Implementing the BGC Array Test in the NHS

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Blood transfusion Genomics Consortium Fringe Meeting

ISBT Barcelona June 2024

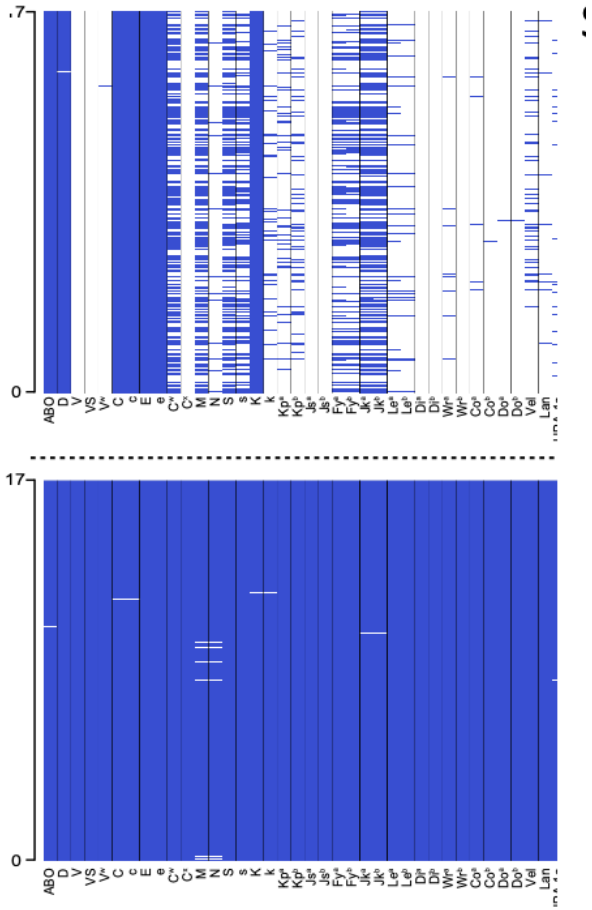
What are the necessary components to deploy a test in a health service?

- The test must be validated for clinical use and relevant to local population
- Test efficacy better/same but certainly cheaper than current testing
- Funding for the test
- Blood service engagement, socialisation of genotyping
- Ability to work with the regulator
- Building internal processes for implementation
- Hospital engagement
- Patient engagement
- 5 months on – what have we learned?

Test validated for clinical use and relevant to local population

- Fit for our patient population
- Enriched for genotypes more commonly seen in our cohorts with complex transfusion needs
- Validated against phenotypes
- Compared to existing typing in the blood service

Test efficacy better/same but certainly cheaper than current testing



	Phenotype	Standard red cell genotype	Red cell genotype for haemoglobinopathy patients	Axiom™ Total Blood Typing Solution
Definition	The observed characteristics of the red cell antigen when detected on the surface of the rbc	The interpretation of the genetic code of the blood groups	The interpretation of the genetic code of the blood groups	**The interpretation of the genetic code of the blood groups**
Process	serology/antibodies	genetic/molecular	genetic/molecular	**genetic/molecular**
Price	££	£££	££££	**Free -> £48?**
Red cell variants	No	No	Some of them	**Many of them**
If typing sera unavailable	No	Yes	Yes	**Yes**
Can use if transfused in last 3/12	No	Tes	Yes	**Yes**
Turnaround Time	7/7	12/52	12/52	**2/52?**
Other antigens?	N	N	N	**HLA/HPA/HNA**

Funding

- Training
- Staff
- Analysers
- Consumables
- Engagement activities

Funding: Engagement event

- Focused on:
  - Better matched blood to reduce the complications of transfusion
  - Equity of care and inclusion
- Leaders
  - NHS Blood and Transplant
  - NHS England
  - University College London Hospitals
  - University of Cambridge Hospitals

What happens when you take the money?

- Pros
  - Large reach
  - Implement change that may have taken a lot longer
- Cons
  - Ownership
  - Complicated to get agreement on minor changes
  - Things not relevant to blood but relevant to politics can impact delivery
  - Meetings, meetings, meetings, and more meetings

Socialising of genotyping

- Challenges
  - Decision makers often not scientists
  - Change is seen as a risk
  - Poor documentation of risk of current processes on existing systems
  - Visibility of complications to those within blood services
  - Job security
- What has worked
  - Ongoing discussions with stakeholders
  - Cost of genotyping reduced
  - Supportive encouraging debate
  - Patient impact stories
  - Public and patient involvement

Working with the regulator

- A manufacturer can apply to supply a medical device that does not comply with the law to protect a patient's health if there is no legitimate alternative available. This is called an exceptional use of a non-UKCA marked medical device. The same provision may be made for custom-made devices that have not complied with the standard conformity assessment procedure.
- The MHRA may authorise manufacturers to supply a non-compliant device in the interest of the protection of health under Regulation 12(5) of the Medical Devices Regulations 2002 (SI 2002 No 618, as amended) (UK MDR 2002). This also applies for active implantable medical devices in regulation 26 and for in vitro diagnostic medical devices under regulation 39(2).

