

## **Impact of the early phase of the COVID pandemic on cancer treatment delivery and the quality of cancer care: a scoping review and conceptual model**

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## **Impact of the early phase of the COVID pandemic on cancer treatment delivery and the quality of cancer care: a scoping review and conceptual model**

### **ABSTRACT**

**Background:** The disruption of health services due coronavirus disease (COVID) is expected to dramatically alter cancer care; however, the implications for care quality and outcomes remain poorly understood. We undertook a scoping review to evaluate what is known in the literature about how cancer treatment has been modified as a result of the COVID pandemic in patients receiving treatment for solid tumours, and what domains of quality of care are most impacted.

**Methods:** Citations were retrieved from MEDLINE and EMBASE (1 Jan 2019 to 28 Oct 2020), utilizing search terms grouped by key concept (oncology, treatment, treatment modifications and COVID). Articles were excluded if they dealt exclusively with management of COVID-positive patients, modifications to cancer screening, diagnosis or supportive care, or were not in English. Articles reporting on guidelines, consensus statements, recommendations, literature reviews, simulations or predictive models, or opinions in the absence of accompanying information on experience with treatment modifications in practice were excluded. Treatment modifications derived from the literature were stratified by modality (surgery, systemic therapy and radiotherapy) and thematically grouped. To understand what areas of quality were most impacted, modifications were mapped against the Institute of Medicine's quality domains. Where reported, barriers and facilitators were abstracted and thematically grouped to understand drivers of treatment modifications. Findings were synthesized into a logic model to conceptualize the inter-relationships between different modifications, as well as their downstream impacts on outcomes.

**Results:** In the 87 retained articles, reductions in outpatients visits (26.4%), and delays/deferrals were commonly reported across all treatment modalities (surgery: 50%; systemic therapy: 55.8%; radiotherapy: 56.7%); as were reductions in surgical capacity (57.1%), alternate systemic regimens with longer treatment intervals or use of oral agents (19.2%), and the use of hypofractionated radiotherapy regimens (40.0%). Delivery of effective, timely and equitable

care were the quality domains found to be most impacted. The most commonly reported facilitator of maintaining cancer care delivery levels was the shift to virtual models of care (62.1%), while patient-initiated deferrals and cancellations (34.8%), often due to fear of contracting COVID (60.9%), was a commonly reported barrier.

**Conclusions:** As it will take a considerable amount of time for the cancer system to resume capacity and adjust models of care in response to the pandemic, these treatment delays and modifications will likely be prolonged, and will negatively impact quality of care and patient outcomes.

**Keywords:** COVID, coronavirus, quality of care, treatment modifications, cancer, conceptual model

## INTRODUCTION

Beyond the devastating effect of Coronavirus Disease 2019 (COVID) infection itself,[1-3] the broader disruption of health services is expected to dramatically alter cancer care.[4-6] Numerous guidelines for treatment modification have been published, aimed at reducing in-person visits, and mitigating potential issues with staff and resource shortages.[6-8] Proposed changes include the use of oral over intravenous therapies, alternate modalities (surgery vs chemo-radiation) and virtual care, modification of dosing schedules, and prioritization of curative intent treatments.[8-11] However, it remains unclear which treatment modifications have been implemented into practice, and to what extent quality of care has been impacted globally. As it will take a considerable time to resume full capacity following the pandemic, it is highly probable that treatment delays and modifications will be prolonged, and may negatively affect patient outcomes.[9,12] Following disruptions to cancer care during Hurricane Katrina, the 10-year mortality among survivors diagnosed with breast, lung, or colon cancer within six months of the hurricane was higher relative to case-matched controls from other jurisdictions during the same time period.[13] Emerging models predict 20% excess mortality in the oncology population as a result of delays in diagnosis and treatment during this pandemic.[14]

To further understand the impact the COVID pandemic has had thus far on cancer care we undertook a scoping review guided by the question “how cancer treatment has been modified as a result of the COVID pandemic in patients receiving treatment for solid tumours, and what domains of quality of care are most impacted?”. A scoping review was utilized as the study focuses on the initial wave of the pandemic so there is no existing comprehensive review on the topic[15] and the broad scope of retained studies (methods and study design) makes formal meta-analysis not feasible.[16,17] Findings were synthesized in a logic model to conceptualize the inter-relationship between care modifications and potential downstream outcomes. We also evaluated barriers and facilitators driving changes in care.

