

Guideline

Subject: **Sudden Unexpected Deaths in Infants (SUDI) in Australasia**
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The RCPA has developed the following guidelines to be applied to investigation of SUDI in Australasia.

The guidelines in the investigation of Sudden Unexpected Deaths in Infants (SUDI) deaths were implemented to assist in a thorough systematic investigation of all SUDI deaths in Australasia and to ensure a degree of consistency in the investigation of these deaths. The primary aim of these guidelines are to improve the investigation of all sudden deaths in infants younger than 12 months in age and secondly allow the opportunity to peer review these deaths across jurisdictions.

The RCPA acknowledge that due to jurisdictional and legislative differences across the states/regions, a structured set protocol would not be feasible. Several agencies are involved in the investigation of these deaths and many states/regions have documentation and guidelines in place to assist with the investigation of these deaths. The following are regarded as recommendations (good practice guidelines), which, if possible, could assist in standardising the investigation.

- a. Prior to the autopsy:
 - Scene investigation/information
 - i. It is recommended that pertinent death scene information be provided to the pathologist prior to the autopsy examination. It is recognized that the death scene investigation might differ across regions. It is suggested that the minimal information to be provided should at least include the sleeping environment of the infant (the bedding, co-sleeping and position of the baby).
 - Medical history
 - i. It is advised that an adequate medical history be obtained. This should ideally include all information pertaining to the birth (including the gestational period, type of delivery and APGAR scores), immunization record, milestones and specific comments on the health of the infant in the 24 – 48 hours prior to his death. Furthermore, the infant health record¹ (the coloured book provided after birth), should also be reviewed.

¹ <https://www.pregnancybirthbaby.org.au/infant-health-record>

b. Autopsy:

- Radiology
 - i. A full skeletal survey is strongly recommended and is regarded as the gold standard to look for evidence of NAI prior to the performance of the post mortem examination. A skeletal survey (not a babygram) is superior to CT scanning.²
 - ii. Full body CT scan can be performed
 - iii. It is advised that these images be reviewed by a specialist radiologist and that a formal report be obtained prior to release of the infant.

- Photography
 - i. The pathologist should photograph the external aspect of the baby. These photographs should include the following:
 - a. Anterior and posterior aspect of the body,
 - b. Face (including the sides),
 - c. Eyes (including the conjunctiva),
 - d. Mouth (including the frenulae),
 - e. Hands and feet.
 - ii. Photographs of the organs should at a minimum include all abnormalities.

- External examination
 - i. Thorough external examination.
 - ii. Measurements specifically:
 - a. Body weight,
 - b. Crown-heel-length,
 - c. Crown-rump length,
 - d. Head circumference,
 - e. Chest circumference at nipples,
 - f. Abdominal circumference at umbilicus.

- Internal examination
 - It is recommended that a full three cavity internal examination be conducted on all these cases

²Knipe J, Bhattacharya et al. Suspected physical abuse. <https://radiopaedia.org/articles/suspected-physical-abuse-1>

- Ancillary testing
 - i. Histology:
 - a. The following sections are provided as a guide to consider as the minimal required sections to be evaluated histologically:
 - a. Cardiovascular System
 - i. Left ventricle, right ventricle, interventricular septum, grossly apparent lesions
 - b. Respiratory System
 - i. Each lobe of both lungs, trachea
 - ii. Supplemental – lobar bronchi, true vocal cords, epiglottis/aryepiglottic folds
 - c. Hepatobiliary System
 - i. Liver
 - d. Genitourinary System
 - i. Minimum – each kidney
 - ii. Supplemental – bladder, gonads
 - e. Endocrine System
 - i. Minimum – each adrenal gland, thyroid gland, pancreas
 - ii. Supplemental – pituitary gland
 - f. Gastrointestinal System
 - i. Minimum – stomach, small intestine, colon
 - ii. Supplemental – esophagus
 - g. Immune System
 - i. Minimum – spleen, thymus, bone marrow
 - ii. Supplemental – tonsil
 - h. Musculoskeletal System
 - i. Minimum – rib with chostochonral junction.
 - ii. Supplemental – diaphragm, psoas
 - ii. Neuropathology:
 - a. In view of the scarcity of neuropathologist and the potential differences pertaining to organ retention across the jurisdictions, it would not be feasible to prescribe that whole brain retention and formal neuropathology review should be done in all cases. It is acknowledged that the neuropathology retention would be prescribed by the local guidelines and the wishes of the next of kin.
 - b. It is advised that in all cases, comprehensive photography should be undertaken in order to allow future review. These photos should include photographs from all 4 external surfaces as well as photographs from each coronal section.
 - c. The specific histology sections that should be done, would ultimately be determined by local procedures. It is well documented that, generally, a low there is a low yield in decrementing a cause of death with neuropathological

