Guideline Resource Unit
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Sampling of Suspected Pediatric Solid Tumours

Effective Date: December 2025

Background

The diagnosis of pediatric solid tumours presents unique challenges compared to adult cancers, requiring specialized handling by a multidisciplinary team. The primary aim of these guidelines is to standardize tissue acquisition to ensure sufficient, high-quality material is available for diagnosis, prognostic testing, and clinical trial enrollment. Sufficient sampling at the initial procedure is paramount, as many pediatric tumours require extensive molecular and cytogenetic analysis for definitive classification and risk stratification. Following these recommendations will help optimize patient care by facilitating timely, accurate diagnoses and minimizing the need for repeat invasive procedures.

Guideline Questions

1. Where is the most appropriate setting for performing a pediatric biopsy?
2. Which multidisciplinary teams are required to ensure the optimal diagnosis of a pediatric tumour?
3. What is the optimal procedure for biopsy of possible pediatric tumours?

Search Strategy

Relevant literature and guidelines were identified through a systematic search of PubMed and oncology-based health organization resources up to August 2025. See Appendix A for detailed search strategy.

Target Population

The following recommendations apply to pediatric patients under the age of 18, with suspicion of a solid tumour occurring outside of the central nervous system.

Recommendations

1. All pediatric biopsies should be performed at specialized pediatric hospitals[1-4]. In Alberta these are the Stollery Children's Hospital in Edmonton or the Alberta Children's Hospital in Calgary.

2. Prior to biopsy, the patient requires a multidisciplinary assessment[2], including at least: pediatric medical oncology, pediatric general surgery/pediatric subspecialty surgery, pediatric radiology (interventional radiology), and pediatric pathology. This meeting may be formal (e.g., tumor board, patient rounds) or informal (e.g., virtual chat, discussion in person) but should occur before proceeding with tissue procurement, with particular attention paid to the amount of tissue required to complete all relevant investigations and whether fresh frozen tissue is required.

Suspected Lymph Node Involvement by Lymphoma/Leukemia

Core Needle Biopsy Protocol:

3. Excisional or incisional biopsy of lymph node suspected to be involved by lymphoma/leukemia is considered the standard of care[5-7]. Fine-needle aspirate of a lymph node alone is considered insufficient for diagnosis of lymphoma/leukemia as it inadequately captures lymph node architecture. Core biopsies of a lymph node are only reserved for situations where excisional or incisional biopsy cannot be performed due to anatomical or patient factors.

   Sampling Requirements:

Needle Gauge	14	16	18
Number of cores required for diagnosis	4 – 6	6 – 8	8 – 10
Minimum cumulative core length required	8 cm	12 cm	16 cm

**1 – 2 additional core biopsies are required for each additional test (e.g. microbiology, flow cytometry, enrolment in clinical trials)*

Open Biopsy Protocol:

4. Complete lymph node sampling is the standard of care for nodal involvement by a lymphoproliferative disorder[5-7]. Assessment of the complete lymph node architecture is necessary for a subset of lymphomas. Although a lymphoma protocol exists for adults, the collection and submission of tissue may differ in the pediatric population in specific situations.

   Sampling Requirements: Resection of entire lymph node (when possible).

Somatic/Visceral Tumours

Core Needle Biopsy Protocol:

5. For most pediatric tumours, fine needle aspiration does not provide sufficient material for a diagnosis, as such image guided core biopsies are strongly recommended except in situations where cytology is routinely used for diagnosis (e.g. thyroid or salivary gland lesions). Moreover, core biopsies may provide insufficient material for diagnosis compared to open surgical biopsies in some malignancies[8]. The following represent suggestions on the collection and submission of imaging guided biopsies that can safely be used in a given patient/clinical situation based on available clinical evidence[9-11].

   Sampling Requirements:

Needle Gauge	14	16	18
Number of cores required for diagnosis	4 – 6	6 – 8	8 – 10
Minimum cumulative core length required	8 cm	12 cm	16 cm

**1 – 2 additional core biopsies are required for each additional test (e.g. microbiology, flow cytometry, enrolment in clinical trials)*

Open Surgical Biopsy Protocol (Incisional Biopsy):

6. This guideline is intended for sampling aimed at diagnosis and is not intended for situations where surgery is aimed at complete resection. Compared to core biopsies, open biopsies of deep lesions carry an increased recovery time as well as increased risk of complications[8,12]. However, open biopsies have an overall higher diagnostic rate than core biopsies[8]. Typically, open biopsies are suggested in instances where core biopsies are not possible due to the anatomical location, or where prior core biopsies yielded insufficient material for a complete diagnosis.

