INTRODUCTION

Singapore reported its first confirmed case of coronavirus disease 2019 (COVID-19) infection on 23rd January 2020 [1], and the situation escalated rapidly as Singapore recorded the highest number of cases outside of China in February 2020, before its spread to other parts of the world. The World Health Organization subsequently declared a global pandemic on 11th March 2020 and there have since been more than 3.3 million infected patients with more than 238,000 deaths worldwide across 215 nations [2]. Since the Severe Acute Respiratory Syndrome outbreak in 2003, Singapore set up a series of national prevention and response measures including the creation of a Disease Outbreak Response System Condition (DORSCON) [3].

MANPOWER

All staffs had to attend N95 mask fitting sessions and Powered Air-Purifying Respirators (PAPR) training. It was mandatory for all staffs to record their temperature twice daily on a mobile-based staff health surveillance system, and everyone was encouraged to seek medical attention if unwell. HCW in Singapore were lucky as we did not face a severe shortage of personal protective equipment (PPE) or masks as described in many other countries, due to our existing resources and capabilities of the government in providing all HCW with appropriate equipment.

Our department initially adopted an “off-site” team approach, whereby a senior and junior consultant were paired up to be on mandatory “off-site” duty for 1 week every 4 weeks with complete isolation from the hospital and no patient contact. However after 5 weeks, we had a review and decided it was not sustainable. We then quickly adopted a segregated team approach by dividing the entire department, including rotating residents and nurse
clinicians, into 2 teams. Interaction was kept to a minimum to decrease exposure and risk of cross-contamination. Physicians’ leave was cancelled as part of the hospital directive to maximize manpower allocation to critical clinical areas.

OUTPATIENT

All patients who attended outpatient clinic visits had mandatory health and travel declarations and temperature screening. All staffs at clinical areas had surgical masks and PPE as required. In accordance with the recommendations published by Ramirez et al. [4], British Gynaecological Cancer Society [5] and Kim et al. on behalf of Asian Society of Gynecologic Oncology (ASGO) [6], we reviewed our outpatient clinic lists of patients and restricted clinic visits only to new patients, patients with active oncologic issues and those on active treatment for their cancers. All routine surveillance and follow-up visits were postponed after tele-consults with the patients to ensure that they remained asymptomatic [4]. Only essential clinic personnel attended to the patients and they were only allowed to have one accompanying person at all times [4]. Colposcopy clinic load was reduced and most patients’ appointments were deferred to 3 to 6 months later [6]. Only new cases with high-grade abnormal pap smears or high-risk human papilloma virus positive were scheduled within the next 3 months [6].

In view of the travel restrictions enforced by the Singapore government as part of DORSCON Orange, we did not have any international patients and that further limited our staff to potential exposure from imported cases.

These measures resulted in our outpatient clinic load decreasing by approximately fifty percent in the last month.

INPATIENT

Patients were subject to strict temperature screening and health and travel declarations prior to admission. In the event of any symptoms or suspected positive contact, the patients were isolated in our isolation ward and COVID-19 swabs were performed in consultation with our infectious disease consultant-on-call. Staffs wore appropriate surgical masks and PPE at all times and the number of staff attending to one single patient was limited. There were also no visitors allowed as part of the hospital’s protocol.

SURGERY

All elective cases were reviewed by individual surgeons to ensure that only urgent and time-critical cases were allowed to proceed. Patients with advanced cancer were reviewed and tissue biopsy with neoadjuvant chemotherapy was considered in favor of primary debulking surgery [4,6]. This was also partly due to the restrictions on cross-cluster staff movement as part of DORSCON Orange, thereby limiting our usual surgical support from our partner hospital. If complex multidisciplinary surgery was deemed urgent and necessary, we transferred these patients to Singapore General Hospital, a tertiary hospital under the same healthcare cluster, after ensuring proper infection control measures were taken.
All pre-operative patients underwent stringent screening and if they reported symptoms or had any positive contact, they would be isolated and swabbed, and have the surgery postponed. In the event of emergencies, the entire operating room (OR) team would be in appropriate full PPE or PAPR throughout the entire surgery, and the surgery would be done in a negative-pressure OR.

