

Impact of Movement Control Order (MCO) on Primary Percutaneous Coronary Intervention (PCI) at a Tertiary Centre in Malaysia.

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Abstract

Introduction: The pandemic of Covid-19 infection has affected all primary health services including subspecialty services in healthcare facilities across Malaysia. The cardiology service worldwide especially the primary percutaneous coronary angioplasty for ST- elevation myocardial infarction (STEMI) was also affected due to the current pandemic. In this study, we would like to examine the effect of the covid-19 pandemic to a leading cardiology service of a tertiary centre in Malaysia.

Methods: The study evaluated retrospective data from the Invasive Cardiovascular Laboratory (ICL), National Cardiovascular Database (NCVD) Registry, and medical records of University Malaya Medical Centre (UMMC). We used quantitative methods to gather and compare data on the total catheterisation procedures performed in UMMC, total patients whom presented with acute coronary syndrome (ACS) and patients whom underwent Primary Percutaneous Coronary Intervention (PCI) prior to the covid-19 movement control order (MCO), during the MCO and post MCO during the Recovery Movement Control Oder (RMCO). Data was analysed using thematic analysis obtained from seven cardiology consultants of UMMC on factors affecting the cardiology services during the pandemic and alternative measures in the event of another healthcare system crisis.

Results: The total number of angiograms and angioplasty performed in UMMC reduced by 50% during the MCO period and incidence of cases of ACS also reduced by 45.4% during the MCO period. Reduction of 68% for number of primary PCIs were reported during the MCO period. However, we found that the average door-to-balloon time for primary PCIs during period of MCO and prior to MCO were similar. Thematic analysis suggested a comprehensive protocol or "pandemic play book" and crisis training should be available to government-based healthcare services.

Conclusion: This unprecedented global crisis has undoubtedly impacted on all walks of life. We hope that this study has shed light on the challenges and effects of the covid-19 pandemic on a cardiology service in a tertiary centre in Malaysia and what preventive steps can be put in place to be prepared for such healthcare crisis.

Key Word: Cardiology services, Primary PCI; Covid-19; Movement Control Order;

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I. Introduction

The pandemic of Covid-19 infection that has hit the world since 2019 is affecting the way we practice medicine. All medical services from primary health care services up to subspecialty services in tertiary centres were affected. In order to contain the rate of infection of Covid-19, many countries including Malaysia imposed a Movement Control Order (MCO). Malaysia was among the first country to implement a Movement Control or Restriction Order in the South East Asian Region. The cardiology service especially the primary PCI for STEMI was also affected worldwide due to the pandemic, movement control order and multiple other logistic reasons. In Wuhan, their cardiologist opted for thrombolysis as the upfront strategy in managing patients who presented with STEMI unless contraindicated.(1) In Malaysia, a strict MCO was enforced from 18th March 2020 until 9th June 2020, where only essential services like health service, transportation, grocery store were allowed to operate.(2) Nonetheless, the MCO in Malaysia posed a serious impact in the health service in Malaysia.(3)

Thus, we aimed to identify the effect of the MCO to the cardiology service in the Cardiology Unit of University Malaya Medical Centre (UMMC).

II. Objectives

This study aims to review and provide contemporary data on the Cardiology Unit service provided prior and during the MCO and RMCO. Secondly, this study helps to evaluate the difference on the delay in door-to-needle-time and door-to-balloon-time for Primary Percutaneous Coronary Intervention (PCI) prior and during the MCO and RMCO and its outcome on patients' survival rate. Furthermore, this study will also identify and provide prospective recommendations of acceptable alternatives based on expert opinion on how to overcome the limitations and restrictions in the similar event of a movement control order in the future.

III. Methodology

Study design: This is a retrospective study

Study Location: This is a tertiary care teaching hospital-based study conducted in the Cardiology Unit of University Malaya Medical Centre (UMMC), Kuala Lumpur, Malaysia.

