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The Impact of the COVID-19 Pandemic on Multidisciplinary Clinics: A High-Volume Pancreatic Cancer Center Experience

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The unprecedented impact of the Sars-CoV-2 pandemic (COVID-19) has strained the healthcare system worldwide. The impact is even more profound on diseases requiring timely complex multidisciplinary care such as pancreatic cancer. Multidisciplinary care teams have been affected significantly in multiple ways as healthcare teams collectively acclimate to significant space limitations and shortages of personnel and supplies. As a result, many patients are now receiving suboptimal remote imaging for diagnosis, staging, and surgical planning for pancreatic cancer. In addition, the lack of face-to-face interactions between the physician and patient and between multidisciplinary teams has challenged patient safety, research investigations, and house staff education. In this study, we discuss how the COVID-19 pandemic has transformed our high-volume pancreatic multidisciplinary clinic, the unique challenges faced, as well as the potential benefits that have arisen out of this situation. We also reflect on its implications for the future during and beyond the pandemic as we anticipate a hybrid model that includes a component of virtual multidisciplinary clinics as a means to provide accessible world-class healthcare for patients who require complex oncologic management.

Introduction

Pancreatic cancer (pancreatic ductal adenocarcinoma) has a dismal 5-year survival of only 10% and is estimated to become the second leading cause of cancer-related deaths in the United States by 2030.[1] The poor prognosis is chiefly attributed to late detection, poor chemotherapeutic response, and a high propensity for early systemic dissemination.[2-5] The heterogeneous nature of this disease has been met with increasing complex multimodal treatment demands and a meticulous approach to determining the optimal course of management.[6]

Over the last decade with improvement in systemic control through the introduction of more effective multi-agent chemotherapies, it has become clear that the evaluation and management of patients with pancreatic cancer requires a multidisciplinary approach (radiologists, gastroenterologists, pathologists, medical oncologists, radiation oncologists, surgical oncologists, pain specialists, and researcher staff).[7] Furthermore, the increasing number of patients with borderline resectable and locally advanced diseases who are being considered for surgical resection makes a multidisciplinary approach even more valuable.[8-10] Accordingly, many practices, particular at high volume-centers, have now adopted a formal 'Multidisciplinary Care' (MDC) approach to integrate perspectives and manage these complex patients.[7] MDC has the potential to optimally sequence multimodal treatments in accordance with best available evidence, current guidelines, and patient-specific characteristics and preferences. Patients can also be offered novel clinical trials with innovative approaches.[11] MDC can facilitate multimodal care, ensuring efficient and optimal treatment plans with the highest chances of success. At the same time, patients are educated on available clinical trials and other clinical research activities. In the past, MDC clinics have been shown to improve outcomes in patients with cancer.[12,13] The Pancreatic Cancer Center at the Johns Hopkins Hospital comprises a comprehensive multimodality program that provides

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diagnostic and consultation services for patients with pancreatic cancer in a 1-site 1-visit format.[7] The pancreatic MDC (PMDC) offers an opportunity for a multidisciplinary team to comprehensively review all relevant findings, and provide optimal therapeutic recommendations to patients in a personalized manner.

Recently, however, the COVID-19 pandemic has drastically changed healthcare systems worldwide.[14-17] Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is an airborne RNA virus that started in China and spread rapidly intercontinental and was subsequently declared a pandemic by the World Health Organization (WHO) on March 11, 2020.[17] Cancer patients, in particular, are at an increased risk of severe COVID-19 infection, with about a 3.5-fold increase in the risk of mechanical ventilation, intensive care unit (ICU) admissions or death.[18] Thus, a delicate balance must be found in order to comprehensively treat these complex cancer cases while ensuring patient safety.

Owing to the importance of social distancing, disinfection protocols, reduced abilities of patients to travel, and the highly infectious nature of the disease, oncological care has been immensely affected during the pandemic. Herein, we provide an overview of the multiple ways in which the practice of our high-volume PMDC at a tertiary care hospital has been impacted by the COVID-19 pandemic and reflect on its provoked implications for the future, both during and even beyond the pandemic.

