

# Initial Education and Training of Pharmacists: Genomic Medicine Indicative Curriculum

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## Introduction

**This curriculum for Genomic Medicine has been developed by NHS England – Workforce, Education and Training (WT&E) Directorate, NHS England - National Genomics Education team and the Pharmacy Schools Council.**

The revised General Pharmaceutical Council (GPhC) standards for the Initial Education and Training of Pharmacists (IETP) integrate learning outcomes that demonstrate competency as an Independent Prescriber at the point of registration. They span the entire initial five years of training. **Independent prescribing will not be incorporated into foundation training until the 2025/26 training year. The learning outcomes for training years 2021/22 – 2024/25 have been modified by the GPhC to reflect this.**

To support the implementation of the IETPs, a number of priority subjects were identified by NHS England WT&E and Pharmacy Schools Council for the development of indicative curricula. Genomic medicine was identified as one of these subjects. Indicative curricula are designed in the interest of an effective continuum of learning and training in practice across the 5 years of initial education and training.

This document is intended to provide a series of resources to guide the teaching content in both the MPharm and the Foundation Training Year to support effective initial education and training in England. This will support undergraduate pharmacy students and trainee pharmacists to successfully demonstrate the learning outcomes of the IETPs and RPS Prescribing Competencies that link to Genomic Medicine. It is not compulsory to use but is there as a guide to support educators.

## Indicative Curriculum

Below is an indicative curriculum for Genomic Medicine. It can be used to guide the design and delivery of teaching and training within the MPharm and Foundation Training Year. The resources in this document will provide underpinning context and knowledge that support learners to develop towards the following GPhC learning outcomes and RPS Prescribing Competencies.

[Table 1](#) lists the learning outcomes from the GPhC standards for the Initial Education and Training of Pharmacists. [Table 2](#) lists the competencies from the [RPS Competency Framework for All Prescribers](#) that are covered by this Indicative Curriculum for Prescribing Training.

**Please note:** Some of these resources may require a login to access which may only be available to pharmacy professionals. Where this is applicable, we have tried to indicate within the curriculum.

**Table 1. GPhC Learning Outcomes**

<b>GPhC Learning Outcomes:</b>	<b>MPharm degree</b>	<b>Foundation training year</b>
<b>Domain: Person-centred care and collaboration</b>		
1. Demonstrate empathy and keep the person at the centre of their approach to care at all times	Does	Does
2. Work in partnership with people to support and empower them in shared decision-making about their health and wellbeing	Shows How	Does
3. Demonstrate effective communication at all times and adapt their approach and communication style to meet the needs of the person	Does	Does
4. Understand the variety of settings and adapt their communication accordingly	Shows How	Does
5. Proactively support people to make safe and effective use of their medicines and devices	Shows How	Does
6. Treat people as equals, with dignity and respect, and meet their own legal responsibilities under equality and human rights legislation, while respecting diversity and cultural differences	Does	Does
7. Obtain informed consent before providing care and pharmacy services	Does	Does
8. Assess and respond to the person's particular health risks, taking account of individuals' protected characteristics and background	Shows How	Does
9. Take responsibility for ensuring that personal values and beliefs do not compromise person-centred care	Does	Does
10. Demonstrate effective consultation skills, and in partnership with the person, decide the most appropriate course of action	Does	Does
11. Take into consideration factors that affect people's behaviours in relation to health and wellbeing	Shows how	Does
12. Take an all-inclusive approach to ensure the most appropriate course of action based on clinical, legal and professional considerations	Shows How	Does
13. Recognise the psychological, physiological and physical impact of prescribing decisions on people	Shows How	Does
14. Work collaboratively and effectively with other members of the multi-disciplinary team to ensure high-quality, person-centred care, including continuity of care	Shows How	Does
<b>Domain: Professional Practice</b>		
16. Apply professional judgement in all circumstances, taking legal and ethical reasoning into account	Does	Does
17. Recognise and work within the limits of their knowledge and skills, and get support and refer to others when they need to	Does	Does
18. Take responsibility for all aspects of pharmacy services, and make sure that the care and services provided are safe and accurate	Does	Does
21. Apply the science behind pharmacy in all activities	Does	Does

