Neoplasms of the Heart, Pericardium, and Great Vessels Histopathology Reporting Guide

Family/Last name

Given name(s)

Date of birth DD – MM – YYYY

Patient identifiers

Date of request DD – MM – YYYY

Accession/Laboratory number

Elements in **black text** are CORE. Elements in **grey text** are NON-CORE.

☐ indicates multi-select values ◯ indicates single select values

SCOPE OF THIS DATASET

OPERATIVE PROCEDURE (Note 1)

- ◯ Not specified
- ◯ Resection
- ◯ Endovascular biopsy
- ◯ Image guided percutaneous biopsy
- ◯ Explantation
- ◯ Other, *specify*

SPECIMEN INTEGRITY (Note 2)

(Applicable for resection and explant specimens only)

- ◯ Indeterminate
- ◯ Intact
- ◯ Disrupted, *describe*

TUMOUR SITE (select all that apply) (Note 3)

- ◯ Not specified
- ☐ Atrium
  - ☐ Left ☐ Right ◯ Laterality not specified
- ☐ Ventricle
  - ☐ Left ☐ Right ◯ Laterality not specified
- ☐ Endocardial
- ☐ Myocardial
- ☐ Epicardial
- ☐ Septum
- ☐ Free wall
- ☐ Parietal pericardium
- ☐ Valve, *specify*
- ☐ Great vessel, *specify*
- ☐ Other, *specify*

MAXIMUM DIMENSION OF PRIMARY TUMOUR (Note 4)

(Applicable for resection and explant specimens only)

mm

- ◯ Cannot be assessed

TUMOUR FOCALITY (Note 5)

- ◯ Indeterminate
- ◯ Unifocal
- ◯ Multifocal, *specify number of tumours in specimen and their locations*

BLOCK IDENTIFICATION KEY (Note 6)

(List overleaf or separately with an indication of the nature and origin of all tissue blocks)

HISTOLOGICAL TUMOUR TYPE (Note 7)

(Value list based on the World Health Organization Classification of Thoracic Tumours (2021))

Heart

BENIGN

- ◯ Papillary fibroelastoma
- ◯ Cardiac myxoma
- ◯ Cardiac fibroma
- ◯ Cardiac rhabdomyoma
- ◯ Adult cellular rhabdomyoma
- ◯ Cardiac lipoma
- ◯ Lipomatous hypertrophy of atrial septum
- ◯ Lipomatous hamartoma of atrioventricular valve
- ◯ Hamartoma of mature cardiac myocytes
- ◯ Mesenchymal cardiac hamartoma
- ◯ Cardiac haemangioma
  - ◯ Capillary
  - ◯ Arteriovenous
  - ◯ Cavernous
  - ◯ Venous
- ◯ Conduction system hamartoma
- ◯ Cystic tumour of atrioventricular node

MALIGNANT

- ◯ Cardiac angiosarcoma
- ◯ Cardiac leiomyosarcoma
- ◯ Cardiac undifferentiated pleomorphic sarcoma
- ◯ Other sarcoma, *specify*

TUMOURS OF UNCERTAIN BEHAVIOUR

- ◯ Inflammatory myofibroblastic tumour
- ◯ Paraganglioma

Version 2.0 Published December 2021 ISBN: 978-1-922324-27-6

Pericardium

- ◯ Solitary fibrous tumour
- ◯ Mixed germ cell tumour
- ◯ Angiosarcoma
- ◯ Other, *specify*

Great vessels

- ◯ Angiosarcoma
- ◯ Pulmonary artery intimal sarcoma
- ◯ Other, *specify*

HISTOLOGICAL TUMOUR GRADE (Note 8)
(Applicable to sarcomas only)

- ◯ Cannot be graded
- ◯ Grade 1
- ◯ Grade 2
- ◯ Grade 3
- ◯ Ungraded sarcoma

Necrosis

- ◯ Cannot be assessed
- ◯ Not identified
- ◯ Present

Extent of necrosis ____ %

Mitotic count
(most proliferative area) ____ /mm^2

EXTENT OF INVASION (Note 9)

