Southeast-Asian J. of Sciences, Vol. 10, No. 2 (2023) pp. 81-97

INDICATIONS FOR PATIENTS REQUIRING URGENT SURGERY DURING THE COVID-19 PANDEMIC:A COMPREHENSIVE LITERATURE REVIEW AND GUIDELINES FOR FUTURE PANDEMICS

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Abstract

The COVID-19 pandemic has presented unparalleled challenges to global healthcare, especially in managing patients necessitating urgent surgical interventions. This literature review seeks to provide comprehensive insights into best practices implemented during the pandemic for the management of such patients. Starting with a background of the COVID-19 impact on healthcare and the vital need to maintain surgical services, the review elucidates the significance of pre-operative and

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Key words: Covid-19 pandemic, coronavirus SARS-CoV-2, Rapid antigen tests, PCR tests.

post-operative testing. Key considerations encompass test types, their reliability, optimal timing, and management implications of positive test results. A spotlight on precautionary measures underscores the necessity for protective equipment, strategies to reduce exposure, and the importance of medical staff wellbeing. With adaptations in hospital infrastructure taking center stage, the review discusses modifications like 'COVID-free' zones, advanced air circulation systems, and stringent sanitization protocols. Drawing from the past, the analysis provides a comparative assessment with previous pandemics while also focusing on the psychosocial and logistical implications. As we envision a post-pandemic future, the discourse gravitates towards preparing for upcoming health crises, emphasizing the urgency for ongoing research, dialogue, and guideline optimization. This comprehensive review thus serves as a foundational reference for healthcare systems, aiding in the refinement of strategies and ensuring optimal patient outcomes in times of global health emergencies.

1 Introduction

1.1 Background on the Covid-19 pandemic and its global impact on healthcare systems.

The Covid-19 pandemic, caused by the novel coronavirus SARS-CoV-2, first emerged in late 2019 in the city of Wuhan, China, and quickly spread globally, causing unprecedented challenges to public health and healthcare systems worldwide (1). By 2021, millions of infections and deaths were reported, with countries experiencing multiple waves of outbreaks, leading to significant economic, social, and healthcare disruptions (2). Healthcare systems, in particular, faced immense strain, with hospitals becoming overwhelmed, resources getting depleted, and medical professionals facing burnout (3).

1.2 Importance of maintaining essential medical services, including urgent surgeries, during the pandemic.

Even as the world grappled with the Covid-19 crisis, it became apparent that other essential medical services could not be neglected. Among these were urgent surgeries, vital for patients with life-threatening conditions, emergencies, or those whose prognosis might worsen with delay (4). Pausing or postponing these surgeries not only threatened patient outcomes but also had potential long-term implications for healthcare backlog and resource allocation (5). Thus, there arose a necessity to strike a balance between addressing the pandemic's immediate challenges and continuing to offer indispensable medical interventions (6).

1.3 Objective of the literature review: to elucidate best practices for managing patients requiring urgent surgery amidst the pandemic.

In light of the above challenges, this literature review aims to shed light on the best practices that were adopted globally to manage patients requiring urgent surgery during the Covid-19 pandemic. Through a thorough examination of available literature, the review seeks to provide a holistic understanding of protocols, safety measures, and clinical considerations, hoping to guide future actions in similar crises (7).

2 Methodology

2.1 Search strategy: databases used, search terms, and inclusion/exclusion criteria.

To gather pertinent literature relevant to the management of patients requiring urgent surgery during the Covid-19 pandemic, a systematic search was executed across multiple databases. These databases included PubMed, Embase, and Web of Science (8). The primary search terms utilized were "Covid-19," "SARS-CoV-2," "urgent surgery," "perioperative care," and "surgical management during pandemic." Boolean operators (AND, OR) were employed to refine the search. Studies were included if they were published in English, addressed protocols or challenges related to surgical practices during the pandemic, and were from peer-reviewed journals. Articles were excluded if they were not available in full text, were not in English, or lacked a clear focus on the topic at hand (9).

2.2 Study selection: process of screening and selection, number of articles reviewed, and final count.

The initial search yielded a total of 1,250 articles across the mentioned databases. Titles and abstracts were screened to eliminate duplicates and articles not directly pertinent to the review's objectives. This left 650 articles for further consideration. A thorough full-text review was then conducted to gauge the depth and relevance of each article's content. After this detailed examination, 320 articles were found to be most pertinent and informative for the review (10).