## **METHODS**

### ***Data Sources***

Citations from 1 Jan 2019 to 28 Oct 2020 were retrieved from MEDLINE and EMBASE.[18] Search terms were grouped by key concept (oncology, treatment, treatment modifications and COVID); syntax and subject headings were translated as appropriate for the included databases (**Online Supplementary File 1**). Resulting citations were imported into Covidence (Veritas Health Innovation; Melbourne, Australia) and duplicates were removed. The study was carried out according to the PRISMA guideline extension for scoping reviews.[19]

### ***Study Selection and Abstraction***

Titles and abstracts were screened for relevance by two reviewers (MP, CMD). Full text articles were reviewed for inclusion by two reviewers (MP, and CMD or SH); any questions regarding eligibility for inclusion and conflicts were discussed, if study eligibility was unclear, a consensus decision was made with the third reviewer. The population of interest was patients diagnosed with solid tumour cancers accessing or receiving treatment with surgery, radiotherapy or

systemic therapy (ST). Articles were excluded if they dealt exclusively with management of COVID-positive patients, cancer screening, diagnosis or supportive care, or were not in English. As such, articles reporting on guidelines, consensus statements, recommendations, literature reviews, simulations or predictive models, or opinions in the absence of accompanying information on experience with treatment modifications in practice were excluded. Data was extracted using a study-specific electronic abstraction form in Covidence by one reviewer (CMD or SH). A second reviewer (MP) extracted data from a random sample of 25% articles to evaluate the reliability of the data abstraction process; there were no discrepancies between reviewers.

### *Analysis*

Treatment modifications were grouped by treatment modality (surgery, systemic therapy or radiotherapy) and thematically categorized; modifications spanning the three treatment modalities were deemed “overall.” The proportion of articles reporting a modification out of the number of articles reporting on the modality was calculated (overall: 87, surgery: 56, ST: 52, radiotherapy: 30). Modifications were mapped to the Institute of Medicine’s six domains of quality framework (safe, effective, patient-centred, timely, efficient, equitable) to evaluate which aspects of quality of care were most impacted utilizing the existing domain definitions and example quality measures through consensus by two authors (MP, MKK).[20] To understand potential drivers of the observed treatment modifications barriers and facilitators to maintaining care delivery were thematically categorized. A logic model [21-22] was utilized to synthesize findings and conceptualize the inter-relationship between reported modifications to care, and downstream outcomes likely to be impacted. Inputs included barriers to maintaining care; change activities were those primary mitigation strategies that had been implemented by the cancer centres. Downstream modifications to treatment resulting from these inputs and change activities were categorized as early, intermediate and late outcomes.

## **RESULTS**

## Literature Description

The search returned 464 articles (211 MEDLINE, 252 EMBASE), including 107 duplicates; 357 unique titles and abstracts were screened for relevance (**Figure 1**). In the 87 retained papers (**Online Supplementary File 2**), data collection through chart abstraction and registry data (35.6%, 31/87), or clinician survey (27.6%; 24/87) were common, as was the reporting of clinician opinions (19.5%; 17/87; **Table 1**); sample size ranged widely (chart abstraction/ registry studies: 12-8397; clinician surveys: 11-2494; patient surveys: 33-5302). The majority reported on modifications in Europe (35.6%; 31/87) or Asia (25.3%; 22/87), in patients with genitourinary cancers (14.9%; 13/87) or across multiple disease sites (37.9%; 33/87). Of the studies that utilized a comparator (23.0%; 20/87), the same period in the previous year (55%; 11/20) or the period just prior to the pandemic (40.0%; 8/20) were the most common comparators. Most articles focused on modifications to surgery (64.4%; 56/87) or ST (59.8%; 52/87) either alone or in combination with other treatment modalities, while fewer discussed modifications to radiotherapy (34.5%; 30/87).

## Treatment Modifications

### *Overall*

Twenty eight unique treatment modifications were reported; the most prevalent modifications, common to all three treatment modalities (**Table 2**) were the reduction of in-person care through the utilization of remote or virtual care (46.0%; 40/87) and reduction in outpatient visits (26.4%; 23/87) - both new patient consultations (24.1%; 21/87) and follow-up visits (14.9%; 13/87). While delays or deferrals of tests and imaging were reported (13.8%; 12/87), one article cited improved wait times for imaging due to the overall reduction in outpatients.[23] The majority of articles reported delays and deferrals, across all three modalities (surgery: 50%; 28/56, ST: 55.8%; 29/52, radiotherapy: 56.7%; 17/30). The length of delay or deferral reported varied by treatment modality, wherein surgery (3.2 days to 6 months) and radiotherapy (>14 days to 5 months) experienced the longest delays, while ST delays were comparatively shorter (1.9 days to 36.7 days). Decisions to modify treatment were reportedly influenced by treatment intent, age, comorbidities, and frailty or performance status.

