

Local Experience for Managing Oncology Services during COVID-19 Pandemic in a Tertiary Care Hospital in Saudi Arabia

Nagwa Ibrahim^{1*}, Mohamed Almeziny¹, Abdulaziz Alhamad², Ashraf Farrag^{2,3}

How to cite this article: Ibrahim N, Almeziny M, Alhamad A, Farrag A. Local Experience for Managing Oncology Services during COVID-19 Pandemic in a Tertiary Care Hospital in Saudi Arabia. *Glob J Med Therap.* 2020;2(3):1-6. <https://doi.org/10.46982/gjmt.2020.105>

Copyright: This is an open access journal published under the Creative Commons Attribution Non-Commercial License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction, provided the original work is properly cited and its authors credited.

Abstract— The COVID-19 pandemic led to several critical challenges that impacted the healthcare system worldwide. Many guidelines have been developed internationally and nationally aiming to minimize the risk of infection and its sequential complications. Cancer patients on active treatment are at higher risk to get infected either due to the disease itself or the cancer treatment and other comorbid diseases. In this manuscript we share our local experience while delivering oncology services during the COVID-19 pandemic at Prince Sultan Military Medical City in Riyadh, Saudi Arabia.

Keywords: COVID-19, pandemic, oncology, healthcare, challenges

1. INTRODUCTION

The COVID-19 pandemic led to critical healthcare challenges that are impacting everyone including healthcare professionals, patients and the public. The confirmed number of COVID-19 cases till 1st of July 2020 exceeded 10 million cases globally with a rapid increase lately, while the confirmed deaths are approaching 509,000. The number of countries, areas or territories with confirmed cases are 215. The confirmed number of COVID-19 cases in Saudi Arabia till 9th of July is 220,144 cases and the confirmed deaths are 2059. There is no systematic and standardized record of the number of healthcare workers who have contracted the disease or died from it. The elderly and subjects with comorbid conditions such as cancer, heart disease, hypertension, lung disease, chronic kidney disease and diabetes are at the highest risk for mortality [1]. The number of new cases affected by COVID-19 remains to

significantly rise worldwide despite the implemented regulations in multiple countries and regularly updated recommendations at the international and national levels to tackle this pandemic [2-4]. Common symptoms of COVID-19 include cough, fever and shortness of breath [5]. The disease severity ranges from asymptomatic to mild disease, pneumonia and respiratory failure which can further lead to death. Healthcare professionals including physicians, pharmacists, nurses, etc. are playing a crucial role in impeding the spread of the virus and ensuring patient safety.

Cancer patients are vulnerable and at higher risk of infection [1]. This might be related to the disease itself, active treatment of cancer such as chemotherapy or the presence of other comorbid diseases. It has been recently reported that specific cancers and hematological malignancies including leukemia, lymphoma and myelodysplastic syndromes are associated with an increased risk of infection with COVID-19. For these patient's cancer itself as well as its treatment affects the immune system [6]. Moreover, lung cancer patients are at higher risk of developing respiratory complications due to the underlying lung disease [7]. In addition, patients with a history of bone marrow transplant are of increased risk due to the associated prolonged suppression of their immune system [8].

Cancer patients are at high priority to receive their active treatment during crises such as the COVID-19 pandemic. The aim of treatment should be reducing morbidity and mortality rates as well as the physical and emotional suffering. However, several measures that limit the spread of infection with COVID-19 should be implemented to reduce the risk in this vulnerable group. Treatment of cancer patients is advised to be administered in a timely fashion to avoid any negative impact on the clinical outcome. This article describes the approach used to manage oncology patients' services in response to the COVID-19 pandemic in Prince Sultan Military Medical City, Riyadh, Saudi Arabia. This real-world experience, suggestions and recommendations might be considered as a guide for other oncology centers in other affected areas.

¹Prince Sultan Military Medical City, Department of Pharmaceutical Services, Riyadh, Saudi Arabia.

²Prince Sultan Military Medical City, Adult Oncology Department, Riyadh, Saudi Arabia.

