THE CHANGING LANDSCAPE OF PAEDIATRIC GENOMICS

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THE CHANGING LANDSCAPE OF PAEDIATRIC GENOMICS

- Importance of a genetic diagnosis for children
- Evolution of genomic analysis
- Paediatric genomic mainstreaming
- Cell free DNA analysis
- Gene therapy
- Personalised cancer pathways
- The Generation study
- Resources for genomics education

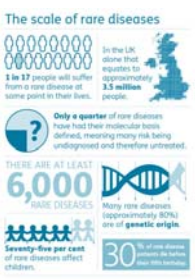
IMPORTANCE OF A GENETIC DIAGNOSIS IN CHILDREN

'Genomic medicine has the potential to save costs and improve quality of care by targeting treatment, maximising benefit and reducing side effects. For patients with rare diseases, it can shorten their 'diagnostic odyssey' helping to identify therapeutic options faster and improve outcomes.'

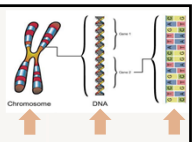
– *Sally Davies CMO 2016*

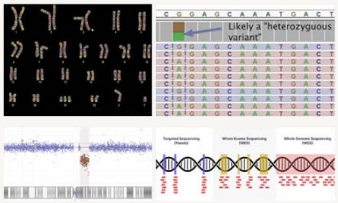
'I want another child but without any answers it seems like such a gamble.'

SWAN UK member



EVOLUTION OF GENOMIC ANALYSIS





The 100,000 Genomes Project

NHS

National Genomic Test Directory

Testing Criteria for Rare and Inherited Disease

NATIONAL TEST DIRECTORY

TESTS PAEDIATRICIANS CAN REQUEST:

R222	NF1
R28	Congenital malformation/dysmorphism - microarray
R29	Intellectual disability
R377	Intellectual disability - microarray
R47/R48	Angelman/Prader Willi syndrome
R49	Beckwith-Weidemann syndrome
R53	Fragile X
R69	Hypotonic infant
R70	SMA type I
R147	Growth failure in early childhood
R149	Severe early-onset obesity
R67	Monogenic hearing loss
R24	Achondroplasia
R73	Duchenne Muscular Dystrophy
R88	Severe microcephaly
R222	NF1
R137	Congenital heart disease - microarray
R135	Paediatric/syndromic cardiomyopathy

TESTS THAT CAN BE REQUESTED WITH CLINGEN APPROVAL:

R14 - Rapid Exome Sequencing (Exeter)
R27 - Congenital malformation and dysmorphism super panel

- Array (copy number variants)
- MLPA (single/partial gene deletion/dup)
- STR (short tandem repeats)
- Other (methylation | linkage | DUX)
- Single gene sequencing
- Small panel or WES
- WGS

https://www.england.nhs.uk/publication/national-genomic-test-directories
https://nhsgms-panelapp.genomicsengland.co.uk/

PAEDIATRIC GENOMIC MAINSTREAMING

PAEDIATRICIAN

EVOLVING ROLE OF THE PAEDIATRICIAN

- Facilitating genomic testing
- Seeking informed consent
- Understanding key aspects of genomic reports
- Managing a genomic diagnosis
- Working with genomic specialists

LABORATORY SCIENTISTS

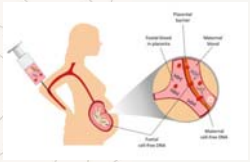
MDT

GENETIC COUNSELLOR

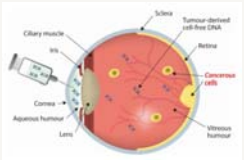
CLINCIAL GENETICIST

CELL FREE DNA ANALYSIS

NON-INVASIVE PRENATAL DIAGNOSIS (NIPD)



PRECISION MEDICINE IN ONCOLOGY



GENE THERAPY

LEBER CONGENITAL AMAUROSIS *(RPE65)*

LUXTERNA

SPINAL MUSCULAR ATROPHY *(SMN1)*

ZOLGENSMA
[Nusinersen (Spinraza)]
[Risdiplam (Evrysdi)]

METACHROMATIC LEUKODYSTROPHY *(ARSA)*

LIBMELDY

PAEDIATRIC CANCER

GENERATION STUDY

Newborn Genomes Programme

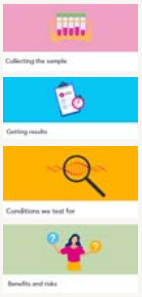
Delivering the NHS-embedded Generation Study

Genomics England

We are using whole genome sequencing to look for changes in genes linked to more than 200 rare conditions. The conditions we test for:

- Usually appear in the first few years of life
- Can be improved if caught early
- Can be treated through the NHS in England

These conditions have different types of symptoms, but can all cause someone to be more sick than the average child.