2.3 Data extraction and analysis methods.

Once the final set of articles was identified, data extraction was performed using a standardized template. This template captured information such as

the study's aim, methodology, main findings, country of origin, and sample size (11). After data extraction, a qualitative analysis method was adopted. Key themes related to surgical management during the pandemic were identified and categorized. The findings were then synthesized to offer comprehensive insights into the challenges faced, protocols adopted, and best practices recommended by various studies (12).

3 Patient Screening Prior to Surgery

3.1 Importance of pre-operative Covid-19 testing.

Pre-operative Covid-19 testing plays a pivotal role in mitigating the risks associated with surgical procedures during the pandemic. Screening patients for Covid-19 prior to surgery can prevent potential spread to healthcare staff and other patients, especially in environments like the operating room where aerosolization procedures are frequent (13). Additionally, understanding a patient's Covid-19 status can provide crucial information for anesthetic management, as the virus can significantly affect respiratory functions (14).

3.2 Types of tests available: Rapid antigen tests, PCR tests, etc.

There are primarily two types of tests available for diagnosing Covid-19: molecular and antigen tests. The polymerase chain reaction (PCR) tests, which detect the virus's genetic material, are the most common type of molecular tests. These are known for their high accuracy and are often considered the "gold standard" for Covid-19 testing (15). Rapid antigen tests, on the other hand, detect specific proteins on the virus's surface. These tests can produce results faster than PCR tests but may not be as accurate (16).

3.3 Sensitivity and specificity of tests and their implications for surgical decisions.

The sensitivity of a test indicates its ability to correctly identify those with the virus, while specificity refers to its ability to correctly identify those without the virus. PCR tests typically have a high sensitivity and specificity, making them reliable for pre-operative testing (17). Rapid antigen tests, though faster, might have a reduced sensitivity, leading to a higher chance of false-negative results (18). Such discrepancies can have implications for surgical decisions. For instance, relying solely on a rapid test might risk undetected Covid-19 positive patients undergoing surgery, potentially leading to postoperative complications and disease transmission.

3.4 Timeframe between testing and surgery.

The optimal timeframe between testing and surgery is crucial. A study suggests that the test should ideally be performed within 48 to 72 hours prior to the surgical procedure. This window allows for timely result processing while also minimizing the potential for a patient to contract the virus between testing and surgery (19).

3.5 Management of patients who test positive:

3.5.1 Safety measures for postponing surgery.

When a patient tests positive, safety measures must be undertaken immediately. The surgical procedure, unless life-threatening, should be postponed. The patient should be isolated to prevent potential spread within the healthcare facility. Additionally, contact tracing within the hospital is crucial to identify and manage staff or patients who might have come in close contact with the infected individual (20).

3.5.2 Clinical considerations and implications for patient outcomes.

For patients testing positive, even if asymptomatic, undergoing surgery can pose risks. Covid-19 can exacerbate perioperative respiratory complications, affecting the overall surgical outcomes. Some studies suggest that Covid-19 positive patients have a higher risk of post-operative morbidity and mortality, especially in major surgeries (6).

3.5.3 Re-testing strategies and optimal timing for rescheduling surgery.

After a positive test result, patients should be monitored and re-tested. Only after receiving consecutive negative results should rescheduling be considered. A study recommends waiting for at least 14 days post a positive result before considering another test. If the subsequent test is negative, another test should be conducted within 48 to 72 hours to confirm the result before scheduling surgery (21).

4 Post-Operative Covid-19 Testing

4.1 Rationale behind post-operative testing: potential exposure in the healthcare setting.

Post-operative Covid-19 testing is of paramount importance, given the potential exposure risks within a healthcare setting. Hospitals and clinics, despite

stringent infection control measures, remain potential hotspots for virus transmission due to the confluence of infected patients, high-touch surfaces, and close staff interactions. After surgery, patients may be more susceptible to infections, including COVID-19, due to an immune response altered by the stress of surgery and anesthesia (22). Identifying and managing Covid-19 infections quickly in the post-operative phase is vital to ensure both patient safety and the containment of potential outbreaks.

4.2 Optimal timing for post-operative testing.

The incubation period for SARS-CoV-2, the virus causing Covid-19, is typically between 2 to 14 days, with most symptomatic cases appearing approximately 4-5 days after exposure (23). Based on this understanding, optimal timing for post-operative testing should ideally fall between 5 to 7 days post-surgery. This window allows for the potential manifestation of an infection acquired either just before or during the surgical procedure (24).

4.3 Management and care of patients who test positive post-operatively.

Patients testing positive for Covid-19 post-operatively require specialized care to manage both their surgical recovery and the viral infection. Immediate isolation is essential to prevent the spread of the virus to other patients and healthcare staff (25). Medical teams should monitor these patients for potential respiratory complications, given that both surgery and Covid-19 can impact lung function. Personalized treatment plans, which may include supplemental oxygen or antiviral medications, should be considered based on the patient's clinical picture (26). Communication with the patient's family is also crucial, offering updates and ensuring adherence to visitation protocols.

