

**Implementation of Standardized Coronavirus Disease 2019 Risk Assessment to Guide
Personal Protective Equipment Wear in the Perioperative Setting**

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Author Note

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Abstract

Background: Perioperative staff are at increased risk of contracting COVID-19 due to exposure to aerosol-generating procedures. Patients and staff who contract COVID-19 in the perioperative period are at risk for adverse outcomes. A Lack of consistent COVID-19 risk assessment and appropriate PPE wear by staff is a missed opportunity to mitigate risks to staff and patients alike.

Methods: An evidence-based quality improvement framework and Plan-Do-Study-Act (PDSA) cycles were used to implement a standardized COVID-19 risk assessment process to guide appropriate PPE wear among perioperative staff in a large academic medical center. A PPE decision-making algorithm and chart labeling system were developed to facilitate risk assessment and communication. Staff were educated on the use of the algorithm and appropriate chart labeling. Compliance with chart labeling and identified PPE needs were measured after implementation. **Results:** After implementation, compliance with risk assessment and chart labeling was 21.6%, lower than our aim of 70%. Compliance was higher on weekdays (predominately scheduled cases) than weekends (predominately urgent cases) and positively correlated with facility COVID-19 rates ($\rho = 0.555, p = 0.040$). When risk assessment was completed and the chart appropriately labeled, the use of required eyewear and N95 mask was 25.9%, below our aim of 90% and not correlated with facility COVID-19 rates (eyewear: $\rho = 0.175, p = 0.549$; N95: $\rho = 0.521, p = 0.056$). **Conclusions:** The healthcare team plays a vital role in preventing the spread of COVID-19 to patients and themselves. Compliance with perioperative COVID-19 risk assessment, chart labeling, and PPE wear did not meet the aims of this initiative. Change fatigue among staff was a significant barrier. Barriers to staff compliance with risk identification and PPE wear must be intentionally and continually addressed to increase

the likelihood of successful implementation of this important and evidence-supported intervention in future initiatives.

Keywords: COVID-19, perioperative care, PPE, infection control, documentation, decision algorithm, patient care communication

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As the Coronavirus Disease 2019 (COVID-19) pandemic has rapidly grown, life has been significantly altered to meet the demands and challenges of this devastating disease (Brat et al., 2020). As of June 25th, 2022, 86,787,443 COVID-19 cases have been reported within the United States, and 1,011,013 deaths have resulted (Centers for Disease Control and Prevention (CDC), 2022). Since June 25th, 2022, in Tennessee, there have been 2,098,895 reported cases of COVID-19 and 26,616 total deaths from COVID-19 (Tennessee Department of Health, 2022).

Healthcare workers experience a high risk of exposure to COVID-19 due to the significant amount of time they spend with patients and other healthcare staff at risk. Healthcare professionals are estimated to have contact with 14 to 18 people every shift. Nurses may be at higher risk of exposure due to the vast amount of their shift being spent in close patient contact (Ho et al., 2020). During the pandemic, the risk of patients developing COVID-19 postoperatively was not found to be significant, but perioperative COVID-19 infection was associated with worsened postoperative outcomes in patients (Axiotakis et al., 2021). The operative setting at our facility lacked a standardized system for assessing and communicating patient COVID-19 risk and appropriate staff personal protective equipment (PPE) requirements to team members, which was a missed opportunity to mitigate risk for both healthcare staff and patients.

Available Knowledge

During the early portion of the pandemic and with surges in COVID-19 within the United States, elective surgeries were paused to help prevent the spread of the disease and keep available beds open for a potential influx of patients. Between July 2020 to August 2020, an

estimated 28 million surgeries were canceled or postponed (Darwish et al., 2020). Although the risk of developing COVID-19 during the postoperative period is minimal, patients with comorbid COVID-19 have demonstrated poorer health outcomes (Axiotakis et al., 2021). Furthermore, COVID-19 has led to increased physical and mental health issues due to high psychological stress among patients, family members, and healthcare workers (Bartoszek et al., 2020). Due to the contagious aspects of this disease and the destructive results of infection, enhanced documentation and precautions have become a priority for healthcare facilities, including perioperative settings (Darwish et al., 2020).

