

Universal Pre-procedural Screening for COVID-19 with RT-PCR for SARS-CoV-2 during the First Wave of Pandemic Period in King Chulalongkorn Memorial Hospital

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Background: Coronavirus disease 2019 (COVID-19) pandemic was the global health crisis. Institutional protocol for pre-procedural screening with real-time reverse transcription polymerase chain reaction (RT-PCR) was applied since increasing cases in Thailand.

Objectives of Study: To evaluate the prevalence of positive pre-procedural RT-PCR test for COVID-19 and its effect on pre-operative waiting time.

Materials and Methods: Observational study in university hospital was performed since 13 April to 31 May 2020. Every patient scheduled for aerosol-generating procedures were enrolled. Patients were pre-operatively screened for COVID-19 by RT-PCR with specimen from nasopharyngeal and/or throat swabs. Risk factors, clinical symptoms and chest radiograph were collected. Pre-operative waiting time was also recorded.

Results: One thousand and two hundred patients were enrolled (89.66% inpatient cases and 12.17% emergency

cases). No patients had positive RT-PCR test. Most common risk factors were history of visiting crowded area. Fever and cough were suspected symptoms recorded. None of healthcare providers found positive for COVID-19 in this study. Furthermore, no abnormal chest radiography related to COVID-19 detected. Pre-operative waiting time was minimally delayed for urgency procedures with approximately 177 minutes from scheduling to starting operations compared with 144 minutes in normal situation.

Conclusion: Despite of negative result, appropriate protocols to control disease transmission are important. Cost-effectiveness and patients' inconvenience should be considered. Protective equipment should be available if COVID-19 screening was not performed.

Keywords: Coronavirus disease 2019, COVID-19, prevalence, pre-procedural screening, RT-PCR

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Introduction

A novel coronavirus was first reported in Wuhan, China in December 2019.¹ It causes various degrees of respiratory tract infection ranged from mild respiratory infection to acute respiratory distress syndrome (ARDS). The World Health Organization (WHO) renamed it as severe acute respiratory syndrome related coronavirus-2 (SARS-CoV-2) and defined the disease caused by this virus as coronavirus disease 2019 or COVID-19. The first case of COVID-19 in Thailand was confirmed by the

Ministry of Public Health at 13th January 2020¹. WHO announced COVID-19 outbreak as the pandemic with human-to-human transmission. The number of cases outside China increased up to 13-fold around the world.² In Thailand, the confirmed COVID-19 cases increased from 19 in January 2020 to 42 in February 2020 which continuously increased to 1,651 at the end of March 2020, with average mortality rate of 0.6%.³ Since the increasing of the COVID-19 cases in Thailand, Bangkok became a high-risk and high alert area for transmission

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prevention strategies.

King Chulalongkorn Memorial Hospital (KCMH) is the large university hospital in Bangkok, Thailand. The first confirmed COVID-19 case was reported at 9th March, 2020. Since then, there were continuously increasing cases diagnosed as COVID-19 in KCMH. Our institutional protocol for procedural intervention during COVID-19 pandemic was temporary suspension the elective operations except for time-sensitive and emergency procedures, aimed for prevention of disease transmission. All patients scheduled for procedural interventions at KCMH were screened with real-time reverse transcription polymerase chain reaction (RT-PCR) test for SARS-CoV-2, although there were no suspected clinical symptoms or no risk factors related to COVID-19. RT-PCR test with specimen from nasopharyngeal and/or throat swab is the gold standard diagnostic test regarding to the Center of Disease Control (CDC) guideline.⁴ The elective procedures were performed only if the tests were negative. Many hospitals developed institutional policy of pre-procedural screening for COVID-19.⁵⁻¹¹ Objectives of these protocols were to identify asymptomatic cases which might cause viral transmission to healthcare workers and other patients. Moreover, there was a benefit on protective resources allocation such as personal protective equipment (PPE) and N95 mask during the shortage crisis of equipment in pandemic situation.

The prevalence of positive RT-PCR test for COVID-19 in patients scheduled for procedural interventions in KCMH had not been identified. The purpose of this study was to evaluate the prevalence of positive pre-procedural screening test for COVID-19 in patients undergoing procedures in KCMH. Secondary objective was the effect of screening test on preoperative waiting time in emergency situation.