³Clinical Oncology Department, Assiut university Hospitals, Assiut, Egypt.

*Corresponding Author: Nagwa Ibrahim, Pharm D, PhD.

Email address: nag_ibrahim@hotmail.com

Received: 25 June 2020

Accepted: 15 July 2020

Published: 23 July 2020

2. MULTI-DISCIPLINARY MANAGEMENT PLAN

The complexity of cancer care requires a multi-disciplinary approach management plan especially during the COVID-19 crisis. The following is our experience at Prince Sultan Military Medical City (PSMMC) describing how we were able to ensure an effective and continuous service to oncology patients while maintaining maximum safety precautions for patients and caregivers.

1. Hospital leadership:

COVID-19 guidelines:

Adaption of recently published international / national guidelines related to the COVID-19 pandemic based on the hospital needs including but not limited to the following:

- COVID -19 Guidelines by Saudi Center for Disease Prevention and Control (Weqaya) [9].
- Saudi Ministry of Health (MOH) Protocol for Patients Suspected of/Confirmed with COVID-19: Supportive care and antiviral treatment of suspected or confirmed COVID-19 infection [10].
- Hospital admission criteria for COVID-19 patients Guidelines [11].
- Saudi National Cancer Institute COVID-19 Caregiver and Facility Clinical Practice Guidelines by the Saudi Arabia National Cancer Institute (SANCI) / Saudi Council for Health Services [12].
- Centers for Disease Control and Prevention (CDC) Guidelines [13]
- Development of guidelines for employees travelling to or coming back from any of the affected countries.

All the adapted guidelines had accelerated approval from PSMMC Pharmacy and Therapeutics Committee (P&T).

Healthcare professional's education:

- Development of educational posters about COVID-19 mode of transmission, symptoms, prevention methods, hand washing methods, etc. These posters were distributed electronically on regular bases to all hospital employee official emails and printed as banners that were located in different areas within the hospital.
- Conduction of regular virtual educational webinars.

Facilities preparation:

- Limit access to one-point entry.
- Suspend the fingerprint attendance system.
- Restrict visitors, vendors and ancillary services from accessing patients care areas.
- Provide and identify virtual support services such as initiation of virtual clinics and extra hotlines to minimize patients' visits.
- Ensure the availability of personal protective equipment (PPE).
- Perform N95 mask fitting test for all medical staff.
- Establish virtual clinics to deal with employees' worries, anxiety and depression in order to avoid staff burn out as staff mental health was a priority by leadership.

COVID-19 prevention:

- All staff, patients and visitors were subject to screening outside the facility for:
 - History of travel in the past 14 days internationally or from high risk areas as per MOH updated list.
 - History of fever and flu-like symptoms.
- Measure temperature using an infrared thermometer for all patients and staff entering patient care areas at the entry points.
- Ensure implementation of institutional standard precautions.
- Ensure implementation of the adapted institutional guidelines.

2. Oncology department:

Facilities preparation:

- Triage stations were established at the entrance for the Day Units "outpatients" clinics and radiotherapy units.
- A distance of 1.5 meters apart was maintained at front desks and during the screening of staff and patients before they enter patients care area.
- The chairs in the waiting area were redesigned to maintain a physical separation of at least 1.5-meters distance.
- The infusion suite was redesigned to a private space with 1.5-meters distance.
- Most of on-site / in-person group and patient activities were suspended and switched to virtual meetings.
- The staff were educated on how to detect patients with COVID-19 symptoms and signs.
- Virtual tumor boards for challenging cases that require necessary multidisciplinary coordination were utilized to apply physical distance and decrease risk of infection.

Patient appointments:

- Routine follow up visits were postponed for patients not on active cancer treatment.
- All non-urgent surgical, dental and invasive / interventional procedures were postponed.
- A refill mechanism was developed for patients on maintenance therapies such as mailing or drive through.
- Virtual clinics with a unified phone number, websites, social platform was provided for patients seeking support.
- Telemedicine was adapted for patients not requiring a physical exam.
- Staff was educated to conduct and document telephonic and telehealth interactions with patients.