Study Duration and sample:

The study population was drawn from patients who presented to UMMC emergency department and was subsequently referred to the cardiology unit and diagnosed with ST- elevation myocardial infarction. Total study duration was 9 months, consisting of 3 samples groups:

Group A: Prior to *MCO period (18th December 2019 – 08th March 2020)

Group B: During *MCO period (18th March 2020 – 08th June 2020)

Group C: During **RMCO period (18th June 2020 – 08th September 2020)

*MCO stands for Movement Control Order 2020

**RMCO stands for Recovery Movement Control Order 2020

IV. Method Of Analysis:

For data that was obtained quantitatively, data was initially tabulated systematically in an Excel sheet, and subsequently analysed using Statistical Package for the Social Sciences (SPSS) Version 3.0 software for analysis. Before analysis, the dataset was checked for missing data and outliers. All values outside the calculated range were considered outliers (Hoaglin & Iglewicz, 1987). The data was then analysed using statistical software SPSS.

Data that was obtained qualitatively is studied using thematic analysis. This involves coding of all the data before identifying and reviewing the key themes. Each theme was examined to gain an understanding of experts' perceptions and motivations.

Procedure methodology

This study involves quantitative data collection of total procedures performed in University Malaya Medical Centre (UMMC), patients presented with acute coronary syndrome and patients whom underwent Primary Percutaneous Coronary Intervention (PCI). Data was obtained from Invasive Cardiovascular Laboratory (ICL), National Cardiovascular Disease Database Registry and medical records of UMMC.

We also used an online survey form utilising "Google Forms" to obtain opinions from experts. This survey form was given to all Cardiologists in UMMC by a secure independent link. The survey form consists of two questions with three sub-questions for each of the questions based on three different categories. The first question on the form was in the format of selection of checkboxes, which allows experts to point out the possible causes that may be the key components that correlate to the findings of the study. The second question is to collect data from the experts using a qualitative method, to gain a better insight into the possibilities for improvement in an event of a pandemic. Examples of questions asked were;

"Based on the possible causes above, what are the alternatives proposed to improve the performance and overcome the limitations in our Cardiology Unit in the similar event of a pandemic and Movement Control Order in the future?"

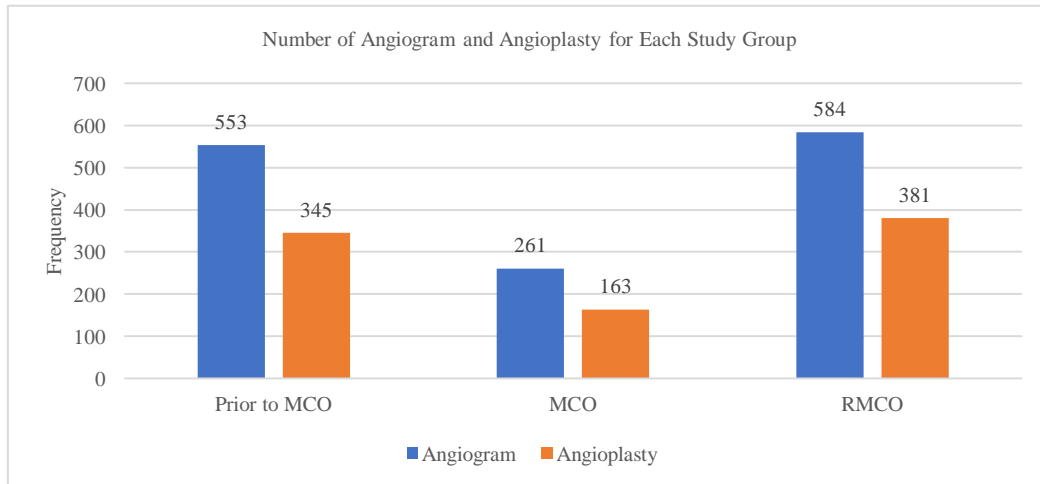
Data were collected in terms of three categorical issues, which are health care providers, patient factors and issues regarding higher management of the hospital.

V. Results

Cardiology Unit Service in PPUM and the total number of procedures performed.