Pre-COVID-19 PMDC

A detailed description of the MDC program developed at the Pancreatic Cancer Center at Johns Hopkins Hospital (JHH) has been published previously.[7] Briefly, patients undergo an initial evaluation to determine stage and resectability. A coordinator is tasked with the consolidation of all past records including imaging studies and pathology slides which are re-reviewed by our in-house radiologists and pathologists. On the day prior to the clinic, these patients undergo laboratory testing and a pancreas protocol computed tomography (PPCT) on site. On the morning of the clinic, these patients are seen by designated healthcare providers and history is obtained and a physical examination is performed. All acquired information is then presented in a multidisciplinary conference which is attended by pathologists, radiologists, radiation oncologists, medical oncologists, surgical oncologists, gastroenterologists, pain anesthesiologists, and research staff. Each case is individually deliberated, and a collective assessment by the team determines the most appropriate management plan. This plan is then conveyed to the patients in the afternoon by physicians relevant to each patient's specific treatment plan. In the past, implementation of this approach at our institution has shown that a multidisciplinary review can result in a change in diagnosis and staging of approximately 20% and management plans in approximately 25% of patients.[7]

Impact of COVID-19 on PMDC

Impact on Patients and Quality of care

The quality of patient care in our pancreas MDC has been challenged by the COVID-19 pandemic, especially in the context of assessing each patient's unique disease biology. From a patient's perspective dealing with a new diagnosis of pancreatic cancer can be very difficult, and the challenges presented by the pandemic add to their anxiety. In our opinion the following factors need to be considered. Firstly, the biggest issue faced by patients, early on in the pandemic, was the perceived need to avoid in-person visits due to a fear of exposure to the virus. Patients worry about how an in-person visit might put them and their families at an added risk of contracting the virus. According to a study done by Harvard University and Phreesia, a healthcare technology company, on data from over 50,000 providers across the US, a 60% reduction in ambulatory care visits was observed by April 23, 2020.[19] The general perception of pancreatic cancer in the public is that is a "death sentence". These patients are confused and terrified and the ever changing COVID-19 related recommendations and travel guidelines add to the anxiety brought on by this new diagnosis. Secondly, pancreatic cancer is a disease of the elderly population, a majority of whom are not well versed in using modern technologies that are required to arrange these virtual visits. Third, limitations of remote interactions with patients who have a serious, life-threatening illness, have well-documented limitations.[20] The ability of physicians to address patient queries and confusion thereby forming a strong patient-doctor bond is handicapped by the lack of face-to-face encounters. This is of paramount importance in patients with pancreatic cancer who have a short life expectancy. These providers often take care of these patients for the rest of their lives, and in the absence of this bond, navigating patient management and providing comprehensive patient care is compromised. Fourth, the management of pancreatic cancer requires a fine balance between administration of multi-agent chemotherapies while limiting toxicity, and timely sequencing of radiation therapy and surgery. The pandemic has slowed a number of patient care processes, and these delays can be multiplicative in the management of patients with pancreatic cancer. Further effects are seen through recommendations of suboptimal treatments to these patients via hypofractionated regimens, as both patients and doctors are burdened by the trade-offs of cancer management Vs risk of contraction of the Sars-CoV-2 virus.[21] Fifth, travel has been limited during the pandemic, and an inability to travel from out of state can particularly impact patients with pancreatic cancer. For example, upon completion of their neoadjuvant therapy patients have to travel to our institution for radiation therapy which can again become stressful when considering the travel and housing arrangements they have to make with the given restrictions. Lastly, having family members participate in their care can help patients deal with the challenges of emotional stress, drug toxicities, and difficult discussions about their prognosis. Current guidelines do not allow family to join them during their in-person visits making the situation even more stressful.

The mental burden of setting up virtual visits, limited understanding of the disease, planning in-person visits for therapy, and potential disruption in treatments on patients with a disease that is associated with an uncertain life expectancy must be considered and addressed in this COVID-19 era.[22,23] Highlighted in a recent study by Wang and Zhang, the primary risk for cancer patients amidst the COVID-19 pandemic is limited access to healthcare and the inability to administer necessary medical services in a timely manner.[24]

Radiological and Histopathological Assessment of Disease

Precise imaging and accurate reporting lie at the heart of multidisciplinary care for pancreatic cancer. The gold standard for assessment of these patients is a pancreas protocol computed tomography (PPCT). Guidelines for the techniques of performing and accurately reporting a PPCT are well described.[25] These have been developed to facilitate the decision-making for the management of patients with pancreatic cancer. The scan permits focused visualization of the arterial and venous structures in relation to the primary tumor; which is imperative for accurate staging and surgical planning. Furthermore, three-dimensional (3D) reconstruction of the scans is routinely performed at our PMDC which can provide additional valuable information such as the degree of tumor-vessel relationship, aberrant anatomy through vascular mapping, and more sensitive assessment of occult metastatic disease.[26-28] Given that our PMDC is commonly comprised of patients with borderline and locally advanced diseases having access to complete and accurate radiological information becomes exceedingly valuable.

