review articles

Conceptual Framework for Cancer Care During a Pandemic Incorporating Evidence From the COVID-19 Pandemic

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abstract

PURPOSE With successive infection waves and the spread of more infectious variants, the COVID-19 pandemic continues to have major impacts on health care. To achieve best outcomes for patients with cancer during a pandemic, efforts to minimize the increased risk of severe pandemic infection must be carefully balanced against unintended adverse impacts of the pandemic on cancer care, with consideration to available health system capacity. Cancer Australia's conceptual framework for cancer care during a pandemic provides a planning resource for health services and policy-makers that can be broadly applied globally and to similar pandemics.

METHODS Evidence on the impact of the COVID-19 pandemic on cancer care and health system capacity to June 2021 was reviewed, and the conceptual framework was developed and updated.

RESULTS Components of health system capacity vary during a pandemic, and capacity relative to pandemic numbers and severity affects resources available for cancer care delivery. The challenges of successive pandemic waves and high numbers of pandemic cases necessitate consideration of changing health system capacity in decision making about cancer care. Cancer Australia's conceptual framework provides guidance on continuation of care across the cancer pathway, in the face of challenges to health systems, while minimizing infection risk for patients with cancer and unintended consequences of delays in screening, diagnosis, and cancer treatment and backlogs because of service interruption.

CONCLUSION Evidence from the COVID-19 pandemic supports continuation of cancer care wherever possible during similar pandemics. Cancer Australia's conceptual framework, underpinned by principles for optimal cancer care, informs decision making across the cancer care continuum. It incorporates consideration of changes in health system capacity and capacity for cancer care, in relation to pandemic progression, enabling broad applicability to different global settings.

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INTRODUCTION

The COVID-19 pandemic is currently continuing worldwide, with successive infection waves and the spread of new variants of coronavirus SARS-CoV-2, such as the more infective Delta and Omicron variants.[1,2] At early April 2022, more than 490 million confirmed COVID-19 cases and more than 6.1 million deaths have been reported globally.[3] The pandemic continues to have major impacts on health care including potentially overwhelming health systems, with significant impacts on cancer care,[4-6] defined as care across the cancer pathway from prevention and early detection to survivorship and end-of-life care. Changes in cancer care delivery have included changes in use of telehealth, innovative care models, and impacts on cancer research and clinical trials.[4] Adverse impacts of the pandemic on cancer care may be more prolonged and greater in low- and middle-income countries (LMICs).[6]

Patients with cancer may be at increased risk from a pandemic infection because of factors such as older age; comorbidities such as cardiovascular disease, diabetes, and chronic lung disease; and immunosuppressed state because of the underlying cancer or anticancer treatments.[7-9] Patients with cancer have high levels of interaction with health care providers and may need frequent hospital admissions and visits, presenting another potential risk for pandemic infection. Patients with cancer are heterogenous, so individual factors that enable assessment of risk, including the type and stage of cancer and treatment type, also need to be considered.[10]

Throughout the COVID-19 pandemic, Cancer Australia has actively monitored emerging international evidence and clinical guidance on COVID-19 infection and cancer. In May 2020, Cancer Australia published a conceptual framework for the management of cancer

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CONTEXT

Key Objective

Cancer Australia has developed a conceptual framework as an evidence-based planning resource to support optimal cancer care across the continuum during the COVID-19 pandemic and future similar pandemics.

Knowledge Generated

Patients with cancer are at increased risk of severe COVID-19 disease and worse outcomes, so minimizing the risk of exposure to and harm from COVID-19 disease must be considered in cancer care. However, evidence from the COVID-19 pandemic supports the continuation of cancer care wherever possible during this, and similar pandemics, to achieve the best outcomes for patients with cancer and minimize adverse impacts of the pandemic on cancer care, including delays in screening, diagnosis, and treatment.

Relevance

Cancer Australia's conceptual framework reflects changing health system capacity, enabling its broad applicability to different global contexts, and is underpinned by principles for optimal cancer care. The framework provides guidance for cancer care during a pandemic for multiple stakeholders including health services and policy-makers.

during a pandemic as a thought piece for optimal cancer care during a pandemic.[11] It provided a framework for system-wide approaches to cancer management and decision making about modifications to cancer care, in accordance with the principles of the Optimal Care Pathways (OCPs) for people with cancer.[12]

The scenarios or phases of the pandemic underpinning Cancer Australia's initial framework were based on acute and recovery phases described by the American College of Surgeons[13] across modeled scenarios of COVID-19 cases[14] in relation to whether health system capacity limits were being approached or exceeded. The steps of the cancer care pathway (from prevention and early detection, through to survivorship and end-of-life care) were those defined in the Australian OCPs.[12]

Since the publication of Cancer Australia's initial conceptual framework, the COVID-19 pandemic has undergone successive waves and COVID-19 vaccination has become available. The aim of this review is to investigate the evidence of the impact of the COVID-19 pandemic on health system capacity and on cancer care and to further develop and update Cancer Australia's conceptual framework for cancer care during a pandemic.[11]

The conceptual framework does not include management of the pandemic-related illness, such as COVID-19 disease. The intended audience includes health services, health professionals, cancer organizations, and policy-makers. The framework differs to many other published frameworks and guidance, in that it covers the care of all cancers across the cancer care continuum; is not specific to any tumor site, clinical specialty, or health service; incorporates evidence and learnings from the COVID-19 pandemic; and is generalizable for similar pandemics in a global setting.

METHODS

A review was undertaken for evidence on the impact of the COVID-19 pandemic on patients with cancer, cancer care and health system capacity, and managing the impact of the COVID-19 pandemic, based on searches up to June 2021. A systematic approach was used to provide an evidence base that was fit for purpose. Although PICO criteria were not directly applicable, the following criteria were broadly applied:

- Population: patients with cancer during the COVID-19 pandemic.
- Interventions: cancer care across the continuum of care, including treatment of cancer. The management of COVID-19 disease/SARS-CoV-2 infection in patients with cancer was excluded.
- Comparator: patients with cancer, not during a pandemic.
- Outcomes: outcomes of cancer and pandemic infection.

Searches for cancer care (not tumor-specific) during the COVID-19 pandemic were undertaken in the PubMed database using search terms including health system capacity, COVID-19, pandemic, cancer, and oncology. The inclusion criteria were systematic reviews and meta-analyses; peer-reviewed original articles (published since relevant systematic reviews or meta-analyses) on prospective or retrospective controlled studies with large sample sizes; additional high-level evidence or reviews (eg, reviews on the basis of systematic approaches with particular relevance); or existing clinical guidance, recommendations, and position statements from peak cancer organizations. Websites of peak cancer organizations, Australian medical colleges, and databases were searched, and additional relevant articles were identified by Google searches and snowballing techniques.

Abstraction of evidence for the initial conceptual framework was repeated for the updated framework, with input from secondary evidence reviewers. There was an extensive internal Cancer Australia review with a consensus approach used. The conceptual framework was updated on the basis of the evidence identified, current international and national guidance, recommendations, and

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position statements, broadly similar in principle to a meta-guideline approach.[15] This pragmatic approach enabled the timely incorporation of international and national guidance.

RESULTS

The conceptual framework:

1. Incorporates consideration of changes in health system capacity and capacity for cancer care during a pandemic.
2. Is informed by evidence on the effects of COVID-19 disease in patients with cancer.
3. Is informed by evidence on the impacts of the pandemic on cancer care.
4. Is underpinned by principles for optimal cancer care.

Health System Capacity During a Pandemic

Health system capacity. Components of health system capacity relevant to a pandemic similar to the COVID-19 pandemic (listed in Table 1) include availability of resources such as hospital beds and supplies (personal protective equipment [PPE], oxygen, medications, blood, etc); availability of skilled health care staff, intensive care unit (ICU) and ventilator capacity; and access to pathology and imaging services.[16,21] Health system capacity components are dynamic and may increase or decrease during a pandemic, as described in Table 1.[2,16-20] These components may vary in an asynchronous manner during a pandemic, and some may increase, whereas others decrease.

