Welcome!

HMDS Network Meeting 2026

British Society for Haematology
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Haematological Malignancy Diagnostic Service (HMDS) Network Meeting 2026

HMDS network aims:

- Supporting a network of Haematological Malignancy Diagnostic Services in the UK
- Working with other national organisations
- Working on specific projects to support patient access to high quality HMDS laboratories

Tom Butler

Consultant Haematologist and Haematopathologist, Barts Health NHS Trust

Pathology Clinical Director, NHS East and South East London Pathology Partnership

British Society for Haematology Laboratory Specialist Interest Group

Chair, UK HMDS Network

27/2/26

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Haematological Malignancy Diagnostic Service (HMDS) Network meeting

27 February 2026

Thank you:

- BSH Board
- BSH team
  - Especially Anne, Thomas, Saskia
- Lab SIG committee
- Speakers
- HMDS Lab leads

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UK HMDS Network

Aim: Supporting a network of Haematological Malignancy Diagnostic Services in the UK, working with other national organisations, on specific projects to support patient access to high quality HMDS laboratories

Collaboration, Communication, Liaison, Leadership, Education, Training, Workforce Planning, Audit, Peer Review, EQA, Research, Epidemiology, Clinical Advice, Equity of Access, Setting Standards, Seeking Consensus

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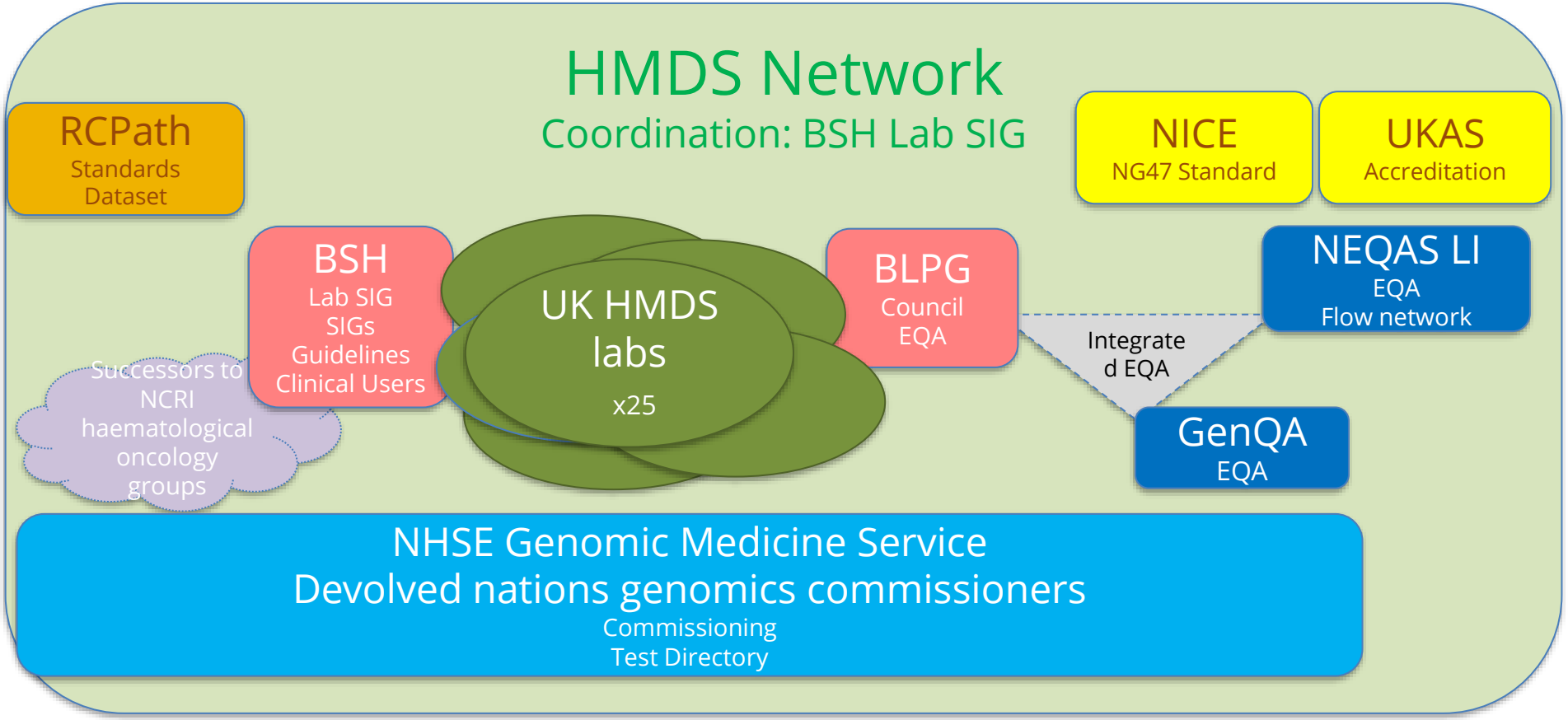

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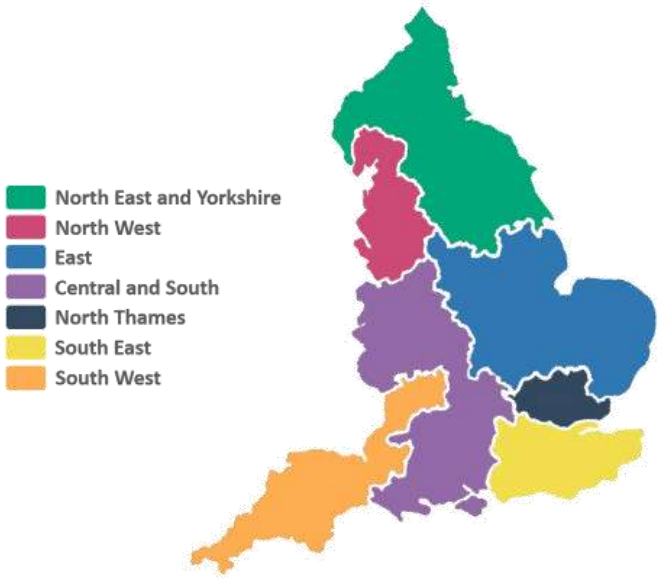
(SI)HMDS landscape in the UK

Attendees Feb 2026

GLH						Total
Central & South	Birmingham	Oxford	Southampton	Dorset		4
East	Cambridge	Leicester	Nottingham			3
North West	Liverpool	Manchester				2
North Thames	Barts Health	Great Ormond Street (Paediatric)	Imperial	Royal Marsden	University College London	5
South East	Guys & St Thomas'	Kings College Hospital				2
South West	Bristol					1
North East & Yorkshire	Leeds	Newcastle	Sheffield			3
Region						
Scotland	Edinburgh	Glasgow				2
Wales	Cardiff	Swansea				2
Northern Ireland	Belfast					1

SIHMDS by GLH/region:

- 20 HMDS in England
- 5 in Devolved Nations



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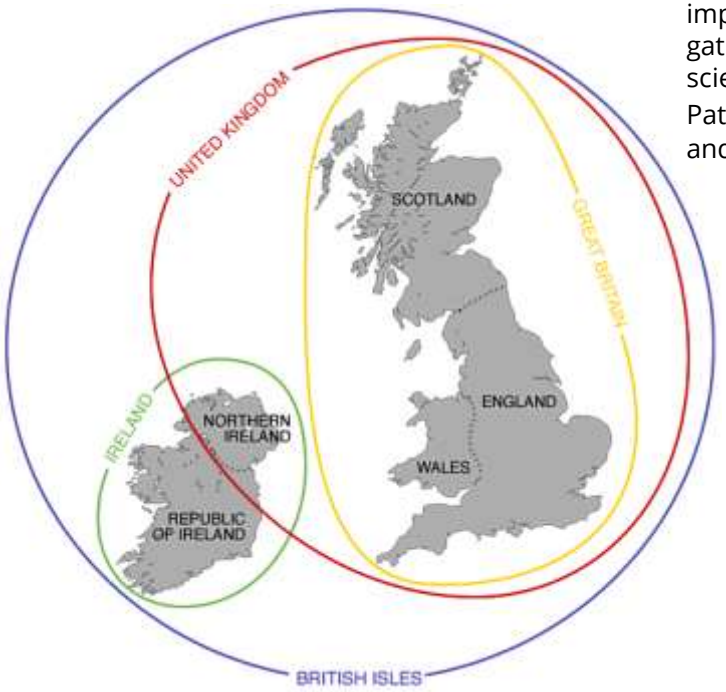
What is a national society or guideline?

HMDS for patients in devolved nations

The **British Society for Haematology (BSH)** has been bringing haematology professionals together since 1960 to transform the care our members provide to patients. With over 2500 members worldwide, we are the largest UK haematology organisation and the only society to cover all aspects of the specialty.

The **Royal College of Pathologists** is a professional membership organisation with charitable status, concerned with all matters relating to the science and practice of pathology. It is a body of its Fellows, Affiliates and trainees, supported by the staff who are based at the College's London offices. The College is a charity with over 11,000 members worldwide. The majority of members are doctors and scientists working in hospitals and universities in the UK.



The British Lymphoma Pathology Group (BLPG) was established in 1974. It initially gathered a small group of Haematopathologists who have historically shaped some of the most important developments in the understanding and classification of lymphoma. The BLPG today gathers more than 200 members with practice in Haematopathology. It provides important scientific and practical diagnostic updates, advice and guidance to the Royal College of Pathologists and other bodies relevant to Haematopathology practice in the United Kingdom and runs the Haematopathology External Quality Assurance (EQA) scheme.

NHS Genomic Medicine Service for England

National Institute for Health and Care Excellence (NICE) clinical guidelines cover the NHS in England, Wales and Northern Ireland. (See www.sign.ac.uk for information about clinical guidelines in Scotland.) NHS organisations such as hospitals, clinical commissioning groups, local health boards and GP practices are expected to take into account the recommendations in NICE clinical guidelines when deciding what treatments to offer people.

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Patients 1 & 2: who do you want to be?

Patient 1

- FBC abnormal
- Blood film abnormal
- BM & LN biopsy sent to an SIHMDS
- NGS in 72h
- Integrated report in a few days
- MRD markers identified
- WGS in 7 days
- Links to MDTs, GTABs, GRDABs
- Treatment initiated based on initial results, modified as results come in and response assessed

Patient 2

- FBC abnormal
- Blood film abnormal
- BM and LN samples sent to different labs
- Flow not done
- NGS not available, PCR delayed
- No integrated report
- Treatment delayed and incorrect
- Correct diagnosis made at relapse

Every system is perfectly designed to get the results it gets[1]

We all want to reach the summit:

- Different routes, same dangerous mountain
- How do we know when we reach the top?

1. W Edwards Deming

The future is already here — it's just not very evenly distributed[1]

Blood cancer is the UK's third biggest cancer killer

- Blood cancer is the fifth most common cancer in the UK, with over 41,000 people being diagn r
- There are about 250,000 people living with blood cancer in the UK
- One in every 16 men and one in every 22 women will develop it at some point
- It is the most common type of childhood cancer

Improving the consistency and accuracy of diagnosis is probably the single most important aspect of improving outcomes in haematological cancer [2]

Haematopathology: the cutting edge of personalised/precision/stratified medicine

- SIHMDS and Haematopathology innovations have led to pioneering diagnostics and treatment
- Haematology and Haematopathology experts have pioneered mainstreaming genomics into standard of care pathology and precision medicine: 50% of all genomics activity in the English GMS is HaemOnc/SIHMDS genomics
- Superspecialisation is good for patients by increasing quality and allowing precision/personalised medicine
- But superspecialisation requires high standards and creates workforce and training challenges
- We have a duty to promote equity of care and support each other
- We want to learn from each other. We want to continue innovating

1. William Gibson

2. Ireland R. Haematological malignancies: the rationale for integrated haematopathology services, key elements of organization and wider contribution to patient care. *Histopathology* 2011;58:145–154

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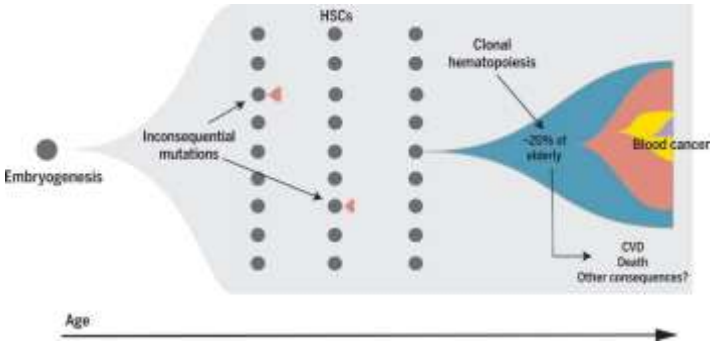
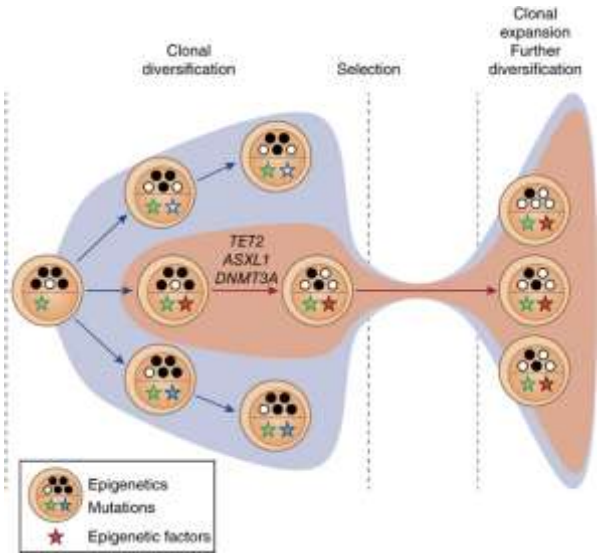
Why is Haematology at the cutting edge of precision medicine?

Biology of blood cancers make them easy to study and target

- Biology of blood cancers relatively simple:
  - BCR::ABL1 positive Chronic Myeloid Leukaemia (1960)
  - Acute Leukaemias, MPNs, lymphomas
- Younger age of some patients
- Aging and **clonal haematopoiesis**:
  - Stem cells
  - CHIP, MGUS, MBL
  - CHIP: Importance for cardiology and medical oncology?
  - What is normal?
- Evolution of subclones, **resistance and relapse**
- Each patient's cancer and **MRD target** is unique?
- **Inherited diseases**:
  - Haematologists pioneered molecular medicine and treat the most common inherited disorders (sickle cell, thalassaemia, haemophilia, haemochromatosis)
  - Blood cancers with inherited predisposition: increasingly defined entities





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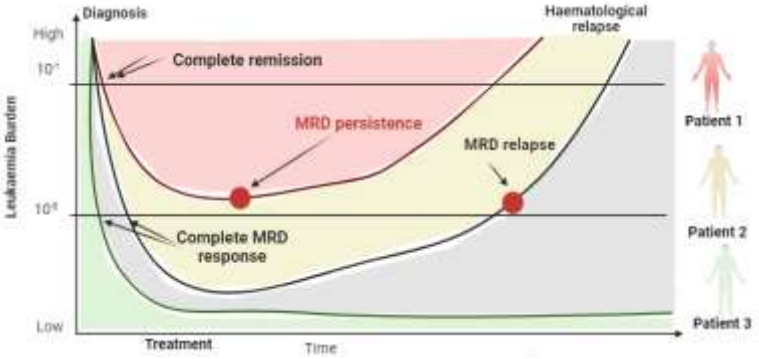
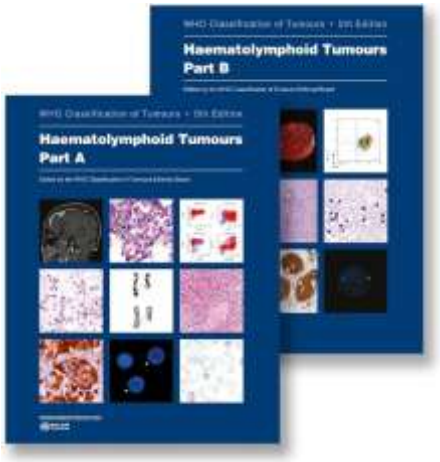
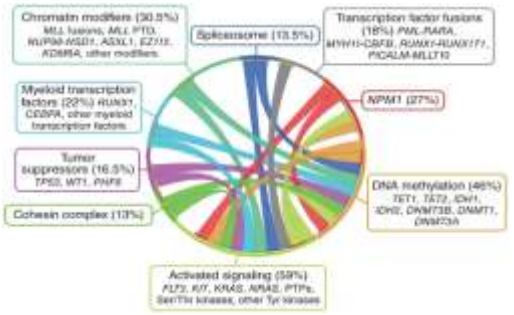
Haematological malignancies:

Why is Haematology at the cutting edge of precision medicine?

- Haematologists: **Pathologists and Physicians**
- **Access to samples** is easier for research and treatment
- **Treatments/actionable targets:** Chemotherapy, TKIs, immunotherapy (SCT, CART, IMIDs), multicentre trials, gene and cellular therapies
- **Personalised treatment/Precision Medicine:** Measurable Residual Disease (MRD), Genomic prognostication, Diagnostic classifications driven by genomic discoveries
- Pioneering **digital pathology and AI** in analysing blood counts, flow cytometry, images, genomic data
- **Integrated diagnostics**



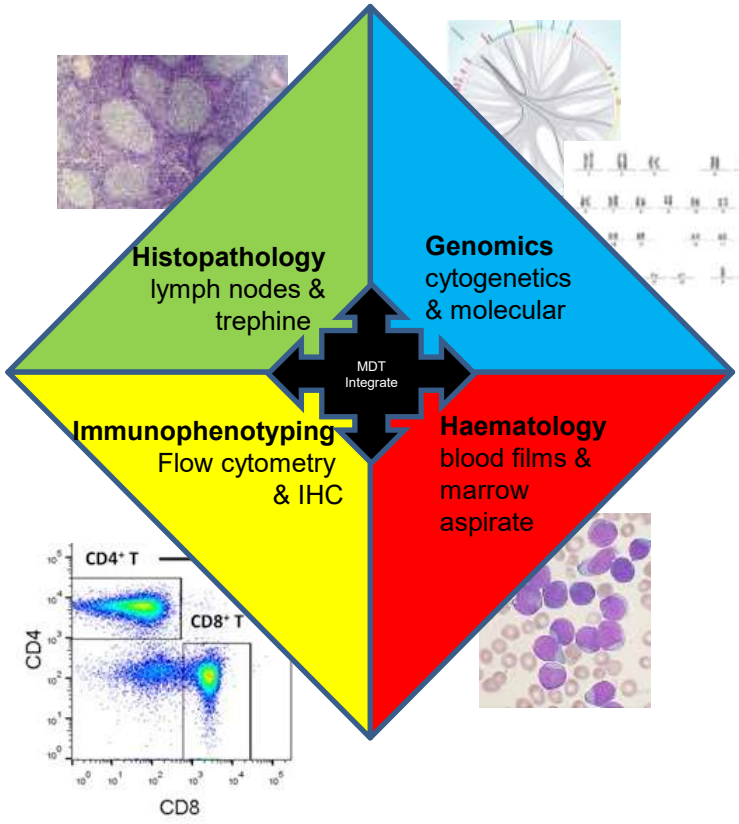




SIHMDS: NICE guidance on integrated diagnosis

Specialist Integrated Haematological Malignancy Diagnostic Services

- "Improving the consistency and accuracy of diagnosis is probably the single most important aspect of improving outcomes in haematological cancer"[1]
- Key concept is integration: no single modality answers the diagnostic question
- Studies suggest that 5–15% of blood cancers are misdiagnosed outside an SIHMDS setting
- A relatively small investment in pathology at the beginning of the pathway: greater effect on the patient and on the NHS than high-cost drugs
- Demand optimisation of high-cost tests
- Cancer MDT alignment
- The model for blood cancers has also informed integrated reporting in solid tumours[2]



1. Ireland R. Haematological malignancies: the rationale for integrated haematopathology services, key elements of organization and wider contribution to patient care. *Histopathology* 2011;58:145–154

2. Royal College of Pathologists. *Standards for Integrated Reporting in Cellular Pathology*: www.rcpath.org/uploads/assets/442fcdc1-af22-401f-8fcd1b4b65603810/G155-StandardsIntegratedReportingCellPath-Jan17.pdf

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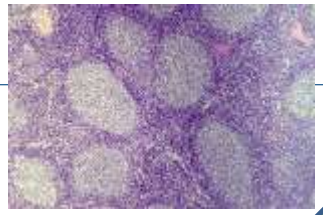
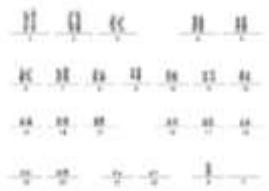
SIHMDS NICE NG47 compliance?





- Modalities co-located
- Integrated approach
- No single approach or platform, but unifying principles
- National Cancer Peer Review Programme 2013-16

- **Are all 25 (SI)HMDS Labs NICE compliant?**

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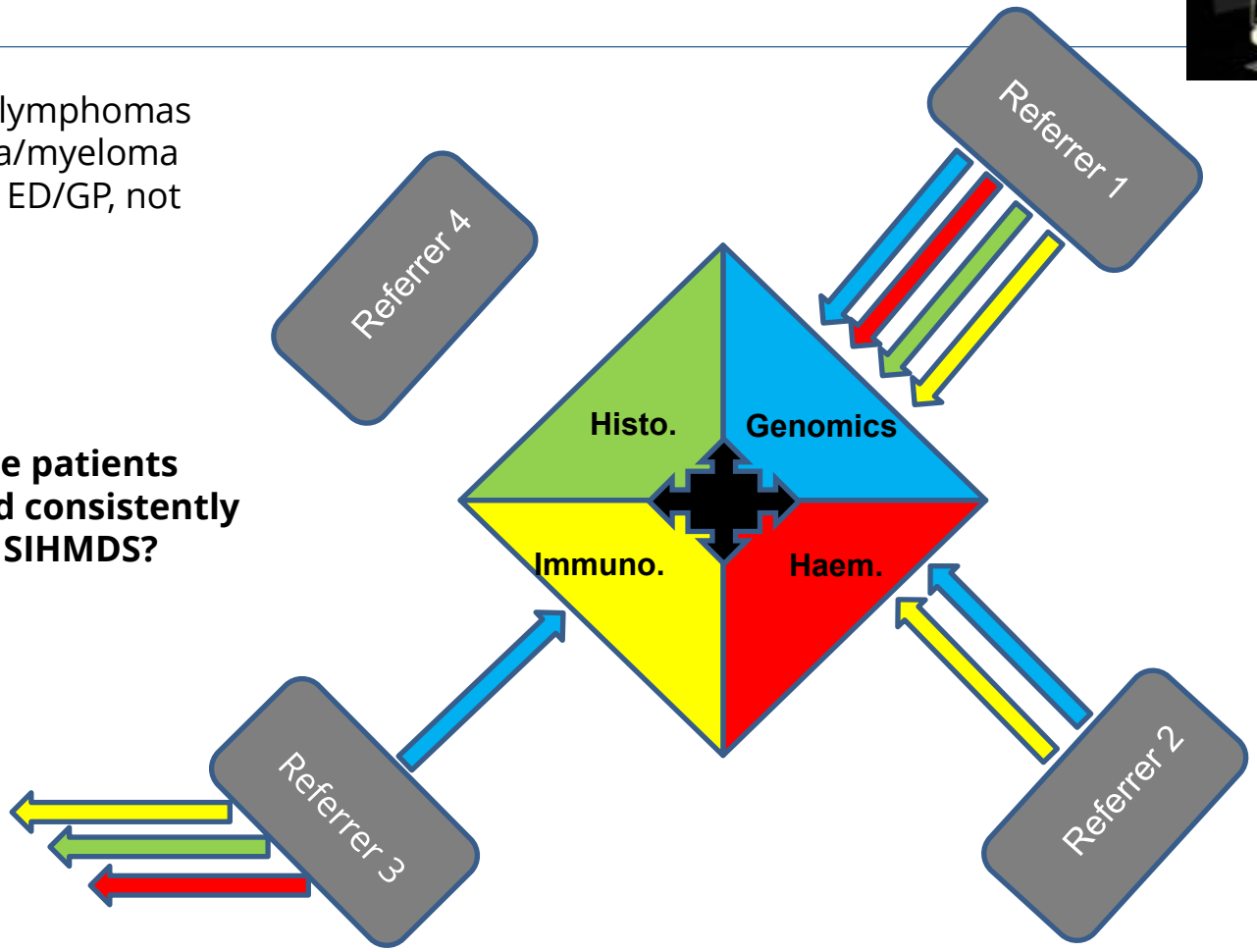
Do all patients access an SIHMDS?

- Backdoor lymphomas
- Leukaemia/myeloma diagnosis: ED/GP, not 2ww/FDS

Are all eligible patients equitably and consistently accessing an SIHMDS?



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Challenges to integrated diagnostics

- **Coordination and investment:** Need for single specimen reception and collocated laboratories at a single site; Multiprofessional staff work within a single quality management system; Single IT system to produce an integrated diagnostic report; National genomics IT system and national tariffs: not yet realised
- **Collocation** is main recommendation of NG47[1]: *1.1.1 Take into account that recommendations … are most likely to be achieved if the component parts of the specialist integrated haematological malignancy diagnostic services (SIHMDS) are located at a single site*
- Implementation of all 32 recommendations across single-entity or *collocated* SIHMDS is more achievable than *networked* SIHMDS that send tests to a different lab[2]. **Networked models are inherently less efficient and accurate** than single site models: challenging integration, turnaround times, reflex testing and increasing costs.
- **Differences in Culture, Workforce, Training, Governance, Communication silos**: Haematologists *vs* Histopathologists *vs* Scientists *vs* Clinical Geneticists. Pathology Networks *vs* GLHs.
- **Patients don't tell you they might have a blood cancer: '**Backdoor' lymphomas. Leukaemia diagnosis usually happens via emergency routes. Need to design systems that can diagnose patients from EDs or GPs, not coming via planned 2ww/FDS pathways.

1. *Haematological Cancers: Improving Outcomes*. *NICE Guideline NG47*. www.nice.org.uk/guidance/ng47

2. Cartwright A, et al. J Clin Pathol 2022;0:1–6. doi:10.1136/jclinpath-2021-208075

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Challenges: New Haem-Onc TATs:

Clinical need is for faster turnaround times for increasing numbers of variants + higher sensitivity

Innovation aim is to mainstream WGS

Urgency Category	Clinical Scenario	Suggested Test Method	TAT (days)	Examples (Please note these are for indicative purposes)
Very urgent	Very urgent diagnostic / treatment determining	RT-PCR / targeted mutation testing e.g. fragment analysis / FISH	3[a]	*PML::RARA*
				MYC translocation in Burkitt lymphoma
				BCR::ABL1 for ALL
				FLT3 / *NPM1* mutation testing in AML
				CBF FISH testing in AML
	Urgent upfront treatment determining (including at relapse)	Targeted mutation detection / Limited NGS panel	7	*TP53* in AML / selected lymphomas (e.g. HCL, LPL if morphological uncertainty) / (rarely *TP53* in CLL)[c]
		FISH	7[b]	ALL / AML / (rarely CLL)[c]
		Karyotype	7[b]	ALL / AML / CML (including in transformation) if being used to stratify treatment upfront / other
	Urgent monitoring	Chimerism	7[b]	Post-BMT when concerns re relapse / decision re DLI
		FISH / Karyotype	7[b]	AML / ALL concerns re relapse / required to plan imminent treatment
		(RT)-qPCR	7[b]	AML / ALL concerns re relapse / required to plan imminent treatment

Urgency category	Clinical scenario	Suggested Test Method	TAT (days)	Examples (Please note these are for indicative purposes)
Urgent	Urgent diagnostic pathway	RT-PCR / FISH	7[b]	*BCR::ABL1* in CML / FISH in DLBCL if being used to alter 1[st] cycle of treatment / FISH in MCL
		Clonality	7	B cell / T cell clonality in suspected aggressive lymphoma where clonality is being used to determine diagnosis

Urgency category	Clinical scenario	Suggested Test Method	TAT (days)	Examples (Please note these are for indicative purposes)
Routine	Diagnostic[a]	FISH	14	Lymphoma
		NGS panel / targeted mutation testing	21[b]	MPNs
		Clonality[a]	21	Indolent lymphoma
		FISH	14	Additional AML FISH e.g. MyeChild extended panels / cryptic targets / myeloma if treatment determining
		FISH	21	Myeloma if being performed for prognostication

"Technology is constantly changing: NGS is getting cheaper and quicker, and the drive will be towards local SIHMDS rapid NGS testing as new treatments depend on results that may be needed in 24-72h. "

NGS panel targets increasingly needed sooner, limited single gene PCR for rapid tests becoming obsolete method

- Some tests **needed in a few hours**
- **Needed in <72h**
- *NPM1/FLT3*
- NGS targets:
  - *IDH1/2*
  - *TP53*
  - *Next variant....?*
- Same genomic platforms and staff needed for urgent and routine wet work and analysis, duplication is inefficient

Pressure to decrease TAT as new treatments require knowledge of actionable variants

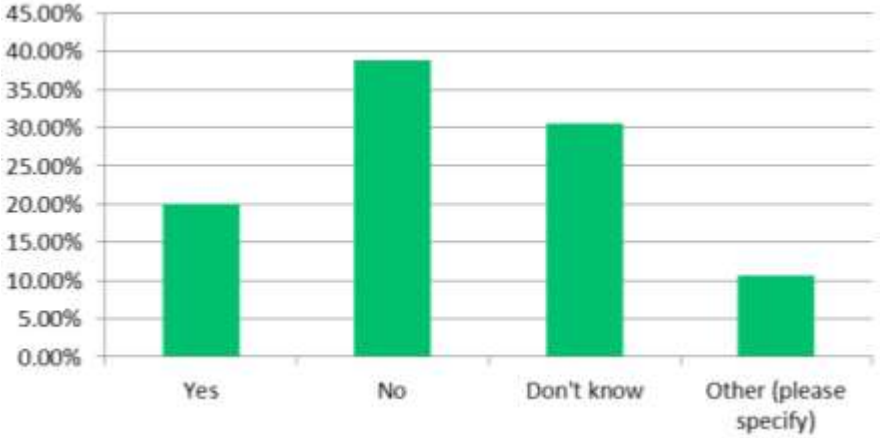
Pressure to increase MRD **sensitivity** whilst decreasing MRD TAT

Challenges: Concerns over Genomic Testing models
SIHMDS Survey: BSH and BLPG 2022

What can be done to ensure equity of access to genomic testing?

- Scrap the GLH model and support local SIHMDS development
- Acknowledgement that some 'local' HMDS have very knowledgeable and skilled staff that are able to provide high standard of some 'specialist' tests. These should not be thrown out with the bathwater
- Let GLH concentrate on non-time critical tests like WGS but all rapid assays should be performed locally
- Allow high quality, efficient testing to be performed within the SIHMDS if this improves patient care. If testing within SIHMDS meets the National test directory and can be performed within a nationally agreed tariff it should be permitted. Rare or complex tests that SIHMDS services choose not to perform can be performed by a GLH model if that is beneficial to the patient but not because of a forced agenda by NHSE.

Do you feel access to genomic testing has been improved by the Genomic Reconfiguration?



SIHMDS survey results and presentations: b-s-h.org.uk/about-us/special-interest-groups/laboratory-sig

What impacts do you experience locally as a result of a lack of integrated IT systems?

Do you think NG47 is compatible with SIHMDS labs sending genetic testing to GLHs?

No: all SIHMDS should have the capacity to provide all genomic tests within the SIHMDS	16%
Partially: some rare haemato-oncology genomic tests can be performed outside the SIHMDS, but the majority should be provided within an SIHMDS	54%
Mostly: most genomic tests do not need to be performed within an SIHMDS	5%
Entirely: an SIHMDS does not need to provide any haemato-oncology genomic tests, if they are provided elsewhere in a cancer hub	6%
Don't know	12%
Other (please specify)	7%

- When asked about NG47 compatibility with the GLH hub model, only 6% said that all genomics could be provided in a cancer hub.
- 70% (87% if don’t know/other excluded) said that SIHMDS should have the capacity to perform all/majority of genomic testing within an SIHMDS.
- 79% said that myeloid NGS panel testing should be provided within an SIHMDS

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Challenges: Concerns over Genomic Testing models

August 2025 To the Genomics Unit, NHS England By email: england.genomics@nhs.net

Dear Sir/Madam,

- **Concerns Regarding Draft Planning Guidance – Page 54: Specialist Integrated Haematological Malignancy Diagnostic Services** We are deeply concerned by the current draft planning guidance, particularly the recommendations outlined on page 54 regarding Specialist Integrated Haematological Malignancy Diagnostic Services (SIHMDS)…..
    - *President of the British Society for Haematology, on behalf of the Laboratory Specialist Interest Group*
- **Concerns Regarding Draft Planning Guidance – Page 54: Specialist Integrated Haematological Malignancy Diagnostic Services**
    - *President of the British Lymphoma Pathology Group*
- **Response from the Haemato-Oncology Guidelines Task Force of the British Society for Haematology to draft guidance from NHSE regarding centralisation of genomics England**
    - *Chair, British Society for Haematology Haemato-Oncology Guidelines Task Force*
- **Re: Negative impact of draft NHS Genomic Medicine Service (service specification, 25/26) on people with blood cancer and request for urgent meeting**
    - *Chief Executive Officer of Blood Cancer UK*

December 2025 Dear SIHMDS leads,

Please see below an update from NHSE Genomics Unit on this issue, regarding a new HaemOnc & Genomics Oversight Group that has been set up in collaboration with our HMDS Network and other key stakeholders.

HaemOnc & Genomics Oversight Group: The inaugural meeting of the Haematological Oncology (HaemOnc) & Genomics Oversight Group was held on Tuesday 4th November 2025. This group was set up as a joint venture between the NHSE Genomics Unit (GU), the British Society of Haematology (BSH), the British Lymphoma Pathology Group (BLPG), Blood Cancer UK and the RCPath, in response to feedback to the draft service specification shared as part of the current procurement process…..

February 2026 Dear SIHMDS leads….

As part of this first meeting it was agreed that a comprehensive review of end-to-end HaemOnc genomic testing delivery, including governance and engagement across all NHS GMS regions would take place. We would like to put the first of these meetings in place in the first part of the new year….

2025 HMDS Network Meeting
Peer Review & Shared Learning Aims:
Why? What is the problem we are trying to solve?

The Future is already here, it's just not very evenly distributed

But we also to create a bit more future and continue innovating and setting new standards

- Lack of process *and* outcome measures describing quality of care
- Lack of evidence for equity of quality
- Lack of evidence for equity of access
- Need for new evidence base, to inform RCPath dataset, NG47
- Need to bring together stakeholder organisations
- Lack of evidence consensus over standards/quality measures/models

Plan to use qualitative methodology to agree definitions and standards:

- Focus groups and surveys to share learning, create definitions or standards
- NG47 is still valid but doesn't have all the answers or detail. Plan to seek consensus from experts, in absence of evidence base
- Create new standards to audit against. Encourage use of definitions for research and evidence base
- Publication of results as best practice papers, contribution to audit templates and future NG47

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2025 HMDS Network Meeting
Peer Review & Shared Learning Aims:
What are we trying to achieve?

- Tell story of how our HMDS community is doing, bring together HMDS community to share learning and good practice
- Drive better practice, drive up standards
- Ensure equity
- Bring together a community to learn and support
- Share good practice and innovation
- Assure patients, clinicians, Trusts, stakeholders
- Research and knowledge generation
- Learning and knowledge dissemination
- Support HMDS labs needing investment
- Guide Pathology Networks, commissioning, reconfiguration, funding streams
- Quality Improvement methodology: How do we know if a change is an improvement? Annual review of progress?

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Peer Review & Shared Learning:

HMDS Network meeting 2025 endorsed a 3-year strategy

Not too much, too quickly. Iterative approach: learn from year 1: presenting today

Proposed topics for workshops, surveys, qualitative research, year 1:

Achieved and being presented Feb 2026:

- Flow Cytometry Network
- Integrated Reporting and Integrated EQA
- BLPG workshop and EQA
- Medical Training and Workforce

Not achieved in year 1:

- Scientific Training and Workforce
- Diagnostic Algorithms, signpost specialist centres for specific diseases/tests

Year 2/3 proposals:

- Defining MDTs/DCR Meetings
- NDRS: review of COSD diagnostic data from registries: Do all HMDS laboratories/users diagnose the same diseases? Are all patients equitably accessing diagnostics?
- Endorsement/Designation HMDS *vs* SIHMDS : self-assessment plus site visits? Processes for Endorsement/Designation and consideration of peer review-like framework
- Liaise with UKAS
- NICE NG47 update
- Some proposals may require funding

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Time	Title	Speakers
0930-1000	Registration and coffee	
1000-1010	**Welcome and aims of the day**	Tom Butler BSH Lab SIG, HMDS Network Chair
1010-1045	**What is Integrated Reporting?** **Integrated reporting interviews summary**	John Burthem Manchester HCDP
1045-1105	**AI in integrated reporting**	Luke Carter-Brzezinski John Burthem Manchester HCDP
1105-1115	Break and networking	
1115-1145	**Integrated report survey, plans for Integrated EQA scheme**	Ash Cartwright UKNEQASLI
1145-1225	**UK Flow Cytometry Network**	Ruth de Tute Tim Farren UKNEQASLI
1225-1310	Lunch	
1310-1325	**The RaMP-Var (rare myeloproliferative variants) registry**	Anna Godfrey Cambridge HODS
1325-1355	**HMDS Medical Workforce workshop summary**	Liron Barnea Slonim Tom Butler BLPG Council BSH Lab SIG
1355-1425	**Overview of BLPG and EQA scheme survey**	Lakshmi Venkatraman Anna Green BLPG Council
1425-1445	Break and networking	
1445-1530	**Developing the NHS GMS to deliver for HaemOnc patients –** NHS England Commissioning Updates HaemOnc Genomics Oversight Group Feedback HaemOnc WGS provision, Networks of Excellence from April 2026	Alex Pickard Angela Hamblin Polly Talley NHSE Genomics Unit
1530-1615	**NHS GMS Networks of Excellence projects 2023-2026:**NoE leads	Catherine Cargo Angela Hamblin Lívia Rásó-Barnett Debbie Yallop
1615-1630	Closing remarks	Tom Butler

Requests to participants

- Leave your egos and institutions at the door
- Wear your name badges
- Say hello to each other
- Share learning and best practice
- Help plan meetings and projects 2026-28
- Reflect on today, help plan 2027 meeting

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Specialist integrated haematological malignancy diagnostic services (siHMDS)

Developed in response to: Improving Outcomes Guidance (IOG):

- Originally 2003: a framework to define service configuration as part of cancer networks
- Updated in 2016 (NICE NG47) Philosophy was reaffirmed (not changed) but clearer implementation expectations the guidance became a commissioning standard.

A defining feature of siHMDS is the delivery of a single integrated report:

This report unifies cytology and/or histopathology, flow cytometry, cytogenetics and molecular genetics as well as relevant clinical information. And is produced within a single unified governance structure.

Acceptance of the model (UK)

Based on evidence: improved diagnostic accuracy, outcome evidence more difficult
There were doubts and resistance to introduction: partly personal, partly perceived risk, partly structural
Progressively since NG47 the model is accepted throughout the UK.

- Institution uniform: delivery of the model varies
- Not a model worldwide: this is likely structural (NHS) Similar models are often institute focussed

Downside:

- Reduced diagnostic confidence
- Lowered knowledge of diagnosis
- Increasingly expectations are changing

Change in expectations is beginning to impact on delivery models

The nature of reporting is changing

- Balance of test importance has changed: increasing reliance on molecular and cytogenetic results
- Complexity: WHO, ICC. More demanding of data interpretation, including clinical information
- Timing: tests take longer, treatment is often instituted before a full test set is available
- Treatment options are expanding and increasingly dependent on molecular features
- Prognostic scores and MRD assessments are increasingly important
- Reporting of remission is becoming standardised and important

Changed view of the diagnostic role: expanded expectations from clinicians, but no clear arc of responsibility.

The siHMDS model is well suited to manage this complexity. But can we?

The problem in a nutshell (my view)

Increasingly clinicians are required to make complex decisions, often with variable skillsets and expertise. Also, with limited resources and increasing time pressure. This will increase

Who are the best people to inform these decisions?

SiHMDS structure is suited to provides EQUITY: not dependent on hospital or clinician
We have (potentially): INFORMATION and EXPERTISE

BUT
Do we want to re-envision our role?
Do we have the resources?

“Semi-structured” interviews

What I have found out 1:

First, the structure of the diagnostic service substantially influences approach:

We are not the same:

- Single fully co-located site
- Multiple sites within one hospital
- Co-ordinated multiple hospitals
- Transactional multiple hospitals
- Specialist outsourced tests
- Semi-detached hospitals
- User base varies in expertise and engagement

Determine how we work and provide reports and co-ordinate, different structures different challenges.

“Semi-structured” interviews

What I have found out 2:

The nature of the IT system is very important to how a final combined report has evolved, and necessarily restricts what is provided. (Satisfaction 40-90%)

Differences exist in:

- How a diagnosis is classified?
- What is included in a report?
- When it is it final?
- Who signs off and are there multiple levels?
- Follow up, MRD, treatment recommendations
- Mandated information

Any changes we make must be deliverable

My Questions

When should integration begin?

The interim report

Final report is after treatment initiation, should **we** produce guidance before then?

What should a report look like?

What are we trying to communicate? Bottom line or full information set. ICC/WHO

Where should integration stop?

What else should/could we provide?

Can we identify workload implications?

We can't commit to what is not achievable. Can we seek evidence?

Your turn

QUESTION SET: How strongly do you feel?

Importance for a combined report to reference (in an ideal world): -5 …… +5

Mandated clinical information i.e. referral standards
Formal sign off guidance – what constitutes a sign off?
Treatment relevant information – should we highlight this in a structured way?
Formal follow up reporting – guidance exists
Interim reports – do we need to provide a “minimum” treatment conclusion
Prognostic scores – our responsibility?
Structured personalised MRD advice – our responsibility
How do we determine resource requirements – do we need a model?
Data collection support how important is the ICDO code within the report

QUESTION SET: How strongly do you feel?

Anything else? Word cloud

The use of AI in Integrated Reporting

Luke Carter-Brzezinski

John Burthem

Robert Lee

Daniel Clarke

Haem.io

Intelligent Diagnostics for Precision Haematology

What is the problem, and what are the opportunities?

Decision making in myeloid malignancies is increasingly complex, time-consuming and difficult*. The potential for error is high.

Advances in AI offer substantial opportunities to support diagnostic classification, but risks uncontrolled implementation.

**complexity: AML WHO: AML ICC:* The WHO offers 29 baseline AML subtypes, and ICC offers 52. With the addition of combinations of essential qualifiers this number rises to 2088 and 3744 respectively (some mutually exclusive)

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Intelligent Diagnostics for Precision Haematology

Why not just use a Large Language Model (LLM) (e.g. ChatGPT) to report?

LLMs are a "Black box": *Answers are calculated from complex numerical-weighted predictions, not inspectable reasoning. The model cannot explain how it reached an answer.*

LLMs "hallucinate": *An LLM does not and cannot verify facts. The answer given is a statistically probable text continuation. This does not always mean the answer is correct.*

Responses to the same data and question may vary: *Possible outputs may have similar probability. Small differences in context, or internal randomness, may shift those probabilities. Answers may vary even for the identical question.*

This is unacceptable where we require accurate, reproducible and transparent answers

Our Model

We use LLMs as a component of an integrated diagnostic platform:

- Harness strengths of LLMs*: we exploit their reliable recognition and extraction of data*
- Rule-based algorithm used to classify*:* avoiding typical weaknesses of LLM
- Value human conclusions*: "human in the loop" - conclusions used, confirmation requested*
- Inspectable conclusions*: transparent data extraction, inspectable algorithm function*
- Regulatory validation*: Industry standard testing: algorithm coherence and data reproducibility*

This is the background of HaemIO

Detail of Scope and Coverage

Haem.io

Intelligent Diagnostics for Precision Haematology

Presently we provide:

- Classification: AML (WHO & ICC)
- Classification: MDS (WHO & ICC)
- Prognostic scores AML: ELN intensive, ELN non-intensive
- Prognostic scores MDS: IPSS-M IPSS-R

There are many ways to take this forward, we will demonstrate a few.

A demonstration of HaemIO

HMDS Network Meeting

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Integrated Report Review and plans for an Integrated EQA scheme

27th February 2026

Ashley Cartwright
Clinical Scientist
UK NEQAS for Leucocyte Immunophenotyping, Sheffield

email: ashley.cartwright@ukneqasli.co.uk

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NICE NG47 Guidance on Integrated Reporting

All SIHMDS should:

1. Produce integrated reports that include all information needed for disease management, and share these with the relevant multidisciplinary team

2. Report diagnoses sub-typed by the current World Health Organisation (WHO) classification

NOTE: guidance published in 2016 prior to emergence of individual WHO and ICC guidance

3. Have an IT system that allows integrated reporting

While NG47 mandates that integrated reports be produced, it provides no direction on report structure, format, or how information should be organised and presented.

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HMDS Integrated Report Evaluation

Example reports received from 12 centres

All centres were from England

Several different styles for integrated reporting, reflecting lack of guidance in NG47

Whilst reports vary by structure and style, they can broadly be categorised into four main approaches

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Conclusion First Approach

This approach was utilised by six centres

Final integrated diagnostic conclusion is presented at the beginning of the report

Detailed individual reports from each pathology modality investigation included after

Individual reports also included information relating to antibodies, FISH probes etc. utilised in some instances

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Executive Summary Approach

This approach was utilised by four centres

A summary of each individual pathology modality result is outlined at the beginning of the report

The final integrated diagnostic conclusion is then documented

Detailed individual reports from each pathology modality are then included

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Sequential Reporting Approach

This approach was utilised by one centre

Detailed individual reports from each pathology modality investigation included at the beginning

Overall integrated diagnostic conclusion provided on final page of report

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Synoptic Summary Approach

This approach was utilised by one centre

A summary of each individual pathology modality result is outlined at the beginning of the report

The final integrated diagnostic conclusion is then documented

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Report Structure Comparison

Conclusion First

'What is it' approach

Patient / sample information

FINAL INTEGRATED DIAGNOSTIC CONCLUSION

Detailed individual reports for from each pathology modality investigation requested (e.g. immunophenotyping, histopathology, cytogenetics, molecular genetics etc.)

Executive Summary

'The big picture' approach

Patient / sample information

Summary of key findings from each pathology modality investigation requested

FINAL INTEGRATED DIAGNOSTIC CONCLUSION

Detailed individual reports for from each pathology modality investigation requested

Sequential

'How we got there' approach

Patient / sample information

Detailed individual reports for from each pathology modality investigation requested (e.g. immunophenotyping, histopathology, cytogenetics, molecular genetics etc.)

FINAL INTEGRATED DIAGNOSTIC CONCLUSION

Synoptic Summary

'What are the key facts' approach

Patient / sample information

Summary of key findings from each pathology modality investigation requested

FINAL INTEGRATED DIAGNOSTIC CONCLUSION

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Produce integrated reports that include all information needed for disease management, and share these with the relevant multidisciplinary team

Conclusion First

'What is it' approach

Patient / sample information

FINAL INTEGRATED DIAGNOSTIC CONCLUSION

Detailed individual reports for from each pathology modality investigation requested (e.g. immunophenotyping, histopathology, cytogenetics, molecular genetics etc.)

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'The big picture' approach

Patient / sample information

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Synoptic Summary

'What are the key facts' approach

Patient / sample information

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NICE NG47 Guidance on Integrated Reporting

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Diagnostic Conclusion: WHO / ICC Guideline Reporting and Referencing Practices

Variation observed in how centres report diagnostic conclusions and reference classification guidelines

Approach 1: Diagnostic conclusion-based reporting (n= 6)

Report heading: Diagnostic Conclusion / Summary / Final Diagnosis

- In some instances, conclusion(s) stated without reference to any WHO / ICC guideline (n= 4)
- In other instances conclusion(s) provided with reference to WHO / ICC / both guidelines (n= 2)

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Diagnostic Conclusion: WHO / ICC Guideline Reporting and Referencing Practices

Variation observed in how centres report diagnostic conclusions and reference classification guidelines

Approach 2: WHO diagnosis / ICD-O classification reporting

Report heading: WHO diagnosis / ICD-O description / code (n=5)

- Final diagnostic conclusion outlined
- Specific reference to WHO guidance utilised is not explicitly stated
- 4 out of 5 reported ICD-O code in the report

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Diagnostic Conclusion: WHO / ICC Guideline Reporting and Referencing Practices

Variation observed in how centres report diagnostic conclusions and reference classification guidelines

Approach 3: Framework-specific reporting

Report headings: WHO-4, WHO-5, ICC

- Separate diagnostic conclusions reported under each guideline classification
  - Utilised by one centre

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Diagnostic Conclusion: WHO / ICC Guideline Reporting and Referencing Practices

Variation observed in how centres report diagnostic conclusions and reference classification guidelines

Review of diagnostic conclusions from reports provided show alignment with WHO / ICC guidelines

Structure, referencing and explicitness of guidelines used varies

- Separate diagnostic conclusions reported under each guideline classification
  - Utilised by one centre

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Diagnostic Conclusion: WHO / ICC Guideline Reporting and

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Variation observed in h nclusions and reference

Joint BSH Lab SIG and British Lymphoma Pathology Group (BLPG) guidance proposes that the WHO5 classification should be accompanied by the ICC classification, if the ICC and WHO diagnoses differ

- Separate diagnostic conclusions reported under each guideline classification
  - Utilised by one centre

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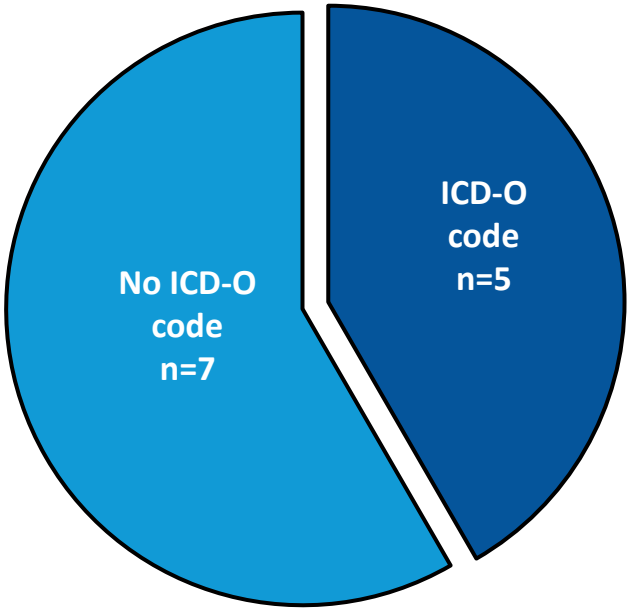
ICD-O Coding in Integrated Reports

ICD-O (International Classification of Diseases for Oncology) code reporting practices varied in the reports reviewed



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Integrated Report Summary: Structure vs Content

While NG47 mandates that integrated reports be produced, it provides no direction on report structure, format, or how information should be organised and presented.

Report structures vary across centres, reflecting the lack of specific guidance in NG47

There is an opportunity to standardise specific reporting details

Specifically relating to WHO/ICC guidelines and ICD-O coding

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Conclusions: Integrated Reports

While reporting structures vary, the content of all meet the needs outlined in NG47 guidance for provision of all information for disease management

However, some disparity in reporting of WHO/ICC based diagnostic conclusions and referencing appropriate guidelines on which conclusion is based

Network discussions could outline and agree on minimum reporting standards for referencing appropriate guidelines in diagnostic conclusions

UK NEQAS LI could aid harmonisation within the HMDS Network by issuing additional surveys when required

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Looking Forward: Changes to LI and LDI Programmes

The current programme design means that these programmes are linked

Leukaemia Immunophenotyping programme

Leukaemia sample issued

Participants required to test samples with appropriate antigens/panels based on clinical details, Full Blood Count and digital images provided

Results submitted by participants in terms of positive / negative expression of antigens tested in relation to malignant population.

