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Organizational Guidance for the Care of Patients with Central Nervous System Tumours in Ontario: Consensus Recommendations

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An assessment conducted in October 2025 deferred the review of Guideline 9-11. This means that the document remains current until it is assessed again next year. The PEBC has a formal and standardized process to ensure the currency of each document (PEBC Assessment & Review Protocol)

Guideline 9-11 is comprised of 3 sections. You can access the summary and full report here:

https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/76866

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Organizational Guidance for the Care of Patients with Central Nervous System Tumours in Ontario: Consensus Recommendations

Section 1: Recommendations

This section is a quick reference guide and provides the guideline recommendations only. For the guideline development process, see the Full Report.

GUIDELINE OBJECTIVES

To provide guidance for the organization and delivery of healthcare services for adult patients with primary central nervous system (CNS) tumours in Ontario.

The goal is to ensure that all patients in Ontario have access to comprehensive CNS tumour services, regardless of their place of residence. Specifically, to ensure appropriate coordination of concurrent services (surgery, chemotherapy, radiotherapy, and supportive care) within a province-wide CNS tumour program, including:

- Appropriate clinician/health professional skill set, experience, and qualifications
- Case review at multidisciplinary case conferences (MCCs)
- Access to expert multidisciplinary resources (including allied health/psychosocial oncology)
- Care as close to home as possible
- Access to clinical trials

INTRODUCTION

In 2020, it was estimated that over 4500 Ontarians would be diagnosed with, and nearly 3500 Ontarians die from, a CNS cancer [1].

Primary CNS tumours are a heterogenous group of malignant and nonmalignant tumours with varied trajectories ranging from noninvasive and surgically curable gliomas, to more common highly invasive and incurable glioblastomas. CNS tumour care must be multidisciplinary, as well as tailored to individual patients, requiring surgery, radiation therapy, and chemotherapy input into a proposed treatment plan for the most responsible physician to consider. Diagnosis often relies on specialized imaging and laboratory testing, including histological examination, immunohistochemistry, cytogenetics and, increasingly, next-generation sequencing. Tumour identity at the molecular level can have a profound effect on determination of treatment approach and on patient outcomes. For example, patients diagnosed with adult-type low-grade gliomas that possess a mutation in the isocitrate dehydrogenase (IDH) gene may have an expected long overall survival, in contrast to the poor overall survival associated with patients diagnosed with a low-grade glioma and adult-type IDH wild type. Therefore, in patients with IDH-mutant low-grade glioma, treatment decisions regarding surgery, chemotherapy, and radiation therapy may have profound effects on the patient's quality of life measured in years or even decades. The principles of rare tumour management hold true particularly for benign but aggressive tumours of the CNS. For example, although the molecular alterations observed for chordoma or craniopharyngioma may not yet have a significant impact on decisions relating to upfront management, initial surgery offers the best chance for cure or tumour control and should be undertaken only at centres of experience to maximize the therapeutic outcome. Postoperatively, decisions regarding radiation therapy are complex and can have long-lasting impacts on a patient's quality of life and chance for cure or disease control, and eligibility for experimental systemic therapy

reserved for recurrence. Lastly, the recognition that the adolescent and young adult population may harbour distinct molecular alterations that can allow for systemic therapies rather than traditional surgical and radiotherapeutic approaches [2-4], further highlights the need for an organized care pathway for patients in Ontario with CNS cancers.

No organizational guidance currently exists at the provincial level to ensure the delivery of coordinated, high-quality, whole-person care for patients with CNS tumours. This includes requirements for clinician experience/qualifications, expert allied health care, and access to all essential components of CNS tumour care.

Over the past decade in Ontario, the footprint of centres offering care for patients with primary brain tumours has expanded, with the goal of diminishing the burden for patients to access high-level, high-quality CNS tumour care. This effort has been tempered by recognition of the rarity of many of these diseases, and by the complexity of treatment and care, particularly given increasingly specialized and sophisticated radiation and surgical techniques, and additional options for targeted systemic therapies. Guidance is needed to ensure quality of care and coordination of services across sites. The delivery of CNS tumour care at centres without sufficient resources places patients at risk of inappropriate treatment decisions, suboptimal service delivery or fragmented care, inequitable access to care, poor outcomes, and increased hospitalization [5-7].

