DOI: http://dx.doi.org/10.33846/hn60608
http://heanoti.com/index.php/hn

RESEARCH ARTICLE
URL of this article: http://heanoti.com/index.php/hn/article/view/hn60608

Implementation of Patient Safety in Hospital during The Covid-19 Pandemic

Maryanur Ekanila[1(CA)], Iman Permana [2], Winny Setyonugroho[3], Budi Susatia[4]
[1(CA)]Hospital Administration Management Study Program, Post-Graduate, Universitas Muhammadiyah Yogyakarta, Indonesia; maryanur12@gmail.com (Corresponding Author)
[2]Hospital Administration Management Study Program, Post-Graduate, Universitas Muhammadiyah Yogyakarta, Indonesia; imanpe.ip@gmail.com
[3]Hospital Administration Management Study Program, Post-Graduate, Universitas Muhammadiyah Yogyakarta, Indonesia; wsetyonugroho@umy.ac.id
[4]Poltekkes Kemenkes Malang, Indonesia

ABSTRACT

Background: The first case of Corona Virus Disease (Covid-19) was discovered in Wuhan, China which caused new burdens and challenges to the health system and healthcare workers, including the implementation of patient safety. This study aimed to find out how to implement patient safety in Hospitals during the Covid-19 pandemic. **Methods**: Relevant articles were obtained from PubMed and SAGE Journals between 2019-2021. This article was chosen to meet the criteria for discussing patient safety in hospitals during the COVID-19 pandemic. **Results**: A total of 28 from 305 articles were analyzed in this review. The Implementation of patient safety during the COVID-19 pandemic can be through initial screening, use of technology, reducing the risk of transmission, physical adjustment of hospital buildings, personal protective equipment for all, and support systems. **Conclusion**: Adjustment of all service activities in hospitals, especially during the COVID-19 pandemic, is the most important thing to improve the quality of the service itself. Efforts made in implementing patient safety are aimed at keeping patients and health professionals safe

Keywords: safety culture; organizational culture; patient safety; safety management; Covid-19

INTRODUCTION

Background

In this era, patient safety is a universal movement to improve the quality of service and patient safety in hospitals. Various developed countries are currently even shifting from the paradigm that previously was "quality" which means improving the quality of service to a new paradigm, namely "quality-safety" which means improving the quality of services and maintaining patient safety consistently and continuously. (1)

The first mysterious case of pneumonia was discovered in Wuhan, China in November 2019 caused by the severe acute respiratory syndrome coronavirus 2 (SARS-COV2) and referred to as Corona Virus Disease (Covid-19). (2) The World Health Organization (WHO) on January 30, 2020 (3), held an emergency meeting and determined that the Covid-19 outbreak is an emerging public health problem that must be the focus of all countries. WHO noted that this virus has low pathogenicity but transmission is very fast. (3) The COVID- 19 pandemic is also known to have a major impact on the health care system and is a new challenge for health facilities to make rapid adjustments that can increase the risk of patient safety incidents. (4)

The COVID-19 pandemic has created an unprecedented burden and challenge on the health system and medical personnel. Uncertainty about the diagnosis and treatment of illness, ignorance of new tasks due to job transfers and changes that occur in the task of caring for patients, increased workload, and restrictions that occur inside and outside of work can cause stress, meanwhile, health workers must protect themselves from infection and avoid infecting their family members. (5) The COVID-19 pandemic has hurt the mental health condition of health workers and is known to result in high symptoms of anxiety, depression, sleep disturbances, PTSD, and burnout syndrome. (6) Working in challenging conditions hurts medical personnel in providing safe and effective care to patients. Factors such as inadequate organization, inadequate workers, increased work pressure, and fatigue is the causes of poor patient safety. (7) The purpose of this article review is to find out how to implement patient safety during the COVID-19 pandemic.

.

METHODS

This study used a literature review method. The literature was obtained from two electronic data sources, namely PubMed and SAGE Journals in the 2019-2021 period with an advanced search method so that the search was more focused. The search keywords were: safety culture, organizational culture, safety management, safety program, Covid-19, SARS-COV-19, NCOV-19, coronavirus, coronavirus disease 2019, and hospital. After deleting the same journal, the title and abstract were identified. Research journals deemed eligible for full-text screening were taken for a full review. The inclusion criteria of this study were: articles with all research designs, Articles in English, published in 2019-2021 and articles published internationally. An ethical review was not required for this review.

RESULTS

At the start of the search 305 articles were found (166 from PubMed and 139 from Sage Journal). After deleting the same article using the delete duplicate by Zotero system feature, there are 195 articles left. After that, each relevant title will be examined as material to be studied, by reading the abstract and obtaining 65 articles which are then checked for the Scopus index with the results of 35 articles being indexed by Scopus. The full-text reading of the article was carried out and it was decided that 28 articles would be studied. A total of 28 research articles were taken for analysis regarding the implementation of patient safety during the COVID-19 pandemic and obtained 5 outlines of efforts that hospitals can do during the COVID-19 pandemic in the form of implementation of patient safety in inpatient units, implementation of patient safety, namely initial screening, use of technology, reduce the risk of transmission, physical adjustment of hospital buildings, personal protective equipment for all, and support systems.

Tabel 1. Mind map

No.	Theme	Point
1.	Initial screening	Screening for Covid-19 patients
		Screening of employees
		Screening for Covid-19 patients and patients companion
		Pre-operative Covid-19 Screening
2.	Utilization of technology	Outpatient telemedicine
		inpatient telemedicin
		Maximizing digital technology in the pharmacy unit
		Technology-based medical reconciliation
		Changes in educational activities and scientific meetings
3.	Reduce the risk of transmission	Adaptation of measures that have a high risk of transmission (aerosols)
		Minimize surgery
4	Physical adjustment of the hospital building	Operating room modification
		Room changes and separate inpatient rooms according toCovid-19 status
		Making hospitals free of Covid-19
5.	PPE management	Personal protective equipment for health workers
		PPE and social distancing
6.	Support system	Training Procurement
		Formation of a special team andArrangement of schedules during Covid-19
		Strategies to rationalize the use of drugs and oxygen

DISCUSSION

Initial Screening

During the COVID-19 pandemic, the hospital implemented several changes, namely efforts to take preventive measures so that the hospital could provide maximum and safe services. The preventive measures found were in the form of screening for COVID-19 on patients in inpatient units, screening for COVID-19 patients and introductions to outpatient units, screening for pre-operative COVID-19, and screening employees.

