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ORIGINAL ARTICLE

Varied impacts on outpatient services among departments and divisions in the early phase of the COVID-19 pandemic: Implications for personnel mobilization and preparatory training

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Abstract

Background: Coronavirus disease 2019 (COVID-19) spread all over the world in 2020. In the face of the sudden pandemic, workforce mobilization has been of critical concern to medical institutions. During the pandemic, the public's behaviors of seeking medical assistance have also changed. Using the real-world data of a large medical center in Taiwan, this study aimed to analyze the fluctuations of outpatient visits among various departments and divisions in the early phase of the COVID-19 pandemic and to provide suggestions for staff allocation in similar future events.

Methods: Data of outpatient visits at Taipei Veterans General Hospital were obtained for analysis. The weekly fluctuations of outpatient visits among 36 departments or divisions were computed for 8 weeks from February 3 to March 29, 2020, the early phase of the pandemic. The monthly data of outpatient visits by department and division in March 2020 were also extracted for comparison with those in March 2019. A simple regression equation was used to calculate the weekly trends.

Results: Average outpatient visits decreased by 26% in 2 months following the outbreak. Among the 36 departments or divisions, ophthalmology, orthopedics, and cardiology underwent marked declines after the outbreak; the slopes of the simple regression equation were –110.8, –100.7, and –99.2, respectively. By contrast, transfusion medicine, toxicology, transplantation surgery, pediatric surgery, chest surgery, technical aid, and oncology were divisions less influenced. In the year-over-year comparison, infection was the only department or division with positive growth (20.5%), whereas all others exhibited negative growth.

Conclusion: In the future, we can fulfil the additional personnel needs during a pandemic by redeploying physicians from departments experiencing a reduced workload. Hospitals should also establish preparatory employee training programs to ensure that the reassigned personnel are adequately equipped to serve in their new positions.

Keywords: Ambulatory care; Coronavirus disease 2019; Personnel staffing and scheduling; Taiwan

1. INTRODUCTION

As of the end of April 2021, the coronavirus disease 2019 (COVID-19) pandemic has caused 149.8 million infections and 3.16 million deaths worldwide.[1] To prevent the spread of the disease, governments have closed borders, strengthened management of medical supplies, and promoted hygienic practices. Medical institutions have correspondingly established screening stations, limited visitor numbers, planned patient transport routes, and organized specialized care teams.[2–5] Moreover, panic over the pandemic has altered the public's behavior of seeking medical advice. Not only have visits to hospital outpatient departments notably decreased but the reasons for those visits have also changed.[6–8]

In the early stages of a pandemic, medical institutions urgently require additional personnel for infection control. The staffing burden can be lessened by recruiting new employees, rehiring previous retirees, redeploying medical staff from other hospitals, or even granting medical students work permits in advance.[9–11] Another more common and immediate approach is to reassign current employees. However, the lack of robust, institution-wide data on health personnel provision and reassignment during the pandemic renders effective decision-making difficult. One study proposed that the priority of specialties to fill staffing gaps be based on the levels of willingness of employees within those specialties.[12] Most of the available literature has focused on staff reallocation experiences within a single department during the

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COVID-19 era.[13–19] Hospital-wide studies on the availability and reallocation of personnel across departments have been scarce.

In our study, the impacts of COVID-19 on distinct medical departments and divisions during the early phase of the outbreak were estimated by analyzing the variations in outpatient visit numbers. Such data could highlight the prospects for immediate personnel mobilization and future preparatory training. Findings drawn from the largest public medical center in Taiwan might provide practical information for hospitals that encounter similar situations.

2. METHODS

Taipei Veterans General Hospital (TVGH) is a medical center in Taiwan with a total of 2808 beds and approximately 8000 outpatient visits per day. In 2019 and 2020, the numbers of outpatient visits were 2 533 249 and 2 170 201, respectively.[20]

By the end of 2020, 799 COVID-19 cases had been detected in Taiwan. Of the confirmed cases, 671 patients had been released from isolation and seven patients had died.[21] The peak of the COVID-19 outbreak in Taiwan occurred in March 2020, with 283 cases diagnosed. The most newly confirmed cases in a single day was 27, which was reported on March 20, 2020.[22]