TARGET POPULATION

This guideline focuses on adult patients with primary CNS tumours (glioma and other primary parenchymal neoplasms, sellar lesions, and skull-base lesions and meningioma) and their caregivers. This guideline does not apply to patients with brain or spinal metastases, sarcomatous tumours of the CNS, or pediatric patients with CNS tumour, as care considerations for these patients have been addressed by previous or parallel guideline efforts. For organizational guidance on brain metastases, please see the related Ontario Health (Cancer Care Ontario) (OH (CCO)) organizational care guideline for stereotactic radiosurgery treatment of brain metastasis [8]. Tumours included within this organizational care guideline are summarized in Table 1-1.

Table 1-1. Central nervous system primary tumours

Gliomas and other primary parenchymal neoplasms	Sellar lesions	Skull-base lesions and meningioma
Low-grade glioma	Pituitary adenoma	Convexity meningioma
High-grade glioma	Parasellar meningioma	Anterior fossa lesions
Germ cell tumours	Craniopharyngioma	Middle fossa lesions
Medulloblastoma	Optic pathway glioma	Posterior fossa lesions
Ependymoma		
Hemangioblastoma		
Pineal tumours		

INTENDED USERS

Stakeholders include all Ontario Regional Cancer Programs and affiliated centres that deliver CNS tumour care (primary brain tumours), as well as programs that plan to provide CNS tumour care in the future. Specifically, this document is intended for administrators responsible for developing, implementing, and maintaining CNS tumour programs and for the oncology health care professionals who interact with and care for patients with CNS tumours.

GUIDELINE QUESTIONS

1. What are the centre requirements for the organization and delivery of care for adult patients with CNS primary tumours?
2. What are the recommended staff requirements and expertise required by medical/surgical, nursing, and allied healthcare professionals to provide optimal care for patients with CNS primary tumours?

Case Scenario 1
A 26 year-old man has a seizure while at dinner with his husband. He is taken by ambulance to a local hospital emergency department, where he is given a benzodiazepine and loaded with phenytoin. A computed tomography (CT) scan is performed, demonstrating a hypodensity in the left frontal lobe, which is concerning for a primary brain tumour. Neurosurgery is consulted through CritiCall (the provincial emergency system designed to allow family doctors and emergency physicians access to urgent neurosurgical consultation), and per their instructions, arrangements are made for an urgent magnetic resonance imaging (MRI) scan. He is seen in the neurosurgery clinic the next day. Because of the location of the tumour, arrangements are made for him to undergo an awake craniotomy with speech mapping. Surgery is uncomplicated. Hematoxylin and eosin analysis of his tumour is consistent with a low-grade glioma. Post-operative imaging shows a substantial reduction in tumour burden, with some residual FLAIR signal adjacent to the speech centre. Molecular analysis performed at the CNS Partner Site's sister CNS Network Centre reveals ATRX loss consistent with a grade 2 IDH-mutant astrocytoma, prompting the tumour board to recommend upfront adjuvant therapy. He is referred to an academic neuro-oncology centre and the radiation oncologist and neuro-oncologist advise that he undergo radiation therapy with concurrent and adjuvant chemotherapy. He tolerates treatment well and remains seizure-free as he is transitioned from phenytoin to levetiracetam. He remains under surveillance in the neuro-oncology clinic with repeat imaging planned at three-to-six month intervals.

Case Scenario 2
A 76 year-old woman is brought by her family to her local emergency department with a two-month history of progressive behavioural change. CT imaging shows a large left frontal brain tumour. Neurosurgery is consulted through CritiCall. The patient is transferred to a neurosurgical centre, where she undergoes urgent MRI, revealing what appears to be a glioblastoma. She is taken to surgery soon after, and a gross total resection is performed. Pathology analysis shows an IDH wild type glioblastoma and MGMT promoter unmethylated. At tumour board review, the consideration of referral to an academic neuro-oncology centre that can offer a clinical trial for patients with unmethylated disease is suggested. The patient and her family are given the news and guided toward options on next steps. They decide against the clinical trial, stating instead that they would like to have standard care at a hospital nearer home. She is referred to a local CNS Partner Site that is able to deliver

adjuvant chemotherapy and radiation to patients with IDH wild type high-grade glioma.