Screening for COVID-19 in inpatients was found to be routinely applied in several hospitals. Screening for COVID-19 is carried out based on the history, symptom findings on physical examination, and PCR examination which aims to reduce the risk of exposure to other patients and health workers and determine the treatment room. [8-11] A Stroke Center begins screening patients for COVID-19 when the stroke code is activated. Screening is carried out in the form of checking the patient's temperature, the patient feels he has fever, chills, cough, diarrhea, loss of smell and taste function, history of traveling to risky areas, has a history of contact with COVID-19 patients or if the above data cannot be obtained. If the temperature is higher than 38OC or one of the screening points, the patient will be considered positive screened and receive treatment as a COVID-19 patient. If a stroke case is found that requires a referral to another facility, it will be considered a positive case of COVID-19, this is done to maximize safety and reduce the risk of transmission to various parties involved during the process of referring patients. [9] At a mental hospital in Taiwan, patient screening is carried out based on history and symptom findings, new patients suspected of being positive for COVID-19 will be referred to other health services for treatment, and patients who pass the screening will be quarantined for 8 days before being transferred

to another hospital. ordinary ward. This is intended to reduce the risk of transmitting COVID-19 to other patients and health workers. [8] During the COVID-19 pandemic, all neonatal and infant patients who experience an emergency airway in the NICU at a hospital in Philadelphia will be assessed as positive for COVID-19 until proven negative to reduce the risk of exposure to health workers [33]. Screening for COVID-19 using a PCR swab was carried out on patients in the obstetrics and gynecology unit at a hospital in France to determine the patient's treatment room. [10]

COVID-19 screening for outpatients and introductions is carried out routinely in several hospitals, screening before entering the hospital is carried out with questions about COVID-19 symptoms and temperature checks. In addition to screening for COVID-19 symptoms, outpatient services were also found to apply patient triage by categorizing patients into certain groups according to health service needs. Outpatient screening is carried out to reduce cross-contamination and minimize exposure to COVID-19 in patients, caregivers, and health workers. [10,12,13,14-17]

Screening is applied to both patients and their families using a special questionnaire for COVID-19 symptoms and temperature checks when entering the hospital or before entering the outpatient room to reduce cross-contamination and minimize exposure to COVID-19. [13] Total laryngectomy patient visits during the COVID-19 pandemic requiring outpatient treatment are limited by the hospital to patients requiring direct examination, before entering the hospital, screening for COVID-19 symptoms is carried out and patients are advised to undergo self-quarantine before going to the hospital. [12]

Triage in the outpatient unit at Seattle Children's Hospital is carried out by nurses, medical assistants, and call center officers by categorizing patients into three groups, namely patients who have to see a doctor directly because their case requires immediate treatment and direct physical examination, and patients who receive telemedicine services. and patients who will get rescheduled to see a doctor. [17] Triage on an outpatient basis in a hospital in France for pregnant patients who need routine control is done by scheduling visits to pregnant patients based on the risk of pregnancy. In pregnant women who have a low risk, routine control is carried out virtually except at 36 and 39 weeks of gestation which is carried out directly. [10] At a hospital in Singapore, outpatient triage was carried out to reduce the number of patients who came to the hospital, only cases that were considered critical were allowed to come and other patients were given the option of service with telemedicine or routine drug administration. [16] In patients who are routinely checked at a hospital in Singapore, the use of history in the medical record and consultation via telemedicine is carried out to determine whether the patient requires immediate care or delays a visit to the hospital. Delaying hospital visits can reduce the risk of transmitting COVID-19 infection to patients and can relocate health workers to units that need them more. [15] The VFC clinic at a hospital in the UK triages patients using telephone or video call media with experts before a face-to-face consultation, this has the advantage of being able to reduce patient visits to the clinic to improve work safety. [14]

To improve the safety of patients who will receive surgery, COVID-19 screening is carried out on all patients before the procedure is carried out to prevent cross-infection between patients. Screening for COVID-19 is carried out by checking symptoms, COVID-19 swabs, and other supporting examinations. COVID-19 symptom checks and COVID-19 swabs before surgery are routinely carried out in many hospitals. [13,15,17-21] COVID-19 screening can be done 2-3 times before the scheduled surgery. [13] In the department of trauma and orthopedic surgery in the UK a COVID-19 swab is also performed 2 days before the operation. [21] A literature review on the management of patients requiring surgery during the COVID-19 pandemic suggested that COVID-19 screening be carried out 48 hours before surgery to prevent transmission during surgery, but the disadvantage of using PCR examination is that it takes a long time so it has a risk of prolonging treatment time. emergency cases. [20] In critical cases that require immediate treatment, the COVID-19 examination is carried out in the ER without delaying the operation time. [13] A research article conducted additional screening for radiological examinations in the form of a chest x-ray to assess whether there were abnormal results and whether the patient had contact with a previous COVID-19 patient. [15] A review article discussing surgical practice during the COVID-19 pandemic and sourced from a total of 21 articles found that the addition of a chest CT scan could be performed concurrently in patients who received an abdominal and pelvic CT scan. [22] In addition to symptom checks and COVID-19 swabs, Seattle Children's Hospital provides advice that if a COVID-19 test is not yet available at a health facility, the patient can be considered a COVID-19 suspect, and surgery is carried out in an isolation operating room. [17] Some hospitals require patients who will undergo surgery to first be isolated for different periods to reduce the risk of being infected with COVID-19. [18,19,21] As found in urology services in hospitals in the UK, which requires patients to self-isolate for 1 week before performing surgery. [19] An article from Italy obliges patients for elective surgery and their attendants to arrive 2-3 days early for isolation. [18] Elective case management of patients with trauma and orthopedic departments in the UK is given the option of postponing surgery or being isolated 14 days in advance. [21]