- ◯ Cannot be assessed
- ◯ Intracardiac invasion
- ◯ Extracardiac invasion (i.e., into the great vessels or beyond the parietal pericardium), *specify structures*
- ◯ Intraluminal/intracavitary extension, *specify*

MARGIN STATUS
(Applicable for resection and explant specimens only)

- ◯ Cannot be assessed
- ◯ Not involved
- ◯ Involved, *specify margin(s)*

LYMPHOVASCULAR INVASION (Note 10)
(Applicable to solitary fibrous and germ cell tumours of the pericardium)

- ◯ Indeterminate
- ◯ Not identified
- ◯ Present

Method of evaluation

- ◯ Routine staining (H&E)
- ◯ Immunohistochemistry for lymphovascular endothelium, *specify*

ANCILLARY STUDIES (Note 11)

- ◯ Not performed
- ◯ Performed (select all that apply)
  - ☐ Immunohistochemistry, *specify test(s) and result(s)*
  - ☐ Molecular pathology, *specify test(s) and result(s)*
  - ☐ Cytogenetics, *specify test(s) and result(s)*
  - ☐ Other, *specify test(s) and result(s)*

Representative blocks for ancillary studies, *specify those blocks best representing tumour and/or normal tissue for further study*

ISBN: 978-1-922324-27-6

Definitions

CORE elements

CORE elements are those which are essential for the clinical management, staging or prognosis of the cancer. These elements will either have evidentiary support at Level III-2 or above (based on prognostic factors in the National Health and Medical Research Council (NHMRC) levels of evidence[1]). In rare circumstances, where level III-2 evidence is not available an element may be made a CORE element where there is unanimous agreement in the expert committee. An appropriate staging system e.g., Pathological TNM staging would normally be included as a CORE element.

The summation of all CORE elements is considered to be the minimum reporting standard for a specific cancer.

NON-CORE elements

NON-CORE elements are those which are unanimously agreed should be included in the dataset but are not supported by level III-2 evidence. These elements may be clinically important and recommended as good practice but are not yet validated or regularly used in patient management.

Key information other than that which is essential for clinical management, staging or prognosis of the cancer such as macroscopic observations and interpretation, which are fundamental to the histological diagnosis and conclusion e.g., macroscopic tumour details, may be included as either CORE or NON-CORE elements by consensus of the Dataset Authoring Committee.

Back

Scope

The dataset has been developed for biopsy and resection specimens of neoplasms of the heart, pericardium, and great vessels. It includes both benign and malignant primary tumours of the heart, pericardium, and great vessels.

Mesothelioma and haematolymphoid neoplasms (such as primary cardiac lymphoma) are not included in this dataset. For pericardial mesotheliomas refer to the International Collaboration on Cancer Reporting (ICCR) Mesothelioma in the pleura and peritoneum dataset.[2] Haematolymphoid tumours will be covered in a future ICCR dataset. Metastatic lesions should not be recorded using this dataset.

There is currently no agreed-upon staging system (such as TNM) for cardiac tumours, due to an insufficiency of evidence.

The second edition includes changes to align the dataset with the World Health Organization (WHO) Classification of Thoracic Tumours, 5th edition, 2021.[3]

The authors of this dataset can be accessed here.

Back

Note 1 – Operative procedure (Core)

As there may be more than one approach or technique to removing or sampling a tumour at a given location within the heart, specifying the nature of the operative procedure to the extent possible is important and is therefore a core element.[4,5]

Back

Note 2 – Specimen integrity (Non-core)

This element applies only to resection and explant specimens. If the tumour specimen is not received whole and intact, it is important to specify the nature of disruption (removed piecemeal, rupture during removal, etc.). This element has relevance to completeness of tumour removal and size comparison with imaging studies.