### ***Surgery***

Capacity reduction (57.1%; 32/56) was the most commonly reported modification to surgical care, ranging from cancelling procedures (7.1%; 4/86) and restricting surgeries to emergencies or patients at high risk of progression (26.5%; 15/56) to full suspension of surgery (12.5%; 7/56). Paradoxically, two articles from Italy reported increased surgical volumes due to prioritization of oncological procedures for high risk disease and cancellation of non-cancer electives.[24-25] The number of radical procedures (7.1%; 4/56) was reduced, and a shift to open rather than laparoscopic surgery was reported (12.5%; 7/56) to reduce aerosol generation.[26-27] Conversely, 2 articles reported that the use of minimally invasive techniques such as laparoscopy had increased to reduce post-operative complications and length of hospital stays.[28-29] Few articles discussed the utilization of ST and/or radiotherapy (17.9%; 10/56), or hormonal therapy (5.4%; 3/56) as an alternative to surgery, and only one article specifically addressed the impact of surgical restrictions on the other services, citing increased stress given the concurrent capacity reductions in ST and radiotherapy.[30]

### ***Systemic Therapy (ST)***

Cancellations and reductions in treatment capacity were less commonly reported for ST than surgery (13.5% vs 57.1%). Delayed ST cycles (19.2%; 10/52) and discontinuation of ongoing regimens (15.4%; 8/52) were reported. Treatment schedule modifications (19.2%; 10/52) included increasing the interval between infusions for dose dense regimens to every three weeks or hormonal agents to every 3 months (17.3%; 9/52), or decreasing infusion time (1.9%; 1/52). Alternate regimens (21.2%; 11/52) with longer intervals between treatments (11.5%; 7/52) or hormonal agents (7.7%; 4/52) were favoured over dose-dense regimens, and oral drugs over intravenous (17.3%; 9/52). Few articles reported using lower intensity regimens (5.8%; 3/52) or dose reductions (3.8%; 2/52) to reduce potential toxicities. [31-34]. Only one article reported increased prophylactic use of granulocyte colony stimulating factors,[35] likely reflecting the lack of consensus regarding their use, and the shift to utilization of less toxic regimens.

### ***Radiotherapy***

Reduced radiotherapy capacity (33.3%; 10/30), ranging from fewer treatment slots (16.7%; 5/30) to a full shut-down (6.7%; 2/30) and hypofractionation were common (40%; 12/30). Conversely, one article indicated that radiotherapy had increased relative to the year prior due to the centralization of treatments in cancer hubs.[36] Suspension of concurrent ST-radiotherapy in favour of radiotherapy alone was also reported.[31,37] Discontinuation of radiotherapy for ongoing patients (3.3%; 1/30) more infrequent than for patients treated with ST.

### **Impact on Quality of Care**

All six quality domains[20] were impacted in some way by the reported treatment modifications; delivery of effective, timely and equitable care were the quality domains found to be most impacted (**Table 2**). Effectiveness (78.6%; 22/28) has been impacted as dose or frequency modifications of evidence-based ST and radiotherapy regimens have been implemented, coupled with resequencing of modalities to compensate for surgical shut downs. Due to widespread delays and deferrals, delivery of efficient (42.9%; 12/28) and timely (64.3%; 18/28) treatment have been impacted. Suspension of face-to-face care has the potential to impact the provision of patient-centred (42.9%; 12/28) and equitable (64.3%; 18/28) care particularly for subgroups without the technological resources to utilize virtual care, or those without access to translators. Cancellation or discontinuation of treatment for advanced disease, prioritization of curative intent treatments, and reductions in new patients have significant ramifications for equity as they are likely to disproportionately impact subgroups who experience delayed access to screening and higher stage at diagnosis under non-pandemic conditions. Mid-course discontinuation of radiotherapy and ST, coupled with outpatient clinic closures, pose consequences for provision of safe care (60.7%; 17/28), as latent treatment-related toxicities may go without timely diagnosis and management.



## Barriers and Facilitators

Barriers and facilitators to maintaining cancer care were reported by 66 articles. Implementation of remote care was reported as a major facilitator (**Figure 2**); telephone or video were most common (82.9%; 34/41); though email or mobile applications (Viber[38] or Whatsapp[39]) were also reported. Low and middle income countries which may lack the technology and infrastructure to deliver care remotely, reported significant reductions in care.[40-43] Additional facilitators included the organization of “COVID-free” hubs[36,44-47] and separated clinical teams[37,48] to minimize cross-contamination in areas with high infection rates.