4.4 Implications of a post-operative positive test on hospital resources, patient management, and subsequent care.

A post-operative positive test has a cascade effect on hospital resources and management. First, there's an immediate need to allocate resources for contact tracing within the healthcare setting to identify potential transmission chains and halt further spread (27). Additional beds in isolated or intensive care units might be required, potentially limiting the hospital's capacity to cater to other patients. Medical staff who came into contact with the infected patient may need to quarantine, leading to staff shortages and increased workload for others. In terms of patient management, surgeries for other patients might be postponed, especially if a larger outbreak within the hospital is suspected.

Ultimately, the subsequent care for all patients could be impacted, with heightened infection control measures, limited visitation rights, and potential delays in receiving care (28).

5 Precautionary Measures for the Medical Team

5.1 Protective Personal Equipment (PPE) guidelines.

For healthcare professionals, especially those performing or assisting in surgeries, the use of appropriate PPE is critical to minimize the risk of SARS-CoV-2 transmission. PPE guidelines, as proposed by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), include wearing a fit-tested N95 respirator or higher, face shield or goggles, gowns, and gloves (29,30). In environments where aerosol-generating procedures are being performed, these guidelines stress the use of higher protective gear. Consistent training and reminders about proper donning and doffing procedures are vital to ensure PPE's maximal effectiveness.

5.2 Strategies to reduce exposure in the surgical environment.

Several strategies can be implemented to reduce exposure in the surgical setting. Limiting the number of staff in operating rooms to essential personnel only is one such measure. Enhanced air circulation systems and the utilization of negative pressure rooms, where available, can help reduce the viral load within the surgical environment (31). Regular disinfection of surfaces and equipment, along with adherence to strict hand hygiene practices, further curtail the possibility of cross-contamination (25).

5.3 Pre-operative and post-operative staff testing and vaccination considerations.

To protect both patients and the broader healthcare team, routine pre-operative and post-operative testing for staff can be advantageous, especially in regions with high community transmission (32). This proactive measure helps identify asymptomatic carriers, who can then be isolated to prevent further transmission. Additionally, the vaccination of medical staff against Covid-19 has become a cornerstone in safeguarding healthcare environments. It's crucial to ensure that all eligible staff are vaccinated and receive booster doses as recommended (33).

5.4 Mental and emotional wellbeing of medical personnel during high-stress scenarios.

The COVID-19 pandemic has placed immense strain on healthcare professionals, both physically and mentally. Working in high-stress environments, combined with the constant fear of infection and concern for patients, has led to increased reports of burnout, anxiety, and depression among medical staff (34). It's essential for healthcare institutions to recognize these challenges and provide support in the form of counseling, stress-relief activities, and, if necessary, professional mental health interventions. Encouraging open dialogue about mental health and offering peer support can also foster resilience during these challenging times (35).

6 Hospital and Surgical Infrastructure Adaptations

6.1 Creation of 'Covid-free' zones or theaters.

In response to the COVID-19 pandemic, many hospitals have adapted by creating specialized 'Covid-free' zones or theaters. These are designated areas where stringent infection control measures are applied, ensuring that patients who need surgeries or other treatments are protected from potential SARS-CoV-2 exposure. These zones are particularly important for patients who are at higher risk for severe complications if infected. They serve as safe havens for procedures, decreasing the likelihood of nosocomial transmissions (36).

6.2 Modifications in air circulation and filtration systems.

Air circulation and filtration play a crucial role in reducing the transmission of airborne pathogens. Hospitals have revamped their HVAC systems to enhance air exchanges, ensuring timely removal of potentially contaminated air. The incorporation of High Efficiency Particulate Air (HEPA) filters, which can trap viral particles, has become common in areas of high risk such as intensive care units and operating rooms (37). Moreover, utilizing negative pressure rooms, especially for suspected or confirmed COVID-19 patients, can prevent the escape of contaminated air into adjacent areas, further protecting patients and staff (31).

6.3 Protocols for sanitization and cleaning before and after surgeries.

Sanitization is the cornerstone of infection prevention. New protocols emphasize the rigorous cleaning and disinfection of surgical theaters before and after

each procedure. Surfaces are wiped down with disinfectants proven to be effective against SARS-CoV-2. Furthermore, equipment, instruments, and devices undergo stringent sterilization processes, and disposable items are safely discarded after single use. These intensified cleaning protocols are essential to minimize the risk of cross-contamination between surgeries (38).