Capacity may vary during successive waves of infection because of factors such as preparations undertaken between waves and the relative numbers of infected cases and may vary on a local basis. Measures to maintain or increase health system capacity during a pandemic and mitigate potential shortages include the following: adapting existing hospital beds and ICU capacity,[2,17,18] mitigating health care staff shortages,[2,22] implementing protocols to reduce the risk of pandemic infection for health care workers including nosocomial transmission,[23] maximizing supply of ventilators,[24] and planning logistics for surge capacity.[25]

Health system capacity and impacts of the COVID-19 pandemic vary globally with greater impacts in LMICs.[26] LMICs have lower ratio of hospital beds, ICU, and ventilator capacity relative to the population, compared with higher-income countries[26] and have reported worse impacts of the pandemic on cancer care capacity, including significantly greater shortages of PPE and medications, and less availability of virtual clinics (telehealth) and remote care.[27,28]

Progression of a pandemic and pandemic phases. Epidemiologic curves, on the basis of the evidential progression of the pandemic under different scenarios of pandemic numbers and severity, can be used to predict the effects of mitigation strategies such as quarantine, social distancing, contact tracing, and lockdowns in subsequent episodes.[14,17,26]

In Figure 1, the progression of a pandemic is shown as the demand on the health system related to the pandemic infection, and health system capacity as a band, with dashed lines representing its range during a pandemic because of multiple components that could increase or decrease at any time (detailed in Table 1). Figure 1A shows phases where the pandemic demands are within, or exceed, health system capacity in an uncontrolled (rapidly increasing) or mitigated (flattened) pandemic scenario. In repeat pandemic waves (Fig 1B), health system capacity may be exceeded at different times. The pandemic curves will also be influenced by rates of vaccination, which may vary locally and globally between low-resource and high-resource countries, and by efficacy of the vaccine.

As health system capacity and the demands of pandemic infection vary during the different stages and scenarios of a pandemic, so do the resources available for cancer care delivery. At each step on the cancer care continuum, decisions on cancer care should include consideration of health system capacity and capacity for cancer care, in relation to the progression of the pandemic. Incorporating this consideration into the conceptual framework for cancer care enables its broad application to different pandemic settings and to different health services and global contexts.

Acute and recovery pandemic phases, which incorporate both changing health system capacity and the progression of the pandemic,[13] are used in this conceptual framework:

- Acute phase I: Semiurgent setting. Few pandemic infection patients and numbers not rapidly escalating, demand is within health system capacity; hospital supplies and health care staff resources are not exhausted; hospitals still have ICU capacity.
- Acute phase II: Urgent setting. Rapidly escalating numbers of pandemic infection patients, approaching limits of health system capacity; hospital supplies and health care staff resources are limited because of factors such as redeployment to pandemic-related activities; ICU capacity increasingly limited.
- Acute phase III: Emergency setting. High numbers of pandemic infection patients, health system capacity exceeded; hospital supplies and health care staff resources are overwhelmed or exhausted by pandemic-related activities with no spare capacity; no spare ICU capacity.
- Recovery phases. Past the peak of pandemic infection with fewer new daily cases, health system capacity not exceeded; hospital supplies and health care staff resources are more available, including hospital and ICU beds, healthy staff, PPE, and critical testing.

TABLE 1. Health System Capacity Components and Potential Changes During a Pandemic[2,16-20]

Component of Health System Capacity	Potential Increase During a Pandemic	Potential Decrease During a Pandemic
Hospital beds	More hospital beds available because of factors such as cancellation of elective surgery, reallocation of beds to pandemic infection patients, regional networking of hospitals, field hospitals, use of private hospitals to increase public system capacity, construction of new facilities	Depleted availability of hospital beds for nonpandemic patients (including patients with cancer)
ICU beds: beds with equipment for comprehensive critical care and ventilation	More ICU beds available because of factors such as cancellation of elective surgery, regional networking of hospitals, use of private hospitals to increase public system capacity, reconfiguring of existing facilities	Depleted availability of ICU beds for nonpandemic patients (eg, patients with cancer postsurgery)
Health care staff including ICU-trained staff, pathology testing and laboratory staff, oncology health professionals	Increase in health care staff because of factors such as surge in capacity availability, redeployment of staff including those with previous relevant training, workforce upskilling and training	Decrease in health care staff because of factors such as staff infected with pandemic infection including nosocomial outbreaks, staff in quarantine or isolation because of exposure, redeployment of staff (including oncology staff) to meet the demands of the pandemic reducing staff available for cancer care, staff burnout and fatigue, travel restrictions and lockdowns
Ventilators (and ECMO capacity), including ventilators and ventilator accessories	More ventilators available because of factors such as additional procurement of machines and equipment, redeployment (eg, by maximizing existing supply from local or regional sites), reduced demand, for example, by using noninvasive oxygenation and ventilation	Depleted ventilator availability for nonpandemic patients
Oxygen	Increased availability of oxygen because of additional procurement and redeployment	Demand for oxygen for pandemic patients exceeding supply during times of high infection case numbers, supply chain issues, depleted availability for nonpandemic patients
PPE including masks suitable for pandemic infection control, gowns, and gloves	Release of PPE from national stockpiles, additional procurement	Demand for PPE exceeding supply during times of high pandemic infection case numbers, supply chain issues, depleted availability for nonpandemic patients
Medications including medications for pandemic infection treatment and oncology treatment	Additional procurement of medications to meet increased demand	Demand for pandemic patients exceeding supply during times of high infection case numbers, supply chain issues, depleted availability for nonpandemic patients
Pathology services for pandemic testing, including testing staff and consumables for taking samples and testing and for cancer testing	Increased supply or capacity of pathology services (eg, from the private sector), increased staff recruitment and training, additional procurement of consumables	Demand for pandemic testing exceeding availability during times of high infection case numbers, supply chain issues, depleted availability for nonpandemic patients
Imaging services for cancer testing		Workforce redeployment, depleted availability of imaging services for nonpandemic patients
Other supplies, such as hand hygiene and cleaning supplies	Additional procurement of supplies to meet increased demand	Demand for pandemic patients exceeding availability of supplies during times of high infection case numbers, supply chain issues
Systems and capability for coordination and sharing of resources and planning for surge in capacity	Greater capability in response to the demands of the pandemic progression	Workforce depletion, redeployment, or burnout

Abbreviations: ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; PPE, personal protective equipment.

Within these phases, there may be transitions, such as from a preparatory phase with low numbers to a phase with more rapidly increasing numbers during acute phase I. These phases may be repeated during successive waves of infection and with new pandemic variants.

Evidence of Effects of COVID-19 Disease in Patients With Cancer

Risk of COVID-19 disease in patients with cancer. Early reports and a US retrospective case-control study of electronic health records have indicated that patients