Report contains a list of the top 20 antigens tested and the consensus result (positive / negative)

Participants performance monitored on:

1. **Panel design (number of consensus top 10 antigens tested)**
2. **Number of antigens from above criteria tested that are in / out of consensus**

Leukaemia Diagnostic Interpretation (LDI) Part 2 Programme

Fully electronic trial

Assesses a laboratory or individual's ability to diagnose leukaemia based on assessment of multiple pathology results

Each trial consists of:
A clinical history, digital blood film, cytogenetics, molecular genetics
AND
Consensus immunophenotype from LI

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Looking Forward: Changes to LI and LDI Programmes

The current programme design means that these programmes are linked

Leukaemia Immunophenotyping programme	Leukaemia Diagnostic Interpretation (LDI) Part 2 Programme
Leukaemia sample issued	Fully electronic trial
Participants required to test samples with appropriate antigens/panels based on clinical details, Full Blood Count and digital images provided	Assesses a laboratory or individual's ability to diagnose leukaemia based on assessment of multiple pathology results
Results submitted by participants in terms of positive / negative expression of antigens tested in relation to malignant population.	Each trial consists of: A clinical history, digital blood film, cytogenetics, molecular genetics AND Consensus immunophenotype from LI
Report contains a list of the top 20 antigens tested and the consensus result (positive / negative	
Participants performance monitored on: **1. Panel design (number of consensus top 10 antigens tested)** **2. Number of antigens from above criteria tested that are in / out of consensus**	**Performance monitoring based on assessment against the 'Correct Diagnosis'** **OR** **'Differential Diagnosis' – plausible diagnosis in absence of further pathology tests**

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LI and LDI Programme Separation

From April 2026 LI and LDI programmes will operate with independent case material

Enables broader variety of cases with greater educational value - no longer limited to high cell count leukaemia and lymphoma cases suitable for LI

The hope is that cases are issued with a varying complexity to reflect the cases discussed at case sign out meetings

Note: Selected cases may still be shared where there is specific educational value

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LDI Programme Changes: Building a Case Library

To issue a broader variety of educationally valuable cases, we need to build a comprehensive case library

We currently utilise cases sourced locally or from our steering committee

Providing more challenging cases increases the chance of measuring ‘recall’ if we only have cases from a small number of labs

The more cases we have from different HMDS centres, the less of an issue this will be

We would need HMDS Network support to build this library

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Enhanced Participant Feedback in LI Programme

New requirements for participant responses in LI programme

Approximate diagnosis based on immunophenotyping results (e.g. chronic/acute, myeloid/lymphoid)

Information about further testing recommended following immunophenotyping

Better feedback on diagnostic pathways, benchmark interpretive approaches against wider community

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Enhanced Participant Feedback in LI Programme

New requirements for participant responses in LI programme

NOTE: We are aware of the increasing use of Spectral Flow Cytometry

Information about further testing recommended following immunophenotyping

Better feedback on diagnostic pathways, benchmark interpretive approaches against wider community

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Conclusions: UK NEQAS LI Programme Changes

Uncoupling of LI and LDI programmes allows the issuance of broader variety of cases with greater educational value

UK NEQAS LI can support harmonisation objectives of HMDS network when LI-LDI changes are introduced by providing LDI-specific HMDS network reports

Building a library of suitable and technically challenging cases is essential to achieve scheme objectives and success

We would need HMDS Network support to build this library

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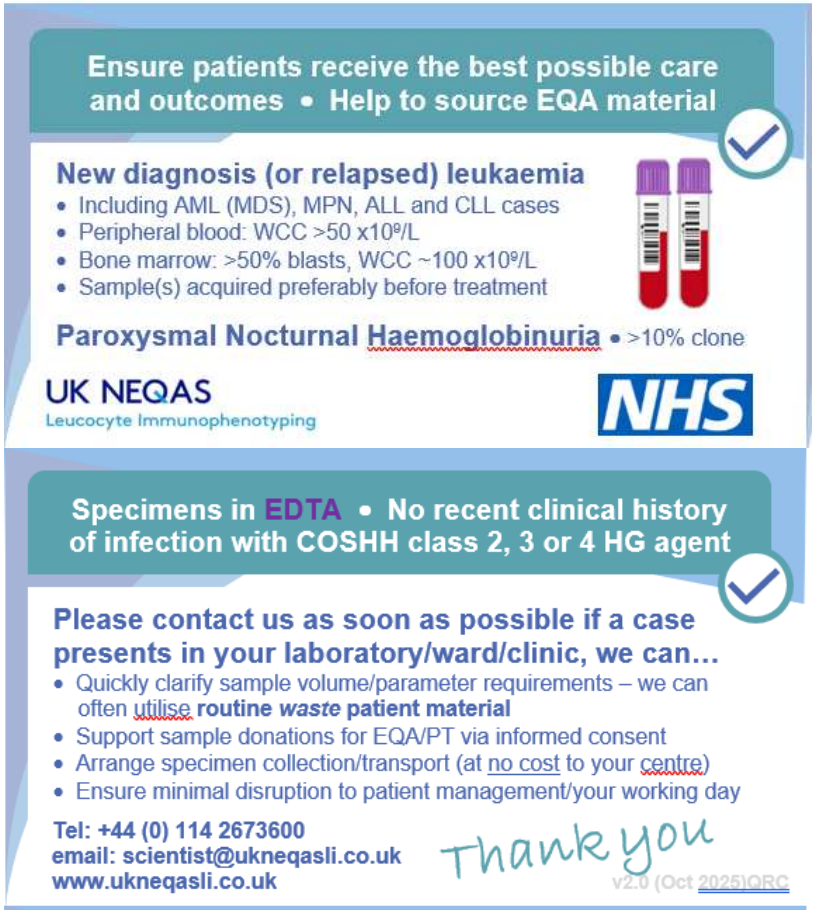
LI Programme: Call for Samples

The LI programme will continue issuing fixed whole blood samples

These are often sourced locally or from members of our Steering Committee

If the HMDS Network do have any interesting samples that may be suitable for use as EQA material, please contact us

Patient consent packs and information will be available from us today



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UK Clinical Flow Cytometry Network

HMDS Network Day • 27th February 2026

Dr Ruth de Tute
Dr Timothy Farren
Dr Tom Butler

UK Clinical Flow CYTOMETRY NETWORK

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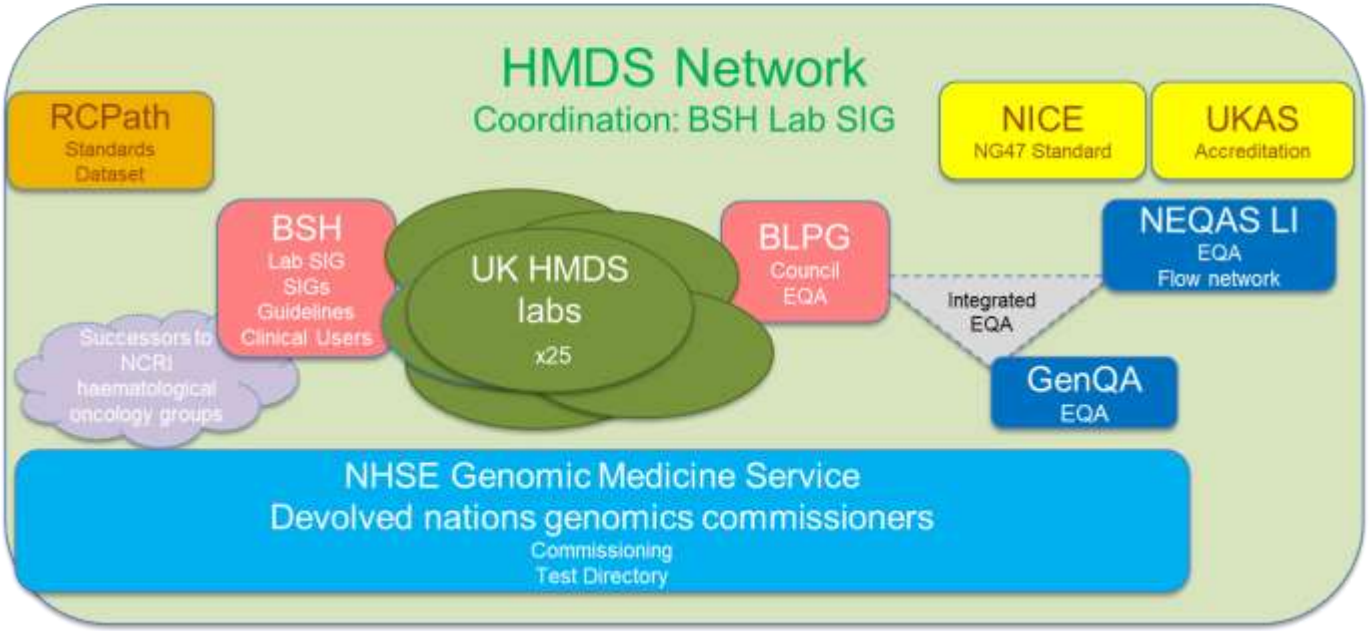
UK HMDS Network

Aim: Supporting a network of Haematological Malignancy Diagnostic Services in the UK, working with other national organisations, on specific projects to support patient access to high quality HMDS laboratories

Collaboration, Communication, Liaison, Leadership, Education, Training, Workforce Planning, Audit, Peer Review, EQA, Research, Epidemiology, Clinical Advice, Equity of Access, Setting Standards, Seeking Consensus



Tom Butler, HMDS Network Chair

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Flow Cytometry Services

Setting the Scene

N=18 respondents across all UK nations

Responses

18

Baseline is directional, not exhaustive.
Not all questions were answered.

Accreditation

100%

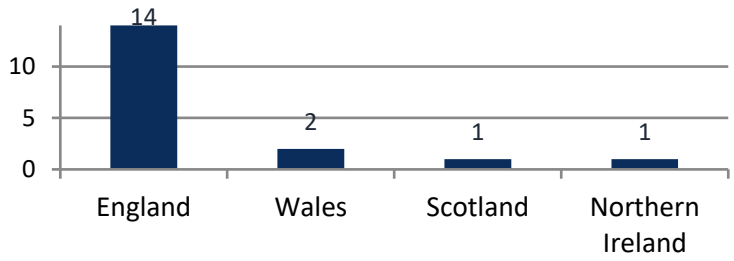
All respondents UKAS ISO 15189.

Intro meeting interest

15/18

Interested in attending the first virtual intro meeting.

Region (responses)



Response and Engagement

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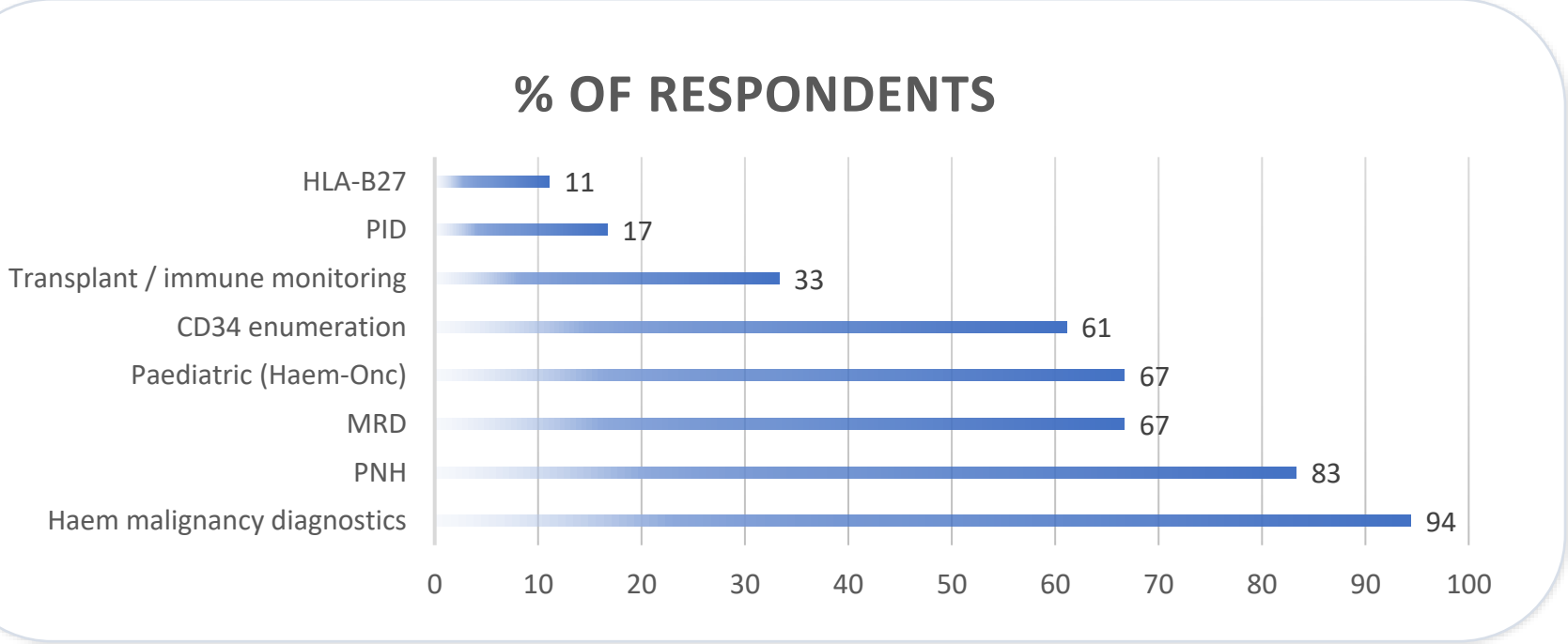
What services are represented?

Core haematological malignancy diagnostics + PNH + MRD are most common



Q: Service landscape (multi-select)

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Who we are – Service Landscape

Wide range in population served and annual test volumes

Population covered (median)

2.5M

Most services: 1-3M
Range: 0.5–8.5M

Annual tests (median)

5.6k

IQR: 3.9k–11k
Approximately 30% of services perform >10,000 tests annually

Growth rate (median)

10%

Most reported 5–18% annual growth.
Over half of respondents' report ≥10% annual growth

Interpretation

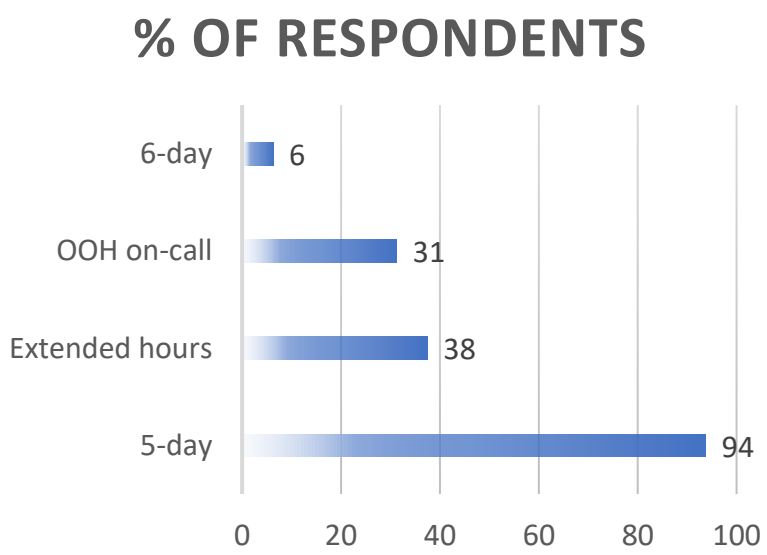
- A “one size fits all” approach won’t work: workload, case-mix, and urgency differ materially.
- Network outputs should be tiered: minimum standards + optional advanced modules (e.g., MRD).
- Use benchmarking carefully: a median of 5.6k hides a 1k–20k spread.
- Growth is real and sustained.

Q9–Q11: Activity and demand

How services run (hours) and targets (TAT)

Most services are 5-day; urgent pathways generally target ≤24h

Operational hours (multi-select)



Median TAT targets (parsed from free text)

Routine diagnostic	72 h	Range: 48 hours – 7 days
Urgent	24 h	Range: 4 hours – 48 hours
MRD	72 h	Range: 48 hours - 28 days
CD34 / stem cell	2h	Range: 1 hour – 24 hours (where offered)

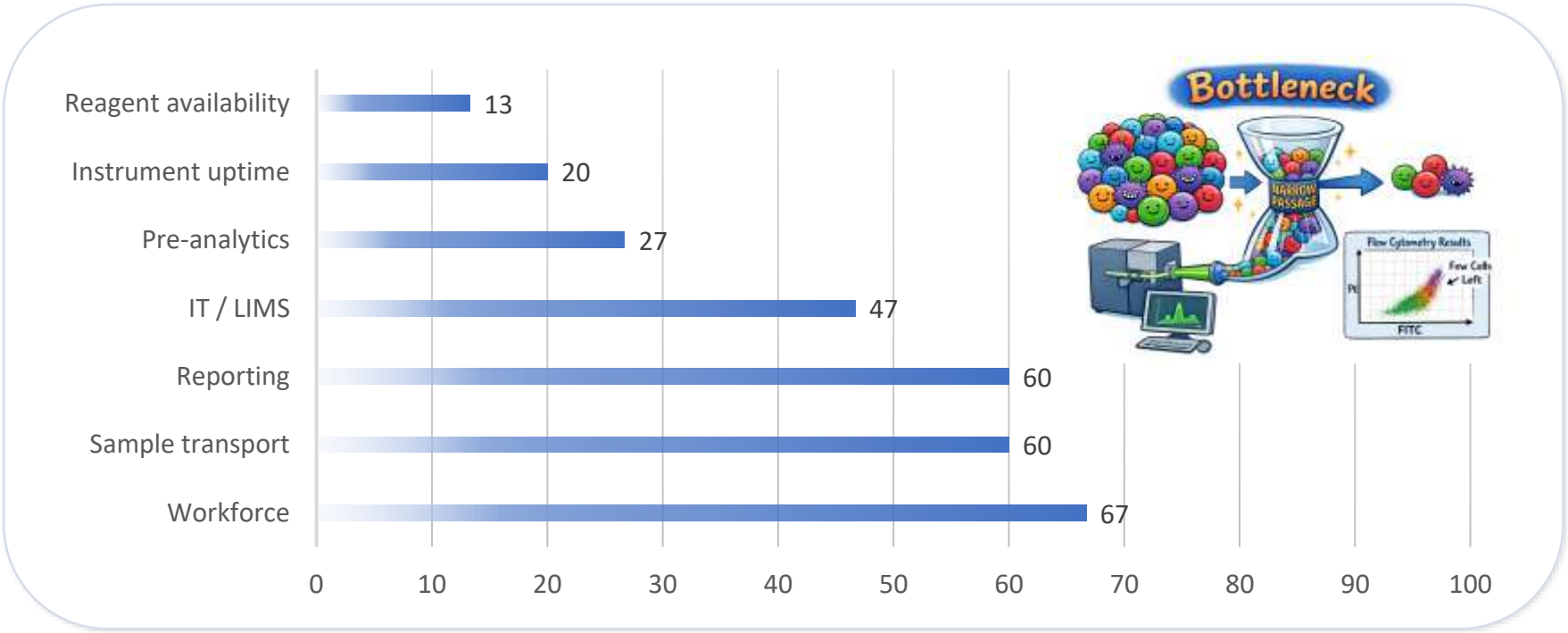
Note: free-text targets use different units/definitions (e.g., “working days”, “calendar days”). Standard definitions are a quick win.

One outlier responded up to 28 days.

Q12 + Q13: Operational

What slows turnaround time?

Workforce, transport, reporting, and IT/LIMS lead

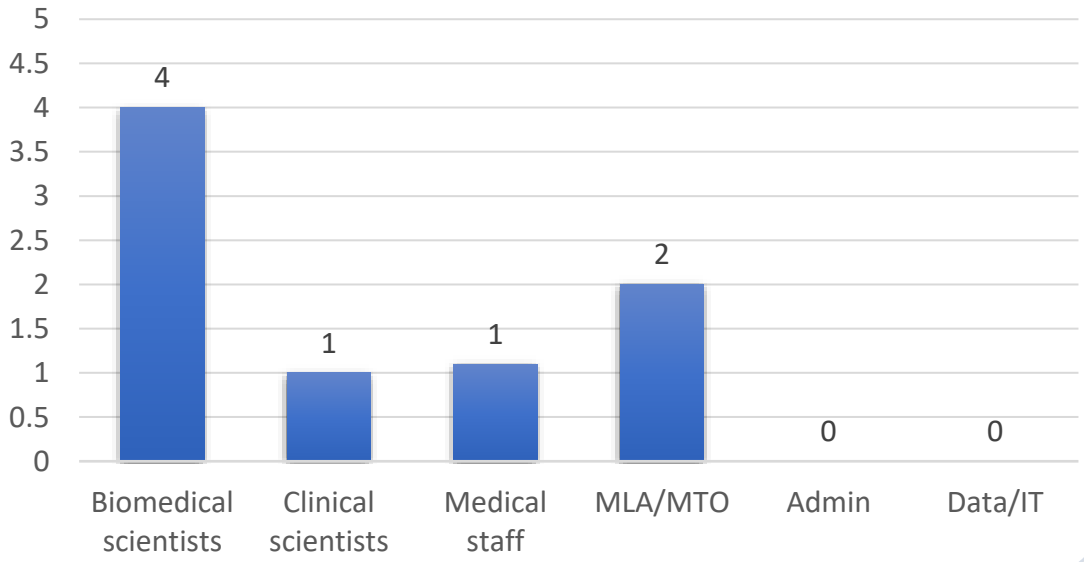


Q14: Bottlenecks impacting TAT (multi-select)

Workforce baseline: where capacity sits

Largest WTE in BMS; limited dedicated data/IT support reported

Indicative median WTE by role (from those who responded)



Biomedical Scientists (n=14)
Median: ~4 WTE
Range: 1.5 – 24 WTE

Clinical Scientists (n=9)
Median: ~1 WTE
Range: 0 – 3 WTE

Medical staff (n=12)
Median: ~1.25 WTE
Range: 0 – 8 WTE

Dedicated data / IT support
Median: 0 WTE
Only one service reported a formal LIMS support team

Standardisation needs "data plumbing"

Can we produce a "right sized" template based on clinical activity and complexity?

Q15: Workforce

Instrumentation is mixed (and changing)

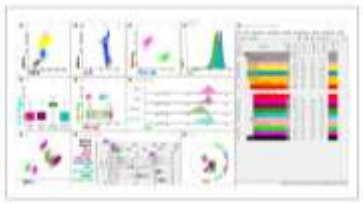
BD and Beckman Coulter both common; several sites are transitioning

Common instrument families (from free text)

- BD: FACSLyric, FACSCanto II, FACSMelody / FACSDuet
- Beckman Coulter: DxFlex, Aquios, Navios (plus middleware: CellMek / Mosaic)
- Several sites reported active transition plans (e.g., Canto → DxFlex)

Acquisition / analysis software (examples)

- BD: FACSuite / Diva
- Beckman: CytExpert (acquisition), Kaluza (analysis)
- Cross-platform analysis: Infinicyt
- Key implication: standardisation needs to be vendor-agnostic



A strong base to build on, and how to control it

All respondents who answered reported a formal competency framework

Competency framework

100%

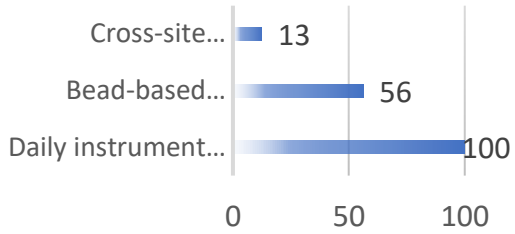
16/16 respondents (2 skipped).
Typical reassessment cycle: 2 years.
Frameworks include technical, analytical, and interpretive competencies.

EQA engagement

Widespread

Most participate in UK NEQAS LI schemes plus others.

Controls & standardisation



Opportunity: share the “how”, not just the “what”

- Competency frameworks exist, but training burden and access to experienced assessors are recurring concerns.
- Network could help curate templates: induction, rolling competency cycles, case-study libraries, assessor guides.
- Link competency to career progression to address retention concerns.

Q19, Q25, Q26: Training, Competency, EQA

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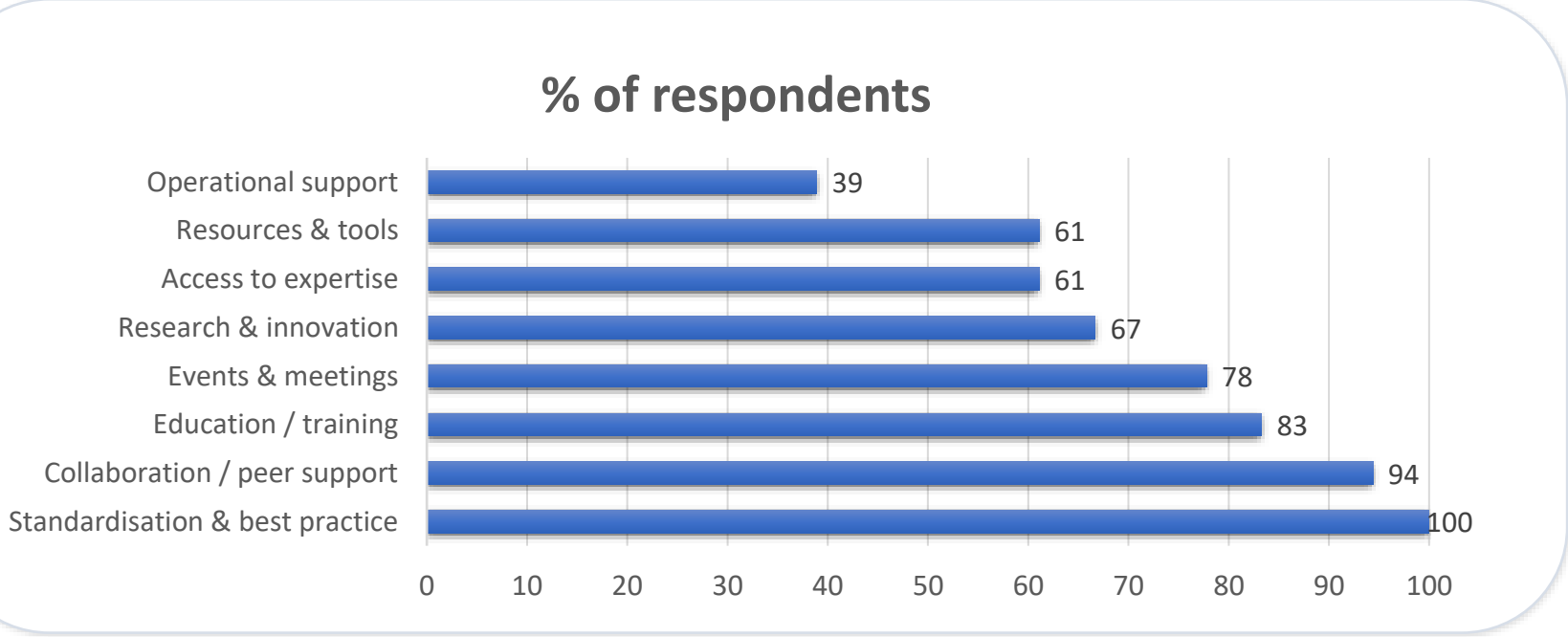
What you want from the network

Top: standardisation + collaboration + education



Q: "What do you want to get out of the network?" (multi-select)

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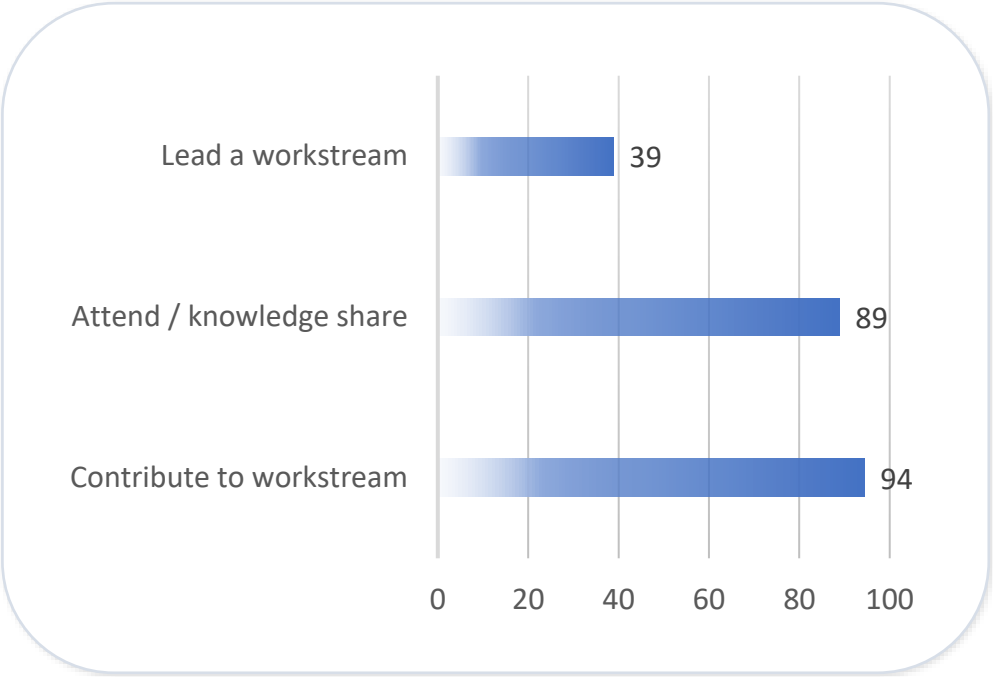
Engagement

How you want to engage

High willingness to contribute; ~40% willing to lead



Willing to lead

39%

7 of 18 respondents

What that means……

We can run workstreams!!

If each workstream has a lead + 4–6 contributors, we can deliver tangible outputs year.

Q: Level of involvement

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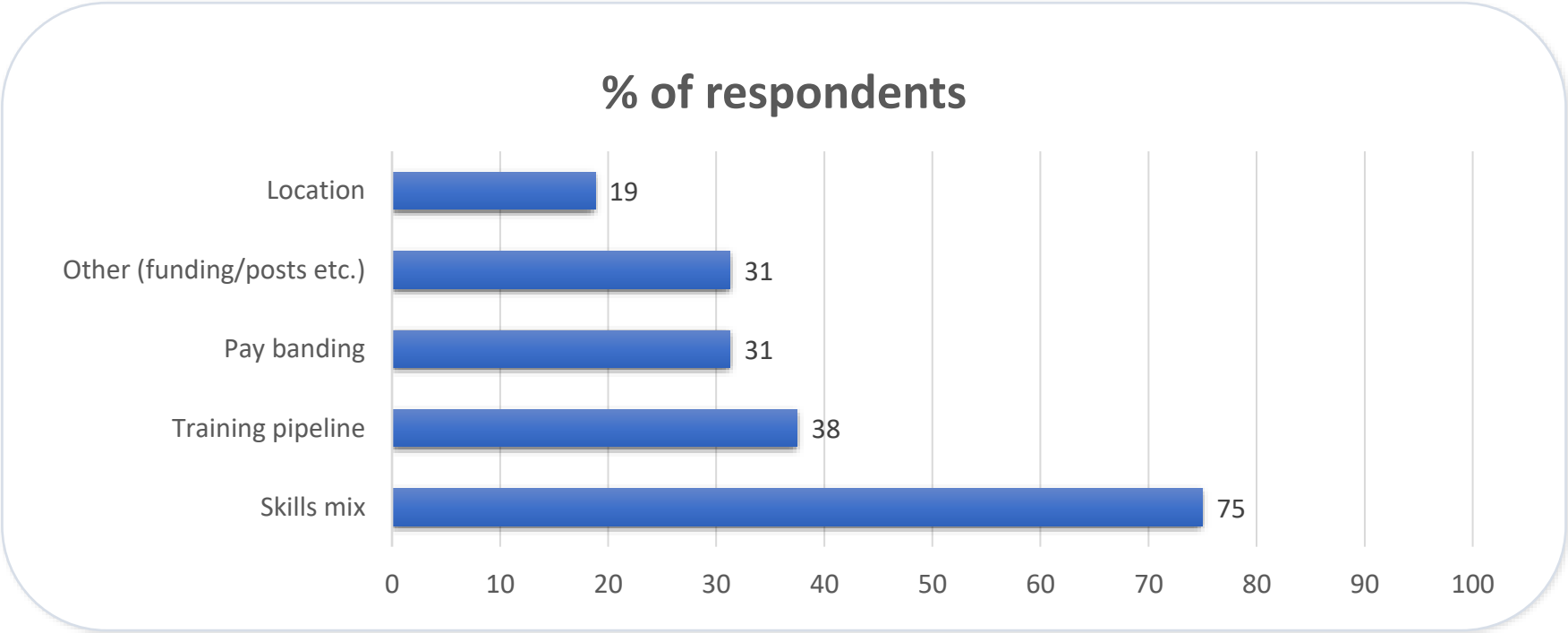
Recruitment: what's hardest?

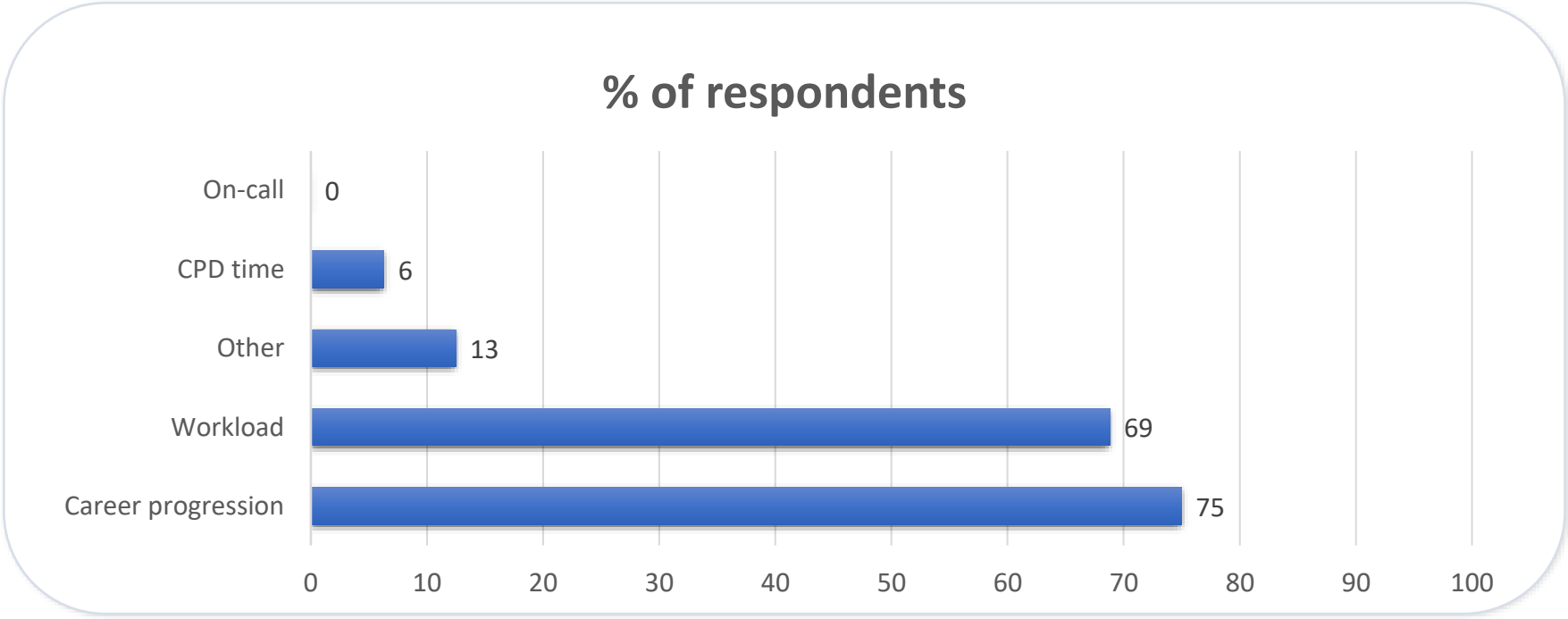
Skills mix and training pipeline dominate



Q17: Recruitment challenges (multi-select)

Retention: what drives churn risk?

Career progression and workload stand out

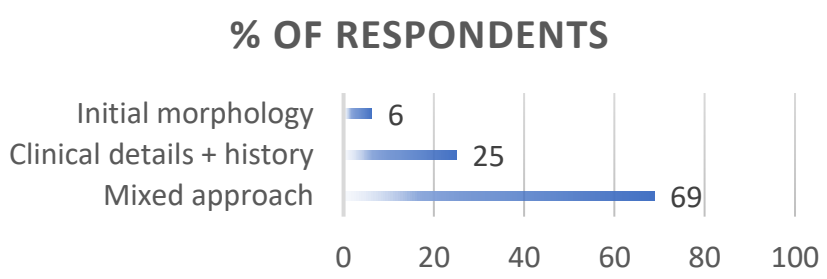


Q18: Retention challenges (multi-select)

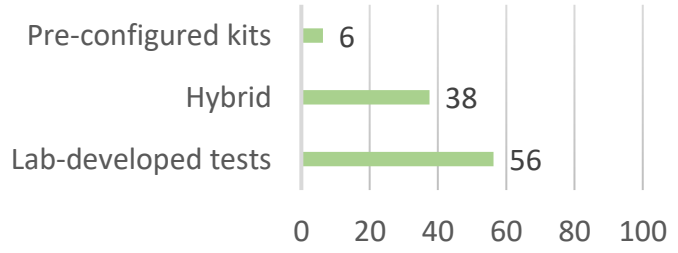
How panels are built and used

Mostly mixed approaches; lab-developed tests dominate

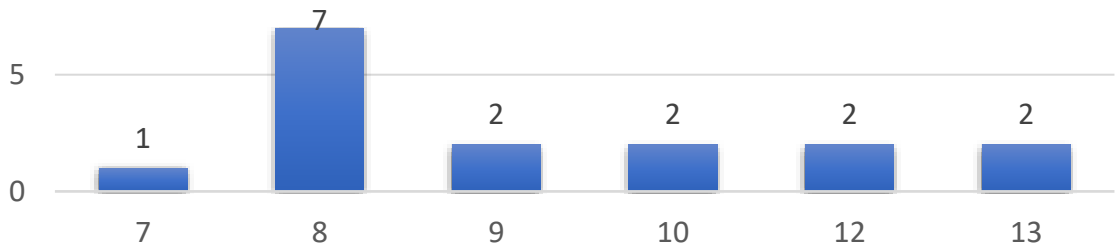
Panel selection basis



Panel build approach



Average fluorochromes in routine panels (counts)



Median ≈ 8–9 colours; range reported: 7–13.

Q21–Q23 + Q22: Analytical Practice and Panel Design

What you test?

Common sample types (n=17 respondents)

Sample type	Number of respondents	% of respondents
Peripheral Blood	17	**100%**
Bone Marrow Aspirate	17	**100%**
CSF	17	**100%**
Pleural Fluid	17	**100%**
Ascitic Fluid	17	**100%**
Pericardial Fluid	13	76%
LN FNA	9	53%
Lymph Node (core)	6	35%
Bone Marrow Trephine	4	24%

Q24: "What sample types do you perform flow cytometry on? (please select all that apply)"

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What the baseline is telling us

A small network can deliver outsized value if it stays practical

- Demand signal is clear: standardisation + best practice is the #1 ask, closely followed by collaboration and education.
- The community is ready: ~94% willing to contribute to workstreams; ~39% willing to lead.
- Operational reality: mostly 5-day services, but a meaningful minority provide extended hours / on-call cover.
- Main throughput constraints are people and process: workforce + transport + reporting + IT/LIMS.
- Technical diversity (instruments/software/panels) means outputs must be vendor-agnostic and tiered.
- Quality culture is strong (UKAS, EQA, competency frameworks) — network can accelerate sharing and reduce duplicated effort.

Key conclusions

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First virtual meeting / webinar

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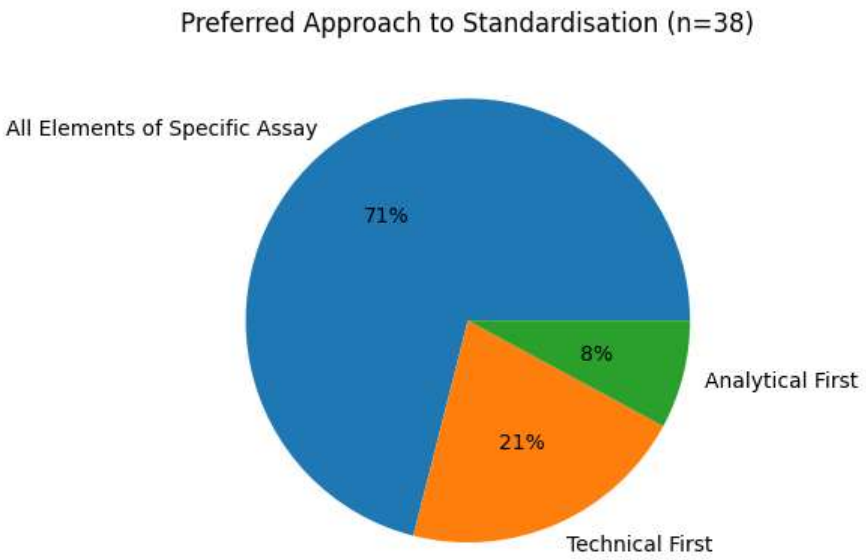

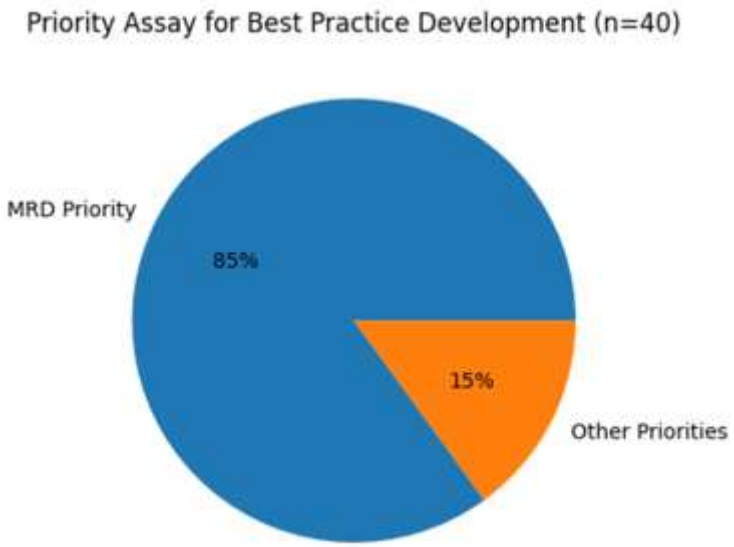

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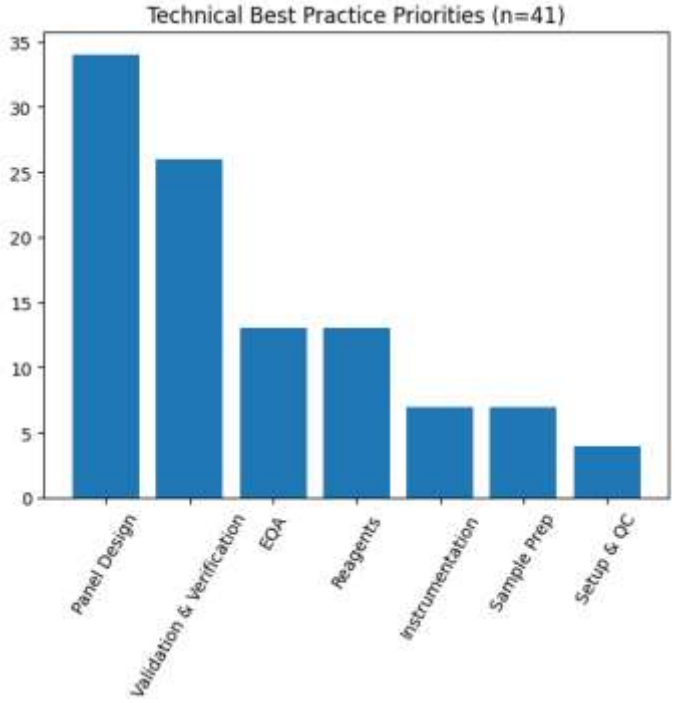

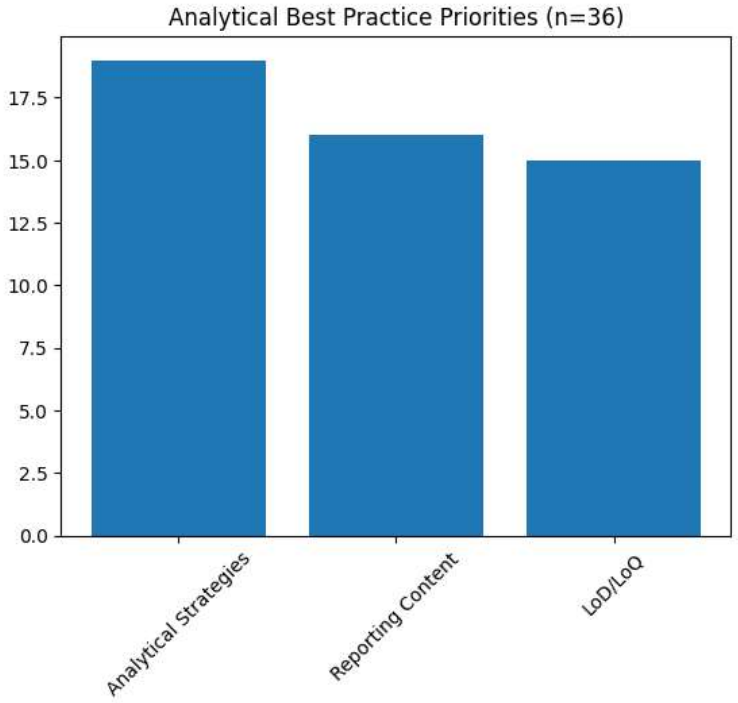

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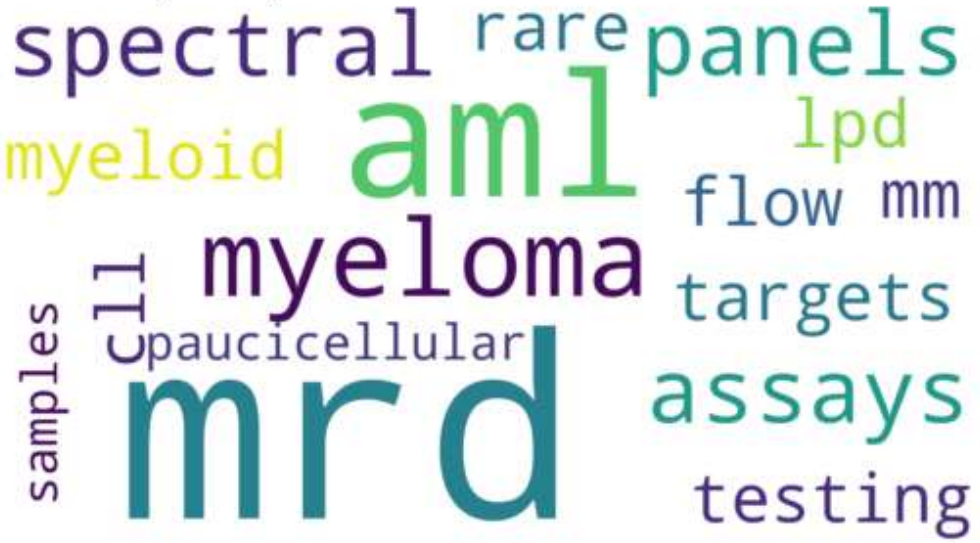
Priority Assays for Best Practice – Network Feedback



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Preferred Training Event Formats – Network Feedback

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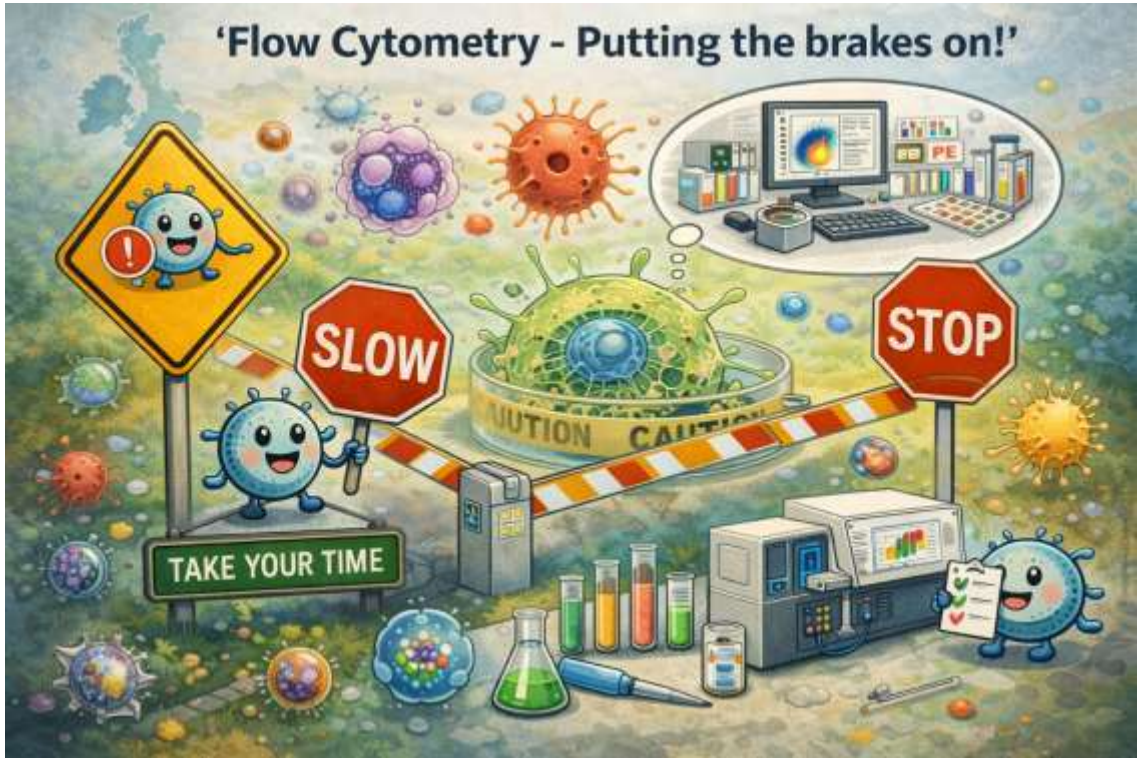

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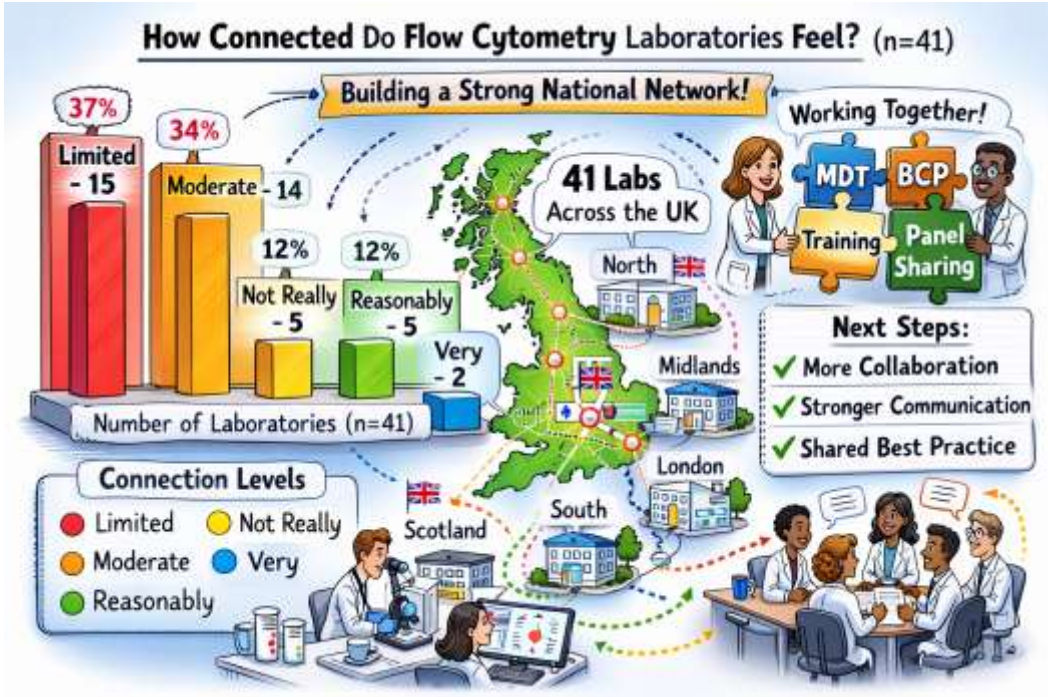

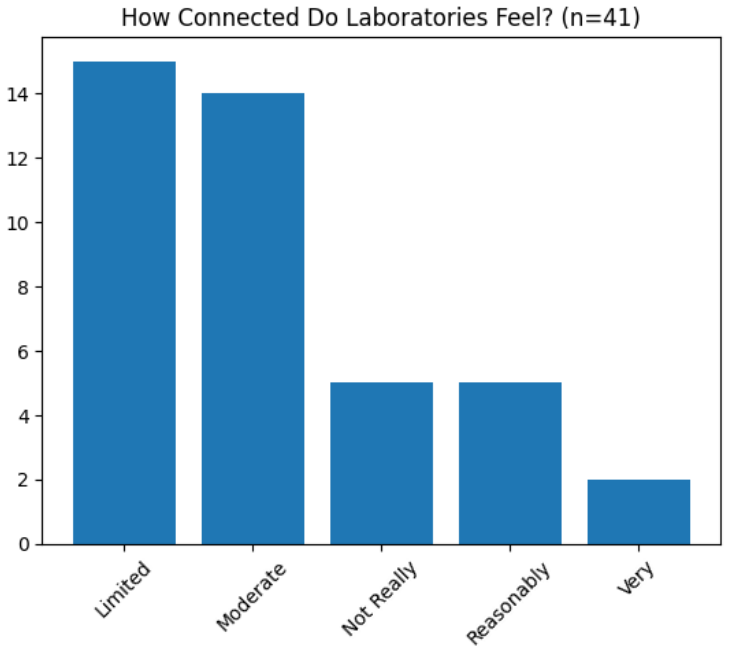

Proposed workstreams (draft)

outcome-driven

Standardisation & harmonisation

Panel templates, antigen targets, reporting conventions, shared definitions

Training & competency

Shared competency templates, case libraries, assessor networks, [illegible]

Workforce & careers

Banding / role clarity, progression pathways, support networking, succession planning

Digital & IT

LIMS interfaces, data standards, reusable analysis templates, minimum dataset

Service benchmarking

Agree metrics (TAT definitions, workload measures), anonymous benchmarking

Research & innovation

MRD methods sharing, pilot studies, grant-ready collaborations – UK WIDE!

