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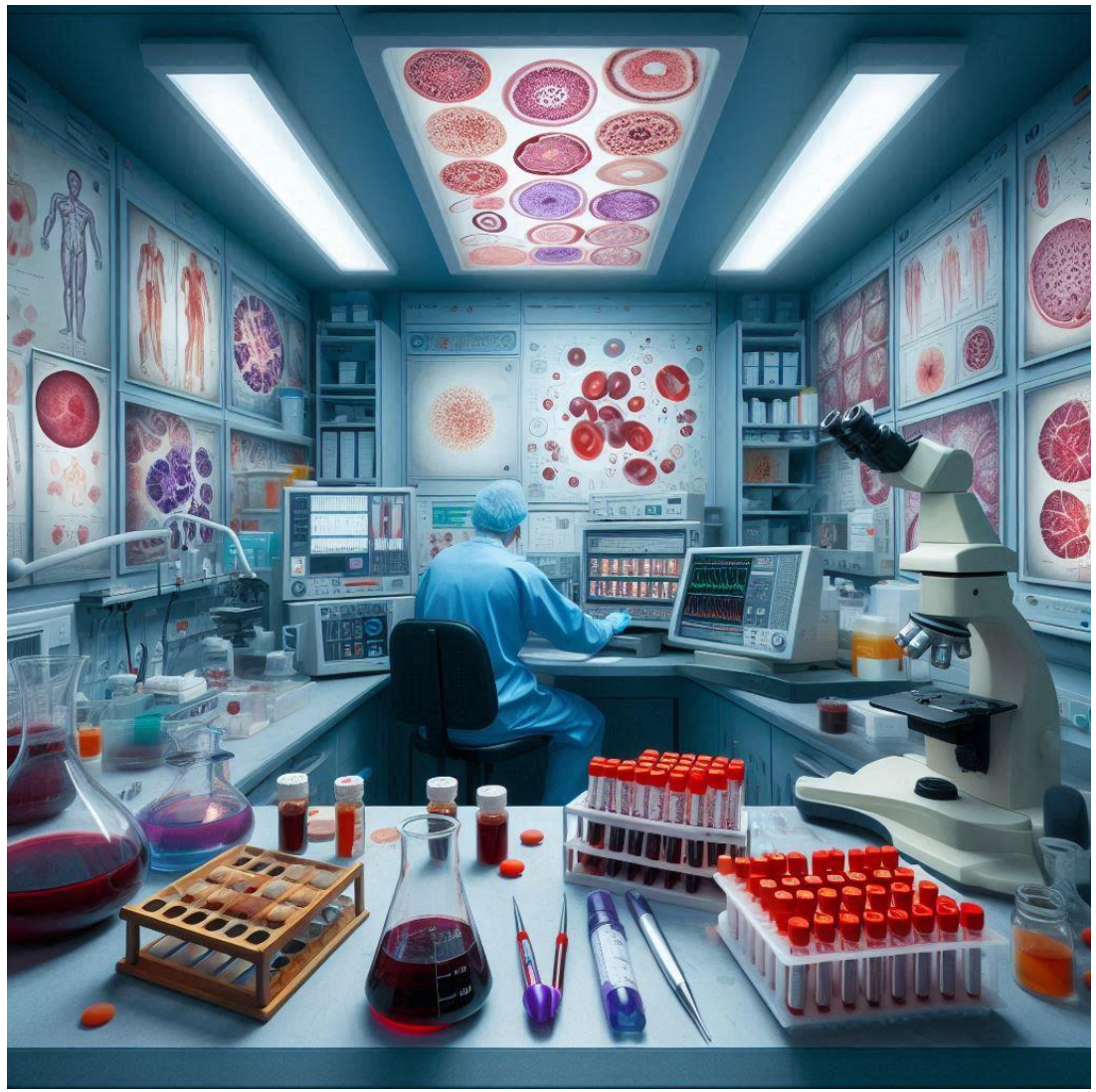
Digital Haematology Task Force

Advancing Digital Pathology in Haematology within the UK



Dr Timothy Farren

On behalf of the BSH Lab SIG

and Dr Guy Hannah Co-Chair of DHTF

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- 1590 – Zacharias Jassen
- 1609 – Galileo Galilei
- 1625 – “Microscope” Faber
- 1665 – “Cells”
- 1667 – Robert Hooke
- 1676 - Leeuwenhoek