Medicines & Healthcare products Regulatory Agency

Building internal processes for implementation

CC/13192 – Change Plan

Final v1 approved 21/08/2023 (approvals recorded in Q-Pulse)

Sample referral dependency – Planned start date 17/09/2023

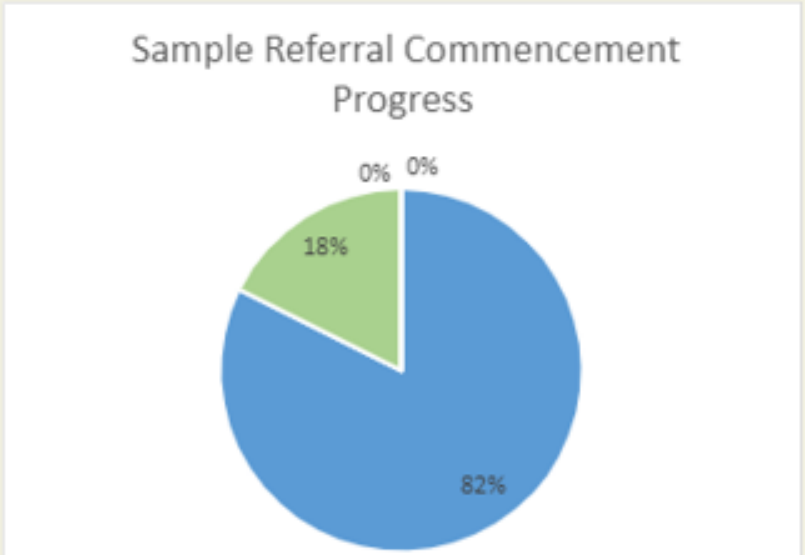
Sample testing dependency – Planned start date 30/11/2023

Action Ref	Action
1	Action: Identify Service Users Evidence Required: List of Service users requiring communication
2	Action: Create & Agree comms plan including comms to clinical teams Evidence Required: Evidence of stakeholder approval & copy of plan
3	Action: Implement comms plan including to agree information to be uploaded to the website Evidence Required: Evidence of communications as per plan
4	Action: Update NHSBT Website Evidence: Relevant information relating to project present on website prior to agreed go live date
5	Action: Provide patient information leaflets Evidence: Copy of patient leaflet and confirmation of its availability
6	Action: Brief Customer Services Evidence: Evidence of communication

Change Control Action Plan - Progress

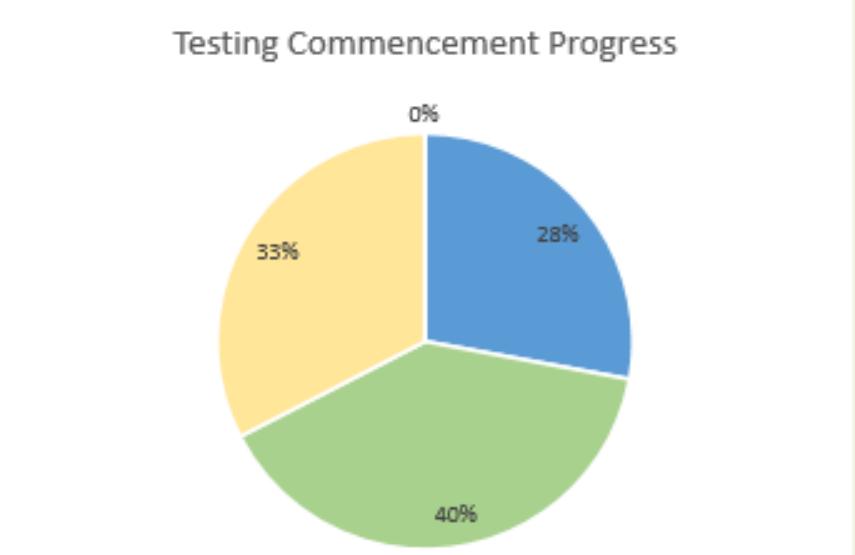
NHS Blood and Transplant

Overarching



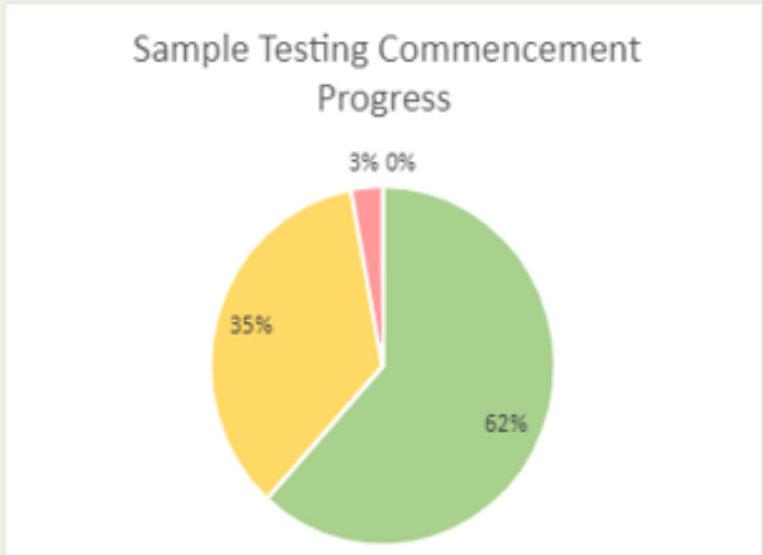
Complete & Evidence uploaded to SharePoint	42	*82%*
Complete – evidence required or underway with no issues	9	*18%*
Underway with challenges or progress uncertain	0	*0%*
Not started with significant challenges or barriers	0	*0%*
	51	