22. Demonstrate how the science behind pharmacy is applied in the discovery, design, development and safety testing of medicines and devices	Shows how	Knows how
23. Recognise the technologies that are behind developing advanced therapeutic medicinal products and precision medicines, including the formulation, supply and quality assurance of these therapeutic agents	Shows how	Does
26. Consider the quality, safety and risks associated with medicines and products and take appropriate action when producing, supplying and prescribing them	Knows How	Shows How
29. Apply the principles of clinical therapeutics, pharmacology and genomics to make effective use of medicines for people, including in their prescribing practice	Shows How	Does
30. Appraise the evidence base and apply clinical reasoning and professional judgement to make safe and logical decisions which minimise risk and optimise outcomes for the person	Shows How	Does
31. Critically evaluate and use national guidelines and clinical evidence to support safe, rational and cost-effective procurement for the use, and prescribing of, medicines, devices and services	Shows How	Does
34. Apply the principles of effective monitoring and management to improve health outcomes	Shows How	Does
35. Anticipate and recognise adverse drug reactions, and recognise the need to apply the principles of pharmacovigilance	Does	Does
36. Apply relevant legislation and ethical decision-making related to prescribing, including remote prescribing	Shows How	Does
37. Prescribe effectively within the relevant systems and frameworks for medicines use	Shows how	Does
39. Take responsibility for people's health records, including the legality, appropriateness, accuracy, security and confidentiality of personal data	Shows How	Does
41. Effectively make use of local and national health and social care policies to improve health outcomes and public health, and to address health inequalities	Shows how	Does
<b>Domain: Leadership and management</b>		
47. Develop, lead and apply effective strategies to improve the quality of care and safe use of medicines	Knows how	Does
49. Use tools and techniques to avoid medication errors associated with prescribing, supply and administration	Shows How	Does

**Table 2. RPS Prescribing Competencies**

<b>RPS Prescribing Competencies:</b>
1.2 Considers patient dignity, capacity, consent and confidentiality.
1.5. Demonstrates good consultation skills and builds rapport with the patient/carer
1.8 Identifies and addresses potential vulnerabilities that may be causing the patient/carer to seek treatment
1.9 Accesses and interprets all available and relevant patient records to ensure knowledge of the patient's management to date.
1.10 Requests and interprets relevant investigations necessary to inform treatment options.
1.12 Understands the condition(s) being treated, their natural progression, and how to assess their severity, deterioration and anticipated response to treatment.
1.14 Refers to or seeks guidance from another member of the team, a specialist or appropriate information source when necessary.
2.2 Considers all pharmacological treatment options including optimising doses as well as stopping treatment (appropriate polypharmacy and deprescribing).
2.3 Assesses the risks and benefits to the patient of taking or not taking a medicine or treatment.
2.4 Applies understanding of the pharmacokinetics and pharmacodynamics of medicines, and how these may be altered by individual patient factors.
2.6 Considers any relevant patient factors and their potential impact on the choice and formulation of medicines, and the route of administration.
2.7 Accesses, critically evaluates, and uses reliable and validated sources of information.
2.8 Stays up to date in own area of practice and applies the principles of evidence-based practice.
2.9 Considers the wider perspective including the public health issues related to medicines and their use and promoting health.
3.1 Actively involves and works with the patient/carer to make informed choices and agree a plan that respects the patient's/carer's preferences.
3.2 Considers and respects patient diversity, background, personal values and beliefs about their health, treatment and medicines, supporting the values of equality and inclusivity, and developing cultural competence.
3.3 Explains the material risks and benefits, and rationale behind management options in a way the patient/carer understands, so that they can make an informed choice
4.2 Understands the potential for adverse effects and takes steps to recognise, and manage them, whilst minimising risk.
4.3 Understands and uses relevant national, regional and local frameworks for the use of medicines.
4.14 Effectively and securely communicates information to other healthcare professionals involved in the patient's care, when sharing or transferring care and prescribing responsibilities, within and across all care settings.
6.4 Recognises and reports suspected adverse events to medicines and medical devices using appropriate reporting systems.
7.5. Keeps up to date with emerging safety concerns related to prescribing
8.2 Accepts personal responsibility and accountability for prescribing and clinical decisions, and understands the legal and ethical implications
8.3 Knows and works within legal and regulatory frameworks affecting prescribing practice.
8.5 Recognises and responds to factors that might influence prescribing.
8.6. Works within the NHS, organisational, regulatory and other codes of conduct when interacting with the pharmaceutical industry

