Guidelines for using digital images for EQA

The purpose of the proficiency testing is to mimic routine diagnostic practice as far as possible.

- If you do not examine digital images during normal working practice, then you should examine the glass slides in the EQA scheme. If you are unfamiliar with examining slides digitally, it is recommended that, prior to result submission, you validate the results obtained digitally against glass slide interpretation for at least 60 cases (six rounds).[1]
- If the majority of your working practice is via digital pathology, then you should use the digital images of the EQA scheme rather than glass slides to submit your results.

A digital image is a high-resolution replica of a section on a glass slide, but it is not an exact replica in every way. Pathologists are experts in the assessment of tissue preparation and staining, and of artefacts introduced in tissues as they are prepared. Digital imaging artefacts may also occur. Technical specifications of the display (including luminance, and resolution and contrast ratio) of the display, broadband width and broadband speed can affects the quality of the image, and ease of use.
The scheme checks all digital images prior to issue to ensure the presentation of the digital image and glass slide are as similar as possible.

General guidelines in assessing digital images

- Ensure the mouse/trackball allows navigation of the whole slide to screen for rare objects such as lymphovascular invasion
- Network connections should be between 100 Mbit/sec to 1000 Mbit/sec or faster. This network capacity can support high resolution (6-8 Megapixel) displays.
- Broadband connection of 15-20 Mbits/ second in the UK is acceptable with a lower resolution display (e.g. 2-4 megapixels); a higher resolution screen may suffer from lower performance as the connection to the digital pathology server is insufficient to stream a higher resolution image, leading to a slower viewing experience or increased “pixellation”.
- Bright ambient lighting can negatively impact on ability to use digital slides, especially if the display being used is less bright. Natural light sources are potentially more impactful than most artificial light sources particularly on bright days. Positioning of the display in front of a window (so the user is looking at the screen and out of the window simultaneously), can inhibit performance more than other positions. A suitable blind or curtain can reduce ambient light and increase the relative luminance and contrast of the display.
- Prolonged use of display monitors can result in fatigue, and pathologists should exercise their judgement in when to take “screen breaks”.

Please be aware that limited evidence in the literature suggests that diagnosis on virtual slides may be more difficult in certain types of pathology[2] including:

[1] Royal College of Pathologists. Best practice recommendations for implementing digital pathology. 2018. [Internet] Available from: https://www.rcpath.org/uploads/assets/f465d1b3-797b-4297b7fedc00b4d77e51/Best-practice-recommendations-for-implementing-digital-pathology.pdf

[2] Williams BJ, DaCosta P, Goacher E, Treanor D. A Systematic Analysis of Discordant Diagnoses in Digital Pathology Compared With Light Microscopy. Arch of Pathol Lab 2017;141:1712–1718.

- dysplasia of epithelial cells (e.g. squamous, urothelial, or glandular), possibly in those areas where the assessment of nuclear texture is important
- detection of small objects (e.g. micro-organisms, foci of acute inflammation in epithelia
- assessment of large areas of tissue for rare events (e.g. micrometastases)
- See Appendix for further details of difficulties with particular tissue types.

Display requirements

A high end calibrated medical grade display with the following specifications is recommended for assessing digital images[3]:

	high end calibrated medical grade display	**Minimum display specification**
Size (diagonal)	**31 inches**	24 inches
Resolution	**6 Megapixels**	3 Megapixels or greater
Contrast ratio	**1500:1**	Adjust contrast and brightness using the monitor on-screen display so you can simultaneously see both the 5% black and 5% white squares
Luminance (max)	**1000 cd/m2**	
Luminance (setting)	**400 cd/ m2**	350 cd/m_2 or greater.
Colour calibration	**Automatic Full colour calibration (sRGB <20%)**	If you can change the colour space and are using a web browser to view images select sRGB

There is a Display quality assurance tool available from Leeds Digital Pathology (http://www.virtualpathology.leeds.ac.uk/research/systems/pouqa) which should be checked every few weeks for routine reporting, or for each reporting session if the viewing environment has changed or if digital reporting is not part of routine practice. If unable to pass the POUQA test, proficiency testing results should be submitted using the glass slides.

Appendix

Areas of digital diagnostic difficulty, by topography [3]

Histopathology subspecialty	**Potential pitfalls**
General	Identification and grading of dysplasia Identification of lymph node metastasis and micrometastasis Identification and quantification of mitotic figures Identification of granulation tissue Identification of micro-organisms
Breast	Identification and grading of nuclear atypia Identifying microinvasion and lymphovascular space invasion Identification of lobular carcinoma Grading invasive cancers (mitotic count component) Identification of weddelite calcification Identification of sentinel lymph node

[3] Royal College of Pathologists. Guidance for remote reporting of digital pathology slides during periods of exceptional service pressure. 2020. [Internet] Available from: https://www.rcpath.org/uploads/assets/626ead77-d7dd-42e1-949988e43dc84c97/RCPath-guidance-for-remote-digital-pathology.pdf

	metastasis/micrometastasis
Skin and soft tissue	Identification and grading of squamous dysplasia Micro-organism detection Granulomatous inflammation Melanocytic lesions Granulocyte identification and classification Identification of sentinel node metastasis Identification of amyloid Identification of lymphoproliferative disease/malignancy
Endocrine	Identification of granulomata Identification of lymph node metastasis Identification of amyloid in medullary carcinoma of the thyroid Classification of thyroid neoplasms- identification of cellular papillary features Identification of mitoses and atypical mitoses
Genitourinary	Identification and grading of urothelial dysplasia Identification of micro-organisms Identification of granulomatous inflammation Identification and classification of inflammatory cells (especially granulocytes) Identification of amyloid Identification of lymphoproliferative disease/malignancy Grading renal carcinoma (nuclear features)