Digital



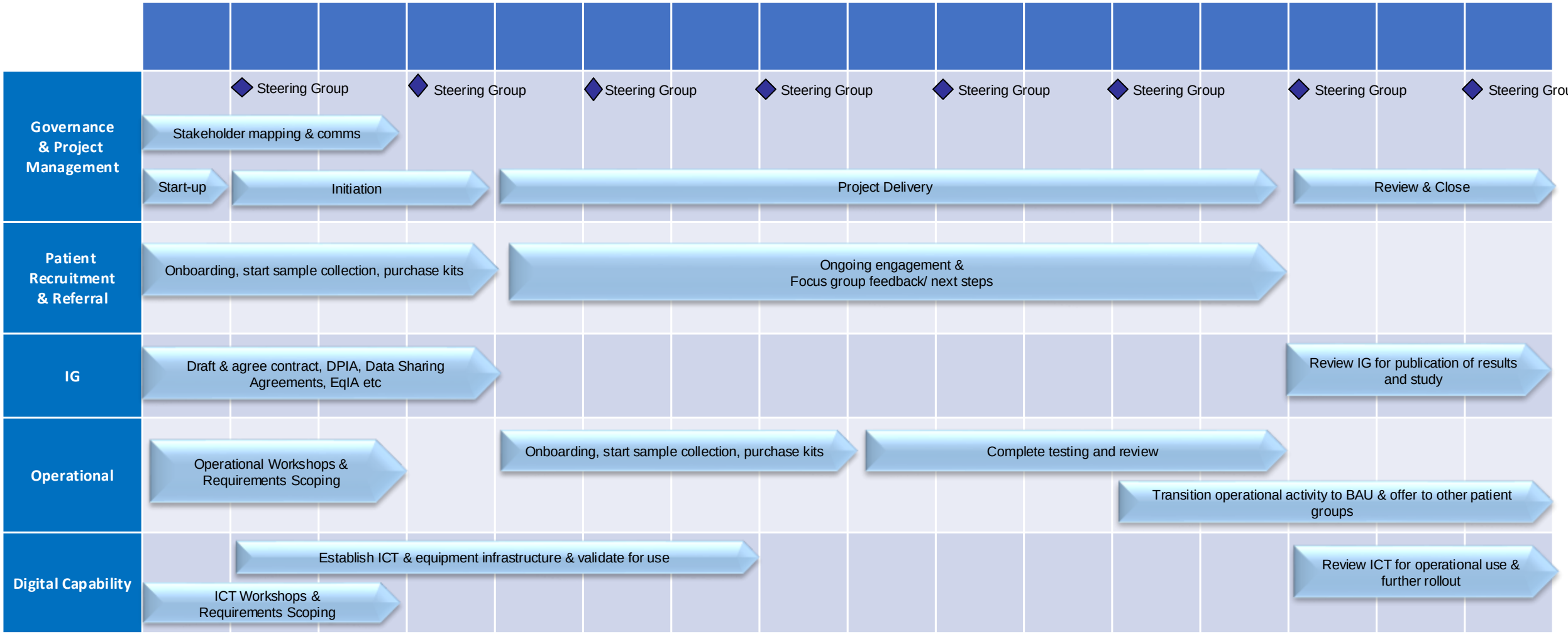
Complete & Evidence uploaded to SharePoint	12	*28%*
Complete – evidence required or underway with no issues	17	*40%*
Underway with challenges or progress uncertain	14	*33%*
Not started with significant challenges or barriers	0	*0%*
	43	

Operational



Complete & Evidence uploaded to SharePoint	0	*0%*
Complete – evidence required or underway with no issues	21	*62%*
Underway with challenges or progress uncertain	12	*35%*
Not started with significant challenges or barriers	1	*3%*
	34	