Unfortunately, since the advent of the COVID-19 pandemic, an increasing number of the patients being evaluated are unable to

undergo CT imaging at our institution. The only available alternative is to have imaging done at their local facilities. In our experience, a significant fraction of these scans are substandard and even when interpreted by expert in-house radiologists do not provide the required information. As a result, patients can be incorrectly staged and the treatment recommendations may not be the most suitable ones for that particular case. While one could argue that this is owing to the type of scanners available at these smaller centers, in our experience a majority of the studies suffer from a lack of adherence to the established protocols. The timing of the contrast and imaging is one of the biggest factors that renders these scans less useful when evaluating the extent of disease, in particular, the tumor vessel relationship. Unfortunately, given these inherent operator-dependent limitations even the most highly trained radiologists cannot provide accurate data to the multidisciplinary team. Based on our experience we recommend that bodies such as the Society of Abdominal Radiologists and the American Pancreatic Association should reinforce the need for adherence to defined protocols for PPCT when imaging these patients. If patients continue to undergo suboptimal imaging patient care would be compromised even in the setting of high-volume multidisciplinary care.

A histopathologically proven diagnosis of pancreatic cancer is required to initiate therapy in these patients. Our pathologists were quick to adapt to the challenges presented by the COVID-19 pandemic, minimizing its impact on their practice. Social distancing guidelines and the use of protective barriers were introduced early on allowing pancreatic pathologists to continue their activities. Furthermore, this unique situation did present the opportunity to validate tools for remote diagnosis using scanned whole slides that were sent from the outside centers.

Clinical and Surgical Management of Patients

Operative management is a crucial component of multidisciplinary patient management that has felt tangible impact of the COVID-19 pandemic. With the pandemic came a need for drastic changes in global surgical practices due to a reduction in workforce, risk of transmission during surgery, and prioritization of select surgical cases. The Centers for Disease Control and Prevention (CDC) and the American College of Surgeons (ACS) released recommendations.[29,30] In short, these include the development of response systems for surgical emergencies, staff education on standard operating procedures (SOPs) and use of personal protective equipment (PPE), contact tracing to limit spread amongst healthcare workers, and designated COVID-19 operating rooms. Additionally, repurposing operating rooms for the management of critically ill COVID-19 patients was recommended.[31] Of note, healthcare workers working in confined spaces (operating rooms) are at a high risk of exposure. Steps were taken to minimize risk included patient testing prior to hospitalization, use of PPE in the operating rooms, covering frequently used equipment (eg, monitors, nursing stations), and negative pressurization of surgical spaces. High-frequency changes in ventilation (>25 air exchanges per hour) and the use of low power electrocautery with evacuator were adopted to dilute air particulates and reduce exposure to smoke and viral particles.[32,33] Most importantly it was recommended that all elective procedures be postponed and only surgical emergencies are operated upon.[34,35]

Our approach to the surgical care of patients with pancreatic cancer care changed dynamically during the pandemic. Initially, the aforementioned guidelines classified pancreatic resections as non-emergency procedures. Additionally, reports from China suggested that COVID-19-positive patients with cancers were at a high risk of severe postoperative complications as compared to their non-cancer counterparts.[18] Thus it was recommended that surgery be postponed in patients with stable disease.[18] In general, patients were guided to neoadjuvant therapies where possible. Albeit multifactorial, during the initial phase of the pandemic, our volumes of pancreatic resections did decrease.