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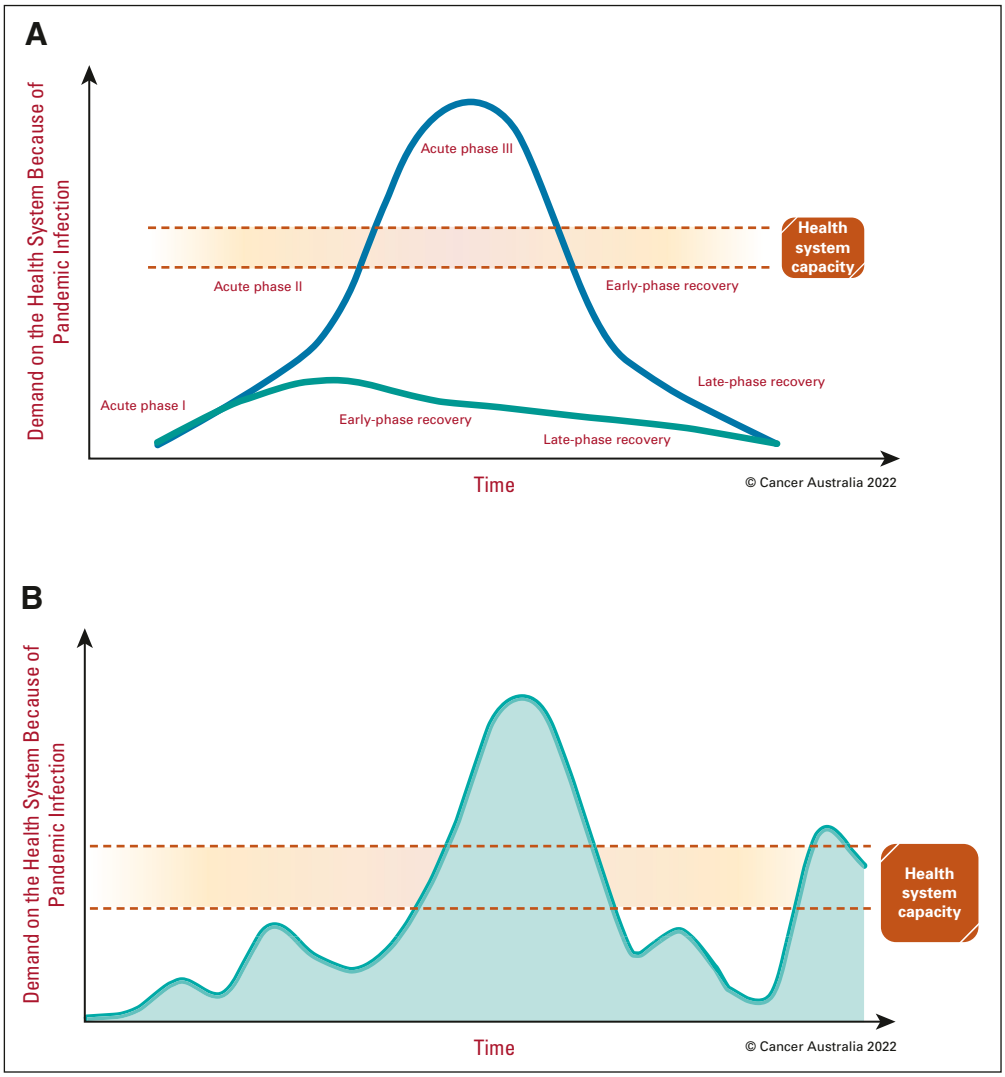

FIG 1. The progression of a pandemic is plotted as the demand on the health system because of the pandemic infection against time. Health system capacity is shown as a band, with dashed lines representing its range during a pandemic because of multiple components that could increase or decrease at any time. (A) Pandemic phases in relation to health system capacity. The blue line indicates an uncontrolled outbreak with rapidly increasing numbers where health system capacity may be exceeded, and the teal line indicates a mitigated scenario with a slower rate of transmission. Acute and recovery phases, incorporating both the pandemic progression and health system capacity, are indicated. (B) Pandemic with repeat waves. Demand on health system capacity because of the pandemic is plotted for repeat pandemic waves over a period of time. Health system capacity may be exceeded at different times during repeat pandemic waves.

with cancer might have increased risk of COVID-19 disease.[29-31] Although the large case-control study had limitations such as those inherent to electronic health records and testing differences between groups, patients with cancer especially those diagnosed within the past year were at significantly increased risk compared with those who never had cancer, and the associations were strongest for those patients with recently diagnosed leukemia, non-Hodgkin lymphoma, and lung cancer.[31]

Severity and complications of COVID-19 disease in patients with cancer. An increased risk of severe complications of COVID-19 disease or ICU admission for COVID-19 disease patients with cancer compared with COVID-19 disease patients without cancer has been reported in several meta-analyses with increased risks ranging from 1.56 to 2.32.[32-35]

Increased severity of COVID-19 disease has been reported for patients with hematologic malignancies (leukemia, lymphoma, and myeloma) compared with patients with solid organ tumors[36] and for patients with lung cancer compared with other cancers.[37-39]

Mortality because of COVID-19 disease in patients with cancer. There is an increased risk of death in patients with COVID-19 disease who have cancer compared with those without cancer, with increased risks ranging from 1.66 to 2.97 reported in meta-analyses.[32,35,40] Mortality rates have been reported to be higher for patients with cancer who have COVID-19 disease with hematologic malignancies[36,41-44] and with lung cancer,[42,45,46] compared with other cancers.

Severity of COVID-19 disease and risk of mortality in cancer patients with COVID-19 disease receiving systemic anticancer treatment or radiation therapy. Recent anticancer treatment before COVID-19 disease has been associated with increased severity of COVID-19 disease or mortality in some studies[47-49] but not in others.[37,50-53] The review by the National Institute for Health and Care Excellence (February 2021) indicated there was, on balance, no difference in all-cause mortality for patients with cancer and COVID-19 disease with any of the systemic anticancer treatments (chemotherapy, targeted therapy, immunotherapy, or hormone therapy) received.[53]

In recent meta-analyses,[29,42] chemotherapy, surgery, or other anticancer treatments were not associated with increased risk of COVID-19 disease severity or deaths in cancer patients with COVID-19 disease.

For specific systemic treatments, a cohort study (4,966 patients with cancer and COVID-19 disease) showed that the anticancer therapies: rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone; platinum combined with etoposide; and DNA methyltransferase inhibitors, were associated with high 30-day all-cause mortality.[54] In another large cohort study (63,413 patients with cancer and COVID-19 disease), recent (within 30 days) cytotoxic therapy was associated with increased risk of all-cause mortality, hazard ratio (HR) = 1.5 (95% CI, 1.1 to 2.1), whereas mortality risk was not increased for patients who had received recent immunotherapies or targeted therapies.[43]

Some studies have reported worse outcomes for cancer patients with COVID-19 disease treated with immune checkpoint inhibitors (ICIs),[52,55,56] whereas other studies have reported no difference in outcomes.[45,54,57] In a meta-analysis (11 studies with 2,826 cancer patients with COVID-19 disease), prior ICI treatment was not associated with higher mortality risk or with disease severity; however concomitant use of ICI and chemotherapy may be linked to higher COVID-19 severity (odds ratio = 8.19; 95% CI, 2.67 to 25.08, with a small sample size).[58]

Evidence on the Impacts of the Pandemic on Cancer Care

Delays in screening, diagnosis, and treatment of patients with cancer during the COVID-19 pandemic. During the COVID-19 pandemic, delays and disruptions to cancer care have included the following: decreases in screening rates; delays in diagnosis; reduction in number of cancer surgeries; delay in radiotherapy or use of other regimens and alternate systemic regimens; and delay, rescheduling, or cancellation of outpatient visits.[20,28,59-61]

Cancer screening programs, such as for breast, cervical, and colorectal cancers, have been disrupted to varying degrees during the COVID-19 pandemic. Some screening programs such as breast screening were suspended during peaks of pandemic infection in some countries.[60,62,63] The disruptions to cancer screening during the COVID-19 pandemic and strategies for maintaining or resuming cancer screening are affected by health system capacity and whether it is exceeded during the varying phases of a pandemic.[64,65]

In 2020 during the COVID-19 pandemic in Australia, cancer-related diagnostic procedures for 14 cancer types were approximately 8% lower than expected (more than 160,000 fewer services) and therapeutic procedures were approximately 9% lower (more than 14,000 fewer services).[5] In the United States, reductions of 46% in the total weekly number of newly diagnosed breast, colorectal, lung, pancreatic, gastric, and esophageal cancers (in the period from March 1 to April 18, 2020) were reported.[66] Interruption in cancer treatment was reported by up to 77.5% of patients responding to surveys in a systematic review of 62 studies from Europe, the United States, Asia, and the Middle East.[20] In a global cross-sectional, questionnaire-based study (356 oncology centers from 54 countries), 88% of centers reported reduction in their usual level of cancer care (including surgery, systemic therapy, radiotherapy, and palliative care).[27]

