GAVIN PUBLISHERS

OPEN ACCESS

Family Medicine and Primary Care: Open Access

Research Article

Dunbar-Keller D and Okunji PO. J Family Med Prim Care Open Acc 5: 160.

DOI: 10.29011/2688-7460.100060

The COVID-19 Pandemic: Impact on Operating Room Design and Surgical Services

Danielle Dunbar-Keller[1], Priscilla O Okunji[2*]

[1]RN-to-BSN Student, College of Nursing and Allied Health Sciences, Howard University, Washington DC, USA

[2]Associate Professor, College of Nursing and Allied Health Sciences, Howard University, Washington DC, USA

[*]**Corresponding author:** Priscilla O Okunji, Associate Professor, College of Nursing and Allied Health Sciences, Howard University, Washington, DC 20059, USA.

Citation: Dunbar-Keller D, Okunji PO (2021) The COVID-19 Pandemic: Impact on Operating Room Design and Surgical Services. J Family Med Prim Care Open Acc 5: 160. DOI: 10.29011/2688-7460.100060

Received Date: 20 September, 2021; **Accepted Date:** 21 October, 2021; **Published Date:** 26 October, 2021

Abstract

Background: The world took notice of the Coronavirus (Covid-19) after an outbreak in Wuhan, China in December 2019. Since the outbreak of Covid-19, healthcare professionals around the globe have been struggling to keep up with "best practice" as it relates to their respective units. Healthcare professionals have witnessed the changes within their units as new practices to prevent the spread of Covid-19 amongst themselves and their patients are adapted. The Covid-19 pandemic impacted surgical practice in many ways from the Personal Protective Equipment (PPE) that is worn during surgical procedures to the direction of airflow inside of the operating rooms. Traditionally, best practice guidelines for perioperative personnel are published by The Association of Operating Room Registered Nurses (AORN). AORN publishes guidelines yearly, updating its previous years publication to stay current. In the current pandemic operating room staff are left searching elsewhere for evidence-based practices to prevent transmission of the virus with the operating room due to Operating Room (OR) best practice in this crisis being poorly defined.

Methodology: This is a review study. Search engines were used to extract scholarly articles and journals pertaining to best practice changes in the operating room. PubMed and other renowned search engines and keywords such as: Covid-19, operating room, perioperative, surgery, infection control and airflow were used to query and extract the needed information. Articles detailing many changes within the operating room due to Covid-19 and operating room best practices were extracted from 2015 to 2020. Howard University Libraries site was also used to conduct searches for this study. Library catalog of books, journals and media for information on the research topic were also used. Google Scholar also listed many different resources that directed the search using the inclusions which include studies of any type that concentrate on perioperative infection control, operating room practices, and perioperative design changes due to Covid-19.

Inclusions/ Exclusions: Articles detailing specific practice guideline, recommended guidelines, workflow changes or structural design changes within the operating room, in conditions pertaining to the Covid-19 pandemic, were included. Articles were excluded if they did not meet the inclusion criteria.

Results: Appropriate use of personal protective equipment is vital in the prevention and control of coronavirus transmission. Operating rooms used for procedures on Covid-19 suspected or positive patients should be redesigned with an emphasis on changes to airflow and designated spaces outside of the room to minimized cross contamination. Infection control is paramount in preventing the spread of Covid-19. Proper disinfection of high touch areas and minimizing staff exposure will make a substantial difference. The Covid-19 pandemic has created a critical demand for best practice guidelines within Operating Rooms (ORs) around the world. The use of appropriate Personal Protective Equipment (PPE) is imperative in the control and prevention of the spread of Covid-19 to healthcare workers as well as to the communities they serve. The OR used during procedures on suspected or Covid-19 positive patients were redesigned providing zones that aid in the control of virus transmission and negative pressure ventilation systems that pull the air up and out of the OR through a filtration system instead of the normal positive pressure system that pushes the air out of the OR.

Keywords: Covid-19; Operating room; Perioperative; Surgery; Infection control and airflow

Background

Personal Protective Equipment (PPE) is essential for self-protection during this pandemic [1]. Prior to Covid-19, Association of Operating Room Registered Nurses (AORN) recommended using standard precautions regarding PPE when encountering patients with no known transmissible diseases. This consisted of a hair cover, goggles, standard surgical mask, a surgical gown, gloves and shoe covers when necessary. The use of PPE protects the health care provider's mucous membranes, airway, skin and clothing from encountering blood, body fluids and other potentially infectious materials [2]. Additional precautions are recommended when caring for a patient with a known transmissible disease. With additional precautions being taken, additional or a higher level of PPE is required. Recommendations for Covid-19 are to wear PPE consisting of head protection, FFP2 (for non-aerosol-generating activities)/ FFP3 (for aerosol-generating activities), water-repellant protective clothing (e.g. gown, suit, other combination solutions), double pair of gloves, waterproof shoes, protective goggles/mask, in compliance with industrial safety regulations [1]. The changes to PPE provided an extra layer of protection for the body and increased filtration in masks used during procedures to decrease exposure to airborne and droplet hazards.