As greater experience was gained with the pandemic, statements by the multiple bodies (Society of Surgical Oncology, Society of American Gastrointestinal and Endoscopic Surgeons, European Association of Endoscopic Surgery, European Society of Medical Oncology, American Society of Clinical Oncology, and National Comprehensive Cancer Network) recommended that surgery in these patients should not be considered as an elective procedure given the aggressive nature of disease.[36-41] However, patients with pancreatic cancer are generally older and have comorbidities which increase their risk of severe complications if they develop COVID-19. Therefore, optimal patient selection is key. To address this, high volume surgical centers, including ours, came up with consensus guidelines which for most part represent our modified surgical practices during the pandemic.[42] Firstly, surgery is scheduled as soon as possible for patients who have completed their recommended neoadjuvant therapy. Timely scheduling of these procedures has been challenging since operating rooms are functioning at lower capacities and some of our surgeons have had to be repurposed to support our emergency care teams. If all patients cannot be accommodated assessment of prognostic factors (trends of CA19-9 and radiological response) helps select surgical candidates, while additional systemic therapy is considered for the rest. Secondly, to reduce the risk of postoperative complications and healthcare workers contracting COVID-19, testing is performed on all patients prior to their hospitalization for surgery. If the patient tests positive the procedure is postponed. Rescheduling these patients into an already overbooked schedule becomes very challenging and there is a risk of some patients not receiving timely surgical therapy. Thirdly, preoperative planning is essential in these patients given the complex peripancreatic anatomy. During the pandemic, surgeons have had to rely on suboptimal imaging from outside centers as discussed above. Anecdotally, our surgeons have had to abort cases due to the presence of more extensive local disease than initially anticipated or the presence of metastatic disease that was not appreciated on imaging. While this did happen in the pre-COVID-19 era, in the authors' opinion, the frequency of such events is prone to increase, further stressing the need for adherence to protocols for a PPCT.

Lastly, these procedures are associated with considerable morbidity and recovering from them alone at the hospital, without family around you, can be emotionally challenging. In the most difficult of situations these patients go through tough complications and possibly die alone. In our experience, this is equally challenging and mentally tasking for the surgeons who have had to take over the role of a surrogate family, often spending long hours with individual patients so that they are not alone. Also, there have been instances when the surgeon is the only person on the patient's bedside when they pass away as the family struggles with the situation over a tiny screen on the phone. The mental toll that this pandemic has taken on both the patients and the surgeons cannot be overstated.

In terms of oncological care, the pandemic has also brought its own set of challenges. Important things to consider when administering chemotherapeutics are longitudinal assessment of biomarkers to assess treatment response and evaluating drug toxicities to make appropriate modifications. Now that more patients are receiving therapies locally, the relay of information back to our oncologists can be challenging. Detailed documentation of a patient's treatment and clinical course are required. Often notes from outside centers lack some of the relevant information, making a patient assessment at the PMDC challenging. At times serial assessment of CA19-9 is not performed at appropriate time intervals resulting in a delay in the administration of best possible therapies. As a result, we have recognized the need for detailed documentation and clear communication between oncologists at both institutions. Synoptic reporting could potentially help address these challenges. Furthermore, in the pre-COVID-19 era, medical oncologists at smaller centers were at times

uncomfortable administering these potentially toxic multi-agent therapies. During the pandemic, patients are unable to travel to high-volume centers for frequent administration of chemotherapeutics and therefore the impact of the aforementioned practices has become even more profound. Lastly, the pandemic has effected patient enrollment in trials testing novel therapies as discussed later.

As for radiation therapy, the assessment of patient frailty is of importance. This is compromised when using a telehealth platform. In terms of pancreatic cancer the following need to be considered. Firstly, the pancreas is surrounded by complex vascular structures with tumors often invading them. Review of imaging with patients, in person, allows for radiation oncologists to explain the rationale for administering radiation therapy with respect to the tumor vascular relationship. Since the pandemic patient education, which is essential for the appropriate administration of radiation therapy, has been compromised. Secondly, patient motion during the procedure can put them at risk of injury to the tissue surrounding the pancreas. One of the techniques to mitigate target motion with respiration is the "breath-hold" technique. Patients are asked to hold their breath for a period of time during which the radiation is administered. This requires having the patient breathe through a specific device that tracks the amount of inflow and exflow. The introduction of this device and having the patient practice prior to radiation treatment is helpful, which has become challenging in the remote setting.