Impacts on cancer outcomes of delays in cancer screening, testing, and treatment during the COVID-19 pandemic. The impacts of disruptions to cancer screening because of the COVID-19 pandemic have been estimated by modeling studies for different countries with different screening programs.[67-69] Disruption of breast cancer screening programs has been estimated to have varying short- and long-term outcomes, including increased tumor size, stage shifts to higher-stage cancer, increased mortality, and increased public health burden.[67] In the Netherlands, suspension of the breast cancer screening program and a later restart at reduced capacity resulted in a reduction of screen-detected breast cancers by 67% during February to August 2020, equating to an estimated 2000 delayed screen-detected cancers.[62] It has been estimated that cervical cancer screening disruption in high-income countries will increase cervical cancer cases (2020-2030) by up to 5%-6%, with the greatest impact among women age < 50 years in 2020.[68] Disruptions in colorectal cancer screening were estimated to result in additional colorectal cancer deaths in the long term (eg, for 6-month disruption without catch-up screening, 1,961 additional deaths in 2020-2050 in Australia, 678-881 in the Netherlands, and 1,319 in Canada).[69] However, the impact would be minimized by catch-up screening,[69] and in Australia, there was no suspension of the National Bowel Cancer Screening Program.[63]

Delays in diagnosis because of pandemic lockdown measures have been estimated to result in substantial additional cancer deaths in England.[70] Across breast, colorectal, lung, and esophageal cancers, 3,291-3,621 additional deaths within 5 years were estimated after diagnostic delays from March 2020 over 12 months, with increased deaths ranging from 4.8% for lung cancer to 16.6% for colorectal cancer.[70] A consistent effect of delay in cancer treatment on increased mortality has been estimated in a meta-analysis of 34 studies (all retrospective comparative observational studies) published from 2000 to 2020 on seven major cancer types (bladder, breast, colon, head and neck, nasopharyngeal, cervical, and non–small-cell lung cancer) and surgery, systemic treatment, and radiotherapy treatments.[71] Mortality risk for each 4-week delay for surgery was HR = 1.06-1.08, and for systemic treatment, it was HR = 1.01-1.28. For radiotherapy, there was evidence of a mortality impact because of delay in adjuvant radiation therapy for head and neck cancers and for cervical cancer.[71] Interruptions to cancer treatment during the

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TABLE 2. Application of the Principles of Optimal Cancer Care (from the *OCPs*[12]) in a Pandemic

Principle of the OCP[12]	Application of the Principle in a Pandemic
Principle 1: Patient-centered care Patient-centered care informs and involves patients in their care and respects and responds to the preferences, needs, and values of patients, families, and caregivers	In a pandemic, treatment should be individualized and treatment decisions should be made on a case-by-case basis, with input from both patients and the MDT.[7] The risks and benefits of any changes to treatment plans should be discussed with patients and their families and caregivers, and a shared decision is reached.[82] If required, prioritization decisions should be made as part of a MDT and each patient should be considered on an individual basis, with the reasoning behind every decision documented and clearly communicated to patients, families, and caregivers[7,82]
Principle 2: Safe and quality care Hospitals and health professionals are responsible for providing safe and quality care	During a pandemic, a key consideration is that care should be provided in the safest way possible[83] and that delays in diagnosis and treatment are minimized as much as possible given other considerations. Strategies for providing safe care include optimizing telehealth services when available and appropriate to minimize the need for in-person services and following government-recommended infection control practices.[82-84] Infection control practices to prevent transmission of infectious agents include screening all patients for signs and symptoms of the pandemic infection, universal source control (eg, use of masks by everyone in a health care facility), and infection control practices specific to the pandemic infection and specific to particular settings.[83] Clear information and communication on infection control practices should be provided to patients and health care staff[85]
Principle 3: Multidisciplinary care Multidisciplinary care is an integrated team approach that involves all relevant health professionals discussing all relevant treatment options and making joint recommendations about treatment and supportive care plans, taking into account the personal preferences of patients	In a pandemic, multidisciplinary planning, which may be accomplished by virtual meetings, is of paramount importance.[7,86,87] Treatment planning can be affected by delays or limited availability of diagnostic and therapeutic procedures and surgeries. Multidisciplinary discussions to guide treatment planning, starting from the time of diagnosis, are key to adjusting to changes and coordinating treatment, such as the timing and sequence of systemic therapy, radiation therapy and surgery, and supportive care.[86,87] In circumstances of limited access to resources such as surgery and normal pathways of care not being possible, early multidisciplinary discussion can tailor multimodal therapy to mitigate the risk of tumor progression[86]
Principle 4: Supportive care Supportive care is a vital part of any cancer treatment program. Supportive care deals with issues that emerge for patients, families, and caregivers from the effects of the cancer diagnosis and its treatment. It is made up of all the services, information, and resources that patients may need to meet their physical, psychological, social, information, and spiritual needs from the time of diagnosis	Evidence from the COVID-19 pandemic indicates that patients with cancer may experience psychosocial impacts during a pandemic, including increased distress, depression and anxiety, and unmet information needs.[88,89] Strategies to address supportive care needs for patients with cancer during a pandemic include the following: increased psychosocial support; extra vigilance to screen for the presence of anxiety and/or depression symptoms, especially in those with a history of mental health concerns; improved communication of changes to cancer care plans; provision of timely information and guidance, including links to telephone and online support; and improved communication of virus control measures operationalized in health care settings.[88,90] It is important to recognise increased levels of distress that patients with cancer and their families may face during a pandemic, over and above that in relation to their cancer diagnosis and treatment, and to have supports in place in cancer programs to assess the level of distress and intervene appropriately[91]
Principle 5: Care coordination Care coordination is the responsibility of every professional, both clinical and nonclinical, who works with patients and their families and caregivers	In a pandemic, coordinated care with clear documentation is especially important for cancer treatment and treatment planning in circumstances such as limited access to resources, adjusting to any changes in cancer treatment, change in the patient's usual health professional, or change in location where care is delivered.[82,86] Increased use of telehealth also necessitates robust note-keeping and consideration of privacy and security[90]
Principle 6: Communication Everyone employed in the health care system is responsible for ensuring that the communication needs of patients and their families and caregivers are met	In a pandemic, truthful, compassionate, and honest communication is essential and clinicians need to communicate directly with patients and their families about patients' values and goals of care at all stages of cancer treatment.[92] Information regarding the pandemic infection and cancer treatment should be readily available, and communication should be rapid and effective.[90] There should be communication and discussion with patients on any changes in their cancer treatment that include the benefits and risks and individual factors such as patient preferences[82,84]
Principle 7: Research and clinical trials Research and clinical trials play an important role in establishing the efficacy and safety of diagnostic, prognostic, and therapeutic interventions and establishing the role of psychological, supportive care, and palliative care interventions	There are challenges to research and clinical trials during a pandemic such as the risk of infection, shortage of clinical care resources, management of participants with COVID-19 disease, and protocol violations, that have resulted in suspension or disruption of many trials.[93] Guidance on the conduct of research and clinical trials during the COVID-19 pandemic from the Australian Government Department of Health includes the following principles: The conduct of research related to COVID-19 disease is a significant priority; however, the initiation and continuation of other ongoing and proposed research may also be critical for the well-being of patients, participants, communities, and the research sector. Compliance with or adherence to regulations, guidelines, codes, policies, and other standards remains necessary. However, interpretation of research responsibilities in the context of a crisis such as COVID-19 should be informed by flexibility, consultation, and good sense so as to retain the focus on the safety and well-being of those most at risk in our institutions and communities.[94] Guidance on clinical trials for patients with cancer has been provided by ASCO[95] and ESMO[96]

Abbreviations: ESMO, European Society for Medical Oncology; MDT, multidisciplinary team; OCP, Optimal Care Pathway.