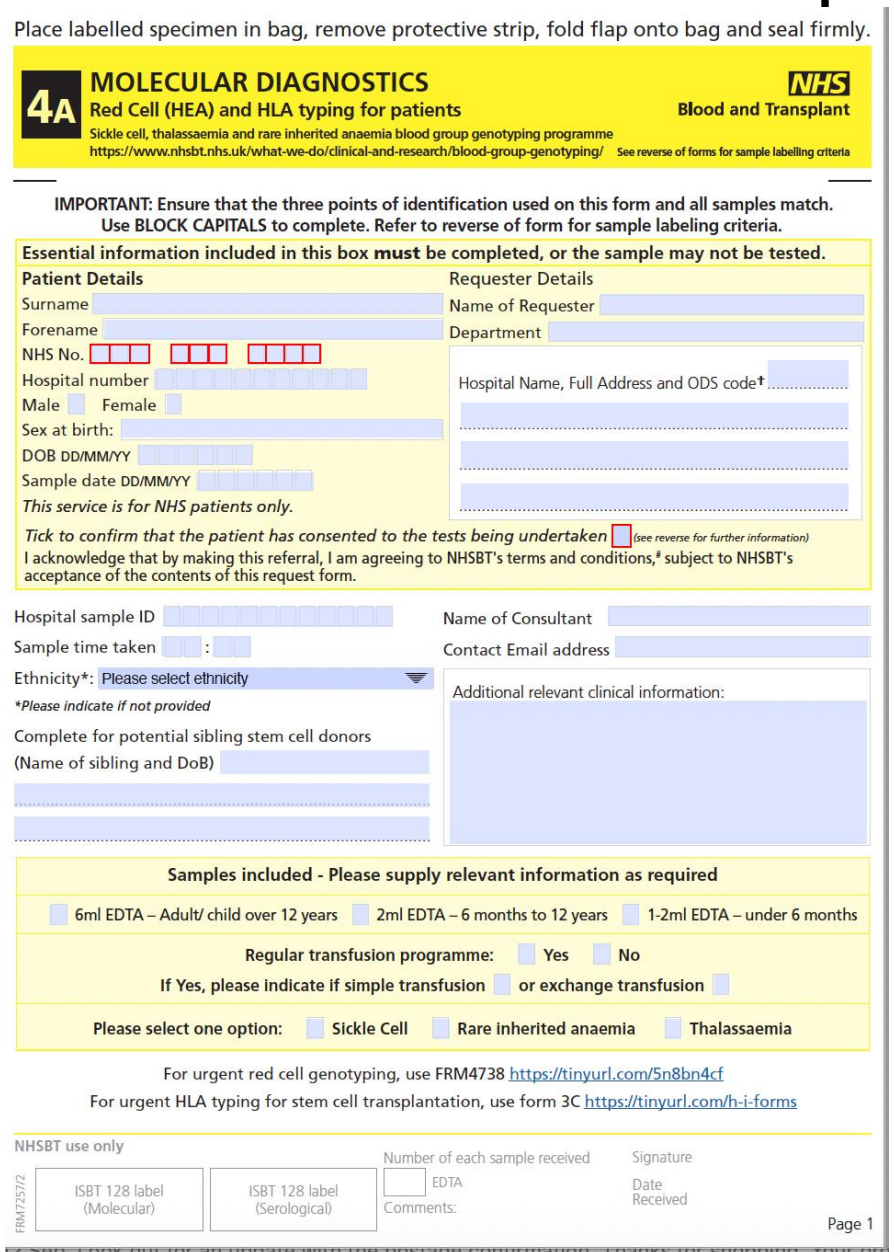
High Level Workplan



Hospital engagement

- Inclusion of haematologist and blood bank managers in the NHSE/NHSBT groups
- Webinars for staff
- Fully comprehensive information – “Frequently asked questions”
- Dedicated email for any further questions
- Presentations at key meetings to promote engagement
- NHSE letter to chief executives of hospitals and pathology directors “Get ready” and “Sample collection go live”.
- Sampling video
- Posters with QR codes

Hospital engagement (2)



Place labelled specimen in bag, remove protective strip, fold flap onto bag and seal firmly.

4A MOLECULAR DIAGNOSTICS
Red Cell (HEA) and HLA typing for patients
NHS Blood and Transplant
Sickle cell, thalassaemia and rare inherited anaemia blood group genotyping programme
https://www.nhsbt.nhs.uk/what-we-do/clinical-and-research/blood-group-genotyping/ See reverse of forms for sample labelling criteria

IMPORTANT: Ensure that the three points of identification used on this form and all samples match. Use BLOCK CAPITALS to complete. Refer to reverse of form for sample labeling criteria.

Essential information included in this box must be completed, or the sample may not be tested.

Patient Details
Surname
Forename
NHS No.
Hospital number
Male Female
Sex at birth:
DOB DD/MM/YY
Sample date DD/MM/YY
This service is for NHS patients only.

Requester Details
Name of Requester
Department
Hospital Name, Full Address and ODS code†

Tick to confirm that the patient has consented to the tests being undertaken *(see reverse for further information)*
I acknowledge that by making this referral, I am agreeing to NHSBT's terms and conditions,‡ subject to NHSBT's acceptance of the contents of this request form.