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
<b>Genomic Medicine Overview</b>			
<p><b>Fundamental Principles of Genomics</b></p> <p><i>Genomics is the study of an organism's genome and how that information is applied as part of clinical care. These resources will introduce you to the principles of genomics.</i></p>	<p>The National Genomics Education team was established to ensure that the NHS workforce has the knowledge, skills and experience to make the best use of genomics in their practice. These resources link to the fundamental principles but there are a wide range of other resources on the website.</p> <ul style="list-style-type: none"> <li>• <a href="http://hee.nhs.uk">What is genomics? - Genomics Education Programme (hee.nhs.uk)</a></li> <li>• <a href="http://hee.nhs.uk">Genomics glossary - Genomics Education Programme (hee.nhs.uk)</a></li> </ul> <p>There are a series of short videos which explain more about some of the fundamentals of genomics:</p> <ul style="list-style-type: none"> <li>• <a href="#">What is DNA?</a></li> <li>• <a href="#">What is a genome?</a></li> <li>• <a href="#">How we inherit genomic information</a></li> <li>• <a href="#">Why do we want to know about genomes?</a></li> <li>• <a href="#">The power of a genetic diagnosis</a></li> </ul> <p>The National Genomics Education team have worked with E- learning for healthcare to develop a series of Genomics 101 e-learning packages. Each takes no longer than 30 minutes to complete and you will get a certificate of completion (<i>login required</i>). (Note: If you have a CPPE account, it is recommended to sign in to e-LfH via their website by searching for 'e-LfH' and selecting the e-learning for healthcare learning modules – e-learning.)</p> <ul style="list-style-type: none"> <li>• <a href="#">Genomics in Healthcare</a></li> </ul>	21, 22, 23, 29, 47	2.8, 8.5

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
	<ul style="list-style-type: none"> <li>• From Genes to Genome</li> <li>• Taking and Drawing a Genetic Family History</li> <li>• From Gene to Protein</li> <li>• Inheriting Genomic Information</li> <li>• Talking Genomics</li> <li>• Dominant, Recessive and Beyond: How Genetic Conditions are Inherited</li> <li>• Investigating the Genome Part 1: The Process</li> <li>• Investigating the Genome Part 2: The Tests</li> </ul> <p>The National Genomics Education team have developed a webpage of genomics in Pharmacy.</p> <ul style="list-style-type: none"> <li>• <a href="#">Genomics in Pharmacy - Genomics Education Programme</a></li> </ul> <p>FutureLearn have a free online course developed by St George’s University Hospital and St George’s, University of London which provides a basic grounding in genomic medicine and how in time this will provide the mainstay of patient diagnosis, treatment and disease prevention.</p> <ul style="list-style-type: none"> <li>• <a href="#">Future of Genetics in Medicine - Online Course - FutureLearn</a></li> </ul>		
<b>National policy</b>	<p>In 2016, NHS England set out a vision for Personalised Medicine in the NHS. This sets out the personalised medicines story and how medicine might be delivered.</p> <ul style="list-style-type: none"> <li>• <a href="#">Improving outcomes through personalised medicine</a></li> </ul>	30, 31, 41, 47	2.7, 2.8, 4.3, 8.5