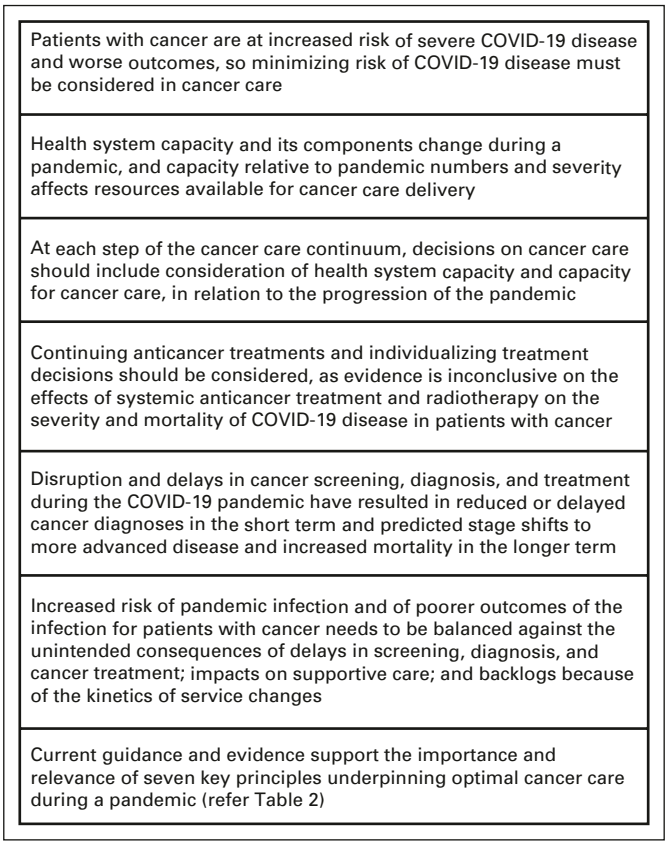

FIG 2. Summary of evidence and rationale underpinning the conceptual framework.

COVID-19 pandemic were further affected by the kinetics of rapid shutting down followed by slower ramping up later, for example, in Canada, where an immediate 60% decrease in mean surgical volume was followed by a slow 6% weekly increase,[61] and may result in large backlogs of cases. Treatment delays and modifications may be prolonged and negatively affect patient care and outcomes, as it will take considerable time for cancer care to resume capacity and adjust models in response to the pandemic.[28]

In a global study of the impact of the COVID-19 pandemic on cancer care (356 centers from 54 countries), the magnitude of the impact on reduction or disruption of cancer care and reported estimates of harm to patients were more pronounced in lower-resource countries,[27] for example, impacts of the pandemic on cancer surgery reduction have been greater in lower-income countries.[72]

Impacts of the COVID-19 pandemic on follow-up and supportive care. The impacts on follow-up care for patients with cancer during the COVID-19 pandemic include the following: delays or cancellations of follow-up appointments, modifications of follow-up plans (eg, suspension or postponement of imaging and physical examinations and of exercise programs), and increased use of telehealth.[73,74] Although telehealth has replaced many face-to-face appointments,[4] barriers to its implementation include variable access to technology and concerns about anxiety and distress in some patients with cancer related to telehealth.[73,74] Changes in follow-up care may include models such as shared care, nurse-led or GP-led care.[4,73,75]

Patients with breast cancer in Australia have reported concerns around missing social supports from family and friends, lack of access to social support services, and hospital restrictions on visitors during treatment.[76] It has been suggested that closer consideration is given during the COVID-19 pandemic to maintaining inclusion of caregivers, who are an integral component of a patient's care team, in appointments and hospital visits.[77]

Impacts of the COVID-19 pandemic on oncology health professionals. Negative impacts of the COVID-19 pandemic on oncology professionals reported in an international survey in April/May 2020 (1,520 participants from 101 countries) included being at risk of distress (25%), feeling burnout (38%), and not being able to perform their job compared with the pre–COVID-19 period (66%).[78] In other international surveys, negative impacts of the pandemic on mental health and well-being were reported by approximately 50% of oncologists (surveys from the Middle East, North Africa, Brazil, and the Philippines[79] and from Europe, Australasia, and Asia[80]). Psychological distress, fatigue, and disrupted practice have also been experienced by cancer care clinicians in Australia.[81]

Burnout and fatigue experienced by oncology health professionals because of the COVID-19 pandemic can lead to decreased health care staff capacity (refer Table 1).

Principles Underpinning Optimal Cancer Care During a Pandemic

Seven key principles underpin the *OCPs* for people with cancer in Australia: patient-centered care, safe and quality care, multidisciplinary care, supportive care, care coordination, communication, and research and clinical trials.[12]

The guidance and evidence identified in the current review support the importance and relevance of these principles during a pandemic (described in Table 2), including provision of safe and quality care by minimizing the risk of pandemic infection for patients with cancer and health care staff[82,83]; patient-centered and multidisciplinary care for individualized treatment and treatment decisions[7,82]; and care coordination and communication, which are essential especially for changes in cancer treatment and treatment planning.[82,90] Supportive care can assist with the psychosocial impacts of a pandemic.[88,90] New opportunities for research and clinical trials, such as those based on large registries, have become available during the COVID-19 pandemic.[93]

Evidence on health system capacity and capacity for delivery of cancer care during a pandemic and the impact of the COVID-19 pandemic on cancer care have informed the updating of the content of the conceptual framework. Key areas where the framework was updated included the

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
	Vaccination, if vaccination against the pandemic pathogen is available, should be offered to patients with cancer, with consideration of any vaccine contraindications, type of cancer, type and timing of treatment, and level of immunocompromise[97-100]						
Acute phase I Semiurgent setting Few pandemic infection patients and numbers not rapidly escalating, demand is within health system capacity; hospital supplies and health care staff resources are not exhausted; hospitals still have ICU and ventilator capacity	Continue population-based cancer screening[64,83] Continue HPV vaccination if available Consider social distancing in planning screening appointments[64,95] Follow up abnormal screening results identified in patients already screened, prioritizing those suspicious for cancer[91]	Encourage community members to continue to present to GP with *red flag* symptoms of cancer Use telehealth where possible[a] to assess patients with symptoms suspicious for cancer Appropriately investigate and refer patients with symptoms suspicious for cancer to a specialist linked to a multidisciplinary team[86]	Prioritize diagnostic procedures for patients with symptoms and test results suspicious for cancer,[86,91] including colonoscopy for positive bowel cancer screening	Surgery: Consider delaying surgery for patients not predicted to have a negative outcome if surgery is delayed for 3 months[13] Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital or before invasive procedures regardless of symptoms, if considered at high risk of mortality from the infection[96,101] Reduce patient visitors or support persons in hospitals Radiation therapy: Reduce radiation therapy fractions (hypofractionation) where appropriate[102,103] Prioritize patients who have commenced a course of radiation therapy, and support these patients in completing their treatments[102] Systemic treatments: Minimize face-to-face visits including monitoring, treatment administration, with shift to telehealth where possible,[a] and community-based care where available[82,90] Defer nonessential investigations and routine follow-up or shift follow-up visits from face-to-face to telehealth where possible[a,82,90] Use oral anticancer agents where possible, but weigh up any different toxicities with convenience[82,90]	Delay face-to-face follow-up appointments (as well as any hospital imaging and/or blood tests) for patients where feasible[82] Maximize the number of reviews performed by telehealth where possible[a,82,90,96,106] Consider innovative models of care, eg, shared follow-up care with GP Consider arranging for blood tests and scans to be performed locally rather than at hospital facilities, especially for patients being reviewed by telehealth[a,82,90] Health care providers should be vigilant in psychosocial screening for signs of anxiety, depression, and distress and should ensure that psychosocial support is provided[90] Provide education to patients about their specific level of immune suppression on various long-term adjuvant therapies and after chemotherapy[90] including specific symptoms to be aware of (eg, dysphagia and hematuria)	Consider delaying commencement of IV treatment for patients with refractory/resistant disease or palliative regimens with a low likelihood of response/benefit Minimize commencement of palliative regimens with high risk of complications requiring admission Consider treatment breaks for patients with low-volume and/or stable metastatic disease[90] Use short-course radiation therapy schedules for symptom control[107]	Maximize communication by telehealth where possible[a,107] Consider early referral and communication with community palliative care services[90] Empower patients and caregivers to manage symptoms at home, eg, provide access to subcutaneous treatments[107] Enhance provision of supportive and palliative care through innovative models of care, eg, virtual palliative care through hospitals delivering care in the home[90] Prioritize management of patients with urgent symptomatic need[91,107] Advance care planning and goals of care should be discussed with patients and appropriately documented (eg, by using an Advanced Care Directive)[90,108]

