United Kingdom Liver Pathology Group

# Survey for members of UKLPG: Digital Pathology and AI in liver disease

## Introduction

Thank you for participating in this survey. Your responses will build a picture of the UK liver pathology community's opinions on digital pathology and artificial intelligence (AI) and we anticipate the results will be published as a report. This report could influence future decisions about research priorities in this area. This survey aims to build on discussions from a focus group of interested pathologists working in liver research. Your individual answers will remain confidential throughout this process and will not be used for purposes other than those outlined above.

This first page contains some general introductory questions that we would like all participants to complete. The following pages are optional but we would be grateful for your insight. If you do not feel able to answer certain questions, please select "don't know" or you can skip to the next question.

* 1. Describe the hepatology services in your current place of work

- ◯ Tranplant centre
- ◯ Tertiary non-transplant centre
- ◯ Secondary care / DGH
- ◯ Other (please specify):

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* 2. Approximately how many liver specimens would you typically report per year

- ◯ <20
- ◯ 20-49
- ◯ 50-199
- ◯ 200-500
- ◯ >500

* 3. What is your experience of using digital pathology? (Please select all those that apply)

- ☐ Primary diagnosis
- ☐ Second opinion
- ☐ Research
- ☐ Teaching / training
- ☐ EQA
- ☐ No experience of digital pathology
- ☐ Other (please specify)

* 4. Do you have any experience, knowledge or interest in AI development? (Please select the best description)

- ◯ Yes, direct experience of AI research
- ◯ Yes, knowledge of AI research but no direct experience
- ◯ Generally interested but no prior knowledge or experience of AI research
- ◯ No prior experience, knowledge or interest in AI research

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## Digital Pathology

Digital pathology usually refers to images of histology generated by whole slide imaging and available to review by a pathologist on a computer.

Access and experience may vary across the group, but we would like to understand what considerations are important to liver pathologists in this area. With your current knowledge and future expectations, please rate how the questions relate to you.

Questions are rated from strongly disagree to strongly agree, with the option to say "don't know" or you may skip the question. Comments and suggestions may be added at the bottom of each question.

5. **Digital pathology** could be useful for:

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Primary diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Second opinions | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Transplant frozen sections | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Training and education | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Flexible working | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Research | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Establishing national and international networks | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Creating large, multicentre image datasets | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

6. **Digital pathology:**

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Could improve speed of diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Could improve accuracy of diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Should have pathologists involved in its deployment for clinical use | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Should be easy to use | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

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### Artificial intelligence (general concepts)

Artificial intelligence usually refers to machines demonstrating intelligent behaviour by evaluating their environment and taking resulting actions. In the context of histopathology, this is often referring to machines extracting information from an image.

Access and experience may vary across the group but we would like to understand what considerations in general are important to liver pathologists in this area. With your current knowledge and future expectations, please rate how the questions relate to you.

7. **Artificial intelligence could improve:**

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Speed of diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Accuracy of diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Consistency of diagnosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| The range of tools available to a pathologist | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Understanding of tissue features not currently recognised by pathologists | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

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### Artificial intelligence and liver diseases

We would like to establish where AI might be useful to assist with diagnostic work. Please rate how useful you think AI tools would be in assessment and diagnosis these diseases.

8. **Artificial intelligence** could be useful for the pathological assessment and diagnosis of

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Fatty liver diseases | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Inflammatory liver diseases | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Biliary diseases | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Neoplastic liver diseases | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Transplantation | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

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### Artificial intelligence tools

We have suggested some potential tools that might be performed by a computer with an AI algorithm to assist with your diagnostic work. Please rate whether these would be useful.

Possible concerns are included at the bottom, please rate whether or not these are of concern to you.

9. Artificial intelligence tools performing the following for diagnostic work would be useful in **medical liver diseases**

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Quantifying steatosis | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Quantifying collagen | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Other quantitative tasks e.g. bile duct or portal tract numbers | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Identifying inflammation | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Identifying ballooning or Mallory bodies | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Identifying copper associated protein | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Predicting patient outcomes | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

10. Artificial intelligence tools performing the following for diagnostic work would be useful in **neoplastic liver disease**

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Quantify tumour grade | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Identifying lymphovascular invasion | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Identifying perineural invasion | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Classifying nodule type e.g. regenerative, dysplastic, HCC | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Providing morphomolecular classification | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Predicting patient outcomes | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Predicting genetics | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

11. I am concerned that **artificial Intelligence** may:

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Don't know |
|---|---|---|---|---|---|---|
| Be developed without pathologist involvement | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Replace pathologists | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Make decisions that we cannot understand | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Create additional work for the pathologist | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Impair training | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| De-skill pathologists | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Be unsafe for patients | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Struggle with existing digital systems | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

Additional comments / suggestions

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### Priorities and final comments

Please outline any concept(s) that you feel would be most important or useful to your practice in this area of research. Please feel free to add any final comments or suggestions.

Thank you for completing this survey.

12. If you were to highlight a priority / priorities for research and development in this area that would be most useful for your practice, what would you choose?

13. Please give any further comments or additional suggestions