Training of Residents and Fellows

Since its introduction, PMDC has offered trainees (residents, clinical fellows, and research postdoctoral fellows) an excellent platform for learning. Firstly, these trainees get an opportunity to practice focused history taking and physical exam, and case presentation to a multidisciplinary team. Secondly, observing the cross-discipline interaction expedites the learning process and instills the benefits of collaborative care. Often providers utilize patient cases to educate trainees on various facets of disease and patient management. Unfortunately, with new virtual meetings, we have noticed that the emphasis on training has decreased substantially. While not intentional, it seems likely that the in-person pre-COVID-19 PMDC provided a more conducive and stimulating environment. Lastly, with social distancing protocols in place, our pathologists find it difficult to accommodate students and trainees in the labs, which limits their training. While the effect of these changes on the field will not be immediate, it would certainly influence patient care in the long run, by effecting training of future healthcare providers. We recommend that faculty take this into account and potentially identify other avenues of teaching that could help overcome these deficiencies.

Research

Clinical trials are critical for the development and introduction of novel management strategies and therapies. However, the COVID-19 pandemic has challenged therapeutic trials globally and largely halted many non-therapeutic trials and research-related procedures.[43] The Food and Drug Administration (FDA) has provided guidance to ensure patient safety amidst the pandemic.[44] Firstly, our multidisciplinary teams would recommend clinical trials to patients who were referred after having failed to respond to traditional therapeutics. Trial enrollment often requires the administration of these therapies at our institution. With more patients receiving therapies locally, patient enrollment in these trials has decreased. While, advantage of these investigational therapies has not been established, patients who could potentially benefit from them currently do not have access to these opportunities. Secondly, remote patient consenting can be challenging requiring restructuring of our research setup. Third, in person conversations between providers and patients deliberating the pros and cons of current management options, provides a conducive atmosphere to generate important research questions worth investigating. On that note, in the past, the multidisciplinary meeting provided an excellent medium for identification of these questions leading to clinical studies and trials that have changed patient care for pancreatic cancer over the last decade. This was always considered to be a big advantage of our traditional PMDC. However, with the current changes, we feel that this aspect of our PMDC is suffering significantly. Lastly, our institution is one the premier centers for translational research on pancreatic cancer, the group has attracted significant funding in form of active direct support and endowments to date.[45] The translational research has indeed been impacted by the COVID-19 pandemic. Initially, our labs had to be shut down completely followed by reopening at limited capacity (tissue acquisition decreased with the reduction in surgical volumes).

Potential Benefits

While the pandemic has had a momentous impact on our current practices, it has also provided us with an opportunity to learn, adapt, and improve. It has become clear that, although challenging, our PMDC can be delivered remotely and is no longer restricted by geographic constraints. Traditionally, patients who could not have had access to care at a high-volume center are now offered this opportunity without the financial and physical burden of traveling. However, this is limited by the licensing policies, with providers required to expedite licensing in other states, to continue seeing these patients. In addition, providers who are traveling, or providing care at multiple hospitals can now participate in PMDC remotely. Furthermore, in terms of research, remote consenting for research might result in fluent patient consenting and saving time and effort for the research staff which can then be dedicated to other research activities. This will require us to readapt and modify current practices, however, could prove useful in the future.

In conclusion, the pandemic has unquestionably changed the way we practice medicine, especially in the multidisciplinary setting. Physicians of all specialties have been impacted to various degrees. However, this collective experience has provided us with a learning opportunity to change and improve on how we do things and become more effective in making world-class healthcare accessible to a broader patient population. It has led us to identify potential shortcomings in the system such as the need for strict adherence to imaging protocols for PPCT. Even once this pandemic is behind us, new norms will persist that can improve how we provide patient care if we are mindful of the pitfalls and appreciate the potential benefits of adopting this new approach. We anticipate a certain hybrid model for multidisciplinary clinics as a means to provide accessible world-class healthcare for patients who require complex oncologic management for pancreatic cancer.

