proven to increase awareness of potential fire risks and improve the quality and safety of patient care.

**Purpose:** The purpose of this project was to perform a needs assessment regarding surgical team members’ knowledge, awareness, and utilization rate of FRA checklist as a precautionary measure to prevent surgical fires. Moreover, this project attempted to gather data concerning potential barriers towards the implementation and adoption of the FRA checklist to the already established surgical timeout prior to every procedure being performed.

**Setting:** This project took place at a Level 1 trauma hospital in the greater Phoenix, Arizona metro area. The study included (N=16) participants, who were the members of the surgical team at this organization.

**Method:** An online survey was disseminated to participants. The survey consisted of two sections which examine 1) sociodemographic information, and 2) assessment of knowledge, practice, and attitudes related to FRA checklist during the surgical timeout.

**Results:** Majority of the respondents acknowledged that FRA is an appropriate tool and is necessary during the surgical timeout. Only 25% (N=16) of respondents acknowledged reviewing this current practice guideline on FRA checklist. The most important finding from this study is that half of the respondents (N=8) supported on the usefulness of the FRA checklist.
during the surgical timeout in their current clinical practice setting. Furthermore, 69% (N=11) of the participants agreed this gap exists in their current practice related to FRA checklist during the surgical timeout.

**Conclusion:** By surveying the surgical team members’ knowledge, attitudes, and perceptions, the researcher identified gaps in current practice. These findings were then used to determine the need for the FRA checklist during the surgical timeout at this healthcare organization. This Facility implemented a protocol for the FRA checklist effective February 7, 2018.
INTRODUCTION

Emergency Care Research Institute (ECRI) published an analysis performed by the Pennsylvania Patient Safety Authority, estimating that 550-650 operating room (OR) surgical fires occur annually in the United States (ECRI, 2015). OR surgical fires are a significant risk to patient safety especially since surgical fire is a preventable medical error that is a threat to the patient as well as the OR team.

In 1999, the Institute of Medicine (IOM) publication, “To Err is Human: Building a Safer Health System,” revealed that a large number of people had been harmed or lost their lives due to preventable medical errors. There are approximately 20 million surgical errors per year and over one hundred thousand unintentional deaths per year attributed to medical error, making medical errors one of the leading causes of death in the US. (Schuer, Doll, & McNellis, 2010; Watcher, 2012). The intent of To Err is Human was to call upon key healthcare stakeholders to make system-wide changes to recognize, prevent, and mitigate harm from medical errors. Armed with the knowledge that over fifty percent of medical errors are preventable and such errors are associated with increased mortality and morbidity, IOM has called for healthcare organizational change and implementation of practices to improve patient safety through reduction of medical and surgical related errors (Wachter, 2012).

A surgical fire is a preventable medical error that occurs in the operating room (OR). Surgical fires are devastating events that carry the weight of high morbidity and mortality (Apfelbaum, Caplan, Barker, Connis, Cowles, Ehrenwerth, . . . & Wolf, 2013; ECRI, 2015; The Joint Commission, 2015). Through acknowledgment of fire risks among all OR team members, proper education, and training, as well as effective communication, a surgical fire in the OR is a
preventable medical error (Association of periOperative Registered Nurses [AORN], 2005). The consequences of a surgical fire in the OR are drastic, therefore, Clinical Practice Guidelines (CPG) and OR Fire Prevention Checklists have been developed by several organizations as a precautionary measure to prevent surgical fire in OR. In 2003, two surgical fires occurred at Christiana Care Health System (CCHS) in Newark, Delaware (Carlson & Rice, 2014). These surgical fire occurrences prompted CCHS to develop their own Fire Risk Assessment (FRA) checklist and further incorporate it into their surgical timeout (Carlson & Rice, 2014). CCHS has made their FRA checklist publicly available for use (Appendix A). Such guideline and checklist provide decision-making algorithm to aid the healthcare provider in the prevention of surgical fires and actions to be taken if a surgical fire were to occur. The focus is placed on the identification of a patient’s risk factors and the procedural risk factors associated with surgical fires as well as the practice recommendation for prevention of surgical fires.

It is paramount that the interprofessional healthcare team, especially those providers that are responsible for the care of the patient in the OR, takes steps to protect patients and the operating team from the devastating effects of surgical fires through the promotion of fire safety, and prevention of fires.

The purpose of this Doctor of Nursing Practice (DNP) project was to determine if there was a need for the implementation of the FRA checklist at a local Phoenix hospital. A needs assessment addressing the surgical team’s awareness, perception, and utilization of FRA checklist, as well as analysis of the potential barriers to implementation of the FRA checklist, will inform the organization of valuable information for future endeavors to promote fire safety and prevention.
Background and Significance

Abundantly present in the OR are the three components of the fire triad; fuel, oxidizer, and ignition source which all are necessary for a fire to occur (AORN, 2005). Three separate OR team members are responsible for each component of the fire triad, increasing the complexity of factors that contribute to a surgical fire (Apfelbaum et al., 2013).

FIGURE 1. The Fire Triad. (Adapted from Caplan et al., 2008.)

The OR nurse is responsible for the fuel source, which are items that may come into contact with the patient in the OR environment. Fuel sources include, but are not limited to, alcohol-prep solutions, sponges, gauzes, cables and tubes, drapes, gowns, patient’s hair, and even gastrointestinal tract chemical gases. The anesthesia provider controls the oxidizer, which is the amount of oxygen and/or nitrous oxide administered to the patient. These gases, which the fuel source requires to burn and has the potential to increase the intensity of the fire. The surgeon controls the ignition source, which is any object capable of producing a spark or creating a fire in the presence of a fuel source and oxygen. In the OR ignition sources include electrocautery units (ECU), lasers, heated probes, defibrillator pads or paddles, and light sources (Apfelbaum et al., 2013). Regardless of each providers’ responsibility, preventing fire and maintaining the safety of
the patient is the responsibility of the entire surgical team (ECRI 2015; Hart, Yajnik, Ashford, Springer, & Harvey, 2011).

Although it is estimated that the occurrence of surgical fires in the US is less than 650 annually, the actual number of surgical fires may be much higher, as the literature frequently reports only those incidences in which a surgical fire caused patient harm or demise (Apfelbaum et al., 2013). Surgical fires are classified as “never-events,” however, the rate of occurrence of OR fires are as common as wrong-site surgeries, and retained foreign bodies (ECRI, 2015). Surgical fires can cause serious injuries including severe burns leading to permanent disabilities, scarring, disfigurement, and/or mortality (The Joint Commission, 2015). The consequences of a surgical fire can be devastating to patients and traumatic for surgical team members with feelings of empathy and remorse for the patient, second-guessing, and blaming other team members (ECRI, 2009). The classification as a “never event” deems a surgical fire as a preventable and indefensible occurrence with significant economic and legal implications for not only the healthcare provider but also the organization (Cady, 2007; Guglielmi, Flowers, Dagi, Constantine, McKibban, Greenier, . . . & Groah, 2014; Putnam, 2015; Spruce, 2016). It is crucial for all the OR team members to be cognizant of the components of the fire triad necessary to support combustion and collectively work to keep these components apart and promote fire safety and prevention (ECRI, 2009).

Providing excellent, safe, quality patient care is paramount to the U.S. healthcare system and is attainable through the promotion and implementation of patient safety initiatives. In another study it was determined that utilization of the various checklists and protocols in the current health care system demonstrates significant improvement in the quality of care, making
routine patient care safer and more reliable (Leotsakos, Zheng, Croteau, Loeb, Sherman, Hoffman, & . . . Munier, 2014). Checklists and protocols provide standardization, consistency, and valuable information that help guide the healthcare provider ultimately leading to improved patient safety, interoperability, and quality of care. The addition of FRA checklists has been proven to increase awareness of potential fire risks and improve the quality and safety of patient care (Leotsakos et al., 2014). Therefore, it is imperative to learn if FRA checklists are being done and if not, what barriers exist in regard to the implementation of the FRA checklist to the already standardized universal protocol bedside procedure to start down the path of sustainable surgical fire prevention and adoption.

