



## ORAL PRESENTATION

# Image standardization in tissue – based diagnosis

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### Background

Application of virtual slides in research and routine diagnosis requires specific standards that still have to be defined, developed, and generally accepted.

### Basic conception

Virtual microscopy, i.e., the microscopic diagnostics on images derived from completely digitized glass slides has to be distinguished into (1) human performance and (2) automated machine algorithms. Both methods can result in diagnostic errors that have to be graded (or scored) according to their clinical significance. A proposed system includes 10 different scores, reaching from main significant errors {normal <> abnormal tissue, (0)} to {identical findings (10)}. The system developed by Mireskandari et al<sup>1</sup> is appropriate for and has been tested in telepathology sessions to grade differences between primary and secondary diagnosis. The procedure can be embedded into a general hierachic standardization method which includes three levels {aim, methodology, and specific limitations}<sup>2</sup>. Three different “columns”, i.e., legal, medical, and technical aspects can be implemented into the hierarchy. Specific aspects of microscopic images can be added to well known communication standards such as DICOM 3, HL 7, or HTTP. Image quality standards have to include parameters that describe accuracy of object segmentation, correct image illumination or shading, and equalize the gray value distribution. Additional standards have to give regulations for image display (size and resolution of image display systems), minimum number, size, and magnifications of transmitted image compartments, and color distributions. Simple questions, for example which color space is appropriate for which color distribution, have also to be answered in an unequivocal manner.

### Preliminary investigations

Preliminary experiences derived from trials to perform automated diagnosis on digitized slides demonstrate

that a standardization of image quality includes at least measures of vignette (shading), maximum gray value height, and homogenous gray value distribution. The minimum number of potential segmentation thresholds related to the derived diagnosis as well as image entropy and compression modes are additional features that have to be defined in quantitative measures. The use of fixed image sizes is prerequisite for any texture analysis including area dependent image transformations.

Perspectives: The development and implementation of image standards focussing on specific needs of virtual microscopy is an issue that has to (and certainly will) become of significant attention in human and automated application.

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### References

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