(Continued on following page)

TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
				Supportive care interventions should be provided for chemotherapy complications such as anemia, febrile neutropenia, thrombocytopenia-related complications, thromboembolic events, and chemotherapy-induced nausea and vomiting, to minimize patients' risk of infection and need for hospitalization[104,105] Consider using alternate systemic anticancer therapy regimens with fewer visits, less frequent IV administration, and shorter duration, when there are acceptable alternatives[82,90] Consider postponing/omitting supportive care treatments that are not time-critical (eg, zoledronic acid for bone metastases) or switching to oral options to avoid hospital visits[90,104] Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital regardless of symptoms if considered at high risk of mortality from the infection or before starting immunosuppressive therapy (eg, cytotoxic chemotherapy, stem-cell transplantation, and biologic therapy) or invasive procedures[95,96,101] Reduce patient visitors or support persons in hospitals			
	Vaccination, if vaccination against the pandemic pathogen is available, should be offered to patients with cancer, with consideration of any vaccine contraindications, type of cancer, type and timing of treatment, and level of immunocompromise[97-100]						

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
Acute phase II Urgent setting Rapidly escalating numbers of pandemic infection patients, demand is approaching limits of health system capacity; hospital supplies and health care staff resources are limited because of factors such as redeployment to pandemic-related activities; ICU and ventilator capacity is increasingly limited	Consider reduction of routine population-based cancer screening if resource availability is limited (eg, staff deployed elsewhere),[64,83,91] but for the least possible time during prolonged acute phases Follow up abnormal screening results identified in patients already screened, prioritizing those highly suspicious for cancer[91]	Encourage community members to continue to present to GP with *red flag* symptoms of cancer Use telehealth where possible[a] to assess patients with symptoms suspicious for cancer Appropriately investigate and refer patients with symptoms suspicious for cancer to a specialist linked to a multidisciplinary team[86]	Prioritize diagnostic procedures for patients with symptoms and test results suspicious for cancer[86,91]	Surgery: Prioritize surgery for patients for whom surgery within 4 weeks is expected to save life or prevent progression of disease beyond operability[7,91] Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital or before invasive procedures regardless of symptoms, if considered at high risk of mortality from the infection[96,101] Nonsurgical options such as neoadjuvant treatment may be considered if appropriate, with input from a multidisciplinary team, if the outcomes are similar[7,108] Limit patient visitors or support persons in hospitals (except at end of life) Radiation therapy: Consider delay in commencement of treatment where survival or morbidity is not compromised,[102,106] if radiation services are limited Where possible, use hypofractionation for adjuvant and radical treatments to reduce the number of treatment slots required[7,102,103] Treat all emergency and urgent patients where alternative management to radiotherapy is not possible; prioritize patients with rapidly progressing, potentially curable tumors and patients already on treatment[91,102]	Delay face-to-face follow-up appointments (as well as any hospital imaging and/or blood tests) for patients where feasible[82] Maximize the number of reviews performed by telehealth where possible[a,82,90,96,106] Consider arranging for blood tests and scans to be performed locally rather than at hospital facilities, especially for patients being reviewed by telehealth[a,82,90] Consider innovative models of care, eg, shared follow-up care with GP Health care providers should be vigilant in psychosocial screening for signs of anxiety, depression, and distress and should ensure that psychosocial support is provided[90] Provide education to patients about their specific level of immune suppression on various long-term adjuvant therapies and after chemotherapy[90] including specific symptoms to be aware of, eg, dysphagia, hematuria	Minimize commencement of IV treatment for patients with refractory/resistant disease or palliative regimens with a low likelihood of response/benefit Consider deferring palliative radiation therapy treatments,[106] except where these are for life-threatening or urgent conditions (such as hemorrhage, superior vena cava obstruction, or malignant spinal cord compresssion[102]) Use short-course radiation therapy schedules for symptom control[107] Consider deferring commencement of palliative treatments with high risk of complications requiring admission Limit patient visitors or support persons in hospitals (except at end of life)	Maximize communication by telehealth where possible[a,107] Consider early referral and communication with community palliative care services[90] Empower patients and caregivers to manage symptoms at home, eg, provide access to subcutaneous treatments[107] Enhance provision of supportive and palliative care through innovative models of care, eg, virtual hospitals delivering care in the home[90] Prioritize management of patients with urgent symptomatic need[91,107] Advance care planning and goals of care should be discussed with patients and appropriately documented (eg, by using an Advanced Care Directive)[90,108]

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
				When modifying an individual patient's radiotherapy treatment plans, take their clinical circumstances into account, involve the multidisciplinary team, and record the reasoning behind each decision[102] Systemic treatments: Transition patients from IV treatments to subcutaneous or oral chemotherapeutic medications if there are acceptable alternatives[82,84,108] Consider ways of reducing exposure for patients as a consequence of treatment[82] Consider ceasing treatment for patients where the goals of treatment are limited[108]; defer IV/IP treatments for patients with refractory/resistant disease Consider postponing/omitting supportive care treatments that are not time-critical, eg, zoledronic acid for bone metastases, or switching to oral options to avoid hospital visits[90,104] Delay concurrent chemoradiation or adjuvant chemotherapy unless proven survival benefit for the addition of chemotherapy Consider less toxic regimens where efficacy advantage is minimal/unproven. Consider using less frequent immunotherapy regimens and consider the potential harms and benefits of therapy for each patient[82,108]			

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
				Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital regardless of symptoms if considered at high risk of mortality from the infection or before starting immunosuppressive therapy (eg, cytotoxic chemotherapy, stem-cell transplantation, and biologic therapy) or invasive procedures[95,96,101] Supportive care interventions should be provided for chemotherapy complications such as anemia, febrile neutropenia, thrombocytopenia-related complications, thromboembolic events, and chemotherapy-induced nausea and vomiting to minimize patients' risk of infection and need for hospitalization[104,105] Limit patient visitors or support persons in hospitals (except at end of life)			
	Vaccination, if vaccination against the pandemic pathogen is available, should be offered to patients with cancer, with consideration of any vaccine contraindications, type of cancer, type and timing of treatment, and level of immunocompromise[97-100]						

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
Acute phase III Emergency setting High numbers of pandemic infection patients, health system capacity exceeded; hospital supplies and health care staff resources are overwhelmed or exhausted by pandemic-related activities with no spare capacity; there is no spare ventilator or ICU capacity	Consider reduction or deferral of routine population-based cancer screening,[64,83,91] but for the least possible time during prolonged acute phases Follow up abnormal screening results identified in patients that are highly suspicious for cancer[91]	Encourage community members to continue to present to GP with *red flag* symptoms of cancer Use telehealth where possible[a] to assess patients with symptoms suspicious for cancer Appropriately investigate and refer patients with symptoms suspicious for cancer to a specialist linked to a multidisciplinary team[86]	Prioritize diagnostic procedures for patients with symptoms and test results highly suspicious for cancer[86,91]	Surgery: Prioritize urgent/emergency surgery for life-threatening conditions such as bowel obstruction, bleeding and regional and/or localized infection, and permanent injury/clinical harm from progression of conditions such as spinal cord compression[7,91] Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital or before invasive procedures regardless of symptoms, if considered at high risk of mortality from the infection[96,101] Nonsurgical options such as neoadjuvant treatment may be considered if appropriate, with input from a multidisciplinary team if the outcomes are similar[7,108] Limit patient visitors or support persons in hospitals (except at end of life) Radiation therapy: Defer radiotherapy if clinically appropriate and avoid radiotherapy if the evidence suggests that there may be little to no benefit or if an alternative treatment is available If radiotherapy is unavoidable, use the shortest safe form of treatment[102,103] Treat all emergency and urgent patients where alternative management to radiotherapy is not possible; prioritize patients with rapidly progressing, potentially curable tumors and patients already on treatment[91,102]	Delay face-to-face follow-up appointments (as well as any hospital imaging and/or blood tests) and use telehealth for patients where possible[a,82] Consider innovative models of care, eg, shared follow-up care with GP Health care providers should be vigilant in psychosocial screening for signs of anxiety, depression, and distress and should ensure that psychosocial support is provided[90]	Minimize commencement of IV treatment for patients with refractory/ resistant disease or palliative regimens with a low likelihood of response/benefit Limit patient visitors or support persons in hospitals (except at end of life) If radiotherapy is needed for symptom control, use the shortest safe form of treatment[102,107]	Consider ceasing palliative treatments that have minimal chance of substantial benefit Prioritize management of patients with urgent symptomatic need[91,107] Enhance provision of supportive and palliative care through innovative models of care, eg, virtual hospitals delivering care in the home[90] Advance care planning and goals of care should be discussed with patients and appropriately documented (eg, by using an Advanced Care Directive)[90,108]