**Local Problem**

Currently, at a local community hospital, a surgical timeout is routinely performed. However, FRA checklist is not routinely performed and rarely used. All surgical team members are required to participate prior to the initiation of any surgical procedure. When performing the timeout, the patient’s name, date of birth, allergy, type, and correct site of surgery, and the name of the prophylactic antibiotic administered are verified. The purpose of these checks is to avoid performing the wrong surgery, on the wrong patient, on the wrong side, and/or administering a wrong drug(s) or omitting a drug. These simple, yet important steps were designed to advance the quality of patient care and prevent errors (Leotsakos et al., 2014). At this facility, the addition of the FRA checklist to the already established surgical timeout will enhance the facilities ability to protect the patients it serves from harm, improve patient safety, and provide safe quality care.

The surgical team must advocate for patient safety and promote the use of the FRA checklist during every surgical timeout. The devastating consequences associated with surgical
fires coupled with the most current evidence-based research demonstrate that the use of the FRA checklist is essential to patient safety. Clinical practice guidelines (CPG) have been developed based on systematic reviews of evidence with the intent to assess the benefits and harm of alternative care option in the prevention and management of OR fires. A key recommendation within the CPG is the utilization of the FRA checklist. Sluggish adoption of CPG recommendations may be attributable to providers’ attitudes and standards, conflicting patient goals, as well as organizational characteristics (Colón-Emeric, Lekan, Utley-Smith, Ammarell, Bailey, Corazzini, & … Anderson, 2007).

Potential reasons for lack of use of FRA checklists maybe due to lack of time to implement this practice, lack of awareness, and/or provider perceptions and preferences. Implementation and adoption of the FRA checklist have been shown to be reactive, in that adoption occurs after a surgical fire has transpired (Carlson & Rice, 2015). Due to the rarity of surgical fires, many facilities and surgical teams have never experienced the devastation of one which contributes to the poor adoption rates of FRA checklist as well.

Apfelbaum et al. sites that a majority of surgical adverse events are due to lack of communication and human error (2013). A review of the literature revealed that nearly all surgical fires are avoidable with effective communication, appropriate recognition, and acknowledgment of risk among all OR team members (Apfelbaum et al., 2013; Engel et al., 2012; Flowers, 2012; Ing, Schwass, & Connor, 2014; Putnam, 2015; Spruce, 2016; Stewart & Bartley, 2015). These preventative measures are 100% effective with minimal cost and resources required for implementation and adoption to occur (Apfelbaum et al., 2013). Considering the negative consequences of a surgical fire for the patient, healthcare providers, and the
organization, it is crucial to be proactive in adopting measures that will serve in the prevention of surgical fires. The inclusion of a surgical FRA checklist into the already established surgical timeout will encourage the surgical team to communicate and discuss measures to prevent the occurrence of a surgical fire (Apfelbaum et al., 2013; Guglielmi et al., 2014).

**Purpose**

The purpose of this DNP project was to perform a needs assessment regarding surgical team members’ knowledge, awareness, and utilization rate of FRA checklists in order to prevent surgical fires. Moreover, this project gathered data concerning potential barriers towards the implementation and adoption of the FRA checklist to the already established surgical timeout prior to every procedure being performed. As a future Certified Registered Nurse Anesthetist (CRNA), it is imperative to understand current surgical fire prevention process in the OR, as well as assessing barriers to adoption of measures that aid in the prevention of OR fires.

Key knowledge gained from this project can serve as a foundation for the potential need to develop a proactive plan which aims to reform the healthcare practice in regard to surgical fire occurrence which ultimately serves to improve patient safety in the surgical setting.

**Key Stakeholders**

Key to sustainable and reliable patient safety initiatives adoption emphasize the importance of engagement and inclusion of stakeholders and those in the management position within the healthcare organization at the earliest opportunity (Coghlan & Barnnick, 2014). Hospital administrators and Chief Operating Room Director are key stakeholders that have a vested interest in preventing surgical fires and improving patient safety in the OR. Anesthesia providers, as well as the entire surgical team, also serve as stakeholders since they serve on the
front line utilizing FRA tool during the surgical timeout. The level of buy-in from stakeholders is dependent on their active participation in the decision-making process (Coghlan & Barnnick, 2014). Continuous support and involvement of the stakeholders will immensely improve the success and long-term outcomes of this project.

**Research Questions**

Among surgical team members in a local Arizona hospital, is there a need to address the awareness, knowledge, and utilization rate of the Fire Risk Assessment (FRA) checklist in their facility?

**FRAMEWORK AND SYNTHESIS OF EVIDENCE**

**Theoretical Framework**

The Health Belief Model (HBM) will serve as the theoretical framework to explain why the problem in this DNP project exists. A psychological framework developed by psychologists Hochbaum, Kegels, and Rosenstock (1952), focuses on behaviors that motivate and empower individuals to modify their actions to achieve a better outcome (Yin Kwan Ho, Berggren, & Dahlborg-Lyckhage, 2010). HBM predicts and describes the behavior of the individual based on their beliefs and attitudes (Galvin, 1992). The framework maintains that people are mostly rational in their thoughts and actions. Individuals will take action if they believe they are at risk for a negative consequence or to prevent a negative outcome, and if they believe they can be successful to take a recommended action (Healy & Zimmerman, 2010). HBM provides a guideline for project development and allows the researcher to better understand and address the surgical team members’ behaviors (Hayden, 2014). Furthermore, this model allows participants to understand their susceptibility to a condition and increases their knowledge about the severity,
benefits, and barriers of taking an action (Carpenter, 2010; Hayden, 2014; Yin Kwan Ho, 2010).

**Concepts**

The six main constructs of the HBM framework attempts to describe the perceived threat and net benefits that account for an individual’s readiness to take action or change a behavior (Figure 2). A summary of the six constructs and the association to this DNP project are provided in Table 1.

![The Health Belief Model](image)

**FIGURE 2.** The Health Belief Model. *(Adapted from Becker and Rosenstock, 1984)*.

**Perceived Susceptibility**

*Perceived susceptibility* to a problem is the first construct in the HBM and argues that individuals will become motivated to change their behavior if they believe they are at risk for a negative outcome. For example, if an individual feels they are at risk for pneumonia they are more likely to participate in an annual health screening and to accept preventive treatment like receiving the pneumonia vaccine (Carpenter, 2010). The surgical team members’ perception of a
patient’s surgical fire risk and the likelihood of an OR fire to occur correlates with perceived susceptibility. This variable is a strong predictor of the likelihood of surgical team members’ engagement and adoption of the FRA checklist.

**Perceived Severity**

*Perceived severity* is a person’s insight of the significance or severity of a negative outcome. The stronger the negative perception regarding the effects, a provider will sustain if a surgical fire were to occur the more likely the anesthesia provider will adopt measures for prevention to mitigate negative outcomes (Carpenter, 2010).

**Perceived Benefit**

*Perceived benefit* is a person’s awareness that taking action will be beneficial in avoiding a situation or preventing a condition. A surgical team member will likely adopt the FRA checklist if there is the belief that it will prevent an OR fire and reduce the risk for themselves as well as for the patient (Carpenter, 2010).

**Perceived Barriers**

*Perceived barriers* are the person's awareness of negative outcomes of an action or behavior. The greater the barriers an individual expects to face for taking a certain action, the less likely they are to modify their behavior (Carpenter, 2010). The perceived barriers in this context are the surgical team member's view of the inconvenience and difficulties they would face if they modify their action or behavior.

**Cues to Action**

*Cues to action* are the construct that influences behavior. Cues to action are the presence of internal and external stimulants that support or prevent individuals from altering their action
and/or their behavior (Carpenter, 2010). Previous experience, education, and/or advice from other providers or colleagues that spark the readiness of the surgical team member to change their action or behavior represent cues to action.