   Sampling Requirements: Minimum of 1.0 cm^3 (more tissue is preferred if possible).

Bone Tumours

Bone Core Needle Biopsies for Suspected Tumours without Soft Tissue Component:

7. For pediatric tumours, fine-needle-aspirates provide inadequate material for diagnosis of osseous lesions and are not recommended. The goal is to obtain equivalent volume of tumour that would be acquired from an open biopsy which equates to 1 – 3 cm^3 of tissue[2]. The following represent strongly recommended guidelines on the collection and submission of imaging guided biopsies.

   Sampling Requirements:

Needle Gauge	12	13	14	16	18
Number of cores required for diagnosis	5 – 7	5 – 7	7 – 12	15 – 20	18 – 30
Minimum cumulative core length required	5 cm	5 cm	7 cm	11 cm	18 cm

** If osteosarcoma is suspected, acquire an additional 2–3 cores of the underlying osteoid*

***1 – 2 additional core biopsies are required for each additional test (e.g. microbiology, flow cytometry, enrolment in clinical trials)*

Bone Core Needle Biopsies for Suspected Tumours with Soft Tissue Component:

8. For pediatric tumours, fine-needle-aspirates provide inadequate material for diagnosis of osseous lesions and are not recommended. The goal is to obtain equivalent volume of tumour that would be acquired from an open biopsy, which equates to 1 – 3 cm^3 of tissue[2]. Of note, the current COG recommendation is to sample either the bone or the soft tissue component. However, sampling of both the bone and the soft tissue component is strongly recommended to prevent the necessity for repeat biopsy. The following represent strongly recommended guidelines on the collection and submission of imaging guided biopsies.

   Sampling Requirements: Bone and Soft Tissue Component

Needle Gauge	12	13	14	16	18
Number of cores required for diagnosis	5 – 7	5 – 7	7 – 12	15 – 20	18 – 30
Minimum cumulative core length required	5 cm	5 cm	7 cm	11 cm	18 cm

** If osteosarcoma is suspected, acquire an additional 2–3 cores of the underlying osteoid*

***1 – 2 additional core biopsies are required for each additional test (e.g. microbiology, flow cytometry, enrolment in clinical trials)*

Sampling Requirements: Soft Tissue Only

Needle Gauge	14	16	18
Number of cores required for diagnosis	10 – 13	15 – 20	25 – 30
Minimum cumulative core length required	10 cm	12 cm	25 cm

** If osteosarcoma is suspected, acquire an additional 2–3 cores of the underlying osteoid*

***1 – 2 additional core biopsies are required for each additional test (e.g. microbiology, flow cytometry, enrolment in clinical trials)*

Open Biopsy Protocol (Incisional Biopsy):

9. This guideline is intended for sampling aimed at diagnosis and is not intended for situations where surgery is aimed at complete resection. The following represent suggestions on the collection and submission of image guided biopsies that can safely be used in a given patient/clinical situation[2].

   Sampling Requirements: Cumulative volume 1.0 – 3.0 cm^3

Tissue Submission Guidelines

10. **Storage Media:** Place biopsy on saline-dampened Telfa (preferred) or gauze pads. Do not immerse in formalin, saline, or any other solution.

11. **Pathology Submission:** During pathology lab business hours (0800 – 1700 hours; M-F) transport the tissue immediately to the staffed pathology laboratory tissue submission window. Please keep warm ischemic time to a minimum (less than 15 minutes) and store the tissue temporarily in a fridge when required. If biopsy is obtained outside of lab business hours please notify the pediatric pathologist on call prior to obtaining the tissue to arrange tissue handling.

Discussion

Referral to pediatric medical oncology is the ideal first step for pediatric solid tumors as they can coordinate all the steps necessary to obtain adequate tissue for diagnosis and subsequent treatment. A multidisciplinary assessment is required prior to tumour sampling, with the patient discussed at an ad-hoc meeting (virtual chatroom or EPIC chat) or pediatric tumour boards when time permits. This multidisciplinary assessment ensures appropriate sampling.

Needle core or incisional biopsy are considered standard of care, though the latter is associated with a higher risk of post procedural complications. Primary resection for suspected soft tissue sarcomas is typically considered for superficial lesions <3 cm, where an R0 excision is possible[13].