Travel bans were cited as a significant barrier to patients and providers accessing centres, due to traffic issues and reduced access to public transportation, as well as medication[42-43,49-50] and blood product[32,51-53] shortages. Institutions were faced with increased costs of diagnosis and treatment associated with the additional infection control measures implemented,[31,43,54-55] as well as reduced revenue from decreased caseloads[42] and fundraising opportunities.[33] Patients faced added treatment costs from purchasing medications that they would have otherwise received in hospital,[49,56] or from facing economic hardships leading to treatment abandonment.[32] Lack of resources, including human resources due to infection and redeployment (16.7%; 11/66), appropriate equipment or technology due to insufficient infrastructure or redeployment of ventilators and imaging equipment to the diagnosis and treatment of COVID patients (19.7%; 13/66), insufficient hospital bed or ICU capacity (15.1%; 10/66), and access to appropriate personal protective equipment (PPE), was cited as a major barrier. One in three articles indicated that modifications, including delays and cancellations, were patient-initiated (34.8%; 23/66), out of a fear of contracting COVID at appointments or during post-treatment recovery due to immunosuppression (60.9%; 14/23).

## DISCUSSION

### ***Statement of Principal Findings***

While some modifications to cancer care have been implemented to specifically facilitate COVID care delivery, such as reducing the number of scheduled surgical resections to decrease the need for ICU capacity and ventilators, other treatment modifications are downstream effects, such as the increased use of neoadjuvant chemotherapy as a result of increased interval from diagnosis to surgery (**Figure 3**). Understanding the complex inter-relationships between treatment modifications as well as their downstream outcomes is necessary as we enter the next phases of the pandemic and beyond. Delivery of effective, timely and equitable care were the quality domains found to be most impacted. As it will take a considerable amount of time for the cancer system to resume capacity and adjust models of care in response to the pandemic, it is highly probable that the reported treatment delays and modifications will be prolonged, and will negatively impact quality of care and patient outcomes. Dosing and frequency modifications to evidence-based regimens, and untested resequencing of modalities have the potential to significantly impact the treatment effectiveness. Some modifications may be more appropriate than others; however, without evidence, their impact on disease outcomes are difficult to ascertain.

### ***Interpretation within the Context of the Wider Literature***

Our findings are consistent with published recommendations<sup>[55]</sup>; reductions in outpatients visits (26.4%), and delays and deferrals were reported across all three modalities (surgery: 50%; ST: 53.8%; radiotherapy: 56.7%), as were reductions in surgical capacity (57.1%), favouring alternate ST regimens with longer treatment intervals or use of oral agents (21.2%), and the use of hypofractionated radiotherapy (40.0%). However, the majority of published recommendations were consensus-derived and thus there is a high potential for negative impact given there is little evidence from similar healthcare disruptions in modern times. While the implemented modifications helped maintain care during the early phase of the pandemic, continued resource constraints coupled with ongoing care deferral present significant challenges going forward as many aspects of cancer care cannot be safely delayed without implications for prognosis or quality of life. It was anticipated that a reduction in radical surgery, surgical delays and cancellations would drive the use of ST and radiotherapy as alternate treatments

(17.9%), though few articles addressed this shift. Coupled with delays and discontinuations of ST and radiotherapy, this raises concerns about the potential impact on prognosis, as well as the future economic and resource burden to the health care system[31,43,54-55] associated with providing more intensive treatment to advanced cases that may have been curable if timely treatment had been available.[58-60]

### ***Implications for Policy, Practice and Research***

Cancellation or discontinuation of treatment for incurable disease (5.7%), prioritization of curative intent treatments (16.1%), and reductions in new patients (24.1%) have significant ramifications for equity, given that this is likely to disproportionately impact patients who have difficulty accessing care under normal conditions and are more likely to present with advanced disease at diagnosis.[61] While the shift to virtual care has been widespread (46.0%), it highlights the widening gap for patients with low literacy, language, or socioeconomic status who may lack the skills or resources to adequately access virtual care. Given the high prevalence of COVID in some low and middle income countries, they stand to benefit most from remote care delivery, but lack the infrastructure to implement it.[40-43] Additionally, little is currently known about the impact of virtual delivery of care on cancer patients' experience or outcomes.