**Self-Efficacy**

*Self-efficacy* is an individual’s own belief in their ability to take certain action and to modify their behavior (Carpenter, 2010). The provider’s belief and confidence that he/she can successfully utilize the FRA checklist will ensure successful adoption of this beside procedure.

**TABLE 1. The six main constructs of the Health Belief Model**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
<th>Relevance to Fire Safety in Operating Room</th>
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</thead>
<tbody>
<tr>
<td>Perceived Susceptibility</td>
<td>One's opinion of chances of getting a condition</td>
<td>OR team members believe a surgical fire can occur at their workplace, especially, if the surgery involves the anatomical region of upper chest, neck, and/or head.</td>
</tr>
<tr>
<td>Perceived Severity</td>
<td>One's opinion of how serious a condition and its consequences are</td>
<td>OR team members believe the consequences of a surgical fire can be devastating enough that they are willing to take measures to avoid it from occurring.</td>
</tr>
<tr>
<td>Perceived Benefits</td>
<td>One's belief in the efficacy of the advised action to reduce risk or seriousness of impact</td>
<td>OR team members believe that following the guidelines and recommendations on surgical fire safety initiatives would reduce the risk of surgical fire from occurring.</td>
</tr>
<tr>
<td>Perceived Barriers</td>
<td>One's opinion of the tangible and psychological costs of the advised action</td>
<td>Since surgical fires are relatively rare events, OR members may have certain perceptions and attitudes, such as “This will not happen in this operating room”. Publications and case reports from several organizations and federal agencies may spur these health care providers into believing that surgical fires are a real problem, it could happen in any setting, and pose a serious risk to patients, members of the surgical team, and the healthcare facility.</td>
</tr>
<tr>
<td>Cues to Action</td>
<td>Strategies to activate “readiness”</td>
<td>Implementation of fire risk assessment during the surgical timeout for every surgical procedure.</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>Confidence in one's ability to take action</td>
<td>OR team members are confident that the steps they are taking minimize the risk of surgical fire from occurring.</td>
</tr>
</tbody>
</table>

(Adapted from University of Twente n.d.)

Utilization of the HBM in this project serves to guide the premise that the identification of the surgical team members’ knowledge, awareness, perception, and attitudes in regard to the implementation and adoption of a FRA checklist will change behavior. By identifying obstacles,
attitudes, and perception to behavior modification, one can predict which elements have the potential to hinder team assimilation and adoption (Rezapou, Mostafavi, & Khalkhali, 2016). Lastly, HBM aids in the development of a sustainable plan of action that best fits with the organizations' cultural assumptions, attitudes, and beliefs (Rezapour, Mostafavi, & Khalkhali, 2016).

**Definition of Terms**

**High-Risk Surgery**

A surgery in which an ignition source is in close proximity to an oxidizing source, thereby increasing the risk of a surgical fire. A high-risk risk surgery includes, but is not limited to, a surgical procedure that occurs above the nipple line and/or in close proximity to the head, neck, and face (Caplan et al., 2008).

**Oxygen-Enriched Environment**

An atmosphere that contains a greater percentage of oxygen than the typical 21% oxygen contained in ambient air. An oxygen-enriched environment contains greater than 22% oxygen presenting a significant risk of fire and explosion (de Almeida, Curi, Brezinscki, & de Freitas, 2012).

**Fire Prevention Checklist**

A fire assessment tool that assesses and ranks the risk of surgical fire during a surgical procedure utilizing an evidence-based list of components. The assessment tool ranks a surgical fire risk from 0-3, with a score of 3 being the highest risk for surgical fire and a score of 1 being the lowest risk for surgical fire (CCHS, 2010). (Appendix A).
Never Events

Adverse medical incidents that are serious in their consequences and entirely preventable and should never occur to a patient. Never events include, but are not limited to, wrong site surgery, wrong patient surgery, a surgical fire, the unintentional retention of a foreign object inside the patient after surgery (Lembitz & Clarke, 2009).

Synthesis of Evidence

Since the reported occurrence of surgical fires is the same as wrong-site surgery, it is necessary to include a FRA checklist to the already established surgical timeout. Therefore, a literature review was undertaken to evaluate current evidence related to surgical fire safety, reported the occurrence of OR fires, and outcomes related to surgical safety checklists on teamwork and communication. Key searched terms included; “surgical fire,” OR “fire,” “fire assessment,” “surgical time out,” “airway fire,” “fire protocol,” “checklist,” “surgical pause,” “never event,” and “fire prevention” utilizing the electronic literature databases, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Embase, and Google Scholar. Additional criteria for the literature search included; article published within the last ten years, English language, and human species yielding a total of 253 results. Further exclusion criteria were applied including articles that did not relate to surgical fires, or fires that did not occur in the operating room, or surgical checklists. A comprehensive summary of relevant articles that includes clinical practice guidelines, systematic reviews, meta-analyses, surveys, and case reports can be found in table format (Table 2). The quality of evidence, validity, and reliability of these studies can be viewed in Table 2.
### TABLE 2. Appraisal of evidence.

<table>
<thead>
<tr>
<th>Author/Article</th>
<th>Key Variables Hypothesis/Research Question</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
</table>
| National Guideline, Clearinghouse. (2013). Practice advisory for the prevention and management of operating room fires: An updated report by the American Society of Anesthesiologists Task Force on Operating Room Fires. | • To identify situation conducive to fire  
• To prevent the occurrence of operating room (OR) fires  
• To reduce adverse outcomes associated with OR fires  
• To identify the elements of a fire response protocol                                                 | National Guideline  | 124 articles contained direct linkage-related evidence | • Hand-searches of published literature (primary sources)  
• Hand-searches of published literature (secondary sources)  
• Searches of electronic databases  
• Searches of unpublished data | This guideline provides guidance based on evidence regarding the efficacy of specific perioperative activities associated with the prevention and management of OR fires including:  
• Education  
• OR fire drills  
• Preparation  
• Management  
  o Ignition sources  
  o Fuel sources  
  o Oxidizer sources |}