Back

Note 3 – Tumour site (Core)

The tumour site within the heart has implications in terms of obstruction of blood flow, valvular dysfunction, and potential embolisation and haematogenous spread to downstream vascular beds.[4,6] All sites including the chamber and substructures that are involved by tumour should be listed.[7] An accurate listing of sites of tumour involvement may require radiological and intra-operative correlation.

Back

Note 4 – Maximum dimension of primary tumour (Core)

This element applies only to resection and explant specimens in which the entire tumour can be measured. Reporting the size in biopsy and other incomplete tumour samples may be misleading clinically.

Back

Note 5 – Tumour focality (Core)

Multiple tumours may be present at the same site or at different sites. A single tumour may invade multiple structures and thereby also be present in multiple cardiac locations. The tumour focality element clarifies this issue and is therefore a core element.

Back

Note 6 – Block identification key (Non-core)

The origin/designation of all tissue blocks should be recorded. This information should be documented in the final pathology report and is particularly important should the need for internal or external review arise. The reviewer needs to be clear about the origin of each block in order to provide an informed specialist opinion. If this information is not included in the final pathology report, it should be available on the laboratory computer system and relayed to the reviewing pathologist.

Recording the origin/designation of tissue blocks also facilitates retrieval of blocks for further immunohistochemical or molecular analysis, research studies, or clinical trials.

Back

Note 7 – Histological tumour type (Core)

Neoplastic entities occurring in the heart, pericardium, and great vessels should be classified according to the most recent edition of the WHO Classification of Thoracic Tumours, 5th edition, 2021 (Table 1).[3] The neoplastic nature of some space-occupying lesions (lipomatous hypertrophy of the atrial septum, vascular malformations, hamartoma of mature cardiac myocytes, conduction system hamartoma, etc.) is not entirely clear.[4,8] Whether or not this dataset should be used on these lesions is left to the discretion of the pathologist.

Table 1: World Health Organization classification of thoracic tumours.[3]

Descriptor	ICD-O codes[d]
Heart	
Benign tumours	
Papillary fibroelastoma	8820/0†
Cardiac myxoma	8840/0
Cardiac fibroma	8810/0
Cardiac rhabdomyoma	8900/0
Adult cellular rhabdomyoma	8904/0
Cardiac lipoma	8850/0
Lipomatous hypertrophy of atrial septum	
Lipomatous hamartoma of atrioventricular valve	
Hamartoma of mature cardiac myocytes	
Mesenchymal cardiac hamartoma	
Cardiac haemangioma	9120/0
Venous haemangioma	9122/0
Capillary haemangioma	9131/0
Arteriovenous haemangioma	9123/0
Cavernous haemangioma	9121/0
Conduction system hamartoma[a]	
Cystic tumour of atrioventricular node	8454/0
Malignant tumours	
Cardiac angiosarcoma	9120/3
Cardiac leiomyosarcoma	8890/3
Cardiac undifferentiated pleomorphic sarcoma	8802/3

Descriptor	ICD-O codes[d]
Tumours of uncertain behaviour	
Inflammatory myofibroblastic tumour	8825/1
Paraganglioma[b]	8693/3
Pericardium	
Solitary fibrous tumour	8815/1
Mixed germ cell tumour	9085/3
Angiosarcoma	9120/3
Great vessels	
Angiosarcoma	9120/3
Pulmonary artery intimal sarcoma[c]	9137/3

[a] Previously histiocytoid cardiomyopathy.
[b] Previously extra-adrenal paraganglioma.
[c] Previously intimal sarcoma.
[d] These morphology codes are from the International Classification of Diseases for Oncology, third edition, second revision (ICD-O-3.2).[9] Behaviour is coded /0 for benign tumours; /1 for unspecified, borderline, or uncertain behaviour; /2 for carcinoma in situ and grade III intraepithelial neoplasia; /3 for malignant tumours, primary site; and /6 for malignant tumours, metastatic site. Behaviour code /6 is not generally used by cancer registries. Subtype labels are indented.
† Labels marked with a dagger constitute a change in terminology of a previous code.