Next Steps

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Areas Benefiting Most from Increased UK Collaboration

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UK Clinical Flow CYTOMETRY NETWORK

Building the UK Flow Network

— Strong Foundations → Sustainable Growth —

FOUNDATIONS

- ✓ Clear **Purpose**
- ✓ **Leadership & Roles**
- ✓ Agreed **Priorities**
- ✓ Realistic **Goals**

STABILITY

- ✓ Consistent **Communication**
- ✓ Engaged **Members**
- ✓ Reliable **Activities**
- ✓ Stronger **Core Team**

SUSTAINABLE GROWTH

- ✓ Expand **Initiatives**
- ✓ Broader **Engagement**
- ✓ Strategic **Partnerships**
- ✓ **Lasting Impact**

Deliberate Pace • Clear Purpose • Lasting Impact

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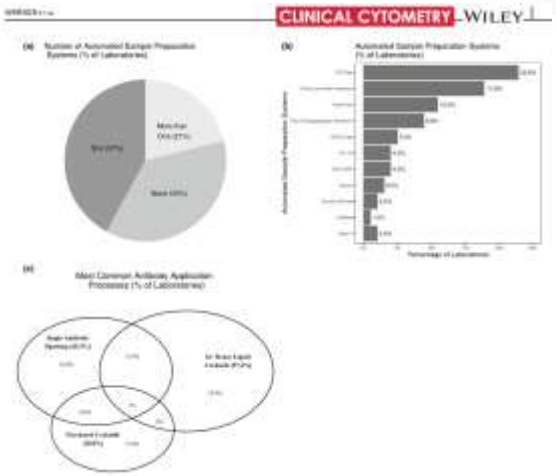
International Clinical Cytometry Society 2023 workload survey of clinical flow cytometry laboratories

	Current 2023 workload survey					
	All laboratories			U.S. laboratories alone		
	Median (IQR)[a]	Mean[a]	Assays (sum) per staff member (sum)	Median (IQR)[a]	Mean[a]	Assays (sum) per staff member (sum)
Per Staff$_{LabOps}$[b]						
Assays$_{Total}$	796 (469–1312)	2524	1719	838 (524–1309)	3231	1900
Assays$_{Lab}$	350 (178–636)	437	365	369 (255–675)	485	402


CLINICAL CYTOMETRY –WILEY–

Assays by category	Number, proportion and mean[a] for assays reported			No. and proportion of laboratories performing the assay		Summary statistics for laboratories that perform the assay		
	No.	%	Mean[a]	No.	%	Median (interquartile range)	Min	Max
CD34 counts	26,441	2.4	311	48	47.5	230.5 (100–918.3)	2	3500
Moderate complexity[b] assays								
Leukemia/lymphoma panels (excluding MRD analysis)	237,889	21.2	2403	97	96.0	1724 (700–4000)	56	9500
Paroxysmal nocturnal hemoglinuria	13,985	1.2	163	55	54.5	100 (50–281.5)	5	4500
Other write-in assays								
Platelet testing	540	< 0.1	N/A	3	3.0	200 (107.5–262.5)	15	325
Cell sorting	1964	0.2	N/A	4	4.0	210 (115–586)	100	1444
Neutrophil oxidative burst assay	148	0.0	N/A	2	2.0	N/A	20	128
CAR-T related testing	5500	0.5	N/A	1	1.0	N/A	N/A	N/A
High complexity[b] assays								
Minimal/measurable residual disease, other (ALL, CLL, lymphoma, etc.)	38,084	3.4	433	44	43.6	200 (50–423.8)	8	14,000
Minimal/measurable residual disease (myeloma)	16,266	1.5	191	35	34.7	120 (43–400)	4	4200
Minimal/measurable residual disease (myeloid neoplasms)	41,779	3.7	497	31	30.7	150 (24.5–800)	2	14,000

Werner, D., Linden, M. A., Turner, L. E., Kreisel, F., Al-Attar, A., Dunlop, A., Ali, A., Denny, T., Kern, W., Litwin, V., Marti, G., Olteanu, H., Trindade, C., Zhang, L., Langworthy, B., Wallace, P. K., & Monaghan, S. A. (2025). International Clinical Cytometry Society 2023 workload survey of clinical flow cytometry laboratories Cytometry Part B: Clinical Cytometry, 1–16. https://doi.org/10.1002/cyto.b.22259

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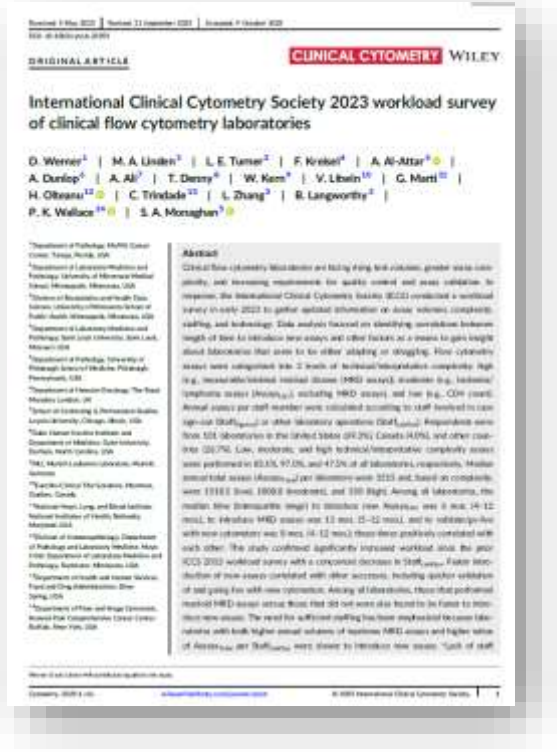

CLINICAL CYTOMETRY WILEY

ORIGINAL ARTICLE

International Clinical Cytometry Society 2023 workload survey of clinical flow cytometry laboratories

D. Werner[1] | M. A. Linden[2] | L. E. Turner[2] | F. Kreisel[3] | A. Al-Attar[3] | A. Dunlop[4] | A. Ali[5] | T. Denny[6] | W. Kern[7] | V. Litwin[10] | G. Marti[11] | H. Olteanu[12] | C. Trindade[13] | L. Zhang[3] | B. Langworthy[2] | P. K. Wallace[14] | S. A. Monaghan[3]

Abstract

Domain	UK Clinical Flow Cytometry Network (Baseline Survey)	ICCS 2023 Clinical Flow Cytometry Survey	Comparability / Key Difference
Annual workload per laboratory	Median ~5.6k tests/year (IQR ~3.9k–11k); ~30% >10k	Median 3,515 assays/lab/year (IQR 1,700–11,087)	**Broadly comparable distributions**;
Panel complexity (fluorochromes per tube)	Routine panels typically 7–13 colours; median ~8–9	Most common maximum 9–10 colours (55%); smaller groups at 7–8, 11–12, ≥13	**Strong alignment** around 9–10 colour operating norm.
Turnaround time (TAT)	Explicit national focus: routine ~72h, urgent ~24h, MRD ~72h, CD34 ~2h	Not a primary metric; TAT not reported in manuscript	**Different focus**: UK emphasises service delivery KPIs; ICCS does cover in manuscript.
Assay development / implementation time	Not routinely captured	Median 6 months (leukaemia/lymphoma); 11 months (MRD); 8 months to validate new cytometer	
Staffing levels & pressure	Median ~4 BMS, ~1 clinical scientist, ~1.25 medical staff; workforce main TAT bottleneck	Median ~3 MT/MLT; 3.2 sign-out staff; widespread vacancies; staffing/time main barrier to new assays	**Highly concordant message**: workforce capacity is the dominant constraint.
Out-of-hours / extended working	Majority 5-day services; minority with extended or on-call provision	90% report testing outside regular hours; weekend/holiday cover common	**Practice differs**: ICCS cohort more routinely out-of-hours.

Werner, D., Linden, M. A., Turner, L. E., Kreisel, F., Al-Attar, A., Dunlop, A., Ali, A., Denny, T., Kern, W., Litwin, V., Marti, G., Olteanu, H., Trindade, C., Zhang, L., Langworthy, B., Wallace, P. K., & Monaghan, S. A. (2025). International Clinical Cytometry Society 2023 workload survey of clinical flow cytometry laboratories. Cytometry Part B: Clinical Cytometry, 1–16. https://doi.org/10.1002/cyto.b.22259

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Where to start?

'network" to "network outcomes"

- Formal feedback to the network with summary of the Virtual Flow Network meeting (Jan 2026), with wider commentary surrounding the HMDS network.
- Establish connections across the network making it equitable for all. "Communication and Engagement"
- Agreed priorities -> realistic goals -> Lasting impact
- Recapitulate ICCS Clinical Cytometry Survey from a UK perspective.
- Working with "other partners" including J&J and LnL.
- Slow and steady wins the race!

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Join the Laboratory Special Interest Group.
The SIG welcomes both members and non-members of the BSH who have a special interest in Laboratory Haematology and is free to join.

https://b-s-h.org.uk/about-us/special-interest-groups/laboratory-sig

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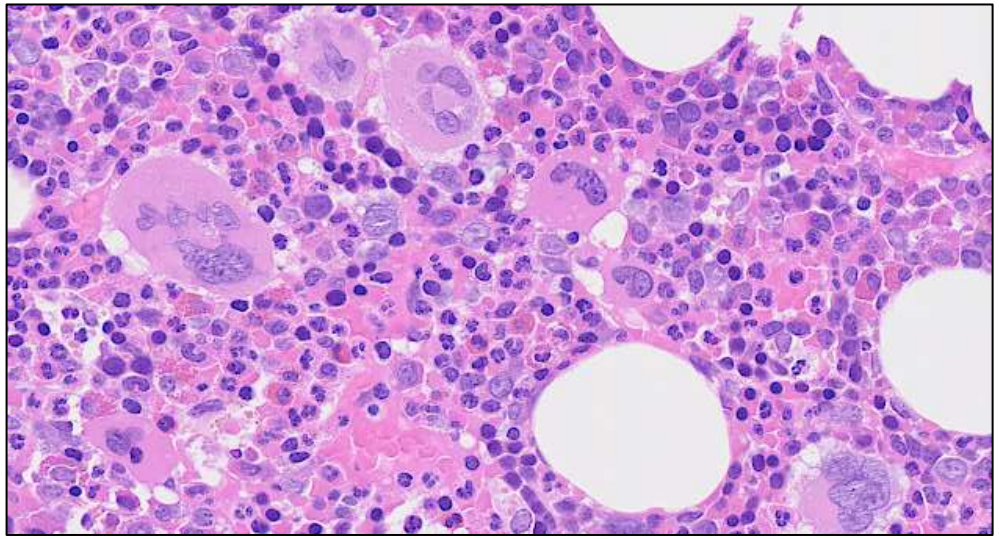
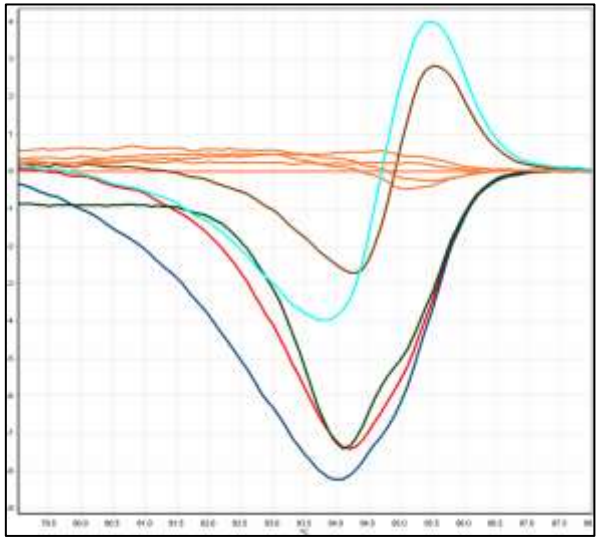
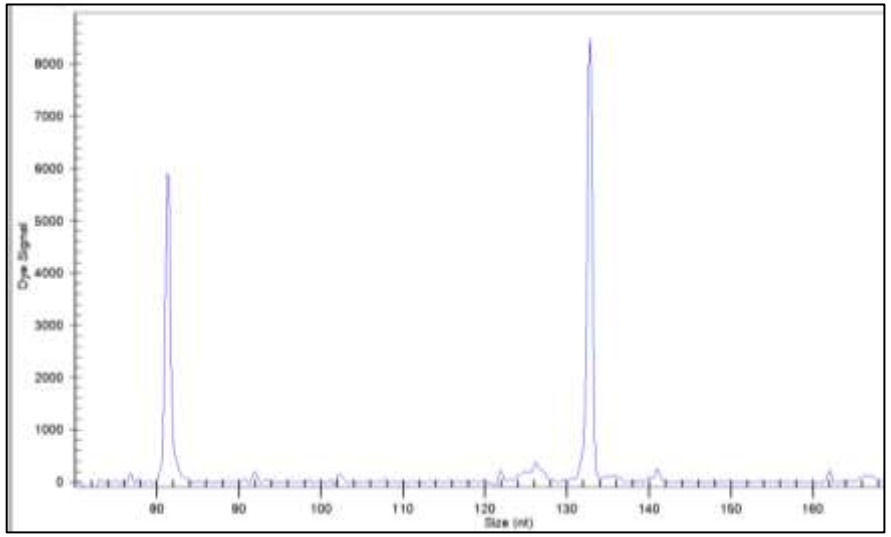
UK Clinical Flow
CYTOMETRY NETWORK

UK Rare MyeloProliferative Variant Registry

Anna Godfrey





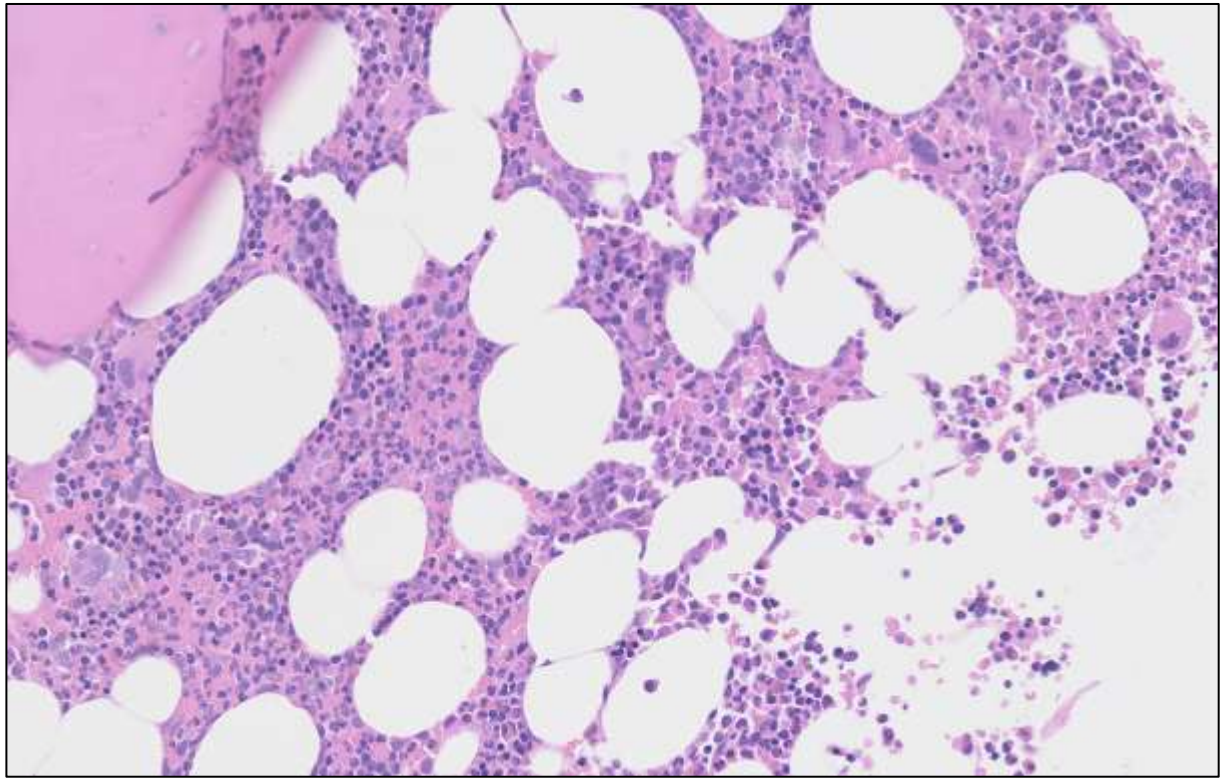


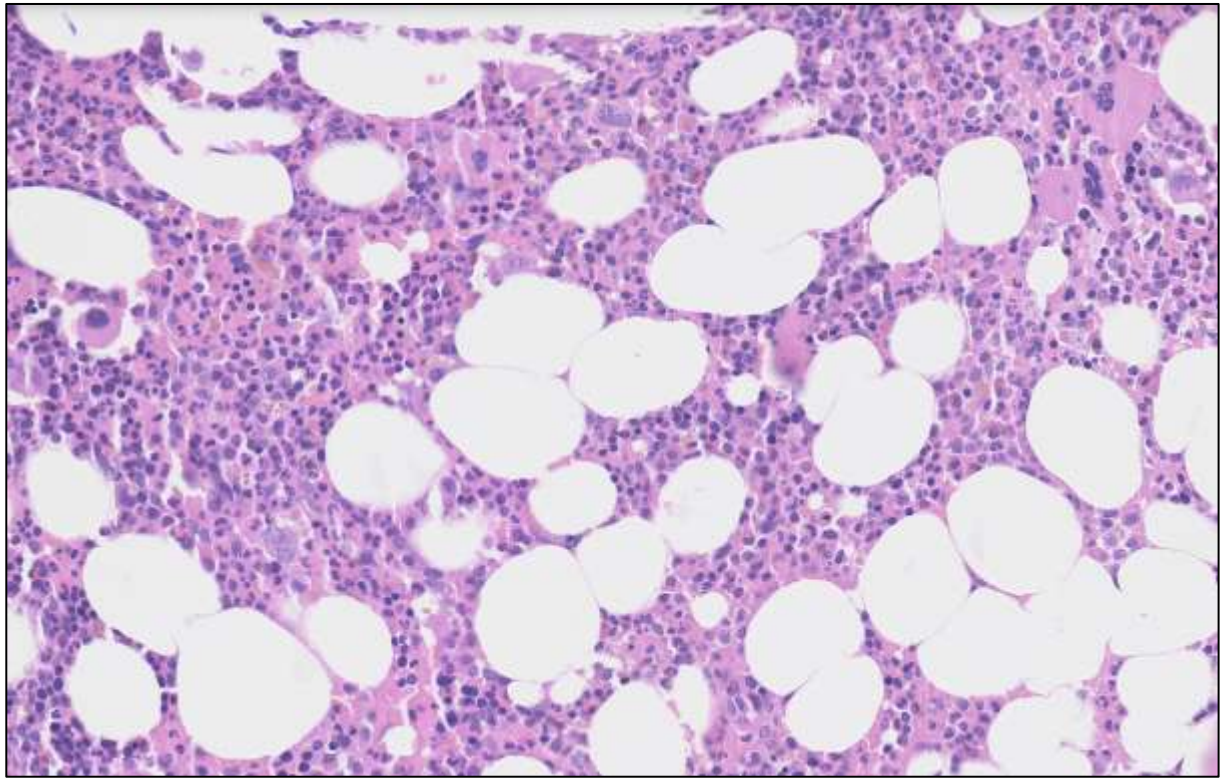
Case 1

- 69 year-old woman
- Hypercholesterolaemia, hypertension
- No prior vascular events

Hb	154
WBC	6.8
Plts	759

- *JAK2, CALR, MPL, BCR::ABL1*: negative; normal CRP, ferritin





- Myeloid NGS panel:

DNMT3A p.(Phe350LeufsTer42) VAF 8.6%

MPL p.(Glu259Lys) VAF 6.8% - annotated variant of uncertain significance

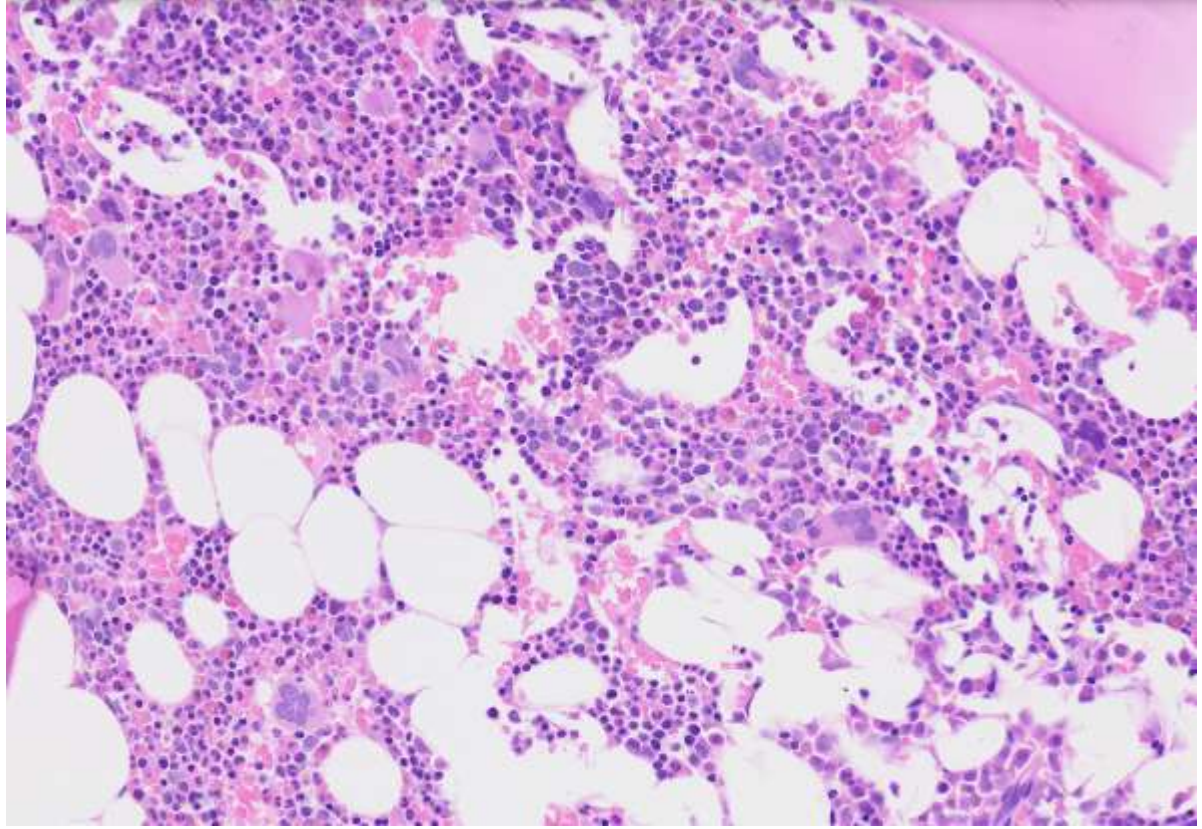
→ Acquired, non-hotspot mutation in MPN driver – is it doing anything?

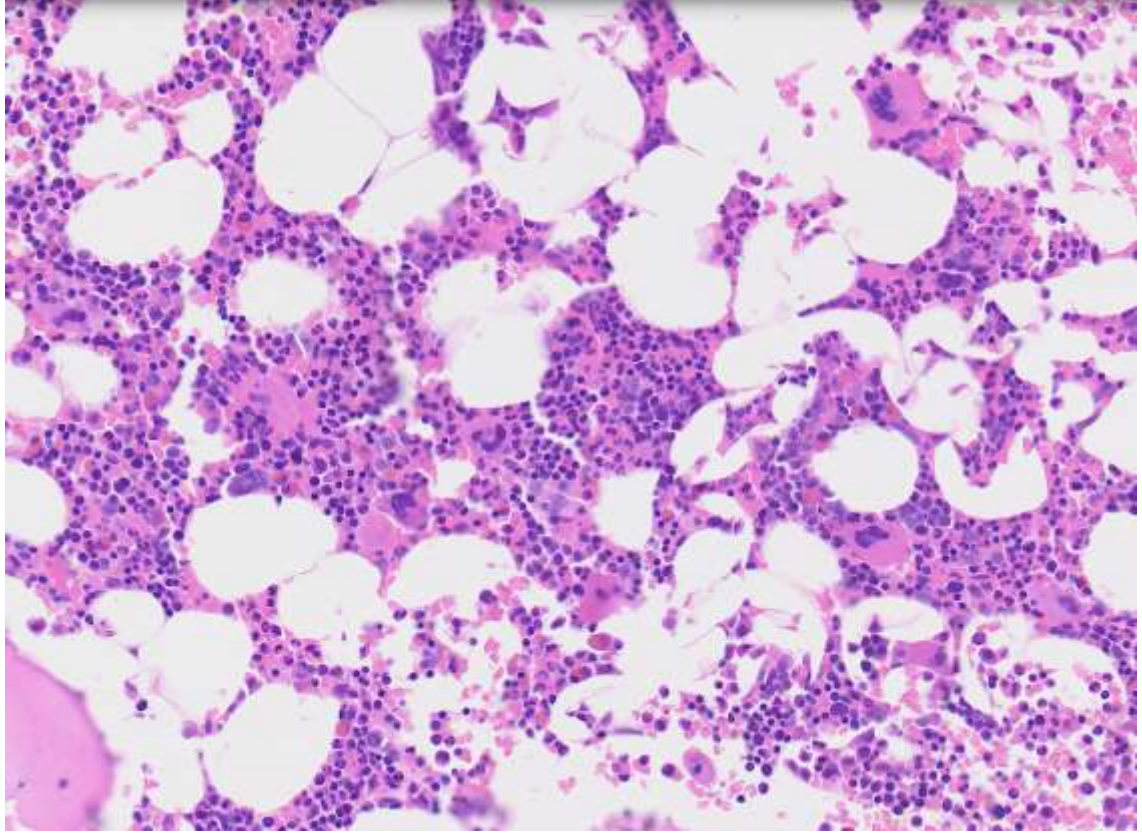
Case 2

Hb	174
WBC	10.0
Plts	803
Hct	0.49

- 31 year-old man
- Mild symptoms of erythromelalgia and aquagenic pruritus
- No prior vascular events
- Spleen 17.7cm on ultrasound

- *JAK2, CALR, MPL, BCR::ABL1*: negative; normal CRP, ferritin





- Myeloid NGS panel:

SH2B3 p.(Ser433ArgfsTer31) VAF 48.7% - pathogenic

SH2B3 p.(Glu395Lys) VAF 50.5% - variant of uncertain significance

- Two potential germline mutations in putative MPN driver
  - are they doing anything?

UK Rare **M**yelo**P**roliferative **Var**iant Registry

Aims

- Collect clinical, histological and laboratory data on UK patients investigated for MPN with uncommon variants on myeloid gene panel
- Share data between UK haempath and genomic labs to support prospective variant interpretation

Design

- Data submitted by SIHMDS
- Curated by steering committee scientist before entry onto repository
- Read-only spreadsheet accessible by UK genomic and SIHMDS labs
- Initial pilot phase with 5 centres, opened UK-wide Nov 2025

Unexplained Hct>0.48 (F) or >0.52 (M) or platelet count >450x10^9/L and one of the following on myeloid gene panel:

1. Likely acquired variant at *JAK2*, *MPL*, *SH2B3* or *CALR* outside known hotspots, particularly without a canonical MPN driver variant (or with)

2. Likely germline variant (VAF 45-55%) in *JAK2*/*MPL*/*SH2B3*/*THPO*/*CALR*
   - Considered of potential relevance to phenotype
   - Low frequency in population databases

3. Acquired variant(s) in genes other than canonical MPN phenotypic drivers
   - Pathogenic / likely pathogenic but no co-occurring hotspot MPN driver gene variant
   - No alternative confirmed myeloid disorder (i.e. “clonal thrombocytosis of undetermined significance”)

Approvals process:

- Each centre sets up data sharing agreement with lead site (CUH)
- Each centre also registers as a service development (audit type) project

Progress:

- 9 centres with data sharing agreement in place
- 5 additional centres + 1 in Ireland have expressed interest
- Mostly SIHMDS to avoid duplication but coordinate with clinical teams

Things we've learned along the way…

- Ease of approvals process is highly variable
- Emphasising sharing of *anonymised* data with primary aim for *routine patient care* can be helpful

A quick look at the data so far…

- 121 cases from 7 centres

Thrombocytosis, no canonical MPN driver	60
Erythrocytosis, no canonical MPN driver	14
Other myeloproliferative phenotype, no canonical driver	6

A quick look at the data so far…

- 121 cases from 7 centres

Thrombocytosis, no canonical MPN driver	60
Erythrocytosis, no canonical MPN driver	14
Other myeloproliferative phenotype, no canonical driver	6

Primary variant of interest:
28 *MPL*
20 *JAK2*
19 *SH2B3*
3 *CALR*
10 Others

MPN phenotype with canonical MPN driver	40

Primary variant of interest:
20 *MPL*
15 *JAK2*
5 *SH2B3*

Focus on *MPL* acquired variants

- 48 cases
- 38 cases “likely acquired” cases (remove non-recurrent variants with VAF 46-54%)

7 x p.(Ser204Xaa)	→	All presented with thrombocytosis and no canonical MPN driver
12 x p.(Tyr591Xaa)	→	10/12 presented in the context of MPN phenotype with canonical MPN driver, often at progression
1 x p.(Arg592Gln)	→	VAF 7.6%, VUS, MPN phenotype with canonical MPN driver

Others of potential interest…

1 x p.(Leu498_His499delinsTrpCys); 1 x p.(His499Thr)

Next steps

- Identify recurrent acquired variants allowing more confident annotation, describe phenotype and identify in protocol
  - i.e. turn the VUS into pathogenic

- Identify candidate germline variants of relevance → may need further work

→ ***Please join us***

→ ***HaemSTAR network can help with finding support with data collection***

Thank you…

Steering committee

Clinical:
Anna Green
Guy Hannah
Andrew Innes
Alesia Khan
Andrew McGregor
Andrew Wilson

Scientific:
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Rachel Moore
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HMDS Medical Workforce and Training

Summary of survey and 6/2/2026 Workshop

Dr Tom Butler
Chair, UK HMDS Network
BSH Lab SIG

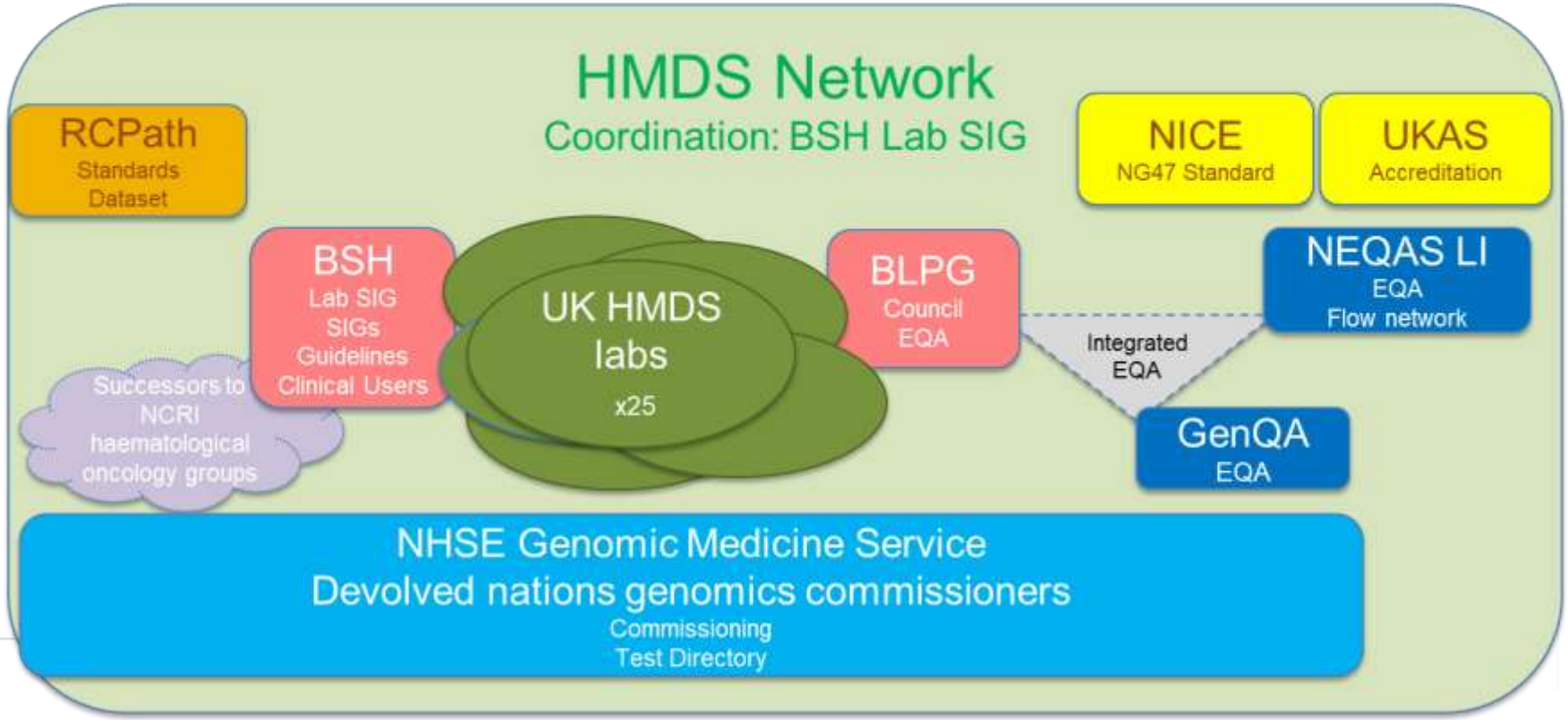
Dr Liron Barnea Slonim
BLPG council

HMDS Network day 27/2/26

UK HMDS Network

Aim: Supporting a network of Haematological Malignancy Diagnostic Services in the UK, working with other national organisations, on specific projects to support patient access to high quality HMDS laboratories

Collaboration, Communication, Liaison, Leadership, Education, Training, Workforce Planning, Audit, Peer Review, EQA, Research, Epidemiology, Clinical Advice, Equity of Access, Setting Standards, Seeking Consensus



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Agenda

1. Methods: Survey and Workshop
2. Defining Haematopathology
3. Survey results: workforce, reporting and training
4. Existing and potential training pathways
5. Proposed solutions and discussion

HMDS Network Medical Workforce Survey

Sent 13/1/26

Dear HMDS leads,

Thank you for your participation in our HMDS Network. We are exploring medical workforce and training issues in HMDS laboratories. We invite you to complete a **short baseline survey** to help us understand current service models, challenges, and priorities across HMDS laboratories.

Please use this link to access the survey, and the deadline for completion is Friday 30th January. We only require one response per institution. https://www.surveymonkey.com/r/HWCMYKD

The anonymised and aggregated survey results will be shared in a virtual **HMDS Medical Workforce and Training Workshop** meeting on **Friday, 6th February 2026, 1pm-3pm**— please indicate your interest in the survey if you wish to participate in the workshop.

The results of the survey and workshop will be summarised and shared at the HMDS Network Day Friday 27th February.

All responses will be anonymised for reporting and handled in line with information governance requirements.

Thank you for your support in shaping the future of the HMDS Network.

Kind regards,
Liron and Tom

Dr Liron Barnea Slonim
BLPG council

Dr Tom Butler
Chair, UK HMDS Network
BSH Lab SIG

25 UK HMDS Labs contacted
13 (52%) responded
Question: Should we ask remaining HMDS labs to complete survey for a full picture and enable all labs to benchmark? Perhaps busier HMDS labs did not complete?

A consensus definition of Haematopathology?

Workshop participants agreed a consensus definition would be useful

- 13 different responses in survey
- Narrow & broad, various themes, some definitions based on:
  - Professional background
  - Sample or disease type
- Discussed existing AAMC definitions and proposals previously refined with BLPG, BSH, RCPath
- Most survey responses overlapped with AAMC and BLPG/BSH proposal
- Workshop participants mostly endorsed Liron Barnea Slonim's **Haematopathology Fellowship Curriculum definition 2023, discussed within BLPG and endorsed by BSH Lab SIG:**

- **Definition of Subspecialty:** Haematopathology is the practice of pathology concerned with the study and diagnosis of human diseases involving haematolymphoid cells and tissues.
- The subspecialty of haematopathology requires skill and expertise in the practise of procedural techniques, microscopic evaluation of blood, bone marrow aspirates, bone marrow core biopsies and lymphoid and other tissues, in addition to an understanding of handling and interpreting multiple ancillary testing of these specimens (e.g. Flow cytometry, cytogenetic and molecular tests).

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BRITISH LYMPHOMA PATHOLOGY GROUP

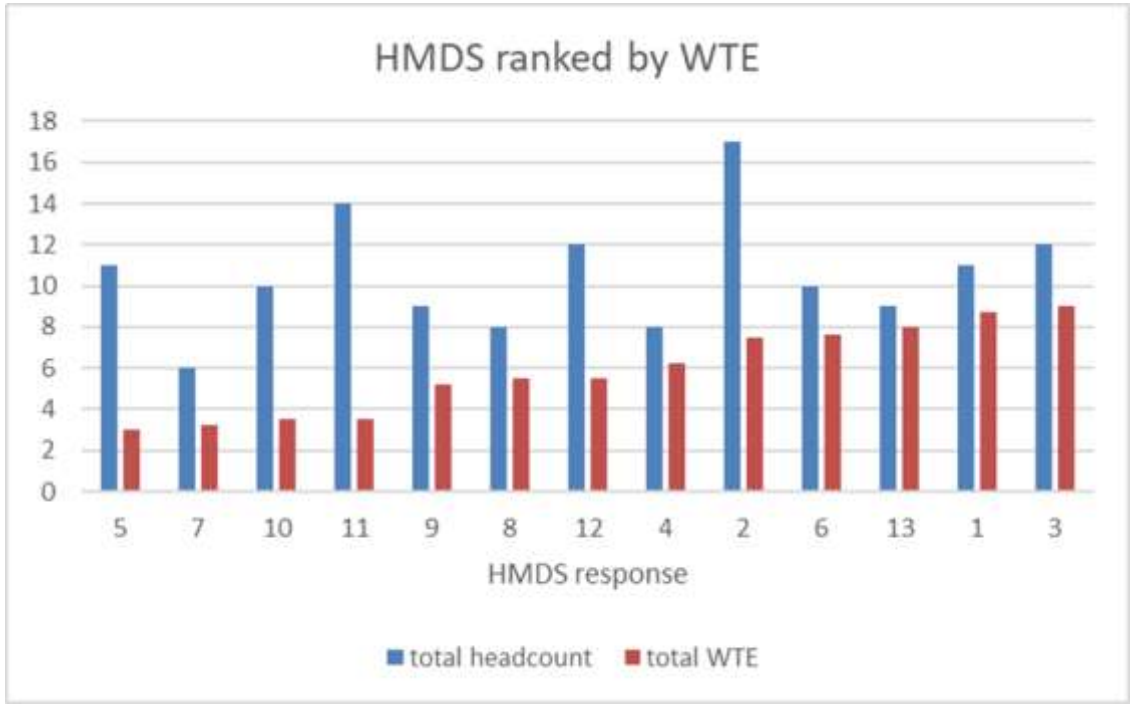
Workforce and reporting practices

Survey results

@BritSocHaem

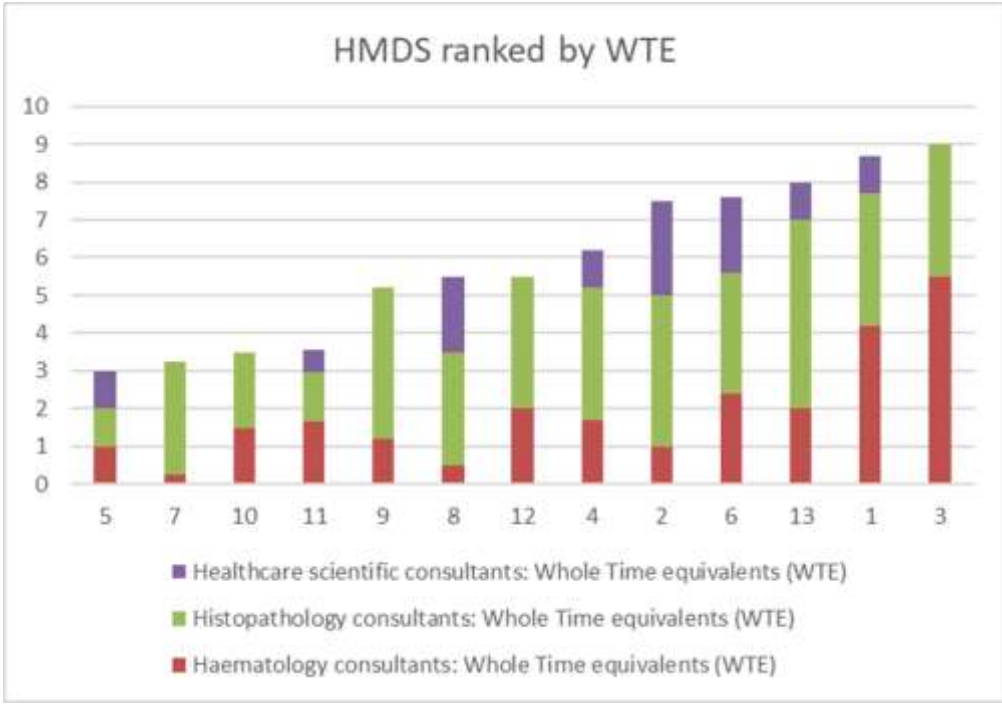
How many consultants work in your HMDS?
Please indicate whether they work full time/part time in the HMDS by providing WTE

	Haematology consultants: number of consultants (headcount)	Haematology consultants: Whole Time equivalents (WTE)	Histopathology consultants: number of consultants (headcount)	Histopathology consultants: Whole Time equivalents (WTE)	Healthcare scientific consultants: number of consultants (headcount)	total headcount	total WTE	WTE per million population	What is the approximate size of the population covered by your service? (millions)
Median	5	1.7	5	3.5	1	10	5.5	1.8	3.1
Max	8	5.5	7	5	4	17	9	6.5	10.0
Min	2	0.3	4	1	0	6	3	0.6	0.5



Some labs have many consultants, but they spend less time on HMDS lab activities

Professional mix variable



How many consultants work in your HMDS?
What is the approximate size of the population covered by your service?

	Haematology consultants: number of consultants (headcount)	Haematology consultants: Whole Time equivalents (WTE)	Histopathology consultants: number of consultants (headcount)	Histopathology consultants: Whole Time equivalents (WTE)	Healthcare scientific consultants: number of consultants (headcount)	total headcount	total WTE	WTE per million population	What is the approximate size of the population covered by your service? (millions)
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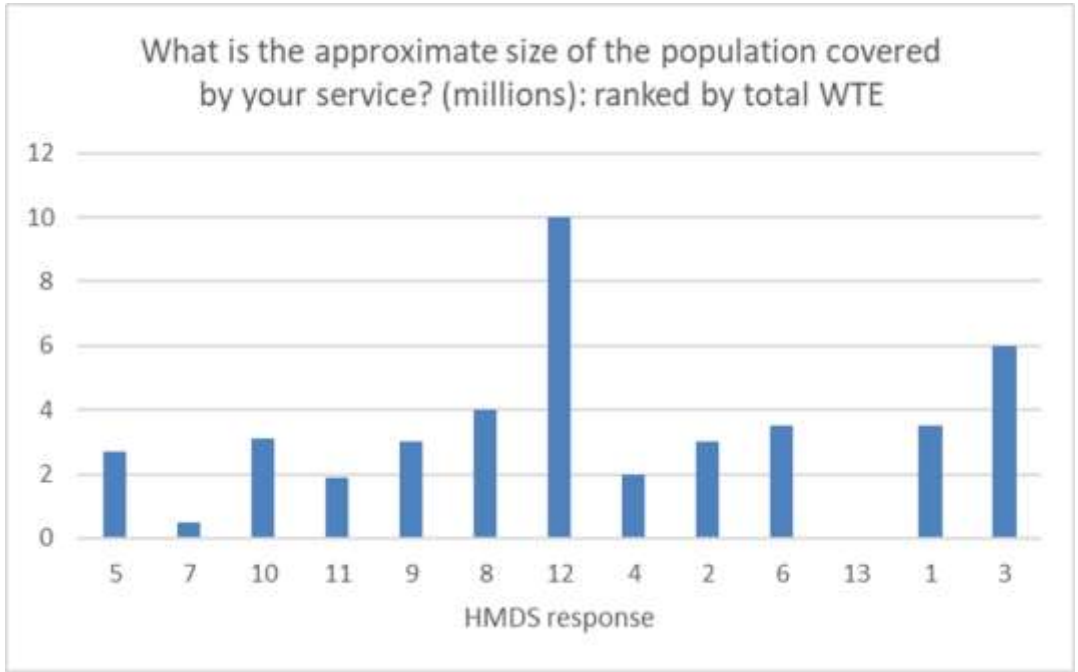
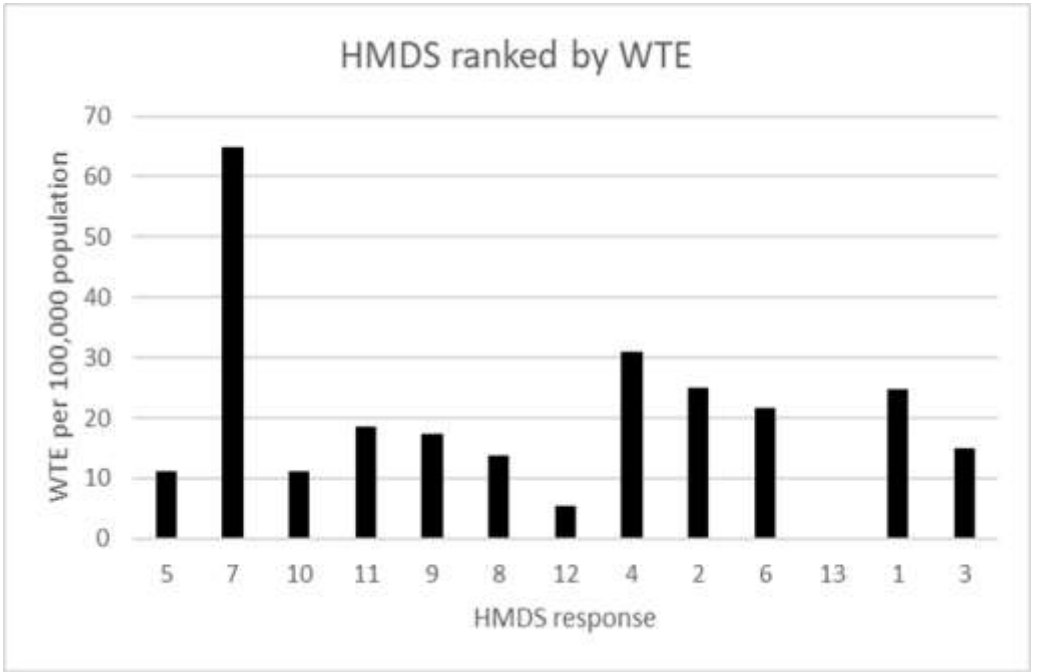
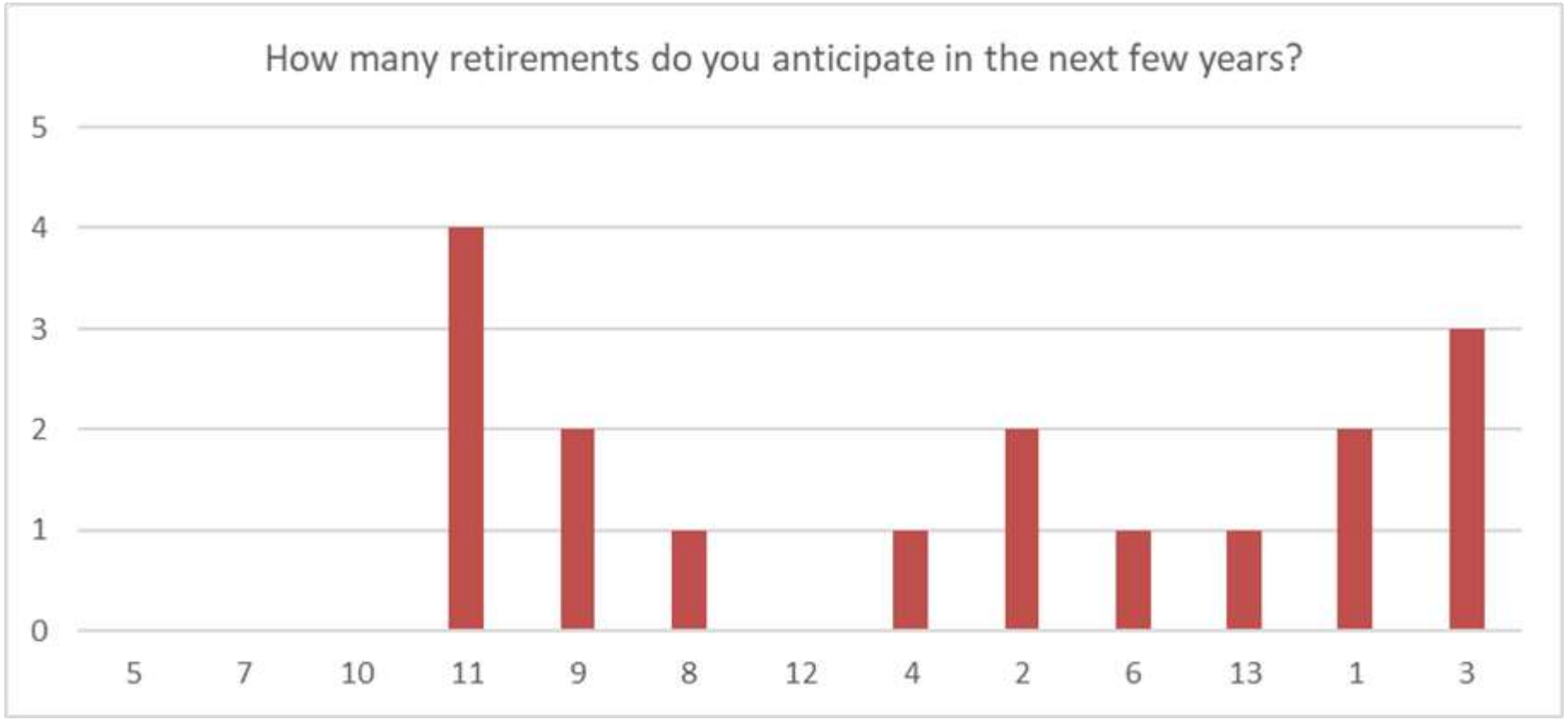


Would be better to have more complete survey responses



Do we have a workforce problem?



What do you see are the challenges and problems of haematopathology/HMDS training and workforce in the UK?

- Histopathologist **staffing levels** - haematopathology diagnostic work is by its nature challenging, and there may be in general less opportunity for remote working (due to the hands-on lab support required for swift case turnover) and less directly remunerated private work than other histopathology specialities.
- The multidisciplinary nature of the work means there is a need for close collaboration, and outdated NHS infrastructure can in this setting lead to geographically challenging and/or suboptimal working conditions (physical distance between services, office space etc.).
- Based on risk:reward ratio in the current economic climate, these factors might provide less incentive to train in this speciality than others in the UK.
- The **integration of research** into day-to-day practice seems less cohesive than the models offered in Europe and the USA, which is a general challenge of UK academic medicine and may be a push factor in well-qualified candidates taking jobs in those locations rather than the UK.
- This is a potentially appealing sub-speciality for those with a strong background or interest in molecular biology, but the current **separation of GLHs from HMDSs** is a major risk to its attractiveness.
- There is no **formal training pathway or accreditation** meaning it is challenging for individual Trusts/Deaneries to fund **dedicated fellowship/training posts**.

What do you see are the challenges and problems of haematopathology/HMDS training and workforce in the UK?

- Service and cost pressures and increasing gulf between haematology reporting less trephines and histopathologists not training in aspirate reporting.
- **Retirements** leading to **contracting workforce** without enough succession planning for future services.
- Insufficient dedicated laboratory time / lab based haematology posts in many centres due to pressures of clinical work, lack of funding, lack of physical space/ equipment. Lack of protected teaching time.
- Insufficient emphasis given to **training of resident doctors in laboratory diagnostics**. Very few residents show interest. Insufficient **workforce.**
- Lack of clear laboratory ring fence rotations for a sustained period of time. Time and pressure from clinical haematology duties
- **Centralisation of genomics** to GLH hub reduces local expertise and learning
- **Aren't enough consultants being produced.**
- Trusts not supporting expansion in staffing. **Asp and treph being pulled into the HMDS hub > deskilling the peripheral sites**. **Move to digitalisation and working from home.**
- Empty departments Increasing workload and complexity.

What do you see are the challenges and problems of haematopathology/HMDS training and workforce in the UK?

- Time, **funding**, and trainees who are interested. The perception that the FRCPath Haem part 2 is sufficient for HMDS work (it is not)
- No **dedicated/ recognized training programme**. No incentive for either trainees (haematology or histopathology) to take this up which is perceived as difficult.
- Haematopathology is an 'orphan' amongst the histopathology sub specialties and in some ways within haematology training. It does not have the clout of dermatopathology or neuropathology as RCPath do not recognise it for a fellowship. **There is no structured training and many of us have arrived at consultant level through varied paths and self motivation. There is no recognition of the specialty within histopathology or sufficiently, even in haematology. There is over reliance on senior haematopathologists to carry the work. In 5-7 years, when they retire, the specialty will face a major crisis.**

What do you see are the strengths of haematopathology/HMDS training and workforce in the UK?

- The multidisciplinary nature of the workforce (and therefore training), and in centres where haematopathologists are monospecialists the ability to develop deep expertise.
- The comprehensive general histopathology background provided by team members with CCTs in Histopathology is essential for a safe service, and the UK model ensures this. Similarly, the comprehensive general haematology background provided by team members with CCTs in Haematology provides essential clinical insights to inform reporting and diagnostic processes.
- For haematologists, the centralised diagnostic environment provides an opportunity for fully integrated understanding of diagnostic processes in haemato-oncology for both trainees and consultants
- Integrated working at specialist centres and inclusive MDTs; availability of increasing genomic testing through national genomic medicine service
- Close collaboration with clinical team; multidisciplinary; cross discipline training (haem reporting trephines +/- flow FNA; histo starting to report aspirates); embedded genetics
- A dedicated workforce that can undertake haem diagnostics accurately, in a timely manner, with multidisciplinary support
- In our system, collaborative working between haematologists and histopathologists. The excellent HODS services present with some exceptional senior haematopathologists willing to impart knowledge
- Allows dedicated specialist training in a complex area of pathology. Sample/case exposure in terms of numbers and so exposed to rare diseases more frequently
- Genomic provision and experience/expertise
- Integrated reporting with cross-talk between clinical and non-clinical staff

Haematology and haematopathology: The cutting edge of precision medicine

Our strength is also our weakness

- SIHMDS and Haematopathology innovations have led to pioneering diagnostics and treatment
- Superspecialisation is good for patients by increasing quality and allowing precision/personalised medicine
- It can make haematopathology careers attractive to medical and scientific staff
- But superspecialisation makes our workforce harder to train and sustain
- Retirements will occur, but have we trained the next generation?
- It requires protected time for training and maintenance of competence
- And centralisation of diagnostics into SIHMDS risks deskilling other haematologists, histopathologists and scientists
- And genomics centralisation causes other problems for training and workforce
- Histopathology may have a bigger workforce challenge than haematology?

