Genomics Education Programme

NHS
Health Education England

England's Genomics Education Programme for NHS Healthcare professionals

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Developing people
for health and
healthcare

www.hee.nhs.uk

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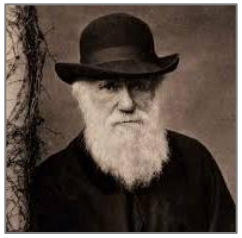
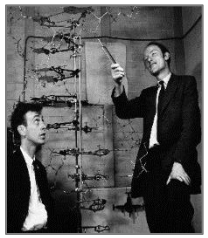
Science & innovation provides the revolutionary change health needs

- Throughout its existence, the NHS has turned to scientific innovation to provide the step-change in practice required to keep pace with patient needs and service demands
- Genomics builds on the long history of discovery and advance in the UK



1859: Darwin – Origin of Species



1951: Watson & Crick

1974: Sanger – DNA sequencing

1984: Alec Jeffreys – DNA fingerprinting

1997: Dennis Lo – cfDNA NIPT

UK has fostered more than twice as many Nobel prizes for Medicine & Physiology per capita than anywhere else in the world.

PLUS firsts in:

- **Diagnostic ultrasound**
- **CT scanning**
- **IVF & PGD**

The NHS has had specialist genetic labs since the 1960s, with Next Generation Sequencing capability & UK Genetic Testing network - sponsored by NHS England - coordinating role for approval of tests/panels

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Aims & principles of the 100,000 Genomes Project

In 2012 Prime Minister launches 100,000 Genomes Project made possible due to the decreasing cost of sequencing and developments in computational power and data analytics

*"By unlocking the power of DNA data, **the NHS will lead the global race** for better tests, better drugs and above all better care.*

Major legacies for patients, the NHS and the UK economy by 2017

- Increased discovery of pathogenic variants leading to **new treatments, devices and diagnostics**
- Accelerate uptake with advanced genomic medicine practice **integrated into the NHS**
- **Increase public understanding & support** for genomic medicine
- **Stimulate and advance UK life sciences** industry and commercial activity in genomics

Key Principles

1. A focus on **rare inherited diseases** and **common cancers**
2. Patients to be **drawn from routine care** and **treated through routine channels**
3. All participants to provide **a fully informed consent providing for a wide range** of data and tissue capture and broad categories of use including research and industry
4. However **neither data nor tissues to go outside NHS-controlled 'safe havens'** and all users to be properly authorised and monitored
5. A separate (*government owned*) company – Genomics England – formed to coordinate the project under an independent board, providing **a 'start-up' mentality and drive**

Whole genome sequencing is providing a step change in the NHS diagnostic repertoire

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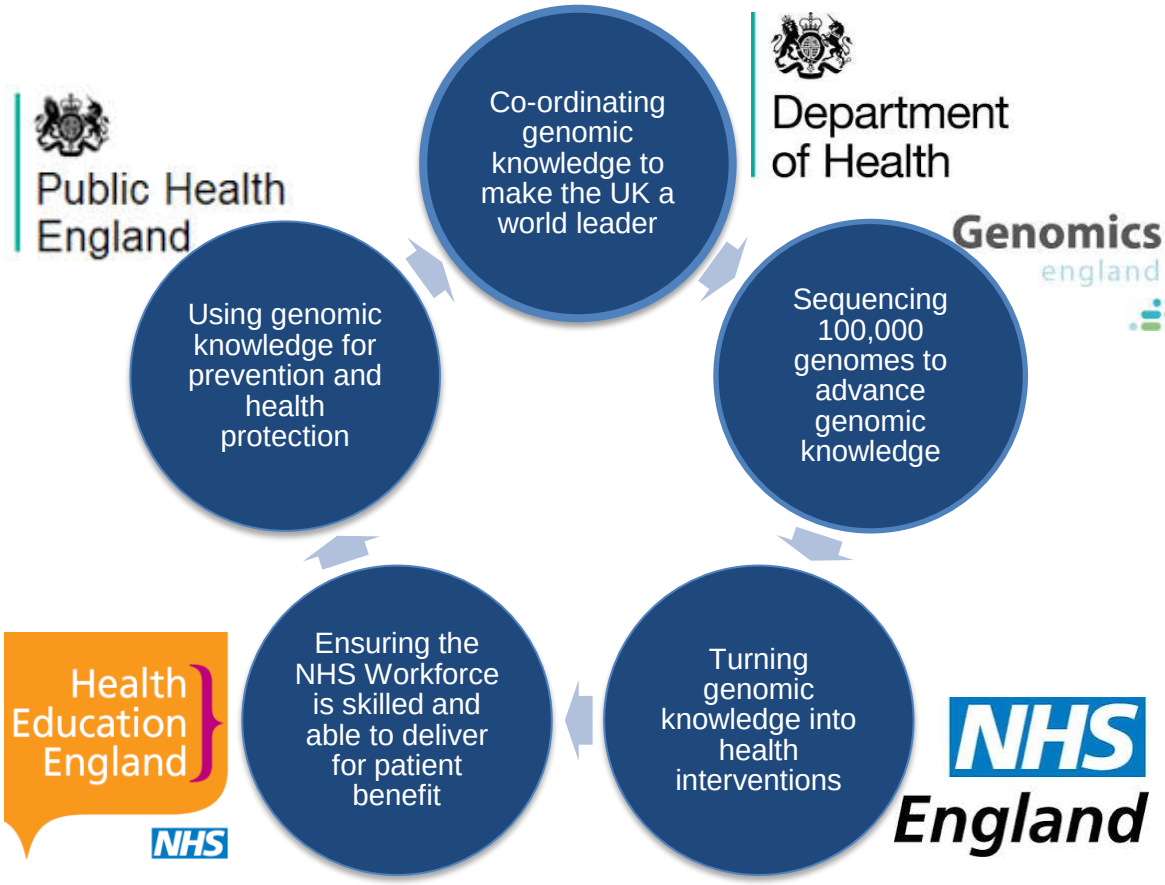
100,000 Genomes Project - A coordinated response across England's health & care system