The clinical course and diagnosis of COVID-19 have varied widely amongst patients in perioperative settings; many factors have contributed to the course of this illness (Wagner et al., 2020). A systematic review and meta-analysis conducted by Brown & Watters demonstrated a 7.9% increased risk of perioperative death in patients diagnosed with COVID-19 at the time of surgery or within 30 days of surgery (2021). Perioperative patients with chronic conditions such as diabetes and cardiovascular disease may be at particular risk of developing COVID-19 in the postoperative period, which could negatively impact outcomes (Axiotakis et al., 2021).

Health care workers are at high risk for developing COVID-19. The World Health Organization estimated that 80,000 to 180,000 healthcare workers died due to COVID-19 between January 2020 and May 2021 (WHO, 2021). Surgical and perioperative staff are at particularly high risk of COVID-19 exposure due to aerosol-generating procedures like endotracheal intubations and tracheostomy placements (Axiotakis et al., 2020; Kumar et al., 2020).

COVID-19 risk assessment before patients are consented for surgery can reduce exposure and transmission risk, subsequently improving patient outcomes (Darwish et al., 2020).

Additionally, use of an Electronic Health Record (EHR) and enhanced paper charting is an effective way to make COVID-19 test results, vaccinations, and past diagnoses accessible to healthcare staff as they provide patient care in the operative setting (Jose et al., 2021).

Rationale

The lack of a standardized perioperative COVID-19 risk assessment and communication process coupled with signs of increased PPE fatigue highlighted the need for an improved process to identify patients at risk of COVID-19 and increase compliance with appropriate PPE to reduce the risk of perioperative staff and patient exposure. Change fatigue has become a prominent issue among healthcare professionals, patients, and families with the progression of COVID-19. With frequent changes and sometimes conflicting COVID-related public health recommendations, coping and adaptation become impaired, leading to apprehension (Ead, 2015). In addition, new epidemic waves and viral variants threaten to relapse progress made (Lee & Morling, 2021). Structured practice change using a simplified method for perioperative COVID-19 risk assessment, documentation, and identification of appropriate PPE requirements is essential for compliance with safety measures.

The John Hopkins Evidence-Based Practice model was chosen to guide this evidence-based practice change project (Dang & Dearholt, 2018). A process model was considered integral to the success of this project as it provides steps to form research into practice, generating an action plan to help execute the project (Nilsen, 2015). The major concepts of the model include: identifying a practice question, searching previous evidence for a need for change, and translating it into a plan with evaluation (Dang & Dearholt, 2018, Chapter 3). Furthermore, Plan-Do-Study-Act (PDSA) cycles were used to support implementation (Institute for Healthcare Improvement, 2021).

Purpose

The purpose of this evidence-based quality improvement project was to standardize and improve perioperative COVID-19 risk assessment and communication among surgical staff to ensure proper PPE was used to prevent disease transmission to patients and team members. The project included the following aims, (a) 70% compliance with COVID-19 risk assessment and chart labeling over a 10-week period and (b) 90% compliance with intraoperative use of N95s and eye protection when COVID risk was identified over a 10-week period.

Methods**Context**

The setting for this practice change project is a level one trauma and urban academic medical center in Tennessee with 30 operating rooms. The average number of surgeries performed per month before this intervention was an estimated 1,550 cases.

The perioperative patient experience progresses through several distinct stages. Pre-admission history collection occurs before the patient is admitted to the hospital. When the patient arrives for their procedure, they are admitted to the holding area. During this process, perioperative nurses conduct admission questions. Electronic charts are opened for patients in the electronic medical record (EMR) and physical copies with consents are created. These charts follow the patient throughout their hospital stay. After consents are signed, and the patient is deemed ready for surgery, the operative phase begins. The intraoperative circulator and provider in charge of anesthesia check the patient's charts for compliance before they are taken back for their procedure. After surgery, the patient is taken to a post-anesthesia care unit (PACU) or an intensive care unit (ICU) if they are intubated or positive for an airborne disease, such as COVID-19. In the PACU stage I, patients are monitored post-surgery. Once recovered from

anesthesia, they are sent to PACU stage II to prepare to be discharged home, or the patient is admitted and given a room on a floor.