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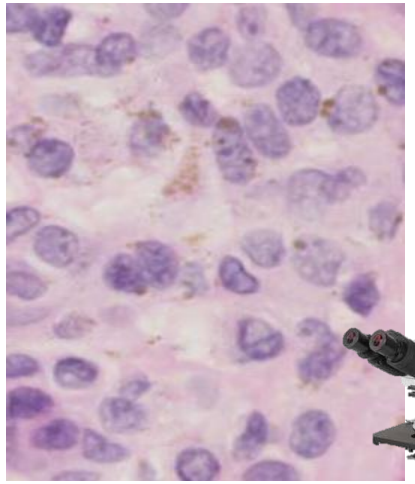
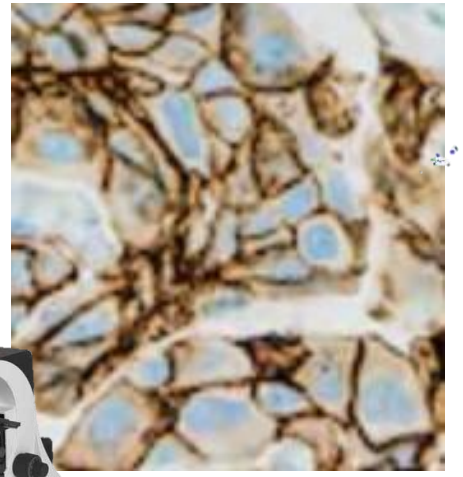
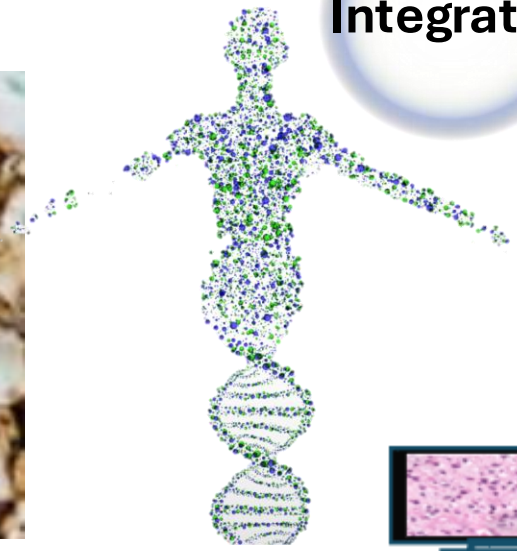
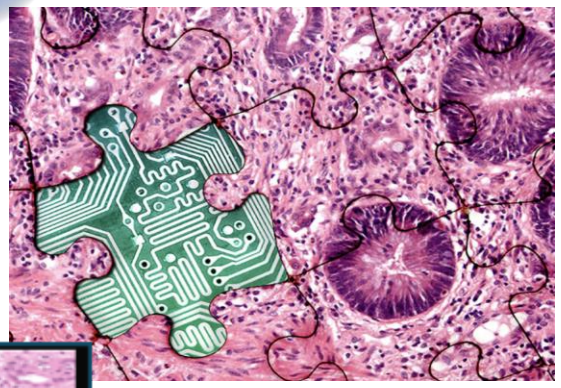
Why Digital?

LOW VALUE
PROCESS DRIVEN

HIGH VALUE
DATA DRIVEN
PRECISION MEDICINE

Integration

Macroscopic	Microscopic	Antibodies/EM	Molecular	Digital
1700-now	1850-now	1970 - now	2000-now	2018- now

First Revolution (Dissection/Microscope)

Second Revolution (Antibodies/Electron Microscope)

Third revolution (Computational)

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Current situation

- The microscope remains a haematologists best friend.

- Limitations:
  - Consistency / reproducibility
  - Specialist referral / multisite
  - Training / Education
  - Capacity and efficiency

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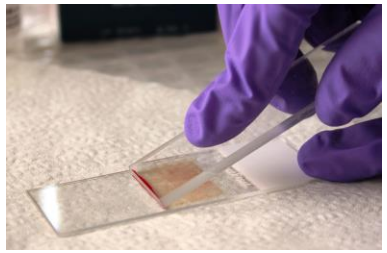