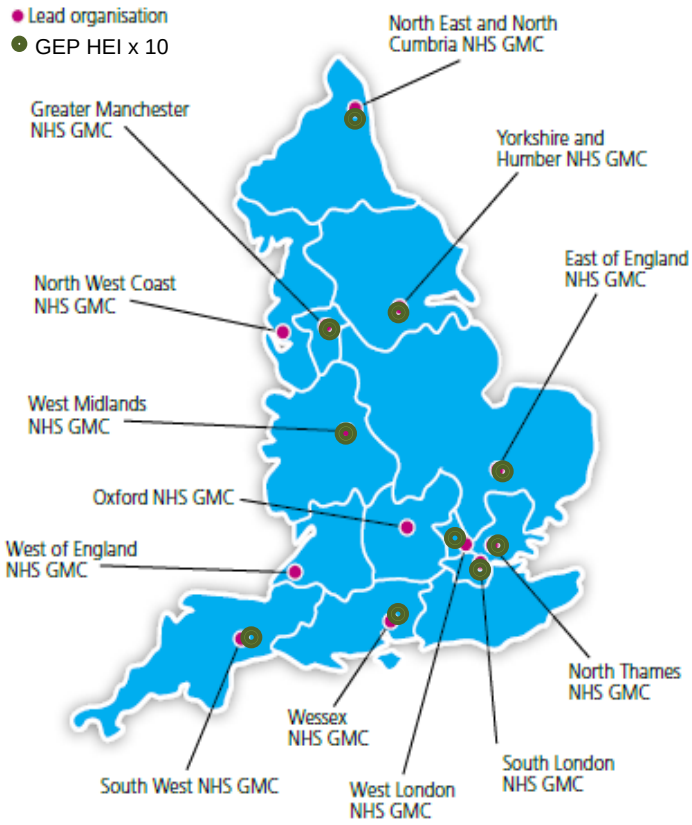


Long-term vision for NHS

- Improving outcomes for patients via better, more precise diagnoses, particularly in cancer & rare disease
- Providing the foundation for an NHS Personalised Medicine Service

Project delivery infrastructure

- Nationwide network of 13 NHS Genomic Medicine Centres – each lead organisation having partnerships with local hospitals as delivery partners
- National network of 10 universities providing staff training through HEE Genomics Education Programme
- Clinical Interpretation Partnerships (GeCIP) integrate with researchers to drive advance
- Genomics England coordinates national partners & initiatives:
  - National Sequencing Centre
  - Biorepository
  - Data centre
  - Interpretation partners
  - Industry & academic collaborations



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Key roles of NHS GMCs

- Involvement of multiple clinical specialities in new MDTs
- Capture of data from multiple systems against defined datasets and standards
- Sample collection, processing & logistics to defined protocols & quality standards
- Step change in analysis of information , validation & reporting
- Return of results to participants & clinical care according to guidelines
- Partnerships & networks working across geographies
- Upskilling the NHS Workforce
- Patient & Public Involvement
- Transforming the NHS – improving outcomes & reducing variation