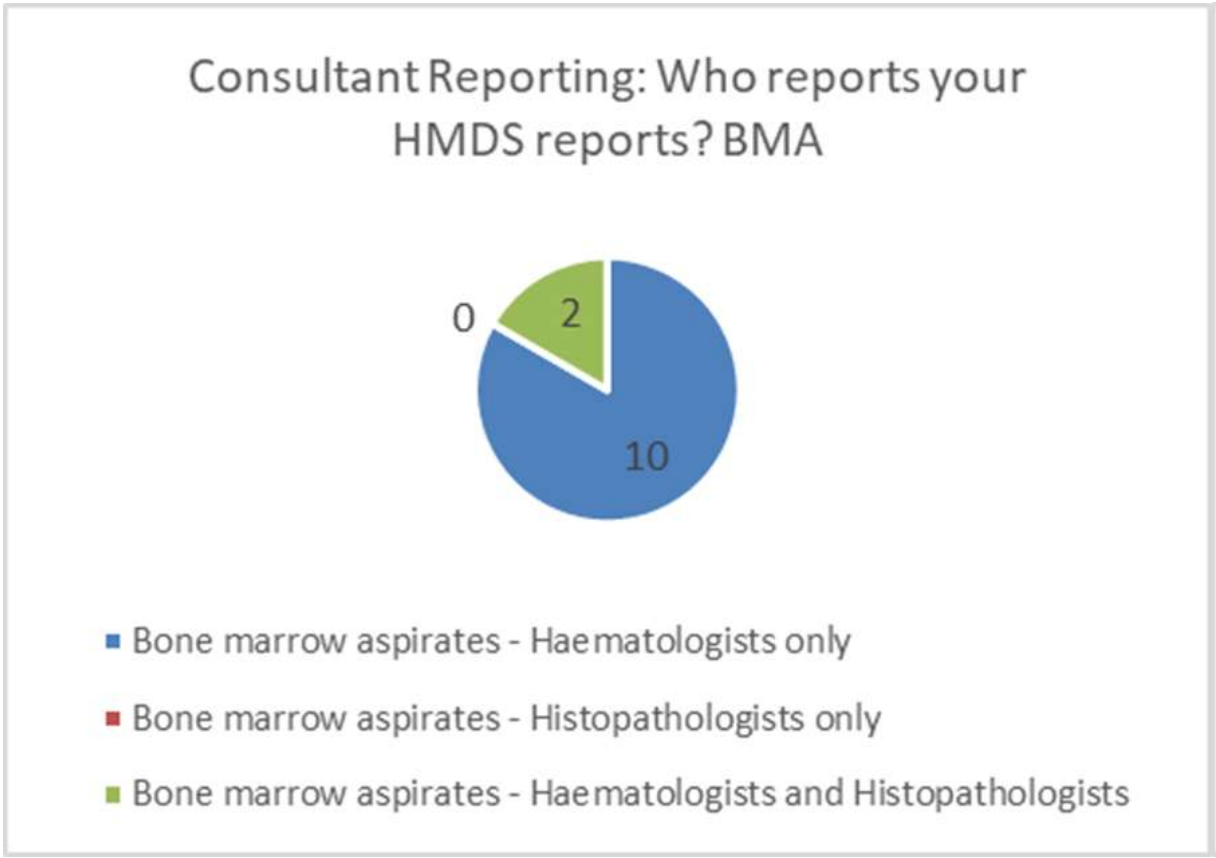
UK Training pathway: Survey results

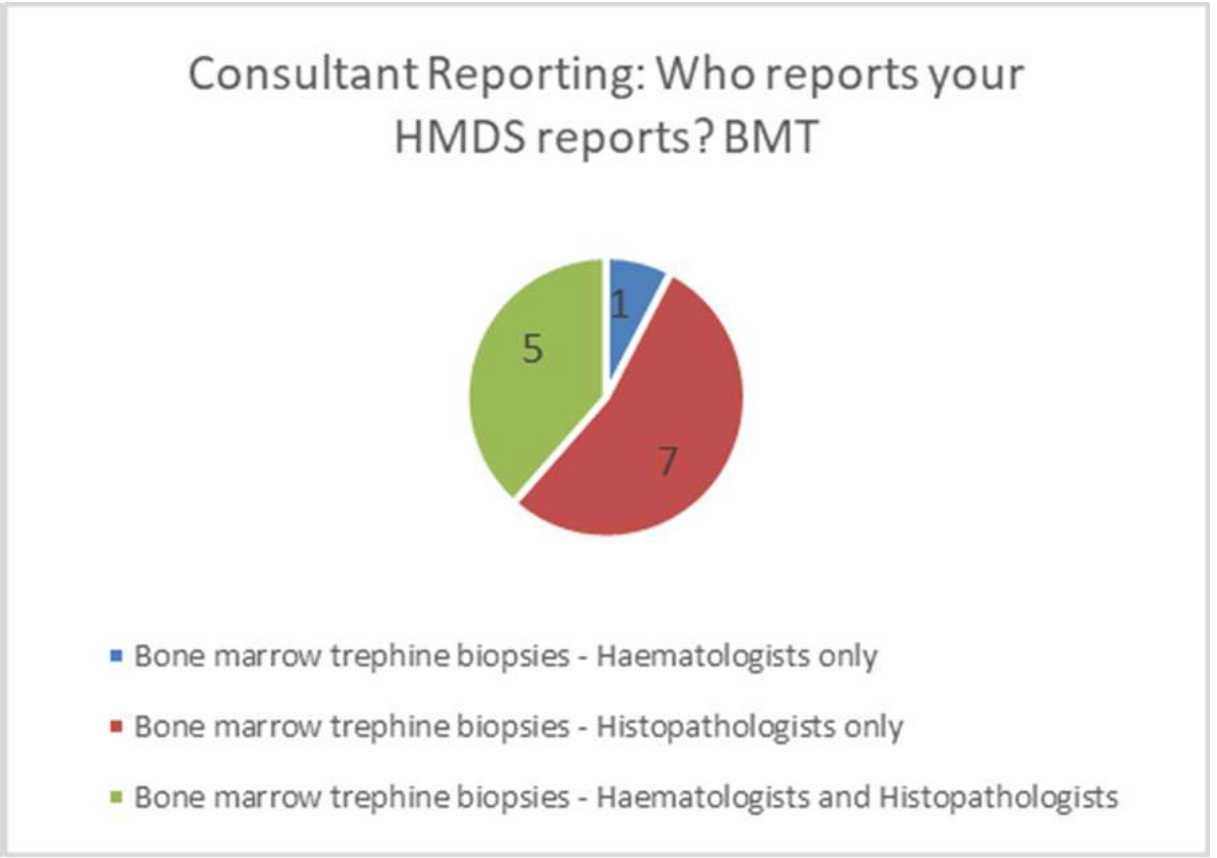
- Most training occurs on the job, with few trained through UK fellowships (pre- or post-CCT), and a substantial numbers undertook international fellowship
- Most residents rotate through an HMDS

How did your HMDS consultants receive their training? Tick all that apply	On the job	Stage D training	Dedicated fellowships in UK (pre-CCT)	Dedicated fellowships in UK (post-CCT)	Dedicated fellowships abroad	Do resident doctors rotate in your HMDS?
13 HMDS Labs total	12	6	4	2	7	11

Who reports Bone Marrow Aspirates & Trephines?

Most HMDS models stick to traditional reporting roles: aspirates, trephines, lymph nodes, flow cytometry and genomics. But there is some professional boundary blurring.





Bone marrow aspirates - Healthcare scientists=5/13

Bone marrow trephine biopsies - Healthcare scientists=1/13

UK Training pathway: Interest in fellowships and dedicated training

- There is interest in training at your HMDS and a few (3/13) already offer fellowship
- But, there are issues:
  - Staffing
  - Standardisation
  - Lack of funding
  - Lack of regulatory body support
  - Physical and geographical boundaries with only partial availability of expertise/testing repertoire (eg. Centralisation of genomics)
  - For residents: Lack of interest, lack of confidence, lack of experience
    - Little/no representation in FRCPath exams
    - Little/limited exposure to diagnostics and teaching
    - Dedicated/uninterrupted training time is needed
    - Other
  - Other surveys have shown interest in haematopathology, but variable confidence and exposure

Workshop discussion: barriers and solutions

- Discussed existing UK histopathology, haematology and subspecialisation pathways
- Limited flexibility due to GMC requirements, CiPs being high level professional competences, curricula difficult to change and requiring agreement from multiple stakeholders
- Some potential flexibility within existing framework for subspecialisation (eg Stage D, paediatric haematology)
- Funding not easily available for post-CCT fellowships and OOP
- US model incorporates haematology diagnostics/haematopathology early in resident training and has numerous dedicated fellowships in hematopathology and genetics with board certification, under the oversight of ACGME
- Draft curriculum, syllabus, rotation, competencies for a Fellowship have been discussed by BSH and BLPG
- Local fellowships in place
- Needs a similar discussion on haematopathology scientific training and workforce, to align with any proposals

Standardisation, Certification and Competency - Why does it matter?

- Uniform training to create expertise and define standards and competencies
- Expertise ensures meeting high quality standards of care
- Recognition of the successful fellow or consultant as a subspecialist
- Is a CCT in histopathology or haematology alone sufficient to become a haematopathologist?
- UKAS accreditation depends on competency
  - UKAS focus on competencies for independent practice: need to support consultant CPD and ongoing competencies, as well as resident training
  - How much time should a consultant spend on Haematopathology to ensure competency?
- Cannot separate haematopathology training from haematopathology consultant workforce planning and CPD

No single, simple correct solution

- Curricula and training programmes are rigid but have some flexibility
- Desire for harmonisation and standardisation, but also flexibility and recognition of local needs
- Needs to work within existing training pathways/curricula in the short/medium term
- Subspecialised and high quality, but not narrow or unattractive
- Needs to look at whole training pathway, not just specialty trainees, but also consultants and workforce needs
- Histopathology, haematology and scientific workforce and training have different needs.
- Blurring professional boundaries can help with some workforce issues, but could cause others
- Pre- and post-CCT fellowships
- Local providers want independent consultants to authorise reports, not trainees
- Needs engagement with key stakeholders and a working group
- Formal routes and fellowships, plus and training and education networks and events
- What can be done in the UK?
    - Standardisation through minimum requirements (CiPs), structured fellowship or rotations (SPIN)
    - SPIN for paediatric haematology not analagous to haempath: earlier and less narrow training
    - Early exposure in SpR training (haem and histo) – incorporation into curriculum
    - Workforce planning

Haematopathology Fellowships

- Can be Pre- or Post-CCT
- Locally coordinated
- Nationally coordinated fellowships need discussion

Fellowship proposal with curriculum

- Draft curriculum discussed with BLPG and endorsed by BSH Lab SIG
- Consideration of competency assessments

Fellowship Syllabus

Diagnostic competency goals:

- Analyzing laboratory results, to include automated haematology analysers, cytogenetics, flow cytometry, immunohistochemistry and molecular studies as well as at least basic knowledge of coagulation and haemoglobin testing results
- Interpreting lymph nodes and other lymphoid tissue specimens
- Interpreting bone marrow aspirates and trephine core biopsy specimens
- Interpreting peripheral blood smears and body fluid examinations
- Interpretation of other advanced diagnostic techniques as they become available
- Observing relevant procedures: Fellows should participate in laboratory procedures for which they will be expected to supervise ancillary staff members as consultants (e.g. sample triage, testing within the different laboratories, etc.)
- Independent reporting

Suggested Rotation Schedules

- **Bone Marrow rotation** (18 weeks): During that period, the fellow gains knowledge and expertise in routine and specialized haematology tests including the interpretation of blood smears, bone marrow aspirates and biopsies as well as, immunohistochemistry, and flow cytometric immunophenotyping. The information from any cytogenetic/FISH and molecular analyses performed on these specimens is correlated with the other data and, when appropriate, integrated into the final diagnosis.

- **Lymph node, solid tissues and body fluids** (15 weeks): During this time the fellow gains expertise in the processing, triaging, analysis, and interpretation of lymph nodes and other biopsies and fluids from the time they are received in the laboratory to the final written report. Interpretation includes morphology, flow cytometry immunophenotyping, immunohistochemistry, molecular/cytogenetic/FISH analysis.

- **Flow cytometry** (2-4 weeks): In addition to the flow cytometry experience that the fellow gains on the Bone Marrow service and Lymph Node rotations, this rotation is dedicated to learning basic techniques in flow cytometry, as well as the analysis and interpretation of flow cytometric immunophenotyping data.

- **Molecular and cytogenetics** (4-6 weeks): In this rotation, the fellow assumes clinical laboratory responsibility in the molecular diagnostics laboratory that provides testing for haematopoietic malignancies. The fellow will gain understanding of methodologies, data interpretation and specimen handling involved in these tests.

- **Dermatopathology** (2 weeks): with a focus on cutaneous lymphomas and mimickers.

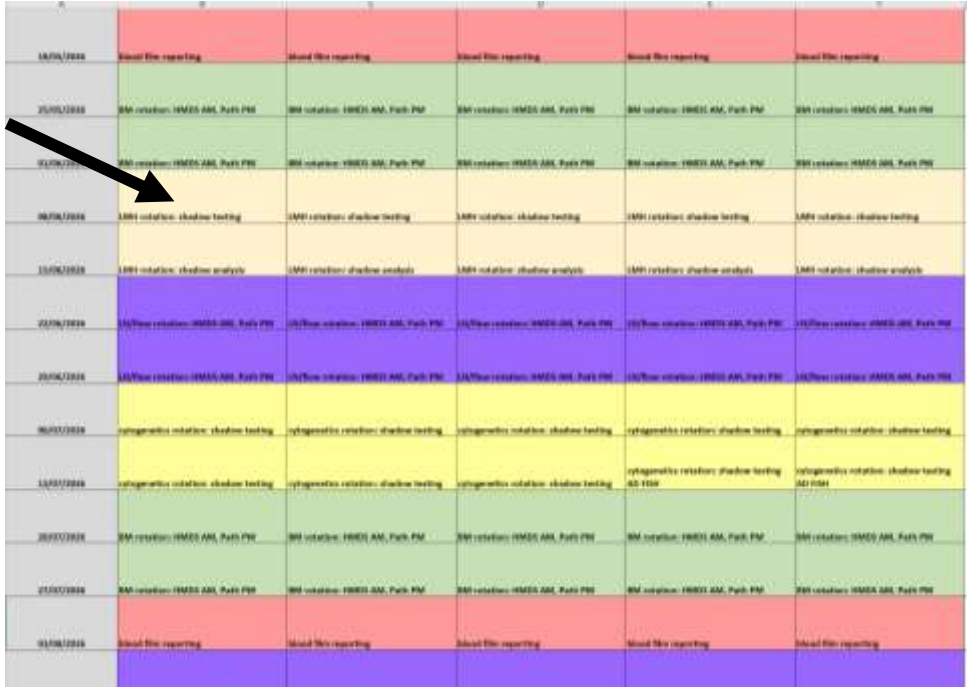
- Elective/research rotation (6 weeks): The fellow is required to pursue a research project that can be completed by the end of the academic year. The fellow is expected to complete at least one project and submit an abstract for presentation at a national or international pathology/haematology meeting and ideally submit a manuscript for publication in a peer-reviewed journal. These elective weeks can be used to gain more experience in one or more of the clinical rotations.

* Coagulation and haemoglobinopathies: Although there is no dedicated rotation for these topics, the Trusts are expected to provide didactic sessions to fellows with no prior knowledge in these fields (i.e. histopathology trainees), as understanding of tests and interpretation of results is required for evaluation of blood films.

*For fellows with no previous experience (i.e. histopathology trainees), observing a number of bone marrow aspiration/biopsy procedures is recommended.

EB Haematopathology Fellowship Rotation Schedule 2026-2027

week / Weekday	Monday	Tuesday	Wednesday	Thursday	Friday
09/03/2026	Introduction to the program: Meet with LBS, tour of HMDS, meet consultants and other staff	peripheral blood modules, lab induction	peripheral blood modules and path portal, lab induction	blood film induction, lab induction	blood film induction, lab induction
16/03/2026	blood film reporting, lab induction	blood film reporting, lab induction	blood film reporting, lab induction	blood film reporting, lab induction	blood film reporting, lab induction
23/03/2026	blood film reporting	blood film reporting	blood film reporting	blood film reporting	blood film reporting, report competenc set
30/03/2026	BM rotation: HMDS Introduction to aspirate reporting (AM), path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM
06/04/2026	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM
13/04/2026	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation
20/04/2026	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation	flow cytometry lab rotation
27/04/2026	BM rotation: HMDS AM (including flow), Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM
04/05/2026	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM
11/05/2026	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM	LN/flow rotation: HMDS AM, Path PM
18/05/2026	blood film reporting	blood film reporting	blood film reporting	blood film reporting	blood film reporting
25/05/2026	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM	BM rotation: HMDS AM, Path PM



Example flow cytometry rotation

Flow cytometry syllabus for haematopathology fellowship

Description of Rotation: While indications and clinical diagnostic interpretation of flow cytometric immunophenotypic results will occur during HMDS flow reporting, two weeks will be spent in the laboratory learning the technical aspects and interpretive analysis involved in these studies.

Goals: The fellow will be expected to understand sample preparation, basic flow cytometry technology, quality control, gating on specific cell populations, determination of positive versus negative staining, methods of data presentation and develop an understanding of the analytic software. The fellow will learn normal and abnormal flow cytometry findings in the various sample types and expected findings in disorders diagnosed by haematopathologists.

Introduction to flow cytometry (concepts):

The cytometer (fluidic, optics, signal processing), sample interrogation, differences in analysers/ number of colours

Flourochromes: properties and pairing strategies

Antibody selection and optimisation

FCS file

Sample types: blood, bone marrow, plasma, serum, solid tissues (require disaggregation)

Preanalytical considerations

Trouble shooting, Artifact/spillover/compensation

Indications for testing

Panels

Sample preparation – observe/take part in wet lab work

Software

Normal patterns/poplulations: Normal bone marrow: Forward scatter, side scatter, Normal maturation/antigenic patterns/lineage assignment

Gating strategies

Special populations: haematogones, mast cells, eosinophils, basophils, plasmacytoid dendritic cells

Enumeration of cells: stem cells with CD34, T/B/NK

Viability 7AAD

Neoplasia

B-cell (FL, CLL, MCL, HCL, MZL/LPL)

Absolute lymphocytes counts for MBL/CLL

Plasma cells

T-cells/NK-cells (T-LGLL, T-PLL, NK-cells, ATLL, ALCL, HSTCL, MF/Sezary)

AML: myeloid, monocytic, PML, AEL, megakaryoblastic

ALL – T, ETP, B

MPAL

BPDCN

MDS

CMML

Mastocytosis

Detection of rare events/intro to MRD

PNH

Additional activities (for those with particular interest)

Assay Validation ?

Quality assurance/control

Schedule: 2 weeks:

Week 1:

Day 1-3: Introductory lectures and lab work

Day 4-5: observing live cases analysis

Week 2:

Day 1-4: observing live cases and taking (live or legacy) cases for primary analysis covering disease categories stated above

Day 5: Assessment

Regulatory bodies and stakeholders

- RCPath – reluctant to increase training time, recognise sub-specialisation, support testing, fund
- BSH – declined fellowship funding/grant application
- Haematology SAC – change of curriculum extremely difficult, CiPs/rotations are easier, generation of working group
- GMC?

Haematopathology Academy?

- Need to emphasise Formative aspects: The joy of learning and sharing haematopathology
- Training and education networks and events
- Advertising existing local and national meetings and courses
- For trainees at various stages, but also for consultants needing to maintain competency
- Networking, mentoring, mutual support, resources
- Formative educational aspects of EQA
- And align with Summative/structural aspects: training pathways, fellowships, workforce planning

- Coordinated by new HMDS Network Haematopathology Training and Workforce Group

Options to support haematopathology training and workforce: Entire training pathway Combination of different approaches needed Consultation and endorsement by stakeholders needed. Needs to align with scientific equivalent							
	Pre-specialisation	**Early specialty training**	**OOP Fellowships (locally or nationally funded)**	**Stage D/ST7 Fellowships/ subspecialisations**	**Post-CCT Fellowship (Locally funded)**	**Post-CCT Fellowship (Nationally funded)**	**Consultant CPD and competency assessments**
Comments	Needs more consideration	Haempath exposure early on	OOPT can be done in final year, not OOPE	Post Part 2 exam, within training but not OOP	Local Post-CCT Fellowships expansion of existing posts	Selected Post-CCT fellowships, 'nationally' coordinated/commissioned	Consultants learning on the job, in HMDS roles
Advantages	Makes haempath attractive	• Existing curriculum	• Helps trainee to decide if likes haempath • Protected time	• Funded • Existing curriculum • Enables trainee to decide if likes haempath	• May meet local needs • Flexible • Exists in some regions	• Meets national *and* regional needs for training *and* workforce • Equitable across UK • Flexible • National workforce planning	• Attractive to local providers • Attractive for trainees • Supports specialists • Flexible • National workforce planning
Disadvantages	TBC	• Inequitable access to local HMDS lab	• Inflexible • Unfunded • Unattractive to local providers • Inequitable access to local HMDS lab • Requires some seniority • Most OOPs are within region (IDT needed between regions)	• Inflexible • Local • Difficult to protect from other duties • Hard to complete exam/ competencies in time • Unfair on other trainees in rotation	• Local funding: unattractive to local providers • Inequitable • May not match local funding needs • May not match local consultant posts • Inequitable access to local HMDS lab: not an option for some regions • Not aligned with number of consultant posts	• **Doesn't exist: large funding needed** • **How many would be needed?** • Ensuring equity isn't simple • Need to align with consultant posts available • Attractive for trainees who can just get a consultant post?	• Unprotected local funding • Unprotected time • **How much time should an HMDS consultant spend on HMDS duties to ensure competency?**
How to support (specific stage)	• Taster days	• TPDs and HMDS engagement	• Advertise and promote current fellowships • Mutual support for new fellowships	• Work with NHSE/RCPath/SACs to increase total number of trainees and provide advice	• Advertise and promote current fellowships • Mutual support for new fellowships	• Bring together stakeholders for funding case and equitable decisions • National workforce planning	• Education • Networking • Draft competencies • Job planning guidance • UKAS advice • National workforce planning
How to support (all stages)	**Haematopathology Academy workforce and training group within HMDS Network, linked to stakeholders, SACs, etc** **Haematopathology Academy: Coordinating and promoting local and national educational events and resources** **Haematopathology draft syllabus and competency assessments for each haematopathology reporting task**						

Discussion

Workshop participants: have we missed anything?

HMDS Network:

1. Do you endorse the approach?
2. Should we repeat the survey for completeness, with or without a similar scientific training and workforce survey?

Please join our Haematopathology Academy Working Group by contacting Liron and Tom

tombutler1@nhs.net

l.barneaslonim@nhs.net

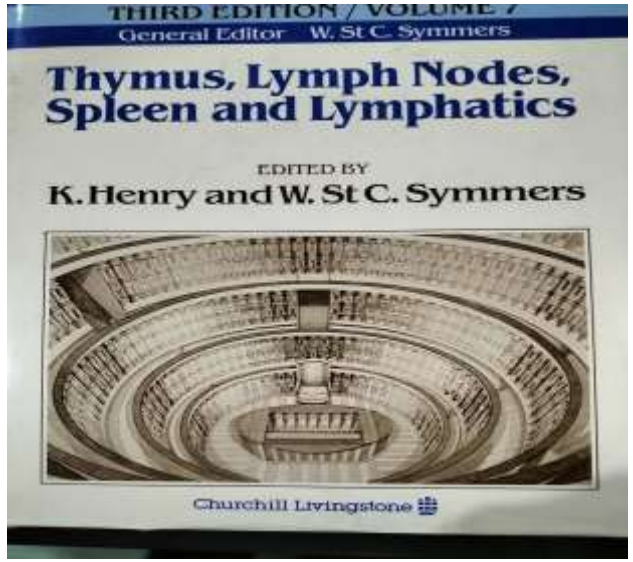
Dr Lakshmi Venkatraman, HMDN Nottingham City Hospital

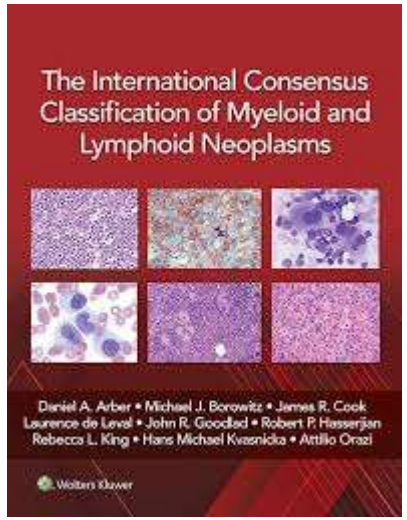
On behalf of the British Lymphoma Pathology Council

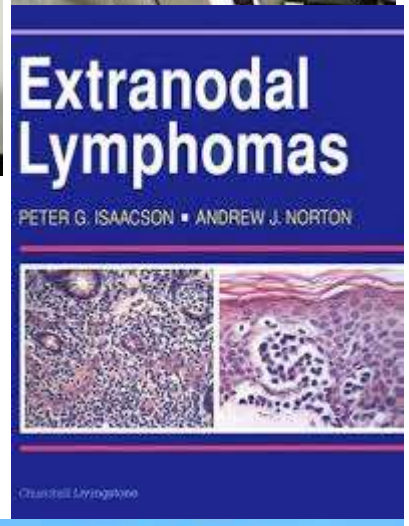
BLPG

ABOUT THE BLPG

- Established in 1974
- Haematopathologists-
  - Diagnostics
  - Research
  - Classification
- Meetings: scientific and practical updates
- Liaising with national bodies- RCPath, BSH, NHSE, PathSoc, EAHP, SocForHaem.
- Haematopathology EQA



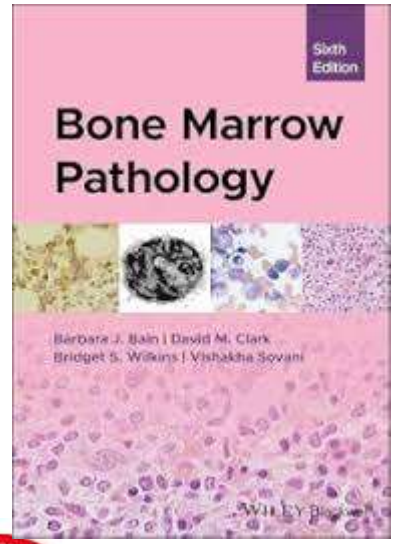




WHO Classification of Tumours: Editorial Board

WHO Classification of Tumours: Editorial Board

Expert members: Haematolymphoid tumours



EBMWG

European Bone Marrow Working Group

COLLABORATIVE WORKING: HAEMATOPATHOLOGIST AND HAEMATOLOGIST

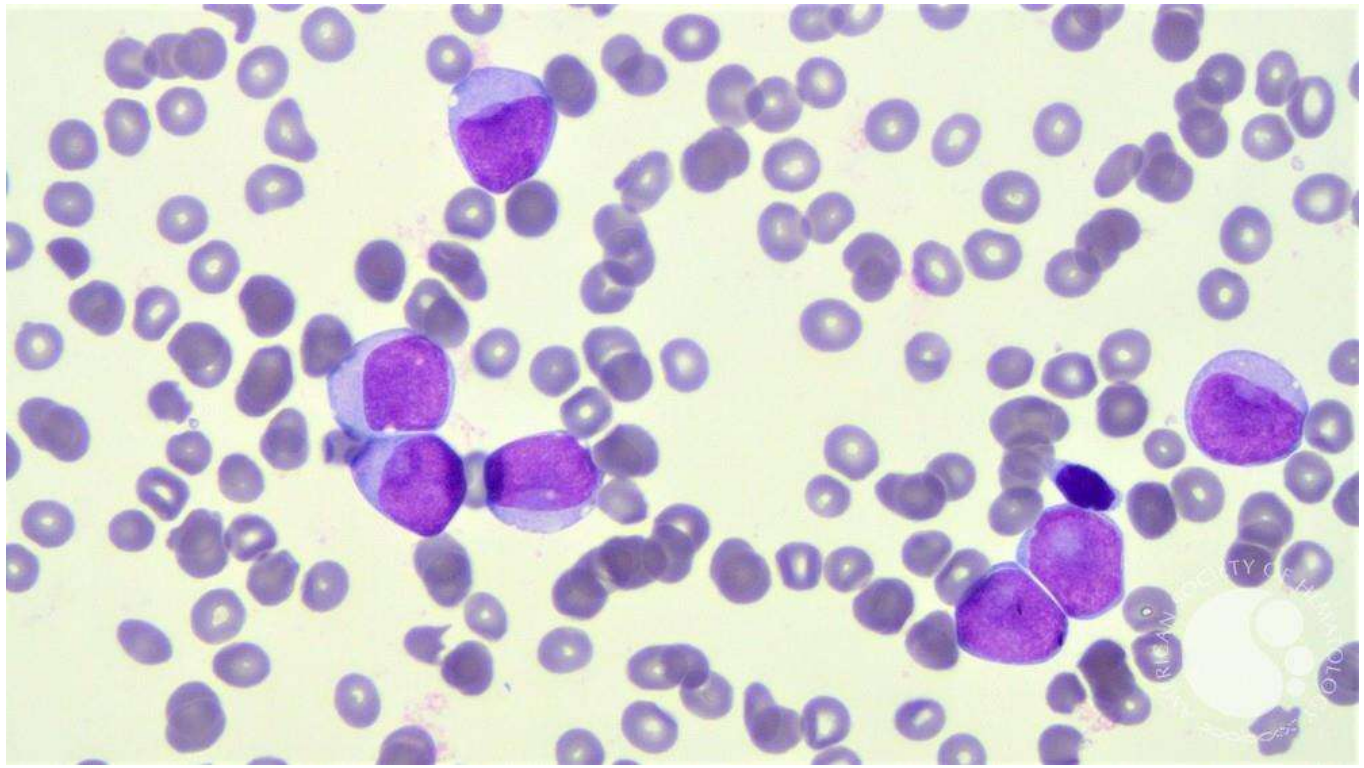
Diagnosis- clinical, morphology, phenotype and genetics

Risk grouping- generic risk adapted therapies

Outcomes- don't always reflect shared morphology or genetics

Mechanisms- pathways

Classification- targeted therapies and clinical trials



COLLABORATIVE WORKING CELLULAR PATHOLOGISTS AND HAEMATOPATHOLOGISTS

Inflammation v neoplasia

Integrated diagnosis and the diagnostic toolkit

Contradiction between results from morphology/IHC or FC/molecular tests

Contradiction between histopathology and clinical features

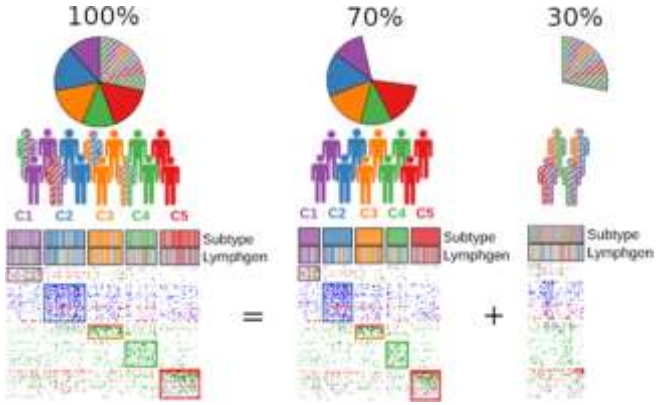
Differences of opinion between pathologists

Inadequate quality / quantity of specimens

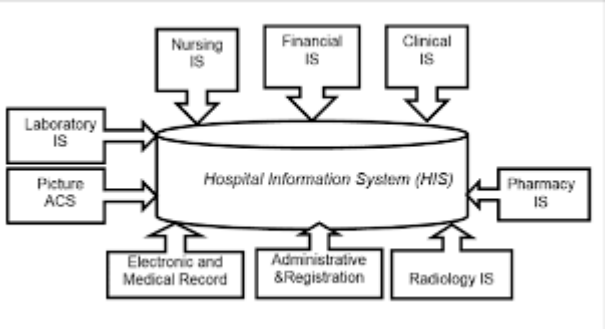
LIMS and legacy IT systems

CHA(LLE)NGES

Workforce and training



Molecular classification



IT systems in NHS

AI

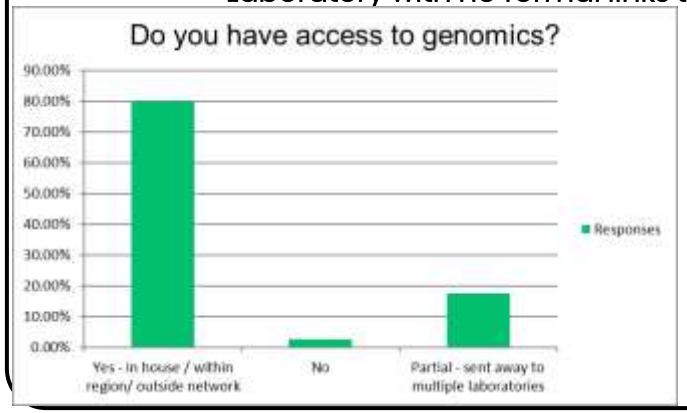
Specimen transport

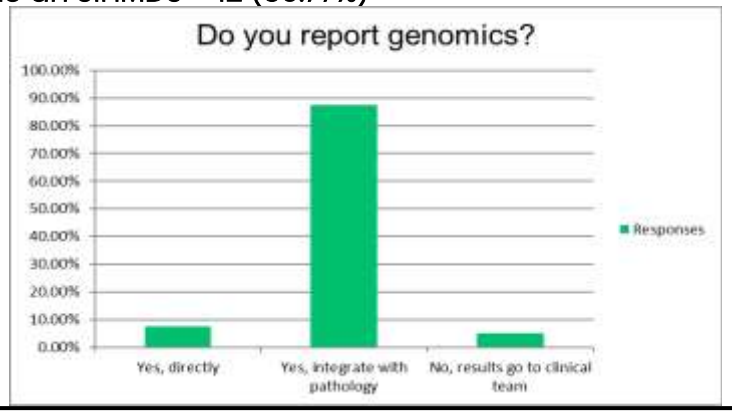
TAKING STOCK

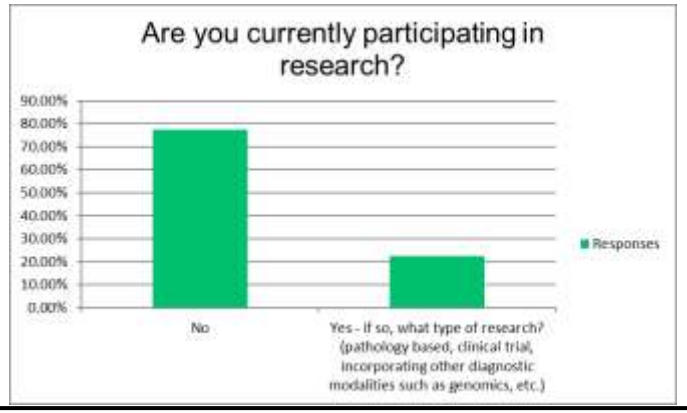
HMDS LEARNING AND BLPG EQA PARTICIPANTS SURVEY FEB 2026

SURVEY RESULTS- WHO, WHERE, WHAT

- The anonymized survey included 16 questions and was sent to the BLPG EQA participants.
- Respondents: 40 (0 Northern Ireland, 1 Scotland, 3 Wales, 36 England); 95% are BLPG members.
  - Haematopathologists (Cellular pathologists by training)- 26 (65%)
  - Haematopathologists (Cellular pathologists with interest in lymphoreticular pathology- 13 (32.5%)
  - Haematologist (Laboratory based) – 1 (2.5%)
  - 25 (62.5%) haematopathology main component of job plan; 15 (37.5%) report a range of other pathology specialties (Renal, GI, Breast gynae, Cytology, Musculoskeletal, Dermatopathology, Autopsy, Endocrine)
  - Work setting
    - SIHMDS- 17 (43.59%)
    - Networked HMDS- 10 (25.64%)
    - Laboratory with no formal links to an SIHMDS – 12 (30.77%)







SURVEY RESULTS- WHAT WORKS WELL? (21/40 RESPONSES)

Everything that can be completed in-house
Able to make timely diagnoses for majority/common haempath diagnoses with haemonc MDT interaction
Set immunohistochemistry panels
solid biopsies
Streamlined panels for testing and canned reports for all diagnosis
Liquid sample pathways well established and samples are sent to several laboratories within the centre or outside as per protocol. Solid / FFPE material is not as well organised in that the range of tests and communication with cellular pathology and the molecular pathology laboratory is not standardized.
Pathways for flow cytometry, bone marrow aspirates, bone marrow trephines and lymph node biopsies

established networks of pathologists and availability of genomics
IHC panels
Uniformity and reliably reproducible practice amongst consultants.
Integration using one software platform
EPR often stores a lot of information, which circumvents some of our integration problems
availability
We have developed local diagnostic pathways within out HMDL using WHO diagnostic criteria and in conjuNction with our local haematologists
More control over pathways for liquid samples than solid biopsies.
All of it
SIHMDS structure

'In my centre': Availability of tools. Standardisation. Management – 1 QMS.

WHAT COULD BE IMPROVED? 21/40

Better accountability and faster turnaround for specimens sent to the local HMDS
Access to clonality studies, FISH and molecular none of which is available in house and there are large delays (mainly administrative I believe) in getting the results back. We used to have in house clonality and this was taken away with detrimental effects to patients.
Genomics is now too separate from the SIHMDS. Consultants are becoming deskilled or are failing to upskill in molecular interpretation / understanding of molecular testing due to loss of contact with this part of the haematopathology diagnostic pathway. Things have shifted to diagnosis based on a "meet in the middle" of separate interpretations instead of what used to be a more wholistic approach to the integration of histopathology and the corresponding molecular testing.

IT systems that can communicate with legacy systems and digital pathology.
Having a set of minimum molecular tests for the different types of lymphoma and a structured pathway so that the tests are done as needed and results available in clinically relevant time.
Genomic tests and immunohistochemistry needs updated for understanding pathogenesis and disease classification as much as risk assessment and patient prognosis or response to therapeutic agents.
molecular pathways are less smooth because we send these specimens out to another SIHMDS

Quality of sections and IHC, sometimes, TAT of molecular testing
specimen transport between labs - currently no ownership of these steps, TAT for IHC and molecular investigations to be more in line with clinical requirements.
More integration - perhaps everything happening on one site.
Increase staffing level to allow cross training. Morse conscious and equal consideration of both liquid and solid components of the work.
Availability of all tests on test directory and/or established pathways for accessing infrequent test requests. TAT for molecular including clonality
Still lots of cases with incomplete information including long TAT of genomics (networked/out-of-house) which are not well integrated
the gene panels need to be standardised across the networks; TAT, access to aggressive B-lymphoma testing
More guidance from BLPG/ HMD network regarding best practice/ minimum requirements with dissemination of most up to date information in a timely way and standardisation of diagnostic requirements
IT connectivity between various systems
Turnaround times
It's not bad, though staffing of various parts of the pathway can be challenging.

Problems: access, TAT, local deskilling, accountability / capacity at GLH/HMDS.
Needs: cross disciplinary training, standards, IT systems, staffing.
Suggestions: modify test directory, modernisation, better integration, pathways for ‘solid’ & ‘liquid’ samples

WHAT DOES INTEGRATED REPORT MEAN TO YOU? (34/40)

Results from different diagnostic test modalities presented together, maybe incrementally in the first instance but, CRUCIALLY, interpreted and put into clinical context by one or more member of the team with appropriate expertise. The report should be meaningful if read by a patient and not filled with reams of caveats and defensive statements.

Unacceptably long, repetitive, impenetrable, near incomprehensible reports that by their unreadability create substantial clinical risk.

ALL MODALITIES	INTERPRETATION	CLINICALLY MEANINGFUL
Created by the pathologist	Report on a single patient episode	No stand alone reports
A final summary should be issued	Pulling together all data	Reduces diagnostic ambiguity
Single clinically actionable diagnosis compliant with WHO/ICC		

CONCLUSION

- BLPG: majority membership Cellular Pathologists
- Practice settings- Single or networked HMDS- 70%, 30% in non- HMDS.
- 80% respondents can access genomics, 20% from multiple centres.
- All respondents are agreed on the meaning of an integrated report
- Good practice tailored to local situation- relies on standardisation, availability of diagnostics and good QMS.
- Concerns around TAT, loss of skills, remoteness of GLH from HMDS and consolidation of genomics
- Mitigations- cross disciplinary training, best practice standards, IT systems, staffing.
- Suggestions: modify test directory, modernisation, better integration, pathways for ‘solid’ & ‘liquid’ samples

Thank you

Special thanks to Thomas Williams, BSH

Q & A

Following EQA presentation

BLPG EQA

HMDS Network Meeting

27/02/2026

Dr Anna Green,

on behalf of EQA sub-committee (Dr Malee Fernando, Dr Lakshmi Venkatraman and Dr Anna Green) and BLPG Council

Histopathology Interpretative EQAs

EQA: External Quality Assurance

Cellular Pathology: Interpretative EQA schemes

“The College regards the feedback that participants gain from appropriate interpretive EQA schemes to be an important contribution to annual appraisal and medical revalidation.”

“However, interpretive EQA schemes are not normally designed to have the rigour of a professional examination and therefore the results should NOT be regarded as a form of proficiency testing that provides a measure of a pathologist’s competence”

Benefits of an Interpretative EQA Scheme

2 Benefits of interpretive EQA schemes

An effective interpretive EQA scheme provides a structure that supports professional standards in interpretive aspects of pathology:

- to standardise and harmonise diagnostic criteria across the country or region
- to keep members abreast of developments in the specialty
- to form part of a framework for high-quality, relevant and effective continuing professional development (CPD)
- to avoid professional isolation
- to empower a participant to reflect on their performance and take corrective action as required, therefore improving patient safety
- to input into accreditation of laboratories – there is a mechanism in place to provide external triangulation during appraisal
- to provide a safe environment for the organiser to raise concerns regarding possible sub-standard performance of a participant to an appropriate professional standards body for further investigation.

RCPath Cellular Pathology NQAAP

- RCPath (until Jan 2026) hosted the Quality Assurance in Pathology Committee (QAPC) and 7 National Quality Assurance Advisory Panels (NQAAPs).
  - Cellular Pathology NQAAP played an important role in reviewing referrals from external quality assurance (EQA) schemes

- QAPC and NQAAP activities paused from January 2026

BLPG Haempath EQA

- Run by a sub-committee of the BLPG Council
- Bi-annual
- Participants:
  - Lymphoid + BMT: ~90-100
  - Lymphoid only: ~120-140
- 8 cases:
  - 6 lymphoid (including ~2 non-neoplastic)
  - 2 BMT
- Scanned slides (accessed by Leeds Virtual

BLPG EQA | Virtual Pathology at the University of Leeds

BLPG Haempath EQA: Process

Cases submitted to Leeds by nominated centre, with proforma (clinical, additional immunophenotype, molecular)

↓

Cases reviewed by BLPG EQA sub-committee; 8 selected

↓

EQA opened to participants for ~ 6 weeks

↓

Responses collated and provisionally scored by EQA sub-committee

↓

Cases and responses presented at BLPG EQA meeting; scores agreed by consensus

↓

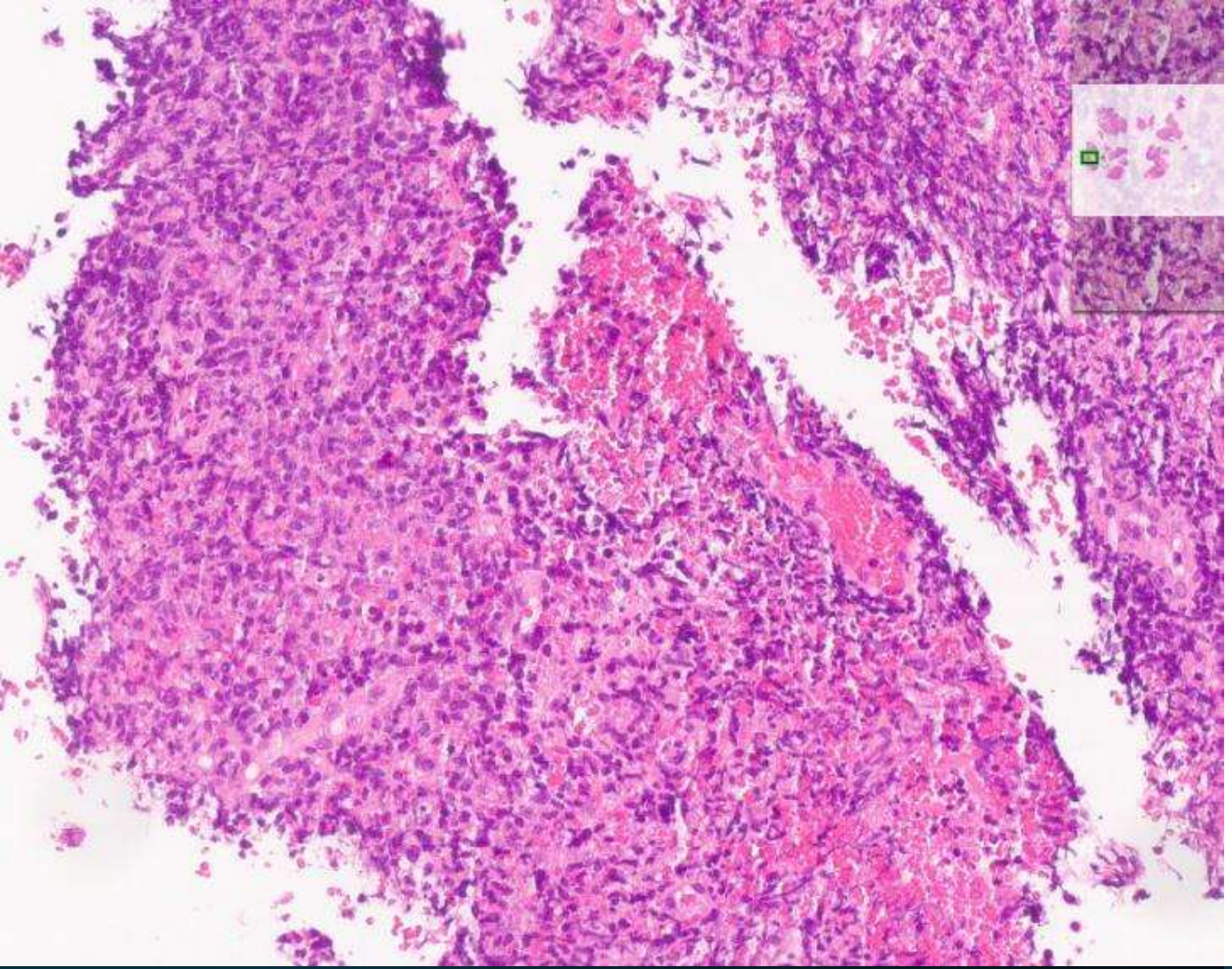
Certificate of participation issued and final scores circulated

↓

Individual and poor performance feedback currently not provided, participants reflect and include in appraisal process

BLPG EQA: Case Example

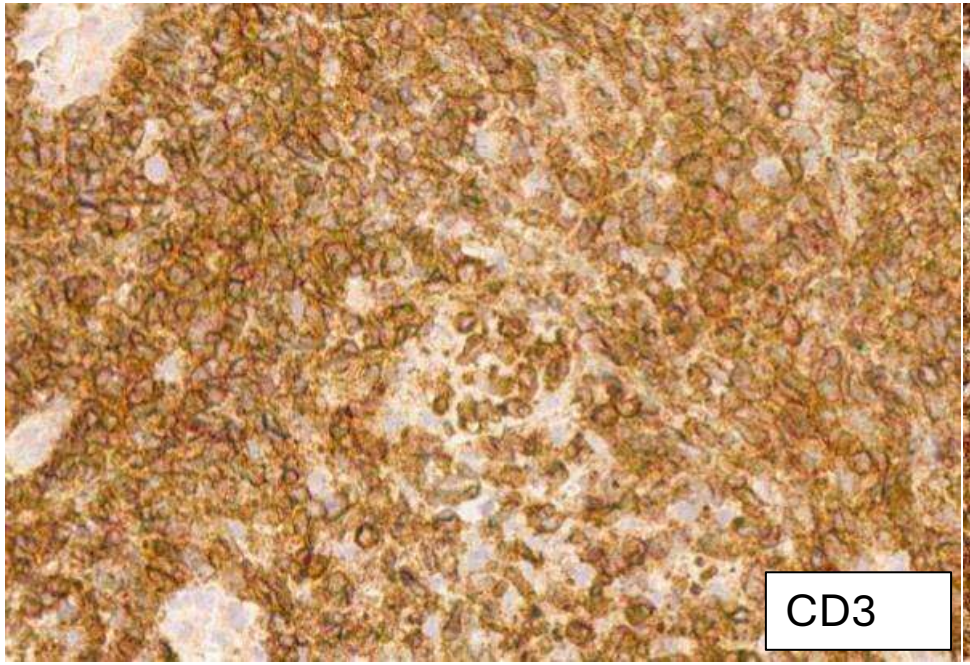
[BLPG EQA Round 24 | Virtual Pathology at the University of Leeds]

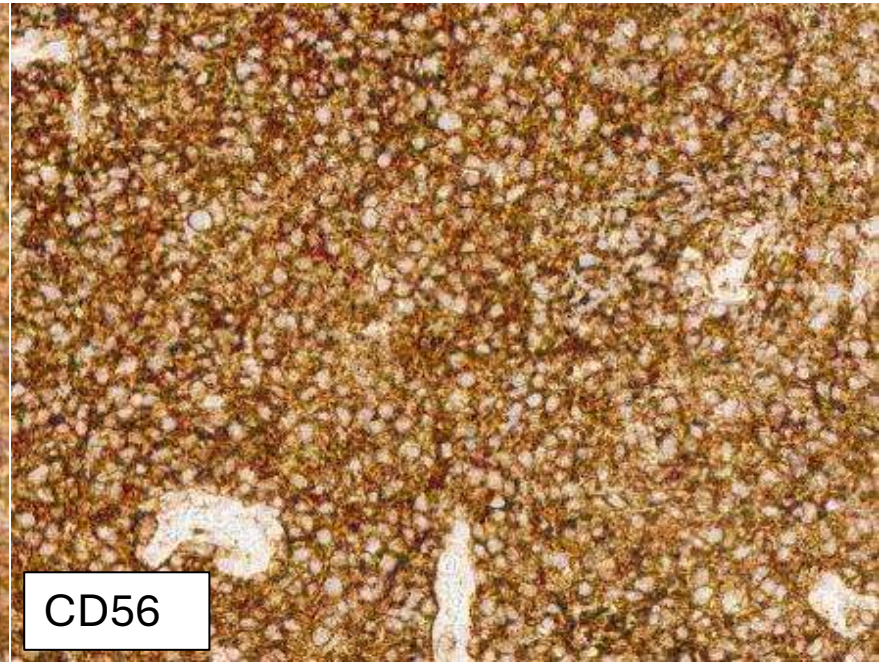


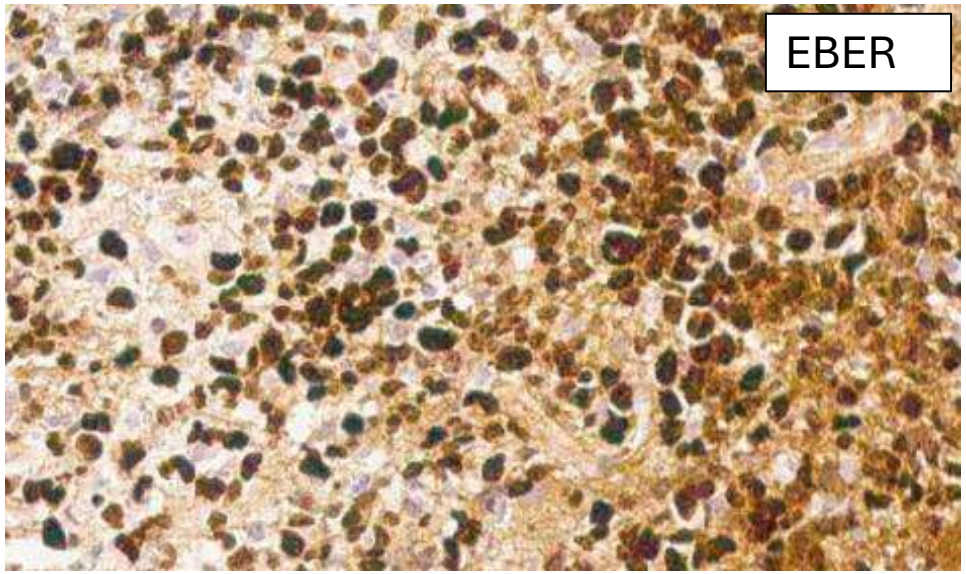
EQA Round 24 – CASE 5

- Clinical History: 25F. Large nasal mass.