### ***Strengths and Limitations***

The study scope did not look at issues of screening and cancer diagnosis, management of treatment-related adverse events or provision of follow-up care, which are likely to also be impacted, and have detrimental downstream impacts on the cancer care system.[62] We sought to understand what changes to cancer treatment delivery had been implemented during the early phase of the COVID pandemic. As such, we did not evaluate whether the observed modifications to treatment were guideline concordant; this is a potential area for future research. While our findings provide an understanding of the broader changes to treatment during the pandemic, the strength of the evidence is poor given the majority of observed modifications were derived from anecdotal evidence shared by patients

and providers through cross-sectional surveys (patients: 10.3%; clinicians: 31.0%) or opinion pieces (19.5%). Given the current body of evidence, it is difficult to ascertain whether treatment modifications were systematic, if there is significant provider-level variation in practice, and to what extent modifications to care were driven by mandate or patient preferences. It is difficult to quantify the impact of the pandemic on care modification as, of the studies reporting primary data from chart review or registries (35.6%), only approximately half (51.6%) included a comparator. Additionally, as the pandemic is ongoing and our findings include relevant citations from 2019 to October 2020, we do not have a full picture of the implications for the provision of cancer care. Analyses of administrative data, once available, may provide a more comprehensive look at the impact on patterns of cancer treatment delivery. However, given the reported prevalence of patient-initiated delays and cancellations, it will be important to take into account drivers of care modifications in planned analyses.

Few studies reported on patient-level factors, such as treatment intent, age, comorbidities, frailty or performance status, associated with modifications. However, none of the articles included a comprehensive analysis of demographic or clinical characteristics associated with treatment modifications, or evaluated the impact on outcomes. Additionally, none of the articles evaluated modifications against the local need for COVID care despite the geographical variability in severity of the pandemic and degree of responsiveness. As such, there is an urgent need to quantify the impact of COVID-related changes on key processes of cancer care and early outcomes, and to identify patient groups that may be at higher risk of negative consequences. To date, reported modifications focus on inputs and change activities; conceptual maps such as ours are important tools for developing comprehensive measurement frameworks aimed at quantifying the impacts on the quality of cancer care delivery and patient outcomes.

### ***Conclusions***

The COVID pandemic has had substantial impact on cancer care delivery thus far. Understanding which components of care are most affected can help identify the most vulnerable aspects during a crisis, which can facilitate mitigation plans in the current pandemic and during similar disruptions to care in the future.

Future research should focus beyond these change activities and their associated early outcomes, towards understanding the future economic and resource implications for the healthcare system. **DISCLOSURES:**

**Author's Contributions:** Conception or design (MP, MKK, SS, SA), data collection and analysis (MP, SH, CMD), interpretation (MP, MKK, SS, SA), drafting or critically revising content (MP, CMD, SH, SS, SA, MKK), providing final approval (MP, CMD, SH, SS, SA, MKK), and accountability for content accuracy and integrity (MP, CMD, SH, SS, SA, MKK).

