Supplementary Table S1. Expanded operational definitions and governance mapping

Note: Table S1A specifies indicator logic (definition, denominator, exclusions, and explicit N/A applicability). Table S1B specifies operationalization (minimum data elements, cadence, ownership, and typical failure modes with balancing checks).

Abbreviations: BT, bone tumor; HRQoL, health-related quality of life; ICU, intensive care unit; IQR, interquartile range; LOS, length of stay; LR, local recurrence; MDTB, multidisciplinary tumor board; N/A, not applicable; OR, operating room; PREM, patient-reported experience measure; PROM, patient-reported outcome measure; RMST, restricted mean survival time; RT, radiotherapy; SAE, serious adverse event; SCS, ; STS, soft tissue sarcoma; TTI, time-to-treatment initiation.

Domain	Indicator	Operational definition (minimum)	Denominator / exclusions and N/A rule
Diagnostic safety & timeliness	Time-to-treatment initiation (TTI)	Days from network entry/definitive suspicion to start of first definitive treatment (surgery/RT/systemic as intent defines/if applicable: interventional therapy); report median and IQR; define intent and start-point explicitly.	All newly treated cases entering the network in the period; exclude benign/watchful waiting; report missing timestamps. N/A: N/A if no treatment is intended (benign/active surveillance) or if start-point cannot be defined consistently.
Diagnostic safety & timeliness	Time-to-final diagnosis and diagnostic concordance	Working days biopsy to signed final diagnosis; concordance local vs reference pathology using pre-defined categories; report non-diagnostic biopsies separately.	All biopsied suspected sarcoma cases with available sign-out; exclude purely imaging-based benign entities. N/A: N/A if reference pathology pathway not implemented; then report time-to-diagnosis only and state governance model.
Diagnostic yield / pathway quality	RMST / biopsy ratio (suspected to confirmed sarcoma)	Ratio of confirmed malignant sarcoma among biopsies performed under a standardized 'suspicious mass' taxonomy; disclose capture completeness.	Consecutive biopsies for 'suspicious' tumors; exclude biopsies without final diagnosis; report denominator capture. N/A: N/A if biopsies are not captured across sites (denominator incomplete); must

			explicitly disclose and prioritize capture.
Diagnostic yield / pathway quality	Diagnostic interval decomposition	Decompose total diagnostic interval into sub-intervals (e.g., first presentation to imaging; imaging to biopsy; biopsy to MDTB; MDTB to treatment) to identify bottlenecks.	All suspected sarcoma referrals with required timestamps; symptom onset optional (high missingness expected). N/A: N/A if timestamps are not reliable/standardized; report missingness and implement timestamp capture first.
Oncologic outcomes	Local recurrence (time-to-LR)	Time to first LR after definitive local therapy; competing-risk estimation preferred; follow-up adequacy stated.	Curative-intent cohort with defined follow-up; exclude benign/palliative intent; define index therapy. N/A: N/A for benign or purely palliative intent; N/A if follow-up insufficient for interpretation (must state).
Oncologic outcomes	Metastatic dynamics (timing, tropism, burden)	Time to first metastasis; site distribution; burden categories; interpret with surveillance cadence caveats.	Cohort with defined follow-up and ascertainment; specify imaging cadence or adjust if feasible. N/A: N/A if metastatic ascertainment is unreliable due to heterogeneous imaging without documentation.
Harms & complications	30-day postoperative morbidity	Any complication within 30 days, graded consistently (e.g., Clavien-Dindo); report rate and severity distribution.	All eligible resections in period; exclude minor procedures only if pre-defined; report missingness. N/A: N/A if complication capture/coding not standardized; implement capture before benchmarking.
Harms & complications	Wound complications after preoperative RT	Wound complication within a fixed post-op window after preop RT and surgery; consistent definitions across sites.	All preop RT plus surgery cases; define window and event types; report reconstruction context. N/A: N/A if RT exposure or wound

			follow-up window cannot be captured consistently.
Harms & complications (measurement validity)	SAE reporting adequacy	System-level completeness and transparency of severe adverse event reporting across protocols/regimens; used as a validity check rather than outcome benchmarking.	Trials or regimens assessed; stratify by therapy class where relevant. N/A: N/A for modalities without systemic therapy exposure; report separately.
Function, PROMs & PREMs	Longitudinal HRQoL completion and change	Completion rate at predefined timepoints plus change from baseline; report missingness and minimal clinically important change where feasible.	All eligible patients enrolled in PROM program with baseline; exclude those without baseline only if stated. N/A: N/A if PROM program not deployed at required timepoints; must be declared.
Function, PROMs & PREMs	Biopsy PREM/PROM (anxiety, pain, satisfaction)	Standardized peri-biopsy patient experience and symptom measures using fixed timing and anchors; interpret as an implementation quality signal.	Consecutive biopsy patients under standardized workflow; report timing adherence. N/A: N/A if not collected; state as gap and implementation target.
Process fidelity & governance	MDTB coverage and time-to-decision	Proportion of eligible cases discussed plus median time to MDTB decision; include decision traceability fields (intent, sequencing, exceptions).	All eligible suspected/confirmed sarcoma cases; define eligibility rules; report missingness. N/A: N/A only if an alternative governance model is used and explicitly described.
Process fidelity & governance	Unplanned resection ('whoops') rate	Proportion of new sarcoma cases referred after prior unplanned excision outside pathway; track over time as a pathway-failure marker.	All new sarcoma cases; requires capture of external surgeries and pathology; disclose completeness. N/A: N/A if external surgery data not accessible; must be declared and addressed.
Costs & resource stewardship	Episode cost/resource use	Resource use and costs for defined care episodes stratified by	Defined episodes with consistent costing method; specify

	stratified by complexity	surgical complexity (STS-SCS/BT-SCS); separate resource use from tariffs/prices.	perspective; report components. N/A: N/A if costing method not harmonized/comparable; disclose and report resource use only.
Costs & resource stewardship	Resource use vs tariff separation	Report resource utilization (LOS, OR time, ICU, implants) separately from tariffs/pricing; prevents price-as-cost confounding.	Same cohorts/episodes as cost analysis; ensure definitional consistency. N/A: N/A if resource-use measures unavailable; prioritize extraction before interpreting costs.