- Additional information:
  - Expressed - CD2, CD7, perforin, TIA1
  - Not expressed - CD20, CD79a, CD5, CD4, CD8, CD10 or CD30
  - Ki67: >90%







EQA Round 24 – CASE 5

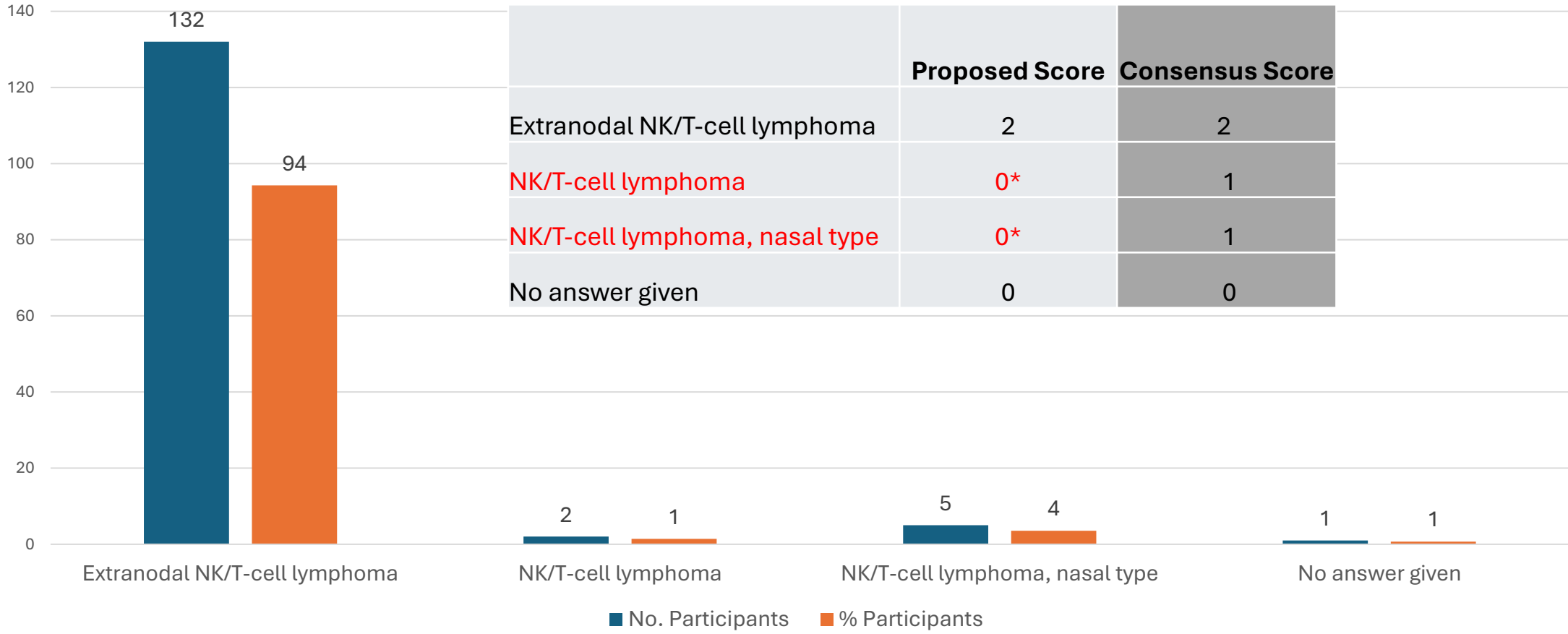
Additional information:

Expressed - CD2, CD7, perforin, TIA1

Not expressed - CD20, CD79a, CD5, CD4, CD8, CD10 or CD30

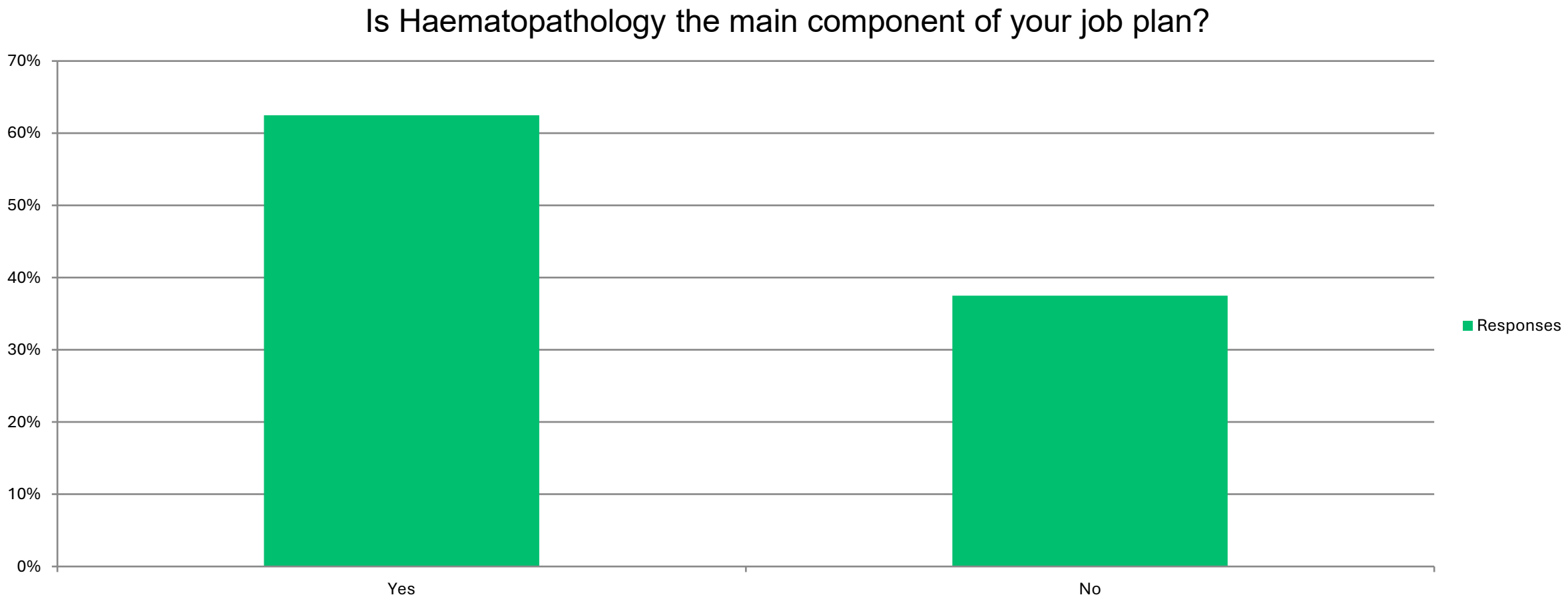
Ki67: >90%

Case 5. Total Participants: 140



	Proposed Score	Consensus Score
Extranodal NK/T-cell lymphoma	2	2
NK/T-cell lymphoma	0*	1
NK/T-cell lymphoma, nasal type	0*	1
No answer given	0	0

EQA Participant Survey

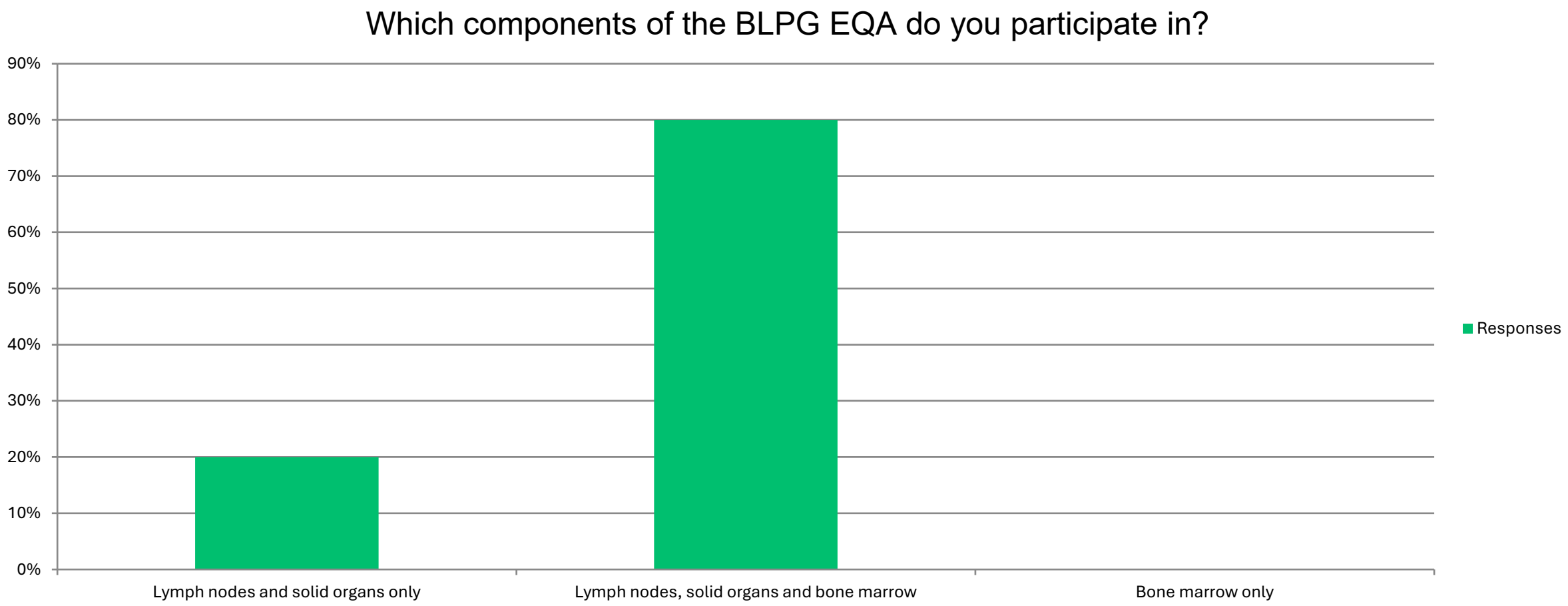


EQA Participant Survey

	Responses	
Haematopathologist: cellular pathologist by training	65%	26
Haematopathologist: not a cellular pathologist by training (please specify training background below)	0%	0
Cellular pathologist with interest in lympho-reticular pathology	33%	13
Haematologist: laboratory based	3%	1
Haematologist: clinical and laboratory	0%	0
Haematologist: clinical only	0%	0
Clinical Scientist (please specify discipline below)	0%	0

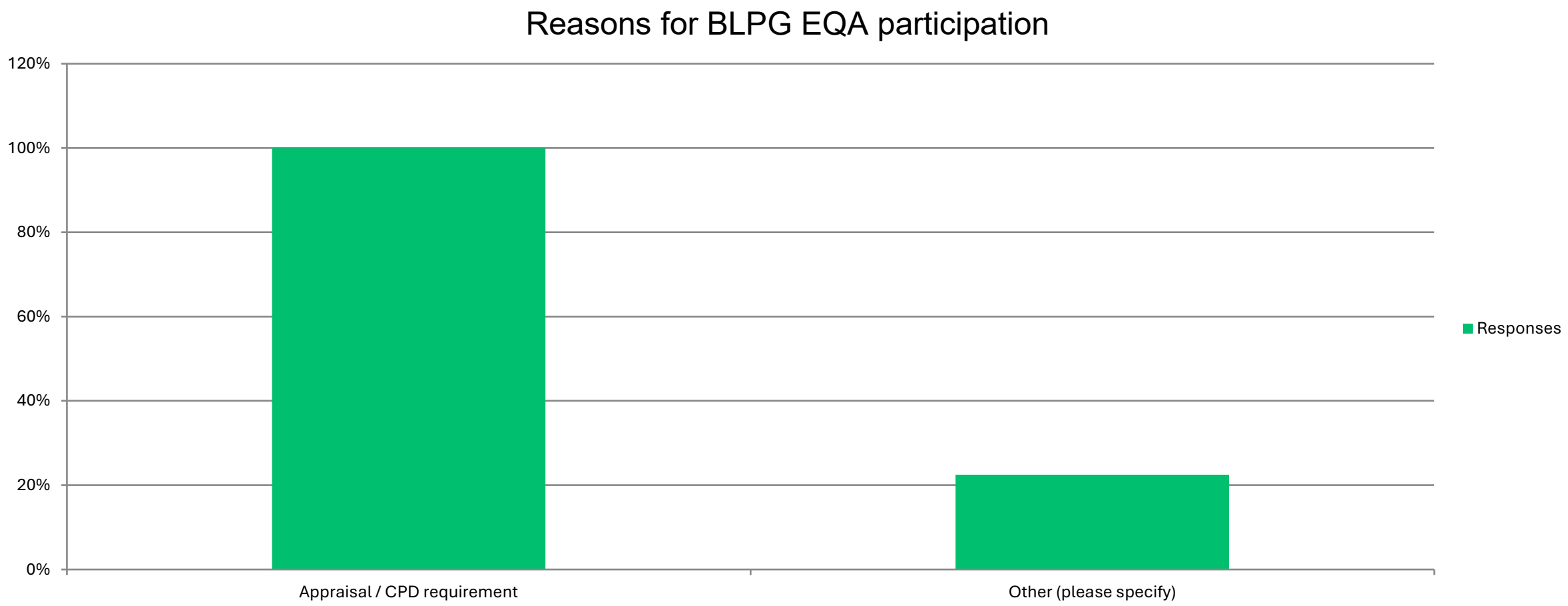
EQA Participant Survey

Which components of the BLPG EQA do you participate in?



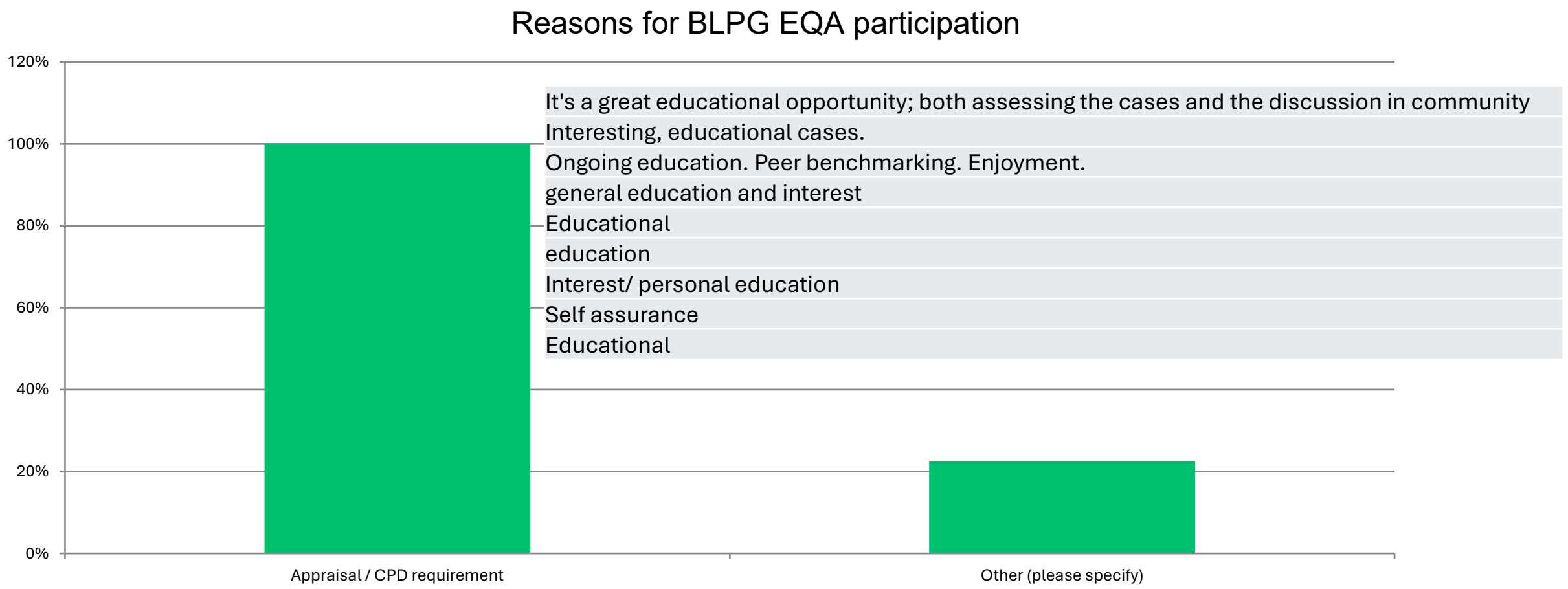
EQA Participant Survey

Reasons for BLPG EQA participation



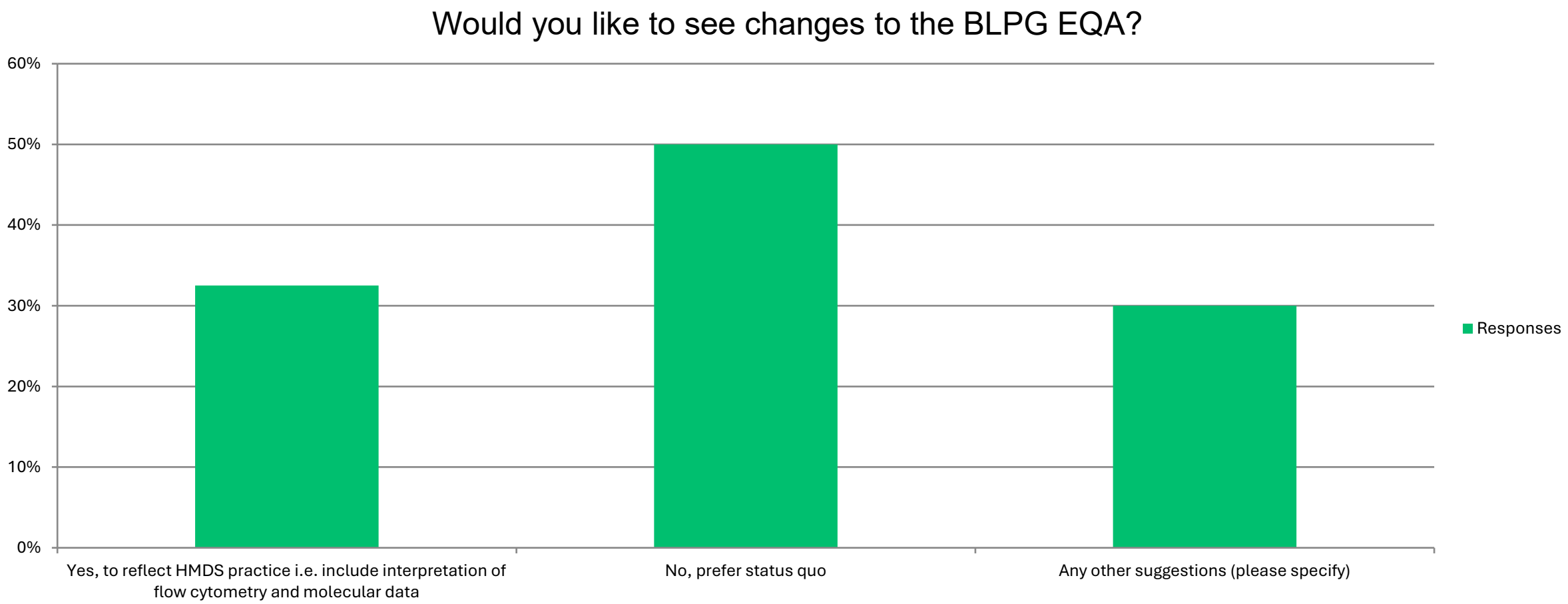
EQA Participant Survey

Reasons for BLPG EQA participation



EQA Participant Survey

Would you like to see changes to the BLPG EQA?



EQA Participant Survey:

Would you like to see changes to the BLPG EQA?

Change to an education scheme only and abandon marking
More focus on clinically important points rather than debates about scoring things that aren't clinically important.
More reflective of real life practice and less onus on this as measure of performance
Frequently cases are not representative of daily practice which they should be. Some of the 'rare' diagnoses should be included as educational cases as these are not cases we see in common practice.
The prelim section should be eliminated and we should go straight to the section with the relevant information. Also, it should be a multiple choice question model for practical reasons. The case info (molecular, IHC, etc..) should be presented in a clearer and easier to read format.
The two part compartmentalization of the each EQA case is really not needed and is a waste of time. It might have been useful a decade back, but we have moved on since then. This needs to be changed and the format for EQA cases needs to be in line with current diagnostic practices.
I would welcome a move to slides being hosted in the RCPath Pathology Portal, which I find much more user-friendly than the current site on which slides often take a long time to load.
The ability for tailoring to an individual's scope of practice (so someone can select to look at e.g., the primary flow plots/molecular data or the report only). If this section is for any changes in general
Not all participants in the BLPG EQA are haematopathologists working in a full HMDS. Not all participants will be producing integrated reports and interpreting /reporting liquid phase / molecular data. It is essential that the EQA caters to those participants who only have access to H+E and immunohistochemistry, please.
BM cytology too

EQA Participant Survey:

What would you like the BLPG EQA to include?

What would you like the BLPG EQA to include?	% Responses
equal number of lymph node / bone marrow cases	24%
more lymph node / extra nodal site cases	19%
more bone marrow cases	8%
less number of bone marrow and lymph node cases	0%
separate bone marrow and lymph node / extra nodal sites components	51%
no view, I report only bone marrow / only lymph node or extra nodal sites	5%
any other suggestions on case types and case mix	35%

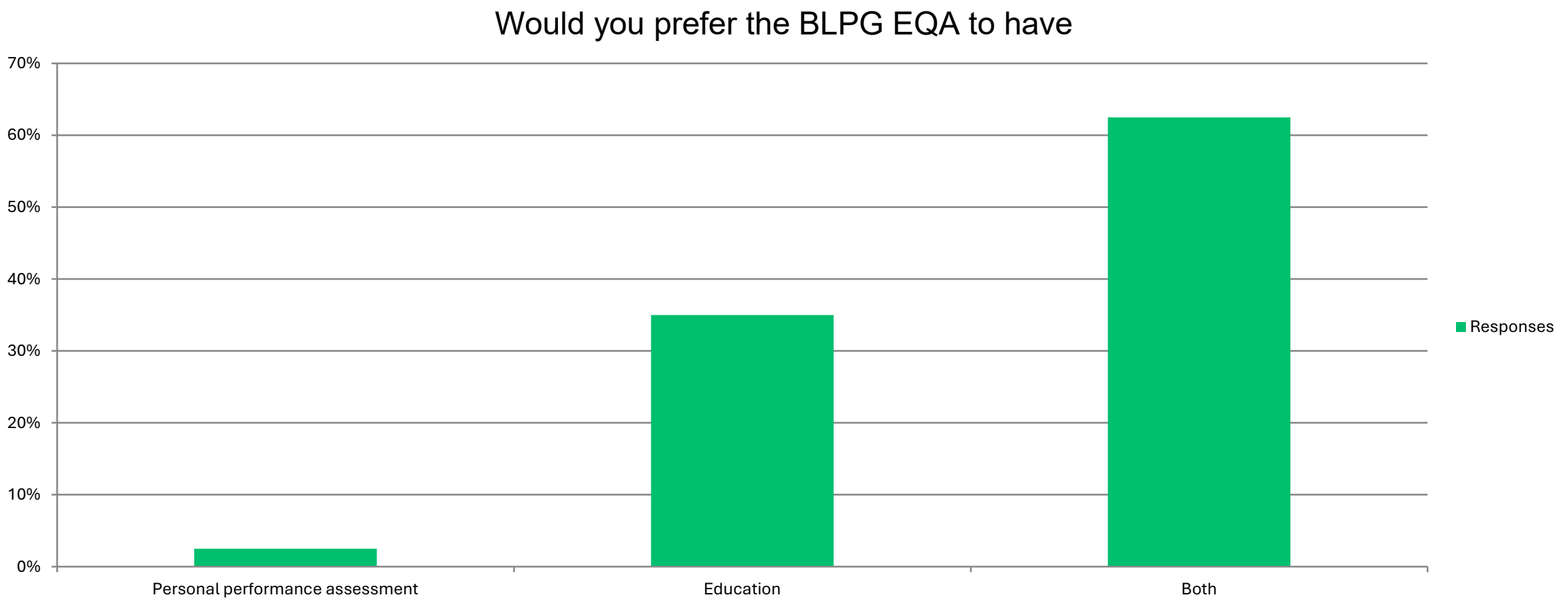
EQA Participant Survey:

What would you like the BLPG EQA to include?

Fine as it is
The mix is fine
Case mix is appropriate with option to report only those cases relevant to your practice
Keep it as it is, but ensure scanned images are in focus.
Separate bone marrow as some do not report. Everything else together.
Would probably be worth increasing and separating out the marrow component to interest more Haematologists. I don't report these myself.
I think the scheme is ready to develop further to have BM and lymphoid modules separately; a bit the way that the MaxFax and ENT Pathology EQA scheme runs.
Bone marrow trephines should be assessed separately from non-trephine specimens. The EQA should not assume that everybody practises in an HMDS.
need more BMTs in addition to what is done currently
More bone marrow cases would also allow for participants to choose just one or the other module, so the number of cases should be the minimum required that are acceptable for EQA
maybe 6 lymph node cases, 3 bone marrows
There are EQA schemes that cater for flow and aspirates already, so this should not be duplicated. I don’t currently report flow and aspirates as there is a good team of haematologists that do that in my SIHMDS
Educational cases and performance assessment cases could be separated.

EQA Participant Survey:

Should the EQA assess performance or be educational?



Future Considerations

- Format of scheme:
  - Continue status quo?
  - Split lymphoid and BMT?
  - Expand BM component to reflect integrated reporting in HMDS setting?
  - Need to separately survey those working in HMDS and those not – different EQA requirements?

- Feedback and poor performers:
  - Registration with RCPath?
  - Formal mechanism for recognising and feeding back to poor performers?

- Which type cases should be included:
  - Routine work?
  - Educational / Rare?
  - Both?

References

- RCPath Professional Practice Directorate, QAPC and NQAAPs – temporary pause in activity, Position Statement, 2025

- Principles and guidance for interpretive external quality assessment schemes in laboratory medicine, RCPath Professional Standards Department, 2017

- BLPG EQA | Virtual Pathology at the University of Leeds

Developing the NHS GMS to deliver for Haem-Onc patients

Alexandra Pickard, Deputy Director, Genomics Unit, NHS England

February 2026

Genomics has an important role to play in delivering the 10 Year Health Plan

The 10 Year Health Plan for England and the Life Sciences Sector Plan set out a number of bold commitments for genomics, aligned to the three strategic shifts that embody precision and personalised care.

Hospital to Community

1. Expand the NHS Genomic Medicine Service (GMS) to develop a **Genomics Population Health Service**
2. **Pharmacogenomics** will be **integrated** into routine **clinical practice** and be expanded to include population level testing.
3. Support the delivery of a number of **large-scale research studies** e.g. Generation Study, Adult Population Study

Analogue to Digital

4. **Develop a Unified Genomic Record** (linked to the Single Patient Record) integrating genomic data with relevant clinical and diagnostic data
5. Work with industry, academia, and other partners to **generate evidence** and **models of adoption** for genomic innovations
6. Expand and enhance the **UK's consented health research datasets** and develop the cutting-edge infrastructure

Sickness to Prevention

7. **Cancer patients** will receive a **comprehensive genomic analysis** and molecular profiling
8. **Reduce the diagnostic odyssey** experienced by some patients with rare diseases
9. **Upskill the broader healthcare workforce** to make genomic medicine common place and increase equitable uptake
10. Begin implementing **Integrated Risk Scores** that bring together polygenic risk scores and other non-biological risk factors

Genomics is at the heart of the transformation

What the National Cancer Plan means for genomics

The plan has a strong focus on genomics and recognises the role that it will play in transforming cancer care for patients, building on the commitments in the 10 Year Health Plan.

We will become a global leader on cancer survival by 2035

- **Cancer patients** will receive a **comprehensive genomic analysis** and molecular profiling
- Data in the NHS App will help consolidate imaging, pathology, **genomics**, and care plans
- **Extend ctDNA and other biomarking testing to other cancers** (subject to efficacy and value for money)
- We will begin to risk stratify the cancer pathway. E**veryone can have a dynamic cancer risk profile.**
- Create new opportunities for **cancer staff to develop their knowledge of** emerging technologies, including **genomics**.

Delivering world class cancer care through world class research

- We are already seeing progress in cancer vaccines through the Vaccine Innovation Pathway and **Cancer Vaccine Launch Pad and will deliver up to 10,000 cancer vaccines by 2030.**
- The NHS GMS will make sure that patients are tested for **suitability for trials** at the **start of their cancer pathway as part of routine genomic testing.**
- Genomics England will work with the NHS GMS to **populate the National Genomic Research Library,** to make cancer genomic data available to researchers and industry to drive up **diagnostic discovery** and the **identification of new treatments**

Rare and less common cancers

- Extend new, more proactive approaches to **identifying people who are at greatest risk of developing these cancers** – based on family history, symptoms or behavioural risk factors, and offer them regular checks
- We will **speed up access to targeted and personalised therapies** for rare cancers

Children and young people

- Make **children and young people's genomics a core deliverable for the NHS GMS** to ensure specialist support and surveillance is available nationally.

Challenges we face – to deliver the genomics commitments

Delivering change at scale and with the right level of investment

Delivering comprehensive genomic testing to inform diagnosis and access to precision medicine

Ethical challenges

Working at speed of public acceptance

Choice and consent

Central role for public

Equity of access

Retaining public trust

Creating a societal 'contract' for people to share their genomic data

Ensuring appropriate governance frameworks

Diversity of data

Ensuring equal benefit to everyone

Including diverse participants

Engaging relevant communities

Managing expectations

Turnaround times

Time needed to gather evidence before Implementation

Level of digital change required to connect genomic and clinical data in real time

Type of diagnostics required

Evolving the NHS Genomic Medicine Service delivery model from April 2026

NHS GMS model

There are 7 NHS GMS geographies, each led by a leading academic hospital, with the CEO as the SRO.

NHS Genomic Laboratory Function
Delivering high quality testing set out in the Test Directory

Clinical functions
Bringing together expertise to embed genomics and transform pathways

- Cancer
- Rare disease
- Population health

Enabling functions, including embedding **patient and public involvement** throughout the model

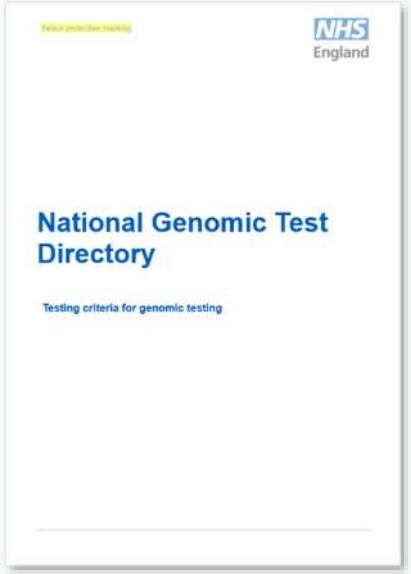
- Data and digital
- Transformation and service improvement
- Workforce, education and training
- Science, research and innovation

Commissioned by a national NHS Genomics Unit
Providing national investment, setting national strategy and standards and annual delivery priorities

Delivering across 7 geographies

Delivery Across The Care Continuum
- 228 Secondary Care Hospital Trusts
- 6400 Primary Care Practices
- Covering Population Sizes 5 -11 Mil

Nationally commissioned testing offer



The National Genomic Test Directory
A comprehensive genomic testing offer – includes testing for over 7000 rare diseases and 200 cancers.
Outlines the eligibility criteria, indications and the test method that is funded.
Testing is available across the life course

Specific HaemOnc NHS GMS Service Specification Requirements

- In line with NICE Guidance (NG47) it is expected that all Haematological Malignancy tests (molecular/genomic and non-molecular) will be ordered via a SIHMDS, with analysis and interpretation and reporting delivered under the governance of the NHS GMS although this may be undertaken in a distributed fashion in conjunction with the SIHMDS as per local agreement and all results will be integrated into a final report in the SIHMDS.
- The genomic testing associated with haemato-oncology services will be consolidated into a single laboratory in each NHS Genomic Laboratory Testing Service **with the exception of those tests where a rapid turnaround time is required** (as outlined in the Test Directory) where an agreement with the Commissioner will need to be made.

National haem-onc genomic testing delivery model

)			Should be consolidated to single lab per GLH (as per service spec)	Should be consolidated limited number of GLH labs (as per service spec)
Rapid (3 day TAT) tests: - *FLT3 / NPM1* - Urgent FISH	**Cytogenetics**: - Karyotyping - FISH	**High volume non-panel longitudinal tests:** - Chimerism - *BCR::ABL1* MRD	**NGS assays / Specialist assays** - All panel tests - Array - Clonality / IGHV - MRD	**Specialised services** - dWGS - rare MRD - *BCR::ABL1* TKD - Histiocytosis
Notes: If transport pathways are not available to meet rapid TAT, these could remain in the SIHMDS but only where sustainable & cost effective.	Notes: These assays require both specific equipment / facilities and interpretation expertise. Testing is expected to transition away from these technologies over the next GU contract period. Image distribution systems remain expensive; it may be appropriate for this to remain where the personnel are providing this is sustainable and cost effective.	Notes: Needs to be consolidated to GMS labs (which may include the SIHMDS); Large GMS geographies approved for a two-lab model may consider this more cost effective to remain of two sites. Movement of longitudinal assays requires substantial repeat work. If equipment / staff will remain in situ for other GMS assays it may be considered cost effective to maintain testing across two labs	Notes: HaemOnc NGS needs to be consolidated to a single GMS lab to meet maximum economic efficiencies. Larger, more comprehensive panels on NovaSeqs bring down cost. Consolidation creates sample capacity for multiple weekly runs to reduce TATs, & the need for rapid stand-alone tests. Specialist / expert tests need to be consolidated to a single GMS lab to allow economically efficient batching & clinically relevant TATs.	Notes: Will be delivered by <7 GLHs due to expertise / infrastructure required. Need to deliver in the most economic manner possible

HaemOnc Service Specification Response

Letters raising concerns and issues raised by BSH, BLPG, Blood Cancer UK, National SIHMDS Leads & Cancer Alliances

Met with Sue Pavord & John Ashcroft (President and Vice President BSH)

Listened to concerns around consolidation of SIHMDSs, TATs, NHS GLH accountability.

Misconceptions were discussed

Proposed ‘HaemOnc Oversight Group’ to lead and guide in this area.

Membership to be nominated to cover all groups with an interest

Manage NHS GMS accountability

Haem-Onc and Genomics Oversight Group

Purpose
To ensure delivery of the commitments above, close oversight between the NHS GMS and the HaemOnc community is required. Therefore, the purpose of the HaemOnc and Genomics Oversight Group is to:

- Provide strategic oversight of the direction and delivery of HaemOnc testing in the NHS, including a focus on the quality of testing, safety of delivery and impact on patient care;
- To create a forum for collaborative engagement with common aims and act as representatives to ensure there is two-way dialogue and feedback to the wider Haem-Onc community;
- Provide the expertise and strategic input to co-design delivery models that enable delivery of high quality genomic testing to improve patient access, deliver more comprehensive testing and drive efficiency and cost effectiveness;
- Provide support for each NHS GMS geography to achieve high standard services across HaemOnc ensuring that the needs for diagnostic outcomes for clinical decision making and access to precision medicines and clinical trials are met;
- Where appropriate, to facilitate and support the production of best practice guidance for HaemOnc Services

The group meets quarterly.

Membership:

- CSO and SRO for Genomics, NHS England (Chair)
- Deputy Director, Genomics Unit, NHS England
- NHS England Genomics Unit, Haem Onc Clinical and Scientific representatives and representative from Specialised Commissioning
- President, British Society for Haematology
- Vice President, British Society for Haematology
- Chair, British Lymphoma Pathology Group
- British Society for Haematology Laboratory Specialist Interest Group
- Chair, UK HMDS Network
- President, Royal College Pathologists
- Haem-Onc lead, Royal College of Pathologists
- Chief Executive Officer, Blood Cancer UK
- NHS GMS Haem-Onc medical leads
- NHS GMS Haem-Onc scientific representatives

End-to-End regional service review

Objectives:

- To understand the current status of Haem-Onc testing within each NHS GMS region
- Co-develop a model for genomic testing that algins with NHS GMS Service Specification requirements and enables a safe and efficient service to be delivered for patients
- Agree action plan required to deliver the co-created model
- Improve communication and engagement between NHS GMS and SIHMDs across the region

Next steps:

- Emails have been sent out to NHS GMS Ops Director and HaemOnc Lead Clinician and Scientist
- Invite to be shared with all SIHMDS leads / stakeholders within the geography
- At this first meeting we are keen to understand:
    - the HaemOnc genomic testing strategy within your region
    - the levels of consolidation achieved already
    - the proposed future consolidation
    - the communication between the SIHMDSs and the NHS GMS
    - areas of success and
    - areas that still require further work
- Progress on the service reviews will be reported to the Oversight Group in April

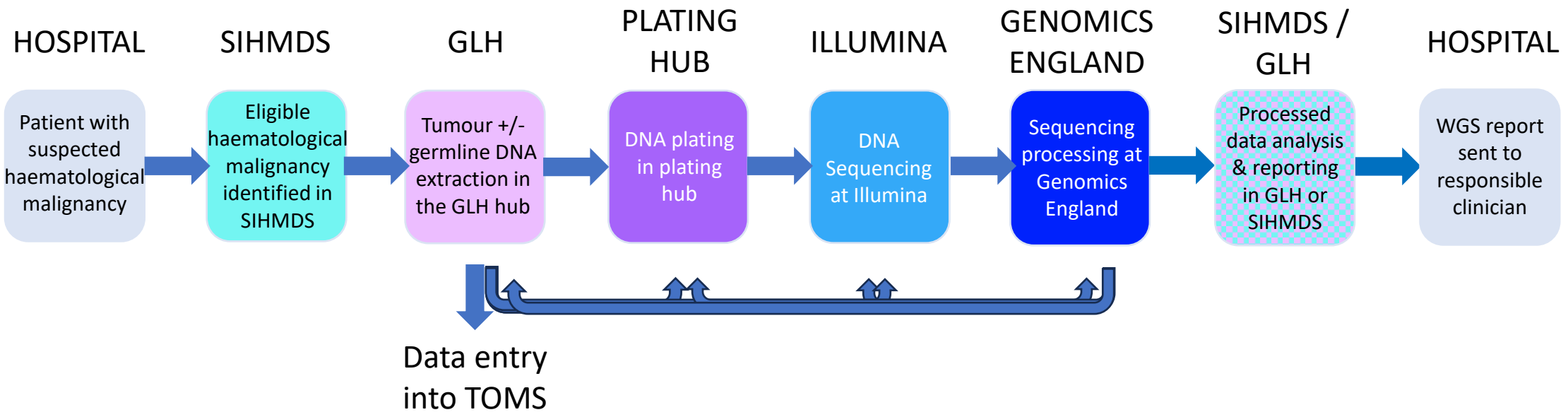
Haem-Onc WGS provision post-April 2026

Dr Angela Hamblin
Consultant Haematologist, Oxford University Hospitals NHS Foundation Trust
Clinical Lead for Haematological Malignancies, Central & South Genomic Laboratory Hub
Principal Clinician for Molecular Haematology & Oncology, Genomics England
Senior Clinical Research Fellow in Translational Genomics, University of Oxford

Haematological Malignancy Diagnostic Service (HMDS) Network meeting
27th February 2026

How WGS is delivered is changing……

Current scenario – centralized model



How WGS is delivered is changing……

More efficient model – distributed WGS (dWGS)

Sample initiates at SIHMDS

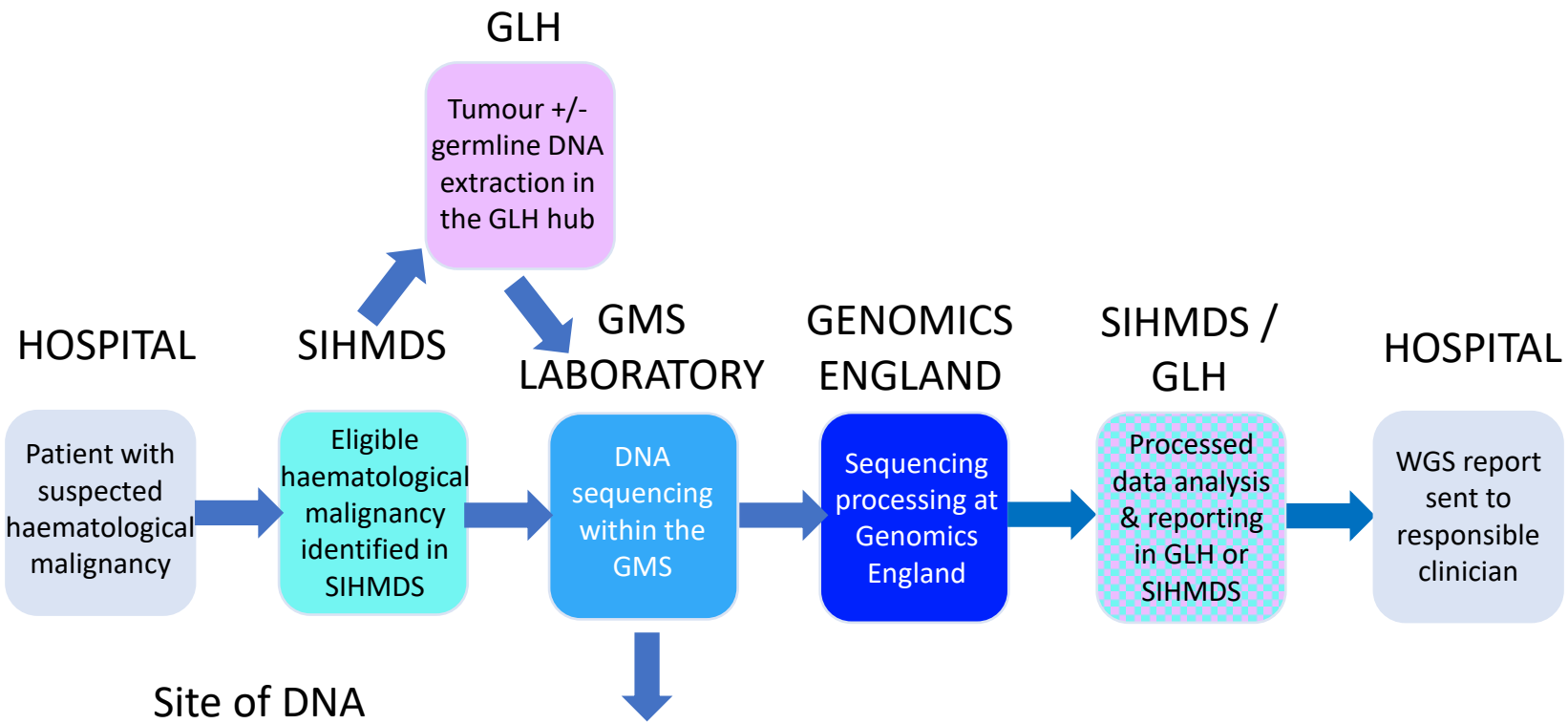
Sent directly to lab where sequencing will take place

Data transferred to Genomics England to go through their bioinformatics pipeline

Genomics england

Pipeline output enhancements and transferred to relevant GLH / SIHMDS for analysis and reporting

How WGS is delivered is changing……

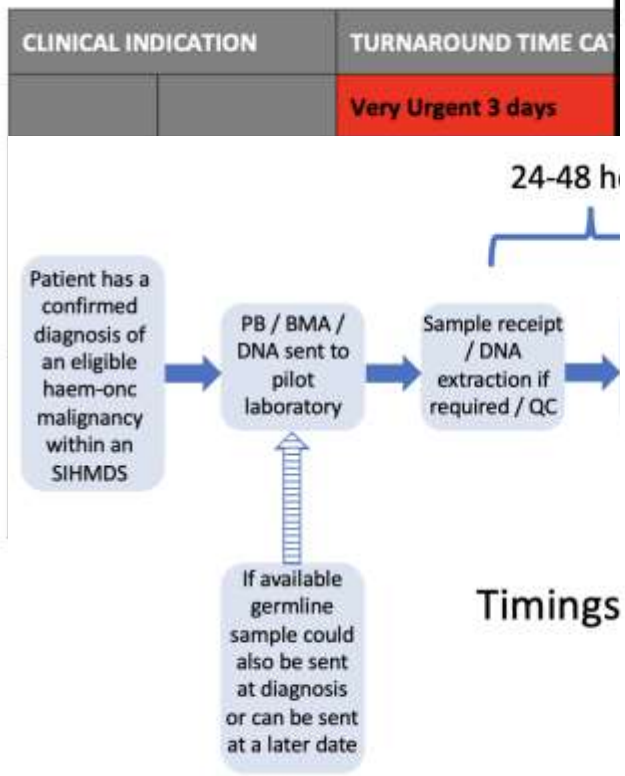


Between April & October – transition away from Illumina and toward GMS laboratory provider

Part of a suite of changes to enhance the clinical utility of WGS

GERMLINE REQUIREMENT → TURN AROUND TIME → COMPLETENESS OF DATA → COMPLEXITY OF ANALYSIS → COMMUNITY CONFIDENCE

TUMOUR



Pharmacogenomics:
TPMT & NUDT15

Genomics England

Next steps…..

- Getting towards the end of contract negotiations at which point sequencing lab for haematology will be known
- GMS will be informed of timelines for switch from Illumina to GMS lab
- GMS / SIHMDS to determine pathways to achieve most clinically relevant TATs

- Further improvements on horizon e.g. using 3 day FISH test to inform ploidy calling

HaemOnc Network of Excellence NoE

Polly Talley

Background

During 2023/24 the NHS will, as part of the evolving NHS GMS Alliance infrastructure, establish 'NHS Genomic Networks of Excellence'

DISCOVERY | TRANSLATION | ADOPTION | DIFFUSION

NHS Genomic Networks of Excellence will be partnerships between the NHS, academia, the third sector and industry to **generate evidence and models of adoption for new technology and testing** and, clinical and laboratory practice in defined topic areas of **strategic importance.** In 2023/24 we expect to fund up to £6m worth of work packages.

NHS Genomic Networks of Excellence will:

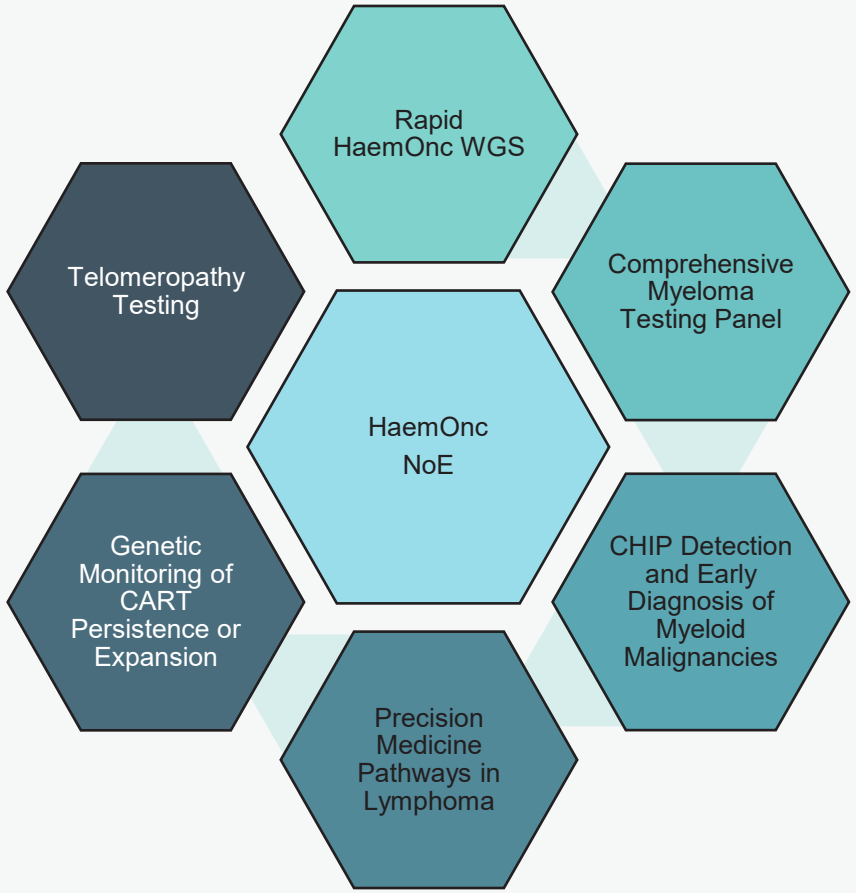
- **be led jointly by at least two NHS GMS Alliances**, with leadership from senior clinical/scientific academic experts in the topic area, working together to agree an overall programme of work;
- **generate evidence on new technologies** and testing and/or best practice in a defined topic area of strategic importance;
- **develop models of adoption** for proven new technologies and/or clinical and laboratory practice which can be **implemented across the NHS GMS**;
- **bring together academia, third sector and industry partners** who are working or have an interest in the topic area, so that expertise, efforts, resources and delivery can be aligned and leveraged; and
- connect with other NHS GMS Alliances and the wider NHS GMS, as is required, to **generate evidence and develop models of adoption**.

HaemOnc Network of Excellence

Rapid HaemOnc SR WGS
SIHMDS straight to sequencing lab, transfer data to GEL
?Domain 0 to speed up analysis
Tumour first / early
Further phases to explore local pipelines, RNA seq and LRS.
Aiming for TAT of ~7 days

Accreditation of telomere length assay (ddPCR)
Utility in diagnosis of aplasia and bone marrow failure syndromes
Gap in test provision in NHS in England
D Yallop (SE) & J Bartram (NT)

Validation and accreditation of ddPCR light chain assay to monitor CAR-T
Correlation with clinical response and inform where to implement augmentation strategies
D Yallop (SE) & C Wragg (SW)



Single DNA panel determines SNV / CVs / SVs in broad range of myeloma targets
Current provision of genomic testing is by FISH – high failure rate & limited data return
Enhanced prognosis and in-time therapy choice
A Hamblin / S Gooding / K Ramasamy (C&S)

Development of guidelines of who to screen for CH
Implementation of MN risk prediction tool
Development of national database
Implementation of high through-put screening panel
C Cargo (NEY) G Vassiliou (E)

Implementation of GEP for diagnosis / prognosis
Implementation of NGS panels
Development of ctDNA
Broader implementation of WGS
C Burton (NEY) L Raso-Barnett (E)

HaemOnc NoE

HaemOnc NoE work packages have been funded in full.

Two years funding. Start date of 1st April 2024.

C&S and NEY GMSA to joint project manage the NoE.

All work packages have the aim of an outcome to benefit all GLHs

Majority of GLHs involved in the individual work packages.

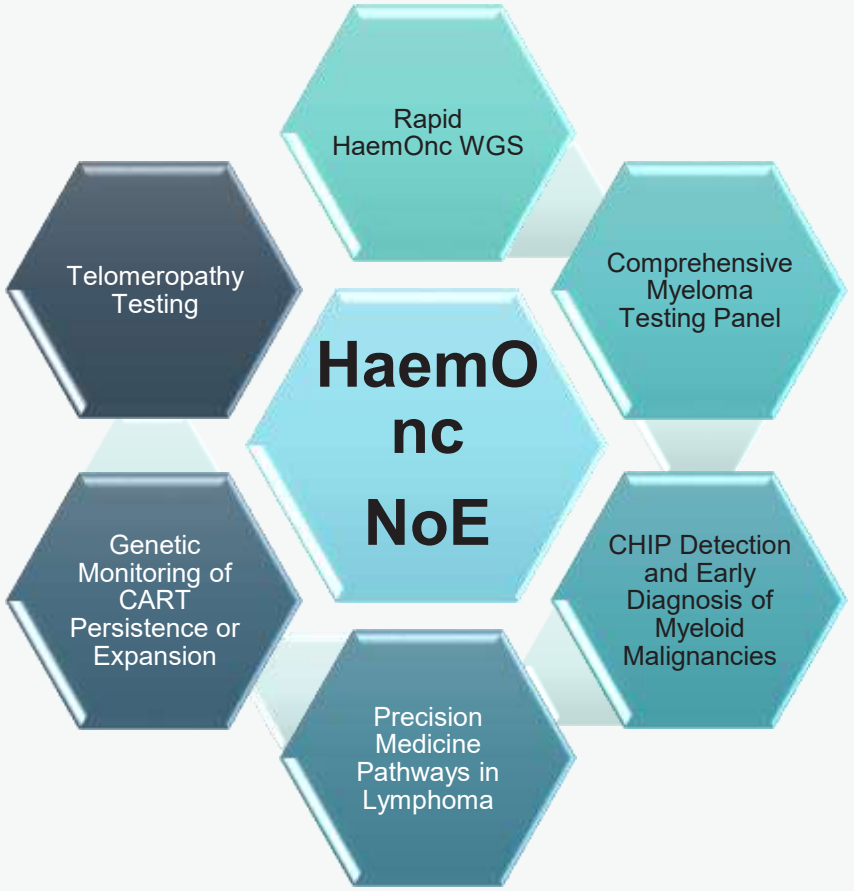
NHSE HaemOnc WG to be included as part of the governance structure.

Mid-term Webinar held to share progress – 21st March 2025

Due to complete March 2026

Invited to submit EoI and then business case for future iteration of the NoE

HaemOnc Network of Excellence

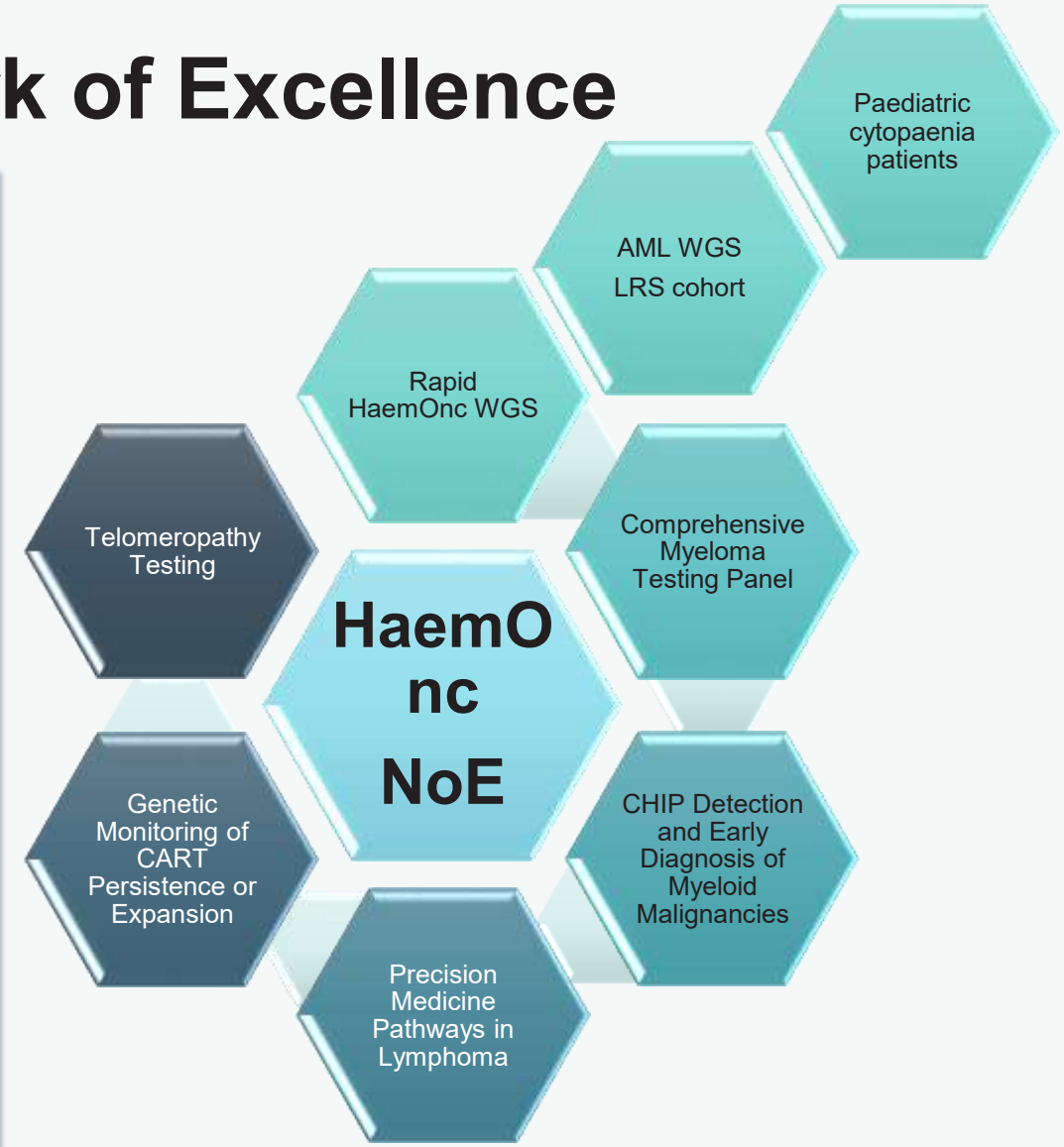


HaemOnc Network of Excellence

WP1 plans to deliver two further activities:

- generating the evidence that WGS is ready for standard of care (SOC) testing for AML. Continue sequencing samples from patients enrolled in the national AML MyeCare Registry
- undertake long-read sequencing (LRS) on a subset of patients) to evaluate the feasibility of adaptive sequencing.