CARE SETTINGS

In Ontario, the care of adults with CNS tumours is provided in a variety of settings. These settings are defined in this guideline as *CNS Network Centres*, *CNS Partner Sites*, and *other hospital sites*. Factors influencing where a patient receives care may include where the patient lives, the type of tumour, and the complexity of associated treatment and care. Some treatments for CNS tumours must be delivered from a CNS Network Centre – a specially designated centre of experience that is usually an academic hospital and affiliated cancer centre. Specialized care may also be provided from CNS Partner Sites - hospitals with oncology expertise that do not have all subspecialties on site. Care decisions depend on multi-disciplinary input supported through partnership with a CNS Network Centre, for example, through a joint MCC (also called tumour board). Other hospital sites may conduct initial investigations and provide routine and supportive care to limit the extent to which the patient needs to travel.

Building relationships among CNS Network Centres, CNS Partner Sites, and other hospital sites is imperative to ensure that patients with CNS primary tumours receive the best possible person-centred care. In recognition of the complexity and specificity of care needs of patients with CNS tumours, sites starting to offer CNS tumour care need to align with, and be mentored by, established CNS Network Centres. In this guideline, use of the term "access to" refers to the ability of a site to access services through an agreement or partnership with another facility.

The Working Group recognizes that a relationship exists between higher practice volumes and improvement in outcomes, however, insufficient data exist to make specific recommendations regarding target volumes for annual number of surgical, radiation, or systemic therapy cases with respect to CNS tumours.

Recommendation 1.1

CNS Network Centre

The CNS Network Centre is an academic hospital and/or cancer centre that must provide the full spectrum of services for patients with CNS tumours, including the specialties of neurosurgery, neuroradiology, neuropathology, neuro-oncology or medical oncology with CNS fellowship training, and radiation oncology with CNS fellowship training or its equivalent. A CNS Network Centre may be composed of one or two closely situated facilities with a formal connection.

CNS Partner Site

The CNS Partner Site is a hospital that should provide a subset of services for patients through a shared-care model, and liaise with CNS Network Centres to share portions of care. Depending on circumstances, CNS Partner Sites may have specialized expertise for specific tumours or in specific services/disciplines. A CNS Partner Site should include a CNS radiation oncologist or a radiation oncologist with sufficient training and competence to treat CNS malignancies, and a neuro-oncologist or medical oncologist with CNS fellowship training either on site or as part of the MCCs.

Other Hospitals

Other hospitals are local hospitals without specific CNS tumour oncology expertise. These hospitals play a critical role in performing initial investigations, administering treatments determined by specialists, and providing supportive, palliative, and follow-up care.

Recommendation 1.2
CNS Partner Sites that care for patients with CNS tumours should establish formal connections with CNS tumour CNS Network Centre to access specialized expertise and services, which must include access to virtual MCCs.

Recommendation 1.3
Many CNS tumours are rare and practice volumes will depend on local conditions. Sites should have sufficient patient volume to maintain competency and safety.

MINIMUM SERVICES FOR ALL PATIENTS WITH CNS TUMOURS

Recommendation 2.1
All patients with CNS tumours must have access to the following services (on-site or through CNS Partner Sites or CNS Network Centres):

- Diagnostics with neuropathology expertise including advanced molecular diagnostics
- Imaging (MRI, CT, other imaging) with neuroradiology expertise including MR perfusion
- Treatment (neurosurgery, CNS radiotherapy (including fractionated radiotherapy for CNS tumours (1.8-3.0Gy/day), fractionated stereotactic radiotherapy (1.8-3.0Gy/fraction), single fraction and hypofractionated radiosurgery [For the technical requirements specific to radiosurgery and fractionated radiosurgery (also referred to as Hypofractionated Stereotactic Radiotherapy/Radiosurgery), please refer to the PEBC Organizational Guideline for the Delivery of Stereotactic Radiosurgery for Brain Metastases in Ontario], and medical oncology/neuro-oncology)]
- Access to clinical trials (all patients should have the opportunity to access clinical trials)
- Review at MCC