• The effect of surgical safety checklists on patient morbidity and mortality.  
• The effect of surgical safety checklists on compliance with recommended surgical safety measures. | Meta-analysis  | 19 Studies that met the criteria and related to the effectiveness of surgical safety checklists on teamwork, communication, morbidity, mortality, and compliance with safety measures. | This study conducted electronic databases including CINHAL, ProQuest, MEDLINE, and Google Scholar | • The effect size of checklists on teamwork and communication = 1.180 \( (p = .003) \)  
• The effect size of checklists on morbidity = 0.123 \( (p = .003) \)  
• The effect size of checklists on mortality = 0.088 \( (p = .001) \)  
• The effect size of checklists on compliance with safety measures = 0.268 \( (p < .001) \).  
• This study indicates that surgical safety checklists improve teamwork and communication, improve patient outcomes, reduce morbidity and mortality, and improve compliance with safety measures. |
<table>
<thead>
<tr>
<th>Author/Article</th>
<th>Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
</table>
  • Hand-searches of published literature  
  • Searches of reference lists of key articles, and tables of content. | • Checklists are effective and economic tools that decrease mortality and morbidity.  
  o Relative risk for mortality= 0.57 (95% CI: 0.42–0.76)  
  o Relative risk of morbidity and any complications= 0.63 (95% CI: 0.58–0.67).  
  • Utilization of Checklists improve compliance of surgical staff  
  • Utilization of checklists reduce costs in hospitals |
  • Only cases in which the primary reason for litigation was determined to be the surgical fire or operative burn were included in the final analysis. | • High energy devices (electrocautery, monopolar, bipolar, lasers, ultrasonic energy systems) remain as the most common cause of injury in 90% of surgical fire cases  
  • Understanding and addressing pitfalls in operative care may mitigate errors and potentially lessen future liability. |
<table>
<thead>
<tr>
<th>Author/Article</th>
<th>Qual: Concepts or Phenomena</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
</table>
• Two reviewers identified relevant publications in 2014.  
• One reviewer used a standardized form to extract data and a second reviewer checked the data.  
• The strength of evidence was established by the review team. Data extraction was completed in 2015. | • Evidence for preventing surgical fires was insufficient, and intervention effects were not estimable.  
• Root-cause analyses suggest the need for improved communication to prevent surgical fires  
• Based on an analysis of closed claims of 103 fires, electrocautery was the ignition source in 93 claims (90%).  
• Survey data of 100 reported fires showed that common fuels were endotracheal tubes and drapes or towels, and supplemental oxygen was in use in most of the cases.  
• An institutional root-cause analysis demonstrated lack of staff awareness of surgical fire and failure to communicate patient’s risks.  
• Surgical fire prevention efforts must begin in the preoperative period:  
  o Use a checklist to ensure that surgical equipment is up to date without any faults  
  o Develop a clear assessment strategy (e.g., checklists) among surgical and nonsurgical staff through a preoperative time-out  
• Continue intraoperative communication, along with the use of surgical apparatus, as appropriate, with great attention to minor details. |
<table>
<thead>
<tr>
<th>Author / Article</th>
<th>Qual: Concepts or Phenomena</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russ, S., Rout, S., Sevdalis, N., Moorthy, K., Darzi, A., &amp; Vincent, C. (2013).</td>
<td>To assess the impact of surgical safety checklists on the quality of teamwork and communication in the operating room.</td>
<td>Systematic review</td>
<td>20 articles formed the basis of this systematic review</td>
<td>This study conducted electronic databases including MEDLINE, EMBASE, PsycINFO, Google Scholar, and the Cochrane Database</td>
<td>The evidence within this study suggests that safety checklists improve the perceived quality of OR teamwork and communication and reduce observable errors relating to poor team skills.</td>
</tr>
<tr>
<td></td>
<td>To gain insight into the impact of surgical safety checklist in reducing never events, minimizing complications and death, and reducing avoidable morbidity and mortality.</td>
<td></td>
<td></td>
<td></td>
<td>Self-perceptions of teamwork and communication improved following the implementation of safety checklists.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observable reduction in visible consequences of poor communication and near-misses associated with communication errors after the checklist implementation.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Safety checklists during time-out process improved teamwork around establishing an open platform for communication at the start of a procedure by:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o sharing critical case-related information</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o promote team coordination and decision making</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o revealing knowledge gaps</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Enhance team cohesion</td>
</tr>
<tr>
<td>Author / Article</td>
<td>Qual: Concepts or Phenomena</td>
<td>Design</td>
<td>Sample (N)</td>
<td>Data Collection (Instruments/Tools)</td>
<td>Findings Related to Project</td>
</tr>
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</tr>
</tbody>
</table>
• To support a briefing process that improves surgical team communication, collaborations, and encourage teamwork and caring | Quasi-experimental : pre-test/post-test | (n=93) included surgeons, nurse anesthetists, operating room nurses, and surgical technologists at Broward Health Imperial Point Hospital in Florida. | • Pretest data were collected during two weeks in the first quarter of 2015  
• Posttest data were gathered during two weeks in the second quarter of 2015. | As a result of implementation of surgical safety checklist, this study observed improved surgical teamwork behaviors and an enhanced culture safety in the operating room. |
• Responses were analyzed using descriptive statistics.  
• The survey was generated to elicit responses regarding preferred anesthetic techniques, use of equipment and devices, | This study indicated that in general pediatric anesthesia provider do not adhere to the ASA-PA due to  
○ Lack of knowledge about the recommendations  
○ A perceived limited clinical applicability in the pediatric setting.  
• Regardless, this study highlights that airway fires during laser procedures in pediatrics population do occur, emphasizing the need for safe practice standards using fire assessment checklists. |
<table>
<thead>
<tr>
<th>Author / Article</th>
<th>Qual: Concepts or Phenomena</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
</table>
| Haugen, A. S., Muruges, S., Haaverstad, R., Eide, G. E., & Søfteland, E. (2013). A survey of surgical team members’ perceptions of near misses and attitudes towards Timeout protocols. *BioMedical Central surgery, 13*(1), 46-46 | To gain insight into how surgical team members perceive near misses and their attitudes towards the use of Time-out checklist in the operating room. | A cross-sectional study using surveys | (N = 427) include surgeons, anesthetists, and operating room nurses | • The survey questionnaire was distributed to all eligible medical personnel through hospital email system.  
• The questionnaire was submitted within four weeks.  
• The questionnaire consisted of 14 items, 11 of which had dichotomous responses (0 = no; 1 = yes) and 3 of which had responses scored on an ordinal scale (items 7–9) (never = 0; sometimes = 1; often = 2; always = 3).  
• Items reflected team members’ own experience of near misses or mistakes; questions about whether they believed that such mistakes could have been avoided by using the checklists during the time-out.  
• The survey also contained an open-ended question that allowed respondents to offer their opinions on the topic. | • To improve the compliance with existing guidance, this study recommends the development of pediatric-specific fire prevention guidelines based on current evidence and taking into account preferred anesthetic technique and specific feasibility factors in this patient population.  
• The majority of our surgical personnel experienced near-miss events.  
• A study found that the near-miss experiences are a wake-up call for systematic risk reducing efforts and the use of checklists in surgery.  
• Systematic risk reducing efforts to prevent never events suggest implementing:  
  o Hospital safety improvement programs  
  o Monitor and develop a safety culture  
  o Chairs must report on a support safety effort  
  o Build in clinical safety defenses and barriers  
  o Surgical team training  
  o Perioperative checklists during surgical time-out that enhances patient safety. |
<table>
<thead>
<tr>
<th>Author / Article</th>
<th>Qual: Concepts or Phenomena</th>
<th>Design</th>
<th>Sample (N)</th>
<th>Data Collection (Instruments/Tools)</th>
<th>Findings Related to Project</th>
</tr>
</thead>
</table>
| Mehta, S. P., Bhananker, S. M., Posner, K. L., & Domino, K. B. (2013). Operating room fires: A closed claims analysis. *Anesthesiology, 118*(5), 1133-1139. | To assess patterns of injury, clinical details, and liability associated with OR fires claims | Case series | A total of 103 OR fires claims were analyzed | - This study obtained databases from American Society of Anesthesiologists (ASA) Closed Claims Project  
- A structured evaluation of closed malpractice claims from 35 professional liability insurance companies | - Electrocautery-induced fires during monitored anesthesia care were the most common cause of OR fires claims.  
- Recognition of the fire triad (oxidizer, fuel, and ignition source), particularly the critical role of supplemental oxygen by an open delivery system during use of the electrocautery, is crucial to prevent OR fires.  
- Continuing education and communication among OR personnel along with fire prevention checklists in high-fire-risk procedures may reduce the occurrence of OR fires. |
**Strengths**

The study strengths included the use of systematic and meta-analysis study designs, which provides the highest level of evidence. The evidence strongly supports the inclusion of FRA checklist during the surgical timeout. During a surgical timeout, utilization of a checklist serves to enhance interprofessional communication and increase the quality of teamwork ultimately leading to improved patient outcomes and bolstering surgical safety (Cabral et al., 2016; Choudhry, Haddad, Khasawneh, Cullinane, & Zielinski, 2016; Lyons et al., 2014; Russ et al., 2013; Schroeck, Healy, & Tait, 2014). A review of the literature revealed that nearly all surgical fires are avoidable with effective communication, proper education, and appropriate recognition and management of fire risks (Cabral, Eggenberger, Keller, Gallison, & Newman, 2016; Hempel et al., 2015; Lyons & Popejoy, 2014; Metha, Bhananker, Posner, & Domino, 2013; National Guideline Clearinghouse, 2013; Russ, Rout, Sevdalis, Moorthy, Darzi, & Vincent, 2013). Although the occurrence of a surgical fire is rare, the evidence demonstrates that they do happen, and rates of their incidence have not declined in the last decade.