Methods

This retrospective and prospective observational study was approved by expedited IRB review (IRB no. 317/63). Data were collected from 13 April 2020 to 31 May 2020. All patients scheduled for procedures including anesthetic procedures, gastrointestinal

endoscopy, bronchoscopy, labor, radiologic and interventional procedures which required anesthesia were enrolled. After informed consent, patients' information was collected from patients and charts. Every patient was screened for COVID-19 by testing the specimen from nasopharyngeal and throat swabs with RT-PCR technique. Exclusion criteria were patient refusal and patients with no result of RT-PCR test for COVID-19. Demographic data including age, sex, types of procedures, risk factors associated with COVID-19, chest radiography and CT chest (if available) were collected. Risk factors associated with COVID-19 were recent history of travelling abroad especially from COVID-19 pandemic area within 14 days pre-operatively, history of close contact with COVID-19 confirmed cases or people from outbreak areas, healthcare workers, and history of visiting risky areas according to the announcements of Thai government such as boxing stadium. We also recorded the pre-operative waiting time from scheduling operation to starting procedure in emergency situations.

According to hospital's policy, the patients who had suspected signs and symptoms such as fever, cough, rhinorrhea, sore throat, dyspnea, and desaturation would be sent to emerging infectious disease (EID) clinic for further investigation. Regarding the RT-PCR test for SARS-CoV-2 in KCMH, the N-gene, ORF-1ab gene and E-gene were detected by Cobas® SARS-CoV-2 or QIAstat-Dx® SARS-CoV-2. This screening test was performed on the day of admission for inpatient case and on the day before procedures for outpatient setting. If test was positive, the elective procedures would be postponed and the patient would be sent to EID clinic for proper management. In emergency situation which procedures could not be delayed, the screening test for COVID-19 was done and the operations would be proceeded immediately at the isolated operating room with the full PPE for all medical staffs. The test result was confirmed after the procedure for proper postoperative management (figure 1). Additionally, screening RT-PCR test for COVID-19 was performed in all parturient admitted for delivery procedures.