Recommendation 2.2
In addition to services listed in Recommendation 2.1, CNS services provided by the following areas of health care must be available or accessible:

- Neurology
- Nursing (patient education, symptom management, supportive care, coordination, and navigation)
- Allied health/Psychosocial Oncology
    - Mental Health (Psychiatry, Psychology)
    - Social work (counseling, caregiver and patient's dependents supports, information regarding home support, transportation [local and distant], and funding assistance)
    - Rehabilitation (Occupational therapy, Physiotherapy, Speech language pathology)
    - Nutrition (Dietitian)
- Palliative and end-of-life care (including medical assistance in dying)

- Patient coordination and communication (Most Responsible Physician [MRP] and continuity of care)

Many of the services listed above may be provided in community settings (e.g., private clinic or home care), particularly for outpatients receiving post-hospital care. Services in the outpatient environment may require out-of-pocket payment or private insurance.

Services with the full spectrum of CNS tumour specialty care are provided on-site by CNS Network Centres. CNS Partner Sites provide a subset of services and access to more specialized services through a shared-care model. Table 1-2 shows the services recommended for the CNS Network Centre and CNS Partner Sites. "Access to" at a site means that local expertise might be available on site; if not, a CNS Partner Site must liaise with a CNS Network Centre, or a site might need to liaise with a specialty hospital to access a particular service.

Table 1-2. Services recommended by site

Recommendation	Service	CNS Network Centre	CNS Partner Site
Recommendation 2.3	Diagnostics (pathology and radiology)	Neuropathology Advanced molecular diagnostics, brain mapping Neuroradiology Advanced imaging protocols Dynamic contrast protocols	Pathology and radiology Access to neuropathology and neuroradiology
Recommendation 2.4	Medical/neuro-oncology	Yes	Yes
Recommendation 2.5	Radiation oncology	CNS radiation oncology	Radiation oncology Access to CNS radiation oncology
Recommendation 2.6	Surgery	Neurosurgery	Access to
Recommendation 2.7		Neurosurgery (with specific training in endoscopy)	Access to
Recommendation 2.8		Skull-base neurosurgery	Access to
Recommendation 2.9		ENT	Access to
Recommendation 2.10		ENT rhinology	Access to
Recommendation 2.11		Neuro-ophthalmology	Access to
Recommendation 2.12		Neuro-otology	Access to
Recommendation 2.13	Endocrinology	Yes	Access to
Recommendation 2.14	Neurology	Yes	Access to
Recommendation 2.15	Nursing	Specialized oncology nursing	Specialized oncology nursing
Recommendation 2.16	Nurse Practitioner	Yes	Access to
Recommendation 2.17	Social work	Social worker with CNS expertise	Social worker with access to social worker with CNS expertise
Recommendation 2.18	Physiotherapy	Yes	Access to

Recommendation 2.19	Occupational therapy	OT with CNS expertise	OT with access to OT with CNS expertise
Recommendation 2.20	Rehabilitation	Access to	Access to
Recommendation 2.21	Speech language pathology	Yes	Access to
Recommendation 2.22	Nutrition	Yes	Access to
Recommendation 2.23	Palliative and end-of-life care	Yes	Access to
Recommendation 2.24	Mental health (psychology and psychiatry)	Yes	Access to

Services are provided on-site unless otherwise noted. CNS=central nervous system; ENT=ear, nose, and throat; NA=not applicable; OT=occupational therapy

Patient Coordination and Communication

The treatment journey following diagnosis with a CNS tumour can be a complex and disorienting experience for patients. Coordination is vital to ensuring the smooth transition between stages of care (e.g., diagnosis, surgery, adjuvant therapy, and surveillance). Ideally, an advisory service would be available throughout a patient's cancer/tumour journey that would cross different treatment specialties and locations and provide continuity and a single point of contact for information and advice [9, 10]. While such an advisory service does not currently exist in Ontario, resources are available for patients and caregivers and advice is provided on ways to enhance patient continuity of care.