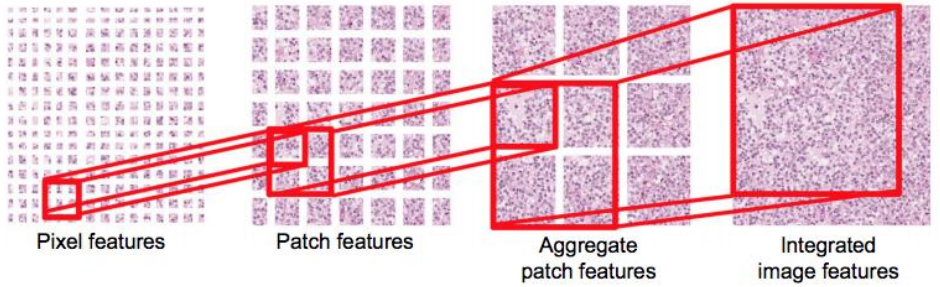

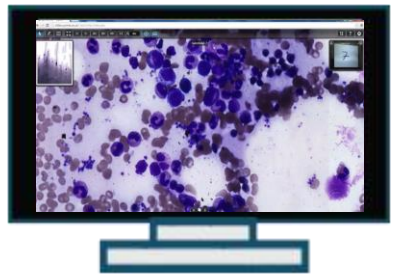

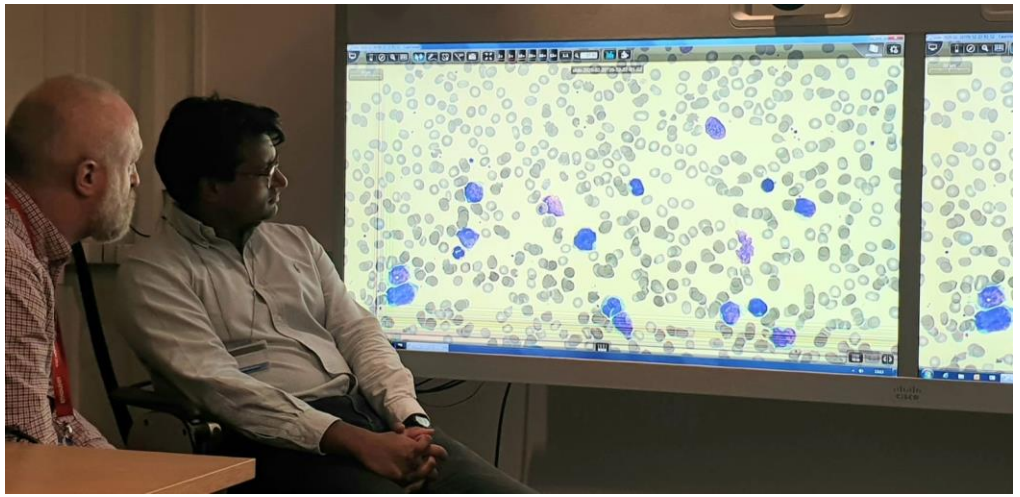

Human Tissue
(Microscope based interpretation)

Data
(Available for Analytics)

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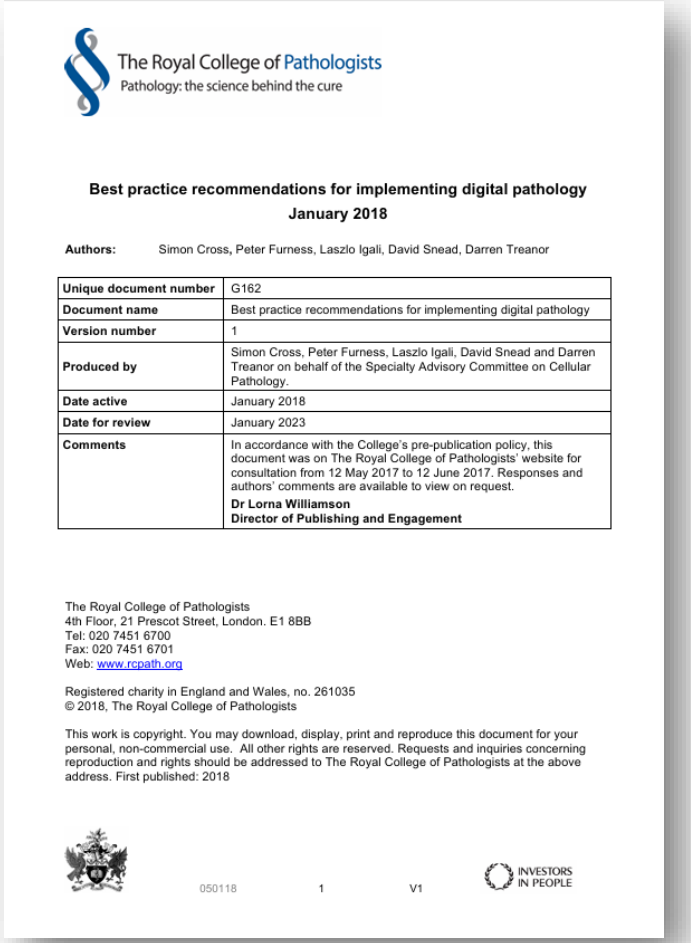
Why Digital Haematology?