In many ORs, there is an average of 15–40 air exchanges per hour [7] and in order to ensure clean air has circulated in the OR, we followed an intubation-extubation protocol designed by the hospital whereby a 5 minute pause is mandated during intubation and extubation and only the anesthesiologists and assistants in full PPE were allowed to be in the OR with the patient. This ensured at least 2 gas exchanges had taken place in the unlikely event that the patient was an asymptomatic carrier of COVID-19 [8]. This resulted in an extra thirty-minute turnaround time for each patient.

The use of laparoscopy and diathermy have been investigated by several authors as it is known to be an aerosol-generating procedure which produces a high concentration of surgical smoke due to low gas mobility in pneumoperitoneum [9]. This can theoretically increase airborne transmission risks to users. All cases listed for laparoscopy were re-evaluated and risks weighed against potential benefits [4]. Cases with anticipated difficulties such as multiple previous laparotomies, high body mass index (>50 kg/m²) or need for bowel resection were considered for open approach rather than initial intended laparoscopy. If laparoscopy were to proceed, our hospital mandated the use of ultra-filtration systems and laparoscopic smoke evacuators and strict protocols were adhered to throughout surgery.

**CHEMOTHERAPY**

Modifications were mainly aimed at rationalizing oncologic care with priority given over curative intent treatments over palliative treatment. Outpatient chemotherapy was encouraged, and measures were taken to reduce the incidence of unplanned hospital admissions for management of treatment related adverse events. Adjustments were made to minimize patient visits to our oncology outpatient clinics and our ambulatory chemotherapy unit. Chemotherapy with longer dosing intervals such as paclitaxel 175 mg/m² and carboplatin (dosed at area under the curve [AUC] 5–6) administered every 21 days was preferred over dose dense (weekly) paclitaxel and carboplatin, to minimize chemotherapy sessions and risks of hypersensitivity reactions [5,10]. Admissions for de-sensitizing protocols were avoided during this period unless deemed necessary by the treating physician. Alternative regimes include caelyx (30 mg/m²) in combination with carboplatin (dosed AUC5) administered every 28 days. Prophylactic filgrastim was used to prevent leucopenia [5,10]. Bevacizumab was used with caution because of its associated hypertension, which is a risk factor for COVID-19 infection [5,10]. Patients who were on best supportive care and symptom management were referred early to palliative home hospice services thus reducing outpatient visits.

**RADIOTherAPy**

All patients requiring radiotherapy were referred to our colleagues in National Cancer Centre Singapore. Movement of the patients across the institutions during the treatment process was eliminated and follow-up visits were only scheduled in our clinics after completion of the entire course of radiotherapy.
ACADEMIC ACTIVITIES

All multidisciplinary tumor board meetings were carried out virtually via a secure web-based video-conference platform and all face-to-face meetings were cancelled. Teachings for residents and medical students were also carried out in similar fashion via video-conferencing and this method was well received by all.

CONCLUSION

The fight against COVID-19 has brought about many changes in our clinical practice and assessment of risk for gynecologic oncology patients. Well-structured public health systems and the national DORSCON system together with strong leadership have allowed us to continue to provide the best care for our oncology patients in this current climate. As proof of effectiveness of our approach, none of our gynecologic oncology patients and staff in the department has contracted COVID-19 to date. As this pandemic is rapidly evolving, the long-term sustainability of this workflow is unknown and the implications of COVID-19 on treatment outcomes, patients’ perspectives, as well as psycho-emotional impact on patients and HCW are important areas of future research. Workflow and clinical framework should be regularly reviewed and audited and the experience gained from this pandemic will no doubt guide us in adapting our practice in response to future global health crises.

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