The development of the role of MRP to effectively engage with patients within each service is encouraged, as is following the recommendations on maintaining continuity of care from person-centred care guidelines [11].

Most Responsible Physician

Recommendation 3

The MRP is an established role in cancer care. The MRP is responsible for a patient during a distinct stage of care (e.g., diagnosis, surgery, adjuvant therapy, and surveillance).

- A physician clearly identified to the patient should have responsibility for directing and coordinating the care and management of an individual patient at a distinct phase of care.
- An MRP should be identified for each service (e.g. surgery, radiation oncology, oncology) that interacts with a patient. The appropriate clinician to fill the MRP role should be determined at the local institutional level.
- Patients with CNS tumours will often receive care from more than one healthcare provider and at more than one healthcare institution. The MRP is the designated point of contact for patients, caregivers, and relatives and ensures the proper transfer of care between specialties and facilities.

Continuity of Care

All patients in Ontario with CNS tumours should have person-centred medical care. Because stages of care may be dispersed across healthcare providers and centres, optimal coordination of care is required. While individual services may effectively assist and communicate with patients and caregivers about matters relevant to their specialties, many

issues that patients have identified as important may not be addressed. These (often practical) issues transcend one particular service or health professional's purview, and affect the entire patient care journey. Areas in which patients may need guidance include transportation and parking, long-distance travel to access specialized care, navigation of health care sites, and access to local support groups or online forums.

Person-centred care should be provided as outlined in the OH (CCO) person-centred care guideline [11]. The guideline provides specific recommendations for continuity of care, which include transition points through all phases of the care continuum.

Continuity of Care Recommendations from OH (CCO) Person-centred Care [11]

Assess each patient's requirement for continuity of care and their preference for how that requirement will be met. This may involve the patient seeing the same healthcare professional throughout a single episode of care, or ensuring continuity within a healthcare team.
For patients who require a number of different services (for example, services in both primary and secondary care, or different clinics in a hospital), ensure effective coordination and prioritization of care to minimize the impact on the patient.
Ensure clear and timely exchange of patient information: • between healthcare professionals in the circle of care (particularly at the point of transitions in care) • between the healthcare team and community services (with the patient's consent, in accordance with the Freedom of Information and Protection of Privacy Act [FIPPA]).
All staff directly involved in a patient's care should introduce themselves to the patient.
Inform the patient about: • who is responsible for their care and treatment • the roles and responsibilities of the different members of the healthcare team • the communication about their care that takes place between members of the healthcare team.
Give the patient information about what to do and who to contact in different situations, such as out of hours or in an emergency.

INITIAL ASSESSMENT

The care journey for patients with a CNS primary tumour is often precipitated by either a medical crisis and presentation to the emergency department or a progressive issue that ultimately requires referral by the family doctor. While imaging often provides a presumptive diagnosis, confirmation of diagnosis typically occurs with harvest of diagnostic tissue at surgery performed at a neurosurgical centre. Post-surgical primary assessment is conducted by a CNS-specific MCC. In some cases, patients may also be reviewed before surgery based on the findings of imaging (e.g., suspected chordoma).

Based on the tissue diagnosis, the MCC engages in complex decision-making to formulate a treatment plan that could involve second-look surgery, radiotherapy, or systemic therapy. Selected treatments may be delivered at a CNS Partner Site; however, the complexity and rarity of a case may prompt a recommendation toward adjuvant treatment being delivered at a CNS Network Centre (Table 1-3).

Multidisciplinary Case Conferences

MCCs ensure that each patient case is discussed in a multidisciplinary forum with appropriate expertise to generate an appropriate treatment plan. Participation in MCCs is a

mechanism by which to ensure that 1) CNS Partner Sites have immediate access to experienced teams at CNS Network Centres; 2) referral pathways required by interdisciplinary care are streamlined; and 3) collegiality and understanding within and between disciplines are fostered. Videoconferencing allows partnering with another hospital that offers a specific disease site MCC or geographically distant partner hospitals.