Back

Note 8 – Histological tumour grade (Core and Non-core)

This element only applies to sarcomas of the heart, pericardium, and great vessels. This element captures information shown to be prognostically important in sarcomas at other body sites.[10] Evidence that these have the same importance in sarcomas of the heart, pericardium, and great vessels is lacking.[4,11]

There is no formal grading system for cardiac tumours. However, the French Federation of Cancer Centers Sarcoma Group (FNCLCC) system for the grading of sarcomas[12] can be used as a guide. The FNCLCC system includes an assessment of mitotic activity, necrosis, nuclear grade and cellularity (refer to Table 2).

Necrosis

The extent of necrosis is estimated as a percentage of total tumour.

Mitotic count

Mitotic count is a non-core element. If recorded it should be expressed as '#/mm^2' due to the fact that differing field diameters of high power (x40) objectives dramatically vary the size of a single high power field (HPF).

Table 2: Histologic grading for soft tissue sarcoma.[13]

Tumour differentiation	Mitotic count	Tumour necrosis
Sarcoma closely resembling normal adult mesenchymal tissue (e.g., low grade leiomyosarcoma) (1 point)	0-9 mitoses per $2mm^2$ (1 point)	No necrosis (0 points)
Sarcomas for which histologic typing is certain (e.g., myxoid/round cell liposarcoma) (2 points)	10-19 mitoses per $2mm^2$ (2 points)	< 50% tumour necrosis (1 point)
Undifferentiated sarcomas, sarcomas of doubtful type, synovial sarcomas, osteosarcoma (3 points)	≥20 mitoses per $2mm^2$ (3 points)	≥50% tumour necrosis (2 points)

$2mm^2$ = 10 high power fields (HPF) if the field diameter is 0.55mm (each pathologist should ensure calibration of their own microscope).

The scores for these variables are added to calculate the following values:

- Grade 1 - Total score of 2 or 3
- Grade 2 - Total score of 4 or 5
- Grade 3 - Total score of 6 or higher.

Back

Note 9 – Extent of invasion (Core)

For the purposes of this data element, the parietal pericardium represents the anatomic boundary between the heart tissues and adjacent organs. Tumours that extend into the great vessels or beyond the parietal pericardium (such as into the pleura, oesophagus, diaphragm, or chest wall) should be considered 'extracardiac invasion'. Tumours crossing tissue boundaries in the heart (e.g., one chamber to another, across a valve, or into the pericardium) should be considered 'intracardiac invasion'.[3,4]

For cases with tumour thrombus/embolus or intraluminal/intracavitary tumour extension, this should be indicated as well as the vessel(s) or chambers involved.

Back

Note 10 – Lymphovascular invasion (Non-core)

This element is commonly reported for malignancies; however, since the majority of tumours in the heart and great vessels exist within the vasculature and have immediate access to haematogenous dissemination, this element should only be reported for pericardial tumours, such as germ cell tumours and solitary fibrous tumour, that do not arise within the vascular system.

Back

Note 11 – Ancillary studies (Non-core)

While ancillary studies are not essential for the diagnosis of entities in this dataset, immunohistochemistry and molecular studies are often useful in classifying many of the tumours listed herein, particularly the differentiated mesenchymal neoplasms and germ cell tumours.[14] If any additional studies are undertaken, they should be recorded.

Back

References

1 Merlin T, Weston A and Tooher R (2009). Extending an evidence hierarchy to include topics other than treatment: revising the Australian 'levels of evidence'. *BMC Med Res Methodol* 9:34.

2 International Collaboration on Cancer Reporting (2021). *Mesothelioma in the Pleura and Peritoneum Histopathology Reporting Guide*. Available from: http://www.iccr-cancer.org/datasets/published-datasets/thorax/mesothelioma (Accessed 10th November 2021).