**Ethics:** Ethics board approval was not required as the study is a literature review.

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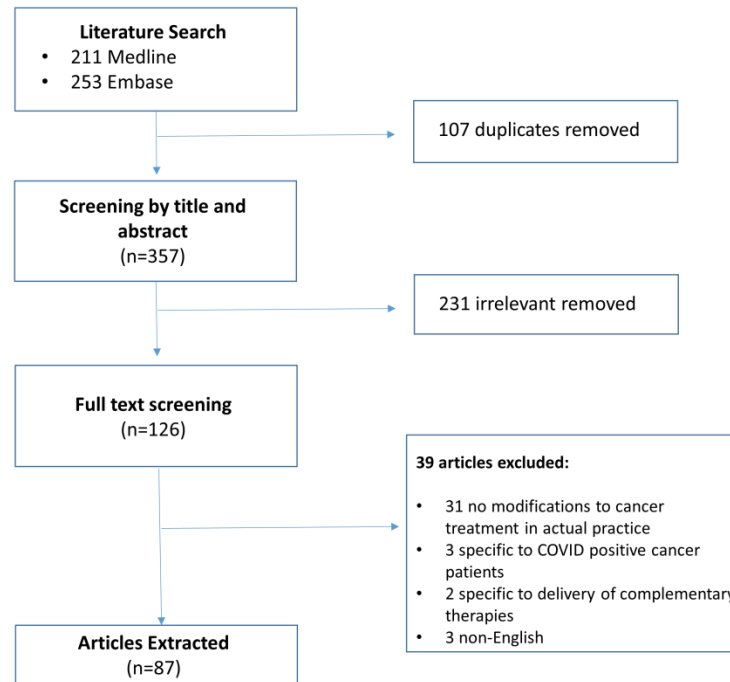
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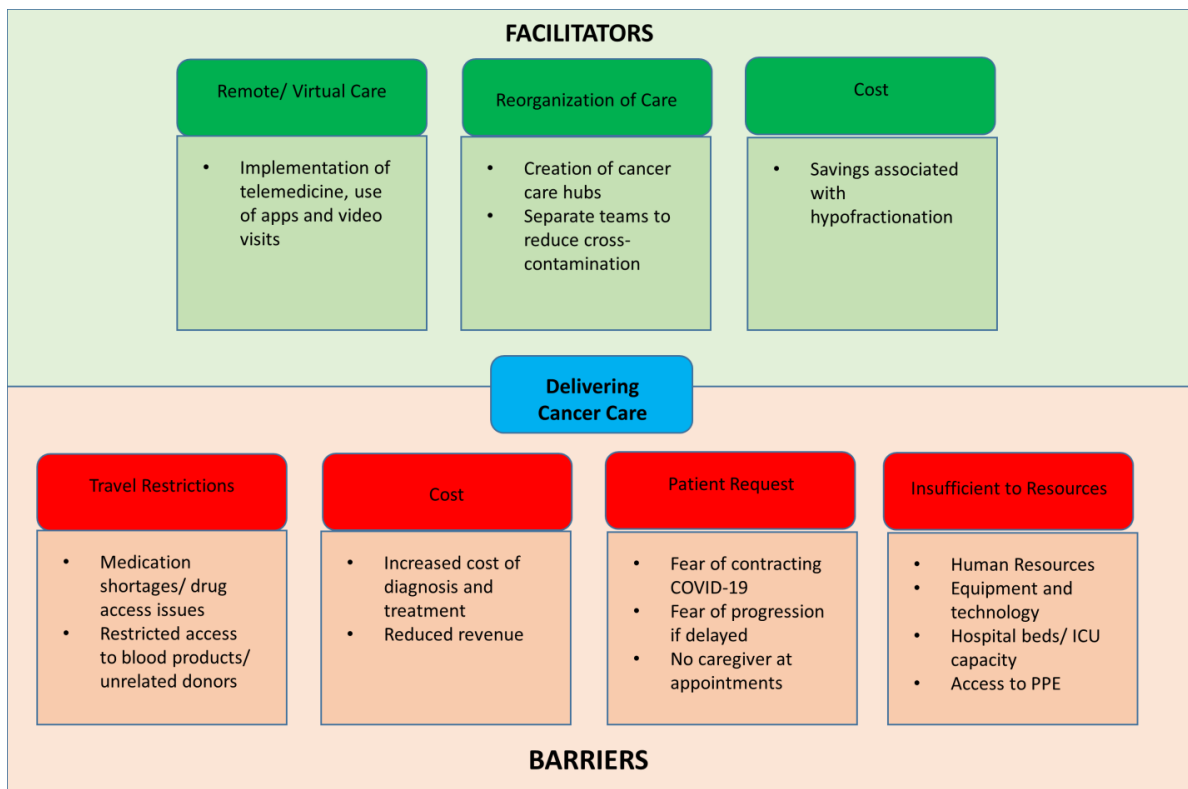
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**FIGURE LEGENDS:**