Periodic checks or screening are also carried out to control the incidence of infection in health workers working in hospitals so that transmission does not occur when treating patients. [8,17,23,24] In a mental hospital in Taiwan, if a confirmed positive COVID-19 patient is found, the health worker who has contact with the patient will receive an examination and quarantine. [8] At Seattle Children's Hospital all health workers who experience

symptoms of COVID-19 such as anosmia, cough, fever, malaise, myalgia, and shortness of breath will be tested for COVID-19 and to return to work the test results must be negative and symptom-free for 72 hours. [17] In addition to patients who get temperature screening before entering the hospital area, health workers are also required to get a temperature check right before entering the hospital. [23] One of the review articles provides an overview of individual risk factors for mortality and morbidity so that they can carry out risk assessment and management in the workplace. In-depth evaluation and consideration of employees in the workplace can be carried out based on individual conditions, such as old age, presence of chronic medical conditions, and presence of immunocompromised conditions. Assessment of these risk factors is expected to guide the creation of a safe workplace and minimize transmission to susceptible individuals. [24]

Utilization of Technology

Advances in technology are used by hospitals to improve services and patient safety efforts, especially during the COVID-19 pandemic. Efforts to utilize technology found in this review article are in the form of outpatient telemedicine, inpatient telemedicine, maximizing digital technology in the pharmacy unit, technology-based medical reconciliation, and changes in educational activities and scientific meetings.

The practice of telemedicine in outpatient units was found to be a substitute for face-to-face services, triage of patients before visiting the hospital, and case consultation. [12-15,19,21,25] Diversion of patient outpatient visits and switching to telemedicine services was carried out in the urology unit of a hospital in the UK during the COVID-19 pandemic to relocate health workers to units that are more in need during the COVID-19 pandemic and can reduce the risk of transmission. [19] Total laryngectomy patients during the COVID-19 pandemic who required outpatient services were transferred to telemedicine if the patient was judged not to require a direct physical examination, this was done to minimize the risk of transmitting the COVID-19 virus. [12] The use of telemedicine in the implementation of patient safety in the Pediatric Otolaryngology unit aims to provide medical services as well as to identify patients who need immediate treatment. [13] In the trauma and orthopedic department in the UK, telemedicine technology is used for outpatient services in cases that are deemed not to require immediate treatment and for consulting cases found by doctors in the ER to orthopedic experts. [21] Telemedicine technology has also been discovered as an outpatient screening tool in the vascular surgery unit of a hospital in Singapore and a hospital in the UK. [14,15]---[7;24]. The application of telemedicine in the department of psychiatry (telepsychiatry) during the COVID-19 pandemic was found to provide benefits in the form of providing remote health services due to the appeal for a travel ban during the COVID-19 pandemic and providing access to wider specialist services such as pediatric psychiatrists and geriatric psychiatrists, facilitating patients who do not need direct interaction with doctors, connecting patients and their families or therapy groups as an alternative to face-to-face meetings that are at risk of transmitting the virus and can provide an immediate response in emergencies in several different places reported by video technology. Barriers to telepsychiatry were found in the form of obstacles to ensuring that practicing doctors are properly licensed to provide remote services, conducting training to improve the ability of doctors, lack of willingness to participate in patients, and using safe media to maintain patient confidentiality. [25]

The practice of telemedicine in inpatient units was found to be one of the important points in efforts to improve patient safety during COVID-19. [9,26,27] The use of telemedicine technology was found in the modification of the protocol for handling stroke patients at a Stroke Center in the United States during the COVID-19 pandemic. One of the Telemedicine carts consisting of cameras, monitors, microphones, speakers, and video codecs or computers was added to reduce exposure to health workers and save personal protective equipment. [9] One of the articles found in this study stated that maximizing health information technology or telemedicine during a pandemic can reduce the rate of infection transmission in the hospital environment. The application of telemedicine was found to have benefits, especially in cases of a surge in patients because it can speed up the governance process, and manage resources such as drugs, ICU beds, and employees. Telemedicine also increases the accuracy and effectiveness of treatment due to the interoperability of systems and data sources that are integrated. [26] Utilizing the Emergency Medical Service (EMS) network belonging to the stroke unit for education and treatment of stroke patients and utilizing telestroke technology for patient consultation and patient care. [27]

Maximizing digital technology in the pharmacy unit was found in an article that describes the opportunities for the pharmacist informatician profession in improving patient care during the COVID-19 pandemic. Pharmacist informatics can work remotely to reduce exposure and risk of contracting in hospitals. Pharmacist informatics is expected to be able to maximize digital technology and data analysis to optimize patient care, minimize the incidence of infection, and for drug procurement. [28]

Technology-based medical reconciliation is one of the things that is included in the use of technology during the COVID-19 pandemic. The existence of medical reconciliation which is the process of identifying drugs given to patients at health facilities can reduce medication errors, unwanted events, and patient readmissions amid the COVID-19 pandemic. The five main components for a successful medical reconciliation process are: a team led and trained by pharmacists, obtaining complete and accurate patient history, educating and involving patients

in the treatment process, conducting medical reconciliation upon admission, transfer, and discharge, and interprofessional collaboration within the home. sick and in community settings. [29]

In addition to changes in services, changes during the COVID-19 pandemic were also found in terms of educational activities, research, and scientific meetings. [15-17,21] Seattle Children's Hospital during the COVID-19 pandemic reduced the clinical workload of residents and fellows from being exposed to COVID-19 patients and replaced them with lectures and webinars. [17] The vascular surgery unit at a Singapore hospital is changing learning activities for medical students online. Opportunities that were obtained during the COVID-19 pandemic were increasing lecture activities, frequency of telerounding for inpatients, and increasing simulations and webinars opportunities. [15] Educational activities at the hand and reconstructive microsurgery unit in Singapore are carried out by video calls or small face-to-face groups, multicenter projects use teleconferences, and research is carried out using retrospective methods, literature, and systematic reviews to reduce direct exposure to patients. [16] Research and learning in trauma and orthopedic units in the UK are experiencing problems due to fewer cases being treated in hospitals and learning programs are still in place but have been shifted to online. [21]

Reducing the Risk of Transmission

Hospital efforts to reduce the risk of transmission of COVID-19 to patients and health workers are carried out in various ways, namely through adjusting actions that have a high risk of transmission (aerosol) and minimizing surgical procedures.