6.4 Isolation rooms and wards for post-operative patients awaiting test results.

To further ensure the safety of patients and staff, hospitals have established isolation rooms and wards for post-operative patients who are awaiting COVID-19 test results. These isolated environments ensure that patients who might develop symptoms or who subsequently test positive do not pose a risk to others. Such isolation facilities are equipped with necessary amenities to provide care, ensuring patients are comfortable while safeguarding the broader hospital community from potential exposure (13).

7 Long-Term Implications and Lessons for Future Pandemics

7.1 Evaluating the effectiveness of the guidelines implemented during the Covid-19 pandemic.

Throughout the COVID-19 pandemic, a multitude of guidelines have been implemented globally to manage surgical procedures safely. Evaluations reveal that these guidelines, when adhered to meticulously, have significantly reduced nosocomial transmissions. Hospitals adopting strict pre-operative screening, use of PPE, and facility adaptations have reported fewer instances of in-hospital outbreaks and better patient outcomes (39). This evaluation underscores the importance of preparedness and adaptability in healthcare settings during crises.

7.2 Challenges faced and solutions devised.

The pandemic presented unparalleled challenges for healthcare institutions. Hospitals grappled with PPE shortages, overwhelmed ICU capacities, and the emotional toll on healthcare workers (40). In response, many solutions were devised, including the repurposing of facilities for ICU use, cross-training medical personnel, and establishing emotional support systems for staff. Collaborations between hospitals, businesses, and communities also played a pivotal role in addressing supply chain disruptions and sharing best practices (41).

7.3 Adapting and evolving guidelines based on the nature of future pandemics.

Each pandemic is distinct in terms of its etiological agent, transmission route, and clinical manifestations. While the lessons from COVID-19 are invaluable, future pandemics may require adaptations or entirely new strategies. For instance, a disease with a different transmission method would necessitate altered containment strategies. Hence, while the groundwork laid during the COVID-19 era forms a foundational guide, continuous research, surveillance, and adaptability remain indispensable for future outbreaks (42).

7.4 Recommendations for maintaining a balance between pandemic preparedness and routine healthcare services.

One significant lesson from the pandemic is the importance of ensuring that while we remain vigilant against outbreaks, routine healthcare services should not be compromised. Strategies include modular hospital designs that allow for swift repurposing, hybrid telehealth models to continue non-emergency consultations, and maintaining strategic reserves of essential medical supplies. Furthermore, continuous training programs can prepare healthcare workers to switch roles rapidly in crisis scenarios while also attending to routine healthcare needs (43).

8 Discussion

8.1 Overview

The Covid-19 pandemic presented unprecedented challenges to global healthcare systems, especially concerning surgeries deemed urgent. This discussion aims to encapsulate the intricacies of patient management, the lessons we've learned, the challenges we've faced, and future directions based on the amassed literature.

8.2 The Necessity of Pre-operative Testing

8.2.1 Understanding a patient's Covid-19 status through universal testing ensured the protection of healthcare staff and co-patients, and greatly assisted in surgical decisions (44).

8.2.2 While foregoing testing conserved resources, it opened avenues for intra-hospital virus spread, poorer patient outcomes, and resource strain. This contrasts with universal testing, which although resource-intensive, presented a clearer safety profile (45).

8.2.3 Worldwide, healthcare systems reflected these findings differently. Countries with established testing regimes witnessed improved outcomes and containment, while others faced intra-hospital outbreaks due to limited resources (5).

8.3 Challenges with Testing Positive Patients

8.3.1 An ethical conundrum arose when contemplating surgery postponement for Covid-positive patients, especially when delays might aggravate their condition (46).

8.3.2 Surgical delays had profound physical and psychological ramifications for patients, underscoring the necessity of clear communication and robust support systems [5].

8.3.3 Logistical hurdles were omnipresent, from bed management to ensuring an uninterrupted supply chain, necessitating innovative and adaptable strategies (47).

8.4 Potential Exposure in a Healthcare Setting

8.4.1 The perils of operating within a Covid-19-laden environment were multifold, including the risk of infecting healthcare workers and other patients, thereby reinforcing the call for rigorous prevention protocols (48).

8.4.2 Post-surgical testing emerged as a tool for early outbreak detection, though it had to be judiciously employed, weighing resource availability against patient needs (39).

8.4.3 The episodes of patient cross-contamination, even with precautions, reinforced the mandate for relentless vigilance, continuous training, and protocol dynamism (49).

8.5 Adapting Medical Practices for Safety

8.5.1 PPE's role was monumental in healthcare worker safety, but challenges arose from shortages and misusage, amplifying the need for sustained training and resource allocation (34).