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
<p><i>National policy context for Genomic Medicine across all professions and sectors</i></p>	<p>In 2020, the Government published a policy paper setting out the strategy to extend the UK's leadership in genomic healthcare and research. It sets out 3 pillars of Diagnosis and personalised medicine, prevention and research.</p> <ul style="list-style-type: none"> <li>• <a href="#">Genome UK: the future of healthcare</a></li> </ul> <p>One of the commitments from the Genome UK: the future of healthcare paper and the NHS Long Term Plan was the establishment of the NHS England Genomics Medicine Service. This aims to enable the NHS to harness the power of genomic technology and science to improve the health of our population. More details about the service can be found on the link below.</p> <ul style="list-style-type: none"> <li>• <a href="#">NHS England » NHS Genomic Medicine Service</a></li> </ul> <p>A directory of all genomic tests available on the NHS can be found here:</p> <ul style="list-style-type: none"> <li>• <a href="#">NHS England » National genomic test directory</a></li> </ul> <p>In 2022, NHS England published a strategy for embedding genomics in the NHS over the next 5 years. There are 4 priority areas for their approach.</p> <ul style="list-style-type: none"> <li>• <a href="#">Accelerating genomic medicine in the NHS</a></li> </ul> <p>In April 2023, the Royal Pharmaceutical Society published the policy statement Pharmacy professionals and Genomic Medicine.</p>		

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
	<ul style="list-style-type: none"> <li><a href="#">Genomic Medicine Position Statement</a></li> </ul> <p>In 2024, NHS England published a Pharmacy genomics workforce, education and training strategic framework.</p> <ul style="list-style-type: none"> <li><a href="#">NHS England » Pharmacy genomics workforce, education and training strategic framework</a></li> </ul>		
<p><b>The legal and ethical implications associated with the use of genomic data</b></p> <p><i>The collection of genetic and genomic data from individuals and populations must be approached with care. It is sensitive information which can have</i></p>	<p>The Royal College of Physicians published revised guidance in 2019 on consent and confidentiality in genomic medicine. It discusses aspects which must be considered by all healthcare professionals when using genetic and genomic information in practice. The guidance also provides examples of where issues around consent and confidentiality have arisen.</p> <ul style="list-style-type: none"> <li><a href="#">Consent and confidentiality in genomic medicine</a></li> </ul> <p>The Joint Committee on Genomics in Medicine published guidance in 2022 for clinical practice on genetic testing in childhood.</p> <ul style="list-style-type: none"> <li><a href="#">Genetic testing in childhood   RCP London</a></li> </ul> <p>The Royal College of General Practitioners and the British Society for Genetic Medicine have a position statement on Direct to Consumer (DTC) Genomic Testing. This gives recommendations on how healthcare professionals should manage situations where a person requests help with the interpretations of DTC genomic results.</p>	16, 18, 26, 36, 39	1.2, 4.14, 8.2, 8.3, 8.5, 8.6

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
<p><i>implications not only for the individual that provided it but for relatives and wider family members.</i></p>	<ul style="list-style-type: none"> <li>• <a href="#">Position Statement on Direct to Consumer Genomic Testing</a></li> </ul> <p>The Department of Health and Social Care have an agreement between the government and the association of British Insurers on the use of genetic test results in underwriting insurance policies.</p> <ul style="list-style-type: none"> <li>• <a href="#">Code on Genetic Testing and Insurance</a></li> </ul> <p><b>Primary Literature</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Magavern et al 2025. A United Kingdom nationally representative survey of public attitudes towards pharmacogenomics</a></li> </ul>		
<p><b>The need for diversity in genomic data</b></p> <p><i>To ensure future healthcare can be truly personalised it is crucial to ensure</i></p>	<p>These two articles from the National Genomics Education team and the Pharmaceutical Journal set out the importance of needing diversity in genomic research.</p> <ul style="list-style-type: none"> <li>• <a href="#">The need for diversity in genomic data - National Genomics Education (hee.nhs.uk)</a></li> <li>• <a href="#">We cannot ignore race when it comes to pharmacogenomics - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> </ul> <p>The NHS Race and Health Observatory and the University of Nottingham published a review of ethnic inequalities in precision and genomic medicine in 2024.</p>	6, 8, 12, 41, 47	2.9, 3.2, 7.5, 8.5