The total number of angiograms and angioplasty performed in UMMC reduced by 50% during the MCO period (n=424) in comparison to the period prior to MCO (n=898). However, the number of angiograms and angioplasty performed managed to increase during the RMCO period as illustrated in Figure 1, surpassing the period prior to MCO (n=965).

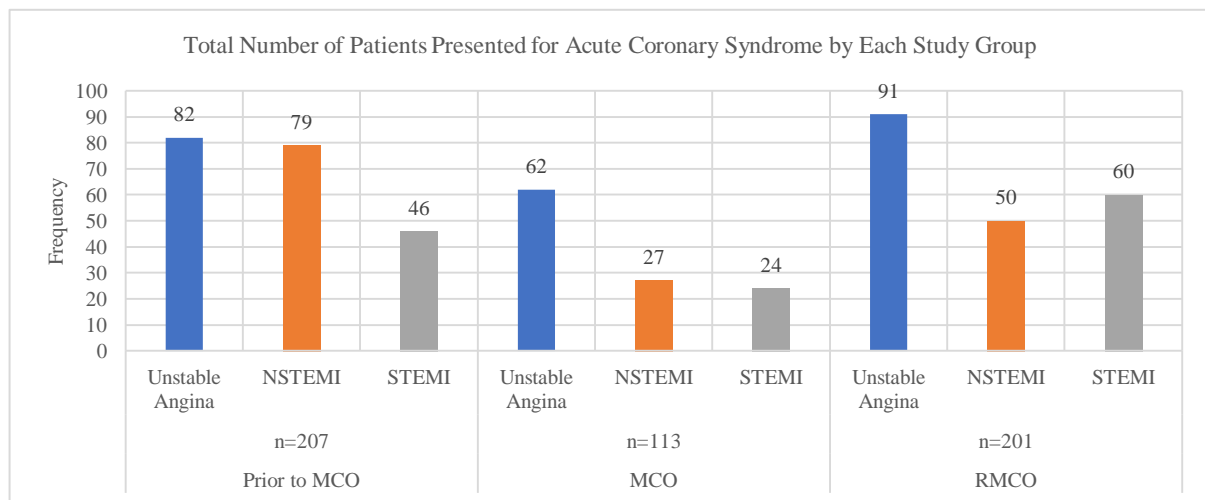
Figure 1: showing the number of angiogram and angioplasty performed during each of the study group.



Incidences of Cases of Acute Coronary Syndrome in PPUM

Over the 9 months period, a total of (N=521) cases of ACS presented to the Cardiology Unit of UMMC, predominantly with cases of unstable angina (n=235), followed by NSTEMI (n=156), and STEMI (n=130). Comparing incidence of cases during the time periods of the three study groups, the total number of cases of ACS presenting to UMMC is the highest in Group A (n=207) but the number of cases reduced by 45.4% in the subsequent three months during the MCO period (n=113). Again, as illustrated in Figure 2, during the RMCO period, the number of cases rebounded to the initial pre-MCO rates (n=201).

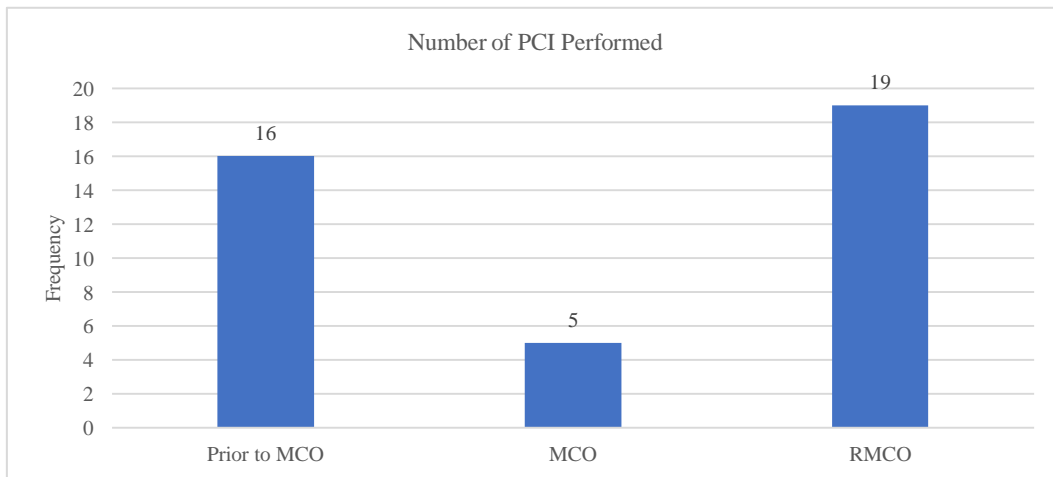
Figure 2: Distribution of Acute Coronary Syndrome cases in each study group.