This study was performed retrospectively by analyzing the number of outpatient visits among 36 departments or divisions at TVGH. Departments or divisions with no or low outpatient volume, including anesthesiology, radiology, critical care medicine, and nuclear medicine, were excluded from this study. We classified the 36 units into the categories of medical section, surgical section, obstetrics and gynecology, pediatrics, and others. Cardiology, gastroenterology, endocrinology, pulmonology, oncology, rheumatology, nephrology, infection, hematology, general medicine, toxicology, transfusion medicine, neurology, geriatrics, and family medicine were included in the medical section. Orthopedics, urology, neurosurgery, breast surgery, general surgery, colorectal surgery, cardiovascular surgery, plastic surgery, chest surgery, transplantation surgery, and pediatric surgery were included in the surgical section. Other categories included ophthalmology, otorhinolaryngology, dermatology, rehabilitation, technical aid, psychiatry, dentistry, and Chinese medicine.

After the confirmation of the 10th case of COVID-19 in Taiwan, we recorded the change in outpatient volume by department or division on a weekly basis for 8 weeks from February 3 to March 29, 2020. Outpatient visit figures for March 2019 and March 2020 were also obtained to perform month-over-month comparison.

These administrative data are routinely computed by the Department of Medical Affairs & Planning. No personal patient data were collected.

Trends in the number of outpatient visits over the 8-week period were determined using a simple linear regression model. Year-over-year growth in outpatient visits between March 2020 and March 2019 was calculated. Descriptive statistics were calculated using Microsoft Excel 2016 and R version 4.0.3.

3. RESULTS

Trends in weekly outpatient visits from February 3, 2020 to March 29, 2020 are presented by department and division in Fig. 1. For each department, a downward trend in the number of outpatient visits was observed over 8 weeks. The slopes in the simple linear regression model were negative for all departments. Among the 36 departments or divisions, ophthalmology (–110.8), orthopedics (–100.7), cardiology (–99.2), dentistry (–97.4), otorhinolaryngology (–87.4), gastroenterology (–87.3), family medicine (–85.2), and neurology (–80.6) demonstrated the steepest negative slopes. Divisions such as transfusion, toxicology, transplant surgery, pediatric surgery, thoracic surgery, technical aid, and oncology were less affected, with slopes ranging from –0.2 to –10.7.

Fig. 2 compares the numbers of outpatient visits of the 36 departments or divisions in March 2019 and March 2020. We sorted those departments or divisions into the medical section, surgical section, obstetrics and gynecology, pediatrics, and others as mentioned in the methods section. The medical section is displayed in orange and the surgical section in green. The number of outpatient visits decreased in all departments or divisions except for that of infection, which had a 20.5% increase in March 2020 compared with March 2019. The departments or divisions with the highest negative growth rates