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing competencies (if relevant)
<i>that genomic research is diverse.</i>	<ul style="list-style-type: none"> <li><a href="#">Ethnic inequities in genomics and precision medicine</a></li> </ul>		
<b>Consultation skills</b>	<p>The Centre for Postgraduate Pharmacy Education (CPPE) have an e-learning package which supports the development of the knowledge, skills and confidence to have person-centred consultations with people about genomics in everyday pharmacy practice. Please note this CPPE programme is only available to GPhC-registered pharmacy professionals, which includes trainee pharmacists.</p> <ul style="list-style-type: none"> <li><a href="#">Genomics in pharmacy: an introduction to person-centred consultations</a></li> </ul> <p>This guide, developed by the Participant Panel, recommends how to talk about the people whose data is curated at Genomics England.</p> <ul style="list-style-type: none"> <li><a href="#">Genomics England - Language and terminology</a></li> </ul> <p>In addition, the National Genomics Education team have a series of short videos, podcasts and other resources available on communicating genomics.</p> <ul style="list-style-type: none"> <li><a href="#">Communicating genomics – National Genomics Education</a></li> </ul> <p>Further resources on consultation skills are available in the <a href="#">Prescribing training curriculum</a>.</p>	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	1.2, 1.5, 1.14, 3.1, 3.3

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing Competencies (if relevant)
<b>Applications of genomic medicine</b>			
<b>Clinical Pharmacogenomics</b>  <i>Resources to introduce the concept of pharmacogenomics and how this can be used in practice to benefit people and improve their care.</i>	<p>University Hospitals Southampton, Medicines Learning Portal, have developed a pharmacogenomics tutorial. The tutorial is designed to support all pharmacists, pharmacy technicians and trainees working in primary and/or secondary care who currently have limited experience working with pharmacogenomic information.</p> <ul style="list-style-type: none"> <li>• <a href="#">Medicines Learning Portal: Pharmacogenomics</a></li> </ul> <p>The Centre for Postgraduate Pharmacy Education (CPPE) have an e-learning package which introduces the topic of pharmacogenomics and how it is applied. The e-learning also explores the opportunities it can bring to patient centred care. Please note this CPPE programme is only available to GPhC-registered pharmacy professionals, which includes trainee pharmacists.</p> <ul style="list-style-type: none"> <li>• <a href="#">Introduction to genomics in pharmacy: CPPE</a></li> </ul> <p>The Royal Pharmaceutical Society have a number of resources on Pharmacogenomics available including videos and webinars to support understanding of pharmacogenomics.</p> <ul style="list-style-type: none"> <li>• <a href="#">Pharmacogenomics – Royal Pharmaceutical Society</a></li> </ul>	21, 22, 23, 26, 29, 37, 41, 47	1.8, 1.10, 1.12, 2.3, 2.4, 2.6, 7.5, 8.5