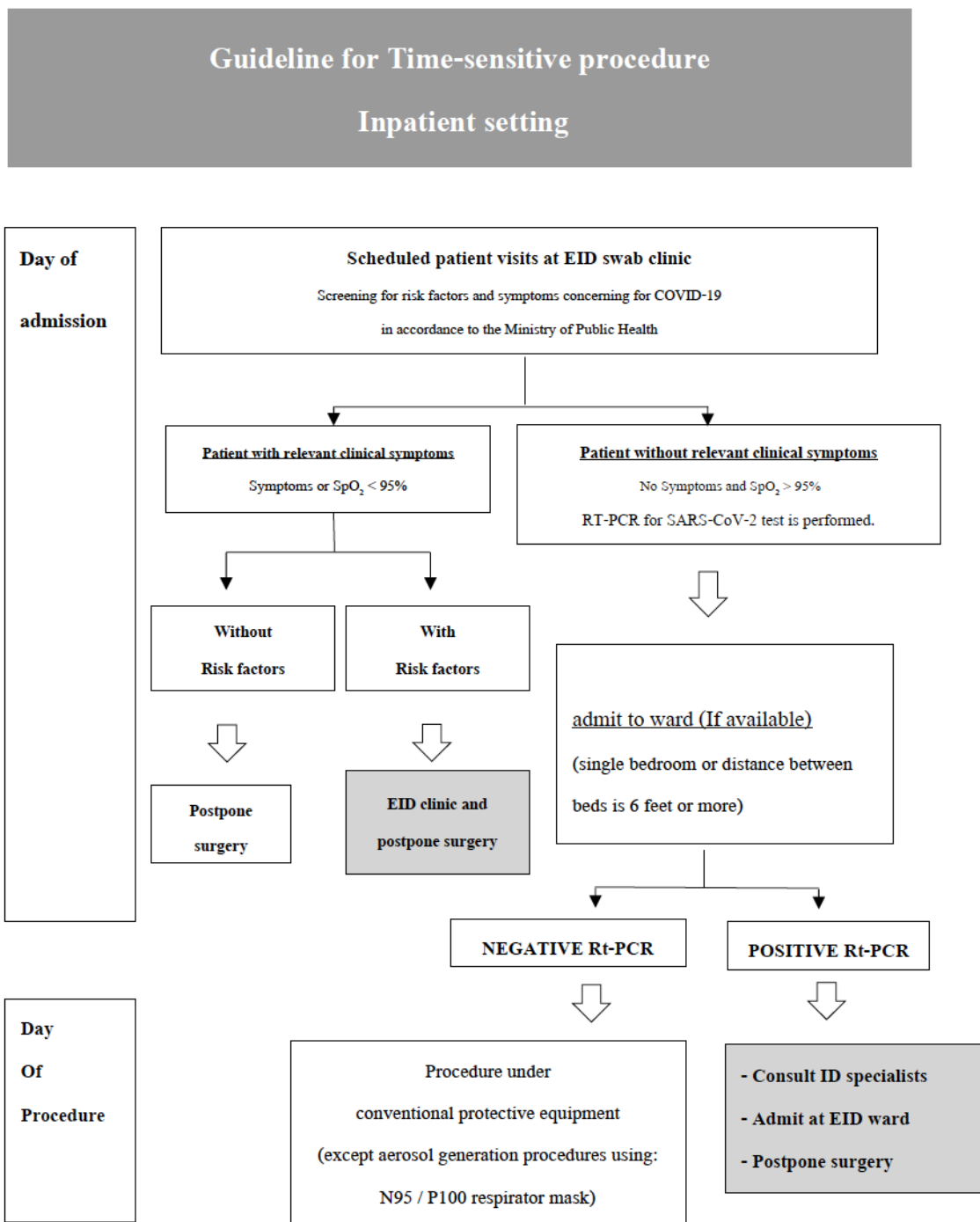


Figure 1 Pre-procedural protocol for time-sensitive procedures

Statistical analysis

The prevalence of pre-operative positive RT-PCR test for COVID-19 was presented as number and percent. Demographic variables that were continuous

and normally distributed were expressed as means with standard deviations whilst categorical variables were expressed as number and percent.

Results

A total of 1,200 patients were performed pre-procedural screening RT-PCR test for COVID-19 during the period of this study from 13 April 2020 to 31 May 2020 including all aerosol-producing procedures both inpatient and outpatient setting. None of these patients were pre-procedurally detected for SARS-CoV-2.

The operations which patients were enrolled in this study were general surgery, plastic surgery, urologic surgery, colorectal surgery, orthopedic surgery, neurologic surgery, obstetric and gynecologic procedures, otolaryngologic surgery, ophthalmic surgery, cardiovascular and thoracic surgery, pediatric surgery, radiologic interventions and procedures which patients required sedation or anesthesia, psychiatric procedures (electroconvulsive therapy), normal labor, gastrointestinal and pulmonary endoscopic procedures. Baseline characteristics of patients and the number of cases in each procedure were demonstrated in table 1 and figure 2, respectively.

Table 1 Demographic data

Demographic data (total 1,200)	N (%)
Age	
- < 1 years	17 (1.41%)
- 1- 15 years	75 (6.25%)
- 15-60 years	752 (62.67%)
- > 60 years	356 (29.67%)
Mean (Min-Max)	46.22 years (1 month-94 years)
Gender	
- Male	446 (37.17%)
- Female	754 (62.83%)
Type of care	
- IPD	1076 (89.67%)
- OPD	124 (10.33%)
Urgency of surgery	
- Elective case	1054 (87.83%)
- Emergency case	146 (12.17%)
Type of anesthesia	
- GA/RA	1070 (89.17%)
- LA	130 (10.83%)
Risk factor of COVID-19 concerning	204 (2%)
Suspected symptoms related COVID-19	72 (5.83%)
Positive RT-PCR for SARS-CoV-2	0 (0%)

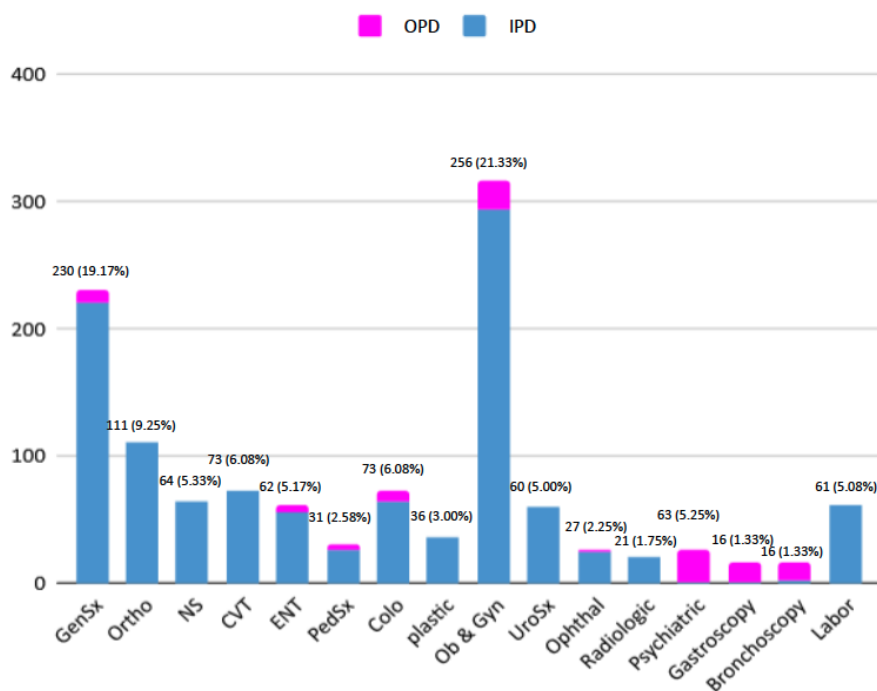


Figure 2 Types of procedures

There were 204 patients (2%) had risk factors associated

with COVID-19 while visiting crowded areas such as mall, supermarket and medical centers were the most common risk history recorded.