Operating Room Design

Aerosol Generating Procedures (AGPs) are associated with an increased risk of infection to health care workers [3]. Operating rooms are equipped with positive pressure airflow, which keeps the air inside the room higher than the air pressure outside. This design is setup to push airborne pathogens out of the room to prevent recirculation into the OR environment. The positive pressure airflow can be felt when the doors to the OR are opened. With the threat of Covid-19, evidence has proven that negative pressure is best for infection control when performing procedures on Covid-19 positive patients. Negative pressure ventilation creates an inward directional flow of air into the room, which is then transmitted through an exhaust system out of the room to the outside of the hospital [4]. In such procedures, droplet precautions are taken to decrease the risk of infection from pathogens such as pertussis, SARS and influenza. Recommendations for the physical operating room specified the use of a negative-pressure OR, alongside strict separation of clean and contamination areas, and a buffer system to ensure that clean rooms remain as such, avoiding cross-contamination [5]. If a procedure is performed on a Covid-19 positive patient in a room with positive airflow, there is a possibility that pathogens will be pushed out of the room which poses a risk of transmission to personnel outside of the room who are not wearing PPE. An anteroom is also recommended, which is an intermediate space between the operating room and the hallway, to have a designated area for donning and doffing possibly contaminated PPE which provides additional protection to spaces outside of the designated Covid-19 operating room.

Importance of Infection Control

The importance of infection control within healthcare facilities is paramount. Forty-one (41%) of all human-to-human transmissions of Covid-19 in Wuhan, China were within healthcare facilities [1]. Infection control is everyone's job no matter the healthcare setting. As an operating room registered nurse or circulator, the investigator is interested in the changes that have taken place in the Operating Room (OR) due to the Covid-19 pandemic because it Covid-19 has directly impacted the way OR nurses perform their daily duties till date. Keeping the nurse, staff and patients safe at all times is the investigators highest priority during a normal day and with the threat of contracting the Covid-19 virus the importance of this is being stressed even more. Recommendations for physical OR specified use of a negative pressure OR, alongside strict separation of clean and contaminated areas, and a buffer system to ensure that clean rooms remain as such to avoid cross contamination [5].

The Covid-19 pandemic has created a host of changes within the operating room in preparation for encounters with patients who have tested positive or emergent patients with no test results. Upgrades to PPE and changes in the operating room design are taking place. Elective surgeries are cancelled, and surgeries are limited to urgent and emergent patients. While researching best practice for surgical practice in the OR a common theme was to avoid surgery where possible [5]. This is not an ideal solution, so steps to decrease chances of transmission are in effect. Elective surgery that can be delayed should be postponed, taking into consideration that it may take 2-3 months for the health-care situation to return to normal [6]. If surgery has to be performed, minimally invasive procedures such as laparoscopies have been considered as a good way to diminish risks, because, in theory, a closed abdomen, which prevents the spread of gas or liquid, would decrease the possibility of contamination [6].

Research Design

The research design for this study is a systematic review. The research relies on existing differences in operating room best practices. Changes made in infection control and operating systems within the operating room due to Covid-19 pandemic were explored. Personal experiences were also used to provide insight and understanding in this study.

Method

Search engines were used to extract scholarly articles and journals pertaining to best practice changes in the operating room. PubMed and other renown search engines and keywords such as: Covid-19, operating room, perioperative, surgery, infection control and airflow were used to query and extract the needed information. Articles detailing many changes within the operating room due to Covid-19 and operating room best practices were extracted from 2015 to 2020. Howard University Libraries site was also used to conduct searches for this study. Library catalog of books, journals and media for information on the research topic were also used. Google Scholar also listed many different resources that directed

the search using the inclusions which include studies of any type that concentrate on perioperative infection control, operating room practices, and perioperative design changes due to COVID-19. PubMed was the most useful because it clearly listed the resources, the resource's references and correct citation in APA format. After the extractions, the articles were synthesized to make an informed decision on the result, and conclusion.

Analysis of Results

Thirty relevant studies were extracted and analyzed for this research. Most of these studies were from the United States. The studies utilized explored practice recommendations and changes to guidelines within the operating room due to the Covid-19 pandemic. This review underlines the need for consistent and concrete safe and best surgical practice.