COVID-19 prevention:

We applied the following prevention measures:

- Patients were instructed to call if they develop fever, flulike symptoms (cough, sore throat).
- Patients were contacted a day prior to their appointment and acute respiratory infection (ARI) screening symptoms for cough, sore throat, fever, or other flu-like symptoms, travel outside the country or high-risk regions or exposure to COVID-19 confirmed cases was conducted.

- All admitted patients underwent a swab test for COVID-19
- Visitors were denied entry to any treatment area.
- The watcher/companion was requested to wait outside treatment areas or return after treatment.
- In case of medical necessity for watcher as for children, we limited it to an identified healthy watcher per admission in a single room.
- The watcher should remain inside the patient room during the patients' stay and should not be allowed to leave the room without permission by the charge nurse and should not leave the hospital without a written permission from the treating consultant.
- Use signage and visualization of symptoms for all patients/visitors, as well as patient's education materials and illustrations of proper hygiene for infection prevention and symptoms to report.
- Rapid isolation of patients with suspected infection in a designated exam room or other private areas with the door closed and providing the patient with a facemask until more thorough testing can be conducted.
- All staff should adhere to standard precautions.
- Follow hospital action plan for patients that present with suspected infection.
- Limit the exposure of vulnerable care providers to high risk patients (fever, respiratory symptoms) and high-risk areas emergency (ER).

Patient screening for the treatment plan management during the COVID-19 crisis:

Oncologists agreed that most patients who are getting treatment are getting it because they need it. So, their treatment can't be automatically cancelled. We considered the recommendations of the American Society of Clinical Oncology (ASCO) [14] and the Saudi National Cancer Institute COVID-19 Caregiver and Facility Clinical Practice Guidelines by the Saudi Arabia National Cancer Institute (SANCI) / Saudi Council for Health Services [12]. Accordingly, all patients' plans were reviewed and each case was evaluated individually based on different factors depending on the intent of treatment such as cure, alleviating symptoms or palliative. Cases were divided as follows:

Outpatient services:

- Patients with less risk:
We delayed the visit or schedule for patients who are getting routine follow up and shifted to having virtual consultation with their treating oncologist. This limited the number of patients in the oncology clinic which leads to risk minimization of exposure to COVID19 either to cancer patients or to the oncology team.
- Patients at higher risk:
Patients currently receiving immune-suppressive treatment, immunotherapy, radiotherapy and those who have active cancer and are not in remission.
 - 1- Patients on active chemotherapy/radiotherapy/surgery were given appointments to visit the hospital on the assigned day. An official letter from the department as well as permission from the security department were

arranged to be sent to them through WhatsApp or email in case of quarantine.

- 2- Patients on hormonal therapy had a virtual consultation with the treating oncologist. The needed medications were prescribed and entered electronically on the hospital system, then issued through the outpatient oncology pharmacy.
- 3- Patients on oral chemotherapy and/or targeted therapy had a virtual consultation with the treating oncologist, then the necessary medications were prescribed electronically through the hospital system after clearing the results of all necessary laboratory tests to avoid drug toxicity or adverse events. This was followed by issuing the drugs through the outpatient oncology pharmacy.

Inpatient services:

- 1- Patients in need for essential admission were admitted directly to the oncology ward without having to pass through the emergency department.
- 2- Patients already admitted were to be reassessed by the treating oncologist for early discharge once stable without the need to conduct any further active interventions. We aimed to minimize their hospital stay period without compromising the health services provided. For these patients, the requested drugs to take home were prescribed on the electronic hospital system and issued by the inpatient pharmacy.
- 3- Patients admitted were seen by the treating oncologist based on the scheduled clinical rounds considering all the protective measures. It is recommended to minimize the number of staff doing the actual round as possible to minimize the risk of infection. Keeping in mind that the patient should be seen by at least by one senior oncologist and one junior oncologist.