Although, there were 72 patients (5.83%) had mild respiratory symptoms before RT-PCR test, none of these patients were detected as positive for coronavirus. The suspected symptoms recorded were rhinorrhea, cough and dyspnea. No abnormal chest radiography related to COVID-19 was reported in this study.

Pre-operative waiting time was minimally delayed for urgency procedures with approximately 177 minutes from scheduling to starting operations compared with 144 minutes in normal situation, since these patients had to perform the pre-procedural COVID-19 screening test. However, there were no adverse events happened due to the prolonged pre-operative waiting time.

There was a pregnant woman with positive RT-PCR test for COVID-19 from the private hospital was referred to our hospital for elective cesarean section. The first test result was weakly positive. The RT-PCR test for SARS-CoV-2 was repeated 3 times consecutively in our hospital because of no suspected symptoms. All of the repeated tests were negative for SARS-CoV-2 so this patient was scheduled for elective cesarean section at the main operating theater. No any suspected respiratory signs and symptoms were observed in both patient and neonate.

Discussion

The prevalence of pre-procedural screening test for COVID-19 in this study was zero during the period of two months. Thai government had implemented the public health intervention such as declaration a state of emergency, prohibited entrance of travelers from other countries especially the pandemic areas, announcement of lockdown measures and physical distancing policy including promoting the public awareness and education on preventive strategies such as improving hands hygiene, wearing face mask, self-isolation in case of suspected symptoms. The number of new COVID-19

confirmed cases had reduced significantly in April 2020 and no new cases of COVID-19 in KCMH since 19th April 2020. Some asymptomatic cases reported in Thailand were detected by pre-procedural screening as in our study protocol.¹²

Matthew, et al⁷ described the prevalence of pre-operative screening for COVID-19 in 25 patients undergoing otolaryngologic procedures from 23th March to 17th April 2020. There were positive results in 3 patients (12%) with one of them did not have any suspected symptoms. Operations were postponed in cases with positive COVID-19 screening and patients would be isolated for 2 weeks. Two consecutive negative tests would be obtained prior to re-schedule the operations. Many studies revealed that even patients without symptoms could transmit coronavirus to others.^{11, 13} There was a report of 46.5% asymptomatic cases during the outbreak of disease in the Diamond Princess Cruise Ship.¹⁴ Moreover, the study of universal screening test for COVID-19 in 214 pregnant women admitted for delivery in New York City between 22th March and 4th April 2020⁸ revealed that 13.7% had positive tests with 87.9% of them were asymptomatic.

Universal pre-procedural screening for COVID-19 have the benefits in active finding asymptomatic COVID-19 patients in order to prevent viral transmission to other patients and health care personnel especially during high risk procedures such as tracheal intubation and gastrointestinal endoscopy. The screening test may have other advantages on isolated wards and protective resources (PPE, N95 mask) allocation.

SARS-CoV-2 virus can be transmitted by respiratory droplets, close contact, and fecal-oral transmission.¹⁵ Healthcare provider is one of the high risk groups for COVID-19 especially who perform the aerosol-generating procedures such as tracheal intubation, otolaryngologic procedures, cardiopulmonary resuscitation, gastrointestinal and respiratory endoscopy.^{11, 15, 16} Appropriate PPE is necessary for them in order to prevent viral contamination and infection. Nonetheless, the situation of PPE shortage during outbreak of the disease and lack of knowledge may increase the risk of infection in healthcare

workers.¹⁷ In March 2020, 4% of confirmed cases in China were healthcare providers. While almost 13.6% of cases reported in Spain were medical personnel.¹⁸ Thailand reported that 102 healthcare workers were detected for SAR-CoV-2 (4% from overall cases at 13th April 2020). Approximately 50% of their infections related to providing medical services for at-risk patients.¹⁹ However, none of our healthcare providers were infected by coronavirus-2 during the study period which might be the result of institutional screening protocol and well-planned PPE resources allocation.