To ensure patient safety, it is imperative that members of the OR team follow surgical fire safety recommendations established by national organizations (Borchard, Schwappach, Barbir, & Bezzola, 2012; Choudhry et al., 2016; Cabral et al., 2016; Haugen, Murugesh, Haaverstad, Eide, & Softeland, 2013; National Guideline Clearinghouse, 2013).

**Weaknesses**

Majority of surgical fire occurrences are presented as case reports, expert opinion reports, and Close Claim Analysis which weaken the overall strength of the evidence. A study performed by Carbal et al., (2016), failed to show an increase in the use of a checklist after staff education
took place. Schroeck et al., (2011) perceived there was a limited clinical applicability of the American Society of Anesthesiologists Practice Advisory (ASA-PA) recommendations in the pediatric setting. However, this study revealed that the majority of participants in the study did not adhere to the ASA-PA recommendations consistently.

Discrepancies found among available literature threatens the findings of the evidence and appears to be attributable to misinformation and lack of awareness in regard to surgical fire risks, prevention, and management. Lack of consistency in findings is concerning when attempting to evaluate the utilization rate of fire prevention checklists during the surgical timeout in the OR.

Gaps

Due to their rarity and unpredictability, surgical fire studies in the literature are naught. Current literature within the last five years regarding the usefulness of FRA during the surgical timeout is lacking. In addition, there is a gap in the evidence regarding the best time during the perioperative period to perform a surgical fire risk assessment, what individuals should be required to participate, and which fire safety prevention checklist is more reliable. Discrepancies among available literature threaten the strength of the evidence.

Limitations

Doubtless, the true number of surgical fires that occur annually is underreported since only those surgical fires that result in patient harm are mandatory reported events. The suspected lack of reporting limits the validity of current evidence. As well, the nature of the literature available limits the reliability and transferability of the evidence. Closed Claims Analysis data is collected via a retrospective survey of potentially biased participants which threatens the trustworthiness of data claimed.
Summary

The existence and ramifications of surgical fires in the OR are well documented in the literature. However, specific fire risk prevention and management standards of care in the clinical setting remains deficient. High-quality meta-analysis and systematic reviews have revealed that the use of checklists during the surgical timeout leads to an improved culture of patient safety, reduces the risk of never events, and increases the quality of teamwork and communication in the OR. To increase patient safety and decrease the occurrences of surgical fires in the OR, the American Society of Anesthesiologist (ASA), the American Association of Nurse Anesthetist (AANA), the Association of Perioperative Nurses (AORN) and the U.S. Food and Drug Administration (FDA), state that healthcare organizations have a duty to adopt and incorporate a FRA checklist during the already established surgical timeout.

METHODS

The needs assessment by Rothwell and Kazanas (1992) was utilized to implement this practice improvement project (Figure 3). Rothwell and Kazanas’ model for developing a needs assessment has five key phases:

1) Establish purpose of needs assessment

2) Select a sample group

3) Select data collection method

4) Establish a method for data analysis

5) Assess feasibility of needs assessment plan
FIGURE 3. Rothwell and Kazanas needs assessment for planning model.

The first step for this project was to identify the gap in current practice and to determine if there was a need to operationalize a FRA checklist during the surgical timeout. Second, the sample group selected for this needs assessment consisted of a surgical team member at a local hospital in Arizona. Third, the data collection method selected for this project included survey questionnaires. (Appendix B & Appendix C). Through a survey, surgical team members were asked to respond to questions that address their current knowledge, attitude, and utilization rates of fire prevention procedures. In addition, this survey tool assessed the perceptions and barriers to adoption of a FRA checklist. Forth, descriptive statistics using frequency tables were utilized for data analysis. Fifth, feasibility for the FRA checklist during the surgical timeout was examined after evaluating surgical team members' knowledge, attitude, and rate of utilization of FRA checklist.
Design

The design of this project was a non-experimental needs assessment. The focus of this project was on performing a needs assessment for safety improvement purposes via the need for a FRA. The modified fire safety assessment survey collected both demographic and descriptive data from participants for the intent of gaining insights into the current understanding of the current fire safety culture embedded in this healthcare organization (Polit & Beck, 2012). Self-report data were collected via survey regarding the knowledge, attitude, and utilization rate of FRA checklist by the surgical team members during the surgical timeout. The survey was distributed to 63 surgical team members at a local hospital in Phoenix, Arizona. The survey was open to participants for 25 days. A reminder email was sent to participants a week after the survey was sent to optimize their responses.

Setting and Participants

A convenience sample of surgical team members included surgeons, anesthesiologists, nurse anesthetists, circulating room nurses, and surgical technicians working at a level one trauma hospital in the greater Phoenix, Arizona metropolitan area with eleven operating rooms were surveyed for a period of three weeks.

Ethical Considerations

Ethical principles to consider when conducting research with human subjects are based on the principles of respect for person, beneficence, and justice. These principles will guide the researcher through difficult situations where demands of the study conflict with the ethical rights of the participants (Sims, 2010). Prior to data collection for this DNP project, approval for survey distribution via email was obtained from the Chief of Anesthesia Department (Appendix D). In
addition, a determination of human research form was completed and submitted to the Human Subjects Protection Program at the University of Arizona. Approval from the Institutional Review Board (IRB) at the University of Arizona was obtained which exempt this DNP project since it did not meet human subject review (Appendix E).

**Respect for Persons**

Participant’s voluntary participation without penalty, coercion or a liability in the completion of the survey with full disclosure of all aspects of this DNP project ensures respect for persons participating in this project (Polit & Beck, 2012). The participants in this project are those individuals that are part of the surgical team and will not include patient’s perspectives or data. As a guest at this facility, the project lead, is aware that she is a guest in the facility and that all healthcare providers are autonomous agents that are entitled to protection (US Department of Health & Human Services [USDHHS], 2017.). With the intent to provide protection, the purpose of the project will be fully explained, and informed consent will be obtained without coercion or influence. All participants will receive a welcome letter describing the purpose of the study, terms of confidentiality, methods for storing data, as well as any risk or benefits of participating.

**Beneficence**

Beneficence is doing good for others, being considerate, showing kindness, committing to do well, and avoiding harm (Sims, 2010). To minimize discomfort, the participants had full disclosure of the purpose of the study and were informed that their perspectives may be used for further research and development of an action plan. Furthermore, participants were informed that the findings from this project will be shared with them upon request.
Justice

The principles of justice are to treat people fairly and equally (Sims, 2010). For this study, all participants were treated equally as all participants were required to complete the same questionnaire and questions were the same regardless of the participant’s work specialty or experience.

Population Vulnerability

The subject population of the surgical team members at this particular healthcare setting did not encompass vulnerable participants such as children, prisoners, or specific people from a race, religion, or society (Sims, 2010). There were no identifiable harms associated with survey questionnaire and while benefits to respondents may be insignificant, they were offered the opportunity to view study results upon request.

Tools and Data Analysis

The knowledge and attitude questions selected to carry out this project were based on an original questionnaire developed by Upton and Upton (2006) and had been slightly modified to fit the context of this project (Appendix B and Appendix C). Permission to use the survey was obtained from Professor Upton (Appendix F). This questionnaire has been validated and found to be highly reliable (Upton & Upton, 2006). Cronbach’s α was 0.87 for their questionnaire when used among 1,000 nurses across the United Kingdom (Upton & Upton, 2006).

