Genomic Medicine Summary

The role of the GP in genomic medicine

The term 'Genomic Medicine' is increasingly used in health services. Whilst Genetics focuses on the DNA coding for single functional genes, Genomics is the study of the entirety of an individual's DNA, recognising the role of non-protein-coding DNA and the complex interactions between multiple genes and the environment. Genomic medicine involves using genomic information about an individual as part of their clinical care (e.g. for diagnostic or therapeutic decision-making). The term encompasses both Genetics and Genomics.

As a GP your role is to:

- Take and consider family histories in order to identify families with or at risk of genetic conditions (including autosomal and X-linked disorders) and familial clusters of common conditions such as cancer, cardiovascular disease and diabetes
- Identify patients and families who would benefit from being referred to appropriate specialist services
- Manage the day-to-day care of patients with genetic conditions even if the patient is under specialist care
- Coordinate care across services, including transitions from paediatric to adult services
- Communicate information about genetics and genomics, including discussing results from antenatal and new-born screening programmes
- Understand how genomic information is used within the context of routine clinical practice.

Key Areas for Exam preparation

Common and important conditions

Variations in the human genome may have no effect, predispose to common complex diseases, or result in genetic conditions. Many of these conditions (e.g. cystic fibrosis, Huntington's Disease) are individually rare, but as a group share common principles in terms of diagnosis, management, and supporting patients and their families. As a GP you should understand the following:

- Autosomal dominant conditions (e.g. familial hypercholesterolaemia, polycystic kidney disease, Huntington's Disease, thrombophilias)
- Chromosomal disorders (e.g. Down syndrome, trisomy 18, Turner syndrome, Klinefelter syndrome)
- Autosomal recessive conditions (e.g.cystic fibrosis, hereditary haemochromatosis, haemoglobinopathies)
- X-linked disorders (e.g. Fragile X Syndrome (see also RCGP Topic Guide *Neurodevelopmental disorders, intellectual and social disabilities*), Duchenne and Becker Muscular Dystrophy, haemophilia).

Common complex diseases follow a multi-factorial inheritance pattern e.g. ischaemic heart disease, hypertension, diabetes, cancer, obesity. A proportion of patients with a common complex disease demonstrate familial clustering of the condition or have an autosomal dominant condition that confers high risk e.g.*BRCA 1* pathogenic variant in breast cancer, Lynch syndrome or familial hypercholesterolaemia in Ischaemic Heart Disease.

Suggested resources:

General Reading

- Bradley-Smith G, Hope S, Firth H, Hurst J. *Oxford Handbook of Genetics* Oxford University Press, 2009
- Harper PS. *Practical Genetic Counselling* London: Hodder Arnold, 2010
- www.geneticseducation.nhs.uk
- www.cafamily.org.uk
- www.rarechromo.org
- https://bestpractice.bmj.com/topics/en-gb/700

***e*-GP**

The e-GP course on Genetics in Primary Care includes topics such as taking, drawing and interpreting genetic family histories, communicating genetic information and managing and referring patients. www.e-GP.org

Screening:

UK National Screening Committee

This webpage give access to all the UK screening programmes, including the antenatal and newborn and cancer programmes. www.screening.nhs.uk

Taking a genetic family history

The NHS National Genetics and Genomics Education Centre website has a number of resources designed around taking and drawing a family history, including a series of factsheets, pedigree drawing exercises and videos. In addition, the website contains information about core concepts in genetics, information about genetic conditions and an extensive knowledge base of genetic terms.

www.geneticseducation.nhs.uk

Information for families:

Contact a Family

Contact a Family is a UK-wide charity that provides advice, information and support to parents who have a child with a disability. www.cafamily.org.uk

Unique

Unique is a UK-based charity which provides information and support to both families and individuals affected by rare chromosomal conditions, as well as the health professionals involved in providing ongoing medical management and care.

www.rarechromo.org

Single gene:

Autosomal recessive (eg Cystic fibrosis, Freidreiche's Ataxia, Sickle cell anaemia, Thalassaemia, Tay-Sacs disease, Usher syndrome, Sideroblastic anaemia, Maple syrup urine disease,

- https://www.nhs.uk/conditiona/cystic-fibrosis/
- https://www.blf.org.uk/support-for-you/cystic-fibrosis
- https://ghr.nlm.nih.gov/condition/cystic-fibrosis
- https://www.cs.cmu.edu/~genetics/units/instructions/instructions-PBA.pdf
- https://www.cs.cmu.edu/~genetics/units/instructions/instructions-PBA.pdf
- https://www.ninds.nih.gov/disorders/patient-caregiver-education/fact-sheets/friedreichs-ataxia-fact-sheet
- https://ghr.nlm.nih.gov/condition/friedreich-ataxia#inheritance

Autosomal Dominant (eg Huntington's Chorea, type 1 Neurofibromatosis, Polycystic kidney disease, Tuberous sclerosis complex, Treacher Collins syndrome, Protein S deficiency, Protein C deficiency, Phenylketonuria, Noonan syndrome, Werner's syndrome, Marfan's syndrome, Ehlers-Danlos syndrome, Acondroplasia,

- https://www.cs.cmu.edu/~genetics/units/instructions/instructions-PBA.pdf
- https://ghr.nlm.nih.gov/condition/huntington-disease
- https://www.nhs.uk/conditions/huntingtons-disease/

X-linked recessive condition (eg Duchenne muscular dystrophy, Haemophilia, Fragile X syndrome)

- https://www.cs.cmu.edu/~genetics/units/instructions/instructions-PBA.pdf
- https://www.ncbi.nlm.nih.gov/books/NBK21257/figure/A531/?report=objectonly
- https://www.duchenneuk.org/pages/faqs/category/what-is-duchenne
- https://www.mda.org/disease/duchenne-muscular-dystrophy

Chromosomal Abnormalities (eg Downs syndrome**,** Edward's syndrome, Patau syndrome, Turner's syndrome, Klinefelter's syndrome, Cri du chat syndrome

- https://www.evidence.nhs.uk/search?q=chromosomal%20syndromes&ps=50