- assess paediatric patients presenting with cytopenias who often have a combination of rare germline and somatic aberrations. This aims to comprehensively cover the germline analysis delivered for these patients as well as the somatic aspect of the diagnosis

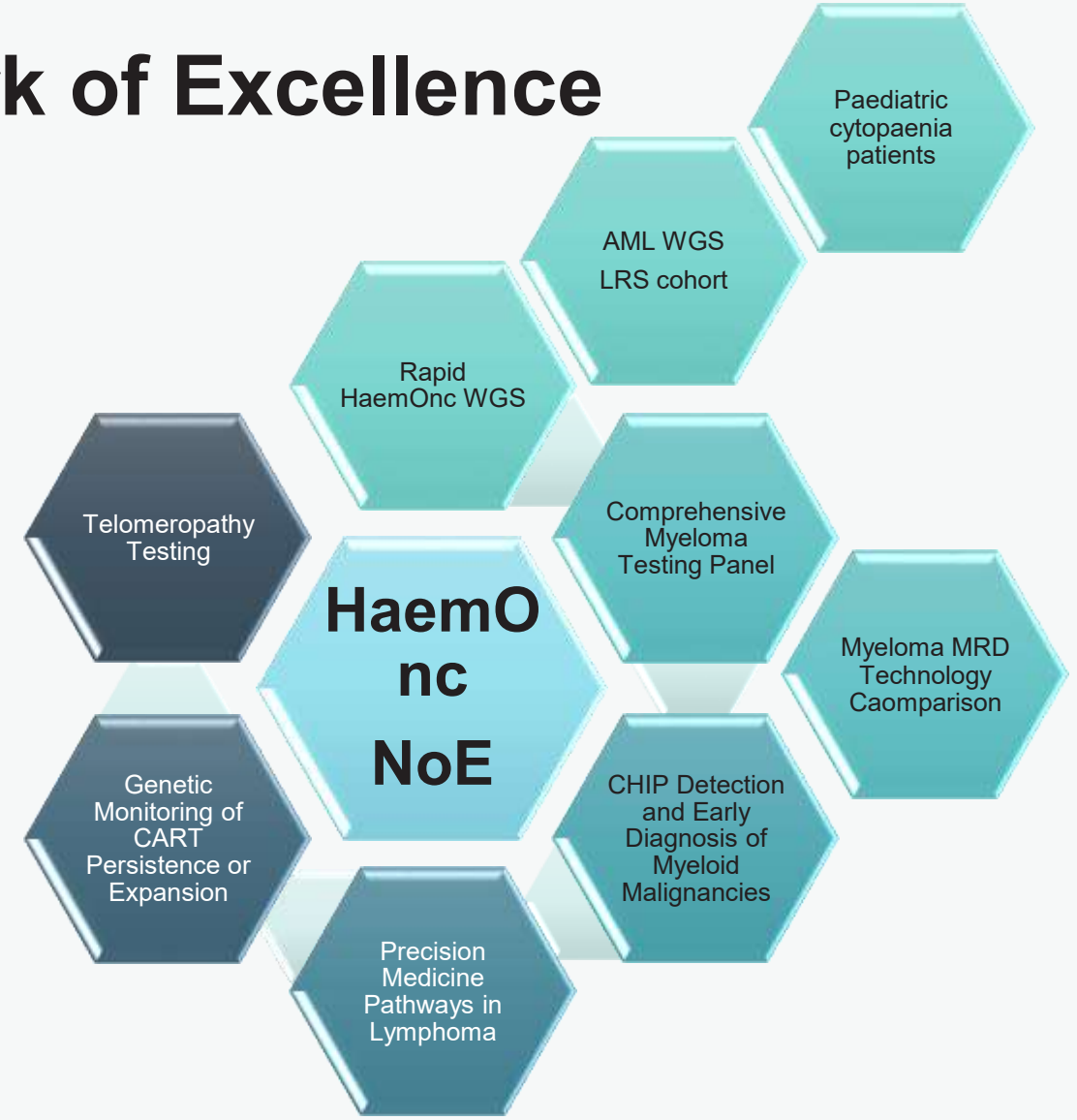


HaemOnc Network of Excellence

WP2 plans to move into the measurable residual disease (MRD) space for myeloma. This WP will aim to:

- evaluate DNA and protein-based MRD assays against conventional immunophenotyping

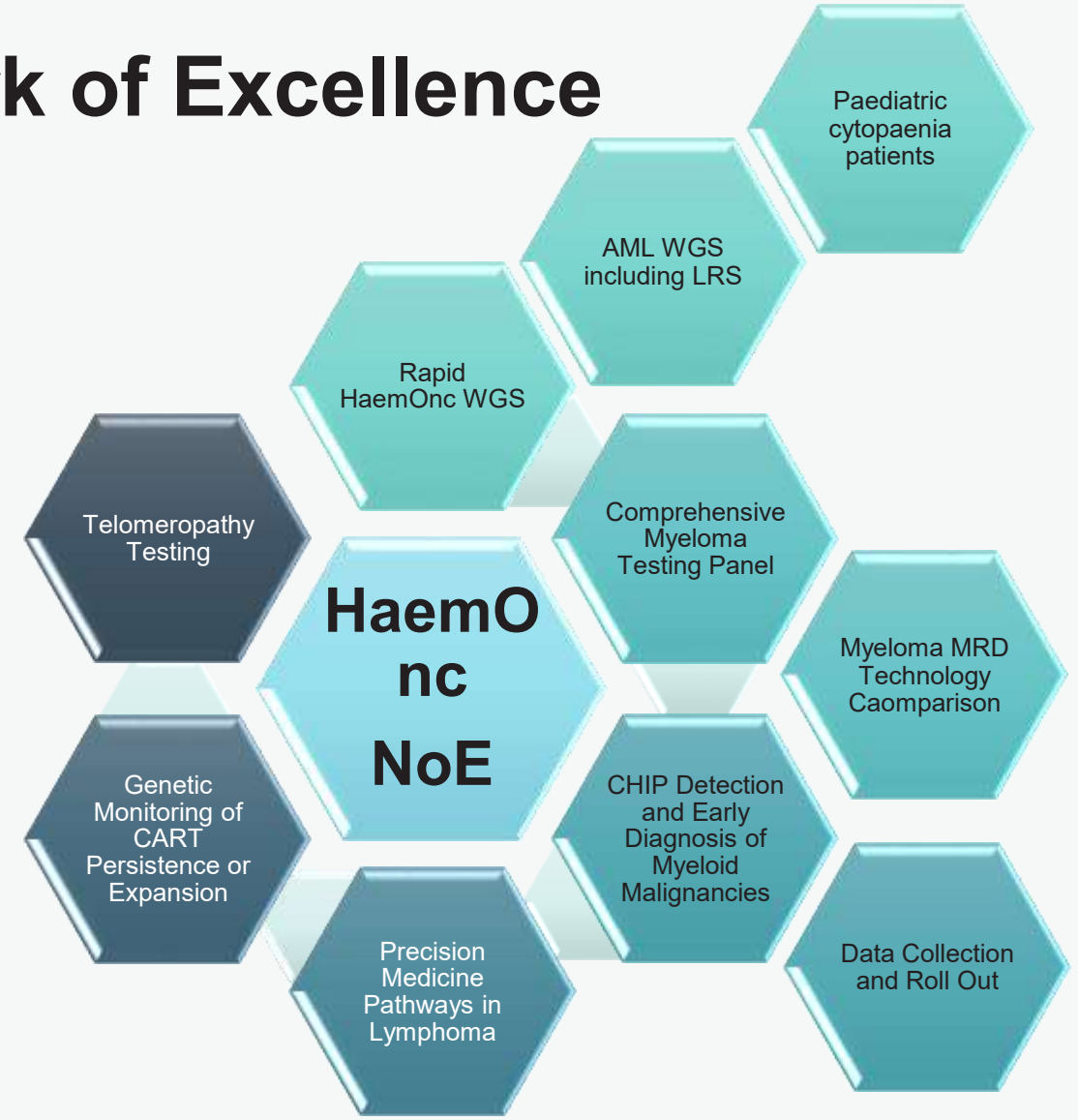
- to determine which approach is the most reliable and deliverable within the NHS to assist in therapy decisions (eg cessation in deep remission preventing toxicity and reducing cost)



HaemOnc Network of Excellence

WP3 has developed a database as well as completing the complex ethics and CAG approval process for data collection

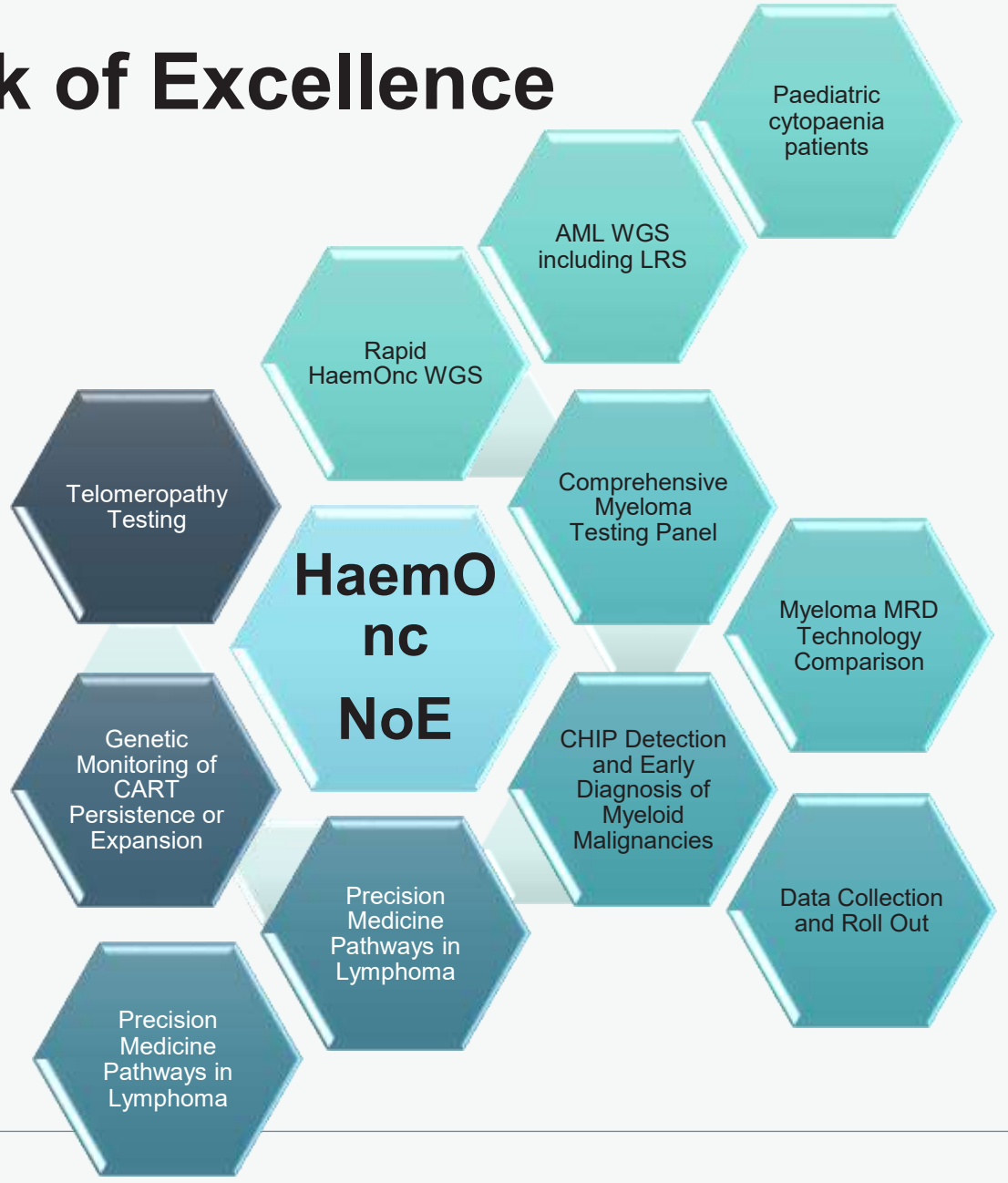
This WP plans to move into the data collection and roll out phase to ensure this important development is available nationally through the MDS expert group.



HaemOnc Network of Excellence

WP4 aims to build on the work already completed. A lymphoma NGS panel has been designed and set up and importantly patient cases are being assessed and reviewed through a GTAB in order to collate the clinical benefit for patients. ctDNA is lymphoma is proving valuable in the research setting and the WP proposes to create NHS implementation plans for this area of work

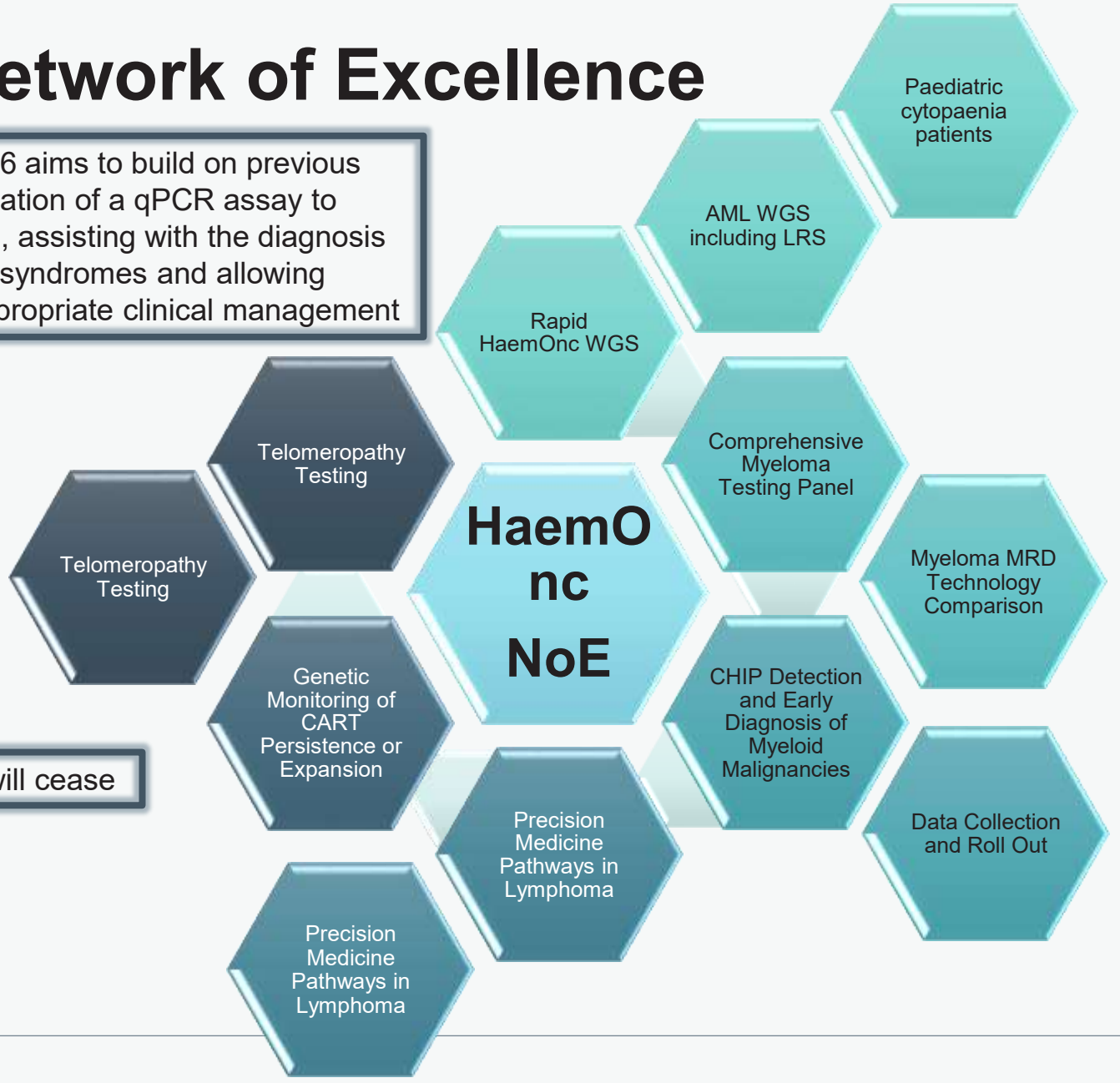
We have been asked to slightly amend this WP to ensure the most clinically relevant aspects are those taken forward



HaemOnc Network of Excellence

The telomeropathy WP6 aims to build on previous work with the final validation of a qPCR assay to assess telomere length, assisting with the diagnosis of bone marrow failure syndromes and allowing earlier instigation of appropriate clinical management

WP5 is complete and will cease

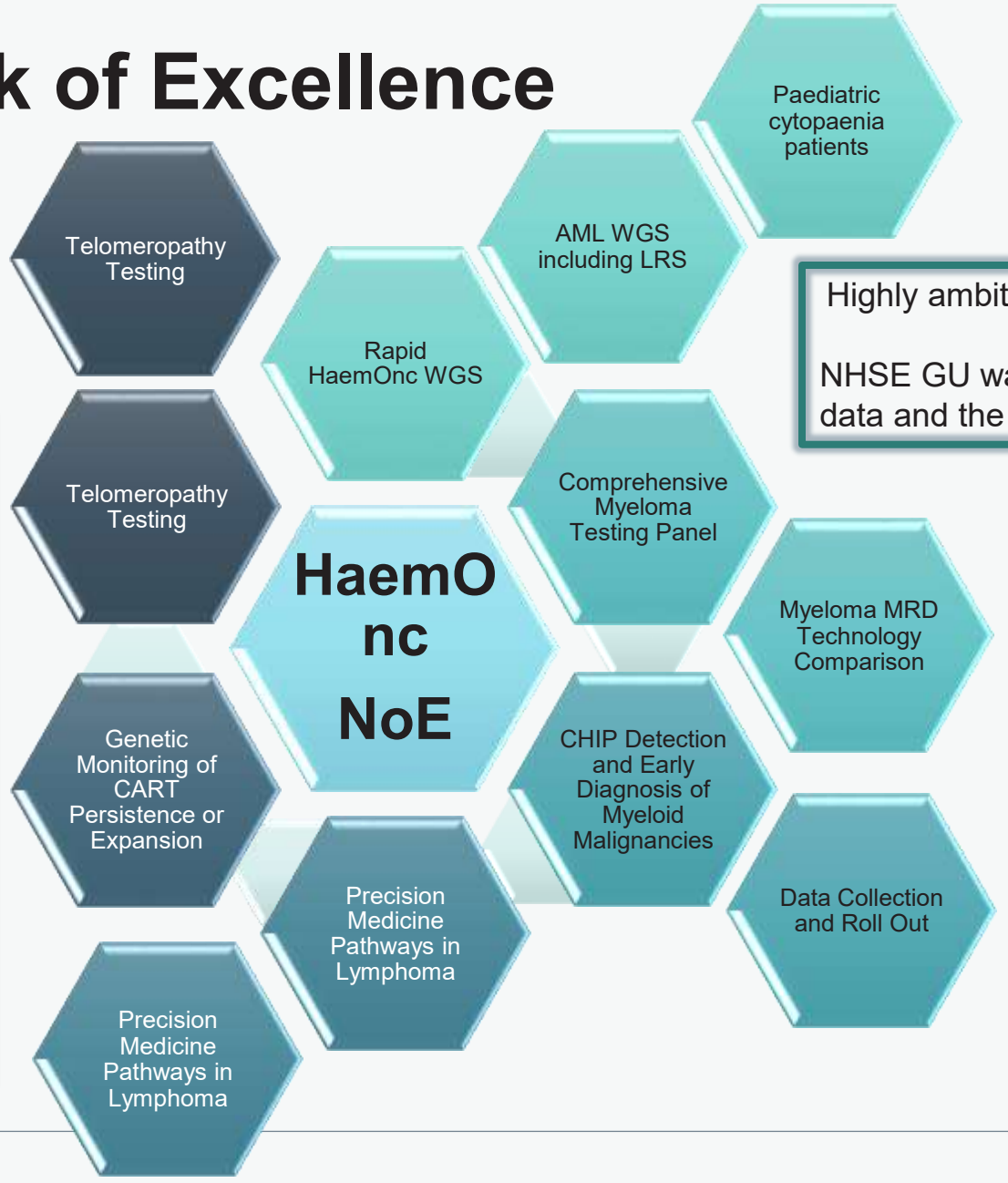


HaemOnc Network of Excellence

HOP-VINE

A new HaemOnc Predisposition and Variant Interpretation Network of Excellence (HOP-VINE) work package was proposed in the predisposition space.

This seeks to develop the infrastructure for secure data collation and integration of germline and somatic variants, refine the relevant variant interpretation guidelines, evaluate clinical pathways for confirmatory testing and cascade screening and develop appropriate educational resources and workforce training.



Highly ambitious but the finances are currently prohibitive.
NHSE GU want to explore this in the data and the need is recognsed

HaemOnc NoE

HaemOnc NoE has been funded for 2026-2028

Some modifications to the business case have been requested

C&S and NEY GMS to continue to joint project manage the NoE.

All work packages have the aim of an outcome to benefit all GLHs

Majority of GLHs involved in the individual work packages.

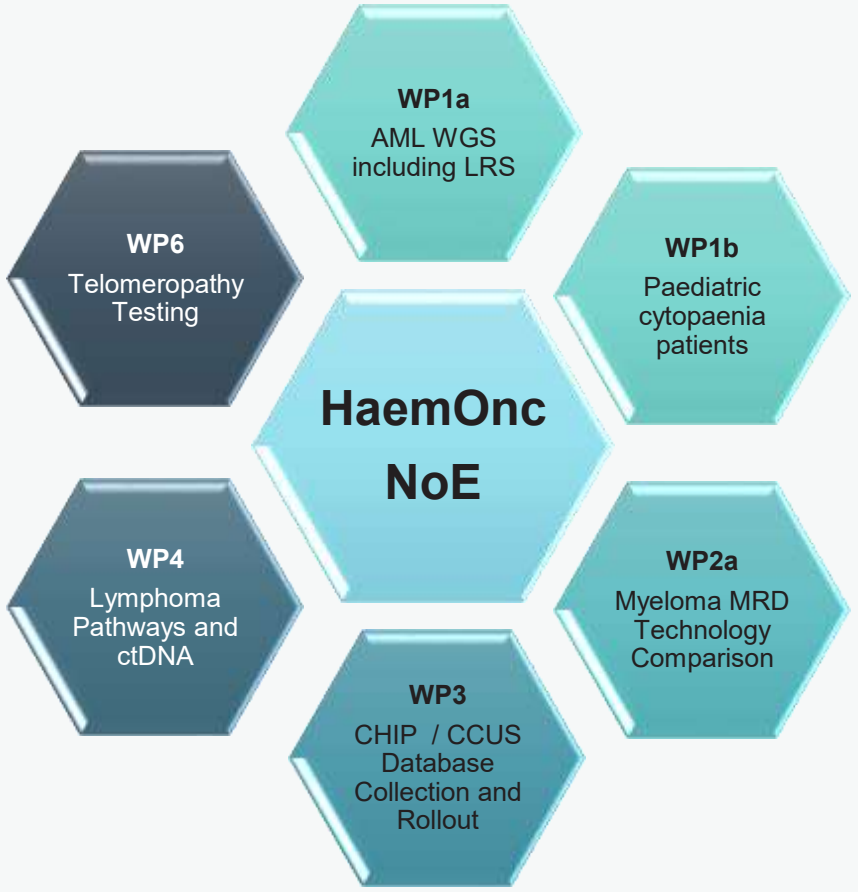
NHSE HaemOnc WG to be included as part of the governance structure.

HaemOnc Network of Excellence 2026-2028

WP6
- final validation of a qPCR assay to assess telomere length, assisting with the diagnosis of bone marrow failure syndromes.

WP4
- build on the clinical work (through the GTAB) assessing the value of lymphoma NGS panel testing in order to propose future TD direction
- ctDNA is lymphoma is proving valuable in the research setting and the WP proposes to create NHS implementation plans for this area of work

WP3
- move into the data collection and roll out phase to ensure this important development is available nationally through the MDS expert group.



WP1a
- generating the evidence that WGS is ready for SOC testing for AML. Sequencing samples from patients enrolled in the national AML MyeCare Registry
- undertake long-read sequencing (LRS) on a subset of patients) to evaluate the feasibility of adaptive sequencing.

WP1b
- assess paediatric patients presenting with cytopenias who often have a combination of rare germline and somatic aberrations

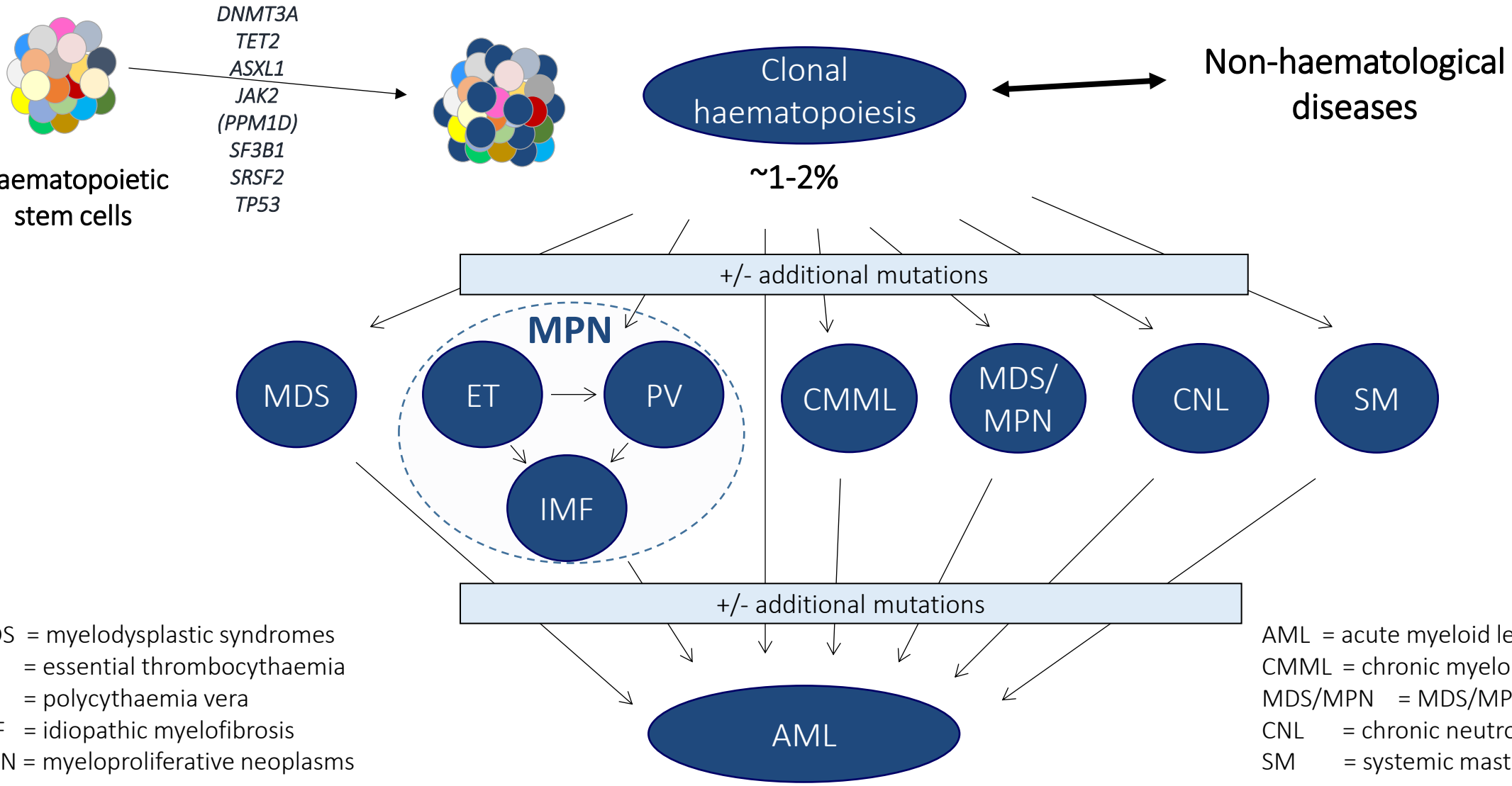
WP2a
- evaluate DNA and protein-based MRD assays against conventional immunophenotyping to determine which approach is the most reliable and deliverable within the NHS.

Detection of Clonal Haematopoiesis & Early Diagnosis of Myeloid Malignancies

Dr Catherine Cargo

Clinical Lead HaemONC NE&Y GLH

Clonal haematopoiesis & myeloid neoplasms

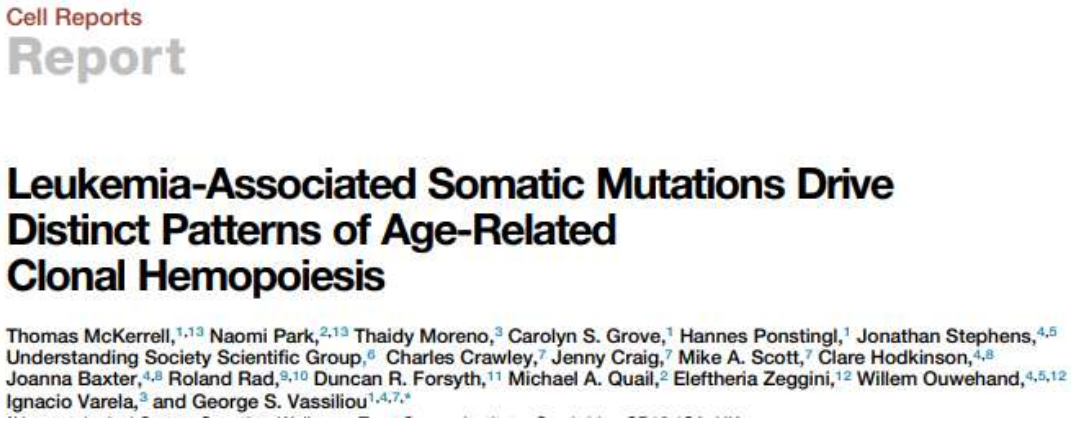


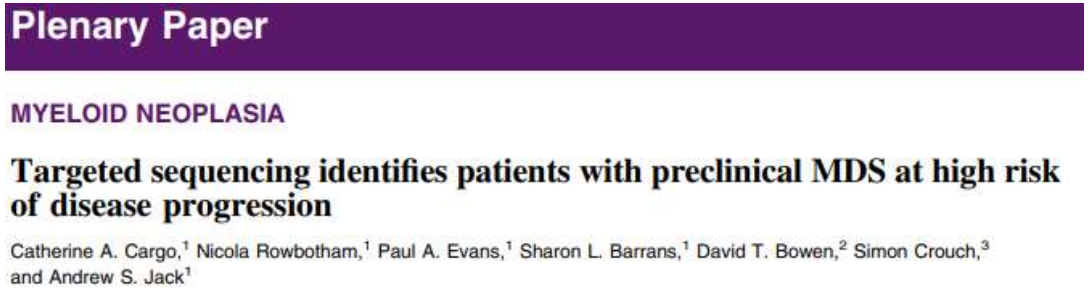
MDS = myelodysplastic syndromes
ET = essential thrombocythaemia
PV = polycythaemia vera
IMF = idiopathic myelofibrosis
MPN = myeloproliferative neoplasms

AML = acute myeloid leukaemia
CMML = chronic myelomonocytic leukaemia
MDS/MPN = MDS/MPN with neutrophilia
CNL = chronic neutrophilic leukaemia
SM = systemic mastocytosis

Background

- CHIP and CCUS now recognised entities in the WHO and ICC
- Individuals with CH have significantly higher risk of progression to myeloid malignancies and worse overall survival
- Currently no clear guidance on which patients should be screened and how these patients should be managed
- Need for large population-based datasets to increase our knowledge of the natural history of these conditions
- Inform predictive tools and identify high risk patients who may benefit from intervention





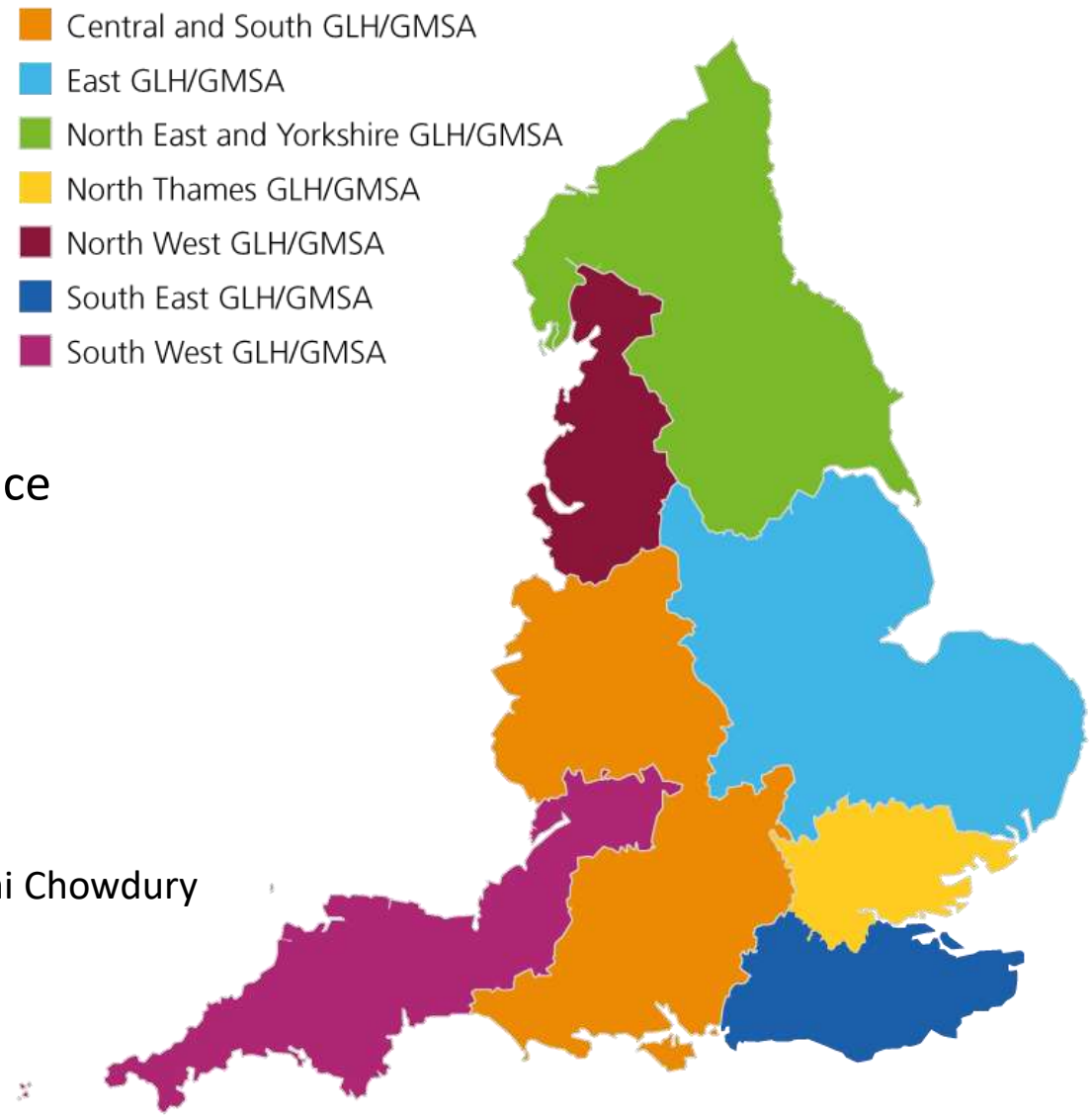
Aims

- Harmonise the detection and management of patients with CHIP and CCUS nationally
- Translate the extensive genetic and experimental research into the clinical field
- Create the infrastructure and patient cohorts to facilitate interventional studies in myeloid cancer prevention and improving outcome

Clinical Network for myeloid cancer prevention

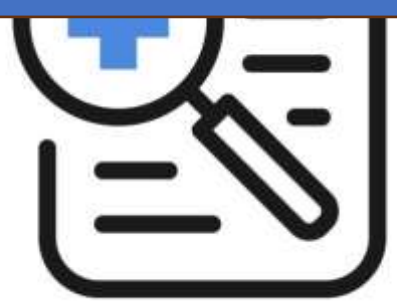
- Representation from across the UK
- Meets every 3 months – alternative meetings face to face

- Regional Clinical Representative
  - **North East and Yorkshire** Dr Catherine Cargo
  - **East** Prof George Vassiliou
  - **North West** Dr Dan Wiseman
  - **Central and South** Dr Manoj Raghavan / Dr Oni Chowdury
  - **North Thames** Dr Beth Payne
  - **South East** Dr Lynn Quek
  - **South West** Dr Tom Coates



Clinical Network for Myeloid Cancer Prevention

Development of clinical guidelines



Development of patient information

Coordination of national database

Develop rapid panel to potentially screen healthy individuals for CHIP

Development of clinical resources

Clonal Haematopoiesis: Information Booklet

Key facts about Clonal Haematopoiesis

Clonal Haematopoiesis (CH) is a very common condition and most people will develop it in their lifetime, without ever being aware of it. It's important to know that:

- CH is not in itself a type of blood cancer.
- CH does not usually have symptoms and shouldn't affect daily life.
- There is a risk that CH can develop into a type of blood cancer, but this is rare.

This booklet will help you understand what CH is and what it means for you.

1. What is Clonal Haematopoiesis?

Our blood is made up of trillions of white blood cells, red blood cells and platelets, most of which are short-lived and need to be continuously replaced by a process known as **haematopoiesis**, the medical term for **blood-making**. Haematopoiesis takes place in our bone marrow and generates more than 200 billion new blood cells every day. All these blood cells are continuously produced by a much smaller number of long-lived cells known as **blood stem cells**. When we are young, we have about 100-200 thousand active blood stem cells. As we age, this number decreases.

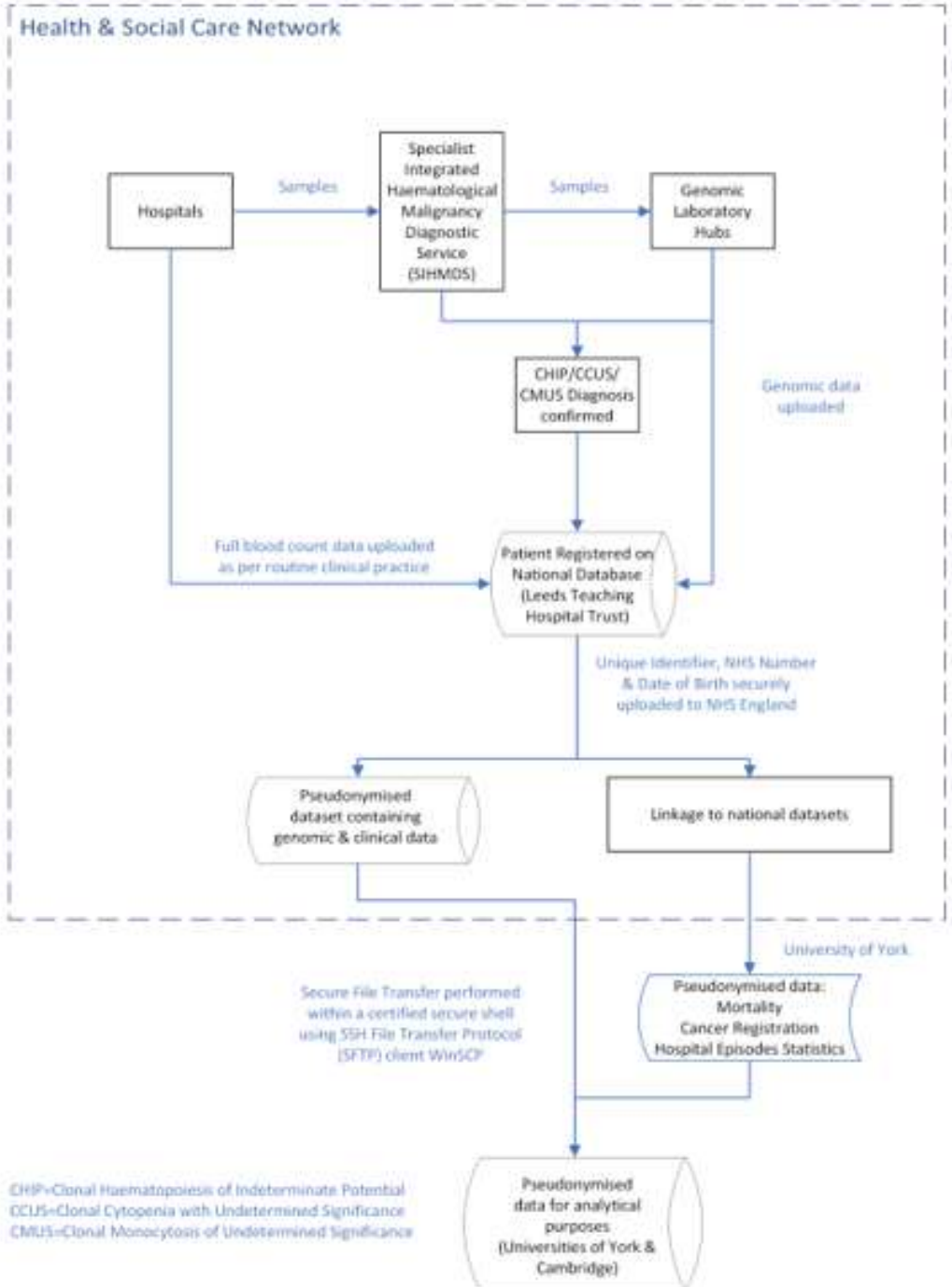
National CH database

The genomics structure and SiHMDS network in England provides a unique opportunity to explore clonal haematopoiesis at a population-based level

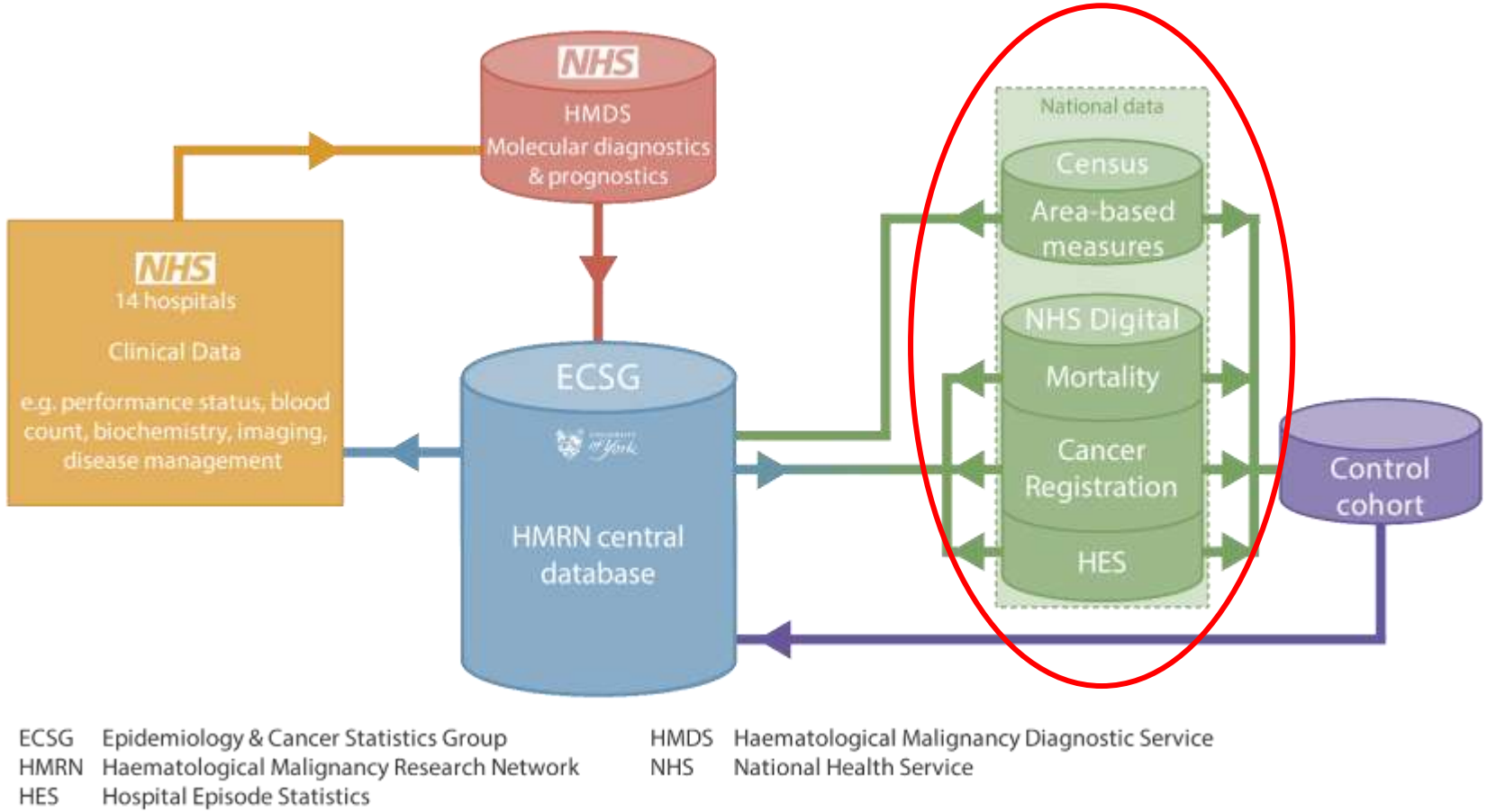
Specific Objectives

1. To register all patients (retrospectively and prospectively) with CH across England on a centralised database, linking to genomic data and to collect longitudinal blood count data measured as per the patient's normal clinical care
2. To link these patients to national dataset including Hospital Episode Statistics (HES), cancer registration and mortality to obtain information on health outcomes.
3. To examine the association with longitudinal laboratory and clinical data with data on health outcomes

Ethics and CAG approval obtained to register patients without explicit consent to ensure the database is representative of the whole population



Data Collection & Linkages will mirror what we do for the regional registry – Haematological Malignancy Research Network



Hospital Episode Statistics (HES) is a data warehouse containing details of all admissions, outpatient appointments and Accident and Emergency attendances at NHS hospitals in England & include clinical information about diagnoses (ICD-10) and operations.

Example of a Hospital Episode for a CCUS patient

Admission Date

Specialty

Diagnoses code (ICD-10)

Operation Code

HES APC Episode browser

Select episode: 552316 - 06/10/2017

Episode ID	552316	Spell ID	491728	Study ID	14-01877
Admission date:	06/10/2017	Admission Cat	NHS patient		
Admission Method:	Elective: planned				
Admission Source	The usual place of residence, including no fixed abode				
Discharge date:	06/10/2017				
Discharge method:	Discharged on clinical advice or with clinical consent				
Discharge destination:	The usual place of residence, including no fixed abode				
Main specialty:	Clinical haematology				
Treatment spec:	Clinical haematology				

Diagnoses

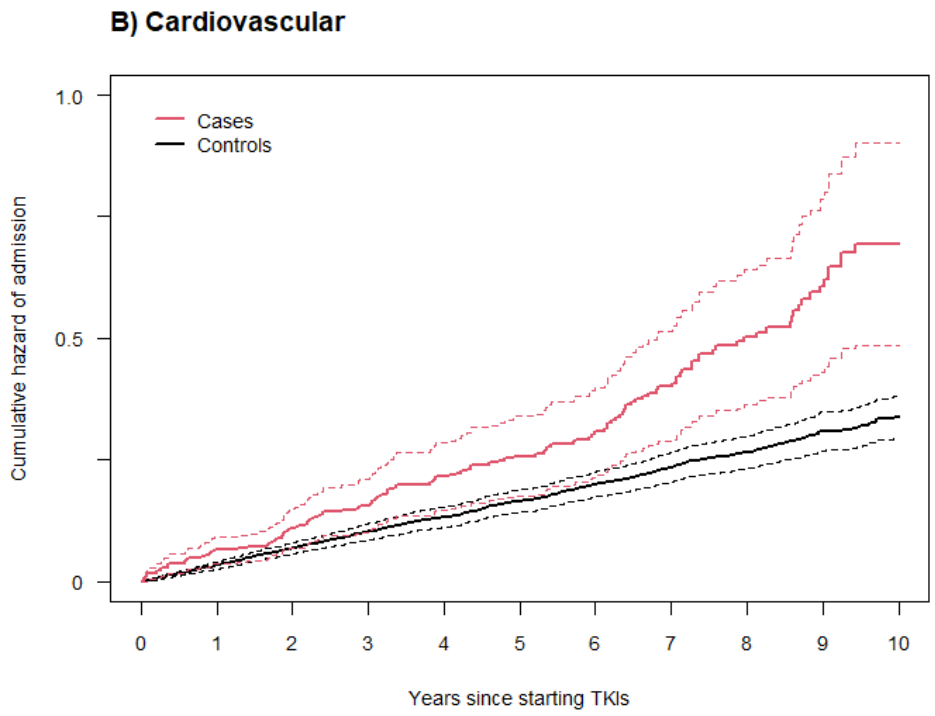
Epi ID	Diag #	Diag code	Diag Group	Diagnosis
552316	1	C920	Myeloid leukaemia	Acute myeloblastic leukaemia
552316	2	N189	Chronic kidney disease	Chronic kidney disease, unspecified
552316	3	J449	Other chronic obstructive pulmonary disease	Chronic obstructive pulmonary disease, unspecified
552316	4	I500	Heart failure	Congestive heart failure
552316	5	E119	Non-insulin-dependent diabetes mellitus	Non-insulin-dependent diabetes mellitus: Without complications
552316	6	I10X	Essential (primary) hypertension	
552316	7	I739	Other peripheral vascular diseases	Peripheral vascular disease, unspecified

Operations

Epi ID	Op #	Op date	Op code	Combo code	Code type	Description	v
552316	1	06/10/2017	X368	X368	Opertn	Other specified blood withdrawal	4.8

How national data can be used….

Cumulative hazard of admissions for cardiovascular disease in CML patients



Accepted International Journal of Cancer

Annual Rheumatology Episodes in lymphoproliferative disorders

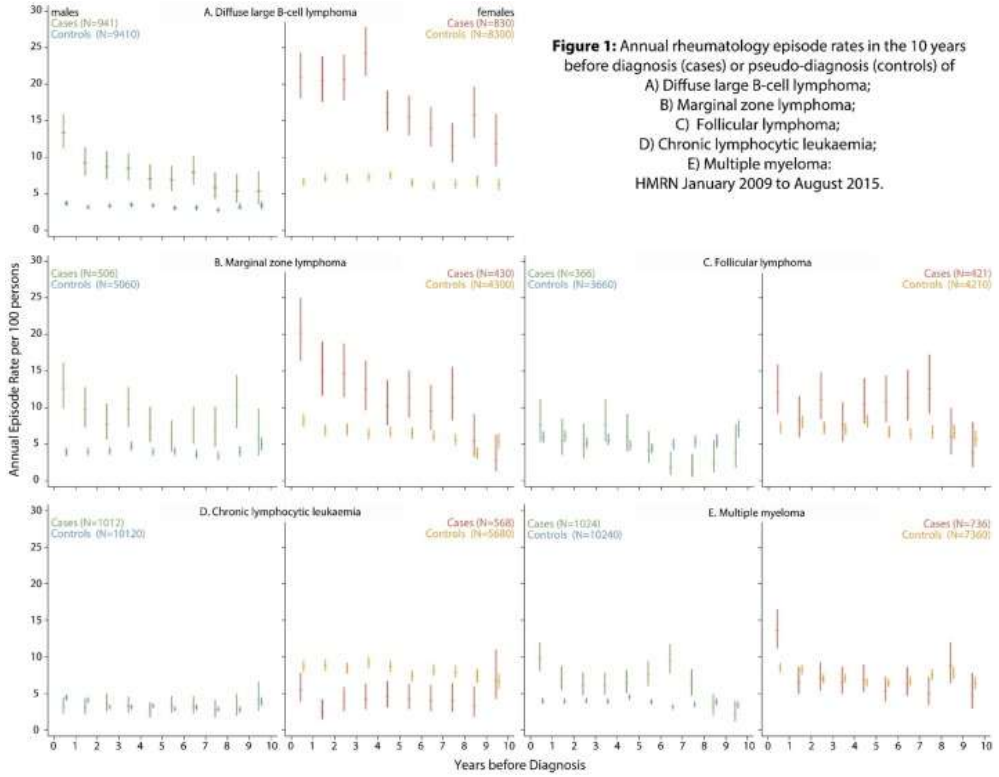
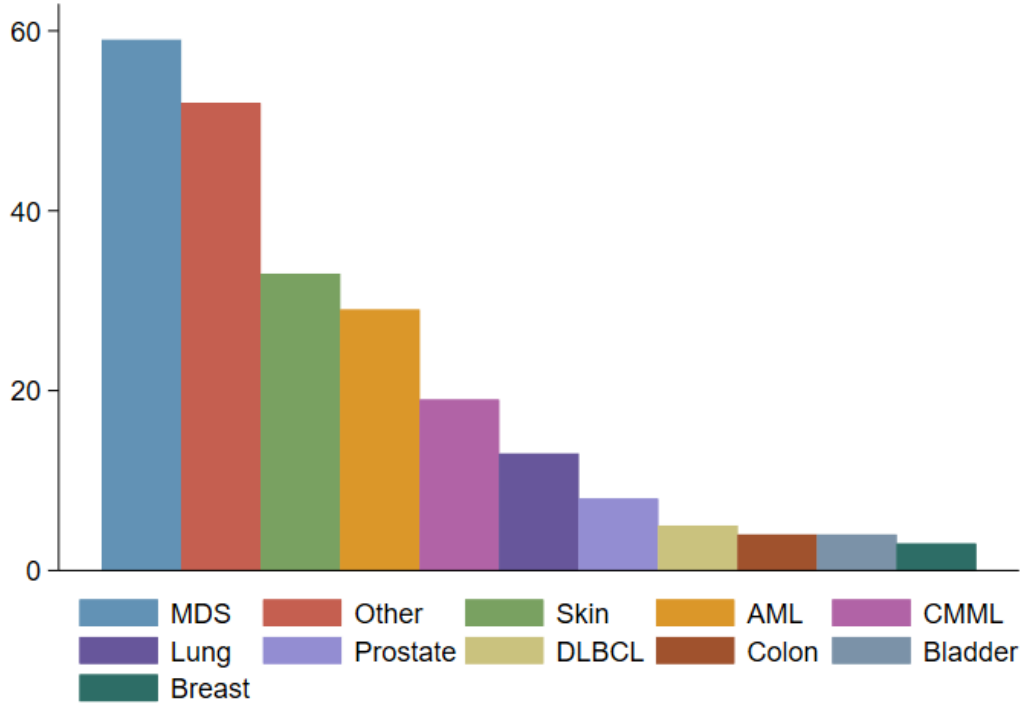


Figure 1: Annual rheumatology episode rates in the 10 years before diagnosis (cases) or pseudo-diagnosis (controls) of
A) Diffuse large B-cell lymphoma;
B) Marginal zone lymphoma;
C) Follicular lymphoma;
D) Chronic lymphocytic leukaemia;
E) Multiple myeloma:
HMRN January 2009 to August 2015.