Primary Percutaneous Coronary Intervention (PCI) in PPUM

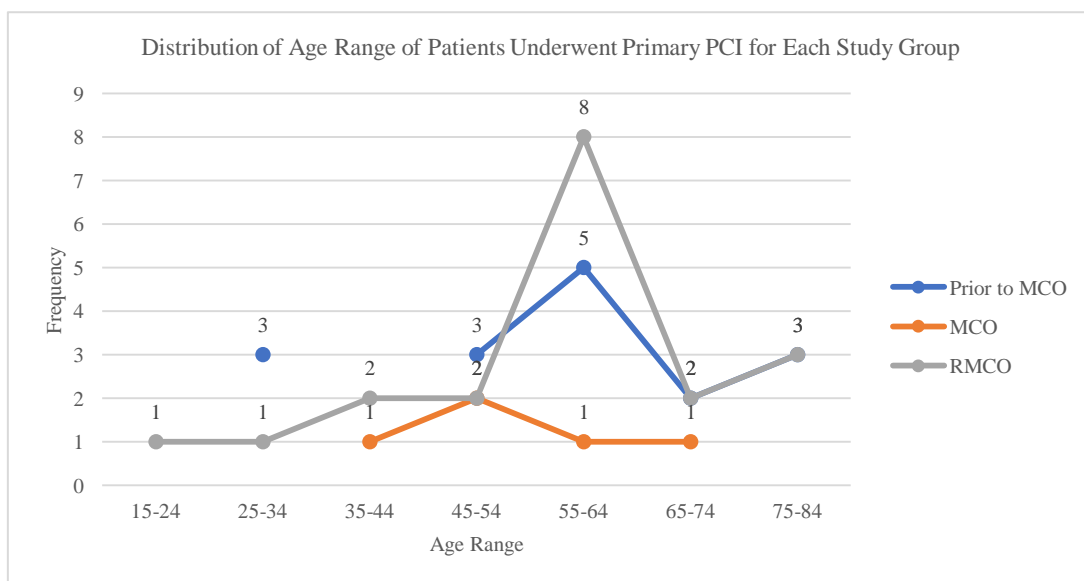
There was a total of 40 patients who underwent PCI during the period of 9 months of pre-MCO to RMCO. There is a significant decrease in the number of primary PCIs performed during the MCO period, as the number has reduced from 16 cases prior to the MCO period to only 5 cases during the MCO period. As illustrated in figure 3, again there was a rebound in number of primary PCIs performed (n=19) during the RMCO period, that surpasses the initial pre-MCO cases performed.

Figure 3: Number of Primary Percutaneous Coronary Intervention for each study group.



The age range of patients who underwent primary PCI throughout the whole study period were from the age of 15 to 81, with a mean age of 56.20. Breaking down to each study group, the period of pre-MCO showing that the patients who underwent Primary PCI were from the age range of 28 to 81, with a mean age of 55.63. During the MCO period, a younger age group of patients underwent Primary PCI among the three study groups with a mean age of 53.20; age range of 40 to 72. Lastly, during RMCO, the age of patients who underwent primary PCI was in the range of 15 to 80 and with a mean age of 57.47.

Figure 5: Age distribution of patients underwent Primary Percutaneous Coronary Intervention (PCI) for each study group.