References

1. Atlanta: American Cancer Society. American Cancer Society. Cancer Facts & Figures 2021.
2. Chari ST, Kelly K, Hollingsworth MA, et al. Early detection of sporadic pancreatic cancer. Pancreas 2015;44:693–712.
3. Rahib L, Smith BD, Aizenberg R, et al. Projecting cancer incidence and deaths to 2030: the unexpected burden of thyroid, liver, and pancreas cancers in the United States. Cancer Res 2014;74:2913–21.
4. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. CA Cancer J Clin 2020;70:7–30.
5. Hruban RH, Gaida MM, Thompson E, et al. Why is pancreatic cancer so deadly? The pathologist's view. J Pathol 2019;248:131–41.
6. Wolfgang CL, Herman JM, Laheru DA, et al. Recent progress in pancreatic cancer. CA Cancer J Clin 2013;63:318–48.
7. Pawlik TM, Laheru D, Hruban RH, et al. Evaluating the impact of a single-day multidisciplinary clinic on the management of pancreatic cancer. Ann Surg Oncol 2008;15:2081–8.

8. Javed AA, Wright MJ, Siddique A, et al. Outcome of patients with borderline resectable pancreatic cancer in the contemporary era of neoadjuvant chemotherapy. J Gastrointest Surg 2019;23:112–21.
9. Gemenetzis G, Groot VP, Blair AB, et al. Survival in locally advanced pancreatic cancer after neoadjuvant therapy and surgical resection. Ann Surg 2019;270:340–7.
10. Janssen QP, Buettner S, Suker M, et al. Neoadjuvant FOLFIRINOX in patients with borderline resectable pancreatic cancer: a systematic review and patient-level meta-analysis. J Natl Cancer Inst 2019;111:782–94.
11. Herbst B, Zheng L. Precision medicine in pancreatic cancer: treating every patient as an exception. Lancet Gastroenterol Hepatol 2019;4:805–10.
12. Chang JH, Vines E, Bertsch H, et al. The impact of a multidisciplinary breast cancer center on recommendations for patient management: the University of Pennsylvania experience. Cancer 2001;91:1231–7.
13. Newman EA, Guest AB, Helvie MA, et al. Changes in surgical management resulting from case review at a breast cancer multidisciplinary tumor board. Cancer 2006;107:2346–51.
14. Rubin R. COVID-19's crushing effects on medical practices, some of which might not survive. JAMA 2020;324:321–3.
15. Wosik J, Clowse MEB, Overton R, et al. Impact of the COVID-19 pandemic on patterns of outpatient cardiovascular care. Am Heart J 2021;231:1–5.
16. Al-Jabir A, Kerwan A, Nicola M, et al. Impact of the Coronavirus (COVID-19) pandemic on surgical practice - Part 1. Int J Surg 2020;79:168–79.
17. Al-Jabir A, Kerwan A, Nicola M, et al. Impact of the Coronavirus (COVID-19) pandemic on surgical practice - Part 2 (surgical prioritisation). Int J Surg 2020;79:233–48.
18. Liang W, Guan W, Chen R, et al. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. Lancet Oncol 2020;21:335–7.
19. The Impact of COVID-19 on Outpatient Visits in 2020: Visits Remained Stable, Despite a late surge in cases: Available at: https://www.commonwealthfund.org/publications/2021/feb/impact-covid-19-outpatient-visits-2020-visits-stable-despite-late-surge. Accessed March 17, 2021.
20. Li X, Krumholz HM, Yip W, et al. Quality of primary health care in China: challenges and recommendations. Lancet 2020;395:1802–12.
21. Kang JJ, Wong RJ, Sherman EJ, et al. The 3 B's of cancer care amid the COVID-19 pandemic crisis: "Be safe, be smart, be kind"—A multidisciplinary approach increasing the use of radiation and embracing telemedicine for head and neck cancer. Cancer 2020, https://doi.org/10.1002/cncr.33031. Epub ahead of print.
22. Schade E.C., Elkaddoum R., Kourie H.R. The psychological challenges for oncological patients in times of COVID-19 pandemic: telemedicine, a solution?*Future Oncol* DOI: 10.2217/fon-2020-0552.
23. Dalal NV. Social issues faced by cancer patients during the coronavirus (COVID-19) pandemic. Cancer Res, Stats, Treat 2020;3:141.
24. Wang H, Zhang L. Risk of COVID-19 for patients with cancer. Lancet Oncol 2020;21:e181.