In implementing patient safety in inpatient units, adjustments are made to actions that have a high risk of transmission, such as delaying action or using assistive devices in examinations and standardizing the process of returning COVID-19 patients. [11,12,20,30] The intubation procedure is known to be an aerosol-generating procedure and has a high risk of transmission, so to limit exposure and contact with patients, intubation can be performed with video laryngoscopy. [11] The same thing was found in bronchoscopy or tracheoscopy procedures performed in treating patient complications, which can be replaced by radiological examinations to reduce the risk of transmission due to aerosols. [12] A literature review discussing the management of cancer patients stated that one strategy to reduce the risk of infection and patient death during the COVID-19 pandemic is to delay adjuvant chemotherapy because cancer patients receiving therapy are included in patients who are at high risk for contracting COVID-19. [20] An article was found discussing efforts to improve patient safety in inpatient units with a focus on the establishment and implementation of the COVID-19 patient discharge pathway. Standardization of the discharge process of COVID-19 patients to improve patient safety is carried out by establishing consensus on criteria for patient discharge readiness, establishing discharge criteria for various discharges of patients including post-acute care facilities, home care requirements, and homeless patients, and establishing follow-up care protocols. for monitoring conditions after discharge. [30]

Changes and adjustments to measures that have a high risk of transmission are also carried out in surgical units to improve patient safety. [17,20,22] Actions that generate aerosols are considered to increase the risk of COVID-19 transmission because aerosol particles are small and airborne, so they last longer and can spread further than droplets. Aerosols can spread more than 6 feet from the source and can penetrate ordinary masks so special methods are needed to treat patients with procedures that have the potential to generate aerosols. [17] A literature review on the management of patients requiring surgery during the COVID-19 pandemic suggested that endoscopic procedures should be limited to emergency cases. When the endoscopy is carried out, the operator will have a high risk of contact with lung fluid and gastric fluid, which can be a medium for transmitting COVID-19. Endoscopic patients are also advised to be given adequate sedation to minimize the spread of nasopharyngeal secretions that have the potential to cause aerosols. [20] A review article reviewing surgical recommendations during the COVID-19 pandemic provides some changes to procedures that have a high risk of infection. Anesthesia procedure before surgery with intubation and extubation is a high-risk procedure that generates aerosols so personnel restrictions are expected to reduce the risk of exposure. Operations using laparoscopy are considered to have a higher risk of transmission because they generate aerosols compared to open surgery which also has a risk of direct exposure, so the operating team is expected to consider the benefits and risks according to the case. The use of electrocautery is more recommended than a device with radiofrequency and ultrasound. [22]

Minimizing surgical procedures was found to be performed by postponing surgery which has the benefit of maximizing available resources to treat COVID-19 and reducing the risk of infection in patients and healthcare workers. [13-17,20-22,31,32] The pediatric surgery unit at Seattle Children's Hospital during the COVID-19 pandemic conducted selection or triage of existing surgical cases by dividing cases into 3 groups, namely: green cases for patients with effective surgery plans that can be postponed for more than 6 weeks, yellow cases which are cases with the processing time of fewer than 6 weeks and red cases or cases that must be worked on in less than one week. [17] Delays in elective surgery were also found in the hand and reconstructive microsurgery unit at a hospital in Singapore, only operations with emergency cases will receive surgery. [16] The strategy used by one hospital in Singapore to overcome the limited availability of drugs and oxygen used to treat patients with acute respiratory distress syndrome during the COVID-19 pandemic was to rationalize the use of drugs and oxygen, one of which

was by selecting surgery by postponing elective surgery and postponing elective surgery. only perform urgent and emergency operations such as in cancer patients. [31] The postponement of elective surgery in vascular surgery practice in Singapore was also carried out to allocate resources such as personal protective equipment, resuscitation drugs, ICU, ward, and health workers to focus on handling COVID-19 cases. [15] Delaying surgery for fractures, replaced by removable immobilization and postponing control until the bones are judged to have reconnected, was carried out in a UK hospital to reduce patient visits and thus reduce the risk of transmission. [14] A review article discussing general surgical practice during the COVID-19 pandemic and sourced from a total of 21 articles recommended continuing surgery for emergency and emergency cases, postponing elective surgery to reduce the risk of chaotic events in the hospital system during the pandemic, and reducing the risk of cross-infection and the choice of conservative therapy such as antibiotics or drainage of infection over surgery. [22] A review article regarding the modification of guidelines for tracheostomy procedures during the COVID-19 pandemic suggested that the implementation of tracheostomy during the COVID-19 pandemic should be by the indications because tracheostomy is an aerosol-generating procedure and must be performed in a negative pressure room. Delayed tracheostomy reduces the risk for health care workers involved in insertion but increases the risk of prolonged tracheal intubation. [32] Surgical activities in the pediatric otolaryngology unit were changed based on applicable government regulations where the hospital divided operations into 3 groups, namely all elective surgeries postponed would be rescheduled, surgery was categorized as an urgent case if the operation was delayed for up to 2 days and surgery was considered an emergency if the operation could not be postponed. and must be implemented immediately[22]. The postponement of elective surgery is also being applied to trauma and orthopedic surgery units in the UK and emergency surgery is still being performed with prior case screening. [21] Postponement of elective surgery during the COVID-19 pandemic was recommended by a literature review due to complications such as lung infection following elective surgery in a reviewed article. [20]

Hospital Building Physical Adjusment

Changes in the physical structure of the hospital were found to be one of the factors carried out by the hospital to improve patient safety. Adjustments were made in the form of changing rooms and separating inpatient rooms according to COVID-19 status, modifying operating rooms, and making hospitals free of COVID-19.