The test includes

Well-known conditions like Cystic Fibrosis.

Lesser-known conditions like Barth Syndrome and Diamond Blackfan Anaemia.

Hormonal conditions that affect growth and development, like genetic Hypothyroidism and Growth Hormone Deficiency.

Blood conditions that affect red blood cells like Sickle Cell Disease, or blood clotting like Haemophilia.

Immune system conditions that increase someone's risk of life-threatening infections, like Severe Combined Immune Deficiency (SCID).

Metabolic conditions that affect the body's ability to process certain substances and remove toxins, like Phenylketonuria.

The test does not include

Allergies such as food allergies, hay fever, eczema, or asthma.

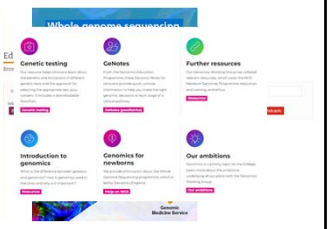
Neurodiversity like Autism, ADHD, ADD, and Dyslexia.

Visit: ge-newborns@genomicsengland.co.uk

Genomic Resources

USEFUL RESOURCES:

- Your local Genomic Laboratory Hub: https://www.norththamesglh.nhs.uk/healthcare-professionals/ordering-whole-genome-sequencing/
- NHSE Genomics Education Programme (GEP): https://www.genomicseducation.hee.nhs.uk/education/
- RCPCH Genomics landing page https://www.rcpch.ac.uk/key-topics/genomics



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- Gene panels information: https://panelapp.genomicsengland.co.uk/

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- Gene panels information: https://panelapp.genomicsengland.co.uk/
- Phenotype information: https://www.omim.org/ https://pubmed.ncbi.nlm.nih.gov/ https://hpo.jax.org/app/

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- Gene panels information: https://panelapp.genomicsengland.co.uk/
- Phenotype information: https://www.omim.org/ https://pubmed.ncbi.nlm.nih.gov/ https://hpo.jax.org/app/
- Paediatric GeNotes: https://www.genomicseducation.hee.nhs.uk/genotes/paediatrics/

TIER ONE

In the Clinic

Focused on the point of patient care, these short scenarios look at when to consider genomic testing and what you need to do.

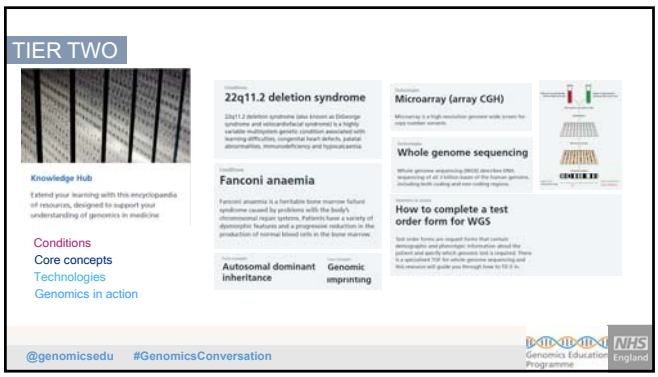
When should you consider genomic testing?

What do you need to do?

What test and what samples are needed?

@genomicsedu #GenomicsConversation

Genomics Education Programme | NHS England


TIER TWO
Knowledge Hub
Extend your learning with this encyclopaedia of resources, designed to support your understanding of genomics in medicine
Conditions
Core concepts
Technologies
Genomics in action
22q11.2 deletion syndrome
Fanconi anaemia
Autosomal dominant inheritance
Genomic imprinting
Microarray (array CGH)
Whole genome sequencing
How to complete a test order form for WGS
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THANK YOU & QUESTIONS
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NHS
Great Ormond Street Hospital for Children