- Already “embedded” by our histopathology colleagues.
- Remote reporting / telepathology
- Collaboration
- Standardisation of image analysis
- AI integration
- Training tools
  - Case libraries
  - Digital teaching sets
- Scalable
- Long Term Plan



The Royal College of Pathologists
Pathology: the science behind the cure

Best practice recommendations for implementing digital pathology
January 2018

Authors: Simon Cross, Peter Furness, Laszlo Igali, David Snead, Darren Treanor

Unique document number	G162
Document name	Best practice recommendations for implementing digital pathology
Version number	1
Produced by	Simon Cross, Peter Furness, Laszlo Igali, David Snead and Darren Treanor on behalf of the Specialty Advisory Committee on Cellular Pathology.
Date active	January 2018
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Comments	In accordance with the College’s pre-publication policy, this document was on The Royal College of Pathologists’ website for consultation from 12 May 2017 to 12 June 2017. Responses and authors’ comments are available to view on request. **Dr Lorna Williamson** **Director of Publishing and Engagement**

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https://www.rcpath.org/static/f465d1b3-797b-4297-b7fedc00b4d77e51/Best-practice-recommendations-for-implementing-digital-pathology.pdf

The Royal College of Pathologists
Pathology: the science behind the cure

Digital pathology strategy 2019

https://www.rcpath.org/static/2248bb71-b773-4693-945bffda593f2f2f/cf251e84-f7d0-415d-bb67217219203066/Digital-Pathology-Strategy.pdf

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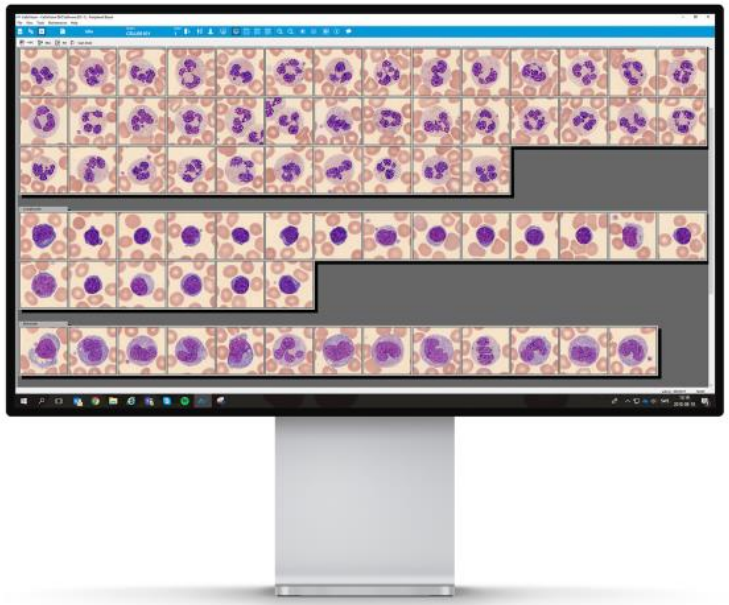
Will it work?

- Already works in Clinical Setting..



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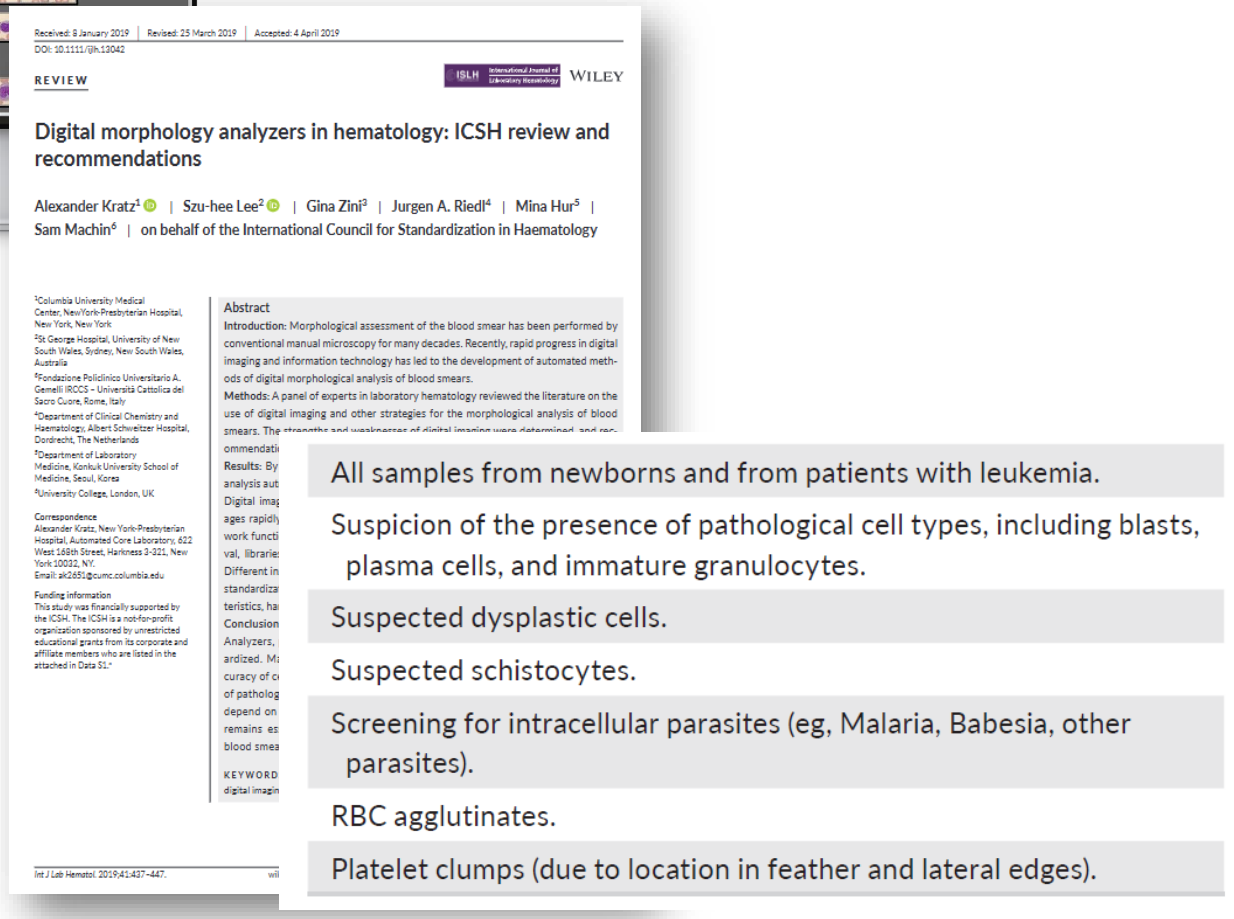
Will it work?