The survey included two sections, 1) sociodemographic questions (n=6), and 2) questions regarding knowledge, practice, and attitudes related to FRA checklist during the surgical timeout (n=13), for a total of 19 questions (Appendix B and Appendix C). An email was sent to participants when the survey opened. Three attachments to the email included an introduction
letter (Appendix H), disclaimer form (Appendix I), and the survey link. The survey was delivered to participants using Qualtrics, a web-based survey software program which facilitated the formatting, email delivery of survey link to participants, and formulating reports (Qualtrics, 2017). All question items used a five-point Likert scale (i.e. strongly agree, agree, neutral, disagree, or strongly disagree). The survey was opened for a period of three weeks with weekly follow-up email in order to improve participation (Appendix J). Features of Qualtrics web-based survey software program is the prohibition of participants submitting multiple surveys or forwarding the link to other participants. Upon closure of survey, data were downloaded from Qualtrics into an Excel computer package for further analysis. Results from the second section of the survey were analyzed with descriptive statistics calculated by the Qualtrics survey platform and summarized according to the percentage, means and standard deviation (SD). Summarized data was presented and formatted using frequency tables and description of the findings.

RESULTS

A total of 16 participants (25.4%) responded to survey. Majority of respondents were female 69% (N=11), with most between the age group of 30-49 (N=13), followed by age group 50-59 (N=2), and one between the age of 20-29 (N=1) (Figure 4).

![Figure 4. Age Group of Respondents](image)
Majority of the participants were anesthesia provider 88% (N=14), followed by one scrub technician 6% (N=1), and one OR nurse 6% (N=1) (Figure 5).

*Figure 5. Role of Respondents*

Most the respondents were master’s degree prepared providers 63% (N=10), followed by doctorate degree 25% (N=4), one baccalaureate prepared provider 6% (N=1), and one with a high school diploma 6% (N=1) (Figure 6).

*Figure 6. Education level of Respondents*
The total number of participants with 1-5 and 6-10 years in practice were equal both categories had 31% (N=5), followed by 11-20 years 19% (N= 3), with 13% of respondents in practice between 20-30 years (N=2), and one in practice for < 1year (6%) (Figure 7).

Figure 7. Years in Practice of Respondents

Results of the survey regarding FRA Checklist are listed below (Table 3).

TABLE 3. The response of the surgical team members at a Phoenix metropolitan hospital.

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2-1</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>38%</td>
<td>6.00%</td>
<td>16</td>
<td>4.00%</td>
<td>1</td>
</tr>
<tr>
<td>Q2-2</td>
<td>6%</td>
<td>6%</td>
<td>13%</td>
<td>69%</td>
<td>1%</td>
<td>16</td>
<td>3.63</td>
<td>0.93</td>
</tr>
<tr>
<td>Q2-3</td>
<td>0.00%</td>
<td>0.00%</td>
<td>19%</td>
<td>81%</td>
<td>0.00%</td>
<td>16</td>
<td>3.81</td>
<td>0.39</td>
</tr>
</tbody>
</table>
TABLE 3. – Continued

Q2-4 I like to have an educational class on fire risk assessment related to the surgical timeout.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0</td>
<td>31%</td>
<td>38%</td>
<td>6</td>
<td>16</td>
<td>3.00</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Q2-5 I am aware of Fire Triad and trusted methods on fire risk assessment performed during the surgical timeout.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0</td>
<td>75%</td>
<td>13%</td>
<td>2</td>
<td>16</td>
<td>2.38</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Q2-6 My literature search skills in retrieving information in regard to fire risk assessment during the surgical timeout is:

<table>
<thead>
<tr>
<th>Poor Below Average</th>
<th>Average</th>
<th>Above Average</th>
<th>Excellent</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0</td>
<td>0.00%</td>
<td>0</td>
<td>16</td>
<td>3.13</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Q2-7 – I review and check for current practice standards on fire risk assessment during the surgical timeout.

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Every once in a while</th>
<th>Sometimes</th>
<th>Always</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>4</td>
<td>31%</td>
<td>13%</td>
<td>2</td>
<td>16</td>
<td>2.56</td>
<td>1.27</td>
</tr>
</tbody>
</table>

Q2-8 - I am aware of trusted information types and sources related to fire risk assessment during the surgical timeout.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6%</td>
<td>1</td>
<td>38%</td>
<td>31%</td>
<td>5</td>
<td>16</td>
<td>2.75</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Q2-9 - I know how to identify gaps in my professional practice related to fire risk assessment during the surgical timeout.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Total (N)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>6%</td>
<td>1</td>
<td>69%</td>
<td>19%</td>
<td>3</td>
<td>16</td>
<td>2.25</td>
<td>0.66</td>
</tr>
</tbody>
</table>
Most of the respondents acknowledged that fire risk assessment is an appropriate tool and is necessary during a surgical timeout. However, 38% (N=6) of respondents were neutral, 31% (N=5) agreed, and 31% (N=5) disagreed on the need for an in-service on fire risk assessment checklist during a surgical timeout. When assessed for participants’ knowledge in regard to FRA checklist, 75% of respondents (N=12) knew about fire triad and other trusted information related to FRA checklist during a surgical timeout. Furthermore, 88% of respondents (N= 14) reported on having average skill in retrieving information about FRA, followed by 13% (N=2) ranking their skill as above average to perform literature search on FRA checklist during a surgical timeout. This correlated with that fact that in question 10, 69% (N=11) of surgical team members
agreed on knowing how to obtain information related to FRA checklist. However, when asked if the participant can distinguish if the source is valid or not, 38% (N=6) agreed, 38% (N=6) were neutral, and 19% (N=3) disagreed in their ability to determine how valid is the data related to FRA during a surgical timeout.

The data from question 7 shows only 25% (N=4) of participants review the current practice guideline on FRA in the OR, while 31% (N=5) of the respondents remained neutral in their responses. Responses to question 13, 38% (N=6) indicated that participants rarely share current practice guideline and trusted information on FRA with the other members of the surgical team. In fact, only 13% (N=2) marked they sometimes share information related to FRA with other members of the surgical team. Question 12 assessed the participants’ attitude and perception on the usefulness of the FRA during the surgical timeout in their current clinical practice setting in which 50% (N=8) of respondents marked they agreed with this statement, while 38% (N=6) were neutral in their responses. This correlated with the responses to question 9 in which, 69% (N=11) of the participants agreed on identifying the gap in their current practice related to FRA checklist during the surgical timeout.

**DISCUSSION**

The project is unique in that it sought to discover the knowledge, attitude, and perception of the surgical team members on the utilization of the FRA checklist during the surgical timeout. Despite published evidence demonstrating that the risk of fire is relatively high in the operating room, there appears to be a considerable variability in provider practice for assessing the risk of fire prior to the start of a procedure. Although this hospital currently does not have a standard FRA checklist during a surgical timeout, it appears that these providers have baseline knowledge about operating room fires and consider surgical fires as a real risk in the OR. The time needed
to institute FRA checklist during surgical timeout appears to be a barrier to implementation. This need assessment was a crucial starting point to evaluate surgical team members’ knowledge, attitude, and perception about FRA checklist during the surgical timeout. This project helped to identify any gaps in the current practice at this hospital. It will be crucial understanding the baseline knowledge and surgical team members' perception in order to plan for a method of changing those attitudes and perception if an implementation plan is to be moving forward.

**Strengths and Limitations**

Despite not having a current standard policy of care for addressing the risk of fire during the surgery at this healthcare facility, a strength of this project was learning that surgical team members have a baseline knowledge about surgical fires in the OR. Furthermore, the providers understand the risk of fire in the OR is considerably high.

A limitation of this study was a lack of participations from surgeons and surgical residents, surgical technicians, and circulating nurses. Although the survey link was emailed to all members of the surgical team, the respondents were mostly anesthesia providers with one surgical technician and one circulating nurse.

Another limitation to this study was the sample size, only 16 out of 63 participants complete the survey, resulting in a 25.4% participation rate. Increased survey participation by surgical team members may have added rich data to this DNP project. However, despite the relatively low response rate, it gives this healthcare facility a starting point on how to move forward with an implementation plan.
**Dissemination Plan**

The summary of the results from this DNP project was shared with nurse anesthetists via the use of electronic poster presentation at the Arizona Nurse Anesthetist Association Sun and Fun Conference poster presentation session held in March 2018. In addition, an executive summary will be emailed to the Chief of Anesthesia Department where this project took place, detailing the participant's knowledge gaps and the barriers that may be blocking the implementation of utilizing FRA checklist during a surgical timeout.