3. Pharmacy department:

Facilities preparation:

The following were the applied measures in the department of pharmaceutical services:

Pharmacy staff-related measures [15]:

- Pharmacists were actively involved in the development and implementation of institutional guidelines related to COVID-19. For example, infectious disease clinical pharmacists were actively involved in the development of Management of Patient Diagnosed with COVID-19 Guidelines and its regular updates based on the Saudi Ministry of Health COVID-19 Management Guidelines. They developed different protocols such as covid-19 therapies-dose recommendation for patients with hepatic and renal impairment protocol and subcutaneous insulin protocol for diabetes or severe hyperglycemia with COVID-19 on dexamethasone. The clinical pharmacists were assigned as an active member of each medical team taking care of COVID-19 patients mainly in the accident and emergency (A&E), intensive care units (ICU) and inpatient isolated wards specified for COVID-19 positive patients. Clinical pharmacists attend the medical COVID-

19 virtual meetings, follow up the treatment plan, check for possible drug interaction mainly for patients with other comorbid diseases and on polypharmacy. They check the need for dose adjustment based on kidney and liver function and ensure availability of medications.

- Pharmacists were requested to provide evidence-based recommendations to healthcare providers and patients based on international, national and institutional guidelines: specialized clinical pharmacists in different specialties such as oncology, ICU, A&E, pulmonology, hepatology, etc. were responsible to provide all required evidence-based recommendations and consultations to healthcare professionals.
- Adapting pharmacy staff shifting hours which increased the gap of meeting together. This minimized the number of staff which might be infected in case of breakdown.
- Ensuring implementation of protective measures recommendations: each area supervisor was responsible to ensure implementation of protective measures among the staff and the availability of PPE.
- Minimize the possibility of staff burnout as staff mental health was a priority by leadership.
- Pharmacists to continue to be extra vigilant and make sure their patients are receiving the most rational and appropriate medication management including dose adjustment, adverse drug reactions, drug interaction management and drug therapy monitoring: clinical pharmacists in different specialties continued to follow up their patients considering all the protection measures recommendations.
- Pharmacists to collaborate with physicians and nurses to adopt care principles as best practice such as switching patients from:
 - Short acting to long acting alternative in case of palliative care such as using long acting analgesics oral form or patches rather than short acting analgesics. For example, replacing morphine tablets with fentanyl patch that cover 72 hours [16].
 - Intravenous form to oral or subcutaneous form. For example, shifting patients on Herceptin or rituximab from intravenous form to subcutaneous form [17] and modifying protocols including 5-Fluorouracil (5FU) to capecitabine oral form based on equivalency published studies [18].
 - Changing immunotherapy regimens frequency e.g. nivolumab from every two weeks to every 4 weeks regimen [19] and pembrolizumab from every 3 weeks to every 6 weeks protocol [20].
 - The decision for each patient should be taken based on individual cases.
- All pharmacists were encouraged to maintain and record all the interventions during the pandemic [21,22].
- All pharmacists were encouraged to contribute in research and clinical trials in pandemic situation. Some research is ongoing already and will be published as soon as finalized.

Preparation and administration and drug availability measures:

- Ensuring enough supply of all medications in collaboration with planning department and suppliers: head of pharmacy department and head of planning department were very collaborative having regular communication to ensure the availability of enough supply and to avoid drugs shortage.
- Implement a list of alternative vendors of essential medications, medical devices, etc in collaboration with the planning department and develop strategy related to shortage.
- Applying the Institute for Safe Medication Practice (ISMP) considerations for automated dispensing cabinets (ADC) usage during COVID-19 [23]:
 1. Accessing the ADC:
 - Disable the fingerprint system and replace it with username and password.
 - Follow the "clean hands" approach, performing hand hygiene before and after accessing ADC when removing or filling medications at the cabinet.
 - Store a container of the appropriate cleaning disinfectant nearby to allow those accessing the ADC to disinfect common touch points.
 2. Decreasing traffic and limiting cross-contamination:
 - Consider temporarily increasing medication PAR levels (days of stock) to decrease the frequency of restocking and thereby reduce traffic to the ADC.
 - Stock medications in multiple ADC bins with fewer doses per bin to minimize touch contamination of the bin by practitioners removing medications.
 3. Returning medications:
 - Never allow medications removed from the ADC to be returned to the original container. This will minimize the risk of errors and cross contamination.
 - One way return bin should be used for returning unadministered medications to the pharmacy (including controlled substances), as long as they have not entered a patient's room.
 4. Maintaining safe practices:
 - Maintain a documented independent double check by another practitioner when removing high alert medications from ADC.
 - Use ADC dispensing alerts to provide practitioners with critical information about new or unfamiliar medications.