Before implementation of this evidence-based quality improvement project, there was no standardized process to ensure COVID-19 risk assessment was completed, risk was communicated, or correct PPE usage was being utilized by staff. Although staff were expected to check the patient chart for a COVID-19 test within the past 72 hours, this step was often overlooked. There was no chart labeling or standardized communication system to note COVID-19 testing compliance. Also, there was no system or user-friendly process to guide the selection of appropriate PPE based on patient COVID-19 status.

Improvement Team

There were various stakeholders invested in the creation of this project. An interdisciplinary team was created, including the project leader, preoperative/pre-admission testing manager, preoperative coordinator, intraoperative manager, intraoperative coordinator, postoperative manager, postoperative coordinator, intraoperative educator, and statistician. The first task of the project team was to clarify the clinical problem and develop a clinical question or PICOT (patient, intervention, comparison, outcome, and time) to guide the search for evidence. The PICOT question was: In perioperative staff, how does standardized COVID-19 testing and vaccination documentation status, compared to no documentation standards, affect compliance of COVID-19 documentation and the use of appropriate Personal Protective Equipment (PPE) within a 10-week period? The Johns Hopkins Nursing Evidenced-Based Practice Model, JHEBP model, (located in Appendix A) was used by the team to move through the development of this practice question, critical appraisal of the evidence, and the translation into an intervention that would meet the needs of this facility (Dang & Dearholt, 2018).

Intervention Development

The intervention was developed by searching for internal and external evidence, appraising evidence found, and synthesizing the evidence (Dang & Dearholt, 2018). Based on the synthesis of the studies gathered, evidence was translated into practice with the development of recommendations for change (Dang & Dearholt, 2018). The evidence's risks and benefits and recommended practice changes were reviewed and discussed among the team before implementation was considered. It was found that standardized COVID-19 risk assessment and documentation methods were appropriate, and implementation will aid with addressing contact exposure and quarantine needs.

The population for this intervention included nurses and anesthesia providers working in the pre-admission, preoperative, intraoperative, and postoperative settings of our facility. The intervention was intended for use in all surgical cases, except for orthopedics or cases in which no surgical nurse was present.

Final team recommendations included: 1) Development and use of a PPE Decision Algorithm to determine COVID-19 risk and appropriate PPE usage and 2) Development and use of a charting system to communicate COVID-19 risk and PPE requirements.

Intervention

COVID Risk Assessment and Communication Tools

As the team identified the need for a standardized but simple process for perioperative COVID-19 risk assessment and communication to improve PPE compliance, the COVID-19 PPE Decision Algorithm (see Appendix B) was created based on facility policy and the Anesthesia Patient Safety Foundation recommendations (APSF). These recommendations included the following: all patients that are having an anesthetic surgery or procedure should have a COVID-

19 test, preferably three days before the procedure, testing should be completed despite the patient's vaccination status, and if the patient tests positive for COVID-19, elective surgical procedures should be delayed (APSF, 2021). Furthermore, based on facility policy, if the patient had been admitted for greater than 72 hours, had a COVID-19 test since admission, and was not demonstrating COVID-19 symptoms, the COVID-19 test obtained after admission could be used to determine PPE requirements. To evaluate COVID-19 risk assessment and communication using the PPE decision algorithm a chart labeling system was developed by the project leader and team (see Appendix C). When using the decision algorithm, if the patient was identified as at risk and COVID-19 PPE was required, a COVID-19 PPE Required Label was placed on their chart. When using the decision algorithm, if the patient was deemed as not needing COVID-19 PPE, a COVID-19 PPE Optional Label was placed on the chart.