On receipt in the laboratory, biopsies should be triaged by the pathologist, or an appropriately trained delegate. Storage in a fridge is recommended, pending triage, to minimize warm ischemia time and DNA/RNA degradation.

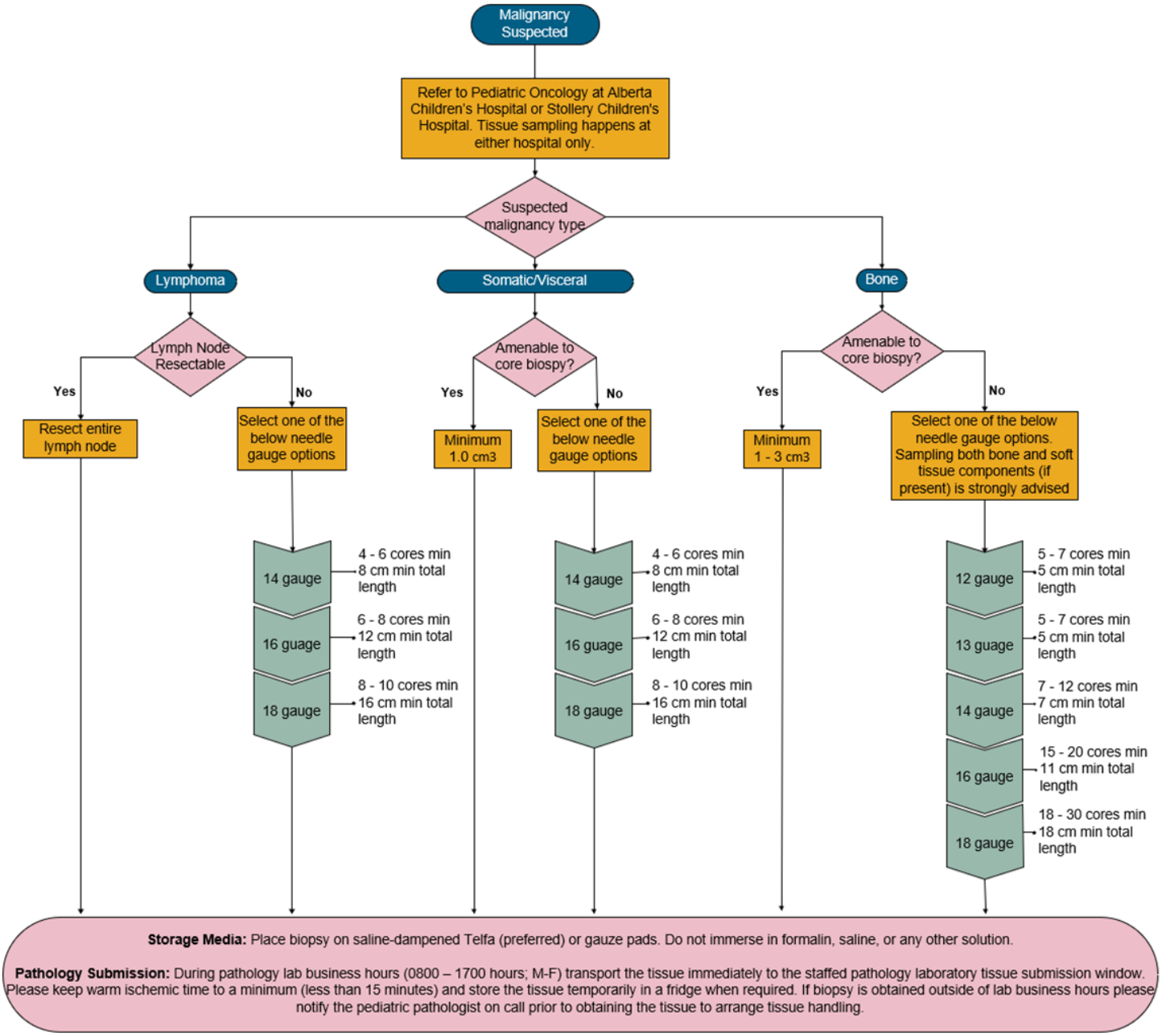

Figure 1. Algorithm for biopsy of suspected pediatric malignancy.