25. Al-Hawary MM, Francis IR, Chari ST, et al. Pancreatic ductal adenocarcinoma radiology reporting template: consensus statement of the society of abdominal radiology and the american pancreatic association. Gastroenterology 2014;146:291–304. e1.
26. Chu LC, Johnson PT, Fishman EK. Cinematic rendering of pancreatic neoplasms: preliminary observations and opportunities. Abdom Radiol (NY) 2018;43:3009–15.
27. Kinny-Köster B, van Oosten F, Habib JR, et al. Mesoportal bypass, interposition graft, and mesocaval shunt: surgical strategies to overcome superior mesenteric vein involvement in pancreatic cancer. Surgery 2020;168:1048–55.
28. Habib JR, Kinny-Köster B, van Oosten F, et al. Periadventitial dissection of the superior mesenteric artery for locally advanced pancreatic cancer: surgical planning with the "halo sign" and "string sign. Surgery, 6; 2020. Epub ahead of print October, https://doi.org/10.1016/j.surg.2020.08.031.
29. Brindle ME, Gawande A. Managing COVID-19 in surgical systems. Ann Surg 2020;272:e1–2.
30. Global guidance for surgical care during the COVID-19 pandemic. Br J Surg 2020;107:1097–103.
31. Cummings MJ, Baldwin MR, Abrams D, et al. Epidemiology, clinical course, and outcomes of critically ill adults with COVID-19 in New York City: a prospective cohort study. Lancet 2020;395:1763–70.
32. Wong J, Goh QY, Tan Z, et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. Can J Anaesth 2020;67(6):1–14.
33. Tao KX, Zhang BX, Zhang P, et al. [Recommendations for general surgery clinical practice in novel coronavirus pneumonia situation]. Zhonghua Wai Ke Za Zhi 2020;58:E001.
34. CDC. Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. Available from: https://www.cdc.gov/coronavirus/2019-ncov/index.html. 2020. Accessed March 15, 2021.
35. Joint Statement: Roadmap for maintaining essential surgery during COVID-19 pandemic (Nov. 23, 2020) Available at: https://www.facs.org/covid-19/clinical-guidance/nov2020-roadmap. Accessed March 15, 2021.
36. Cinar P, Kubal T, Freifeld A, et al. Safety at the Time of the COVID-19 pandemic: how to keep our oncology patients and healthcare workers safe. J Natl Compr Canc Netw 2020:1–6, https://doi.org/10.6004/jnccn.2020.7572.
37. ASCO Coronavirus Resources. *ASCO*. Available at: https://www.asco.org/asco-coronavirus-information. 2020. Accessed March 15, 2021.
38. ESMO. Cancer patient management during the COVID-19 pandemic. Available at: https://www.esmo.org/guidelines/cancer-patient-management-during-the-covid-19-pandemic. Accessed March 15, 2021.
39. Pawlik TM, Tyler DS, Sumer B, et al. COVID-19 pandemic and surgical oncology: preserving the academic mission. Ann Surg Oncol 2020;27:2591–9.
40. SAGES and EAES Recommendations Regarding Surgical Response to COVID-19 Crisis - SAGES Available at: https://www.sages.org/recommendations-surgical-response-covid-19/. Accessed March 18, 2021.
41. GI-and-HPB-Resource-during-COVID-19-3.30.20.pdf Available at: https://www.surgonc.org/wp-content/uploads/2020/03/GI-and-HPB-Resource-during-COVID-19-3.30.20.pdf. Accessed March 18, 2021.
42. Oba A, Stoop TF, Löhr M, et al. Global survey on pancreatic surgery during the COVID-19 pandemic. Ann Surg 2020;272:e87–93.
43. Gosain R, Abdou Y, Singh A, et al. COVID-19 and cancer: a comprehensive review. Curr Oncol Rep 2020;22:53.
44. Research C for DE and. FDA Guidance on conduct of clinical trials of medical products during the COVID-19 public health emergency. U.S. Food and Drug Administration. Available at: https://www.fda.gov/regulatory-information/search-fda-guidance-documents/fda-guidance-conduct-clinical-trials-medical-products-during-covid-19-public-health-emergency. 2021. Accessed March 15, 2021.
45. Javed AA, Wolfgang CL. State of the John L. Cameron, MD division of hepatobiliary and pancreatic surgery "The Program That John Cameron Built. Ann Surg 2018;267:S45–51.