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
				Discuss the risks and benefits of changing treatment schedules or interrupting treatment with patients and their families and caregivers, and record the reasoning behind the decision[102] When modifying individual patient's radiotherapy treatment plans, take their clinical circumstances into account, involve the multidisciplinary team, and record the reasoning behind each decision[102] Systemic treatments: Discuss the risks and benefits of starting, continuing, or deferring systemic treatment, including discussion of risk factors for serious pandemic infection, any uncertainty about the effect of systemic treatments, and goals of treatment with patients and their families and caregivers, and reach a shared decision, documenting the reasoning behind the decision[53,82] If systemic treatments need to be prioritized, make prioritization decisions as part of a multidisciplinary team on an individual basis and communicate clearly with patients, documenting the reasoning behind the decision[53,82] Consider using less frequent immunotherapy regimens and consider the potential harms and benefits of therapy for each patient[82,108]			

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
				Consider deferring commencement of regimens associated with high risk of needing admission[90] Consider starting with a less toxic regimen, reducing the use of combination immunotherapy agents that, although can have survival advantages, have a much higher risk of toxicity (including pneumonitis) requiring hospital admission[90,108] Testing for the pandemic infection should be undertaken if feasible for patients with cancer requiring admission to hospital regardless of symptoms if considered at high risk of mortality from the infection or before starting immunosuppressive therapy (eg, cytotoxic chemotherapy, stem-cell transplantation, or biologic therapy) or invasive procedures[95,96,101] Supportive care interventions should be provided for chemotherapy complications such as anemia, febrile neutropenia, thrombocytopenia-related complications, thromboembolic events, and chemotherapy-induced nausea and vomiting to minimize patients' risk of infection and need for hospitalization[104,105] Limit patient visitors or support persons in hospitals (except at end of life)			
Recovery phase	Considerations for reintroduction of services should include the local levels of pandemic infection transmission, the local or regional health system capacity, and availability of resources. These considerations may change over time and vary by service type and setting[83,91] Gradually reintroduce the standard of care according to perceived risk, prioritizing patients at high risk (such as those most at risk for complications from delayed care or those with high risk of cancer progression or recurrence) with consideration of each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109] Vaccination, if vaccination against the pandemic pathogen is available, should be offered to patients with cancer, with consideration of any vaccine contraindications, type of cancer, type and timing of treatment, and level of immunocompromise[97-100]						

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TABLE 3. Detailed Conceptual Framework: Cancer Care During the Acute and Recovery Phases of a Pandemic (Continued)

Phase	Prevention and Early Detection	Presentation, Initial Investigations, and Referral	Diagnosis, Staging, and Treatment Planning	Treatment	Care After Initial Treatment and Recovery	Managing Recurrent, Residual, or Metastatic Disease	End-of-Life Care
Recovery phase Past the peak of pandemic infection with fewer new daily cases, health system capacity not exceeded; hospital supplies and health care staff resources are more available, including hospital and ICU beds, ventilators, blood, healthy staff, PPE, and critical testing	Gradual reintroduction of routine population-based cancer screening with consideration of local conditions and resource availability[83,91] Prioritize delayed or high-risk patients[83] Consider social distancing in planning screening appointments and delivering screening interventions[64,95]	Encourage community to continue to present to GP with *red flag* symptoms of cancer Appropriately investigate and refer patients with symptoms suspicious for cancer to a specialist linked to a multidisciplinary team[86]	Prioritize diagnostic procedures for patients with symptoms and test results suspicious for cancer,[86] including colonoscopy for positive bowel cancer screening, and use telehealth where possible[a,91]	Surgery: Gradual reintroduction of routine surgery, up to the limit of capacity/resources, according to jurisdictional guidelines Nonsurgical options such as neoadjuvant treatment may be considered if appropriate, with input from a multidisciplinary team if the outcomes are similar[7,108] Prioritize high-risk patients and patients whose surgery was delayed because of the pandemic[91] Radiation therapy Continue hypofractionation where appropriate[7,106]; gradual reintroduction of more appropriate/cost-effective fractionation Systemic treatments Commence or restart as appropriate, adjuvant treatment that was deferred or interrupted	Prioritize follow-up appointments (as well as any hospital imaging and/or blood tests) for high-risk patients and patients whose appointments were delayed during acute phases[83]	Gradual reintroduction of the standard of care according to perceived risk; prioritizing high-risk patients, depending on the environmental circumstances and each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109]	Gradual reintroduction of face-to-face care according to perceived risk; prioritizing high-risk patients, depending on the environmental circumstances and each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109]

Abbreviations: GP, general practitioner; HPV, human papillomavirus; ICU, intensive care unit; IP, intraperitoneal; IV, intravenous; PPE, personal protective equipment.
[a]For telehealth services, videoconferencing is the preferred substitute for a face-to-face consultation.[110,111]

Principles Underpinning Optimal Cancer Care
Patient-Centered Care, Safe and Quality Care, Multidisciplinary Care, Supportive Care, Care Coordination, Communication, and Research and Clinical Trials