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DOI: 10.1111/ijlh.13042

REVIEW

ISLH International Journal of Laboratory Hematology WILEY

Digital morphology analyzers in hematology: ICSH review and recommendations

Alexander Kratz[1] | Szu-hee Lee[2] | Gina Zini[3] | Jurgen A. Riedl[4] | Mina Hur[5] | Sam Machin[6] | on behalf of the International Council for Standardization in Haematology

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[3]Fondazione Policlinico Universitario A. Gemelli IRCCS – Università Cattolica del Sacro Cuore, Rome, Italy
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Funding Information
This study was financially supported by the ICSH. The ICSH is a not-for-profit organization sponsored by unrestricted educational grants from its corporate and affiliate members who are listed in the attached in Data S1.*

Abstract

Introduction: Morphological assessment of the blood smear has been performed by conventional manual microscopy for many decades. Recently, rapid progress in digital imaging and information technology has led to the development of automated methods of digital morphological analysis of blood smears.

Methods: A panel of experts in laboratory hematology reviewed the literature on the use of digital imaging and other strategies for the morphological analysis of blood smears. The

Results: By

Conclusion

KEYWORD

Int J Lab Hematol. 2019;41:437–447.

- All samples from newborns and from patients with leukemia.
- Suspicion of the presence of pathological cell types, including blasts, plasma cells, and immature granulocytes.
- Suspected dysplastic cells.
- Suspected schistocytes.
- Screening for intracellular parasites (eg, Malaria, Babesia, other parasites).
- RBC agglutinates.
- Platelet clumps (due to location in feather and lateral edges).

- Already works in Clinical Setting..
- Increasing “Research” publications.
- Limited “Clinical” publications.
  - DI60
  - Cellavision
  - Vision Hema
  - EasyCell
  - NextSlide
  - HemaCAM
- Peripheral Blood focus.

Kratz A, Lee S-H, Zini G, Riedl JA, Hur M, Machin S; on behalf of the International Council for Standardization in Haematology. Digital morphology analyzers in hematology: ICSH review and recommendations. *Int J Lab Hematol*. 2019; 41: 437–447. https://doi.org/10.1111/ijlh.13042

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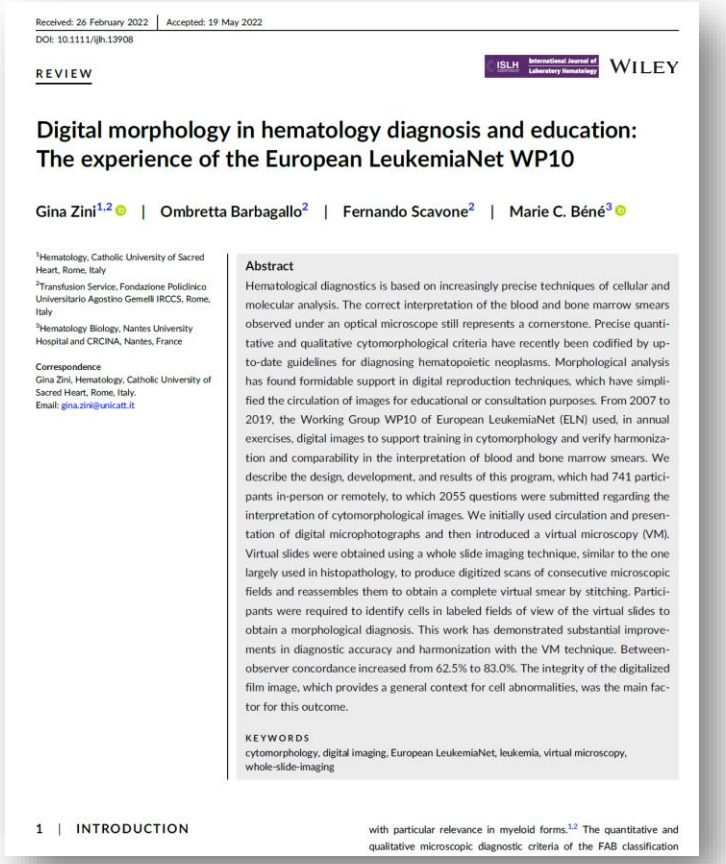
Will it work?