Staff Education

The project leader met with staff during weekly staff meetings and morning huddles to make them aware of the new COVID-19 risk assessment and documentation process, educating them on the PPE Decision Algorithm and chart labels to be implemented. Huddle meetings at this facility occurred daily and staff meetings occurred every Friday. The project leader spent time going to each OR for two weeks prior to implementation to discuss with staff individually, answer any questions, and seek feedback. The project leader put information about the new implementation of the main intraoperative board for everyone to review.

Nurses in the preoperative, intraoperative, and postoperative settings were educated about the implementation and encouraged to participate in using the PPE Decision Algorithm. In addition, the chart labeling system was explained.

PDSA Cycles

Plan-Do-Study-Act (PDSA) cycles were incorporated to analyze the test of change over each 3-week period of implementation (Institute for Healthcare Improvement, 2021). The labeling system was implemented as outlined, and the first round of use occurred over three weeks. After the first 3-week period, the information obtained and changes observed were analyzed by the project team. As a result, a SWOT (strengths, weaknesses, opportunities, and threats) analysis was conducted with the input of staff members, managers, and coordinators at daily huddles. Then, over the next 3-week period, the PDSA cycle was repeated, informed by the SWOT analysis.

Intervention Implementation

The process for intervention implementation was as follows. First, the preoperative nursing staff used the COVID-19 PPE Decision Algorithm to identify COVID-19 risk and PPE requirements. Then, the appropriate chart label (COVID-19 PPE Required Label or COVID-19 PPE Optional Label) was placed on the patient chart. Next, the intraoperative nurse ensured the chart was labeled prior to the patient being moved to the operative room. The intraoperative nurse reviewed the chart label and revisited the COVID-19 PPE Decision Algorithm and placed the appropriate chart label if the chart was unlabeled. If the patient had a COVID-19 PPE Required Label, the intraoperative nurse was responsible for notifying all intraoperative staff of the need for eyewear and a N95 mask. The nurse then dated and initialed the label if everyone in the operating room complied with eye protection wear during the procedure and/or all staff complied with N95 wear during the procedure. If staff were not in compliance with PPE requirements as communicated by the chart label, initials were not placed on the label. After the procedure, the patient was transported to the postoperative area. The postoperative coordinator

communicated PPE requirements information to staff and the receiving floor. The postoperative nurse, postoperative coordinator, or intraoperative nurse then removed the COVID-19 PPE Optional Label or COVID-19 PPE Required Label from the patient's physical chart and placed them in a designated collection box to facilitate data collection.

Study of Intervention and Measures

Process Measures

The primary process measure was staff compliance with COVID-19 risk assessment and communication using the PPE decision algorithm and chart labeling system. This process measure was selected as it aligned with our project aim of 70% compliance with COVID-19 risk assessment and chart labeling over the 10-week period of intervention implementation. This measure was conducted by the project leader. Compliance was operationally defined as the completion of chart labeling. Baseline data was not collected as there was no standardized process before the intervention implementation.

Outcome Measures

The outcome measures were compliance with proper eyewear, compliance with N95 mask use, and compliance with both eyewear and N95 mask use. These measures were also selected as they aligned with our project aim of 90% compliance with intraoperative use of N95s and eye protection when COVID risk was identified over a 10-week period. This measure was conducted by the project leader and operationally defined as a staff initials on the PPE chart label indicating if all staff wore eyewear or masks. Baseline data regarding PPE compliance was not available as it was not tracked prior to implementation.

Additional Measures

Data about scheduled vs. urgent cases and facility COVID-19 rates were also collected to analyze their relationship to our process and outcome measures.

Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) (version 27). Daily data were collected for the number of surgical cases considered eligible for risk assessment and chart labeling and the number of charts labeled as an indicator of compliance with the use of the PPE Decision Algorithm and chart labels. Daily data were also collected for correct use of N95 masks and eyewear when required. Compliance rates on weekdays in which cases are predominately scheduled were further assessed to compare compliance rates on weekends in which cases are predominantly urgent.

