

# Implementation of digital pathology in Estonia

## Summary

**Background:** The field of pathology is characterized by a continuous increase in workload related to the aging population, the growth of cancer incidence, the increase in the amount and coverage of screening programs that assume pathological evaluation, and the development of personal and precision medicine. Traditionally, the pathologist's primary tool for evaluating biological samples has been the light microscope, but over the past decades, digital solutions have been developed to ensure and increase the diagnostic capacity of pathological examinations while maintaining a reasonable turnover time. Nowadays, digital pathology encompasses the production of whole slide images, examination of biological material, as well as management, sharing, interpretation and archiving of digital data.

**Objective:** To compare digital pathology to light microscopy and assess the applicability and budgetary impact of digital pathology in Estonia.

**Methods:** To describe the benefits of digital pathology a systematic literature search was performed in PubMed to identify studies comparing analogue laboratory workflow to the digital one, and whole-slide imaging to light microscopy. In addition, a systematic literature review of the studies evaluating the economic impact of digital pathology implementation was performed. A budget impact analysis of using an institution-based and centrally organised implementation model was used to estimate the cost of implementing digital pathology in Estonia.

**Results:** Based on the systematic literature review, the benefits of digitalisation in the field of pathology can be divided into four categories: 1) digitalisation and automatization of the pathology laboratory workflow that enables to standardise the processing of samples, improve quality control and reduce human error; 2) a whole slide image, being a diagnostical equivalent to a glass slide, is a prerequisite for both sharing samples via digital infrastructure and software-based analysis; 3) telepathology allows fast and reliable data transmission enabling joint examinations and consultations; 4) software-based analysis enables to detect and classify disease-specific changes with equal or greater accuracy compared to a pathologists' assessment, thereby increasing the efficiency of routine and large-scale assessments. The main economic benefit of digitalisation lies in the reduction of daily costs, increased productivity and opportunities to generate additional income, but not all economic benefits can be quantified in monetary terms.

The digitalisation of Estonian pathology laboratories can be done using either an institution-based or central implementation model. Either way, the initial digitalisation requires investments in hardware, software and personnel. The five-year budget impact of using the institution-based implementation model would be around €24,0 million. In the case of using the central implementation model, the total cost would yield around €14,1 million. The cost per whole slide image produced would be €8.68 for the institution-based and €5.10 for the central implementation model. The cost-saving associated with central implementation would come from the shared software and archiving costs.

**Conclusions:** The implementation of digital pathology in Estonia should be done in collaboration between the pathology service providers. The digitalisation would be essential to support the sustainability of the field of pathology in Estonia.

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