examination.³ Available protocols will differ regarding which sections should be taken. At a minimum the following sections should be considered:

- a. Cerebrum with leptomeninges,
- b. Bilateral hippocampi,
- c. Rostral medulla,
- d. Cerebellum,
- e. Any grossly apparent lesions.

iii. Microbiology and virology: ^

Samples to exclude an underlying infective cause of death should generally be taken at autopsy and submitted for further testing. The specific type of sample to be taken to allow further testing would be determined by the local laboratory practices. The history provided, macroscopic findings and the availability of adequate samples at autopsy would also determine which samples will be retained for further investigation. .

iv. Biochemistry: ^

- a. Vitreous humour for electrolyte and glucose testing is suggested as a minimal test. It is acknowledged that this testing might not be feasible due to the local laboratory requirements and/or the availability of a sample for testing.

v. Toxicology: ^

- a. Blood sample to be taken.
- b. Consider the retention of stomach content and hair samples for future testing if this become apparent.

vi. Metabolic screening: ^

- a. It is advised that samples, if available, be retained during the autopsy examination. The testing of samples may be deferred until deemed necessary. The samples to be taken will also be guided by the availability of testing techniques in the local laboratory.
- b. Samples to consider include: Blood spot card, fibroblasts, urine, bile.

vii. Genetic testing: ^

- a. It is recommended that samples such as a blood spot card, stored EDTA blood, extracted DNA and/or cells be obtained during autopsy and appropriately stored in the event that future genetic testing will be deemed necessary. It is acknowledged that the storing of such samples and extraction of DNA would be governed by regional legislation / policy directives.

³ Pryce J.W. etc Role of routine neuropathological examination for determining cause of death in sudden unexpected deaths in infancy (SUDI). J Clin Pathol. 2012; 65: 257-261

- ^ The availability of samples can at times be limited. In the event that not enough sample (i.e. blood) is available to allow microbiology, biochemistry and toxicology testing as well as retention of samples for metabolic and genetic screening, the case pathologist will decide which of these tests are deemed more appropriate depending on the history provided.
- c. After completion of the autopsy:
- Internal peer review of the cases in the department prior to signing out the case to the Coroner is recommended on all these cases.

The following international protocols are available for download:

- International Standardized Autopsy Protocol
https://www.ncbi.nlm.nih.gov/books/NBK513401/figure/tab24_2/?report=object-only
- Royal College of Pathologists – Guidelines on autopsy practice – neonatal death May 2019 <https://www.rcpath.org/uploads/assets/0a7c073e-c773-4941-a1e998df666e17e3/G168-Guidelines-on-autopsy-practice-Neonatal-death.pdf>
- Royal College of Paediatric and Child Health Sudden Unexpected Death in Infancy and Child Health <https://www.rcpath.org/uploads/assets/874ae50e-c754-4933-995a804e0ef728a4/Sudden-unexpected-death-in-infancy-and-childhood-2e.pdf>
- CDC SUID investigation manual – (death scene investigation)
 - i. SUIDI Reporting Form <https://www.cdc.gov/sids/pdf/suidi-reporting-form-508.pdf>
 - ii. SUIDI Additional Investigative Forms
<https://www.cdc.gov/sids/pdf/SUIDIAdditionalForms212011-508.pdf>
- Unexplained Pediatric Deaths: Investigation, Certification and Family Needs – E Bundock, T Corey – NAME expert panel on Sudden Unexpected Deaths in Paediatrics. Appendix 6: Autopsy Specimens and Ancillary Studies for Sudden Unexpected Pediatric Deaths. <https://sudpeds.com/wp-content/uploads/2020/01/UPD-Appendix-6-1.pdf>