	<p>This 2022 report from the British Pharmacological Society and the Royal College of Physicians looks at how pharmacogenomics can be used to improve patient outcomes.</p> <ul style="list-style-type: none"> <li>• <a href="https://bps.ac.uk">Personalised Prescribing   British Pharmacological Society (bps.ac.uk)</a></li> </ul> <p>The National Genomics Education team have developed a resource ‘genomics notes for clinicians (GeNotes)’ and provide short, useful summaries to support healthcare professionals make the right genomic decisions at each stage of a clinical pathway. One of these resources looks at pharmacogenomics.</p> <ul style="list-style-type: none"> <li>• <a href="#">GeNotes - Introduction to pharmacogenomics</a></li> </ul> <p>The UK SACT (Systemic Anti-Cancer Therapy) Board provides clinical staff with guidance for <i>DPYD</i> pharmacogenomic testing ‘<i>Personalised medicine approach for fluoropyrimidine-based therapies</i>’. In addition the Genomics Education Programme have developed a Clinical Pathway Initiative (CPI) project to identify the education and training needs of those delivering DPYD genomic testing in the oncology setting. This Pharmaceutical Journal article also discusses how <i>DPYD</i> pharmacogenetic testing is applied in clinical practice to optimise fluoropyrimidine based therapies.</p> <ul style="list-style-type: none"> <li>• <a href="#">Publications   UK SACT Board</a></li> <li>• <a href="#">CPI: DPYD - Genomics Education Programme</a></li> <li>• <a href="#">DPYD genetic testing and the future of pharmacogenomic testing in routine care - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> </ul> <p>The UK Clinical Pharmacy Association host recommendations on 6-mercaptopurine (6-MP) dosing in adult acute lymphoblastic leukaemia (ALL) based on TPMT and NUDT15 genotypes.</p> <ul style="list-style-type: none"> <li>• <a href="#">UKCPA Genomics community</a></li> </ul>		
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	<p><b>Clinically-relevant curated evidence base resources:</b> <i>(NB: – not all pharmacogenomic tests are currently available by the NHS)</i></p> <p>Pharmacogenomics Knowledge Base (PharmGKB)</p> <ul style="list-style-type: none"> <li>• <a href="https://www.pharmgkb.org/">https://www.pharmgkb.org/</a></li> </ul> <p>Clinical Pharmacogenomics Implementation Consortium (CPIC):</p> <ul style="list-style-type: none"> <li>• <a href="https://cpicpgx.org/guidelines/">https://cpicpgx.org/guidelines/</a></li> <li>• These guidelines help clinicians understand how available genetic test results should be used to optimize drug therapy.</li> </ul> <p>Dutch Pharmacogenetics Working Group (DPWG): (Website is in Dutch)</p> <ul style="list-style-type: none"> <li>• <a href="https://www.knmp.nl/dossiers/farmacogenetica">https://www.knmp.nl/dossiers/farmacogenetica</a></li> <li>• <i>To download the pdf, use the side bar to navigate to "Achtergronddocumenten". Scroll to the right and the document link is under "Pharmacogenetic recommendation text". Note, that not all drug recommendations are updated in each release.</i></li> </ul> <p><b>Primary literature and key projects</b></p> <ul style="list-style-type: none"> <li>• Malki AM &amp; Pearson ER 2020. Drug–drug–gene interactions and adverse drug reactions. The Pharmacogenomics Journal 20:355–36 <a href="https://www.nature.com/articles/s41397-019-0122-0">https://www.nature.com/articles/s41397-019-0122-0</a></li> <li>• Youssef E et al 2020. Estimating the potential impact of implementing pre-emptive pharmacogenetic testing in primary care across the UK <a href="https://bpspubs.onlinelibrary.wiley.com/doi/pdf/10.1111/bcp.14704">https://bpspubs.onlinelibrary.wiley.com/doi/pdf/10.1111/bcp.14704</a></li> <li>• Pirmohamed, M. Pharmacogenomics: current status and future perspectives. <i>Nat Rev Genet</i> (2023). <a href="https://doi.org/10.1038/s41576-022-00572-8">https://doi.org/10.1038/s41576-022-00572-8</a></li> </ul>		
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	<ul style="list-style-type: none"> <li>• Swen JJ et al. A 12-gene pharmacogenetic panel to prevent adverse drug reactions: an open-label, multicentre, controlled, cluster-randomised crossover implementation study. <i>The Lancet</i> (2023). <a href="https://doi.org/10.1016/S0140-6736(22)01841-4">https://doi.org/10.1016/S0140-6736(22)01841-4</a></li> <li>• McDermott JH, Mahaveer A, James RA, et al. Rapid Point-of-Care Genotyping to Avoid Aminoglycoside-Induced Ototoxicity in Neonatal Intensive Care. <i>JAMA Pediatr.</i> 2022;176(5):486-492. <a href="https://doi.org/10.1001/jamapediatrics.2022.0187">doi:10.1001/jamapediatrics.2022.0187</a></li> </ul>		
<p><b>Cancer genomics</b></p> <p><i>Cancer care is an important area where having an understanding of genetics can play a crucial role in diagnosis, prognosis and treatment.</i></p>	<p>The National Genomics Education team have a suite of resources looking into the role that genomics plays in cancer care.</p> <ul style="list-style-type: none"> <li>• <a href="https://www.hee.nhs.uk/cancer-genomics">Cancer genomics - National Genomics Education (hee.nhs.uk)</a></li> </ul> <p>In addition, Genomics England have an overview of cancer genomics including a 4-minute video to help with understanding cancer genomics.</p> <ul style="list-style-type: none"> <li>• <a href="https://www.genomicsengland.co.uk/cancer-genomics">Cancer genomics   Genomics England</a></li> </ul> <p>FutureLearn have a free online learning course developed by the University of Glasgow which discussed how genetics is revolutionising the detection and treatment of the different types of cancer.</p> <ul style="list-style-type: none"> <li>• <a href="https://www.futurelearn.com/courses/cancer-in-the-21st-century">Cancer in the 21st Century: The Genomic Revolution - Online Genomics Course (futurelearn.com)</a></li> </ul> <p>National Genomics Education team - GeNotes</p> <p>Genomics notes for clinicians provide short, useful summaries to support healthcare professionals make the right genomic decisions at each stage of a clinical pathway. One of these resources looks at Oncology.</p>	<p>21, 22, 23, 29</p>	<p>1.12, 2.3, 2.7, 4.3, 8.5,</p>