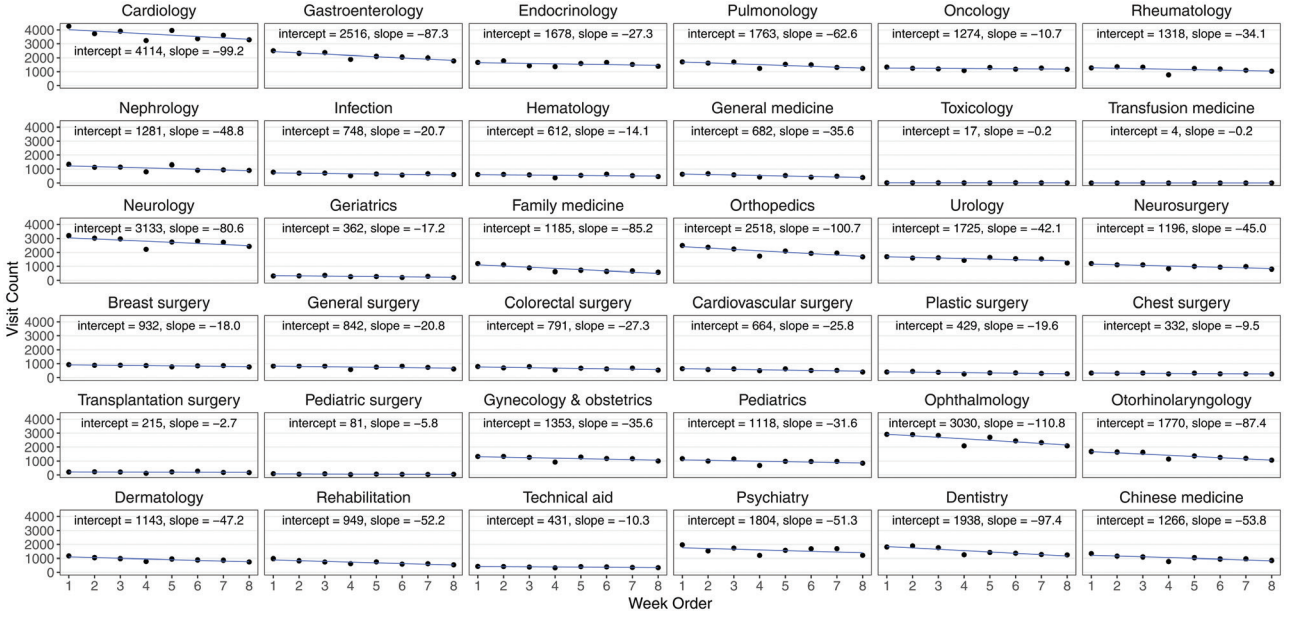

Fig. 1 Trends of weekly outpatient visits by department from February to March 2020.

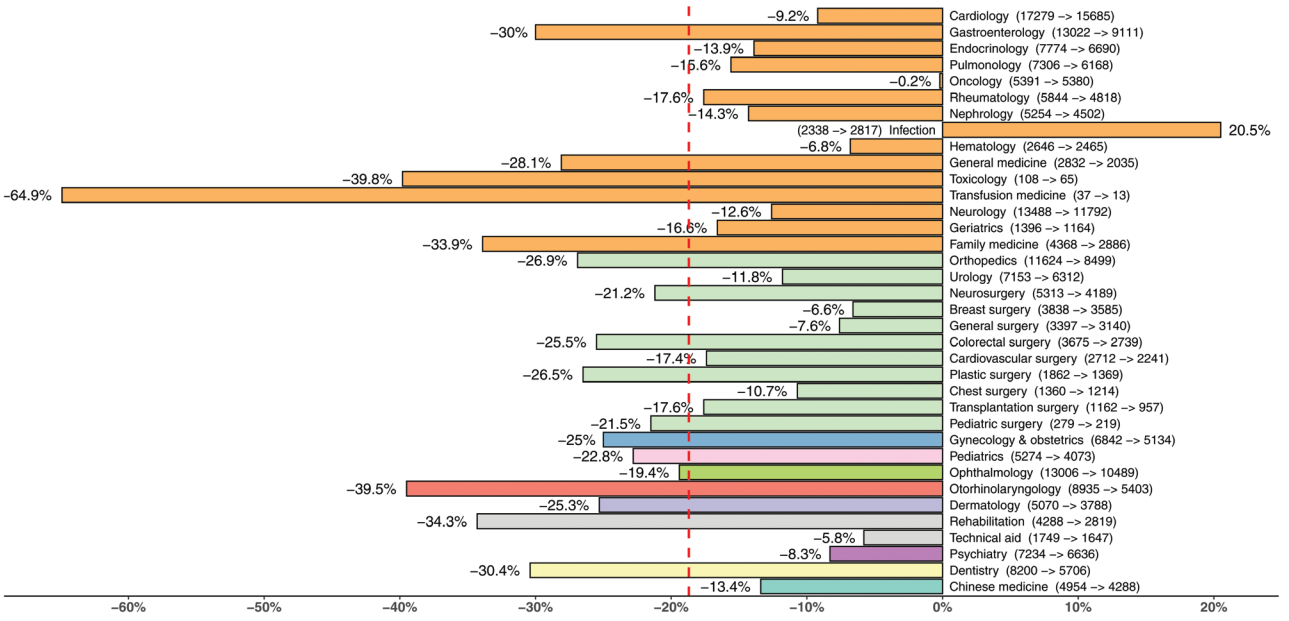

Fig. 2 Year-over-year comparison of outpatient visits by department (March 2019 vs March 2020). The order of the bars is based on medical section, surgical section, obstetrics and gynecology, pediatrics, and others. Medical section is shown in orange and surgical section is shown in green.

were transfusion (–64.9%), toxicology (–39.8%), otorhinolaryngology (–39.5%), rehabilitation (–34.3%), family medicine (–33.9%), dentistry (–30.4%), and gastroenterology (–30.0%). By contrast, oncology, technical aid, breast surgery, and hematology were less affected, with growth rates of –0.2%, –5.8%, –6.6%, and –6.8% respectively. Among the 36 departments or divisions, the average annual growth rate of outpatient visits in March 2020 was –18.8%.