The average duration of time between the onset of the symptoms of ACS to the presentation to A&E was 2 hours 52 minutes 00 seconds. Patients in Group B presented to the A&E within the shortest time; a mean time of 2 hour 21 minutes 00 seconds.

The mean duration from a patient presenting in A&E department to ICL door / ICL door to the needle time / needle time to balloon time showed no significant difference between the three study groups. The door to balloon time for Primary PCI in the 3 groups were more than 90 minutes which was longer than what is recommended by the Malaysian guideline for STEMI⁵.

Figure 6: The mean duration from the onset of ACS symptoms till time to balloon.

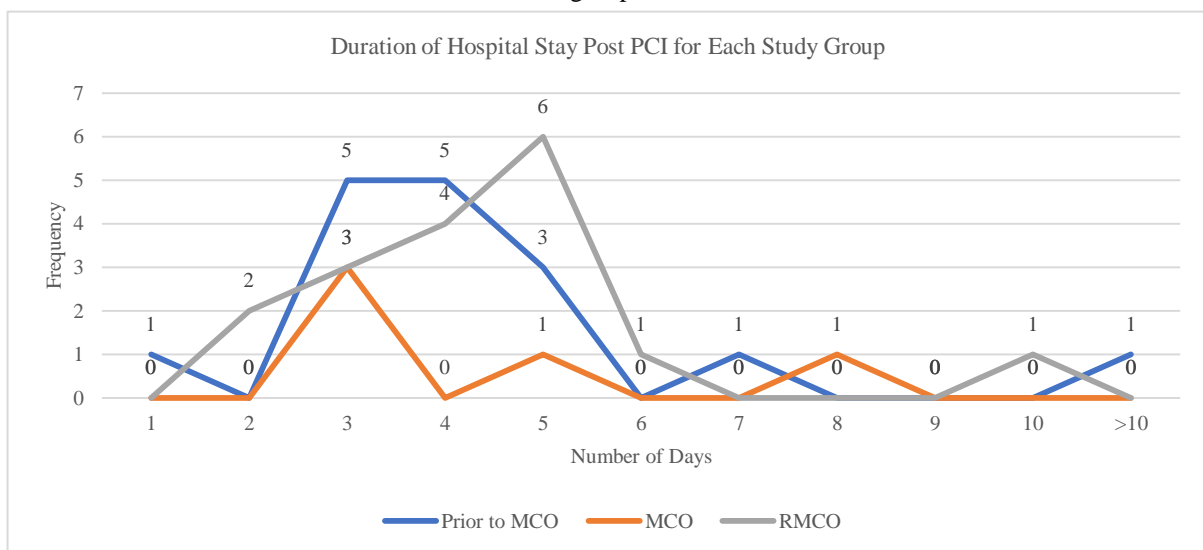
Period	The Mean of Duration			
	Onset of symptoms to A&E	A&E door to ICL Door	ICL door to needle time	Needle to Balloon time
Prior to MCO	02:23:50	01:41:37	00:02:06	00:19:28
MCO	02:21:00	01:40:06	00:01:17	00:20:22
RMCO	03:51:11	01:24:28	00:02:22	00:16:34

*** HH: MM: SS stands for Hours: Minute: Seconds

Post Primary Percutaneous Coronary Intervention (PCI) Recovery Period in PPUM

The average number of days for a patient’s stay in hospital post PCI is 4.46 days. The duration of stay was shortest in group B which was 3 days, in comparison to Group A (3 and 4 days) and Group C (5 days) as illustrated in Figure 7.

Figure 7: The duration of patient stays post Primary Percutaneous Coronary Intervention (PCI) for each study groups.



Mortality and Recurrence of Symptoms Post Primary PCI

The 3 months mortality rate of the patients who undergone primary PCI is noted to be 5% (n=2) during the whole study period, in which 1 patient died within 1 day post primary PCI and another patient died within 1 month post Primary PCI.