Changes to inpatient rooms and separating inpatient rooms according to COVID-19 status are carried out by hospitals to improve patient safety during the COVID-19 pandemic. [10,12,13,23,27,33] Separation of treatment rooms and delivery rooms for patients who were confirmed negative or positive for COVID-19 was also carried out in the obstetrics and gynecology unit of a hospital in France during the COVID-19 pandemic to improve patient and health worker safety efforts. [10] A review article on COVID-19 and Diabetes Mellitus explained that during the COVID-19 pandemic changes to the patient's inpatient setting can be done by placing monitor iv pumps and installing a long extension cord on insulin drip outside the patient's room to reduce the exposure to health workers when monitoring. the condition of inpatients and can improve the quality of services, the safety of health workers, and patient safety. [33] Efforts to implement patient safety in the Pediatric Otolaryngology unit in inpatient units are carried out by limiting patient companions, patients may only be accompanied by one companion who is over 18 years of age which is intended to reduce cross contamination and minimize exposure to COVID-19. [13] Efforts to control infection in patients undergoing total laryngectomy are carried out by placing the patient in an inpatient unit with a negative pressure room and a HEPA filtered room. [12] The modification of the rules in the inpatient room in the maternity unit of a tertiary academic hospital during the COVID-19 pandemic stated that patients with confirmed or suspected COVID-19 were treated in isolation rooms, separated from newborns, and should not be waited on or patients were allowed to be isolated in 1 room. with their baby but still wearing masks and gloves, while COVID-19 negative patients may be accompanied by 1 watchman but no visitors. [23]----[12]. Changes to inpatient rooms can also be made by changing stroke units including beds and equipment to treat excess COVID-19 patients. [27]

Hospital modifications or changes are made to improve patient safety during the COVID-19 pandemic. [15,18,20-22,32] A review article that analyzed 21 research articles stated that efforts to improve the safety of both patients and health workers in the surgical unit were to separate the operating room for negative patients and the operating room for positive patients and suspected COVID-19, limiting the number of health workers in the operating room, including during the procedure. intubation and extubation only the anesthesia team is allowed in the room, cleaning the equipment and operating room after the procedure and establishing a flow of patient transfer back to the ward after surgery. [22] Another change in the operating room was found in the form of handling suspected patients or those who were confirmed positive for COVID-19, surgery was carried out in a special negative pressure room that has special access in and out of the room and is separated from other rooms to prevent cross-infection. in Singapore. [15] Efforts to improve patient safety during the COVID-19 pandemic in trauma and orthopedic units in the UK were carried out by dividing the operating room into dirty rooms and clean rooms. Operations for trauma cases are carried out in a dirty room where the patient comes from the emergency room and it is not clear about the status of COVID-19, while the cleanroom is for surgery for cancer patients to reduce

the possibility of being exposed to the virus in immunocompromised patients. All patients were given an explanation and informed consent regarding the risk of infection with COVID-19 during surgery. [21] One of the articles that discuss handling cases of surgery and anesthesia in pediatric patients during the Covid-19 pandemic made modifications to the operating room and flow of patients in the form of COVID-19 negative patients being delivered to the operating room with one delivery person and after surgery, they were moved to a special room for treatment. post anesthesia, while positive patients or suspected COVID-19 are transferred to the operating room via the negative route without an introduction and the pathway, will be cleaned for each patient after surgery will receive post-anesthesia observations in the operating room and then be transferred to the inpatient room. [18] A review article regarding the modification of the tracheostomy procedure during the COVID-19 pandemic suggested that the tracheostomy during the COVID-19 pandemic be carried out in a negative pressure room because a positive pressure room can increase the risk of aerosols but if a negative pressure room is not available, it can be replaced with a portable high pressure room. efficiency particulate air filtration (HEPA). [32] A literature review that discusses the care of cancer patients and patients requiring surgery recommends limiting the number of health workers in the operating room, separating the operating room for patients with suspected or positive and negative COVID-19, the operating room is ideally negative pressure, there is a special area for use and removal personal protective equipment, operating room doors that must be tightly closed, in and out of the operating room must be controlled, providing hand sanitizer, cleaning the room after each operation is completed and giving health workers time to shower. [20]

One article from the UK describes the perceptions and experiences of patients undergoing elective procedures or surgery in 'COVID-19-free' hospitals during the COVID-19 pandemic. Making a private hospital a hospital that does not treat COVID-19 cases or called a covid-free hospital and PCR swab screening examinations on patients before elective surgical procedures are important points for patient confidence. As many as 60% of patients are worried about undergoing an elective surgical procedure, 30% of patients delay surgery and 95% of patients feel that the precautions implemented in 'COVID-19-free' hospitals have been well designed and proportionate. The perception of patient safety during this operation shows that efforts to increase safety have been well received by patients. [34]

PPE Management

One of the implementations of patient safety during the COVID-19 pandemic is the use of adequate personal protective equipment for health workers, patient personal protective equipment, and social distancing practices in both outpatient, inpatient, and operating rooms.

Adequate use of personal protective equipment in inpatient units is found in the form of masks for patients and health workers personal protective equipment in the form of surgical masks or N95 masks, eye protection or face shields or powered air-purifying respirators (PAPR), medical gowns, gloves, surgical caps, and shoe covers. Adequate personal protective equipment aims to reduce the risk of COVID-19 transmission between patients and health workers. [9,10-12,33] A hospital in Philadelphia added a set of personal protective equipment for health workers when the Neonatal-Infant Airway Safety Program protocol or emergency airway protocol for neonates and infants in the NICU was activated. The additional set of personal protective equipment contains N95 masks, eye protection, medical gowns, and gloves. [11] A clinical recommendation in treating total laryngectomy patients during the COVID-19 pandemic recommends the use of enhanced personal protective equipment for medical personnel consisting of N95 masks and face shields or powered air-purifying respirators (PAPR), disposable surgical caps, medical gowns, gloves, and shoe covers when handling laryngectomy patients whose status is unknown, suspected or positive for COVID-19 status and laryngectomy patients are required to cover the tracheostomy with a special filter and wear a surgical mask. Another thing that must be considered besides the use of personal protective equipment is the process of using and removing (donning and doffing) personal protective equipment. [12] Adaptation during the COVID-19 pandemic to improve patient safety at the OBGYN unit in a hospital in France was carried out by providing surgical masks for all patients and health workers who treat COVID-19 negative patients and providing N95 masks for health workers who treat suspected or positive COVID-19 patients. The provision of masks aims to reduce the risk of COVID-19 transmission between patients and health workers. [10] A Stroke Center in the United States also emphasizes the use of personal protective equipment and inadequate medical personnel in treating patients to reduce potential exposure. [9] The same thing was also found in a review article discussing the relationship between COVID-19 and diabetes mellitus, stating that protection for health workers can be done by reducing exposure to patients and using adequate personal protective equipment. [33]