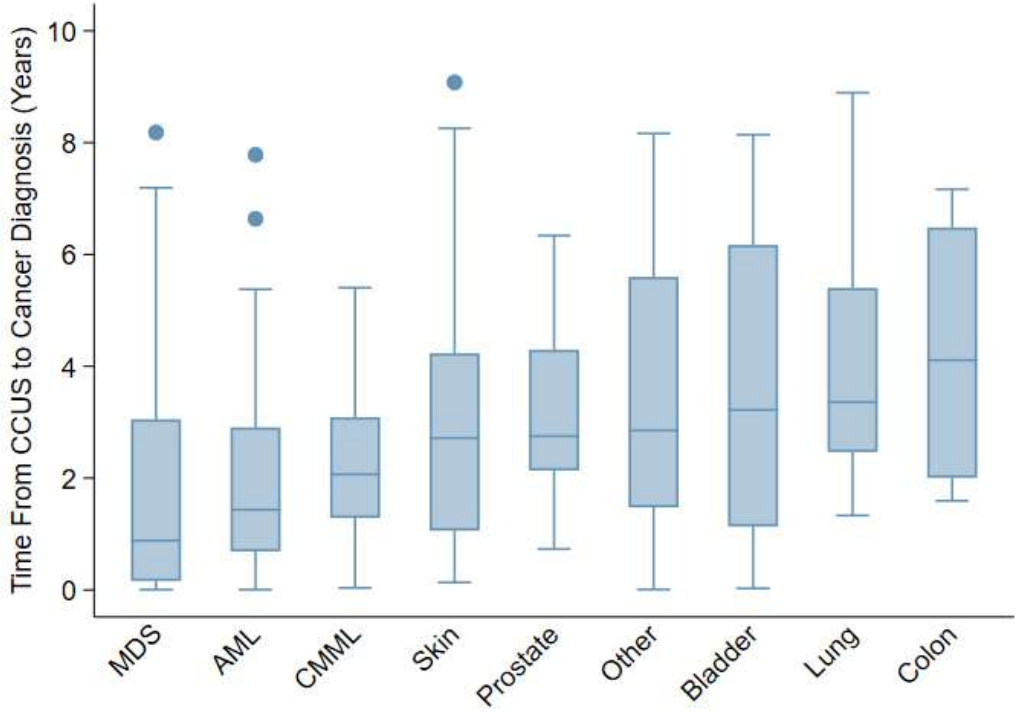
Kane et al doi: 10.1016/j.canep.2019.02.014

Linkage to National Cancer Registration

57% subsequent cancer diagnosis



Median time to cancer diagnosis 2.2 years

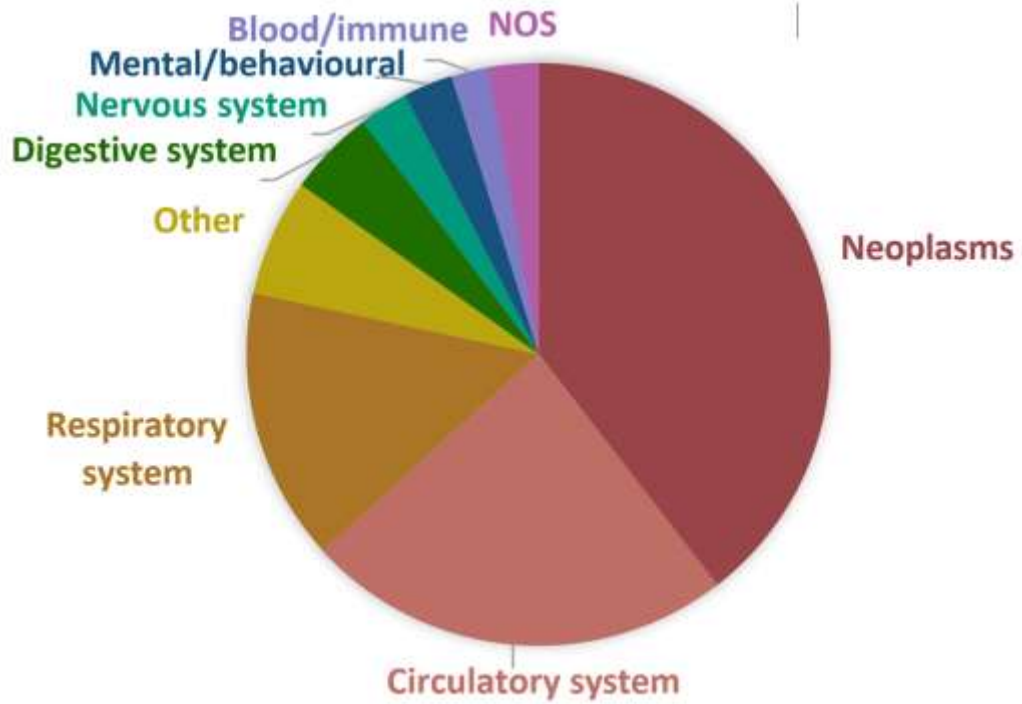


First look at subsequent cancer registrations:

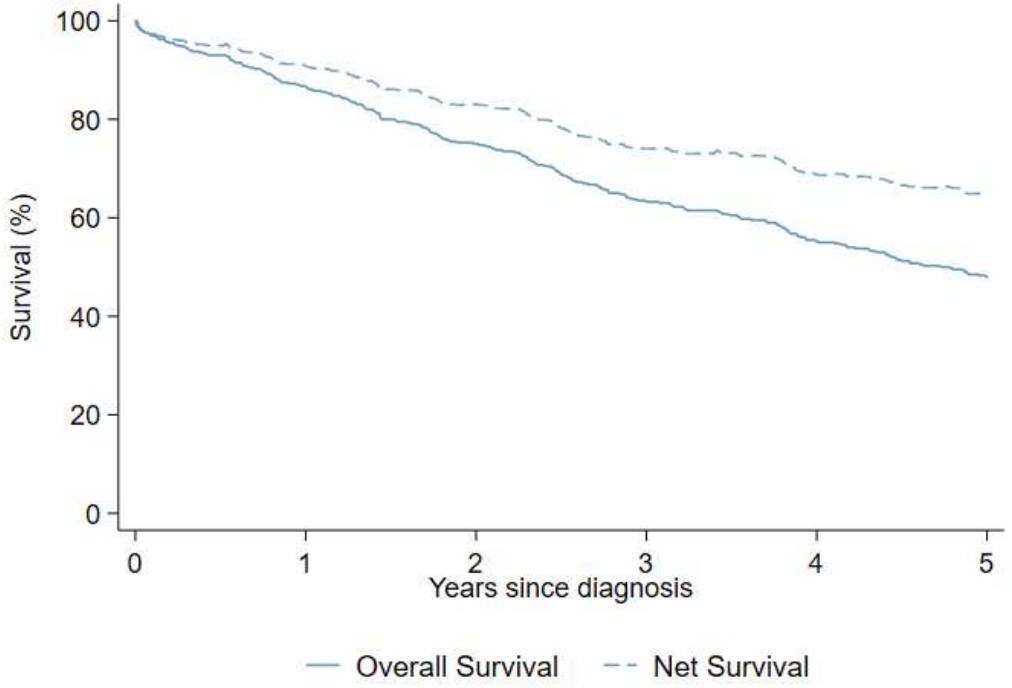
- Need to calculate expected rates by age and sex

Linkage to Mortality Data – Survival & Cause of Death

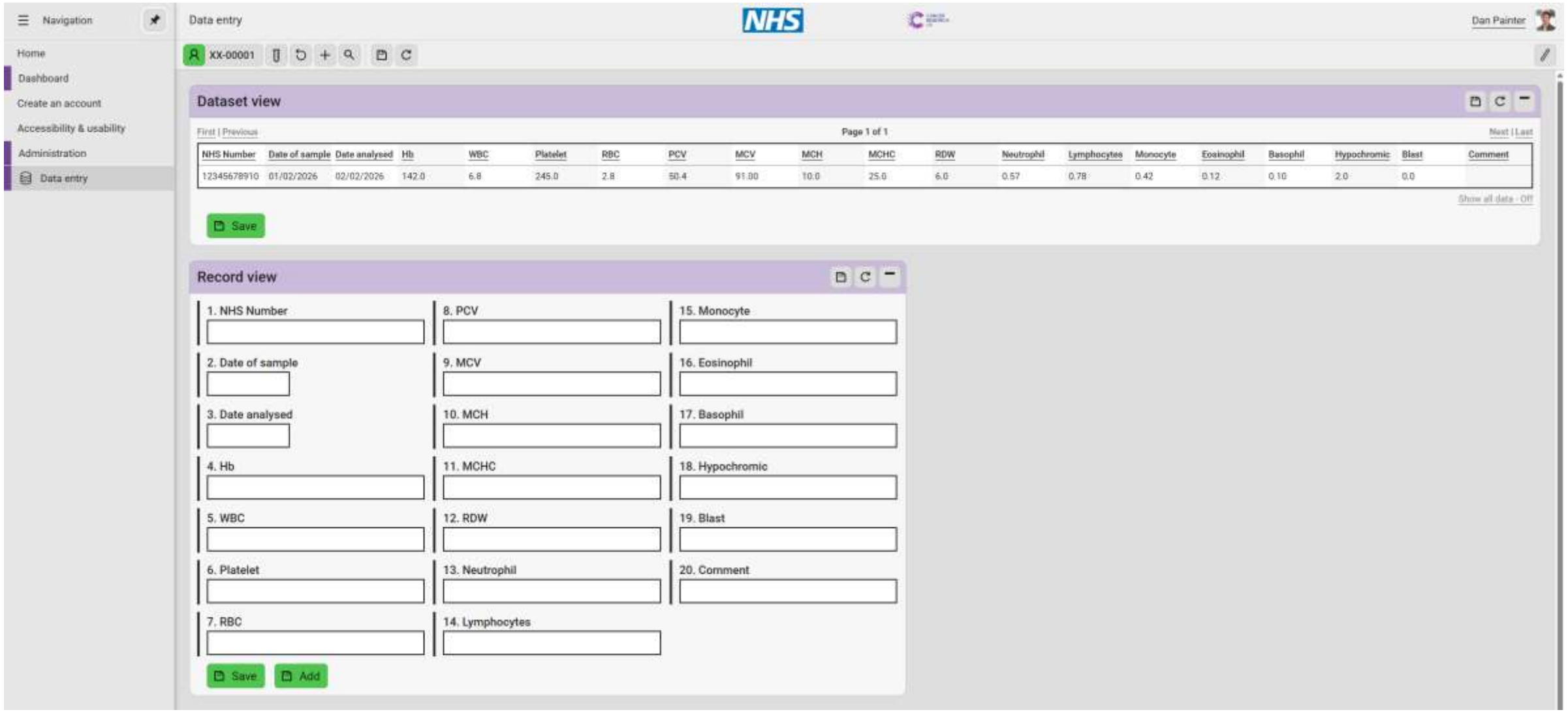
Underlying Cause of Death



Overall & Net Survival



Cargo et al Long-term outcome of patients with clonal cytopenia of undetermined significance: 10 year follow-up of a large unselected cohort Blood (2025) 146 (Supplement 1): 1394. https://doi.org/10.1182/blood-2025-1394


Navigation
Home
Dashboard
Create an account
Accessibility & usability
Administration
Data entry
Data entry
NHS
Dan Painter
XX-00001
Dataset view
First | Previous
Page 1 of 1
Next | Last
NHS Number
Date of sample
Date analysed
Hb
WBC
Platelet
RBC
PCV
MCV
MCH
MCHC
RDW
Neutrophil
Lymphocytes
Monocyte
Eosinophil
Basophil
Hypochromic
Blast
Comment
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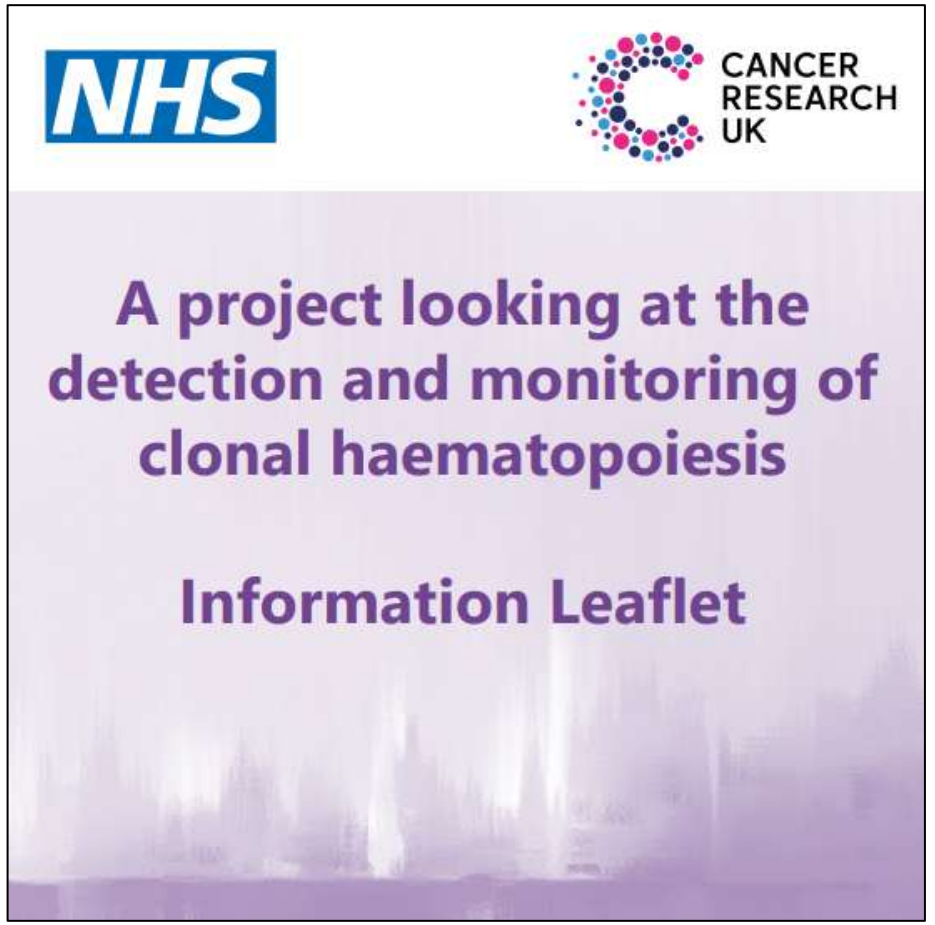
01/02/2026
02/02/2026
142.0
6.8
245.0
2.8
50.4
91.00
10.0
25.0
6.0
0.57
0.78
0.42
0.12
0.10
2.0
0.0
Show all data : Off
Save
Record view
1. NHS Number
2. Date of sample
3. Date analysed
4. Hb
5. WBC
6. Platelet
7. RBC
8. PCV
9. MCV
10. MCH
11. MCHC
12. RDW
13. Neutrophil
14. Lymphocytes
15. Monocyte
16. Eosinophil
17. Basophil
18. Hypochromic
19. Blast
20. Comment
Save
Add

Next steps….

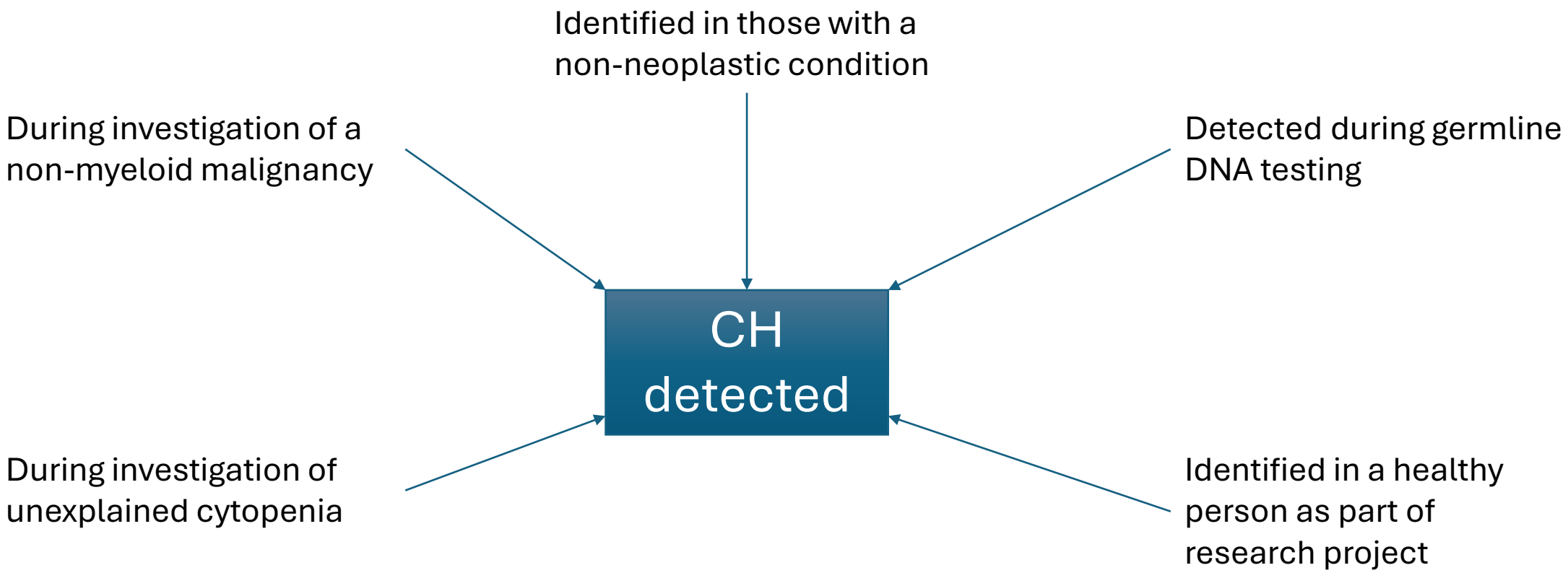
Expand to other GLH regions

Will need DPIA completed and individual pathways defined for data transfer

Funding approved in the next HaemOnc NoE for staff time to support this process

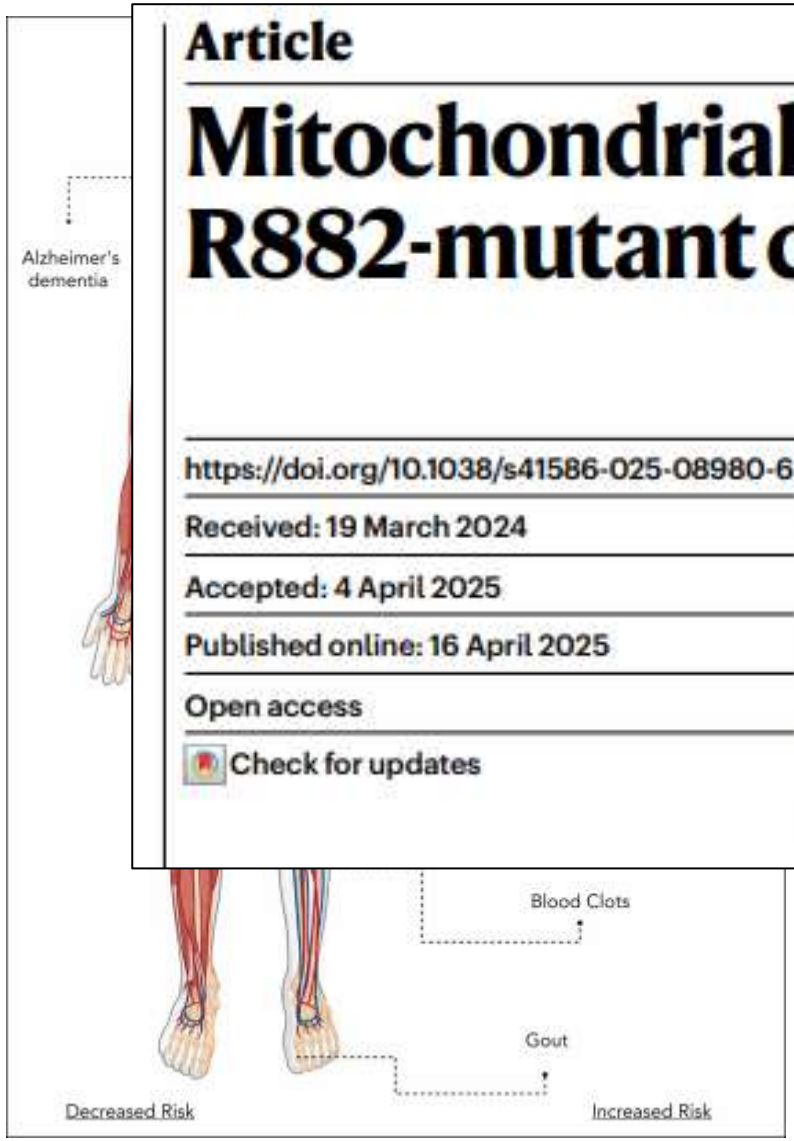


CHIP is detected incidentally



Adapted from Steensma & Bolton, Blood. 2020 Jul 31;136(14):1623–1631

Should we be screening for CHIP?



Article

Mitochondrial metabolism sustains *DNMT3A*-R882-mutant clonal haematopoiesis

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Check for updates

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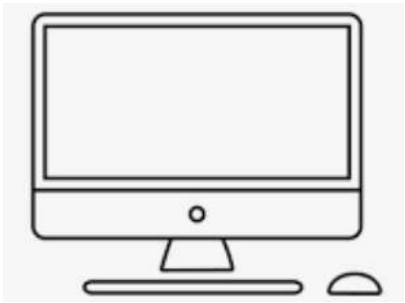
Development of a rapid & scalable diagnostic tool for CHIP

Gene	Amplicon targets
DNMT3A	all coding exons
TET2	all coding exons (3-11)
ASXL1	exons 12 & 13
TP53	all coding exons (2-11)
SRSF2	P95 (on exon 1)
JAK2	exon 12 and V617 (on exon 14)
SF3B1	E622, R625, H662, K666,K700,G742
PPM1D	exon5, exon6
IDH1	R132
IDH2	R140,R172
U2AF1	S34, Q157
MPL	W515
CALR	exon 9
GNB1	exon5, exon6

Captures >97% of CH mutations

Laboratory Protocol



Mutation calling
(own code)

Diagnostic Report

✓ ✓ ✓ ✓

On-going and future work

Blood sample to library prep

Automation

Raise throughout to 24 samples/run

UKAS accredited Dec 2025

Accreditation

Started process of assay accreditation in Feb 2026

Screening & prognostication tools

Prognostication

On going upgrade & maintenance of websites

Summary

- Established a national CH network of scientists and clinicians with a focus on translational research, diagnosis and management of CH patients
- Development of clinical resources for patient management
- Ongoing research to optimise diagnostic pathways for CCUS in UK
- Produced a national database to capture all patients with CH across England and correlate with clinical outcome data
- Developed a rapid scalable panel to potentially screen selected patient cohorts for underlying CH

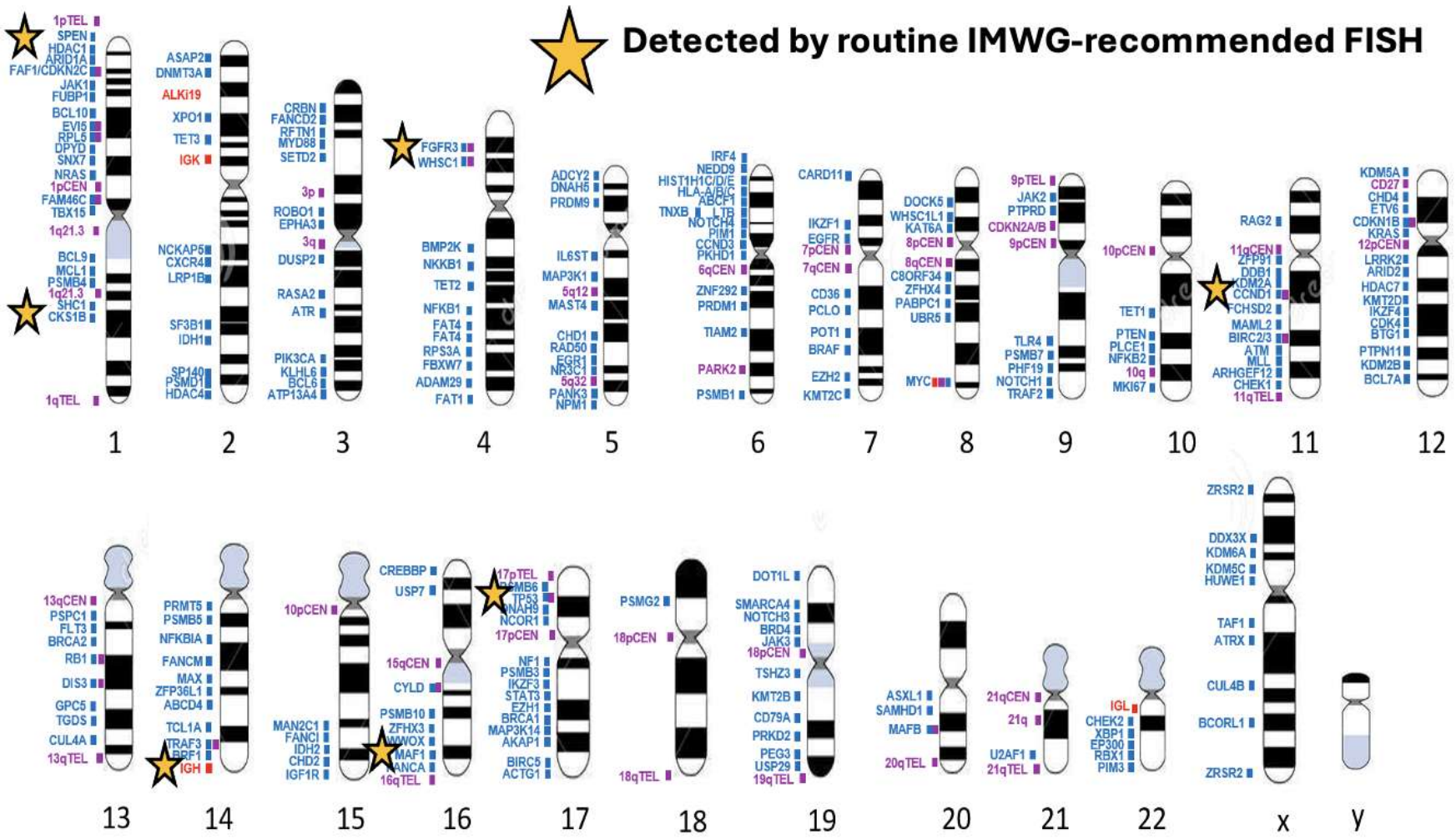
Thank you

Haem-onc Network of Excellence WP2: Comprehensive Myeloma Panel

Dr Angela Hamblin / Dr Sarah Gooding
Consultant Haematologist, Oxford University Hospitals NHS Foundation Trust
Clinical Lead for Haematological Malignancies, Central & South Genomic Laboratory Hub
Principal Clinician for Molecular Haematology & Oncology, Genomics England
Senior Clinical Research Fellow in Translational Genomics, University of Oxford

Haematological Malignancy Diagnostic Service (HMDS) Network meet
27th February 2026

Development of the MGP Panel, capturing 283 loci recurrently mutated in myeloma



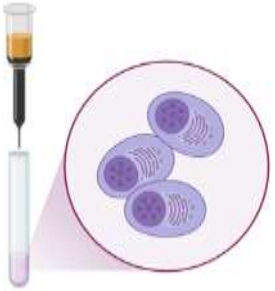
Sudha et. al. 2022

Covers 283 loci in total: ~8797 amplicons, 221 genes for mutations, 56 loci for copy number abnormalities, and 6 loci for detecting translocations

Updated iteration: addition of targets: FCRL5 (FCRH5), SLAMF7, SDC1, PDCD1, CD38, CD74, IL6, CD274, NCAM1, GPRC5D, ITGB7, TNFRSF17 (BCMA), ICAM1, CD40.

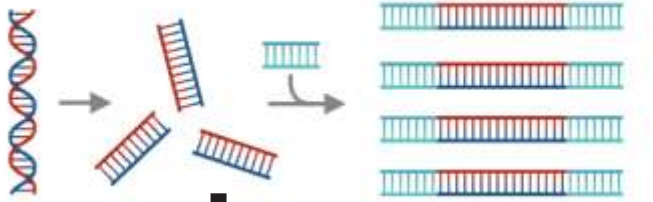
Laboratory Sample Handling

Bone marrow aspirate

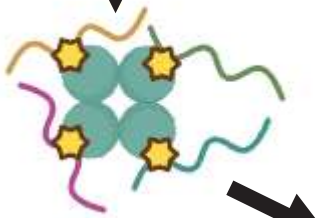


Min: 100,000 cells
75ng DNA

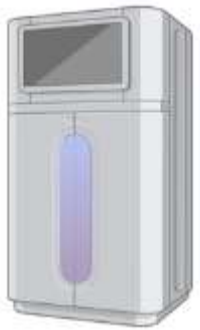
Roche
KAPA
HyperCap
library prep



2x custom
probesets
capture



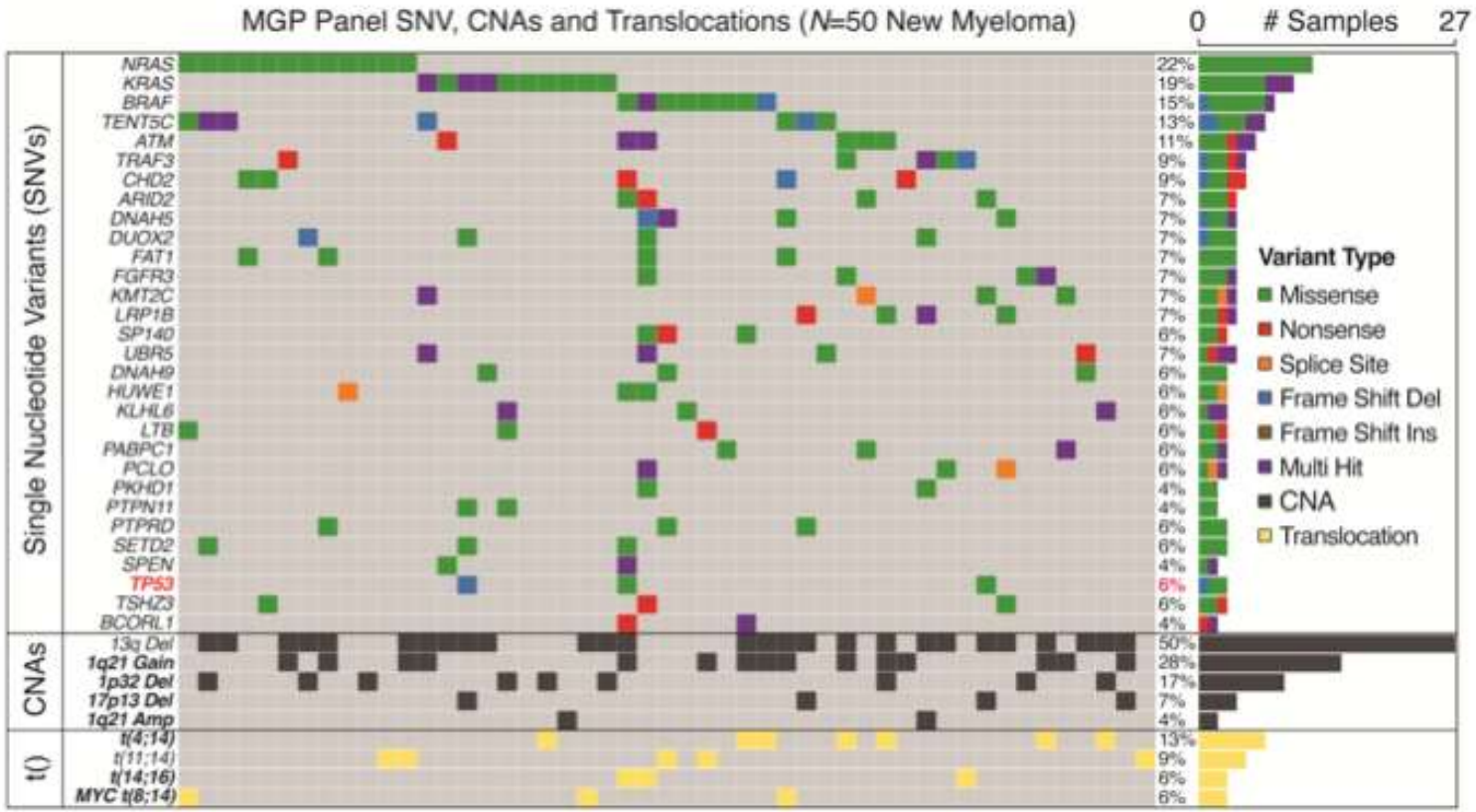
Sequencing: Novoseq X
48 samples per lane
1.5b flowcell



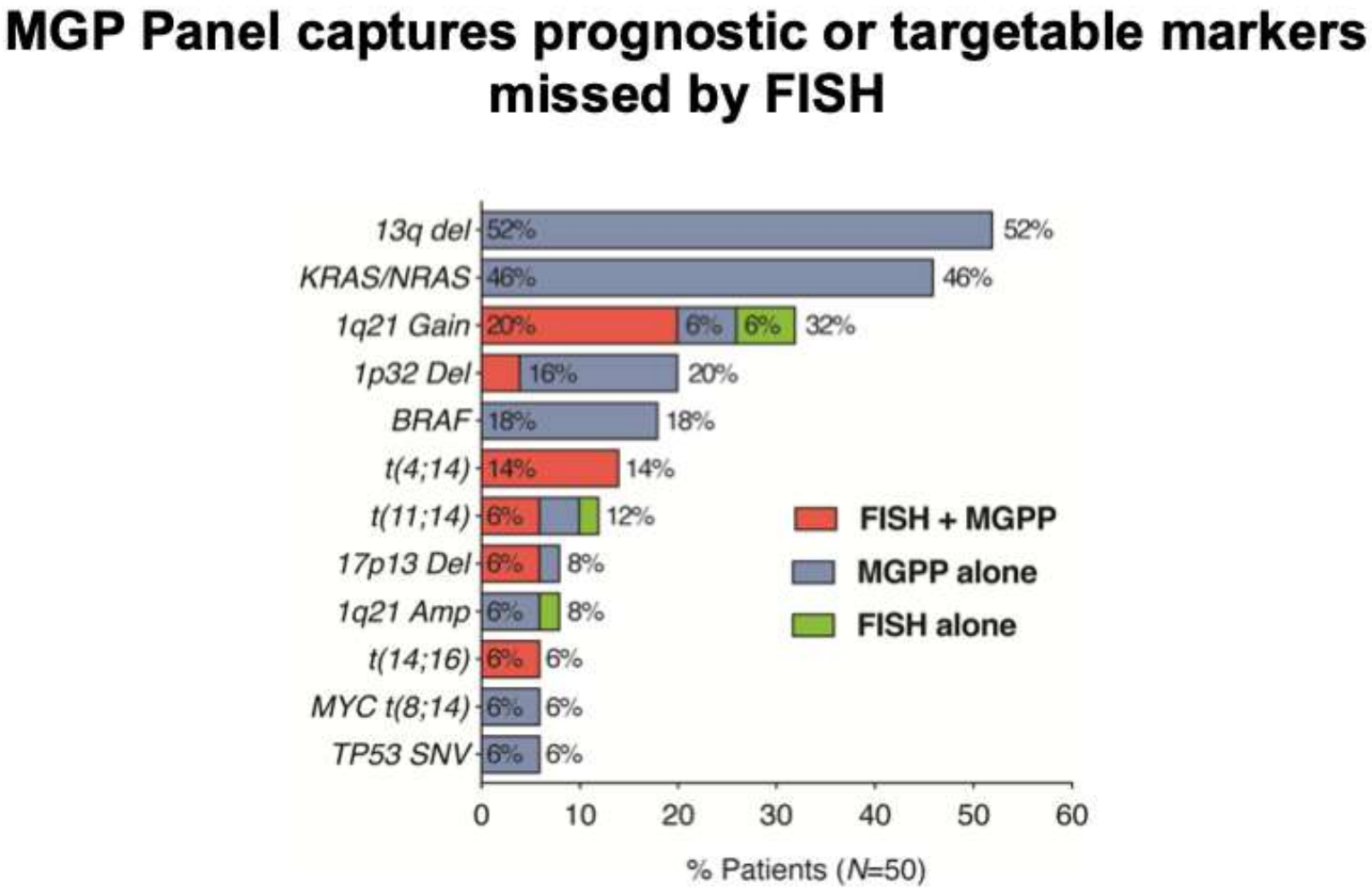
Adenine Study

- Samples from Oxford Research Biobank HaemBio
- Not end to end NHS sample handling
- Used a matched PB germline sample
- Concordance excellent

MGP Panel captures SNVs, CNAs and translocations recurrently mutated in the myeloma genome



Adenine Study

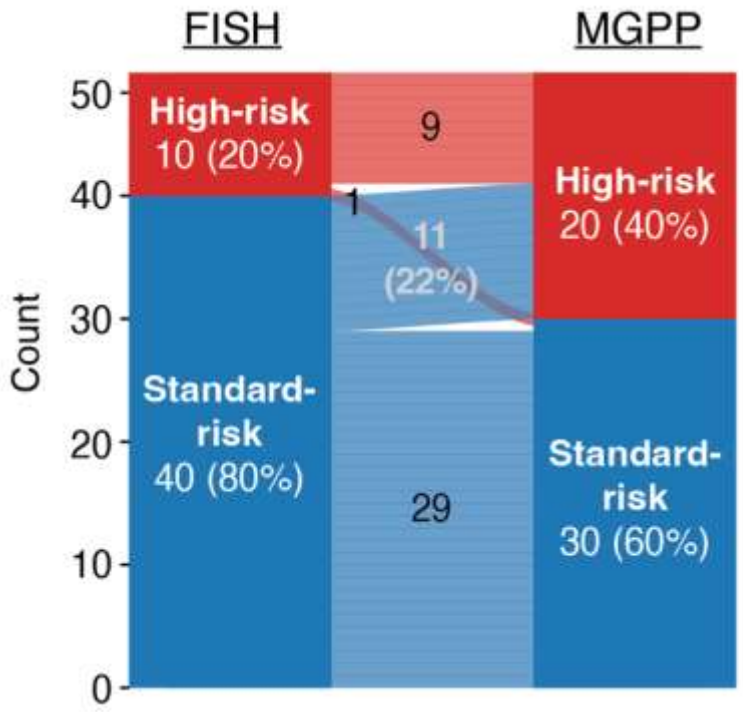


Adenine Study

MGP Panel alters clinician-led risk designation and treatment intention in new myeloma

Risk Designation

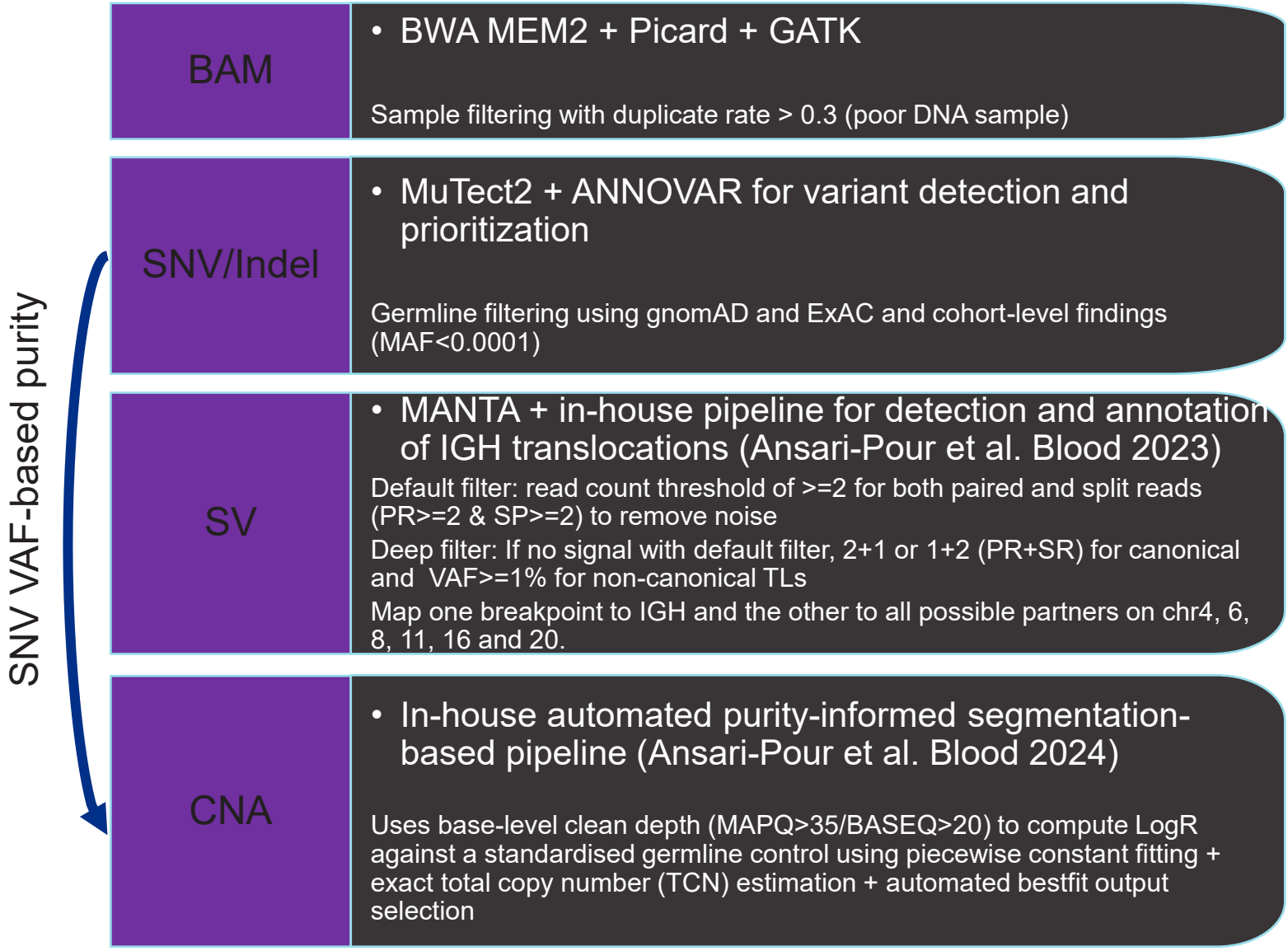
22% up-classified as high-risk with MGP Panel



‘Real world’ pilot

- 104 sequential samples from 4 NHS hospitals (Oxford, Southampton, Reading, Swindon) arriving at Wessex Regional Genetics Lab as per standard FISH pathway
- Double tubes labelled ‘1’ and ‘2’ requested
- Standard of care FISH on tube 1 + cell pellet for DNA if sufficient
- Cell pellet from tube 2 if tube 1 insufficient
- Pellets stored frozen and sent to Oxford for DNA extraction, library prep and sequencing

Tweaking the pipeline



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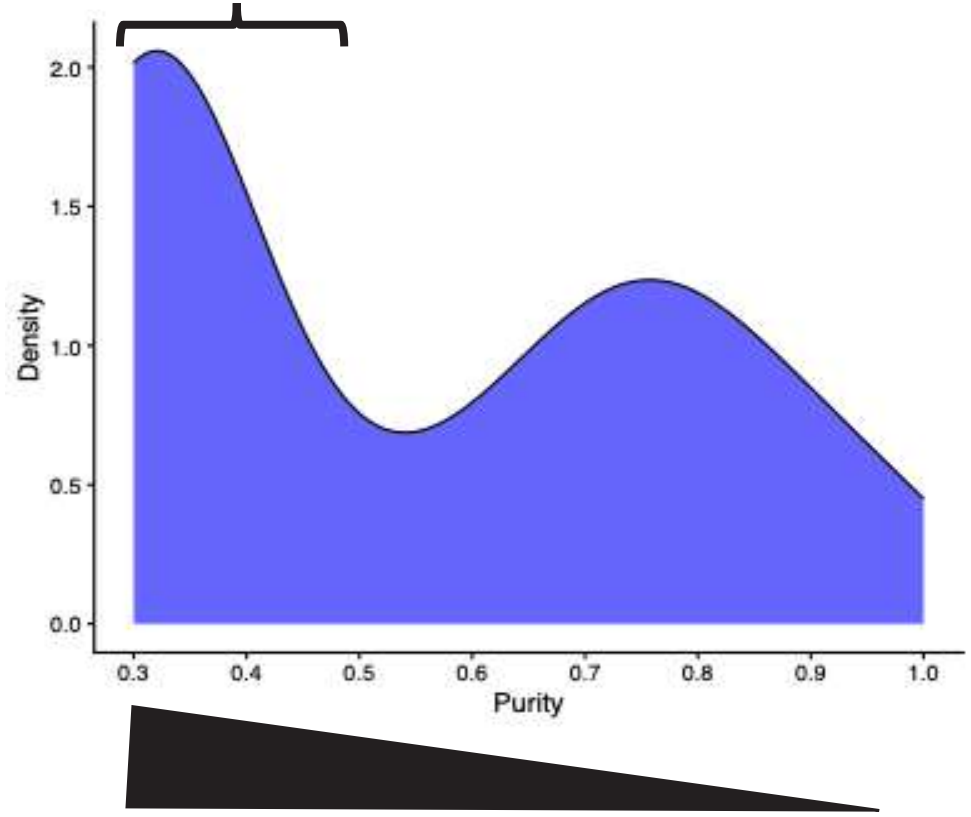
Sample Handling Conclusions

A bimodal Purity Distribution across all sequenced samples

Enriched with samples from ‘tube 2’



Incidence of false CNV calls falls dramatically with improving purity
Subclonal calls require good purity.

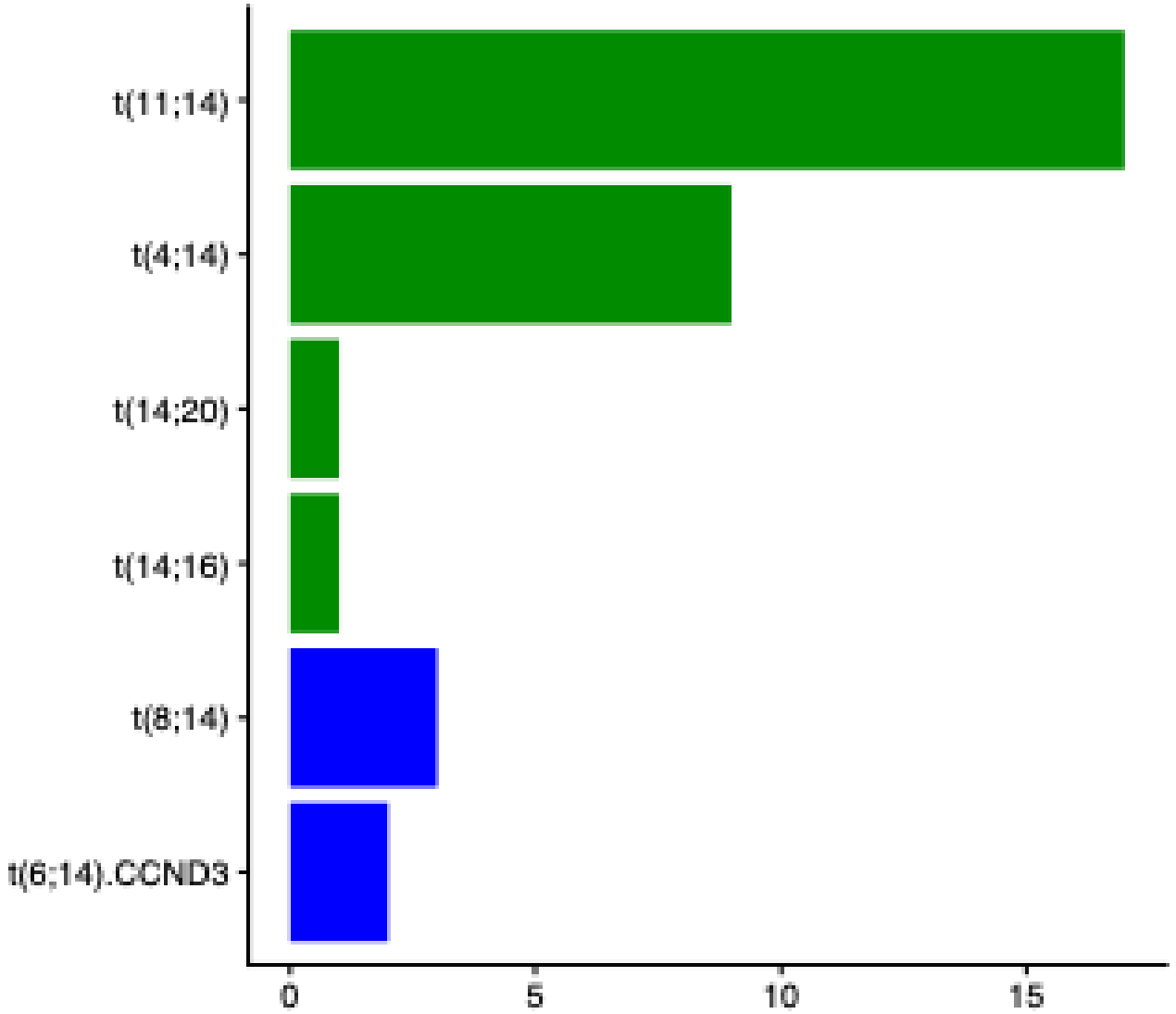
- 8/104 samples failed FISH (all tube 1)
- 12/104 failed adequate DNA extraction
  2 from tube 1
  10 from tube 2
- Low tumour purity post bead sort <40% makes CNV calling very difficult.