The recurrence of ACS symptoms within 3 months post Primary PCI was also examined. A total of 11.11% (n=5) of the total patients, developed symptoms of ACS within 3 months post Primary PCI. During the period prior to MCO, 2 patients developed ACS within 1 month and 2 months post PCI, respectively, while during MCO, 1 patient developed ACS 1 week post PCI and no patient developed ACS during the RMCO period.

VI. Discussion

This study examines the impact of the Covid-19 pandemic during MCO on the cardiology service provided at the University Malaya Medical Centre, Malaysia. Only two other studies have been conducted in Malaysia exploring the limitations and challenges faced in tertiary hospitals during the pandemic and are limited to the impact of surgical procedures in Malaysia^{3,4}. However, globally, there are a few studies that have similarly examine how the Covid-19 pandemic has affected the diagnosis and treatment of acute coronary syndromes⁸⁻¹⁴. Additionally, we have also examined qualitatively expert opinions on the issues faced by the Cardiology Unit during the pandemic period and the alternatives steps or way forward, in the event of a similar pandemic in the future.

Before the discussion on the key findings, some limitations, and strengths need to be mentioned. The sample size of patients who underwent primary percutaneous coronary intervention during the study was relatively small (n=40). Examined separately during three different periods - Group A-prior to MCO period (n=16), Group B-MCO period (n=5), and Group C -RMCO period (n=19), the sample size limited the use of any significance statistical analysis to be performed. Nonetheless, key incidences were recorded across the three

study groups and expert opinions on alternatives steps during the pandemic was examined using thematic analysis.

Firstly, this study illustrates the significant impact of the Covid-19 pandemic on total number of angioplasties and angiograms performed during the MCO period in UMMC (n=424). As a leading cardiology unit that serves a population of approximately 7 million in Klang Valley, the total catheterisation services provided has reduced by 50% during the MCO period. Even though procedures continued with standard COVID precautions and personal protective equipment (PPE), the services were directly impacted by factors such as reduction in number of catheterisation suites available, cardiologist working per shift and also allied health staff working during the MCO period. Only a minimum number of essential personnel was involved in the daily execution catheterisation services. This is a similar finding across studies conducted in Malaysia^{3,4} where all elective cases were cancelled due to the limited resources of PPE, anaesthetists available to be on call and ICU beds, these efforts were made across all departments and disciplines to conserve the limited resources.

Secondly, we also found that the total number of patients who presented to the emergency department for ACS has also reduced during the MCO period by 45 percent. Possible explanations for this decrease in ACS were numerous and remain conjectural. Similar studies globally have similar findings but the underlying reasons are unclear and postulated⁸⁻¹⁴. In Malaysia, we have postulated that the possible fear of contracting the virus during a visit to the hospital and limited access to public transportation services may have implicated in the reduction of the patients seeking medical assistance during the MCO period. However, we believe that by examining gender-based, geographic, and socioeconomic disparities in access to healthcare during this covid-19 pandemic, we might learn some valuable insights into the effects of such factors on access to health systems. A simple demographic analysis was performed on patients who had primary PCI during the MCO period. We found that during the MCO predominantly males and younger adults with a mean age of 53 years old underwent PCI as oppose to the national mean age of patients who underwent PCI in Malaysia.

In terms of the quality and efficiency of the Cardiology Unit in providing emergency catheterisation services, we found that the average door-to-balloon time for primary PCIs during period of MCO and prior to MCO were similar. Although studies globally have reported the effects of physical and mental exhaustion on the healthcare workforce, this did not reduce the goal standard door-to-balloon time for primary PCIs⁵⁻⁷. The similar quality of emergency cardiology services is also further illustrated by similar duration of patients' stay post primary PCI between the period of MCO and before MCO with an average stay of 3 days across both periods. No mortality was also recorded during both periods. Interestingly, we found that during the RMCO period, shorter door-to-balloon times were recorded in comparison to both periods of MCO and before MCO, signifying the adaptation of the cardiology unit in managing patients during the pandemic.

Questionnaire exploring experts' opinion on factors affecting the cardiology services provided during the pandemic and alternative steps in the event of another healthcare system crisis.