Patient-related measures:

- Establish a call center to reply to patients' queries: a call center was established to answer all patients' queries. This center was covered by clinical pharmacists with extensive experience in different specialties such as oncology, hepatology, transplant, hematology and medicine, etc.
- Pharmacists to have an active role in clarifying misconceptions to the public using their expertise and knowledge [24]. All pharmacists were involved in this role based on each pharmacist's work location and expertise.
- Provide medications through mailing and home delivery: an agreement was done with mailing companies to deliver medications to patients in Riyadh and outside Riyadh. In some critical situation the medications were delivered by

volunteered pharmacy staff to avoid delay in critical drugs. An electronic tracking system has been developed. This system helps patients and healthcare professionals to track medication delivery status.

- Implement easy to refill solutions for all out patients as possible to minimize potential and unnecessary exposure: this solution was applied to patients with chronic diseases such as hypertension, diabetes, etc. and stable in their medications. In such a situation, the treating physician will contact the patient virtually and then prescribe the medications electronically for a long time such as 6 months. The pharmacy will mail the patient the stock of 3-6 months based on drug availability. The patient to request for refill about 2-3 weeks prior to the consumption of his/her medications without contacting the physician as no need for a new prescription.

3. DISCUSSION

While we were preparing for our manuscript, few national and international guidelines about managing oncology services during COVID-19 as well as experts' recommendations were published with the same aims and scopes such as maintaining the best oncology services and protecting patients and staff. The national guideline is developed by the Saudi Arabia National Cancer Institute (SANCI)" [12] and the international guidelines are developed by the American Society of Clinical Oncology (ASCO) [14] and the European Society of Medical Oncology (ESMO) [25]. The national experts experience and recommendations are conducted by Jazieh et al and his colleagues [26] and Alshamrani et al and his colleagues [27]. Comparing our plan in managing oncology services during COVID-19 with the national, international and experts' plans, we found that we are similar to them in all aspects including the leadership plan, patient management plan and pharmaceutical services plan, taking into account that each healthcare facility has its own particular circumstances. The following are some examples but not limited to: we did the same dividing the oncology patients to categories based on the intent of treatment, utilizing the virtual clinics for patients who are stable and not in need to visit the hospital as patients having oral or subcutaneous cancer therapy, shifting treatment regimens from intravenous to oral or subcutaneous alternatives based on equivalency evidence [17,18], prolonging the regimens frequency based on the approved safety and efficacy frequencies and doses [19,20], replacing short acting with long acting formularies in supportive care [16]. We applied all the protective measures.

We implemented innovative ideas to minimize patients visits to pharmacy through sending the medications to patients at home through postal carriers and direct delivery by volunteers. For staff management plan we aimed to minimize staff exposure to infection through education, clarifying the roles and responsibilities and minimize their anxiety and stress. A stress management clinic was initiated. We had a great collaboration between hospital leadership, oncology department, pharmacy department and planning department.

We believe that application of all the above-mentioned measures lead to prevention of further harm from COVID-19 to our patients and healthcare workers. We had a great support

from the institution's top leaders and stakeholders to provide and maintain the best services to oncology patients and to protect patients and healthcare professionals as well. Staff were very committed and dedicated to strictly adhere to the institutional guidelines and recommendations towards the prevention of COVID 19. Some of the staff stayed away from their families for few months to prevent them from possible infection. Oncology patients is a priority to healthcare workers at PSMC while managing oncology services.

4. CONCLUSION

Many lessons have been learned during this pandemic crisis. We were able to provide the best care that were implemented in a structured and organized process which improved work flow while keeping staff and patients safe. We recognized that resources could be better utilized. We have to revisit the scenarios that we applied and mentioned above in details. This will minimize the number of patients' visits to the hospital that will positively impact the patient's quality of life and minimize costs to the hospital as well as patients.