Descriptive statistics and central tendencies were determined for total labels collected, eyewear worn, and N95's worn. A nonparametric correlation was done to evaluate the strength and direction of association of compliance (eyewear, N95, and PPE label compliance) with the number of COVID-19 cases at the facility.

Ethical and Reporting Considerations

IRB determination was sought through the University of Tennessee, Knoxville prior to implementation. IRB review determined this project did not constitute human subjects research and therefore did not require further determination.

No patient identifiable data was collected for this quality improvement project. Hard copy data (chart labels) were kept secured in the perioperative coordinator offices. Data from collected labels were transcribed by the project leader into Qualtrics, a HIPAA and PHI compliant survey tool, and labels were then shredded for disposal.

Results

PPE Decision Algorithm

Of the 3,456 eligible surgical cases for which data were collected in the ten weeks after implementation, 748 (21.6%) demonstrated compliance with COVID risk assessment and chart labeling. This was below our aim of 70%. Chart labeling compliance on weekdays (predominately scheduled cases) was higher at 22.7% than chart labeling compliance on weekends (predominately urgent cases) at 8.6%.

Use of PPE

The compliance with N95 and eye protection use over a 10-week period was below our aim of 90%. 3.6% of the 748 risk assessed cases required COVID-19 PPE, including eyewear and an N95 mask. 44.4% demonstrated compliance with intraoperative use of eyewear by every staff member when required. 37% demonstrated compliance with the use of N95s by every staff member when required. 25.9% demonstrated compliance with the use of eyewear and N95s together by every staff member when required.

Impact of Facility COVID-19 Rates

Compliance with chart labeling was positively correlated with the number of COVID-19 patients at the facility ($\rho = 0.555$, $p = 0.040$). However, increasing patient rates of COVID-19 were not correlated with eyewear compliance ($\rho = 0.175$, $p = 0.549$) or with N95 compliance ($\rho = 0.521$, $p = 0.056$).

Discussion

Despite implementing an evidence-based, simplified approach to COVID risk assessment and communication in the perioperative setting, we did not reach our stated aims. We aspired to 70% compliance with COVID-19 risk assessment and chart labeling but achieved 21.6%. We

aspired to 90% compliance with using N95s and eye protection when risk was identified with the PPE Decision Algorithm and labeling system but achieved 25.9%. Despite not reaching our aims, the project had several strengths including facility buy-in, use of a process model, strong evidence to support intervention, strong team partnership, and a need for the practice change due to COVID-19 hospitalizations increasing within the project time period. This intervention is no longer in place due to COVID-19 testing prior to surgeries being discontinued at this facility. However, it is available for use if COVID-19 testing restarts.

Interpretations and Implications for Practice

The use of an EBP model and PDSA cycles helped contribute to the implementation and methods of this project. By identifying an issue within the intraoperative settings and evaluating best practices within the literature, we were able to promote the need for this project at our facility. The project leader found frequent reeducation, PDSA test cycles with staff input, and individualized education aided the implementation of this project.

The biggest barrier to compliance with the practice change was change fatigue, particularly in relation to COVID-19 policies. Change fatigue should be addressed by not conducting multiple changes at one time within a facility (Ead, 2015). Unfortunately, the perioperative staff at this facility had experienced several policy and process changes in the time preceding implementation, which likely exacerbated already existing change fatigue. More frequent and consistent feedback and the intentional application of change theory framework may have helped prioritize the need for change among staff.

High staff turnover was also an identified barrier; many new staff and travel staff were employed during implementation and data collection. An educational module could have been created to instruct new staff members in the use of the COVID-19 risk assessment process and

algorithm to guide PPE wear. Furthermore, current staff should be asked if they feel adequately prepared to train new employees on the intervention.

Also, the lack of interval data collection limited the project team's awareness of low compliance rates. Identifying low compliance early in implementation would have allowed for actions to investigate and mitigate poor compliance with both risk assessment and PPE wear. The use of more frequent PDSA cycles to evaluate the process and compliance with a strong focus on staff feedback would have been an ideal approach to address this barrier.