Hospital sample ID
Sample time taken :
Ethnicity*: Please select ethnicity
**Please indicate if not provided*
Complete for potential sibling stem cell donors
(Name of sibling and DoB)

Name of Consultant
Contact Email address
Additional relevant clinical information:

Samples included - Please supply relevant information as required
6ml EDTA – Adult/ child over 12 years 2ml EDTA – 6 months to 12 years 1-2ml EDTA – under 6 months
Regular transfusion programme: Yes No
If Yes, please indicate if simple transfusion or exchange transfusion
Please select one option: Sickle Cell Rare inherited anaemia Thalassaemia

For urgent red cell genotyping, use FRM4738 https://tinyurl.com/5n8bn4cf
For urgent HLA typing for stem cell transplantation, use form 3C https://tinyurl.com/h-i-forms

NHSBT use only
ISBT 128 label (Molecular)
ISBT 128 label (Serological)
Number of each sample received EDTA
Comments:
Signature
Date Received
FRM7257/2
Page 1

Information and resources for hospital and lab staff

If you're involved in matching blood for patients with inherited anaemias, find out more information about the blood group genotyping programme what it and means for you.

Jump to resources

How this programme will work

Blood group genotyping will be available from January 22, 2024, for all people in England living with sickle cell disorder, thalassemia, and with transfusion dependent rare inherited anaemias.

NHS England is working in partnership with NHS Blood and Transplant. More patients can tested, faster, thanks to a new array developed by the Blood transfusion Genomics Consortium (BGC). The samples will be tested at NHS Blood and Transplant's (NHSBT) Molecular Diagnostics Laboratory in Bristol.

NHS England is funding the test so hospitals will not be charged during the programme, which will last until a date to be confirmed in 2024. After that, we expect NHSBT will charge hospitals. We will also test for Human Leukocyte Antigen (HLA) type (commonly known as the tissue or bone marrow type), so people who are eligible for a stem cell transplant will have taken the first step already.

The test will be made available in Wales, Scotland and Northern Ireland, on a date to be confirmed.

Resources

- Patient information leaflet (PDF 70KB)
- Letter to lab staff, January 2024 (PDF 153KB)

Forms for sample testing
Download all the forms required for sending in samples for genotype testing.

Frequently asked questions
Find answers to common questions about the genotyping programme.

Posters and social media assets
Download and share our posters and social media assets to help promote the programme.

Contact us
If you have any questions about the programme, please contact transfusion@nhsbt.nhs.uk.

Patient Engagement

- Inclusion of patients and patient groups in the NHSE/NHSBT groups
- Fully comprehensive information – “Frequently asked questions”
- Dedicated email for any further questions
- Presentations at patient meetings to promote engagement
- Sampling video
- Patient engagement in comms materials – patient stories
- Patient information leaflet

Patient Engagement

NHS

Sickle Cell and Thalassaemia Blood Group Genotyping Programme

Save lives
Give blood

Information and resources for patients

If you have an inherited anaemia, find out more information about the blood group genotyping programme and how to get involved.

How genotyping will help

There are many different blood groups. Some are well known such as the ABO system. However, there are 300 known blood groups, often known as minor blood groups.

If patients receive blood with a minor blood group that doesn't match their own, they can develop antibodies which make it more difficult to find blood they can safely receive.

This is a real problem for people who may receive many transfusions over their lifetime.

This programme is an important step forwards as patients with these disorders will now know many more of their blood groups, making it easier to match their blood, improving the safety of blood transfusion.

How to get involved

If you have sickle cell, thalassaemia or other rate inherited anaemias, please speak to your clinical team about taking part.

You can find out more in our frequently asked questions for patients.

Who this will help

Stephanie receiving a red cell exchange

Genotyping will help people with sickle cell, like Stephanie who has developed antibodies from past blood transfusions.

She is in the complex patient group because it is now difficult to find blood which she can safely receive.

Advanced blood group testing would help her receive the best matched blood, reducing the risk of developing even more antibodies.

Stephanie said: "I know it's difficult to find well matched blood for me now.

"I have antibodies from past transfusions, better blood group matching will mean I can receive the best matched blood in the future with less chance of developing more antibodies and less chance of not being able to receive blood at all."

Resources and further information

Frequently Asked Questions

Find answers to common questions about the genotyping programme.

» Find questions and answers

Information leaflet

Download our information leaflet for patients.

» Download information leaflet (PDF 70KB)

Contact us

If you have any questions about the programme, please contact transfusion@nhsbt.nhs.uk.