Conflict of Interest Statement: The authors disclose no conflict of interest.

Author contributions: NI had the study idea, suggested methodology and wrote the manuscript. MA, AA and AF contributed to the writing of the manuscript. All authors approved the final version of the manuscript and agree to be accountable for the content of the work.

Funding: The author disclosed no funding to this study.

REFERENCES

1. Kunyu Yang, Yuhang Sheng, Chaolin Huang, Yang Jin, Nian Xiong, Ke Jiang, Hongda Lu, Jing Liu, Jiayuan Yang, Youhong Dong, Dongfeng Pan, Chengrong Shu, Jun Li, Jielin Wei, Yu Huang, Ling Peng, Mengjiao Wu, Ruiguang Zhang, Bian Wu, Yuhui Li, Liqiong Cai, Guiling Li, Tao Zhang, Gang Wu. Clinical characteristics, outcomes, and risk factors for mortality in patients with cancer and COVID-19 in Hubei, China: a multicentre, retrospective, cohort study. *Lancet Oncol.* 2020; 21:904-13. [https://doi.org/10.1016/S1470-2045\(20\)30310-7](https://doi.org/10.1016/S1470-2045(20)30310-7)
2. World Health Organization. Coronavirus disease (COVID-19) outbreak dashboard. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>. Accessed March 21, 2020.
3. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *JAMA.* 2020. <https://doi.org/10.1001/jama.2020.2648>.
4. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020. <https://doi.org/10.1056/NEJMoa2002032>.
5. Grant MC, Geoghegan L, Arbyn M, Mohammed Z, McGuinness L, Clarke EL, et al. The prevalence of symptoms in 24,410 adults infected by the novel coronavirus (SARSCoV-2; COVID-19): A systematic review and metaanalysis of 148 studies from 9