We obtained data from seven cardiology consultants of University Malaya Medical Centre UMMC. Intriguingly, in terms of health care provider related issues faced by the cardiology unit, we have found that the majority believe that the fear of healthcare workers to handle Covid-19 patients was a major contributing factor in affecting services during the pandemic. Similarly, another study conducted in Malaysia attributed to the challenge faced during the initial stage where patients lied about their COVID risks⁴. Some hospitals were closed for disinfection and doctors were quarantined as patients intentionally hid their travel and exposure history. Hence, it was mandatory that all patients had to sign the "COVID-19 Risks Declaration Form" at every level of encounter in all hospitals. Patients were reminded that legal actions will be taken against them if they intentionally lied about their exposure risks and travel history. As a consequential effect of fear, the lack of manpower available during the pandemic and inadequate beds available to accommodate necessary isolation of COVID-19 patients, these were the strong factors in affecting the services provided by the cardiology unit. However, 100% of experts agreed that the hospital has adequately provided Personal Protective Equipment (PPE) to all the health care workers during the pandemic.

In terms of patient related issues, all experts agreed that the fear of patients to seek medical attention during the rising cases of COVID-19 infection was a major contributing factor that result in less patient seeking medical attention during this period. For elective procedures, patients have to undergo COVID-19 diagnostic tests via RT-PCR nasopharyngeal or throat swabs prior to any admission, however in dire emergent situations where COVID-19 status of a patient cannot be ascertained, the catheterisation will proceed with enhanced precautions as per COVID-positive cases. During this emergency situations, to minimize exposure of personnel and to conserve resources like PPE, only minimally essential staff will be present during the procedure.

Finally, in terms of issues or restrictions imposed by higher management in hospital during the pandemic period, the limit to number of procedures was a major cause in the significant reduction of catheterisation services provided during the MCO period. Patients who really require intervention were admitted and posted as semi-emergency cases. Most elective cases were postponed and the cancelled elective cases were screened and triaged by the consultants. These concerns were similarly echoed in other studies that the catching

up and clearing these backlogs of cases will be a challenging task not only to the cardiology unit but all affected public hospitals in Malaysia^{3,4}. With 3 months of MCO, we have lost approximately 240 hours of daycare procedure.

Figure 10: The expert opinion on different prospects that has affect the service of Cardiology Unit.



The way forward – alternatives proposed in the event of another pandemic.

Based on key themes identified during our examination of the questionnaire provided to our cardiology consultants, we have identified common themes that have been proposed to improve the performance and overcome the limitations in our Cardiology Unit in the event of a similar pandemic or MCO. For health care workers, the major theme suggested was for a comprehensive protocol and adequate training given in terms of crisis preparedness to allow maintenance of the elective list. With a comprehensive protocol or “pandemic play book”, government-based healthcare services will be able to be maintained despite the challenges imposed during a crisis. Certified training for all healthcare workers will alleviate the fear from managing patients during a pandemic period.

For patients’ factors, all seven cardiologists believe that advice and education to patients to obtain needed medical attention as soon as possible in the event of any cardiac symptoms despite a pandemic period should be given. Patients on follow up should be called and given specific instructions on where and how they should access the cardiology services if needed. In an emergent situation, public awareness is very important especially in terms of compliance to their medications, monitoring symptoms and access to counsellors. Connor et al proposed using tele medicine as a medium, using a targeted virtual clinic approach for high-risks patients in UK during the COVID-19 outbreak^{3,4}.

VII. Conclusion

In conclusion, the general consensus from the thematic analysis done suggests that a holistic approach is needed for the Covid-19 pandemic, catering for comprehensive training for crisis preparedness for healthcare workers and the possible use of telemedicine in providing access to patients. This unprecedented global crisis has undoubtedly impacted on all walks of life. We hope that this study has shed a light on the challenges and effects of the covid-19 pandemic on a cardiology service in a tertiary centre in Malaysia and what preventive steps can be put in place to be prepared for such healthcare crisis.

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