How the elements of the Project fit together

Oversight: Department of Health

Funding: NHS National Institute for Health Research; NHS England; wellcome trust; MRC Medical Research Council; CANCER RESEARCH UK

Participants

NHS England

13 NHS Genomic Medicine Centres working in a national network

- Clinical samples and patient data (diagnostic and clinical)
- Laboratory processing including molecular pathology
- Broad consent for research and re-contact
- Validation and feedback to participants/clinical teams

Biorepository

biocentre The centre for biomedical services

DNA & samples for multi-omics

Sequencing

illumina

Data

Genomics england

Farr

UNIVERSITY OF OXFORD

Clinical Data

- Identifiable clinical data
- Longitudinal
- Linked to genomic data

Existing Clinical Data

Cancer & RD registries, HES, Mortality data, etc

hscic Health & Social Care Information Centre

Public Health England

Genomics england

Research Data

- Deidentified
- GeCIP and industry partners work within data centre

Data and Analysis Improvement

- Annotation & QC
- Scientists/SMEs
- Product comparison

Fire wall

Clinicians & Academics

Training — NHS Health Education England

Industry

Other countries of UK and other international collaborators working to specification set down by NHS England

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Clinical interpretation - GeCIP

Partnerships between healthcare professionals, academia and charities
39 different domains, 100+ subdomains

Rare Disease (n=13)

- Cardiovascular
- Endocrine and Metabolism
- Gastroenterology and Hepatology
- Hearing and Sight
- Immunology and Haematology
- Inherited Cancer Predisposition
- Musculoskeletal
- Neurological
- Paediatric Sepsis
- Paediatrics
- Renal
- Respiratory
- Skin

Cancer (n=15)

- Adult Glioma
- Breast
- Colorectal
- Upper GI
- Lung
- Melanoma
- Renal Cell & Bladder
- Sarcoma
- Testis
- Ovarian (incl endometrial)
- Prostate
- Childhood Solid Cancers
- Haematological Malignancy
- Pan Cancer
- (Ca of) Unknown primary

Functional (n=11)

- Electronic Health Records
- Validation and Feedback
- Ethics and Social Science
- Functional Effects
- Health Economics
- Machine Learning, Quantitative Methods and Functional Genomics
- Population Genomics
- Enabling Rare Disease Translational Genomics via Advanced Analytics and International Interoperability
- Functional Cross Cutting
- Education and Training
- Stratified Medicine & Pharmacogenomics

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HEE Genomics Education Programme

Strategy and Aims

- Embed genomics into education: current & future healthcare workforce
- Integrate whole-genome sequencing (WGS) & functional genomics into mainstream care - benefit patients & the public
- Build capacity & capability - world-leading response to the genomic medicine revolution
- Legacy of the 100,000 Genomes Project – embedded in the healthcare system & wider economic contribution