- countries. PLoS ONE. 2020; 15(6): e0234765. <https://doi.org/10.1371/journal.pone.0234765>.
6. Malard, F., Genthon, A., Brissot, E. et al. COVID-19 outcomes in patients with hematologic disease. Bone Marrow Transplant (2020). <https://doi.org/10.1038/s41409-020-0931-4>
7. Jacobo Rogadoa, *, Cristina Panguaa, Gloria Serrano-Montero, Berta Obispoa, Almudena Martín Marinoa, Mar Pérez-Pérez, Ana López-Alfonsoa, Pedro Gullónb, Miguel Ángel Laraa. Covid-19 and lung cancer: A greater fatality rate? Lung Cancer. 2020; 146:19-22. <https://doi.org/10.1016/j.lungcan.2020.05.034>
8. Per Ljungman, Malgorzata Mikulska, Rafael del la Camara et al. The challenge of COVID-19 and hematopoietic cell transplantation; EBMT recommendations for management of hematopoietic cell transplant recipients, their donors, and patients undergoing CAR T-cell therapy. Bone Marrow Transplantation. 2020; May. <https://doi.org/10.1038/s41409-020-0919-0> <https://www.nature.com/articles/s41409-020-0919-0.pdf>
9. Coronavirus Disease 19 (COVID -19) Guidelines Saudi Center for Disease Prevention and Control (Weqaya). <https://www.moh.gov.sa/Ministry/MediaCenter/Publications/Documents/Coronavirus-Disease-2019-Guidelines-v1.2.pdf>
10. Saudi MOH Protocol for Patients Suspected of/Confirmed with COVID -19: Supportive care and antiviral treatment of suspected or confirmed COVID -19 infection. <https://www.moh.gov.sa/Ministry/MediaCenter/Publications/Documents/MOH-therapeutic-protocol-for-COVID-19.pdf>
11. Hospital admission criteria for COVID-19 patients Guidelines. <https://www.moh.gov.sa/Ministry/MediaCenter/Publications/Documents/admission-criteria.pdf>
12. Saudi National Cancer Institute COVID-19 Caregiver and Facility Clinical Practice Guidelines by Saudi Arabia National Cancer Institute (SANCI) <https://www.moh.gov.sa/Ministry/MediaCenter/Publications/Documents/Saudi-Arabia-National-Cancer.pdf>
13. www.cdc.gov/ accessed 26/5/2020
14. ASCO special report: a guide to cancer care delivery during the COVID-19 pandemic. May 19, 2020. <https://www.asco.org/sites/new-www.asco.org/files/content-files/2020-ASCO-Guide-Cancer-COVID19.pdf>
15. Executive Summary Recommendations from The Saudi Society of Clinical Pharmacy (SSCP) for Pharmacists during Epidemics and Pandemics. Accessed 10 May 2020.
16. Government of Western Australia, Department of Health, WA Cancer and Palliative Care Network. Opioid Conversion Guide. 2015 Accessed on 7 July 2020. <https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/Health-Networks/WA-Cancer-and-Palliative-Care/Other-resources/Opioid-Conversion-Guide.pdf>
17. S. Dent, C. Ammendolea, A. Christofides et al. A multidisciplinary perspective on the subcutaneous administration of trastuzumab in HER2-positive breast cancer. Curr Oncol. 2019; 2691:e70-e80. doi: 10.3747/co.26.4220 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6380645/>
18. Lakshmi Chintala, Susmitha Vaka, Joaquina Baranda et al. Capecitabine versus 5-fluorouracil in colorectal cancer: where are we now? Oncology Reviews; 2011; 5:129-140. <https://link.springer.com/article/10.1007/s12156-011-0074-3>
19. G.V. Long, S.S.Tykodi, J.G.Schneider et al. Assessment of nivolumab exposure and clinical safety of 480mg every 4 weeks flat dosing schedule in patients with cancer. Annals of Oncology. 2018; (29):2208-2213. doi:10.1093/annonc/mdy408. <https://www.annalsofoncology.org/action/showPdf?pii=S0923-7534%2819%2931886-1>
20. Daniel A. Goldstein, Mark J. Ratain, Leonard B. Saltz. Weight based dosing of pembrolizumab every 6 weeks in the time of COVID-19. JAMA Oncol. 2020; May 27. doi:10.1001/jamaoncol.2020.2493
21. Ibrahim N. How to Improve Clinical Pharmacy Practice Using Key Performance Indicators. Glob J Med Therap. 2020;2(1):10-14. <https://doi.org/10.46982/gjmt.2020.101>
22. Ibrahim N, Altwoujri A, Alabdulkarim H, Alnajjar F, AlSaqa'aby M. Challenges in applying pharmacoeconomics at the hospital level: Experts based approach. Glob J Med Therap 2019;1:1-6. <https://doi.org/10.46982/gjmt.2019.103>
23. Special Edition: COVID-19. ISMP Medication Safety Alert! April 2020. Accessed 11 June 2020 <https://psnet.ahrq.gov/issue/special-editions-covid-19-ismp-medication-safety-alert>
24. Ibrahim N, Al Mutairi M, Al Onazi M. Assessment of Oral Chemotherapeutic Agents Safe Handling Among Healthcare Professionals in Saudi Arabia. Glob J Med Therap. 2019;1(2):14-19. <https://doi.org/10.46982/gjmt.2019.104>
25. Cancer Patient Management During the COVID-19 Pandemic | ESMO 2020, www.esmo.org/guidelines/cancer-patient-management-during-the-covid-19-pandemic. Accessed 10 July 2020.
26. Jazieh A, Alhadab A, Alolayan A et al. Managing oncology services during a major coronavirus outbreak: lessons from the Saudi Arabia experience. JCO Global Oncology. 2020; 6:518-524. DOI <https://doi.org/10.1200/GO.20.00063>
27. Alshamrani M, Alharbi A, Alkhudair N et al. Practical strategies to manage cancer patients during the COVID-19 pandemic: Saudi Oncology Pharmacy Assembly Experts recommendations. J Oncol Pharm Practice. 2020; 0(0):1-12. DOI:10.1177/1078155220935564