Given the high-risk nature of caring for COVID-19 in the perioperative setting, compliance with risk assessment and proper PPE wear is critical regardless of the process. Individual accountability is critical for a culture of safety. Future initiatives may find that assessing individual compliance and seeking individual feedback may provide greater insight into the process and enhance individual and team compliance.

Limitations

Limitations of this project and its findings included a disproportionate ratio of urgent and emergent cases to scheduled cases and a decreased number of total surgical cases due to pandemic-related cancelation of elective cases. This could have led to skewed compliance levels with the intervention conducted. Furthermore, Evidence-based quality improvement initiatives are not generalizable due to the specificity of population and site. Also, evolving COVID-19 screening and management guidelines may necessitate changes in the COVID-19 decision algorithm.

Conclusion

COVID-19 risk assessment and communication of PPE requirements in the perioperative setting are essential to reduce exposure and transmission to staff and patients and prevent adverse

health outcomes. While the aims of our practice change initiative were not met, important lessons were learned that will benefit our facility and others as they standardize risk assessment and communication to ensure appropriate PPE wear. Change fatigue was the primary barrier to compliance in this project. The lack of interval measurement of compliance was a missed opportunity to seek feedback, improve the risk assessment and chart labeling process, and impact compliance. As the evidence strongly supports use of COVID-19 risk assessment in the perioperative settings, efforts to standardize this practice in facilities should continue but may be more successful with intentional attention to change fatigue, seeking staff feedback, and ongoing compliance monitoring.

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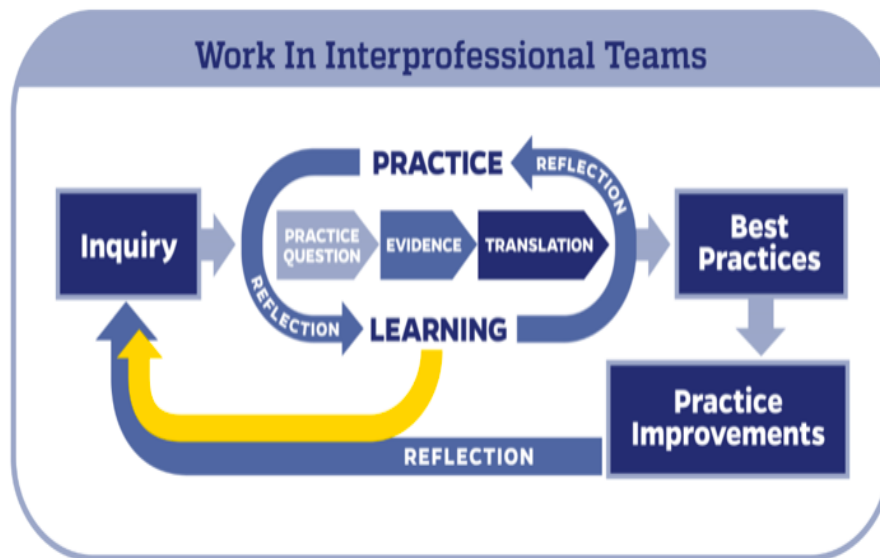
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Appendix A