One of the implementations of patient safety during the COVID-19 pandemic in the operating room is the use of adequate personal protective equipment for health workers in the form of surgical masks or N95 masks or Filtering Face Pieces (FFP2/FFP3), eye protection or face shields or powered air-purifying respirators (PAPR), controlled air-purifying respirator (CAPR), medical gown, gloves, surgical cap, and shoe cover. Adequate personal protective equipment aims to reduce the risk of COVID-19 transmission between patients and health

workers. [13,15-18,20-22,32] A review article that analyzed 21 research articles stated that efforts to improve the safety of patients and health workers when undergoing surgery can be done by using adequate personal protective equipment (surgical caps, N95 or FFP2/FFP3 masks), medical gowns, gloves, eye protection or face shields and PAPR for all cases, whether they are negative cases, suspected cases or positive cases of COVID-19. [22] The pediatric surgery unit at Seattle Children's Hospital recommends the use of a controlled air-purifying respirator (CAPR) which is a full-head helmet that can be used repeatedly to reduce the need for an N-95 mask. [17] In addition to the use of adequate personal protective equipment, a review article regarding the modification of tracheostomy guidelines during the COVID-19 pandemic emphasized that medical personnel must understand the proper system of wearing and removing personal protective equipment so as not to contract COVID-19. [32] The use of adequate personal protective equipment is important for health workers when dealing with surgical patients during the COVID-19 pandemic due to the high risk of infection found in health workers who have poor hand washing habits and the use of the wrong personal protective equipment. wearing and removing personal protective equipment is also of particular concern to reduce the risk of COVID-19 infection. [20]

One of the patient safety implementations carried out by hospitals during the COVID-19 pandemic in outpatient settings was the use of adequate personal protective equipment in the form of masks and social distancing practices. [8,10,12,13,16] The changes made by the Pediatric Otolaryngology unit were to add rules for wearing masks for patients, only allowing 1 companion for patients, and social distancing practices were applied by only allowing a maximum of 4 people in the elevator. [13] Strategies to control infections in mental hospitals in Taiwan at the patient level are carried out by requiring the use of masks, improving hand hygiene, and recommending vaccinations for patients. [8] An article explains that laryngectomy patients who are going to the hospital for control are required to cover the tracheostomy with a heat moisture exchanger (HME) device and are advised to install a special antibacterial filter then cover it with a surgical mask or with a scarf and the patient is required to wear a surgical mask to cover the mouth and nose. [12] A hospital in France also made regulations to wear masks, especially surgical masks, for all patients who came to reduce the risk of transmitting COVID-19 between patients and health workers. [10] In addition to requiring patients to wear masks, outpatient services at the hand and reconstructive microsurgery unit in Singapore apply social distancing in polyclinic waiting rooms and outpatient waiting rooms only for patients. [16]

Support System

During the COVID-19 pandemic, hospitals implemented several other support systems to improve the implementation of patient safety, such as providing training and forming special teams and strategies to rationalize the use of drugs and oxygen.

To improve the abilities and knowledge of hospital employees so that they can provide maximum service, training is carried out, especially training on personal protective equipment, swab training, and telemedicine. [8,9,13,15,35] Increased knowledge through training is carried out by mental hospitals in Taiwan by providing training on infection control and prevention for all hospital employees, in addition to increasing knowledge, training can provide psychological support. [8] Amid time constraints, the Telemedicine Department of the University of California San Diego managed to organize training on the flow and use of telemedicine which was attended by more than 1000 health workers for 7 days. [13] Health workers receive training on using personal protective equipment in a Singapore hospital to reduce the risk of transmitting COVID-19 infection to health workers and maximize the care of COVID-19 patients. [15] Online training on the use and removal of personal protective equipment is carried out to reduce cross-contamination and minimize exposure to COVID-19. [13] The training for nasopharyngeal swab specimen takers was carried out at a hospital in the morning and in the afternoon they started working due to time constraints when cases were very high. Training is provided through presentations and video screenings and skills training in nasopharyngeal swab sampling and the use of personal protective equipment. [35]

Team formation, task reallocation, and scheduling for health workers found in several articles in this review study have the aim of maximizing COVID-19 patient care and reducing patient exposure. [8,9,13,15,16,35] The division of the team with a special rotation schedule in the stroke unit at the University of California San Diego (UCSD) during the COVID-19 pandemic was intended to maintain well-being, prevent burnout and reduce patient exposure. [13] A review article stated that one strategy for controlling infection in mental hospitals in Taiwan is forming an infection control committee with doctors and nurses who specialize in infection control and scheduling and redistributing staff to minimize the risk of transmission. [8] In the vascular surgery unit in a Singapore hospital, reducing the risk of transmission of COVID-19 infection to health workers and maximizing the service for COVID-19 patients, is done by forming a vascular surgery team consisting of inpatient and outpatient teams with the same members and a duty cycle. certain tasks, relocating the duties of health workers to other units that are more in need, eliminating annual leave, and making work from home regulations for administrative employees to reduce the number of visits to hospitals. [15] One of the regulations applied to the maternity unit of a hospital in California during the COVID-19 pandemic was the formation of a special team aimed at caring for the delivery of COVID-19 patients on each shift consisting of nurses, doctors, and room operational staff so that patient care