More information about MCCs is available from the OH (CCO) website including an MCC standards document and several guideline-based clinical tools [12].

Recommendation 4

As per OH (CCO) guidelines for all cancer cases, all CNS primary tumour patient cases should be discussed at CNS-specific MCCs around the time of diagnosis and at progression/recurrence. MCC review is particularly critical for patients with CNS tumours, who often harbour rare tumours that require multi-disciplinary treatment.

Due to the nature of these diseases, engagement of palliative care early in the patient's journey is important. It is recommended that palliative care be considered/referred at the time of MCC. **Every MCC should define how palliative care physicians/teams will be engaged/consulted**. For example, consider palliative care team MCC attendance or clearly define how access to consultation with a palliative care physician/team will be completed near the time of diagnosis

SUBSEQUENT THERAPY

The cancer journey is one part – if sometimes a dominant and defining one – of an individual's life. This guideline has been developed to speak to the elements of the care system specific to the diagnosis and management of CNS primary tumours. These structures are not meant to replace the other pillars of support in a patient's life journey, such as family, community, and other primary caregivers (including a patient's family doctor), nor can they be reasonably expected to do so. Table 1-3 shows the sites that should provide services to patients with specific CNS primary tumours. Recognizing the complex and rare nature of most of these tumours, the services are almost all provided at CNS Network Centres. CNS Network Centres and patients also depend on CNS Partner Sites, which have developed appropriate expertise to provide some of these services, and other hospitals, which constitute a critical part of the support network for patients on the cancer journey.

Table 1-3. Central nervous system tumour specialized services for subsequent therapy

Recommendation	CNS Tumours		CNS Network Centre	CNS Partner Site
Recommendation 5.1	**Glioma and other parenchymal neoplasms**	IDH mutant gliomas Germ cell tumour Medulloblastoma Ependymoma Hemangioblastoma Pineal tumours	•	
Recommendation 5.2		Glioblastoma	•	•
Recommendation 5.3	**Sellar lesions**	Pituitary adenoma Parasellar meningioma Craniopharyngioma Optic pathway glioma	•	

Recommendation 5.4	**Skull-base lesions and meningioma**	Convexity meningioma Anterior fossa lesions Middle fossa lesions Posterior fossa lesions	•

IDH=isocitrate dehydrogenase

PROVIDERS OF CNS TUMOUR CARE

The following health professionals in Table 1-4 may be involved to a greater or lesser extent in the care of patients with CNS tumours. The minimum qualifications and training requirements for professionals in Ontario are described for each provider.

Table 1-4. Central nervous system tumour healthcare providers

Recommendation	Health Professional	Qualifications
Surgery		
Recommendation 6.1	Neurosurgeon	Certified in Neurosurgery by the Royal College of Physicians and Surgeons of Canada (RCPSC) or other internationally recognized program or licensing board. Clinical training experience in the breadth of the discipline of Neurosurgery (vascular and endovascular, spinal, functional, neuro-oncology, peripheral nerve, radiosurgery, and pediatric neurosurgery) [13].
Recommendation 6.2	Skull-base surgeon	Royal College certified in Neurosurgery or Otolaryngology – Head and Neck Surgery or other internationally recognized program or licensing board plus a clinical fellowship within neurosurgery or head and neck surgery covering advanced training in treating lesions in and around the base of the skull [14, 15].
Recommendation 6.3	Neuro-ophthalmologist	Usually Royal College certified in Neurology, Ophthalmology, or both or other internationally recognized program or licensing board. Neuro-ophthalmology is a required part of the curriculum in all ophthalmology and neurology residency programs [16]. Also suggested a fellowship in neuro-ophthalmology [17].
Recommendation 6.4	Rhinologist – Head and Neck Surgeon (Ear, Nose, and Throat [ENT])	Royal College certified in Otolaryngology – Head and Neck Surgery or other internationally recognized program or licensing board [18] plus advanced training in Rhinology [19].
Recommendation 6.5	Neuro-otologist (also neurotologist)	Royal College certified in Otolaryngology – Head and Neck Surgery or other internationally recognized program or licensing board [20]. Also suggested a clinical fellowship in Medical & Surgical Otology/Neurotology [21].
Pathology		