Supplementary Table S2. Operationalization and safeguards (minimum viable).

Abbreviations: ASA, American Society of Anesthesiologists; CGB, Clinical Governance Board; EHR, electronic health record; HRQoL, health-related quality of life; ICU, intensive care unit; KPI, key performance indicator; LOS, length of stay; LR, local recurrence; MDTB, multidisciplinary tumor board; N/A, not applicable; OR, operating room; QI, ; RMST, restricted mean survival time; RT, radiotherapy; SAE, serious adverse event; SSN, Swiss Sarcoma Network; TTI, time-to-treatment initiation.

Indicator	**Core data elements (minimum)**	**Frequency**	**Primary owner**	**Failure mode, safeguards, and typical lever**
TTI	Referral/network entry date; imaging and biopsy dates; MDTB date; treatment start; intent	Monthly/Quarterly	CGB + QI lead	Failure: definitional drift or selective exclusions reduce apparent TTI. Safeguard: version control + missingness monitoring; balancing check: misdiagnosis and complication signals; lever: protected slots and EHR defaults.
Time-to-final diagnosis & concordance	Biopsy date/type; pathology sign-out; reference review and concordance category	Quarterly	Pathology lead + QI	Failure: faster sign-out at the expense of misclassification. Safeguard: concordance tracking; lever: standardized biopsy planning and expert review.

RMST / biopsy ratio	Suspicion taxonomy; biopsy counts; final diagnosis; benign/malignant classification	Quarterly	Diagnostic pathway lead	Failure: gaming by narrowing the 'suspicious' label or denominator loss. Safeguard: audit taxonomy use and capture completeness; lever: triage algorithms and referrer pathways.
Diagnostic interval decomposition	Key timestamps across pathway segments; optional symptom onset	Annual	QI lead + spoke leads	Failure: missing timestamps hide delays; recall bias for symptom onset. Safeguard: timestamp completeness KPI; lever: workflow redesign and hub responsiveness.
Local recurrence (time-to-LR)	Index therapy date; margin; RT; LR date; follow-up	Annual	Outcomes lead	Failure: loss-to-follow-up and heterogeneous surveillance. Safeguard: follow-up adequacy reporting; lever: whoops reduction, margin planning, MDTB sequencing.
Metastatic dynamics	Imaging dates; metastatic sites; burden categories; follow-up	Annual	Outcomes lead	Failure: detection bias from heterogeneous imaging intensity. Safeguard: document cadence; stratify by protocol; lever: risk-adapted surveillance.
30-day morbidity	Surgery type; ASA-Score; tumor type; complications with severity grading	Quarterly/Annual	Surgical quality lead	Failure: under-reporting or inconsistent grading. Safeguard: standardized definitions; lever: perioperative protocols and reconstruction planning.
Wound complication	RT regimen; surgery date; wound event	Annual	RT + surgery co-leads	Failure: confounding by selection into RT regimen. Safeguard:

s after preop RT	window; reconstruction details			stratify by site/regimen/complexity; lever: regimen selection and perioperative optimization.
SAE reporting adequacy	Therapy class; SAE completeness fields; reporting framework	Annual	Therapy lead + QI	Failure: false reassurance from incomplete reporting. Safeguard: completeness audit; lever: standard SAE capture and transparent reporting.
HRQoL completion + change	PROM instrument; baseline and follow-up timepoints; missingness flags	Quarterly	PROM lead	Failure: selective non-response masks worse outcomes. Safeguard: completion-rate targets; lever: embed capture in routine visits and automate.
Biopsy PREM/PROM	PREM/PROM items; timing; analgesia; communication metadata	Quarterly	Diagnostic pathway lead	Failure: inconsistent timing and reporting bias. Safeguard: standard timing windows; lever: patient briefing scripts and pain protocols.
MDTB coverage + time-to-decision	Eligibility logic; MDTB date; structured decision fields (intent/sequence/exceptions)	Monthly/Quarterly	MDTB chair + QI	Failure: 'paper compliance' without substantive decisions. Safeguard: decision traceability; lever: scheduling, triage, and templates.
Whoops rate	External surgery flag; pathology; referral region/source; timestamps	Quarterly	Network governance + spokes	Failure: under-capture of outside events or denominator manipulation. Safeguard: capture completeness statements; lever: soft-stops and referral pathways.

Episode cost/resource use by complexity	Episode definition; utilization measures; cost components; complexity score	Annual	Finance + clinical co-lead	Failure: price-as-cost confusion and non-comparable accounting. Safeguard: separate utilization from pricing; lever: process standardization and predictive planning.
Resource use vs tariff separation	LOS; OR time; ICU; implants; tariffs/prices	Annual	Finance lead	Failure: apparent 'savings' driven by accounting shifts. Safeguard: report utilization separately; lever: reduce utilization drivers of cost.