Results and Discussion

The Covid-19 pandemic did affect best practice standards within the operating room as evidence by recommended changes in practice. Appropriate use of personal protective equipment is vital in the prevention and control of coronavirus transmission. Operating rooms used for procedures on COVID-19 suspected or positive patients were redesigned with an emphasis on changes to airflow and designated spaces outside of the room to minimized cross contamination. Infection control was paramount in preventing the spread of Covid-19 virus. Proper disinfection of high touch areas and minimizing staff exposure made a substantial difference [7].

This systematic review identified, evaluated and analyzed best practice guidelines within the wake of the Covid-19 pandemic. There were over 60,000,000 reported cases of Covid-19 at the initiation of this review. The Covid-19 Pandemic has posed an enormous threat worldwide. Health care systems struggle to keep up with the ever-changing guidelines recommended to prevent and control the spread of the virus. This research found many articles with similar recommendations with varying levels of evidence. In the operating room, mutual recommendations emphasized appropriate PPE usage, room design and infection control practices. The shortage of PPE and its misuse is a significant threat to healthcare workers and the communities they serve. The urgency for suitable PPE, for all phases of surgery, to safeguard healthcare workers and reduce the spread of the coronavirus was highlighted in many of the articles and substantiated by evidence in research from previous outbreaks such as Severe Acute Respiratory Syndrome (SARS) [8].

It is recommended that the appropriate amount/ level of PPE should be evaluated prior to every encounter. Once the level of PPE has been identified, the PPE should be donned and doffed in a specific manner to reduce the risk of virus transmission. Operating rooms are designed with infection prevention in mind. The ventilation systems withing the rooms help disperse airborne pathogens which aids in the prevention of infection to the patient as well as healthcare workers. Proper ventilation has been clinically proven to decrease the occurrence of pathogen transmission. Switching ventilation systems from positive pressure to negative pressure has been a common recommendation amongst researchers [9].

Conclusion

The Covid-19 pandemic has created a critical demand for best practice guidelines within operating rooms (ORs) around the world. The use of appropriate personal protective equipment (PPE) is imperative in the control and prevention of the spread of Covid-19 to healthcare workers as well as to the communities they serve. With the CDC recommendation of postponing all elective surgeries, the remaining non-elective procedures prioritized alleviating the profound PPE shortage and limiting the exposure of Covid-19 to healthcare workers in the operating room setting. Additional airborne precautions were taken when performing aerosol generating procedures (AGPs) on suspected or Covid-19 positive patients, ensuring that the intraoperative staff are well protected by higher level PPE such as a powered air purifying respirator (PAPR) as an alternative to an N95 respirator. The operating rooms used during procedures on suspected or Covid-19 positive patients were redesigned providing zones that aid in the control of virus transmission and negative pressure ventilation systems the pull the air up and out the OR through a filtration system instead of the normal positive pressure system that pushes the air out of the OR.

References

1. Schnitzbauer AA, Kempf VAJ, Hack D, Ciesek S, Meier S, et al. (2020) SARS-CoV-2/COVID-19: systematic review of requirements for personal protective equipment in primary patient contact and organization of the operating area. Chirurg 91: 576-585.
2. Conner R (2015) Guidelines for Perioperative Practice, 2015 Edition. Denver, CO: Association of PeriOperative Registered Nurses AORN.
3. El Boghdady M, Ewalds-Kvist BM (2020) Laparoscopic Surgery and the debate on its safety during COVID-19 pandemic: A systematic review of recommendations. Surgeon 19: e29-e39.
4. Ather B, Mirza TM, Edemekong PF (2020) Airborne Precautions. StatPearls Publishing.
5. Welsh Surgical Research Initiative (WSRI) Collaborative (2020) Recommended operating room practice during the COVID-19 pandemic: systematic review. BJS Open 4: 748-756.
6. Hojaij FC, Chinelatto LA, Boog G, Kasmirski JA, Lopes J, et al. (2020) Surgical Practice in the Current COVID-19 Pandemic: A Rapid Systematic Review. Clinics (Sao Paulo, Brazil) 75: e1923.
7. Awad ME, Rumley J, Vazquez JA, Devine JG (2020) Perioperative Considerations in Urgent Surgical Care of Suspected and Confirmed COVID-19 Orthopaedic Patients: Operating Room Protocols and Recommendations in the Current COVID-19 Pandemic. J Am Acad Orthop Surg 28: 451-463.
8. Bartoszko JJ, Farooqi M, Alhazzani W, Loeb M (2020) Medical masks vs N95 respirators for preventing COVID-19 in healthcare workers: A systematic review and meta-analysis of randomized trials. Influenza Other Respir Viruses 14: 365-373.
9. Bizzoca ME, Campisi G, Muzio LL (2020) Covid-19 Pandemic: What Changes for Dentists and Oral Medicine Experts? A Narrative Review and Novel Approaches to Infection Containment. Int Environ Res Public Health 17: 3793.