According to risk of community transmission, Al-Muharraqi et al. suggested that patients scheduled for surgery should be screened for COVID-19 with the gold standard PCR test and antibody screening before operations.⁵ Even asymptomatic patients with COVID-19 positive can cause viral transmission to others. So all patients undergoing operations should be assumed as risk group of viral spreading and appropriate protocol should be performed. Moreover, COVID-19 patients had higher risk of perioperative morbidity and mortality.²⁰ It is important that infectious status should be verified before surgical intervention in order to increase level of vigilance in infected cases.

The recommendation of pre-procedural screening varied in literatures depended on risk of each procedure.²¹ American Society of Anesthesiologists (ASA) and Anesthesia Patient Safety Foundation (APSF) recommended the nucleic acid amplification test for all patients prior to elective operations in pandemic areas.²² Real-time RT-PCR for SARS-CoV-2 is the gold standard diagnostic test for COVID-19 with sensitivity 63-100% and specificity 93-98%¹⁵ depending on manufacturers' designs. False negative tests were reported in many studies.^{15, 22, 23} One study shown almost 33% of false negative reported in patients who had suspected symptoms of COVID-19.²³ The accuracy of test depends on sampling technique, test maneuvers and timing of the test relative to the infectious course. Negative screening test from nasopharyngeal and throat swab does not rule out COVID-19. The clinical signs and symptoms including chest radiography and

suspected risk history of patients should be considered even the RT-PCR tests for COVID-19 were negative.²⁴ False negative of screening test causes the potential of "false sense of security" among healthcare workers which may affect the clinical decision on operations as well as the use of proper PPE.⁷ Pneumonia-like pattern from chest radiography is one of diagnostic signs for COVID-19. However, its sensitivity was only 69% that was lower than the RT-PCR test.²⁵

The incidence of false positive reported from previous study was minimal.²³ In our study, there was a pregnant woman with weakly positive result of RT-PCR test from other hospital but the repeated tests in our institute were all negative.

Antibody test does not have important role in pre-procedural screening and risk stratification.²² Because antibody would be detected 2 weeks after infection and not every confirmed COVID-19 patient has the detectable antibody level. Additionally, there were false positive results from antibody screening test due to cross-reaction with other coronaviruses.²⁶

A lot of institutes announced the policy of pre-procedural screening for COVID-19 by reviewing patient's history, suspected signs and symptoms, and RT-PCR test.^{21, 27} The COVID-19 screening test was not common routine practice in most of US hospitals. Screening for COVID-19 with RT-PCR in every patient has economic and practical considerations especially in outpatient setting which patients need more hospital visits in order to perform the screening tests before procedural interventions. Moreover, all patients had to be isolated after their procedures for at least 14 days.^{10, 16} These might be infeasible in long term period.²⁸ In our hospital, the cost of pre-procedural RT-PCR test for SARS-CoV-2 was all supported with the total cost of more than 2,500 bath.

There were some limitations in this study. Firstly, our study designed aiming to investigate the prevalence of pre-procedural RT-PCR test for COVID-19. Nevertheless, not all of the patients undergoing procedural interventions in KCMH performed the screening for COVID-19 such as local anesthetic

operations and procedures which did not need any types of anesthesia. The total number of cases enrolled in this study might be underestimated. Secondly, the false negative RT-PCR test for COVID-19 could not be defined, since we did not perform the repeated tests in patients who had the negative result on the first screening. However, none of our patients reported any suspected signs and symptoms of SARS-CoV-2 infection at 14-day period after RT-PCR tests. Thirdly, according to our institutional policy on reduction of elective medical services during the outbreak period of COVID-19, the number of cases enrolled in this study might be less than general situation. So the result of study might not be represented the accurate prevalence of COVID-19 cases. If there were more subjects to be screened, the more reliable outcome of prevalence would be obtained.

In May 2020, Ministry of public Health reported that the number of confirmed COVID-19 cases constantly decreased. Thai government planned to relax lockdown policy and re-open the city. The situation of viral transmission and number of new cases might be increased. Regarding the government policy, many hospitals began to provide full medical services again including our institute. It is important to re-evaluate the necessary of pre-procedural screening for COVID-19 and the cost-effectiveness of this test. The further study may be needed for development of novel pre-procedural screening protocol. However, the 'new normal practice' of healthcare providers in order to prevent viral transmission and contamination should be continued. And institutional protocol should be up-to-date upon new evidences of the COVID-19 pandemic.

Conclusions

The COVID-19 pandemic caused a major challenge to national health systems around the world. Healthcare workers should be aware of the safety patients, safety procedures and safety personnel. Nonetheless, result of this study revealed that the prevalence of positive pre-procedural screening test was zero during 2-month

period. Every effort should be made in order to control the disease transmission especially during providing medical services and interventions.

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