Recommendation 6.6	Pathologist	Royal College certified in Anatomical Pathology or other internationally recognized program or licensing board [22].
Recommendation 6.7	Neuropathologist	Royal College certified in Neuropathology or other internationally recognized program or licensing board. At least 2 years of training in neuropathology including pediatric neuropathology, forensic pathology, and muscle and nerve neuropathology and has enhanced knowledge and skill in the pathology of CNS tumours [23].
Radiology		
Recommendation 6.8	Radiologist	Royal College certified in Diagnostic Radiology or other internationally recognized program or licensing board [24].
Recommendation 6.9	Neuroradiologist	Royal College certified in Diagnostic Radiology or other internationally recognized program or licensing board and completion of an accredited program in Neuroradiology, or equivalent. Enhanced knowledge and skill in performing cerebral and spinal angiography and CT, percutaneous spinal intervention, MRI, ultrasound, plain film radiology, and interventional neuroradiology/endovascular therapy related to the brain, head, neck, and spine [25].
Medicine		
Recommendation 6.10	Neurologist	Royal College certification in Neurology or other internationally recognized program or licensing board. Clinical training experiences in the breadth of the discipline of Neurology, with skill and experience in Neuro-oncology obtained from a formal clinical fellowship or substantial clinical training at an expert centre [26].
Recommendation 6.11	Endocrinologist	Royal College certification in Internal Medicine or Pediatrics or other internationally recognized program or licensing board plus Royal College certification in Endocrinology and Metabolism [27].
Medical Oncology		
Recommendation 6.12	Medical Oncologist	Royal College certification in Internal Medicine and completion of post-graduate training in Medical Oncology (after completion of Internal Medicine) is required, or accreditation from an internationally recognized program or licensing board. Has enhanced knowledge and skill in Neuro-oncology obtained from a formal clinical

		fellowship or substantial clinical training at an expert centre [28].
Recommendation 6.13	Neuro-oncologist	Royal College certification in Neurology and completion of post-graduate training in Neuro-Oncology is required, or accreditation from an internationally recognized licensing board [29]. OR Medical Oncologist (as above) with enhanced knowledge and skill in Neuro-oncology obtained from a formal clinical fellowship or substantial clinical training at an expert centre.
Radiation Oncology		
Recommendation 6.14	Radiation Oncologist	Royal College certification in Radiation Oncology or accredited by an internationally recognized program or licensing board [30].
Recommendation 6.15	CNS Radiation Oncologist	Royal College certification in Radiation Oncology or accredited by an internationally recognized program or licensing board [31]. Enhanced knowledge and clinical training in the treatment of patients with CNS tumours obtained through a fellowship in CNS cancer radiotherapy is required [8].
Recommendation 6.16	Medical Physicist	Graduate degree in Medical Physics, Physics, Science with Physics as a major, or another field deemed acceptable by the Board of the Canadian College of Physicists in Medicine. Certified by the Canadian College of Physicists in Medicine or an equivalent national or international certification agency [32].
Recommendation 6.17	Medical Radiation Therapist	Bachelor's degree in Medical Radiation Sciences plus an advanced college diploma. Certified by the Canadian Association of Medical Radiation Technologists or an equivalent national or international certification agency [33].
Recommendation 6.18	Medical Dosimetrist	Bachelor's degree in Medical Radiation Sciences plus an advanced college diploma, and completion of the Canadian Dosimetry Certificate program from the Canadian Association of Medical Radiation Technologists [34].
Nursing		
Recommendation 6.19	Oncology Nurse	Bachelor's degree in nursing (BScN) and successful completion of the registration exam of the College of Nurses of Ontario (RN) [35]. Certification by the Canadian Nursing Association in Oncology Nursing (C)anada (CON(C) is recommended [36] and