4. DISCUSSION

The purpose of this study is to provide suggestions for personnel allocation during future pandemic scenarios by analyzing the fluctuation of outpatient visits among distinct medical units during the initial phases of the COVID-19 outbreak. The results demonstrate that all departments and divisions experienced negative growth in outpatient visits in 2 months after the outbreak of COVID-19. At the beginning of the pandemic, departments or divisions with close contact with patients or with more elective surgeries, such as ophthalmology, otorhinolaryngology, orthopedics, and cardiology, faced a larger decrease in outpatient visits. Departments or divisions that serve patients with chronic and noncritical conditions, such as family medicine and rehabilitation, had higher negative growth rate. By contrast, divisions with more major surgeries, including transplant surgery, pediatric surgery, and thoracic surgery, or cancer-related divisions, such as oncology, hematology, and breast surgery, were less affected by the outbreak.

Unlike all other departments, the infection division experienced a 20.5% increase in outpatient visits from March 2019 to March 2020. Two reasons may explain this phenomenon. First is the establishment of fever clinics. On January 6, 2020, TVGH established fever clinics to screen at-risk patients for COVID-19 infection. Patients who visited the fever clinics were included in the outpatient visit figures for the infection division. Second, we assumed that patients were more likely to consult with infection specialists if they experienced COVID-like symptoms during the pandemic. Unlike the infection division, the otorhinolaryngology had particularly negative growth in the year-over-year comparison. This phenomenon is mainly related to the transmission of COVID-19 and the use of personal protective equipment (PPE). Current evidence suggests that the SARS-CoV-2 virus mainly spreads through respiratory droplets.[23] Otolaryngologists and paramedical staff in the otorhinolaryngology department are at high risk for exposure to respiratory pathogens.[24] Patients are presumably subject to the same risk, and, consequently, avoiding face-to-face visits is a reasonable reaction on their part. In addition, due to the widespread use of PPE and social distancing measures, the number of patients with upper respiratory tract infections decreased.[25]

The other two departments with high negative year-over-year growth rates were rehabilitation and family medicine, which both primarily serve patients with chronic, noncritical diseases. During the pandemic, a decrease in visits was to be expected among this group of patients. For the rehabilitation department, physical clustering during rehabilitation programs may be a reason why patients avoided visiting that department. Regarding family medicine, the decrease in demand for preventive medicine may partly explain the substantial decline in outpatient visits there.

Ophthalmology, orthopedics, and cardiology had the steepest negative slopes for outpatient visits during the 2-month period. Similar to otorhinolaryngologists, ophthalmologists have close contact with patients during examinations. An outbreak in the ophthalmology department was reported in a Norwegian hospital at the time of our study.[26] To reduce viral transmission, ophthalmology authorities recommended deferring elective surgeries and providing treatment for only acute and chronic sight problems or life-threatening conditions.[27] In the case of orthopedics, a study showed that both elective surgeries and emergency trauma surgeries have decreased during the pandemic.[28] Social distancing policies may be a factor contributing to the decrease in emergency trauma surgeries. Although statistics for orthopedic surgeries and hospitalizations were not collected in our study, both values are expected to have declined considerably. An epidemiological study in Hong Kong revealed a 29% decrease in orthopedic outpatient visits compared with previous years, which was similar to our finding.[28] The decrease in

outpatient visits can be attributed to patients delaying postoperative follow-up and preoperative evaluation. In our study, cardiology had the third largest departmental decline—a 22.9% drop in outpatient visits over the 2 months. We believe that this reduction can be attributed to the decrease in cardiac catheterization and the avoidance of hospital visits by patients with chronic cardiovascular diseases. A single-center study in the United Kingdom reported that in 3 months following the outbreak, cardiology outpatient visits decreased by nearly 90%.[29] That hospital's high decline rate was associated with telemedicine services, which were provided at the beginning of the outbreak.