Pandemic phase incorporating changing health system capacity and pandemic progression	Steps of the Cancer Care Continuum						
	Prevention and Early Detection	**Presentation, Initial Investigations, and Referral**	**Diagnosis, Staging, and Treatment Planning**	**Treatment**	**Care After Initial Treatment and Recovery**	**Managing Recurrent, Residual, or Metastatic Disease**	**End-of-Life Care**
Acute phase I Semiurgent setting Few pandemic infection patients and numbers not rapidly escalating, demand within health system capacity	Continue population-based cancer screening with appropriate social distancing[64,83,95]	Continue initial investigations with use of telehealth where possible[a]; encourage community members to present to GP with *reg flag* symptoms of cancer	Prioritize diagnostic procedures for patients with symptoms and test results suspicious for cancer and use telehealth where possible[a,86,91]	Determine if surgery is elective (can be delayed without a predicted negative outcome)[13]; consider modifications to radiotherapy (eg, hypofractionation)[102,103] and to system treatments (eg, oral, shorter regimens)[82,90]	Consider shared follow-up care, using telehealth where possible[a,82,102]; screen patients for distress and provide psychosocial support[90]	Consider modifying treatments for patients with refractory/resistant disease or treatment breaks for patients with low-volume and/or stable metastatic disease[90]	Consider using telehealth[107] and community palliative care service[90] where possible[a]; discuss goals of care and advanced care planning[90,108]
Acute phase II Urgent setting Rapidly escalating numbers of pandemic infection patients, appproaching limits of health system capacity	Consider reduction of routine population-based cancer screening according to resource availability[64,83,91] but for the least possible time during the prolonged acute phases Follow up abnormal screening results in patients already screened, prioritizing those highly suspicious for cancer[91]	Continue initial investigations with the use of telehealth where possible[a]; encourage community members to present to GP with *red flag* symptoms of cancer	Prioritize diagnostic procedures for patients with symptoms and test results suspicious for cancer and use telehealth where possible[a,86,91]	Prioritize surgery patients by urgency[7,91]; consider delay in commencement of radiotherapy unless urgent[91,102]; and modify systemic treatment as feasible (eg, oral or less toxic regimens).[82,84,90,108] Limit patient visitors or support persons in hospitals (except at end of life)	Delay face-to-face follow-up appointments and use telehealth where possible[a,82]; consider innovative models of care, eg, shared follow-up care with GP; screen patients for distress and provide psychosocial support[90]	Minimize commencement of IV treatment for patients with refractory/resistant disease; consider deferring palliative radiation therapy treatment,[106] except where these are for life-threatening or urgent conditions.[102] Limit patient visitors or support persons in hospitals (except at end of life)	Consider using telehealth[107] and community palliative care service[90] where possible[a]; discuss goals of care and advanced care planning[90,108]
Acute phase III Emergency setting High numbers of pandemic infection patients, health system capacity exceeded	Consider reduction or deferral of routine population-based cancer screening[64,83,91] but for the least possible time during prolonged acute phases Follow up abnormal screening results in patients already screened, prioritizing those highly suspicious for cancer[91]	Appropriately investigate and refer patients with symptoms, with the use of telehealth where possible[a]; encourage community members to present to GP with *red flag* symptoms of cancer	Prioritize diagnostic procedures for patients with test results highly suspicious for cancer and use telehealth where possible[a,86,91]	Prioritize surgery for life-threatening conditions;[7,91] defer or avoid radiotherapy if clinically appropriate and use shortest safe regimens.[91,102,103] Discuss risks and benefits of starting or changing systemic treatment and reach a shared decision.[53,82] Limit patient visitors or support persons in hospitals (except at end of life)	Delay face-to-face follow-up appointments and use telehealth where possible[a,82]; consider innovative models of care, eg, shared follow-up care with GP; screen patients for distress and provide psychosocial support[90]	Minimize commencement of IV treatment for patients with refractory/resistant disease or palliative regimens with a low likelihood of response/benefit; if radiotherapy is needed for symptom control, use the shortest safe form of treatment.[102,107] Limit patient visitors or support persons in hospitals (except at end of life)	Consider ceasing palliative treatments that have minimal chance of substantial benefit; prioritize management of patients with urgent symptomatic need[91,107]; discuss goals of care and advanced care planning[90,108]
Recovery phase Past the peak of pandemic infection with fewer new daily cases, health system capacity not exceeded	Considerations for reintroduction of service should include the local levels of pandemic infection transmission, the local or regional health system capacity, and availability of resources. These considerations may change over time and vary by service type and setting[83,90] Gradually reintroduce the standard of care according to perceived risk, prioritizing patients at high risk (such as those most at risk for complications from delayed care or those with high risk of cancer progression or recurrence) with consideration of each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109]						
	Gradually reintroduce of routine population-based cancer screening with consideration of local conditions and resource availability[83,91] Prioritize appointments for participants whose screening appointment was delayed or for high-risk patients[83]	Appropriately investigate and refer patients with symptoms; encourage community members to present to GP with *red flag* symptoms of cancer	Prioritize diagnostic procedures for patients with test results highly suspicious for cancer and use telehealth where possible[a,86,91]	Gradually reintroduce of routine surgery up to capacity limits and prioritize high-risk patients whose surgery was delayed because of the pandemic[91]; continue hypofractionation where appropriate[7,106]; commence or restart as appropriate, adjuvant treatment that was deferred or interrupted	Prioritize follow-up appointments (as well as any hospital imaging and/or blood tests) for high-risk patients and patients whose appointments were delayed during the acute pandemic phases[83]	Gradually reintroduce the standard of care according to perceived risk, prioritizing high-risk patients, depending on the environmental circumstances and each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109]	Gradually reintroduce the standard of care according to perceived risk, prioritizing high-risk patients, depending on the environmental circumstances and each individual patient's risk of exposure to the pandemic infection because of the resumption of care[83,109]

Vaccination, if vaccination against pandemic pathogen is available, should be offered to patients with cancer with consideration of any vaccine contraindications, type of cancer, type and timing of treatment, and level of immunocompromise[97-100]

FIG 3. Summary of the conceptual framework for cancer care during a pandemic. [a]For telehealth services, videoconferencing is the preferred substitute for a face-to-face consultation.[110,111] GP, general practitioner; IV, intravenous.

following: further consideration of health system capacity components and changes during a pandemic, consideration of continuing anticancer treatments and individualizing treatment decisions, supportive care, health professionals' burnout, and vaccination against pandemic infection.

The evidence and rationale underpinning the conceptual framework are summarized in Box 1 (Fig 2).

The evidence supports the continuation of cancer care wherever possible during a pandemic to achieve the best outcomes for patients with cancer and the community and to minimize the adverse impacts of the pandemic on cancer care. At each step of the cancer care continuum, decisions on cancer care should be based on consideration of health system capacity and capacity for cancer care delivery, in relation to the progression of the pandemic and pandemic infection control.

Cancer Australia's conceptual framework, underpinned by principles for optimal cancer care, provides guidance on how to continue cancer care during a pandemic. Detailed guidance is provided in Table 3 and is summarized in Figure 3. The framework is a matrix structure with guidance across the cancer care continuum, from prevention and early detection through to end-of-life care, for the different acute (I, II, and III) and recovery phases of a pandemic that incorporate changing health system capacity and capacity for cancer care delivery.

The guidance in the conceptual framework is supported by evidence from the COVID-19 pandemic and on guidance, recommendations, and position statements from peak cancer care organizations on cancer care during the COVID-19 pandemic.[82,84,90,91,95,101,102] Many of the guidance and recommendations from peak organizations were expert-based and/or consensus-based. A rapid evidence review[53] informed the National Institute for Health and Care Excellence guidelines on systemic anticancer treatment and radiotherapy for patients with cancer during the COVID-19 pandemic.[82,102]

Vaccination for COVID-19 disease has become available, and cancer organizations have provided guidance that supports offering vaccination against COVID-19 disease to patients with cancer, with consideration of any contraindications and factors such as the type of cancer, type of treatment and timing, and counseling about effectiveness and ongoing prevention measures.[97-99]

Emerging evidence will continue to inform the conceptual framework to guide cancer care during the current pandemic, whereas longer-term evidence and data will inform decisions when faced with another pandemic.

DISCUSSION

The COVID-19 pandemic has affected cancer care because of reduced health system resources available for cancer care and the need to minimize the risk of COVID-19 disease in patients with cancer. The ongoing progression of the pandemic has provided an opportunity to examine the evidence base and reflect on learnings from the COVID-19 pandemic and further develop a conceptual framework for cancer care.

The importance of preventing COVID-19 disease in patients with cancer is predicated by the evidence showing the increased impact of the pandemic infection among patients with compared with patients without cancer. However, the implications of reducing or delaying cancer care across the care continuum, including the impact of rapid shutdown and slow ramping up of services on patient backlogs, are substantial and significant.

Evidence from the COVID-19 pandemic supports the continuation of cancer care wherever possible during a similar pandemic to achieve the best outcomes for patients with cancer and the community and minimize the adverse impacts of the pandemic on cancer care. Underpinned by principles for optimal cancer care and informed by the evidence on cancer care during the COVID-19 pandemic, Cancer Australia's conceptual framework provides detailed guidance on critical considerations and an evidence-based toolkit for cancer care during the current COVID-19 pandemic and future similar pandemics. It reflects changing health system capacity and capacity for cancer care, enabling its broad applicability to different global contexts, and is consolidated by consideration of best practice principles for cancer care. The framework provides a planning resource for multiple stakeholders including health services and policy makers. Emerging evidence and data will continue to inform the evolution of the framework to guide ongoing cancer care during this and future pandemics.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

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