Low purity: 16% in tube 1 samples (n = 43)

52% in tube 2 samples (n = 42)

*** Use first pass tube**
*** Add lysis buffer straight from bead enrichment (no pellet storage!)**

‘Real world’ pilot: Translocation analysis



- 92 samples sequenced
- 28 had FISH *IGH* translocation detection
- Full concordance
- Purity not an issue

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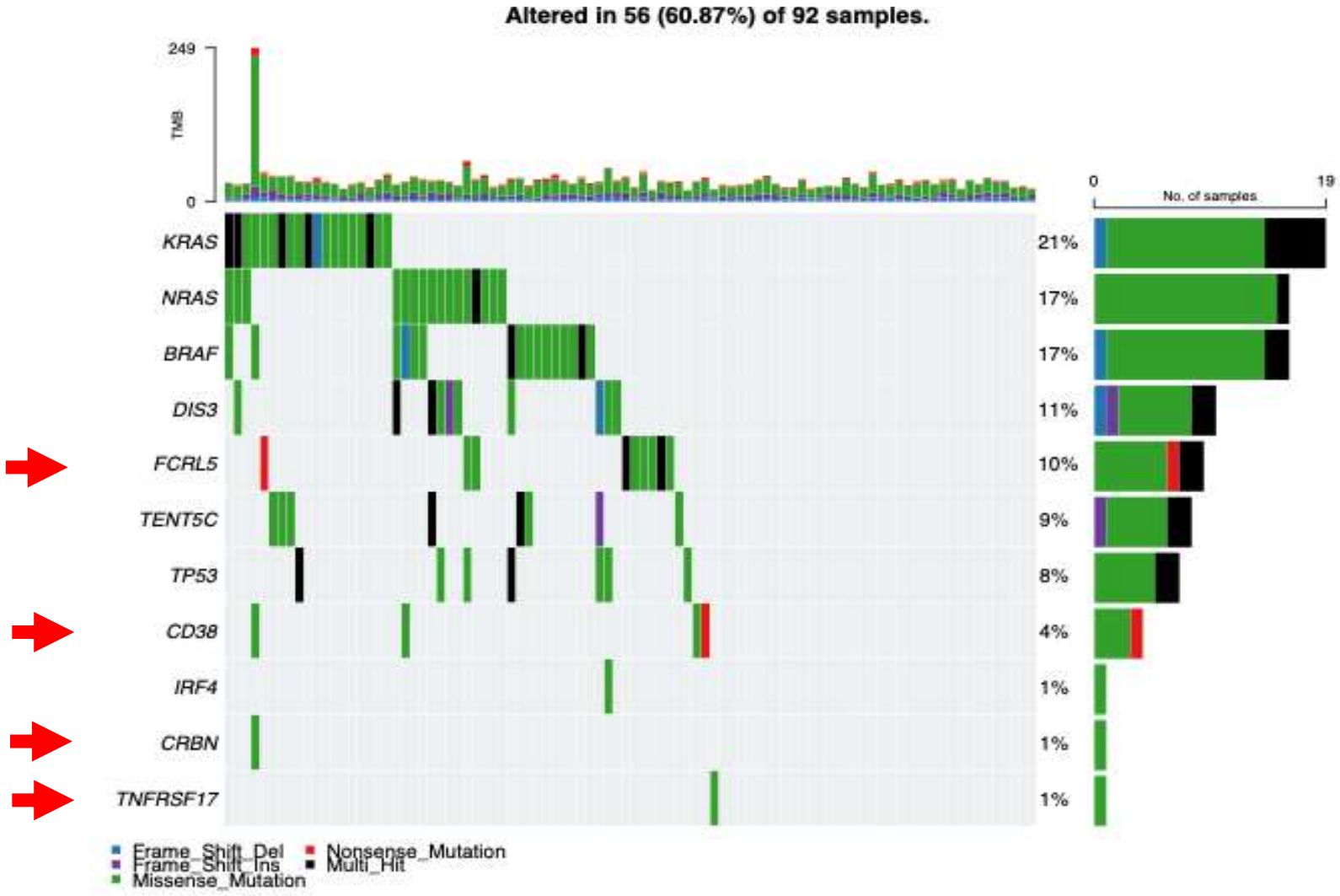
‘Real world’ pilot: Small variant analysis

7 Test Directory Genes

4 Therapy targets



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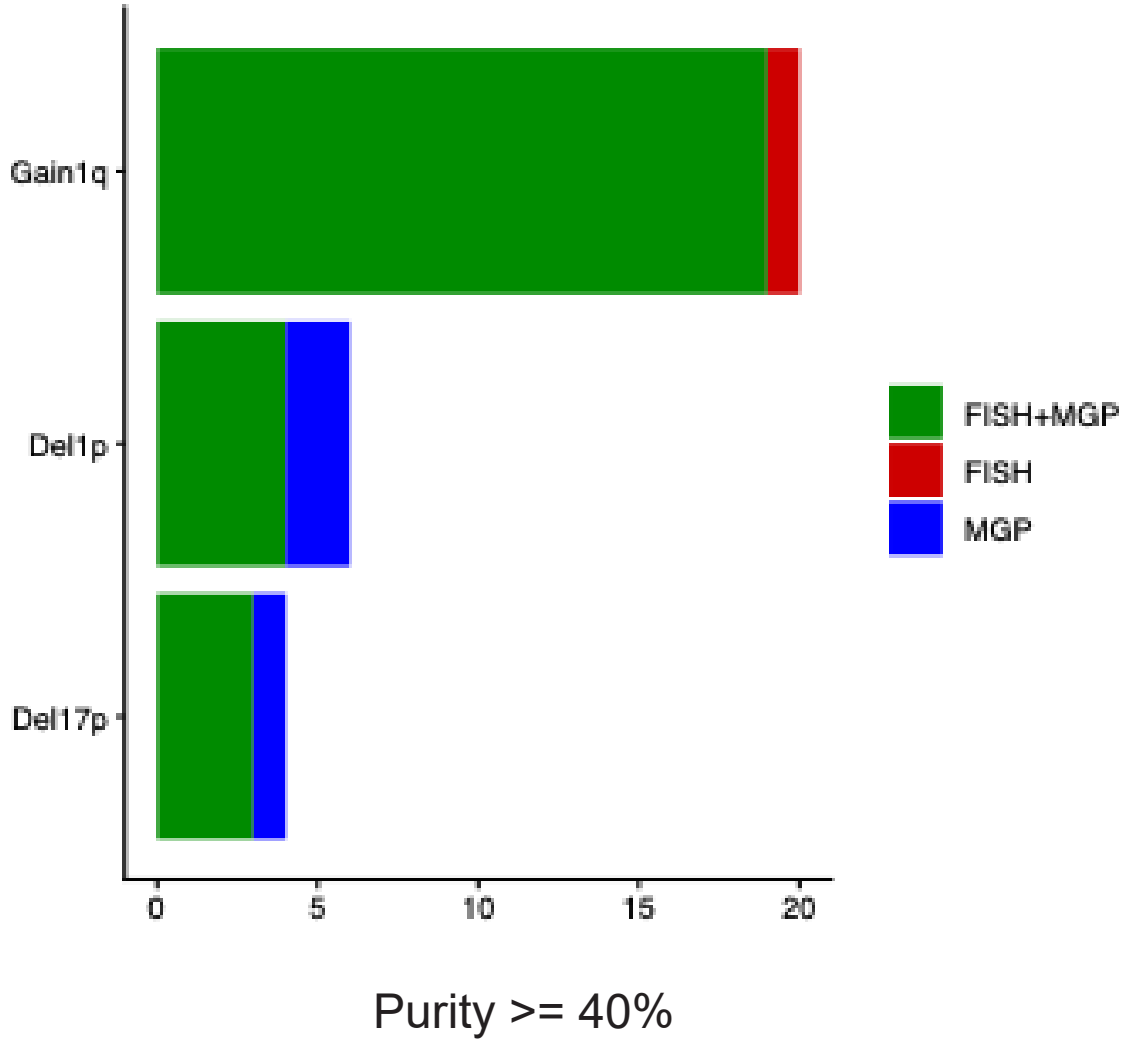
‘Real world’ pilot: Copy number variant analysis

- 42 samples with purity >40%
- 38/42 full concordance
- MGP detected lesions missed by FISH in 3 cases
- FISH detected lesion missed by MGP in 1 case



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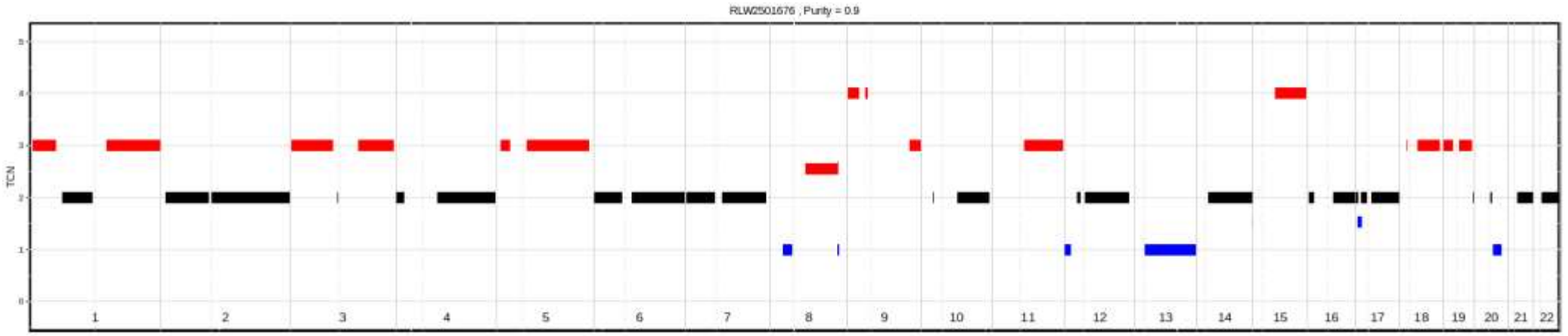
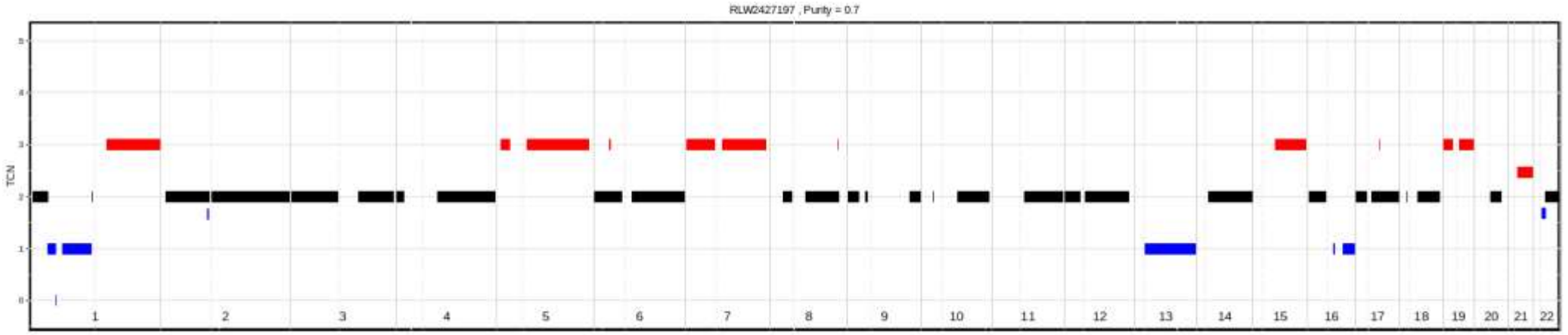
‘Real world’ pilot: Example copy number variant analysis

Copy Number calling is robust when purity >40%

FISH



1p Gain
1q Gain
11q Gain
17p Del



1p Del
1q Gain

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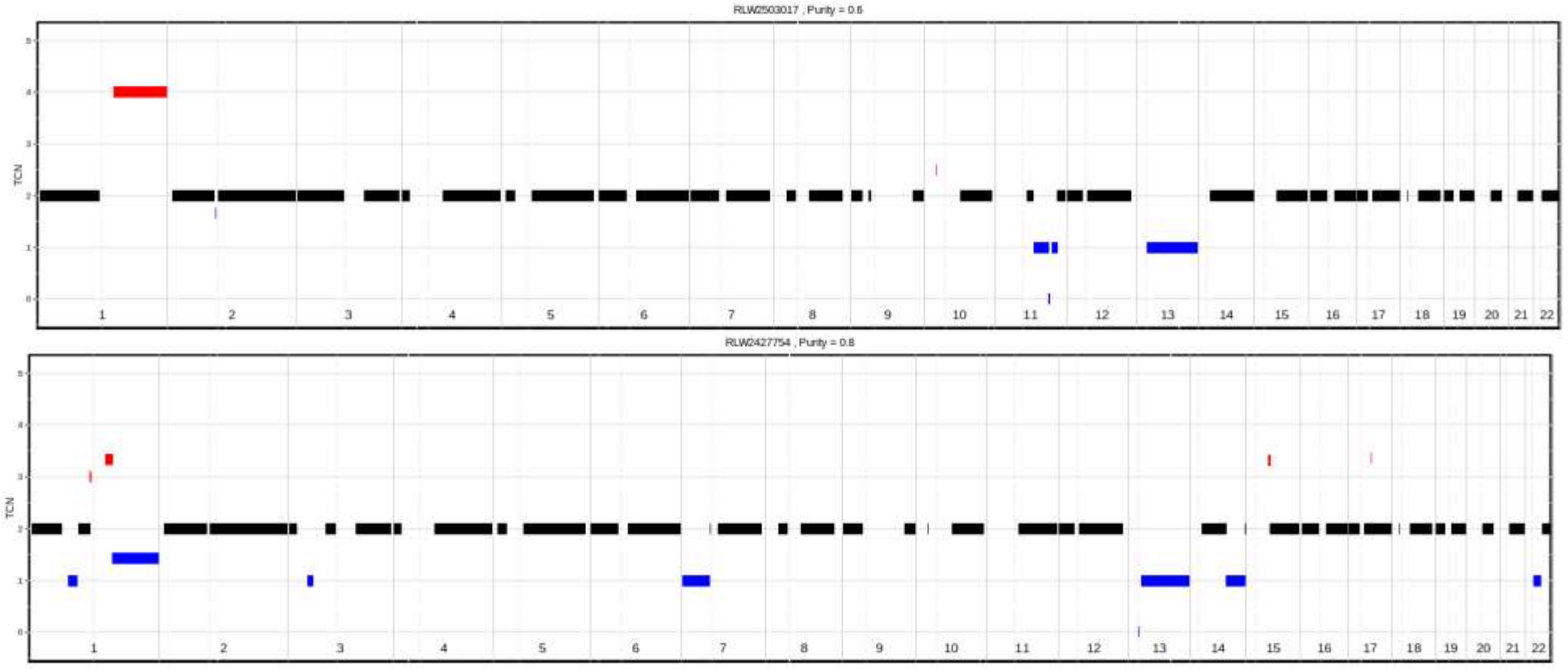
‘Real world’ pilot: Example copy number variant analysis



FISH

1q Amp x4

1q21 Gain (focal)

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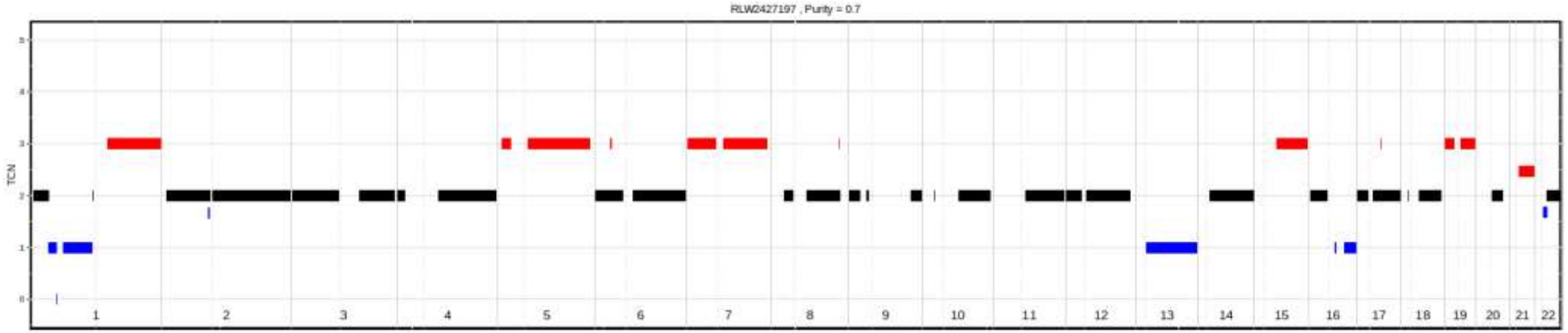
‘Real world’ pilot: Example copy number variant analysis



FISH

1p32 biallelic deletion + 1q Gain

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‘Real world’ pilot: Conclusions

- Post-sort sample purity needs to be >40% clonal malignant cells for robust calling of subclonal CNAs

  - while we confirm this with further audits, we will continue to run FISH for 1p and 17p deletion

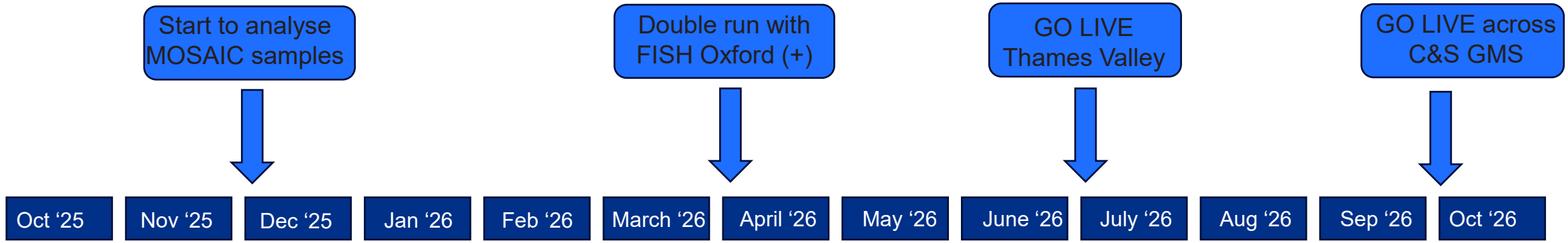
- Purity is significantly favoured by ‘first draw’ conditions
- Sample purity needs assessing (by flow cytometry) pre-DNA extraction
- DNA extraction should be prompt after bead enrichment

- We will issue TL and SNV reports from low purity samples, providing purity and VAF information

It is all commissioned…..

Modality	Test	Test Package	Genomic	Test Name	Legacy 'M' Codes	Test Method	Test Scope	Routin	Urge	Delivery GLHs	SNV Gene Targets	CNV Targets	Structural Variant Targets	Other Targets
Haematological Tumours	TP126	Myeloma	GT1274	Next Generation Sequencing Panel - Structural Variants - Myeloma	M92.7	Sequencing	Structural Variant	21	14	CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW GLH			IGH::CCND1, t(11;14)(q13;q32), IGH::CCND3, t(6;14)(p21;q32), IGH::FGFR3, t(4;14)(p16;q32), IGH::MAF, t(14;16)(q32;q23),	
Haematological Tumours	TP126	Myeloma	GT429	Next Generation Sequencing Panel - Small Variants - Myeloma	M92.1	Sequencing	Small Variants	21	14	CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW GLH	BRAF, DIS3, IRF4, KRAS, NRAS, TENT5C, TP53			
Haematological Tumours	TP126	Myeloma	GT75	Next Generation Sequencing Panel - Copy Number Variants - Myeloma	M92.13	Sequencing	Copy Number Variants	21	14	CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW GLH		Chromosome 17p, Chromosome 1p, Chromosome 1q		Hyperdiploidy
										GLH, NW GLH, SE GLH, SW GLH		Chromosome 1p, Chromosome 1q		
Haematological Tumours	TP126	Myeloma	GT1277	Hyperdiploidy CNV FISH or MLPA - Myeloma	M92.9	Targeted assay	Copy Number Variants	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW GLH		Chromosome 15, Chromosome 5, Chromosome 9		
Haematological Tumours	TP126	Myeloma	GT187	IGH::CCND1, t(11;14)(q13;q32) FISH - Myeloma	M92.4	Targeted assay	Structural Variant	21	14	CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::CCND1, t(11;14)(q13;q32)	
Haematological Tumours	TP126	Myeloma	GT383	Chromosome 17 CNV FISH - Myeloma	M92.12	Targeted assay	Copy Number Variants	21	14	CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW		del(17p13.1) – TP53		
Haematological Tumours	TP126	Myeloma	GT40	IGH::FGFR3, t(4;14)(p16;q32) FISH - Myeloma	M92.2	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::FGFR3 t(4;14)(p16;q32)	
Haematological Tumours	TP126	Myeloma	GT549	IGH::MAF, t(14;16)(q32;q23) FISH - Myeloma	M92.5	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::MAF, t(14;16)(q32;q23)	
Haematological Tumours	TP126	Myeloma	GT565	Other FISH Targets - Myeloma		Targeted assay	Copy Number Variants, Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW				
Haematological Tumours	TP126	Myeloma	GT632	MYC, 8q24 FISH - Myeloma	M92.14	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			MYC::	
Haematological Tumours	TP126	Myeloma	GT725	IGH, 14q32 FISH - Myeloma	M92.8	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::	
Haematological Tumours	TP126	Myeloma	GT746	IGH::MAFB, t(14;20)(q32;q12) FISH - Myeloma	M92.6	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::MAFB, t(14;20)(q32;q12)	
Haematological Tumours	TP126	Myeloma	GT855	CKS1B, 1q21 & CDKN2C, 1p32 CNV FISH - Myeloma	M92.10, M92.11	Targeted assay	Copy Number Variants	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW		del(1p) – CDKN2C, gain(1q21) – CKS1B		
Haematological Tumours	TP126	Myeloma	GT890	IGH::CCND3, t(6;14)(p21;q32) FISH - Myeloma	M92.3	Targeted assay	Structural Variant	21		CS GLH, E GLH, NE GLH, NT GLH, NW GLH, SE GLH, SW			IGH::CCND3, t(6;14)(p21;q32)	

Ongoing timeline



Complete analysis of RWD set / other controls
Explore EQA options

Finalise SOPs of CD138 sorting and library prep including automation;
Finalise local mechanism for reporting using StarLIMS / Alamut

Education piece around assay output / report

Declare intention of ISO Extension to Scope

NOTES

- NHSE Genomics Unit Haematological Malignancies Network of Excellence Work-package 2
- Once SOPs and bioinformatics pipeline locked down plan to share with any GMS who wants it
- Output of pipeline is decision support agnostic – can analyse the output files with Microsoft office and free to download desktop IGV
- Validated on NovaSeq X (sequencer in the majority of the GLHs / GMS) – reduces sequencing cost ++
- Can be multiplexed with other Roche panels (e.g. custom or UniV8) – work done to harmonise library preps so can be processed together – batching potential with other panels optimizes turn-around time

Next Steps

- As this panel fulfils test directory requirements, it can be rolled out: commissioned as equivalent to FISH
- We will roll out across central/south during 2026-27 financial year
  - **Intended for distributed reporting more locally**
- Will report IMWG risk status variants, drug-target related variants, other small variants on the test directory, non-canonical *IGH* TLs, hyperdiploidy
- Pipeline will be shared as requested once released formally on Github
- Flexibility on reporting style and information depth in response to feedback
- Can be updated according to new data, new drug targets
- BRC-funded health economic analysis ongoing: anticipated cost neutral vs FISH

Precision Medicine Pathways in Lymphoma WP4

Dr Cathy Burton
Dr Lívia Rásó-Barnett

HMDS Network Meeting, London, 26/02/2026

Background

- Low uptake of genomic testing in lymphoma diagnostics compared to myeloid disorders, despite lymphoma being one of the cancer types most to gain from genomic-guided medicine

- Unique, multifactorial challenges:
  - Tissue pathways are more complex than myeloid, solid cancer and rare disease samples
  - Sample-related challenges, including extensive histological work up to account for differentiating over a 100 lymphoma types
  - Disease-related challenges requiring reliable test performance in lesional cell-poor samples
  - Limited, predominantly FFPE samples, affecting both DNA quality and quality

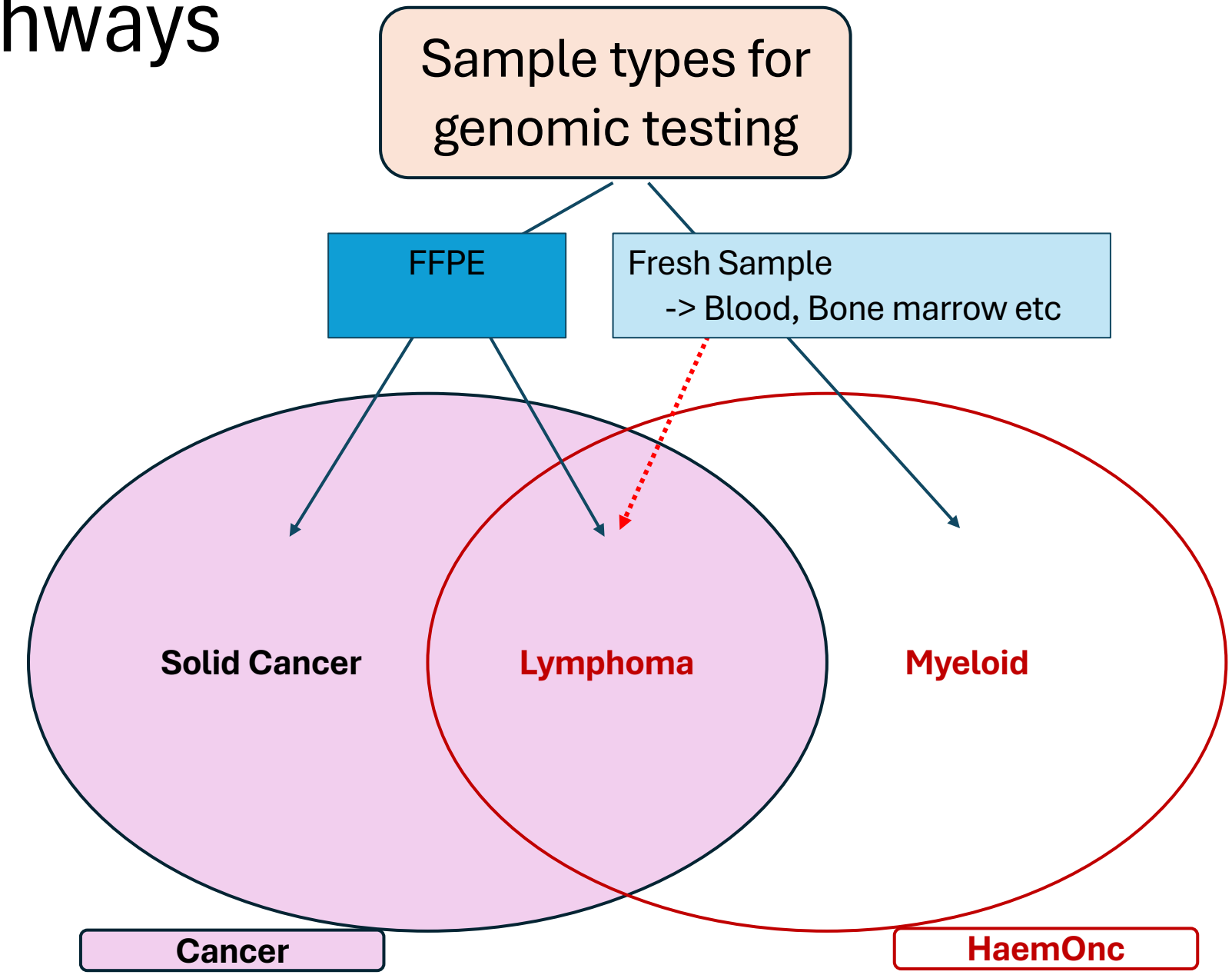
- Rapidly evolving treatment landscape, including high-cost biologically active therapeutic modalities, mandating an equally rapid evolution in molecular diagnostics

Aims and workstreams – 2024-2026

- Tissue Pathways
  - Explore existing tissue pathways, assess aspects that may affect genomic testing and new models of genomic service delivery, including possible ooptimisation of sampling pathways in the doubly centralised service model (Cambridge)
- Optimised and standardised genomic testing: GEP and NGS
  - Establish testing modalities, most suitable for lymphoma samples in the context of the centralised genomics model (Leeds, Cambridge)
- ctDNA
  - Explore role of MRD in treatment strategies, including ctDNA (Cambridge)

- Incorporation of molecular diagnostics into standard of care for lymphoid malignancies

Tissue Pathways

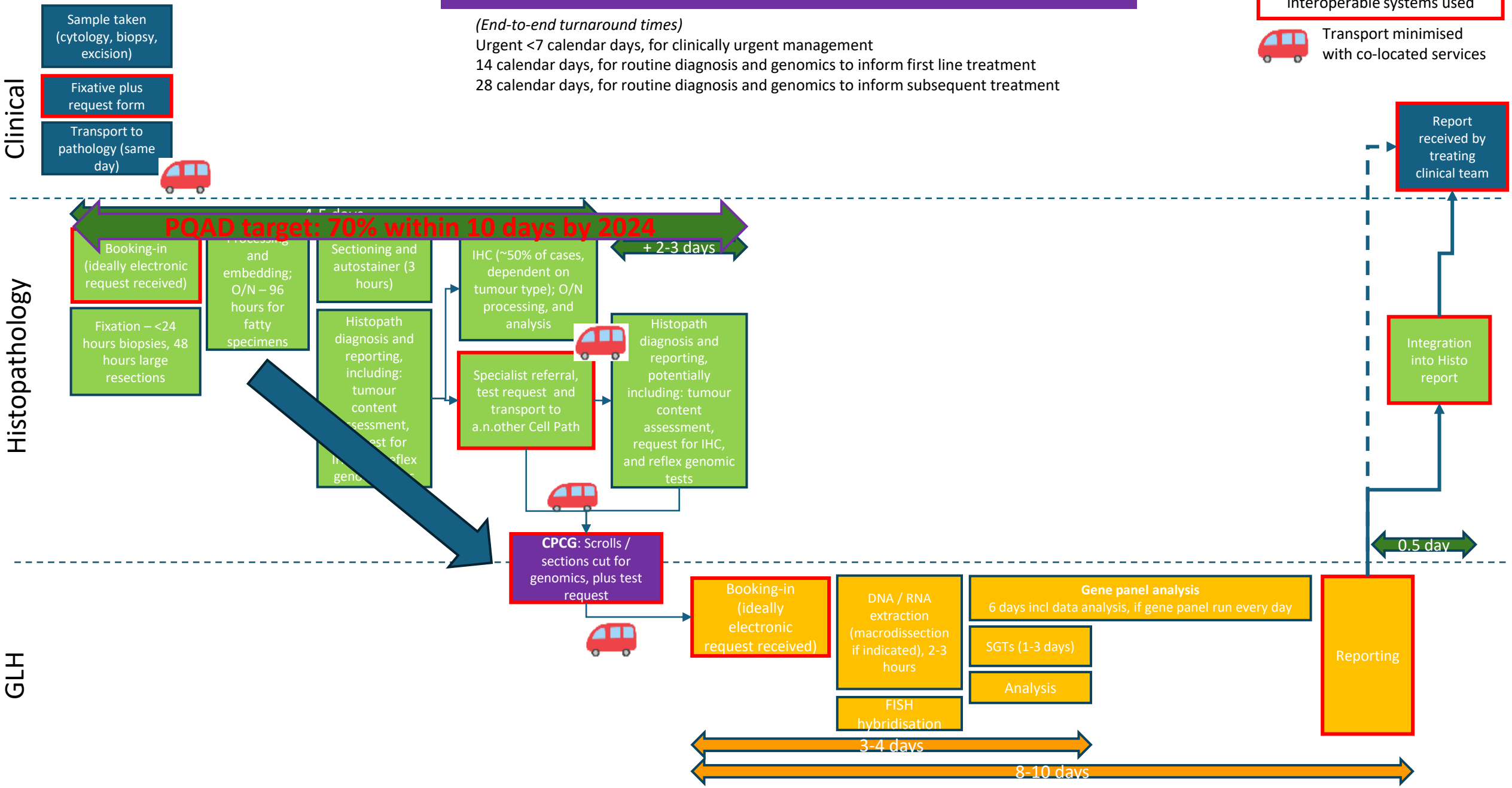


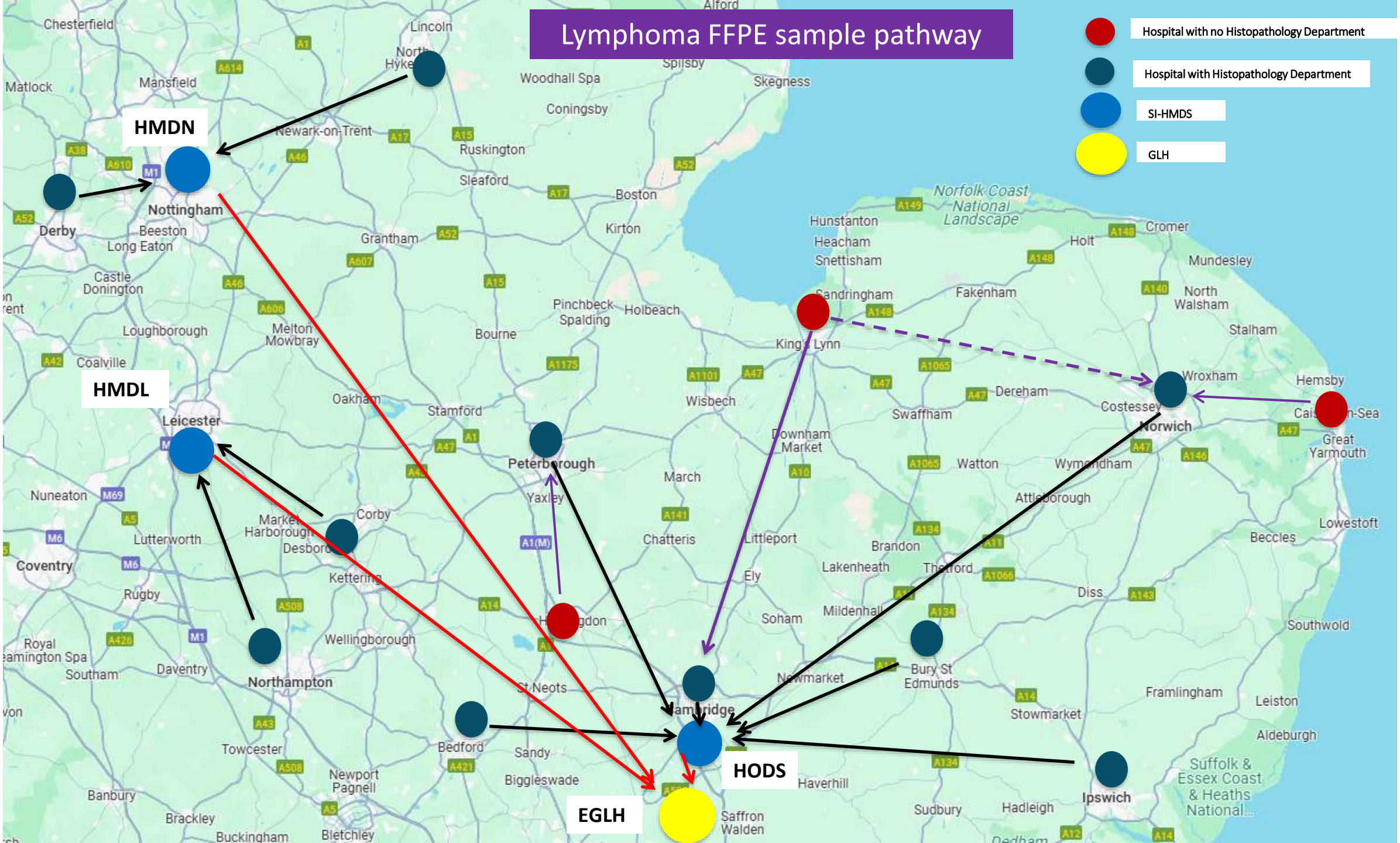
IDEAL end-to-end pathway (solid tumours)

(End-to-end turnaround times)
Urgent <7 calendar days, for clinically urgent management
14 calendar days, for routine diagnosis and genomics to inform first line treatment
28 calendar days, for routine diagnosis and genomics to inform subsequent treatment

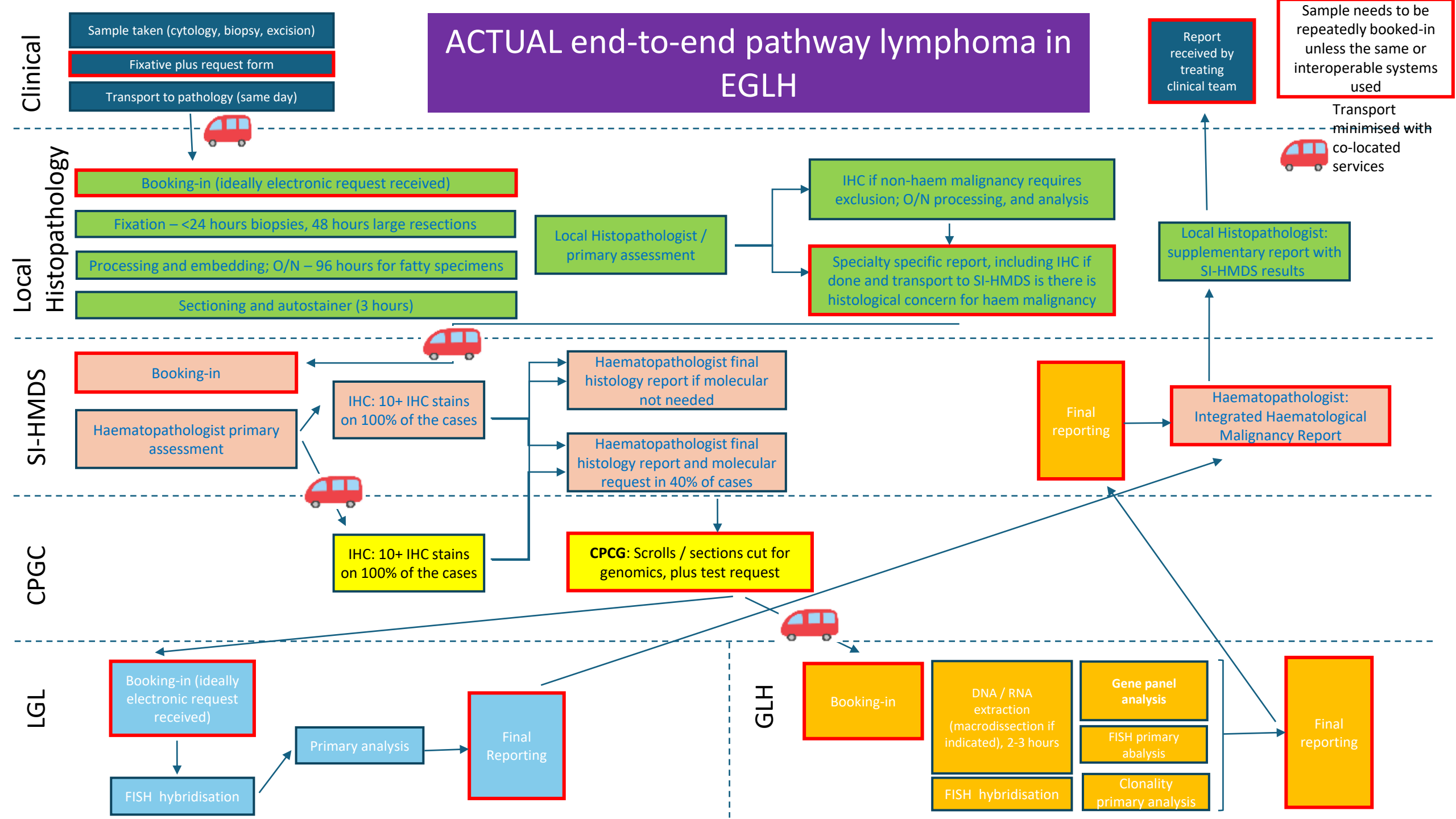
Sample needs to be repeatedly booked-in unless the same or interoperable systems used

Transport minimised with co-located services

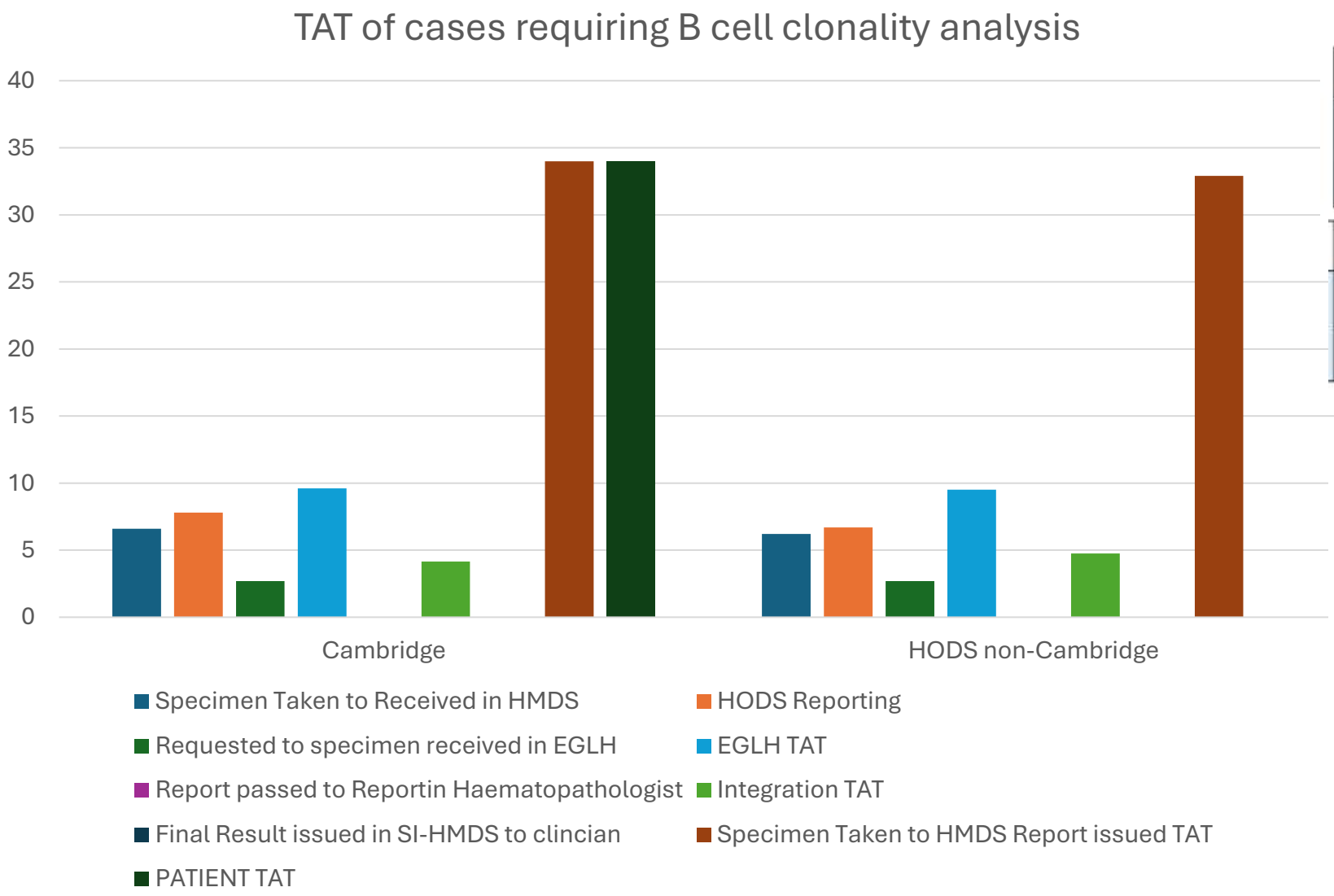



Lymphoma FFPE sample pathway
Hospital with no Histopathology Department
Hospital with Histopathology Department
SI-HMDS
GLH
HMDN
HMDL
HODS
EGLH
Nottingham
Derby
Leicester
Northampton
Peterborough
Corby
Bedford
Cambridge
King's Lynn
Norwich
Wroxham
Hemsby
Great Yarmouth
Bury St Edmunds
Ipswich
Lincoln
Mansfield
Matlock
Chesterfield
Newark-on-Trent
Grantham
Boston
Skegness
Woodhall Spa
Coningsby
Ruskington
Sleaford
Kirton
Pinchbeck
Spalding
Holbeach
Bourne
Stamford
Oakham
Melton Mowbray
Loughborough
Coalville
Castle Donington
Beeston
Long Eaton
Hunstanton
Heacham
Snettisham
Sandringham
Fakenham
Holt
Cromer
Mundesley
North Walsham
Stalham
Norfolk Coast National Landscape
Wisbech
Downham Market
Swaffham
Dereham
Costessey
Watton
Wymondham
Attleborough
Thetford
Brandon
Lakenheath
Mildenhall
Littleport
Ely
Chatteris
March
Yaxley
Soham
Newmarket
Diss
Beccles
Lowestoft
Southwold
Framlingham
Leiston
Aldeburgh
Stowmarket
Haverhill
Sudbury
Hadleigh
Suffolk & Essex Coast & Heaths National...
Saffron Walden
Biggleswade
Sandy
St Neots
Wellingborough
Kettering
Corby
Market Harborough
Lutterworth
Rugby
Coventry
Nuneaton
Towcester
Daventry
Southam
Royal Leamington Spa
Banbury
Brackley
Buckingham
Bletchley
Newport Pagnell

ACTUAL end-to-end pathway lymphoma in EGLH



Network of Excellence / CGIP audit



Urgency category	Clinical scenario
Urgent	Urgent diagnostic pathway

Suggested Test Method	TAT (days)	Examples (Please note these are for indicative purposes)
RT-PCR / FISH	7[b]	*BCR::ABL1* in CML / FISH in DLBCL if being used to alter 1st cycle of treatment / FISH in MCL
Clonality	7	B cell / T cell clonality in suspected aggressive lymphoma where clonality is being used to determine diagnosis

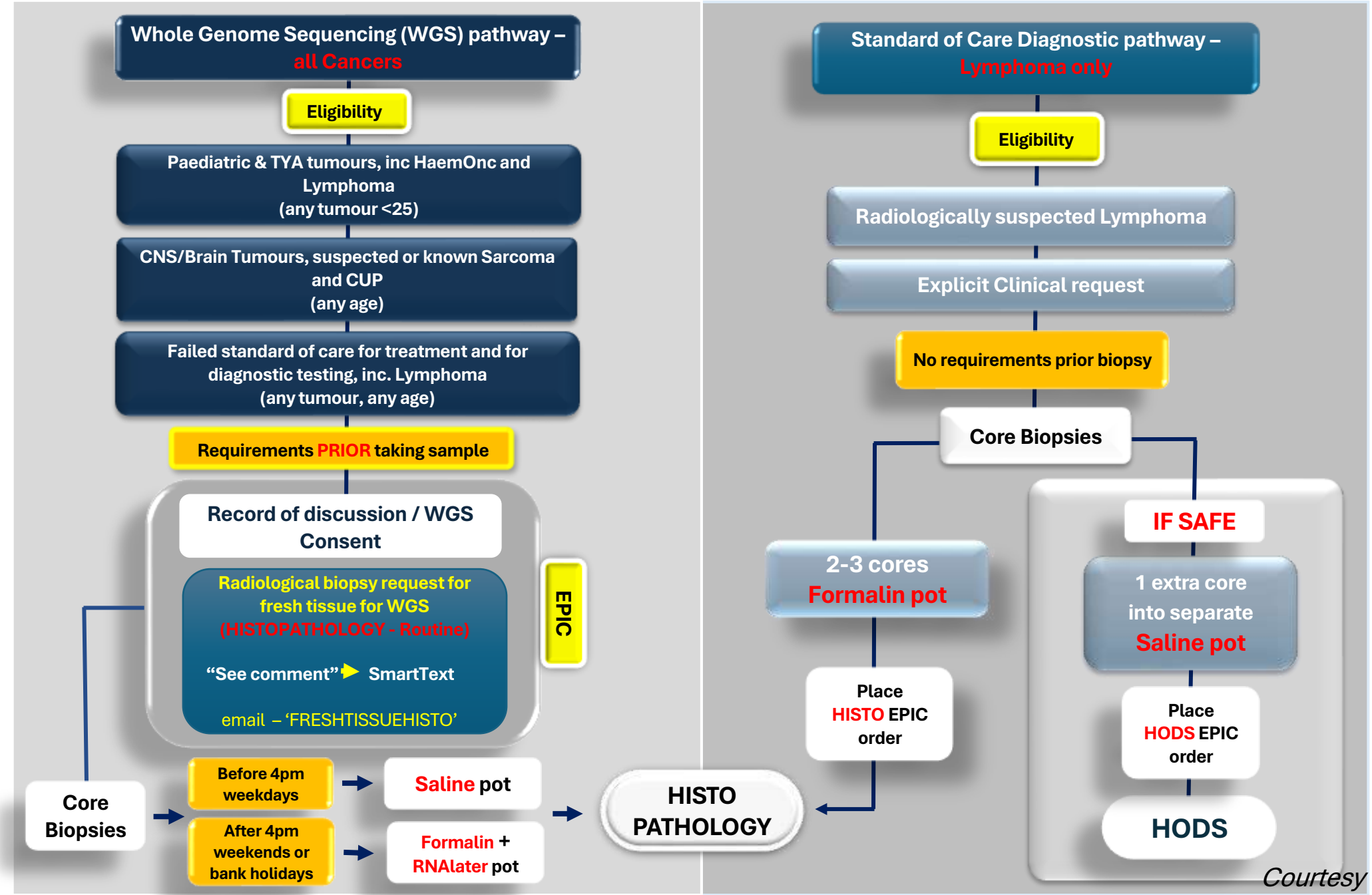
Urgency category	Clinical scenario
	Diagnostic[d]

Suggested Test Method	TAT (days)	Examples (Please note these are for indicative purposes)
FISH	14	Lymphoma
NGS panel / targeted mutation testing	21[b]	MPNs
Clonality[e]	21	indolent lymphoma

Tissue pathways

- Extensive pathway mapping and numerous audits completed.
- Embedded WGS into routine practice as per current TD eligibility, including tumour first, in the EGMS region.
- All paediatric, TYA and select adult cases now routinely sent for WGS – 34 cases sequenced since implementation (no significant uptake prior to NoE).
- Adult WGS routinely considered in regional MDTs, 50% (8 cases) performed on sample yielded from fresh tissue pathway after retrospective consenting.
- Radiology sampling guidance for all fresh tissue applications, including cancer. Multiple presentations across SIHMDSs, Radiology Departments, Grand Rounds and Communities of Practice.

Fresh Tissue Requirements – Radiologically guided Biopsies



Courtesy of Dr P Blanco

Optimised and standardised genomic testing - NGS

- Established pan-lymphoma targeted sequencing panels in Leeds and Cambridge, carefully designed to meet the evolving needs of lymphoma:
  - Aid providing clinically useful therapeutic / prognostic information
  - Aid diagnostics, including resolving differential diagnoses
  - Incorporate targets with imminent therapeutic implications

- Explore additional panel functions, including:
  - Copy number analysis in FFPE samples
  - aSHM calling and its use in replacing/substituting bright field microscopy tests (FISH)

Optimised and standardised genomic testing - NGS

- Leeds:
  - v2 PanHaemOnco panel with additional lymphoma genes fully in use for FFPE and liquid biopsies
  - Virtual panels for CD5-, CD5+, T-cell and LBCL routinely reported with 55 lymphoid genes including copy number
  - Routine use of smaller B-LPD panel for liquid samples
  - Data collection ongoing, 880 lymphoid (non-CLL) cases sequenced, approx. 50 lymphoid cases/month
  - TAT approx. 10 days, <1% failure rate
  - Molecular classification applied to HTS on DLBCL cases
- Cambridge:
  - v1 217 gene Lymphoma Panel validated
  - Protocol unification and multiplexing to remove batching restrictions - critical for making the panel operationally viable in routine NHS practice: Rare Disease small Panel, WES, PanHaem-Onc, Lymphoma and Cancer (in progress)]
  - Retrospective data collection of better covered lymphoma types in progress (770 non-CLL and 1046 CLL cases sequenced in 2024-25 on previous panel with identical coverage of CLL)

Optimised and standardised genomic testing - GEP

- 1200 samples run on HTG Edge PanB panel

- Draft publication and PhD completed on classifiers for discrimination of:
  - MCL, LBCL, MZL, CLL, HL, FL, Burkitt, plasmacytoma, reactive
  - Subclassifications: PMBL, PBL, NLPHL, MCL, DHL, CLL Burkitt, lbcl_11q

- BioSpyder technology undergone full validation

MRD strategies – ctDNA and DIRECT*

1. DIRECT study
    1. multicenter, prospective clinical study (Cambridge, Nottingham, Leicester, Norwich, West Suffolk, Peterborough) with 188 patients enrolled
    2. specifically designed to test the feasibility and added value of ctDNA in aggressive B cell lymphoma
    3. provides a road map for the implementation of ctDNA in a diagnostic lab

2. Customized clinical-grade assay and analytical pipeline, focusing our analysis on three ctDNA applications:

    1. **Pretreatment risk prediction**: ctDNA fraction determination provides value over and above existing clinical-based risk scoring (IPI) in pretreatment risk prediction

    2. **Plasma-based genetic profiling**: provides alternative source of DNA for genomic profiling, which is of particular use if tissue sample is exhausted or biopsy sampling is not possible (site of disease, PS of patient)

    3. **End of Treatment MRD by ctDNA**: ultrasensitive phased variant supported MRD response assessment at the end of treatment outperforms existing radiology-based metrics and may prevent the need for unnecessary follow-up imaging and biopsy inpatients with an ambiguous PET scan at end of treatment

*** doi:** https://doi.org/10.1101/2025.04.14.25325806

Forward looking – years 3&4

- Provision of evidence for utility and treatment implications of diagnostic molecular classification using HTS, GEP and ctDNA in risk stratification in LBCL. Applying a personalised medicine approach to treatment decision making will have a substantial impact on individual patient outcomes and an economic benefit to NHS, as expensive treatments will be targeted to patients in whom the most significant responses will be achieved. Will lead to preparation of submission to NGTD.

- Routine diagnostic deployment of a comprehensive NGS panel for mutation, CNV, SHM & translocation detection, suitable for most sample qualities and quantities, including ctDNA.

- Further expansion of evidence base for NGTD targets in all types of lymphoma.

- Potential for reduction of immunohistochemistry and FISH in routine diagnostics by incorporation of GEP and HTS in diagnosis of lymphoma

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NHSE Network of Excellence Work Package 5

Telomeropathies

A collaboration between the SE and NT GMS.
SE-GLH - KCH, Synnovis, KCL
NT-GLH - GOSH

GMS Lead: SE / NT
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Scientific lead SE – Dr Nicholas Lea (Synnovis), Dr Jie Jiang (KCH), Prof Stuart Adams (GOSH)

Collaborators:
Dr Shreyans Gandhi, Dr Roochi Trika, Dr Katie Snape (SE), Dr Dorte Wren (NT)

WP5 - Telomeropathies

- Telomere length, alongside the sequencing of associated variants in key genes (R91), is a valuable tool for screening patients with suspected telomeropathies, including those with inherited bone marrow failure which can lead to the development of haematological malignancies
- Telomere length also finds use in prognostic scoring in various other haematological malignancies, solid tumours and systemic disorders such as pulmonary fibrosis and cirrhosis of liver
- Significant implications for treatment and prevention of complications of this multi-system disorder. Additionally diagnosis in a proband may have wider implications for family screening and monitoring.

WP5 - Telomeropathies

- KCH receives approximately 600 test requests for telomere length assessment annually where a multiplex qPCR test is performed alongside the TGC gene panel (R91). Due to under-recognition of the clinical phenotype, the current sample request is an underestimation of the true burden of disease
- Gap in test provision in NHS in England
- The project aim was to standardize, validate and accredit PCR telomere length assessment across adult and paediatric cases and accredit the test and offer as a <7GLH test to all GLHs

WP5 Progress

- King's Health Partners (KCH / KCL) team have developed and validated a cheap, rapid quick turnaround time peripheral blood in-house multiplex qPCR telomere length assay with low biological tissue requirement
- KHP have evaluated current methodologies of telomere length assessment; FLOW FISH, the commercial assay TeloNosiX and high throughput single telomere length analysis (HT-STELA)
- The plan is to extend the validation cohorts into all age ranges. currently the validation cohort does not include paediatric cases. GOSH to supply cases for normal range and 44 BMF paediatric cases with known short telomere length (TeloNosiX)
- The work needs to be transitioned into routine service genomics laboratory
- Application to national test directory April 2026 alongside change request for R91

Application to Haem-Onc NTD

Telomere length testing in haemato-oncology services (SIHMDS)

The following are major features associated with telomere biology disorders

-
  - Bone marrow failure/hypoplastic MDS
  - Pulmonary fibrosis/Interstitial lung disease
  - Telomere length in peripheral blood (<1st centile) without alternative explanation
  - Liver disease suggestive of telomere biology disorder (TBD)
  - Premature greying of at least 50% <age 30
  - Dysplastic/dystrophic teeth/nails typical of telomere biology disorder (TBD)
  - Oral leukoplakia/early onset dyplasia in the absence of additional risk factors
  - Skin changes typical of telomere biology disorder (TBD)
  - Squamous cell carcinoma of head and neck or anogenital adenomcarcinoma <50 with no other risk factors
  - Immunodeficiency with abnormal immunoglobulin levels or B/T-cell counts

The following are other non TBD-specific features associated with telomere biology disorders (e.g. these features also occur with many other conditions and are not indicative of TBDs in isolation)

- Developmental delay
- Microcephaly
- Short stature
- Oesophageal stricture
- Cerebellar hypoplasia
- Urethral stricture/phimosis
- Significant hair loss <age 30

Application to Haem-Onc NTD

Testing criteria:

Living individual with any of the following:

1) Bone marrow failure/hypoplastic MDS <50 AND

- Cytopenia with hypocellular bone marrow, **AND**
- DEB test negative

OR

2) Bone marrow failure/hypoplastic MDS any age AND

- Confirmed Personal or FHx in FDR/SDR of at least 1 other major TBD associated feature **OR**
- Confirmed Personal or FHx in FDR/SDR of >2 non specific TBD related features

AND

- Telomere length testing will alter immediate or future clinical management for transplant planning or therapy

OR

- Germline panel testing has not identified a causative variant and testing will change clinical management by supporting a clinical diagnosis of TBD

OR

- Germline panel testing has identified a variant of uncertain clinical significance and testing will influence variant classification

All other indications require discussion at specialist MDT with appropriate specialities present

Application to Rare Diseases NTD

Agree “cassette” of genes which should be tested for all indications for which telomere biology disorders are a possible diagnosis
Update ALL gene panels to this identical “cassette” of genes

- R15 Primary immunodeficiency or inflammatory bowel disease
- R21 Fetal anomalies
- R27 Paediatric disorders
- R91 Cytopenia (not Fanconi)
- R104 Skeletal Dysplasia
- R236 Pigmentary Skin Disorders
- R331 Intestinal failure or chronic diarrhoea
- R347 Inherited Acute Myeloid Leukaemia
- R421 Familial Pulmonary Fibrosis

NHSE Network of Excellence Work Package 6

CAR-T persistence

A collaboration between the SE and (formerly) SW GMS.
SE-GLH - KCH, Synnovis, KCL
SW-GLH - Bristol

GMS Lead: SE / NT
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Academic Lead SE - Dr Reuben Benjamin (KCL)
Scientific lead SE – Nicholas Lea (Synnovis),
Scientific lead SW- formerly Chris Wragg (Bristol)

Collaborators:
Dr Aytug Kizliors, Barnaby Clark (SE),

WP5 – CAR-T Persistence Aims

- Monitoring CAR-T persistence in patients is increasingly relevant in clinical practice regarding prognosis and therapeutic intervention
- Plan to develop and validate ddPCR assays to measure CAR-T levels in patients who receive one of the NHSE licensed CAR-T products (Tisagenlecleucel, Axicabtagene ciloleucel, Brexucabtagene autoleucel, Lisocabtagene maraleuceland and Obecabtagene autoleucel)
- ddPCR is a technique which offers the ability to monitor and evaluate cellular therapy at a highly sensitive level and can be undertaken on peripheral blood with a rapid turnaround time, all of which make it ideal for routine clinical practice

WP5 Progress

- Work package aims complete
- ddPCR for CD19 CAR monitoring validated
- For application to NTD April 2026 for persistence monitoring for Tisagenlecleucel and Obecabtagene autoleucel in B-acute lymphoblastic leukaemia in children and adults