remained constant. maximally enforceable. [23] Scheduling of health workers is carried out by relocating health workers from the Obstetrics and Gynecology unit in a hospital in France to units that need to maximize services for COVID-19 patients and vaccination is also carried out on personnel to improve the safety of both patients and health workers. [10] The arrangement of human resources in the hand and reconstructive microsurgery unit in Singapore is carried out by granting leave permission only when sick or in urgent need, and dividing health workers into teams that treat cases in the pneumonia ward. [16] The arrangement of human resources in the Pediatric Otolaryngology unit is carried out by dividing the team into team A which is in charge of handling outpatients, outpatients, and operations, and team B which is in charge of providing telemedicine services. The division of teams where each team consists of 2-3 members and the schedule is rotated every week aimed at reducing cross-contamination and minimizing exposure to COVID-19. [13] A hospital created a system to improve the safety of health workers in charge of taking nasopharyngeal specimens in patients with suspected COVID-19 and to maximize sampling services by dividing a shift that runs for 2 hours into 2 sessions. The first session is for one hour, one health worker is in charge of taking samples and one health worker provides education to patients, the second session for one hour is then used for the disinfection process. Hospitals also provide psychological support by providing questionnaires to assess the mental health of health workers regularly and provide counseling facilities with professionals. [35] An article review wrote that one strategy that can be done is to transfer the duties of health workers who are assigned to the stroke unit to handle COVID-19 patients in the ICU or other units. [27]

In the face of a shortage of drugs and oxygen amid increasing cases of COVID-19, the strategy to nationalize the use of drugs and oxygen in the ICU and operating rooms during the COVID-19 pandemic was carried out by anesthesiologists at a hospital in Singapore. The strategy is carried out by maximizing the use of existing drugs, replacing opioid sedatives with regional anesthesia during surgery so that opioid sedatives and oxygen consumption can be allocated to units that need it more, using alternative drugs that were previously not commonly used, and minimizing the use of oxygen during anesthesia. [31]

CONCLUSION

The COVID-19 pandemic has become a new challenge in health systems around the world, including the efforts of health facilities in patient safety culture. From the literature review that has been carried out above, it can be concluded that the implementation of patient safety during the COVID-19 pandemic can be carried out through initial screening, utilization of technology, reducing the risk of transmission, physical adjustment of hospital buildings, personal protective equipment for all and support systems. The implementation of good patient safety is an important goal of the health care system during the COVID-19 pandemic. The implementation of good patient safety is an important goal of the health care system during the COVID-19 pandemic so that it can improve the quality of patient care and protect health workers during the COVID-19 pandemic.

REFERENCES

1. Kementerian Kesehatan Republik Indonesia. Pedoman Pencegahan dan PengendalianCoronavirus Disease (Covid-19). 2020.
2. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. 2020.
3. WHO. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus. Geneva: WHO; 2020.
4. Taylor M, Kepner S, Gardner LA, Jones R. Patient Safety Concerns in COVID-19–Related Events: A Study of 343 Event Reports From 71 Hospitals in Pennsylvania. Patient Safety. 2020;2(2):16–27.
5. Chen HY, Lu L, Ko YM, Chueh JW, Hsiao SY, Wang PC, Cooper CL. Post-Pandemic Patient Safety Culture: A Case from a Large Metropolitan Hospital Group in Taiwan. International Journal of Environmental Research and Public Health. 2021;18(9).
6. Chirico F, Ferrari G, Nucera G, Szarpak L, Crescenzo P, Ilesanmi O. Prevalence of anxiety, depression, burnout syndrome, and mental health disorders among healthcare workers during the COVID-19 pandemic: A rapid umbrella review of systematic reviews. 2021.
7. Jha AK, Prasopa-Plaizier N, Larizgoitia I, Bates. Research Priority Setting Working Group of the WHO World Alliance for Patient Safety. Patient safety research: An overview of the global evidence. Quality & Safety in Health Care. 2021;19(1):42–47.
8. Hsu ST, Chou LS, Chou FHC, Hsieh KY, Chen CL, Lu WC, Kao WT, Li DJ, Huang JJ, Chen WJ, Tsai KJ. Challenge and strategies of infection control in psychiatric hospitals during biological disasters-From SARS to COVID-19 in Taiwan. Asian Journal of Psychiatry. 2020;54.
9. Meyer D, Meyer BC, Rapp KS, Modir R, Agrawal K, Hailey L, Mortin M, Lane R, Ranasinghe T, Sorace B, von Kleist TD, Perrinez E, Nabulsi M, Hemmen T. A Stroke Care Model at an Academic, Comprehensive