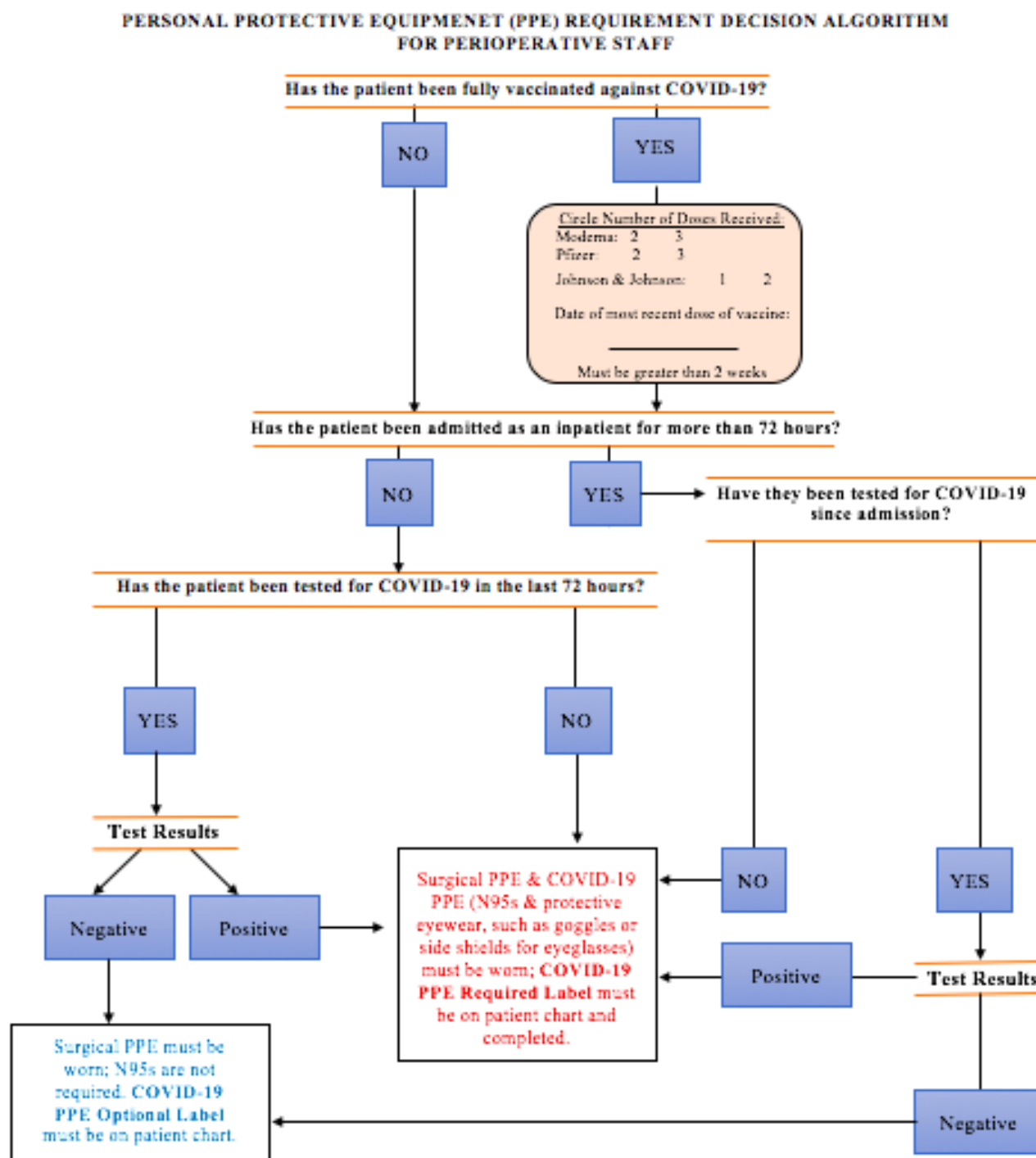
Johns Hopkins Nursing Evidenced-Based Practice Model



Adapted from *Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals: Model and Guidelines* (4th ed.), by D. Dang, S. Dearholt, K. Bissett, J. Ascenzi, & M. Whalen, 2022, Sigma Theta Tau International. (https://www.hopkinsmedicine.org/evidence-based-practice/ijhn_2017_ebp.html). Copyright 2022 by The Johns Hopkins Hospital/The Johns Hopkins University. Reprinted with permission.

Appendix B

PPE Decision Algorithm



Appendix C

Chart Labeling System Labels

COVID-19 PPE Required Label

**PPE
REQUIRED**

Date: _____

N95 masks worn by all staff _____
If yes, initial here

Eye protection worn by all staff _____
If yes, initial here

COVID-19 PPE Optional Label



Date: _____