3 WHO Classification of Tumours Editorial Board (2021). *Thoracic Tumours, 5th Edition, Volume 5*. IARC Press, Lyon.

4 Burke AP, Tavora F, Maleszewski J and Frazier A (2015). *Tumors of the Heart and Great Vessels. AFIP Atlas of Tumor Pathology, Series 4*. ARP Press, Washington DC.

5 Bakaeen FG, Jaroszewski DE, Rice DC, Walsh GL, Vaporciyan AA, Swisher SS, Benjamin R, Blackmon S and Reardon MJ (2009). Outcomes after surgical resection of cardiac sarcoma in the multimodality treatment era. *J Thorac Cardiovasc Surg* 137(6):1454-1460.

6 Siontis BL, Leja M and Chugh R (2020). Current clinical management of primary cardiac sarcoma. *Expert Rev Anticancer Ther* 20(1):45-51.

7 Scicchitano P, Sergi MC, Cameli M, Miglioranza MH, Ciccone MM, Gentile M, Porta C and Tucci M (2021). Primary Soft Tissue Sarcoma of the Heart: An Emerging Chapter in Cardio-Oncology. *Biomedicines* 9(7):774 doi: 10.3390/biomedicines9070774.

8 Chen TW, Loong HH, Srikanthan A, Zer A, Barua R, Butany J, Cusimano RJ, Liang YC, Chang CH, Iakobishvili Z, Razak ARA and Lewin J (2019). Primary cardiac sarcomas: A multi-national retrospective review. *Cancer Med* 8(1):104-110.

9 Fritz A, Percy C, Jack A, Shanmurgaratnam K, Lobin L, Parkin DM and Whelan S (eds) (2020). *International Classification of Diseases for Oncology. Third edition, Second revision ICD-O-3.2.* Available from: http://www.iacr.com.fr/index.php?option=com_content&view=category&layout=blog&id=100&Itemid=577 (Accessed 16th June 2021).

10 International Collaboration on Cancer Reporting (2021). *Soft Tissue Sarcoma Histopathology Reporting Guide - Resection Specimens, 1st edition*. Available from: http://www.iccr-cancer.org/datasets/published-datasets/soft-tissue-bone/soft-tissue-sarcoma-resection-specimens (Accessed 10th November 2021).

11 Trojani M, Contesso G, Coindre JM, Rouesse J, Bui NB, de Mascarel A, Goussot JF, David M, Bonichon F and Lagarde C (1984). Soft-tissue sarcomas of adults; study of pathological prognostic variables and definition of a histopathological grading system. *Int J Cancer* 33:37-42.

12 Guillou L, Coindre JM, Bonichon F, Nguyen BB, Terrier P, Collin F, Vilain MO, Mandard AM, Le D V, Leroux A, Jacquemier J, Duplay H, Sastre-Garau X and Costa J (1997). Comparative study of the National Cancer Institute and French Federation of Cancer Centers Sarcoma Group grading systems in a population of 410 adult patients with soft tissue sarcoma. *J Clin Oncol* 15:350-362.

13 Amin MB, Edge SB, Greene FL, Byrd DR, Brookland RK, Washington MK, Gershenwald JE, Compton CC, Hess KR, Sullivan DC, Jessup JM, Brierley JD, Gaspar LE, Schilsky RL, Balch CM, Winchester DP, Asare EA, Madera M, Gress DM and Meyer LR (eds) (2017). *AJCC Cancer Staging Manual. 8th ed.*, Springer, New York.

14 Urbini M, Astolfi A, Indio V, Nannini M, Pizzi C, Paolisso P, Tarantino G, Pantaleo MA and Saponara M (2020). Genetic aberrations and molecular biology of cardiac sarcoma. *Ther Adv Med Oncol* 12:1758835920918492.