**Figure 1.** PRISMA diagram

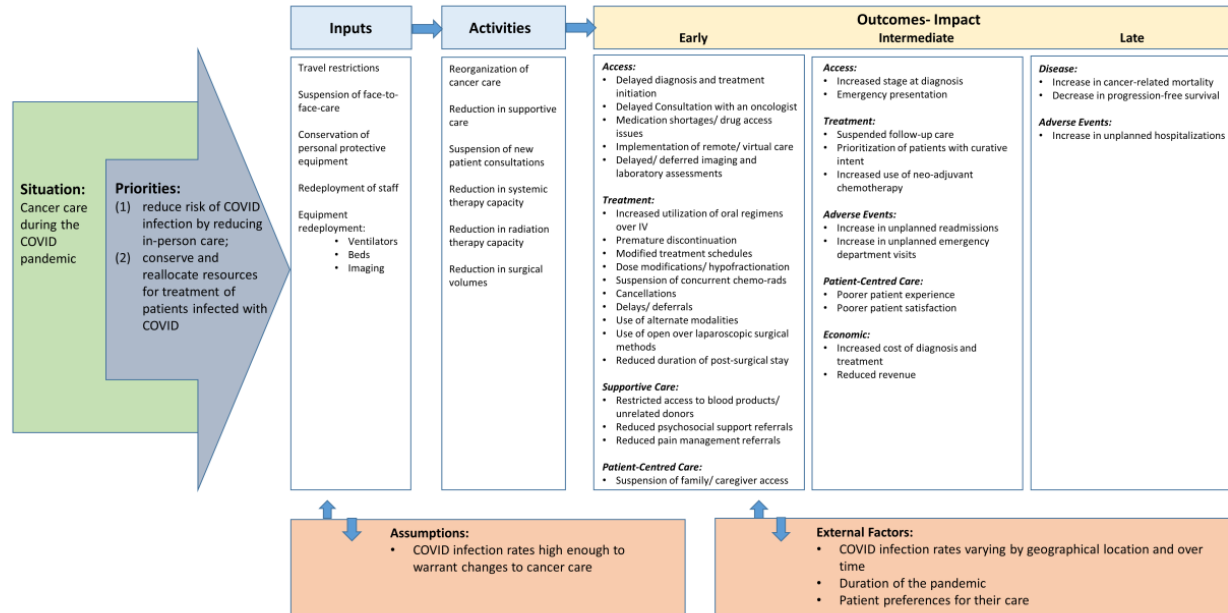


**Figure 2.** Summary of major barriers and facilitators to maintaining cancer care during the COVID-19 pandemic where reported (n=66 articles)



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**Figure 3.** Conceptual map of the potential impact of cancer care modifications during the COVID-19 pandemic on early, intermediate and late outcomes



**Table 1.** Description of Retained Articles

Characteristic		Retained Articles , n=87 n(%)
<b>Article Type</b>	Original Article	57 (65.5)
	Brief Report	4 (4.6)
	Abstract Only	4 (4.6)
	Commentary	8 (9.2)
	Letter/ Letter to the Editor	12 (13.8)
	Review/ critical review	2 (2.3)
<b>Disease Site</b>	Breast	5 (5.7)
	Colorectal	8 (9.2)
	GI	3 (3.4)
	GU	13 (14.9)
	Head and Neck	7 (8.0)
	Gynecology	5 (5.7)
	Lung	3 (3.4)
	Other	8 (9.2)
	Multiple	33 (37.9)
	Not Specified	2 (2.3)
<b>Region</b>	North America	15 (17.2)
	Europe	31 (35.6)
	Asia	22 (25.3)
	Middle East and Africa	5 (5.7)
	South and Central America	2 (2.3)
	Multiple	12 (13.8)
<b>Number of Cancer Centres</b>	Single	43 (49.4)
	Multiple	43 (49.4)
	Unknown	1 (1.1)
<b>Study Type</b>	Chart review/ registry	31 (35.6)
	Clinician Survey	
	<i>Online</i>	24 (27.6)
	<i>Unknown</i>	3 (3.4)
	Patient Survey	
	<i>Online</i>	7 (8.0)
	<i>Paper</i>	2 (2.3)
	Opinion	17 (19.5)
Other	4 (4.6)	
<b>Comparative</b>	Yes	20 (23.0)

	No	67 (77.0)
<b>Treatment Modality</b>	Surgery (Sx)	27 (31.0)
	Systemic therapy (ST)	20 (23.0)
	Radiotherapy (RT)	8 (9.2)
	Multiple	
	<i>Sx + ST</i>	10 (11.5)
	<i>RT + ST</i>	3 (3.4)
	<i>Sx + RT + ST</i>	19 (21.8)

GI= gastrointestinal; GU= genitourinary; Sx= surgery, RT= radiotherapy; ST= systemic therapy

**Table 2.** Cancer treatment modifications (n=28) mapped to the Institute of Medicine six domains of quality. Highlighted rows indicate treatment modifications with potential positive impact on care or where no change was reported.