**Conclusion**

Surgical fires in the operating room (OR) are a relatively rare event. However, when a fire occurs it can be devastating to the patient, surgical team members, and the organization. The majority of the OR fires can be prevented by simple precautionary measures. One of the ways to increase awareness about a surgical fire is to perform the FRA checklist during the surgical timeout.

The goal of this DNP was accomplished by completion of a needs assessment and identification of gaps in practice and evaluation that there was a need to operationalize FRA checklist during the surgical timeout at this healthcare facility in Phoenix, Arizona.

This project added valuable information in understanding the baseline knowledge, attitudes, and perceptions of the surgical team members at this healthcare organization related to FRA checklist during the surgical timeout. Furthermore, as of February 7, 2018 a protocol for FRA checklist and prevention implemented as a routine part of the surgical timeout at this facility.
APPENDIX A:

FIRE RISK ASSESSMENT CHECKLIST BY CHRISTIANA CARE HEALTH SERVICES
UNIVERSAL PROTOCOL AND FIRE RISK ASSESSMENT - BEDSIDE PROCEDURE

<table>
<thead>
<tr>
<th>Pre-Procedure Verification</th>
<th>Side/Ide Site Marking</th>
<th>Time Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedside staff will perform the pre-procedure verification process. Mark if confirmed.</td>
<td>Licensed Independent Practitioner (LIP) performing the procedure will initial the procedure site.</td>
<td>The entire procedure team performs a Time Out. All members verbally agree.</td>
</tr>
<tr>
<td>1. Name and date of birth confirmed □</td>
<td>1. Name and date of birth confirmed</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
<tr>
<td>2. Consent confirmed procedure □</td>
<td>2. Verbal agreement on procedure to be done</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
<tr>
<td>3. Site marking required – go to Step 2 □</td>
<td>3. Correct site/site if required per Step 1</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
<tr>
<td>Site marking not required – go to Step 3 □</td>
<td>4. Correct equipment/implants available</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
<tr>
<td>Initial: ____________________ Time: __________</td>
<td>5. Correct position</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
<tr>
<td>Fire Risk Assessment</td>
<td>If LIP to perform procedure leaves patient room or second procedure is to be done:</td>
<td>Repeated Time Out confirmed:</td>
</tr>
<tr>
<td>Score</td>
<td>Initial: ____________________ Time: __________</td>
<td>Initial: ____________________ Time: __________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure site or incision above the xiphoid</th>
<th>1 (Yes)</th>
<th>0 (No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open oxygen source (face mask/nasal cannula)</td>
<td>1 (Yes)</td>
<td>0 (No)</td>
</tr>
<tr>
<td>Ignition source (cautery, laser, fiberoptic light)</td>
<td>1 (Yes)</td>
<td>0 (No)</td>
</tr>
<tr>
<td>SCORE of 1 or 2 – Initiate Routine Protocol □</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCORE of 3 – Initiate High Risk Fire Protocol (see side 2 for details) □</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial: ____________________ Time: __________

Initial: ____________________ Signature/Title: ____________________ Print Name: ____________________
Initial: ____________________ Signature/Title: ____________________ Print Name: ____________________

UNIVERSAL PROTOCOL AND FIRE RISK ASSESSMENT - BEDSIDE PROCEDURE

PURPOSE: To be used when an RN or Technician (Tech) assists or observes a Licensed Independent Practitioner (LIP) performing a bedside procedure. In the event that the LIP performs a procedure without assistance or observation by an RN or tech, the LIP will document their Time Out in the procedure documentation and this form may be omitted.

- **Step 1 – Pre-procedure Verification Process**
  - **Purpose:** To outline the process for identifying the correct person, correct procedure, and correct site for surgical and invasive procedures with involvement of the patient or decision maker when possible.
  - A. The caregiver (RN/LPN, anesthesia provider, surgeon, resident, PA) beginning the verification process will initial this form.
  - B. Mark (✓) the boxes confirming your verification process.
  - C. Resolve discrepancies identified through the verification process prior to initiating the bedside procedure.

- **Step 2 – Side/Ide Site Marking**
  - **Purpose:** To clearly identify the intended site of incision or insertion.
  - A. Licensed Independent Practitioner (LIP) performing the procedure will initial patients having surgical/invasive procedures involving laterality, digits or level(s). The RN will confirm presence of LIP initial.

- **Step 3 – Time Out**
  - **Purpose:** To conduct a final verification of the correct patient, procedure, site and implants (if applicable).
  - A. Time out is completed prior to the start of each procedure.
  - B. Designated person (assisting RN or tech) will confirm agreement, and record Time Out.
  - C. In the event that the LIP performing the procedure leaves the patient, repositions patient or performs second procedure after the Time Out had occurred, the Time Out process is repeated and documented.

**Fire Risk Assessment**
- **Routine Protocol**
  1. Fuel
     a. When an alcohol based solution is used, use minimal amount of solution and allow sufficient time for fumes to dissipate before draping. Observe drying time (minimum 3 minutes). Do not drape patient until flammable prep is dry.
     b. Do not allow pooling of any prep solution (including under the patient).
     c. If remove all volatile solution from sterile field as soon as possible after use.
     d. Utilize standard draping procedure
  2. Ignition Source
     a. Check all electrical equipment before use.
     b. Protect all heat sources when not in use. (catheters, cautery pencil holder, laser in stand by mode etc.)
     c. Activate heat source only when active tip is in line of sight.
     d. De-activate heat sources before tip leaves surgical site.

- **High Risk Protocol (includes all of routine protocol)**
  1. Use appropriate draping techniques to minimize O2 concentration (i.e. tenting, incise drapes).
  2. Electrical Surgical Unit (ESU) settings should be minimized.
  3. Encourage use of wet sponges.
  4. Basins of sterile saline and bulb syringes available for suppression purposes only.
  5. Anesthesia Care Provider considerations:
     a. Syringe full of saline will be available, in reach of the anesthesia care provider, for procedures within the oral cavity.
     b. Documentation of oxygen concentration/flows. Use of "MAC Circuit" for oxygen administration.
APPENDIX B:

SOCIODEMOGRAPHIC QUESTIONNAIRE
Sociodemographic Questionnaire

1. What is your gender?
   - Male
   - Female

2. What is your age group?
   - 20-29
   - 30-39
   - 40-49
   - 50-59
   - 60 and above

3. What is your ethnicity?
   - White
   - Latino/Hispanic
   - Black/African American
   - Native/Indian American
   - Asian/Pacific Islander
   - Other

4. What is your highest education level?
   - Associate Degree
   - Baccalaureate
   - Master
   - Doctorate: DNP/PhD
5. What is your role on the surgical team?
   - Scrub Tech
   - OR Nurse
   - Anesthesia Provider
   - Surgeon

6. How many years have you been practicing as a healthcare provider?
   - < 1 year
   - 1-5 years
   - 6-10 years
   - 11-20 years
   - 20-30 years
APPENDIX C:

KNOWLEDGE, ATTITUDES, AND PRACTICE SURVEY ON FIRE RISK ASSESSMENT TOOL DURING SURGICAL TIMEOUT AMONG SURGICAL TEAM MEMBERS
Knowledge, attitudes, and practice survey on fire risk assessment tool during the surgical timeout among surgical team members

1. I have no time for the fire risk assessment during the surgical timeout because of quick turnover and/or heavy workload
   1 - strongly agree 2 - agree 3 - neutral 4 - disagree 5 - strongly disagree

2. Fire risk assessment tool is not necessary during the surgical timeout.
   1 - strongly agree 2 - agree 3 - neutral 4 - disagree 5 - strongly disagree