	<ul style="list-style-type: none"> <li>• <a href="#">GeNotes: In the Clinic</a></li> </ul> <p>The Let's Communicate Cancer course is aimed at all members of the pharmacy team. Module 2 'What is cancer' provides an overview of how normal cells work, what goes on inside them, the relationship between DNA and proteins, and how cells respond to signals.</p> <ul style="list-style-type: none"> <li>• <a href="#">Let's Communicate Cancer – elearning for healthcare (e-lfh.org.uk)</a></li> </ul>		
<p><b>Genomics applied in medicines optimisation</b></p>	<p><b>Diabetes</b></p> <p>FutureLearn have a free online learning course developed by the University of Exeter which explores how genomic medicine is transforming our knowledge and treatment of conditions such as diabetes.</p> <ul style="list-style-type: none"> <li>• <a href="https://www.futurelearn.com/courses/diabetes-genomic-medicine">https://www.futurelearn.com/courses/diabetes-genomic-medicine</a></li> </ul> <p><b>Familial hypercholesterolaemia</b></p> <p>The National Genomics Education team have a collection of resources to help support healthcare professionals to deliver the national familial hypercholesterolaemia transformation project.</p> <ul style="list-style-type: none"> <li>• <a href="#">Transformation project: Familial hypercholesterolaemia - Genomics Education Programme (hee.nhs.uk)</a></li> <li>• <a href="#">Familial hypercholesterolaemia - Genomics Education Programme (hee.nhs.uk)</a></li> </ul> <p>This Pharmaceutical Journal article discusses an overview of the symptoms, diagnostic criteria and role of genomics in the identification of familial hypercholesterolaemia and its management.</p>	<p>5, 12, 13, 16, 17, 18, 31, 34, 47</p>	<p>1.9, 1.10, 2.2, 2.3, 2.4, 2.6, 2.7, 3.1, 3.2, 3.3, 4.2 4.3, 6.4</p>



	<ul style="list-style-type: none"> <li>• <a href="http://pharmaceutical-journal.com">Familial hypercholesterolaemia: identification and management - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> </ul> <p><b>Cystic Fibrosis</b></p> <p>The National Genomics Education team have a resource to help support healthcare professionals to understand more about the genetic condition, cystic fibrosis.</p> <ul style="list-style-type: none"> <li>• <a href="http://hee.nhs.uk">Cystic fibrosis - National Genomics Education (hee.nhs.uk)</a></li> </ul> <p><b>Mental health and psychiatry</b></p> <p>These Pharmaceutical Journal articles discuss the role of genetics in mental health conditions and how pharmacogenetic data could be used to improve response to medications. There is also report from the royal college of psychiatrists on the role of genetic testing in mental health settings more broadly.</p> <ul style="list-style-type: none"> <li>• <a href="http://pharmaceutical-journal.com">Making the case for pharmacogenomics in the management of mental health conditions - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> <li>• <a href="http://pharmaceutical-journal.com">Pharmacogenomics is the future of prescribing in psychiatry - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> <li>• <a href="#">The role of genetic testing in mental health settings (CR237)</a></li> </ul> <p><b>Antimicrobial stewardship</b></p> <p>The resources below outline how genomic data can be utilised to diagnose or classify disease, track infectious disease outbreaks, and increasingly to predict response, or adverse response, to medicines.</p> <ul style="list-style-type: none"> <li>• <a href="http://rpharms.com">AMS and PGx (rpharms.com)</a></li> </ul>		
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	<ul style="list-style-type: none"> <li>• <a href="http://www.gov.uk">England world leaders in the use of whole genome sequencing to diagnose TB - GOV.UK (www.gov.uk)</a></li> <li>• Boolchandani M, D'Souza AW, Dantas G. Sequencing-based methods and resources to study antimicrobial resistance. Nat Rev Genet. 2019 Jun;20(6):356-370. DOI: <a href="https://doi.org/10.1038/s41576-019-0108-4">10.1038/s41576-019-0108-4</a>. PMID: 30886350; PMCID: PMC6525649.</li> </ul> <p><b>Care of the older person</b></p> <p>This Pharmaceutical Journal article discusses how genetic testing can improve outcomes for older people by reducing adverse drugs reactions.</p> <ul style="list-style-type: none"> <li>• <a href="http://pharmaceutical-journal.com">We must start using pharmacogenomic information to optimise medicines for older people - The Pharmaceutical Journal (pharmaceutical-journal.com)</a></li> </ul>		
<p><b>Advanced Therapy Medicinal Products (ATMPs)</b></p>	<p>Advanced Therapy Medicinal Products (ATMPs) are an innovative group of medicines. They comprise of somatic cellular therapies, tissue-engineered products and gene therapies.</p> <p>This e-learning for healthcare session 'Introduction to Advanced Therapy Medicinal Products' provides an overview of advanced therapy medicinal products (ATMPs), explaining in simple terms how these therapies are produced, defining key terminology and using a range of illustrative examples.</p> <ul style="list-style-type: none"> <li>- <a href="https://portal.e-lfh.org.uk/Component/Details/712341">https://portal.e-lfh.org.uk/Component/Details/712341</a></li> </ul>	<p>21, 22, 23, 29,</p>	<p>2.8</p>