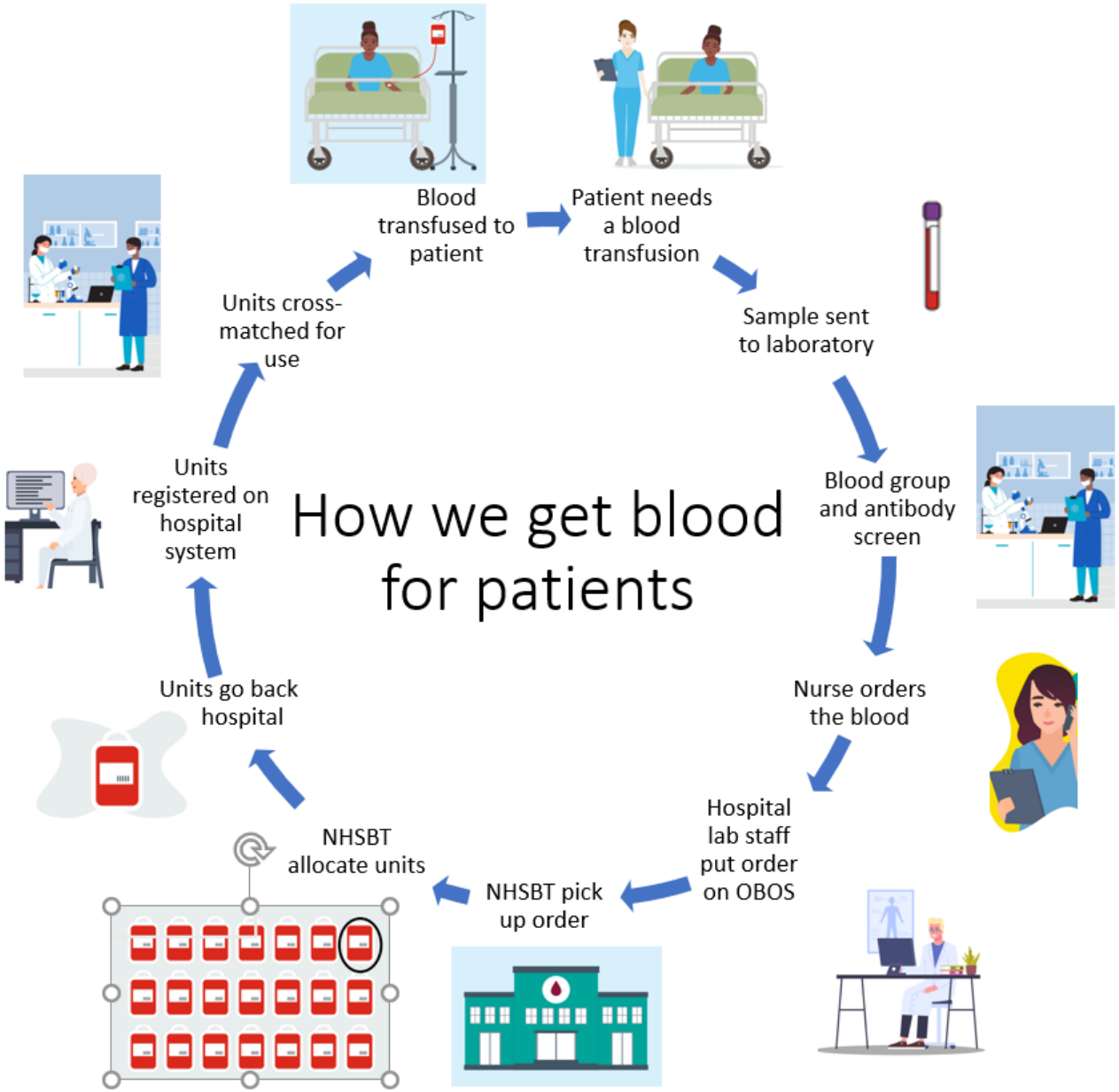
5 months in – where are we now?

- MHRA application part I successful, part II submitted (doing well)
- >3000 samples received
- General acceptability of test for patients and staff
- Some large sites have barely recruited
- High numbers of rejected samples
- A few of the larger hospitals were recently hacked so no samples being sent from them

What next?