3. Fire risk assessment tool during the surgical timeout is waste of time
   1 - strongly agree 2 - agree 3 - neutral 4 - disagree 5 - strongly disagree

4. I like having an education class on fire risk assessment related to the surgical timeout.
   1 - strongly agree 2 - agree 3 - neutral 4 - disagree 5 - strongly disagree

5. I am aware of Fire Triad and trusted methods on fire risk assessment performed during the surgical timeout.
   1 - strongly agree 2 - agree 3 - neutral 4 - disagree 5 - strongly disagree

6. My literature search skills in retrieving information in regard to fire risk assessment during the surgical timeout is:
   1 - poor 2 - below average 3 - average 4 - above average 5 - excellent

7. I review and check the current practice standards on fire risk assessment during the surgical timeout.
   1 - never 2 - rarely 3 - every once in a while 4 - sometimes 5 - almost always

8. I am aware of trusted information types and sources related to fire risk assessment during the surgical timeout.
1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

9. I know how to identify gaps in my professional practice related to fire risk assessment during the surgical timeout.
   1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

10. I know how to obtain information on fire risk assessment during the surgical timeout.
    1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

11. I know how to determine how valid (close to the truth) are the data related to fire risk assessment during the surgical timeout.
    1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

12. I am able to determine how useful fire risk assessment during the surgical timeout to clinical practice:
    1 - strongly disagree 2 - disagree 3 - neutral 4 - agree 5 - strongly agree

13. I share current practice guideline and trusted information on fire risk assessment during the surgical timeout with other members of the surgical team
    1 - never 2 - rarely 3 - every once in a while 4 - sometimes 5 - almost always
APPENDIX D:

PERMISSION TO DISTRIBUTE SURVEY TO SURGICAL TEAM MEMBERS AT
MARICOPA INTEGRATED HEALTH SYSTEM
December 26, 2017

TO WHOM IT MAY CONCERN

Re: Margie Aram

Doctor of Nursing Project on a Needs Assessment Regarding Fire Checklist in the Operating Room

To whom it may concern,

As Chief of the Anesthesia Department at Maricopa Integrated Health System. We would like to assist student registered nurse anesthetist with her survey on A Needs Assessment Regarding Fire Checklist in the Operating Room.

Sincerely,

William Johnson
Chief of Anesthesia Department
APPENDIX E:

THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD APPROVAL
Date: January 08, 2018
Principal Investigator: Margie Huna Aram

Protocol Number: 1801161087
Protocol Title: A NEEDS ASSESSMENT REGARDING FIRE CHECKLIST IN THE OPERATING ROOM

Determination: Human Subjects Review not Required

The project listed above does not require oversight by the University of Arizona because the project does not meet the definition of ‘research’ and/or ‘human subject’.

- **Not Research as defined by 45 CFR 46.102(d):** As presented, the activities described above do not meet the definition of research as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "research means a systematic investigation, including research development, testing and evaluation, designed to contribute to generalizable knowledge”.

- **Not Human Subjects Research as defined by 45 CFR 46.102(f):** As presented, the activities described above do not meet the definition of research involving human subjects as cited in the regulations issued by the U.S. Department of Health and Human Services which state that "human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains data through intervention or interaction with the individual, or identifiable private information”.

Note: Modifications to projects not requiring human subjects review that change the nature of the project should be submitted to the Human Subjects Protection Program (HSPP) for a new determination (e.g., addition of research with children, specimen collection, participant observation, prospective collection of data when the study was previously retrospective in nature, and broadening the scope or nature of the research question). Please contact the HSPP to consult on whether the proposed changes need further review.

The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).
APPENDIX F:

PERMISSION TO UTILIZE SURVEY
Permission to use evidence-based practice questionnaires

Margie Huna Aram <aram@email.arizona.edu>

Oct 14

to Dominic Upton

Professor Upton,

My name is Margie Aram. I am student at the University of Arizona, Doctor of Nursing Practice-Nurse Anesthesia Specialty. I am conducting research assessing operating room team members’ knowledge, attitudes, and practice on fire risk assessment checklist. I would like to get your permission to adapt your evidence-based practice questionnaires tool and modify some of the questions to fit the context of research study.

I appreciate your help and assistance.

Sincerely,

Margie

Oct 15 (13 days ago)

Dominic Upton

to me

Yes, happy to provide permission for the use of the questionnaire. More information, including the terms and conditions are available at www.sbpq.co.uk

Best wishes

Dominic

From: Margie Huna Aram [mailto:aram@email.arizona.edu]
Sent: Saturday, 14 October 2017 8:20 PM
To: Dominic Upton <Dominic.Upton@canberra.edu.au>
Subject: Permission to use evidence-based practice questionnaires
APPENDIX G:

WELCOME LETTER
A Needs Assessment Regarding Fire Checklist in the Operating Room

Welcome Letter

I am writing to you to request your participation in a brief survey. As you may remember my name is Margie Aram and I am a Doctorate student nurse anesthetist at the University of Arizona. I am conducting a study at Maricopa Integrated Health System. The purpose of this study is to survey surgical team members' awareness, perception, and utilization rate of Fire Risk Assessment checklist during surgical time-out. Information gather from this assessment can serve as a foundation for the potential need to develop a proactive plan which aims to reform the healthcare practice in regard to surgical fire occurrence which ultimately serves to improve patient safety in the surgical setting.

The survey is brief and will take less than 10 minutes to complete. Your participation in the survey is completely voluntary and all your responses will be kept confidential. No personal identifiable information will be associated with your responses to any reports or data. Please do not share the survey link with others. Should you have any comments or questions, please feel free to contact me at Aram@email.arizona.edu or 480.695.6070

Thank you very much for taking time to support my DNP project as your input is greatly appreciated.

Sincerely,

Margie Aram BSN, RN, Student Registered Nurse Anesthetist
APPENDIX H:

DISCLAIMER FORM
A Needs Assessment Regarding Fire Checklist in the Operation room

Margie Aram

The purpose of this program evaluation project is to survey surgical team members’ awareness, perception, and utilization rate of Fire Risk Assessment (FRA) checklist during surgical time-out at Maricopa Integrated Health System.

If you choose to take part in this project, you will be asked to take an online survey regarding knowledge and awareness of the FRA checklist during surgical time-out. It will take approximately 10 minutes to complete this survey. There are no foreseeable risks associated with participating in this project and you will receive no immediate benefit from your participation. Survey responses are anonymous.

If you choose to participate in the project, you may discontinue participation at any time without penalty. In addition, you may skip any question that you choose not to answer. By participating, you do not give up any personal legal rights you may have as a participant in this project.

For questions, concerns, or complaints about the project, you may call Margie Aram, BSN, SRNA at (480) 695-6070. (aram@email.arizona.edu)

By taking this survey, you agree to have your responses used for study purposes.

Sincerely,

[Signature]

Margie Aram BSN, RN, Student Registered Nurse Anesthetist
APPENDIX I:

FOLLOW-UP EMAIL
Dear Survey Participant,

Last week you received an anonymous survey seeking your perceptions on online survey regarding awareness, perception, and utilization rate of Fire Risk Assessment (FRA) checklist during surgical time-out. If you have already completed and submitted the survey, thank you so much for your valuable input. If not, please complete your survey [link here], and submit your responses by February 5th, 2018.

Your responses are much appreciated, as they will help me provide factual information regarding the utilization rate of FRA checklist in operating room. Your responses to this survey will remain anonymous.

If you have any questions, please feel free to contact me at aram@email.arizona.edu or 480-695.6070.

Thank you for your time and we appreciate your voluntary participation.

Margie Aram, BSN, RN, Student Registered Nurse Anesthetist
REFERENCES


University of Twente. (no date.). Health belief model. Retrieved from https://www.utwente.nl/cw/theorieenoverzicht/Theory%20Clusters/Health%20Communication/Health_Belief_Model/