In this study, we collected outpatient visit figures from various departments and analyzed their changes before and after the outbreak. Compared with other studies, which have been mostly single-department studies, our findings are more applicable to managing hospital-wide staff deployment.

Emergency department (ED) plays a key role in times of epidemics. Although ED was not included in our analysis, we can get a picture of the changes of emergency services during epidemics from past data. In 2002–2003, the SARS-Co Virus spread from Guangdong, China to the other countries. This resulted in a total of 8098 SARS cases and 774 deaths worldwide.[30] Taiwan had the third highest number of infections after China and Hong Kong, with a total of 346 infections.[31] At the peak of the SARS epidemic, the reduction in daily ED visits in TVGH reached 51.6% of pre-pidemic numbers.[32,33]

We proposed to fill the manpower gap by reallocating manpower and also expected that these staff deployed to the frontline of the epidemic could promptly return to their original duties after the pandemic had stabilized. Unfortunately, Taiwan has entered community transmission stage of COVID-19, with more than hundred local cases per day since May 15, 2021. In the face of the challenges posed by the mid- and long-term pandemic, we believe that advance training programs and continuous education during the pandemic are critical. As the duration of the pandemic extends, we expect that the staff deployed by other departments to support the pandemic-related work can gradually change from a supporting role to a primary role. We strongly recommend that essential divisions during COVID-19 pandemic such as infection, pulmonology, and intensive care should design systematic courses for other divisions during the pandemic. In addition, telemedicine has become a priority for countries in the mid- and long-term phases of the pandemic.[34] By February 2020, the users of telemedicine in Taiwan had extended to individuals practicing home isolation, home quarantine, self-health management, and by May 2021, to the general public.[35] In the postpandemic era, the development and optimization of telemedicine software and hardware and the establishment of related regulations are long-term goals.

Our study has some limitations. First, we analyzed only the changes in outpatient visits. Statistics on hospitalizations and other invasive procedures were not examined. The correlation between outpatient service workload and total departmental workload must be further clarified. It is also worth noting that the system of outpatient departments in Taiwan hospitals differs greatly from that in Western countries. In Taiwan, the National Health Insurance does not establish a strict referral system of Western standard.[36] In America, United Kingdom, and Australia, primary care physicians act as healthcare "gatekeepers" by providing initial medical interventions and referring patients to specialists.[37] On the other hand, people in China, Japan, Korea, and Taiwan have great freedom in choosing healthcare facilities and specialties.[38,39] Even the outpatient departments at the medical centers are accessible at any time. In our study, the number of outpatient visits in all departments decreased in variable degrees during the initial phase of the outbreak. Such a phenomenon not only reflected the panic of the public, but also suggested the existence of a certain number of nonessential visits in medical centers before this pandemic and an unimplemented referral system in Taiwan.

Second, this study is a short-term analysis of the early stage of the pandemic. In Taiwan, the number of initial cases of COVID-19 pneumonia was small and had not yet reached the community transmission stage. We consider this period as a buffer or preparation period for pandemic prevention. The data presented in this study reflected the panic response of the population. We believe that the data from this study can still serve as an important reference for manpower allocation in the event of future outbreaks of similar patterns. In the future, mid- or long-term studies observing these variables in the context of the pandemic should be performed. Last, this study was conducted within a single center in Taiwan. As of the end of March 2020, the total number of diagnosed cases of COVID-19 in Taiwan was only 322, which was much lower than that in most other countries. Differences in healthcare systems and policies across countries should be considered when utilizing the findings of this study institutional decision-making.

In conclusion, this study demonstrated varying degrees of declines in outpatient visits within almost all departments of TVGH after the outbreak. In the event of similar outbreaks in the future, medical institutions can redeploy employees from certain departments experiencing reduced workloads in their usual specialty areas to fulfil additional outbreak-driven staffing needs. Preparatory training programs should be established prior to an outbreak to ensure that potentially redeployed personnel are adequately equipped to serve in their new positions.

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