Pre-analytical phase challenges in gastric, prostate and lung cancer

70% of issues within the tissue sample workflow occur during the pre-analytic phase[1]. These issues reduce the success of molecular profiling, negatively impacting patient care and result in increased costs for healthcare systems[1].

CHALLENGES[2,3]: | RECOMMENDATIONS[1,4,5,6]:

1. Test ordering

Incorrect/incomplete test ordering per patient tumour type may delay appropriate patient care

HCP involved: surgeons, radiologists, medical and radiation oncologists, endoscopists and pathologists

Guidance*
- Follow local clinical guidelines to ensure correct tests are requested
- Ensure test request forms are completed correctly

Useful Tips
- Order only the necessary tests to save sample for future testing
- Ask testing laboratories for help
- Perform reflex testing when needed
- >1 test may need to be ordered e.g., somatic and germline

2. Sample collection

Tumour insufficiency could lead to the inability to perform the required tests

HCP involved: surgeons endoscopist/oncologist

- Tissue sample is the preferred type of sample for biomarker testing
- Collect sufficient volume of tumour biopsy for all required analyses

- Sufficient number of biopsies to increase sample size, if possible MRI-guided biopsies targeting specific prostate lesions

3. Patient identification

Incorrect patient identification/labelling can result in delayed diagnosis and treatment, further biopsies being required, or additional laboratory testing

HCP involved: surgeons endoscopist/oncologist

- Confirm correct sample, test request, and labelling to identify the patient prior to transportation

- When available use electronic systems
- For each sample, strict patient-specific identification is needed

4. Transportation

Excessive transportation and cold ischemia time can compromise tissue integrity, potentially causing artifacts in sequencing results and testing failures in immunohistochemistry and sequencing

HCP involved: surgeons endoscopist/oncologist

- Transport surgical specimens as quickly as possible to reduce time to fixation
- Cold ischemia time ≤60 mins
- Immediately fix biopsies in formalin and transport quickly to pathology

- Document transport time (from sample collection to delivery to pathology)
- Transport fresh specimens immediately for gross examination

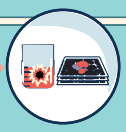
5. Preparation/processing

Incorrect fixation time can reduce quality and integrity of tissue

Insufficient fixative volume in relation to tissue mass may hinder full fixative penetration throughout tissue

Inappropriate sectioning can cause contamination between samples

HCP involved: pathologist



Fixation: 10% neutral phosphate -buffered formalin
- Min 6h, Max 24h for biopsies
- Surgical specimens need more time (evaluated by the pathologist)

Processing:
- Specimen thickness not exceeding 4-5 mm
- Volume to mass ratio preferably 10:1

Sectioning: Specimen thickness on paraffin should not exceed 4–5 µm

- Document fixation time
- During processing: Replace knife blades before each block is cut to prevent cross-contamination between samples

6. Storage

Inappropriate storage can compromise tissue quality and prevent the identification of the best tissue blocks long after sample collection

HCP involved: pathologist

- Blocks should be stored in a controlled environment that should be dry, pest-free and at 18–25°C

- Identify at initial diagnosis, optimal samples/blocks for downstream testing and record in the pathology report e.g., regions with highest cancer cellularity

Abbreviations: HCP: Health Care Professionals
* Please follow local guidelines. Cold Ischemia: In surgery, the cooling of a tissue, organ, or body part after its blood supply has been reduced or cut off.

Clinical Takeaways

Sub-optimal implementation of the pre-analytical phases may reduce the chance of successful downstream testing or reduce result accuracy, ultimately having a negative impact on patient care and cost of care

Standardisation and monitoring of the pre-analytical steps is crucial as well as documenting any deviations that occur in the process

Medical, surgical and pathology departments should work in close collaboration to ensure quality and quantity of the samples

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References

1. Compton CC, Robb JA, Anderson MW, et al. Preanalytics and Precision Pathology: Pathology Practices to Ensure Molecular Integrity of Cancer Patient Biospecimens for Precision Medicine. Arch Pathol Lab Med. 2019;143(11):1346-1363.
2. Cree IA, Deans Z, Ligtenberg MJL, et al. Guidance for laboratories performing molecular pathology for cancer patients. J Clin Pathol. 2014;67(11):923-931.
3. Keppens C, van Royen Y, Brysse A, et al. Incidents in Molecular Pathology: Frequency and Causes During Routine Testing. Arch Pathol Lab Med. 2021;145(10):1270-1279.
4. Kerr KM, Bubendorf L, Lopez-Rios F, et al. Optimizing tissue stewardship in non-small cell lung cancer to support molecular characterization and treatment selection: statement from a working group of thoracic pathologists. Histopathology. 2024;84(3):429-439.
5. Lott R, Tunnicliffe J, Sheppard E, et al. Practical Guide to Specimen Handling in Surgical Pathology. College of American Pathologist. 2023.
6. Susman S, Berindan-Neagoe I, Petrushev B, Pirlog R, Florian IS, Mihu CM, Berce C, Craciun L, Grewal R, Tomuleasa C. The role of the pathology department in the preanalytical phase of molecular analyses. Cancer Manag Res. 2018; 10:745-753.