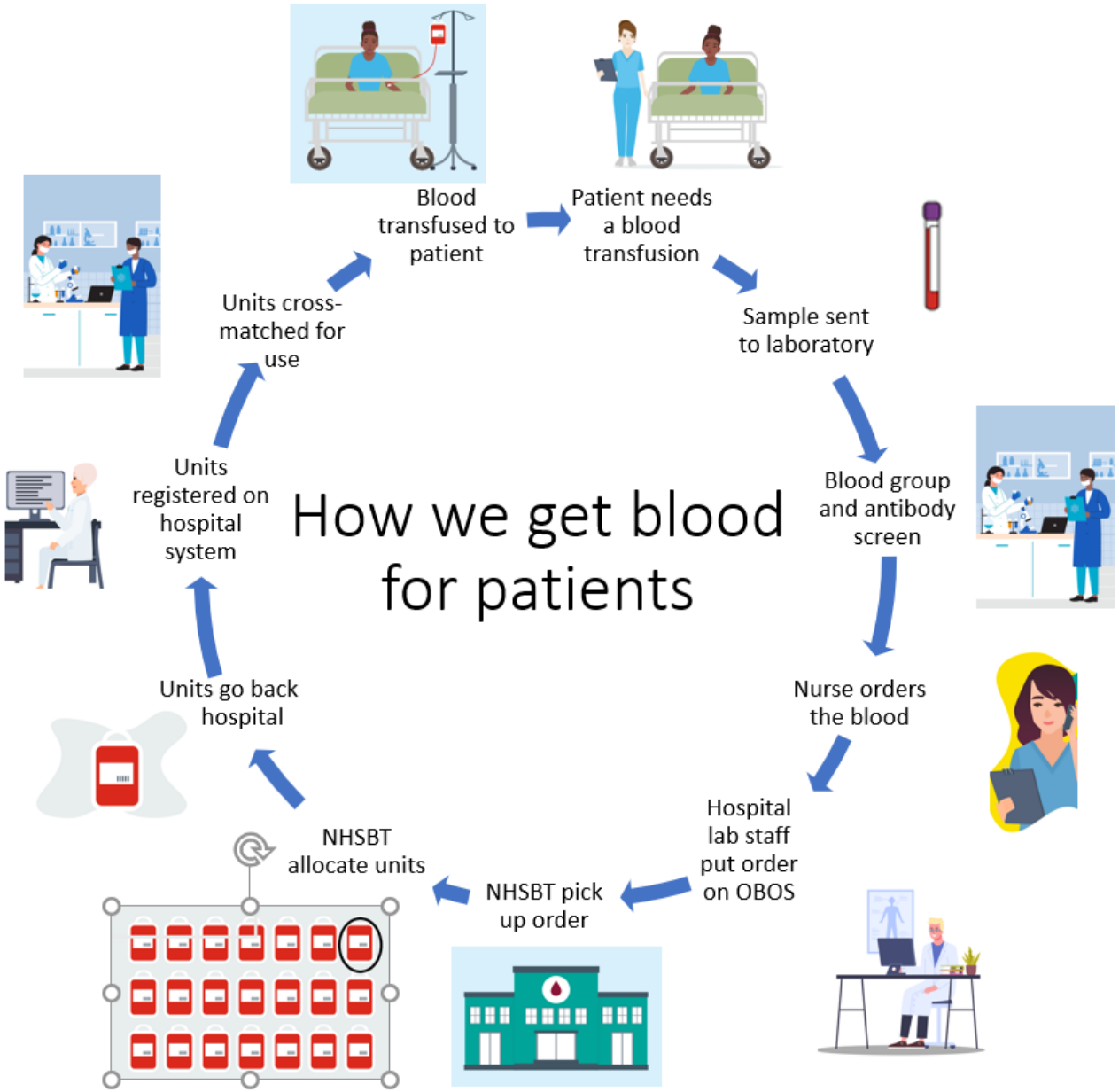
So now we will know the extended blood groups, is this enough?

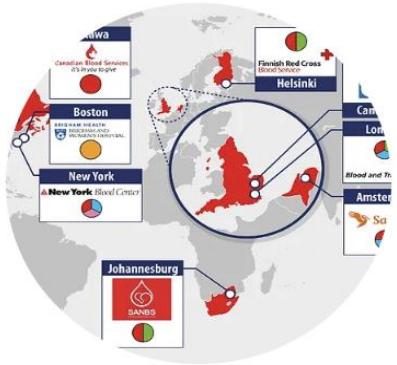
- **Blood grouping technology:**
  - expensive and laborious - the extended blood group is only routinely done on 6% of donors.
- **Numbers of blood groups potentially to match:**
  - >200 blood groups
- **Blood ordering:**
  - done on a group not patient basis
- **Number of units to be matched:**
  - 10,000 units per month for people with sickle in England



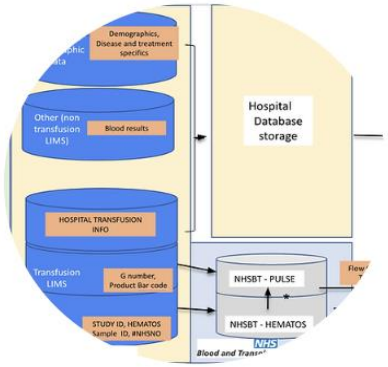
So why can’t we match blood across many blood group antigens routinely (contd)?

- **Available interconnectivity:**
  - There is no meaningful connectivity between NHSBT and hospitals and often within hospitals
- **Selection of blood for transfusion at NHSBT:**
  - Performed manually
- **Stock maintenance and donations:**
  - Not precision managed to meet patient demand
  - A push rather than pull model