Modality	Category	Reported Treatment Modifications	Number of Articles Reporting (%)	Quality Domain						
				Safe	Effective	Patient-Centred	Timely	Efficient	Equitable	
<b>Overall (87 articles)</b>	Appointments	Increased utilization of remote or virtual care	40 (46.0)		X		X	X		X
		Reduced outpatient visits	23 (26.4)		X		X	X		X
		<i>Reduction in number</i>	13 (14.9)							
		<i>Suspension of outpatient care</i>	6 (6.9)							
		<i>Delayed appointments</i>	4 (4.6)							
		Reduced new patients*	21 (24.1)			X	X	X	X	X
		<i>Reduction in new patients</i>	9 (10.3)							
	<i>Urgent new consults only</i>	5 (5.7)								
	<i>Deferral of new patients</i>	5 (5.7)								
	<i>Suspension of new patient consults</i>	3 (3.4)								
	<i>Prioritization of curative intent</i>	14 (16.1)					X	X	X	
	Appointments	Reduced follow-ups	13 (14.9)		X	X	X	X		X
<i>Deferral of follow-ups</i>		11 (12.6)								
<i>Suspension of follow-ups</i>		2 (2.3)								
Appointments	No change	6 (6.9)								
	<i>No change to outpatient care</i>	4 (4.6)								
<i>New patients maintained</i>	2 (2.3)									
Labs and Imaging	Delayed labs/ imaging	12 (13.8)		X	X		X			
	Improved imaging wait times	1 (1.1)								
Supportive Care	Switch to supportive care only for palliative/ incurable disease	5 (5.7)				X	X	X	X	
	Reduced access to supportive care	4 (4.6)			X	X			X	
	Increased prophylactic use of granulocyte	1 (1.1)								



		colony stimulating factors									
<b>Surgery (56 articles)</b>	Capacity	Reduced capacity* <i>Reduction in number of surgeries</i> <i>Restricted to emergency, high risk or symptomatic patients</i> <i>Suspension of surgery</i> <i>Cancellations</i> <i>Palliative surgeries not done</i>	32 (57.1)	15 (26.8) 12 (21.4) 7 (12.5) 4 (7.1) 2 (3.6)		X		X		X	
		Delays/ deferrals	28 (50.0)		X	X		X		X	
		Increased number of cancer surgeries	2 (3.6)								
	Alternate treatment modalities	Switch to Alternate Modality <i>Use systemic therapy or radiotherapy instead</i> <i>Use hormonal therapy instead</i>	13 (23.2)	10 (17.9) 3 (5.4)	X	X	X		X	X	
		Type of Surgical Procedure	Reduction in radical procedures	4(7.1)			X				
	Increase in diverting stoma formation		2(3.6)		X	X					
	Open favoured over laparoscopic		7 (12.5)		X		X		X		
	Minimally invasive continuing <i>Laparoscopic continuing</i> <i>Increased use of laparoscopic</i>		6 (10.7)	4 (7.1) 2 (3.6)							
	<b>Systemic Therapy (52 articles)</b>	Capacity	Delayed/ deferred treatment	29 (55.8)		X	X		X	X	X
			Discontinuation of ongoing courses	8 (15.4)		X	X	X	X	X	X
Reduced capacity <i>Reduction in number of sessions</i> <i>Cancellations</i> <i>Cancellation of peri-operative chemo</i>			7 (13.5)	4 (7.7) 2 (3.8) 1 (1.9)		X		X		X	
No change			10 (19.2)								
Schedule		Using a modified treatment schedule <i>Increasing the interval between treatments</i> <i>Reducing infusion time</i>	10 (19.2)	9 (17.3) 1 (1.9)	X	X		X	X		
		Regimen Type	Utilizing an alternate regimen* <i>Favouring regimens with longer intervals between treatments</i> <i>Favouring hormonal treatments</i> <i>Favouring lower intensity treatments</i>	11 (21.2)	6 (11.5) 4 (7.7) 3 (5.8)		X				X
Favouring oral over IV			9 (17.3)		X		X				
Reduction in use of maintenance therapies			1 (1.9)			X		X			
Intent		Increased use of neoadjuvant chemotherapy	10 (19.2)			X		X	X		
		Decreased use of neoadjuvant chemotherapy	1 (1.9)								
Dose	Dose reduction	2 (3.8)		X	X						
<b>Radiotherapy (30 articles)</b>	Capacity	Delay/ deferral	17 (56.7)		X	X		X	X	X	
		Reduced capacity* <i>Reduced number of treatments</i>	10 (33.3)	5 (16.7)		X		X		X	

		<i>Emergency or high risk only</i> <i>Shut down of radiotherapy</i> <i>Cancellation</i>		3 (10.0) 2 (6.7) 1 (3.3)						
		Discontinuation of ongoing courses	1 (3.3)		X	X	X	X	X	X
		No change No change in radiotherapy Increased number of treatments	5 (16.7)	4 (13.3) 1 (3.3)						
	Dose	Hypofractionation	12 (40.0)		X	X				
	Alternate Treatment Modalities	Use of alternate treatment modality <i>Suspension of concurrent chemo-rads</i> <i>Use of hormonal therapy</i> <i>Use of induction chemotherapy</i>	4 (13.3)	2 (6.7) 1 (3.3) 1 (3.3)	X	X	X		X	X
		No change to concurrent chemo-rads	2 (6.7)							

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