Received: 26 February 2022 | Accepted: 19 May 2022
DOI: 10.1111/ijlh.13908

REVIEW

ISLH International Journal of Laboratory Hematology WILEY

Digital morphology in hematology diagnosis and education: The experience of the European LeukemiaNet WP10

Gina Zini[1,2] | Ombretta Barbagallo[2] | Fernando Scavone[2] | Marie C. Béné[3]

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[2]Transfusion Service, Fondazione Policlinico Universitario Agostino Gemelli IRCCS, Rome, Italy
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Abstract

Hematological diagnostics is based on increasingly precise techniques of cellular and molecular analysis. The correct interpretation of the blood and bone marrow smears observed under an optical microscope still represents a cornerstone. Precise quantitative and qualitative cytomorphological criteria have recently been codified by up-to-date guidelines for diagnosing hematopoietic neoplasms. Morphological analysis has found formidable support in digital reproduction techniques, which have simplified the circulation of images for educational or consultation purposes. From 2007 to 2019, the Working Group WP10 of European LeukemiaNet (ELN) used, in annual exercises, digital images to support training in cytomorphology and verify harmonization and comparability in the interpretation of blood and bone marrow smears. We describe the design, development, and results of this program, which had 741 participants in-person or remotely, to which 2055 questions were submitted regarding the interpretation of cytomorphological images. We initially used circulation and presentation of digital microphotographs and then introduced a virtual microscopy (VM). Virtual slides were obtained using a whole slide imaging technique, similar to the one largely used in histopathology, to produce digitized scans of consecutive microscopic fields and reassembles them to obtain a complete virtual smear by stitching. Participants were required to identify cells in labeled fields of view of the virtual slides to obtain a morphological diagnosis. This work has demonstrated substantial improvements in diagnostic accuracy and harmonization with the VM technique. Between-observer concordance increased from 62.5% to 83.0%. The integrity of the digitalized film image, which provides a general context for cell abnormalities, was the main factor for this outcome.

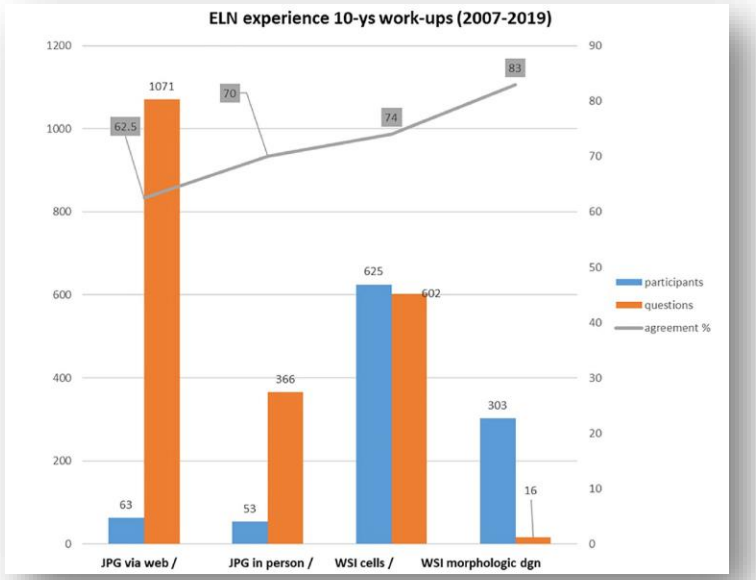
KEYWORDS
cytomorphology, digital imaging, European LeukemiaNet, leukemia, virtual microscopy, whole-slide-imaging