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Appendix A: Search Strategy

The PubMed database was searched for relevant studies, guidelines and consensus documents published up to August 2025. Evidence tables are available upon request. Online resources from oncology-based health organizations and guideline developers were also systematically searched, and relevant guidelines from the following organizations were considered in the development of our recommendations: Children's Oncology Group (COG), Atlantic Provinces Pediatric Hematology Oncology Network, International Society of Pediatric Surgical Oncology, and the American Academy of Pediatrics.

Database	Date	Search Terms	Limits/Filters
PubMed	March 24, 2025	(((pediatric) AND (biopsy[MeSH Terms])) AND (standards[MeSH Subheading])) AND ((oncolog*) OR (cancer))	Humans
PubMed	March 28, 2025	(((Pediatric[MeSH Major Topic]) AND ((biops*) OR (tissue sampl*))) AND (standard)) AND ((oncolog*) OR (cancer))	Humans
PubMed	March 28, 2025	(((pediatric) AND ((biops*) OR (tissue sampl*))) AND (standard)) AND ((oncolog*) OR (cancer))	Humans, English, Published in the last 10 years, Child: birth-18 years
PubMed	Aug. 19, 2025	(((pediatric) AND ((biops*) OR (tissue sampl*))) AND (fail*)) AND ((oncolog*) OR (cancer))	Humans, English, Published in the last 10 years, Child: birth-18 years
PubMed	Aug. 19, 2025	(((pediatric) AND ((biops*) OR (tissue sampl*))) AND (accuracy)) AND ((oncolog*) OR (cancer))	Humans, English, Published in the last 10 years, Child: birth-18 years
PubMed	Aug. 19, 2025	(((pediatric) AND ((biops*) OR (tissue sampl*))) AND (second)) AND ((oncolog*) OR (cancer))	Humans, English, Published in the last 10 years, Child: birth-18 years
PubMed	Aug. 19, 2025	(((pediatric) AND ((biops*) OR (tissue sampl*))) AND (repeat)) AND ((oncolog*) OR (cancer))	Humans, English, Published in the last 10 years, Child: birth-18 years

Development and Revision History

This guideline was developed by a multidisciplinary working group comprised of members from the Alberta Provincial Pediatric Tumour Team, external participants identified by the Working Group Lead, and a methodologist from the Guideline Resource Unit. The draft guideline was externally reviewed and endorsed by members of the Alberta Provincial Pediatric Tumour Team who were not involved in the guideline's development, including pathologists, surgeons, radiation oncologists, pediatric oncologists, and nurses. A detailed description of the methodology followed during the guideline development process can be found in the Guideline Resource Unit Handbook.

This guideline was originally developed in 2025.

Levels of Evidence

I	Evidence from at least one large randomized, controlled trial of good methodological quality (low potential for bias) or meta-analyses of well-conducted randomized trials without heterogeneity
II	Small randomized trials or large randomized trials with a suspicion of bias (lower methodological quality) or meta-analyses of such trials or of trials with demonstrated heterogeneity
III	Prospective cohort studies
IV	Retrospective cohort studies or case-control studies
V	Studies without control group, case reports, expert opinion

Maintenance

A formal review of the guideline will be conducted in 2030. If critical new evidence is brought forward before that time, however, the guideline working group members will revise and update the document accordingly.

Abbreviations

AHS, Alberta Health Services; CCA, Cancer Care Alberta; cm, centimeters; cm^3, cubic centimeters; COG, Children's Oncology Group; DNA, deoxyribonucleic acid; EPIC, Electronic Health Record System; ESMO, European Society for Medical Oncology; GURU, Guideline Resource Unit; NCCN, National Comprehensive Cancer Network; R0, complete resection with negative margins; RNA, ribonucleic acid.

Disclaimer

The recommendations contained in this guideline are a consensus of the Alberta Provincial Pediatric Tumour Team and are a synthesis of currently accepted approaches to management, derived from a review of relevant scientific literature. Clinicians applying these guidelines should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care.

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Conflict of Interest Statements

***Dr. Sarah McKillop** has nothing to disclose.

Dr. Geoffrey Cuvelier reports honoraria for speaking from the American Society of Transplant and Cellular Therapy, and travel reimbursement from the Pediatric Immune Deficiency Treatment Consortium and ACCESS, and participation on a Data Safety Monitoring Board at Cincinnati Children's Hospital, outside of the submitted work.

Dr. Joseph Andrews has nothing to disclose.

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