Element	Suggested resources	IETP Learning Outcomes	RPS Prescribing Competencies (If relevant)
<b>Drug Safety</b>			
<b>MHRA Alerts</b>	<p>The following Drug Safety alerts all have a link to genetic variations causing adverse drugs reactions:</p> <ul style="list-style-type: none"> <li>• <a href="#">Drug Safety Update on 5-fluorouracil (intravenous), capecitabine, tegafur: DPD testing recommended before initiation to identify patients at increased risk of severe and fatal toxicity</a></li> <li>• <a href="#">Drug Safety Update on Aminoglycosides and mitochondrial mutations:</a></li> <li>• Drug Safety Update on Codeine for analgesia: restricted use in children because of reports of morphine toxicity: (linked to genetic variations of CYP2D6)</li> <li>• Drug Safety Update on Carbamazepine, oxcarbazepine and eslicarbazepine: potential risk of serious skin reactions</li> <li>• <a href="#">Abacavir   Drugs   BNF   NICE</a> – Abacavir pre-treatment testing for HLA-B*5701 allele.</li> </ul> <p>The Yellow Card Biobank is a collaboration between the Medicines and Healthcare products Regulatory Agency (MHRA) and Genomics England. Its goal is to improve understanding of how a patient’s genetic makeup may increase their risk of harm from side effects of medications.</p> <ul style="list-style-type: none"> <li>• <a href="#">Yellow Card biobank   Making medicines and medical devices safer</a></li> </ul>	26, 34, 35, 49	4.2, 6.4, 7.5, 8.5

## Appendix 1: Version history and editorial review process

This Genomic Medicine Indicative Curriculum was first published in July 2023.

We encourage education colleagues to share in the development of this guidance and welcome your comments and suggestions via [this link](#).

A joint editorial team consisting of NHS England – Workforce, Education and Training Directorate and Pharmacy Schools Council representatives will review these submissions on a 6-monthly basis and an updated version will be posted on [our website](#).

Version	Change
1.0	Pre-publication version
1.1	Update into new NHS England document template, checked for broken links.
1.2	Additional resources added across multiple sections

**Next review date:** September 2025

**Next publication date:** October 2025

In the meantime, please contact [england.pharmacyteam@nhs.net](mailto:england.pharmacyteam@nhs.net) to report any broken links or errors.

### Acknowledgements

We would like to thank Emma Groves (Pharmacy Subject Matter Expert, National Genomics Education team, NHS England) and Hamde Nazar (Director of Education, Senior Lecturer in Pharmacy Practice, Newcastle University) for their input to this document and review as subject matter experts.