		expertise in CNS cancers (medical and surgical), palliative care, epilepsy, and psychosocial oncology, depending on area of involvement in CNS tumour care.
Recommendation 6.20	Nurse Practitioner	Master's degree in nursing with NP adult specialty or primary health care certification and RN(EC) registration with the College of Nurses of Ontario [37]. Hospital or patient care experience in CNS tumours. Certification by the Canadian Nursing Association in Oncology Nursing (C)anada (CON(C) is recommended [36].
Allied Health & Rehabilitation/Psychosocial Oncology		
Recommendation 6.21	Social Worker	Master's degree in social work (MSW) and registered with the Ontario College of Social Workers and Social Service Workers (RSW) [38]. Hospital or patient care experience in CNS tumours.
Recommendation 6.22	Physiotherapist	Master's degree in physiotherapy and registered with the College of Physiotherapists of Ontario [39].
Recommendation 6.23	Occupational Therapist	Master's degree in occupational therapy and completion of the National Occupational Therapy Certification Examination and registered with the College of Occupational Therapists of Ontario [40]. Hospital or patient care experience in CNS tumours.
Recommendation 6.24	Speech Language Pathologist	Master's degree in speech language pathology from a Canadian university program accredited by the Council for Accreditation of Canadian University Programs in Audiology and Speech-Language Pathology (CACUP-ASLP) and registered with the College of Audiologists and Speech-Language Pathologists of Ontario (CASLPO) [41].
Recommendation 6.25	Nutritionist/Dietitian	Bachelor's degree in nutrition/dietetics/food science from a Canadian university program and completion of a practicum program accredited by the Partnership for Dietetic Education and Practice. Successful completion of the Canadian Dietetic Registration Examination [42].
Recommendation 6.26	Psychologist	Doctoral degree in clinical psychology. Registered with the College of Psychologists of Ontario [45]. Clinical neuropsychology is a specialty stream within clinical psychology training. Has special expertise in the applied science of brain-behavior relationships.

Recommendation 6.27	Psychiatrist	Royal College certification in psychiatry or accredited by an internationally recognized program or licensing board [46]. Subspecialty of neuropsychiatry provides enhanced knowledge of neurological mechanisms of mental illnesses.
Palliative Care		
Recommendation 6.28	Palliative Medicine Physician	Completion of a Royal College-accredited program in adult Palliative Medicine or accredited by an internationally recognized program or licensing board [43] or Certificate of Added Competence from the College of Family Physicians of Canada [44]. The role of Nurse Practitioner may also apply to palliative care.
Primary Care		
Recommendation 6.29	Primary Care Physician	Successful completion of an approved training program and the Certification Examination in Family Medicine of the College of Family Physicians of Canada (CFPC) [47]. Primary care physicians are responsible for the overall health of the patient and are vital to the continuity of care throughout the patient's cancer journey. Although not involved in the day-to-day treatment of the cancer patient, the primary care physician has an important role in post-treatment supportive care and may be actively involved at other stages of care. Primary care physicians are included in all communications. The role of Nurse Practitioner may also apply to primary care.

CNS=central nervous system; CT=computed tomography; MRI=magnetic resonance imaging

FUTURE CONSIDERATIONS

Virtual care in cancer care in Ontario has existed in a limited form, but its adoption has accelerated during the COVID-19 pandemic. OH (CCO) has recently completed a guideline and evidence summary of relevant literature on virtual care in patients with cancer [48, 49].

Feedback from both patient and clinician groups made it clear that there is a need for development of the role of patient navigator. While this need might be relevant for all cancer care, CNS tumour care is a particularly complex landscape that requires excellent communication across many healthcare services. The role of patient coordinator is that of an intermediary between the patient and the healthcare system. The patient coordinator should be a dedicated health professional or team that serves as a liaison between the patient and various health professionals and is available to offer practical advice and assistance to the patient throughout their care journey. Potential patient coordinator responsibilities are:

- to be a point of contact for the patient or family at all times through the care journey.
- to be familiar with the patient's file.
- to refer the patient to the most appropriate health professional to answer a specific question.
- to assist the patient in processing information received from various health professionals.
- to provide the patient with information about local support groups, online forums, Facebook groups (e.g., Brain Tumour Foundation of Canada), and travel assistance (e.g., Hope Air).
- to assist the patient with accessing community health and social services supports.
- ideally, to assist the patient with care transitions across healthcare facilities.