Stroke Center During the 2020 COVID-19 Pandemic. Journal of Stroke and Cerebrovascular Diseases: The Official Journal of National Stroke Association. 2020;29(8).
10. Murtada R, Carbonnel M, Revaux A, Favre-Inhofer A, Ayoubi JM. Managing a Department of Obstetrics and Gynecology in Times of COVID-19 Outbreak: The Foch Hospital Experience. Frontiers in Surgery. 2021;8.
11. Thom C, Deshmukh H, Soorikian L, Jacobs I, Fiadjoe J, Lioy J. 2020). Airway emergency management in a pediatric hospital before and during the COVID-19 pandemic. MedRxiv: The Preprint Server for Health Sciences.
12. Hennessy M, Bann DV, Patel VA, Saadi R, Krempl GA, Deschler DG, Goyal N, Choi KY. Commentary on the management of total laryngectomy patients during the COVID-19 pandemic. Head & Neck. 2020;42(6): 1137–1143.
13. Mukerji SS, Liu YCC, Musso M. Pediatric otolaryngology workflow changes in a community hospital setting to decrease exposure to novel coronavirus. International Journal of Pediatric Otorhinolaryngology. 2020;136.
14. Dunkerley S, Kurar L, Butler K, James M, Lowdon I. The success of virtual clinics during COVID-19: A cloclosed-loopdit of the British orthopaedic association (BOAST) guidelines of outpatient orthopaedic fracture management. Injury. 2020;51(12):2822–2826.
15. Ng JJ, Gan TRX, Niam JY, Menon RK, Ho P, Dharmaraj RB, Wong JCL, Choong AMTL. Experience from a Singapore tertiary hospital with restructuring of a vascular surgery practice in response to national and institutional policies during the COVID-19 pandemic. Journal of Vascular Surgery. 2020;72(4):1166–1172.
16. Omar UF, Pei Yein T, Rajaratnam V. Managing hand and reconstructive microsurgery service during COVID-19 pandemic: Singapore experience. Postgraduate Medical Journal. 2020;96(1137):379–383.
17. Parikh SR, Avansino JR, Dick AA, Enriquez BK, Geiduschek JM, Martin LD, McDonald RA, Yandow SM, Zerr DM, Ojemann JG. Collaborative Multidisciplinary Incident Command at Seattle Children's Hospital for Rapid Preparatory Pediatric Surgery Countermeasures to the COVID-19 Pandemic. Journal of the American College of Surgeons. 2020;231(2):269-274
18. Camporesi A, Melloni GEM, Diotto V, Bertani P, La Pergola E, Pelizzo G. Organizational aspects of pediatric anesthesia and surgery between two waves of Covid-19. Acta Anaesthesiologica Scandinavica. 2021;65(6):755–760.
19. Somani BK, Pietropaolo A, Coulter P, Smith J. Delivery of urological services (telemedicine and urgent surgery) during COVID-19 lockdown: Experience and lessons learnt from a university hospital in United Kingdom. Scottish Medical Journal. 2020;65(4):109–111.
20. Spolverato G, Capelli G, Restivo A, Bao QR, Pucciarelli S, Pawlik TM, Gronchi A. The management of surgical patients during the coronavirus disease 2019 (COVID-19) pandemic. Surgery. 2020;168(1):4–10.
21. Wallace CN, Kontoghiorghe C, Kayani B, Chang JS, Haddad FS. The impact of COVID-19 on trauma and orthopaedic surgery in the United Kingdom. Bone & Joint Open. 2020;1(7):420–423.
22. Bresadola V, Biddau C, Puggioni A, Tel A, Robiony M, Hodgkinson J, Leo CA. General surgery and COVID-19: Review of practical recommendations in the first pandemic phase. Surgery Today. 2020;50(10):1159-1167.
23. Greene NH, Kilpatrick SJ, Wong MS, Ozimek JA, Naqvi M. Impact of labor and delivery unit policy modifications on maternal and neonatal outcomes during the coronavirus disease 2019 pandemic. American Journal of Obstetrics & Gynecology MFM. 2020;2(4):100234.
24. Leso V, Fontana L, Iavicoli, I. Susceptibility to Coronavirus (COVID-19) in Occupational Settings: The Complex Interplay between Individual and Workplace Factors. International Journal of Environmental Research and Public Health. 2021;18(3):3.
25. Morris NP, Hirschtritt ME. Telepsychiatry, Hospitals, and the COVID-19 Pandemic. Psychiatric Services. 2020;71(12):1309–1312.
26. Malden S, Heeney C, Bates DW, Sheikh A. Utilizing health information technology in the treatment and management of patients during the COVID-19 pandemic: Lessons from international case study sites. Journal of the American Medical Informatics Association: JAMIA. 2021.
27. Wira CR, Goyal M, Southerland AM, Sheth KN, McNair ND, Khosravani H, Leonard A, Panagos P. AHA/ASA Stroke Council Science Subcommittees: Emergency Neurovascular Care (ENCC), Telestroke and the Neurovascular Intervention Committees; and on behalf of the Stroke Nursing Science Subcommittee of the AHA/ASA Cardiovascular and Stroke Nursing Council. Pandemic Guidance for Stroke Centers Aiding COVID-19 Treatment Teams. Stroke. 2020;51(8):2587–2592.
28. Falconer N, Monaghan C, Snoswell CL. The pharmacist informatician: Providing an innovative model of care during the COVID-19 crisis. The International Journal of Pharmacy Practice. 2021;29(2):152–156.
29. Elbeddini A, Almasalkhi S, Prabaharan T, Tran C, Gazarin M, Elshahawi A. Avoiding a Med-Wreck: A structured medication reconciliation framework and standardized auditing tool utilized to optimize patient safety and reallocate hospital resources. Journal of Pharmaceutical Policy and Practice. 2021;14(1):10.

30. Patel H, Virapongse A, Baduashvili A, Devitt J, Barr R, Bookman K. Implementing a COVID-19 Discharge Pathway to Improve Patient Safety. American Journal of Medical Quality: The Official Journal of the American College of Medical Quality. 2021;36(2):84–89.
31. Au Yong PSA, Kwa CWX, Chan XHD. Anaesthetic Considerations for Rationalizing Drug Use in the Operating Theatre: Strategies in a Singapore Hospital During COVID-19. SN Comprehensive Clinical Medicine. 2020;1–3.
32. McGrath BA, Ashby N, Birchall M, Dean P, Doherty C, Ferguson K, Gimblett J, Grocott M, Jacob T, Kerawala C, Macnaughton P, Magennis P, Moonesinghe R, Twose P, Wallace S, Higgs A. Multidisciplinary guidance for safe tracheostomy care during the COVID-19 pandemic: The NHS National Patient Safety Improvement Programme (NatPatSIP). Anaesthesia. 2020;75(12):1659–1670.
33. Wallia A, Prince G, Touma E, El Muayed M, Seley JJ. Caring for Hospitalized Patients with Diabetes Mellitus, Hyperglycemia, and COVID-19: Bridging the Remaining Knowledge Gaps. Current Diabetes Reports. 2020;20(12):77.
34. Lee G, Clough OT, Walker JA, Anakwe RE. The perception of patient safety in an alternate site of care for elective surgery during the first wave of the novel coronavirus pandemic in the United Kingdom: A survey of 158 patients. Patient Safety in Surgery. 2021;15(1):11.
35. Qian Y, Zeng T, Wang H, Xu M, Chen J, Hu N, Chen D, Liu Y. Safety management of nasopharyngeal specimen collection from suspected cases of coronavirus disease 2019. International Journal of Nursing Sciences. 2020;7(2):153–156.