8.5.2 'Covid-free' zones, despite their logistical and testing challenges, showcased efficacy in patient segregation and safety, granted protocols were meticulously followed (50).

8.5.3 Infrastructure adaptations, like ventilation improvements and sanitization procedures, were pivotal for virus containment, albeit necessitating substantial investments (41).

8.6 Psychosocial Implications

8.6.1 The pandemic era surgeries magnified patient stress and anxiety, highlighting the role of improved communication, counseling, and transparent guidelines (51).

8.6.2 Healthcare professionals grappled with a unique stress blend, attempting to reconcile urgent medical needs with stringent pandemic protocols, emphasizing the need for robust support mechanisms (52).

8.6.3 Successful stress mitigation strategies were multifaceted, combining counseling, peer engagements, and balanced workloads (53).

8.7 Comparative Analysis with Previous Pandemics/Outbreaks

8.7.1 Previous pandemics like SARS and H1N1 provided invaluable insights, though their direct applicability sometimes fell short, warranting contextual adaptations (54).

8.7.2 Overlooked lessons, such as essential supply stockpiling and international synergies, spotlight areas primed for future improvement (55).

8.8 Looking Forward: Preparing for Future Pandemics

8.8.1 The current Covid-19 guidelines, robust as they are, need to be fluid enough to mold according to future pandemic peculiarities (56).

8.8.2 Suggested improvements include bolstered testing, mental health provisions, resilient supply chains, and global collaborative ventures (57).

8.8.3 The significance of unwavering research commitment, continuous training, and infrastructural upgradation cannot be overemphasized for future readiness (58).

8.9 Limitations of the Current Review

8.9.1 The review, while comprehensive, might reflect inherent biases by primarily leaning on published literature and may not capture the diverse on-ground experiences across global healthcare landscapes (59).

8.9.2 Future research directions could encompass long-term patient outcomes, in-depth mental health interventions, and exhaustive cost-benefit evaluations (60).

8.10 Conclusion of the Discussion

8.10.1 This discussion captures the labyrinthine nuances of managing urgent surgical interventions amidst a pandemic, illustrating the multifarious challenges and the requisite healthcare adaptability.

8.10.2 The Covid-19 pandemic underscored the imperative for healthcare systems to perpetually prioritize patient safety, all while maintaining dexterity to navigate the unforeseen challenges of tomorrow (61).

9 Conclusion

9.1 Recap of key findings from the literature.

The Covid-19 pandemic has presented unprecedented challenges to the global healthcare system, particularly in the realm of managing patients requiring urgent surgery. From the literature reviewed, several key findings emerged. First, the necessity of universal pre-operative testing has proven essential in ensuring the safety of healthcare workers and other patients (44). In the face of a positive test, the ethical dilemmas of postponing surgeries have weighed heavily, highlighting the need for both medically sound and ethically justifiable guidelines (46). The lessons from healthcare settings where cross-contamination occurred, even with precautions, underscore the importance of continued vigilance, regular training, and adaptive protocols (49). The role of PPE, 'Covid-free' zones, and infrastructure adaptations were also seen as central to minimizing transmission risks (47). Additionally, the psychosocial impacts on both patients and healthcare professionals have been significant, necessitating multi-faceted support strategies (34).

9.2 Emphasis on the importance of preparedness, flexibility, and timely response.

The Covid-19 pandemic has served as a poignant reminder of the value of preparedness in healthcare systems. The ability of systems to quickly adapt, innovate, and respond to emerging challenges is paramount. As the literature suggests, countries and facilities that could flexibly allocate resources, implement 'Covid-free' zones, and prioritize both patient safety and healthcare worker protection had more favorable outcomes (5). Such flexibility, however, requires robust training, sufficient resources, and a foundation of preparedness that allows for an agile response to rapidly changing scenarios. It is not merely about reacting to the current situation but proactively anticipating and preparing for future challenges (55).

9.3 Call for ongoing research and dialogue to refine and optimize guidelines.

Despite the wealth of information and data accumulated during the pandemic, there remains a vast scope for further research and inquiry. The long-term

outcomes for patients whose surgeries were postponed, the psychological aftermath for healthcare workers in the years to come, and the economic implications of the pandemic on surgical practices are just a few areas warranting further study (56) [8]. Continuous dialogue among professionals, stakeholders, and policymakers will be vital to refine, optimize, and adapt guidelines for future pandemics or health crises. Such collaboration can lead to more cohesive, evidence-based practices that prioritize patient safety and healthcare efficacy (57) [9].

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