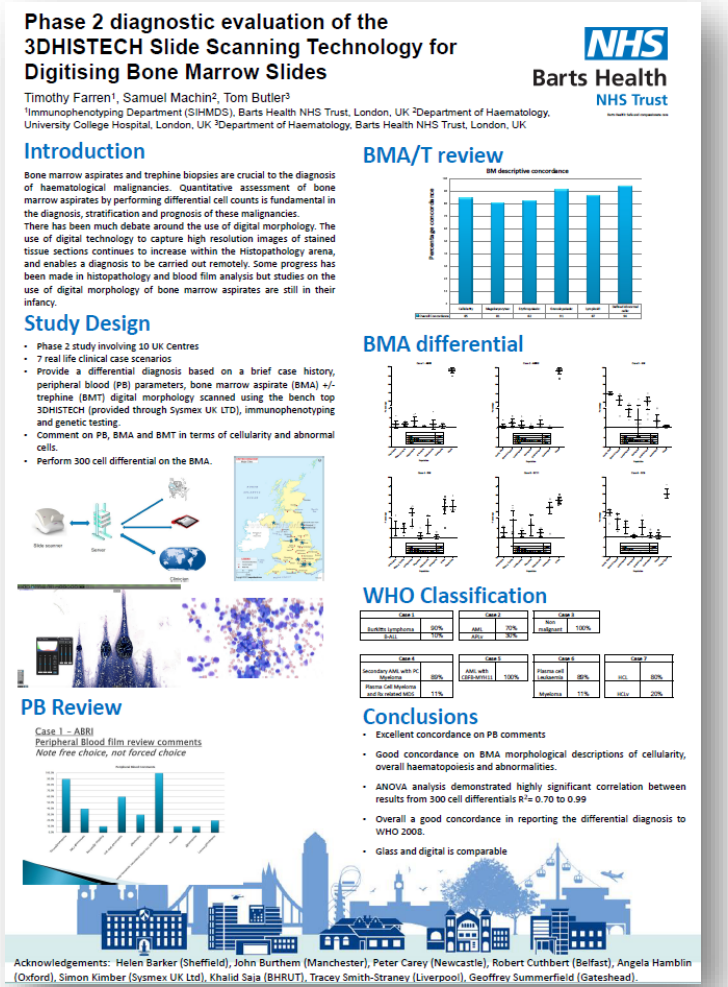
1 | INTRODUCTION

with particular relevance in myeloid forms.[1,2] The quantitative and qualitative microscopic diagnostic criteria of the FAB classification

Zini G, Barbagallo O, Scavone F, Béné MC. Digital morphology in hematology diagnosis and education: The experience of the European LeukemiaNet WP10. Int J Lab Hematol. 2022 Sep;44 Suppl 1:37-44. doi: 10.1111/ijlh.13908. PMID: 36074713.

- 2007-2019.
- JPEG and TIF – 2007 to 2011
- “Virtual Microscopy” utilising WSI.
  - From 2012
  - 62.5% to 83%
  - Enhanced dysplasia and blasts.





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Purpose of the DHTF

"To review and develop the use of digital pathology (and AI) in haematology in the UK to advance the integration of cutting-edge digital technology within haematology to improve diagnostic accuracy, efficiency and patient outcome. "

Proposed aims of the Task Force are:

1. Appraisal of Current Technology and Evidence
2. Data Collection and Experience Sharing
3. Development of research into Digital Pathology in Haematology
4. Development of National Strategy and Guidelines
5. Enhancement of Educational Resources

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The role of Artificial Intelligence

Histopathology

Histopathology 2025, **86**, 58–68. DOI: 10.1111/his.15327

REVIEW

Role of artificial intelligence in haematolymphoid diagnostics

Charlotte Syrykh,[1] Michiel van den Brand,[2,3] Jakob Nikolas Kather[4,5] & Camille Laurent[1,6]

[1]*Department of Pathology, Institut Universitaire du Cancer-Oncopole de Toulouse CHU Toulouse, Toulouse, France,* [2]*Department of Pathology, Radboud University Medical Center, Nijmegen,* [3]*Pathology-DNA, Arnhem, The Netherlands,* [4]*Else Kroener Fresenius Center for Digital Health, Faculty of Medicine and University Hospital Carl Gustav Carus, TUD Dresden University of Technology, Dresden,* [5]*Medical Oncology, National Center for Tumor Diseases (NCT), University Hospital Heidelberg, Heidelberg, Germany and* [6]*INSERM UMR1037, CNRS UMR5071, Université Toulouse III-Paul Sabatier, Centre de Recherches en Cancérologie de Toulouse, Toulouse, France*

Syrykh C, van den Brand M, Kather J N & Laurent C (2025) *Histopathology* **86**, 58–68. https://doi.org/10.1111/his.15327

Role of artificial intelligence in haematolymphoid diagnostics

The advent of digital pathology and the deployment of high-throughput molecular techniques are generating an unprecedented mass of data. Thanks to advances in computational sciences, artificial intelligence (AI) approaches represent a promising avenue for extracting relevant information from complex data structures. From diagnostic assistance to powerful research tools, the potential fields of application of machine learning techniques in pathology are vast and constitute the subject of considerable research work. The aim of this article is to provide an overview of the potential applications of AI in the field of haematopathology and to define the role that these emerging technologies could play in our laboratories in the short to medium term.