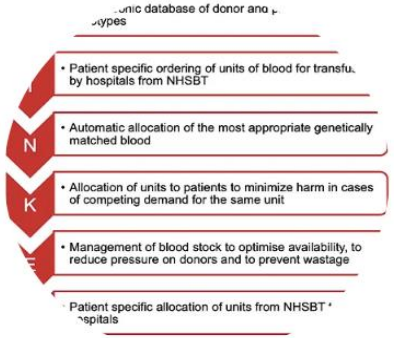


Blood Antigen Genotyping



NIHR HIC TDA Database

Donor/Patient Demand Modelling



Informatics

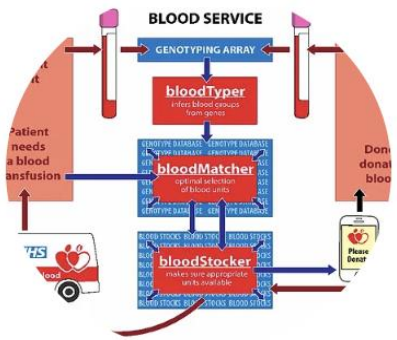
WORK PACKAGE 1

WORK PACKAGE 2

WORK PACKAGE 3

WORK PACKAGE 4

Haem Match



Artificial Intelligence

Health Economics

PPIE

Clinical Studies

WORK PACKAGE 5

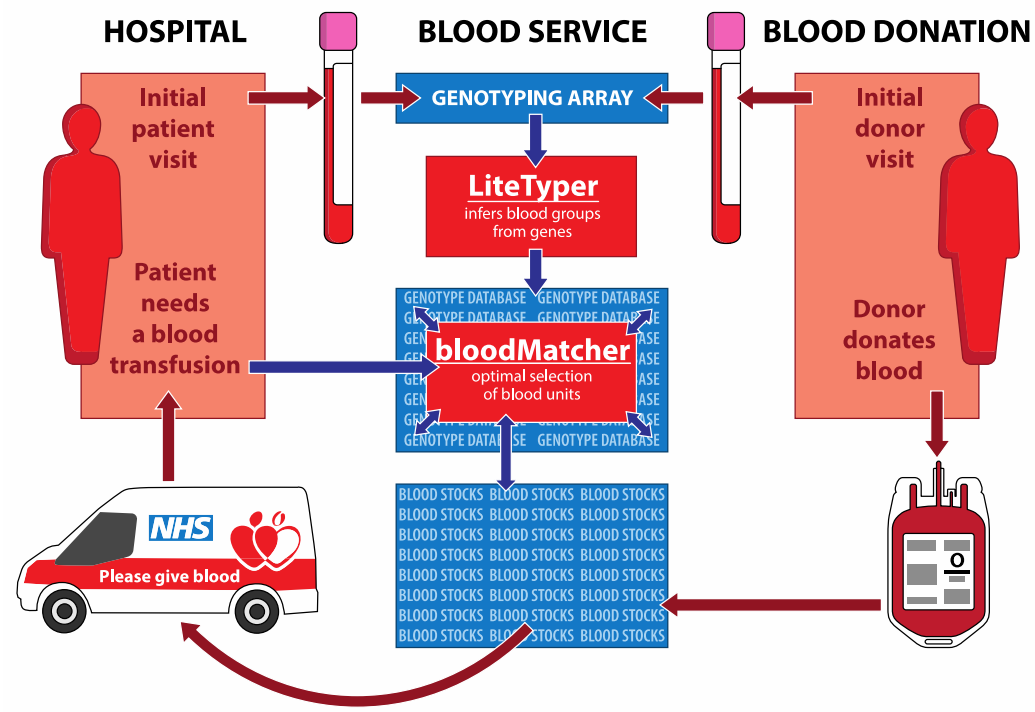
WORK PACKAGE 6

WORK PACKAGE 7

WORK PACKAGE 8

Haem-Match and Feasibility study of genomically matched blood

- Supporting data accrual and access to inform algorithm (NIHR BioResource applications, NIHR HIC TDA)
- Bloodmatcher developed and demonstrates significant reduction in risk of alloimmunisation with no cost to the system
- Study design: single site, 40 patients, sickle, regular exchanges. Aim to start recruitment Q4 2024
- Approvals and funding success
- Institutional engagement and buy in
- REC application imminent



The patient story

- Short patient video

Ai Leen Ang
Claire Bloor
Colin Brown
James Daly
Candice Davison
Emanuele Di Angelantonio
Alexander Dilthey
Parita Ghia
Nick Gleadall
Jeremy Gollub
Aaron Gottschalk
Lavendri Govender
Andreas Greinacher
Shane Grimsley
Andrea Harmer
Martin Howell
Kati Hyvärinen
Ute Jentsch
Shantanu Kaushikkar
Mary Kasanicki
Pawinee Kupatawintu
Lianne Koets
Marco Koppelman
Will Kruka
William Lane
Jennifer Laird
Maja Mattle
Lorna McLintock
Stefan Meyer
Gail Miflin
Celina Montemayor
Ana-Maria Moreno
Sarah Morley
Gorka Ochoa
John Ord
Willem H Ouwehand
Jukka Partanen
Lydia Quaye
David Roberts
Luisa Ronzine
Kathleen Selling
Melissa Schreiner
Marie Scully
Jonathan Stephens
Jennifer Thompson
Sara Trompeter
Ellen van der Schoot
Luca Valenti
Sumathi Venkatapathy
Sunitha Vege
Barbera Veldhuisen
Nico Vreeswijk
Lindsay Walker
Phandee Watanaboonyongcharoen
Darleen Welford
Connie Westhoff
Mark Whelan

bold: Principal Investigators; *italics*: Project Coordination; underlined: Analysis Team; **Blue**: Discordance Resolution; **Green:** Genotyping Lead

Sara Trompeter
UCL, UCLH & NHS Blood and Transplant

Find out more:

www.haemmatch.org

www.bgc.io

https://www.nhsbt.nhs.uk/what-we-do/clinical-and-research/blood-group-genotyping/

NIHR | University College London Hospitals Biomedical Research Centre

NIHR | Cambridge Biomedical Research Centre