Keywords: artificial intelligence, haematopathology, lymphoma diagnosis

Introduction

Lymphomas are among the ten most common cancers worldwide,[1] and are characterized by considerable clinical and biological heterogeneity, with variable prognosis and therapeutic response.[2,3] Lymphoma diagnosis requires in-depth histological analysis by expert pathologists, and relies on ancillary tissue staining techniques, now increasingly combined with molecular analyses (fluorescence *in situ* hybridization [FISH], clonality, high-throughput sequencing). However, access to these sophisticated technologies is limited, and the risk of misdiagnosis by nonexpert pathologists remains high, as demonstrated in a French nationwide study (*Lymphopath* Network), which showed that 20% of the diagnoses are inaccurate, with a direct impact on patients' treatment.[4,5] Recent major breakthroughs in deep-learning

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Abbreviations: AI, artificial intelligence; AUCROC, area under the receiver operating characteristic curve; CLL, chronic lymphocytic leukemia/lymphocytic lymphoma; COO, Cell Of Origin; DLBCL, diffuse large B-cell lymphoma; FISH, fluorescence in situ hybridization; FL, follicular lymphoma; H&E, haematoxylin-eosin; IPI, international prognostic index; MIPI-b, biologic-Mantle cell lymphoma international prognostic index; ML, machine learning; NLP, natural language processing; WSI, whole slide image.

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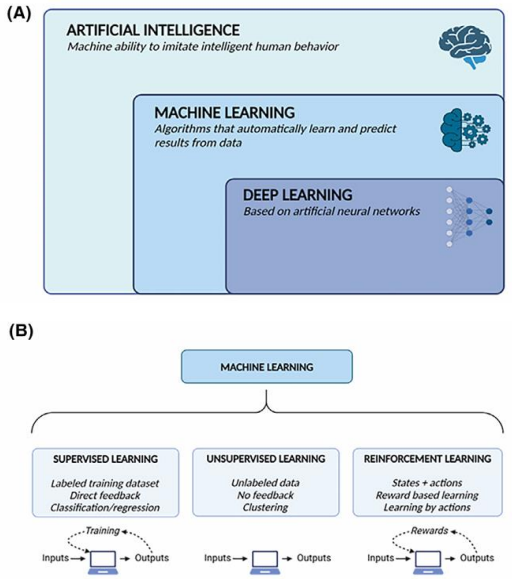

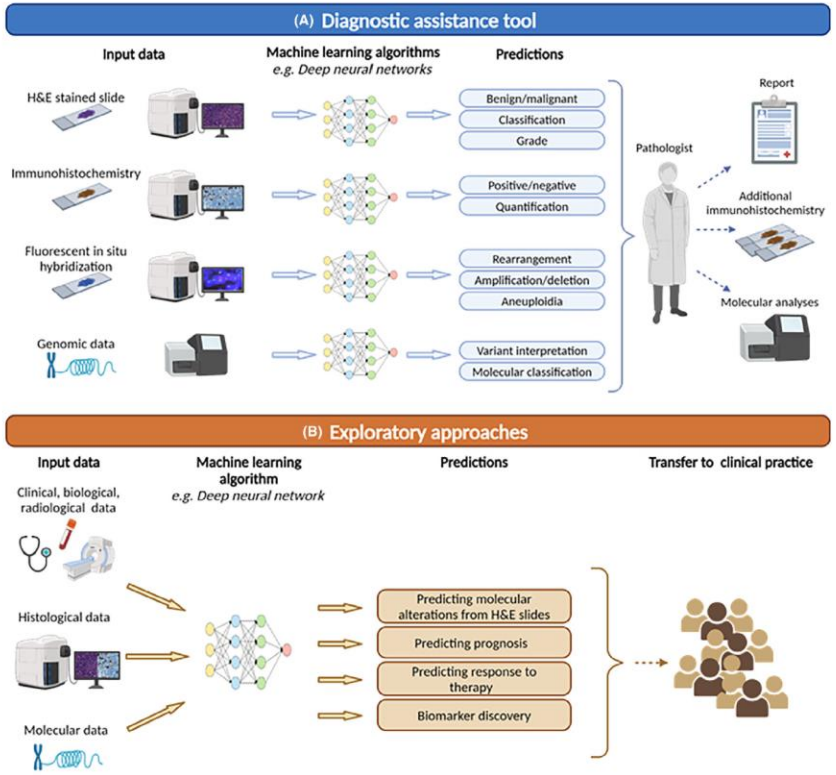

- **Cell classification.**
- **Anomaly detection.**
- **Workflow efficiency.**
- **Remote diagnostics.**
- **Challenges.**
- **Faster, more accurate diagnosis.**