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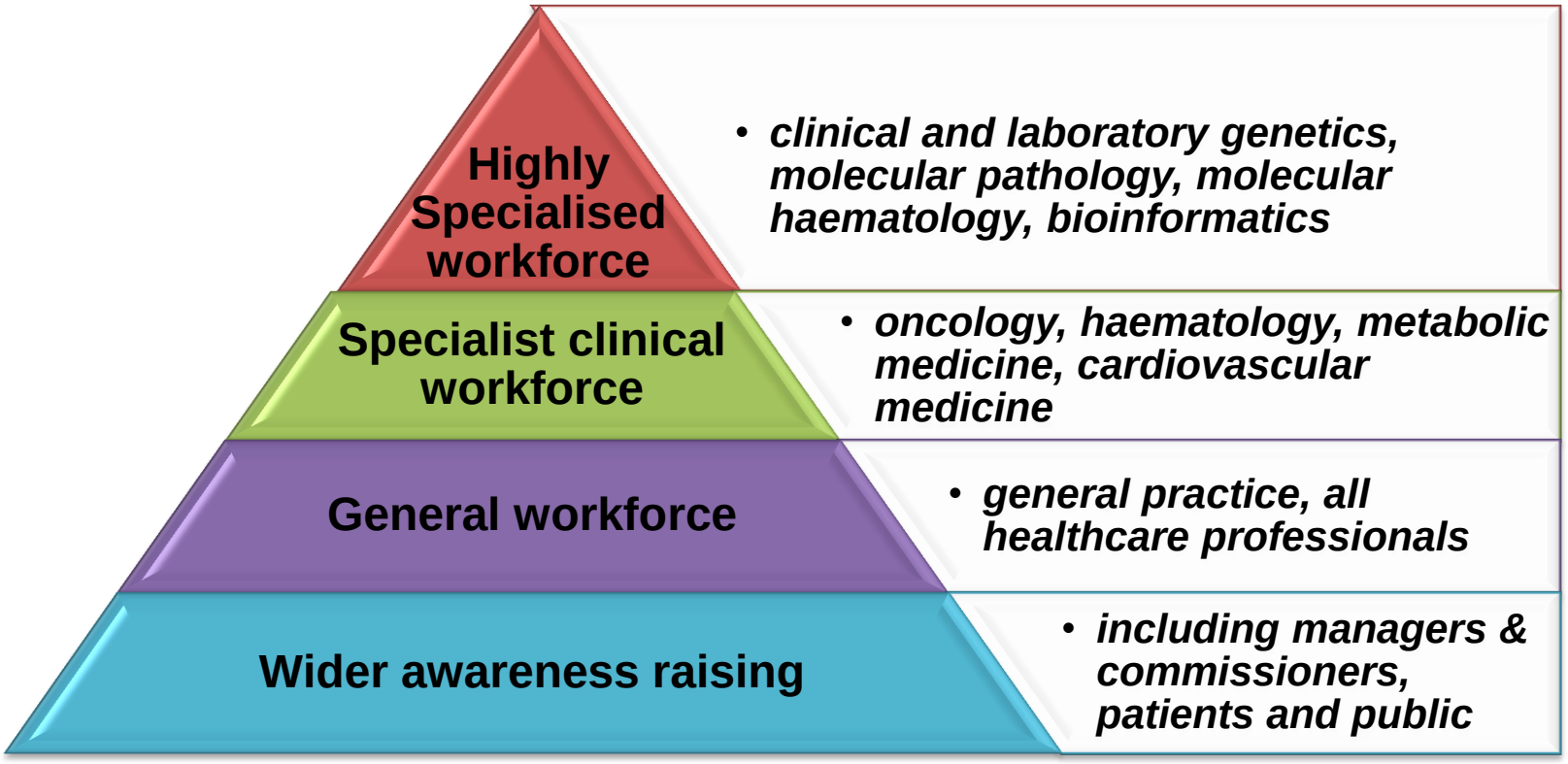
Supporting workforce transformation across the NHS



Planning for the future

- The great challenge is to anticipate the mix of skills, experience and abilities that will be needed to deliver future services
- It takes >11-15 years to train to be a senior nurse, scientist or doctor – so we need to be planning now for 10-15 years' time
- Need to anticipate and prepare for what new technologies will emerge & what will be consigned to history
  – building the flexibility into individual's training to allow them respond to future developments
- Key aspect is to upskill existing staff to allow rapid harnessing of emergent technologies for patient benefit

Mainstreaming genomic education & training

- As genomic medicine becomes a standard part of mainstream NHS practice, so the corresponding education and training will become integrated within the core planning and activity of HEE through its delivery structure
- The Genomics Education Programme exists to establish the systems, processes and core resources – but is time limited
- Programme activity involves close engagement with local education & training and their corresponding NHS GMC(s) to prepare to deliver this activity as part of their ongoing work

Mind the gap…

- Key aspect of GEP is to identify interventions to address gaps in knowledge, skills and competencies for the delivery of current and future care
- Close working with professional bodies and organisations:
  - Council of Medical Deans - undergraduate medical curricula
  - Medical Royal Colleges (eg RC Physicians, RC General Practice) - Postgrad curricula and CPD
  - National School of Healthcare Science – all postgrad curricula have genomics element, all doctoral curricula have a specific genomic competence

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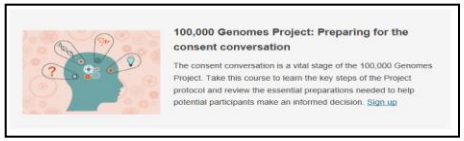
GEP resources to directly support the 100, 000 Genomes project

- Bespoke multiprofessional online on-demand short courses tailored to give staff specific skills for each step of the project pathway
- Development follows the pipeline. Early courses include:
  - Consent conversation
  - Sample Processing
- In development:
  - Tumour Assessment Training Tool
  - Validation & Feedback
  - Data governance & security

- Eligible patients
- Phenotypic data sets
- Sample collection & processing
- Sequencing
- Validation of collected data
- Clinical report and action



Building Capacity and Capability

- New postgraduate curricula for Healthcare professionals
- Multiprofessional Master's in Genomic Medicine
- Pump priming additional training places

- ***PLUS*** Resource development to support the move to more Personalised Medicine across the NHS

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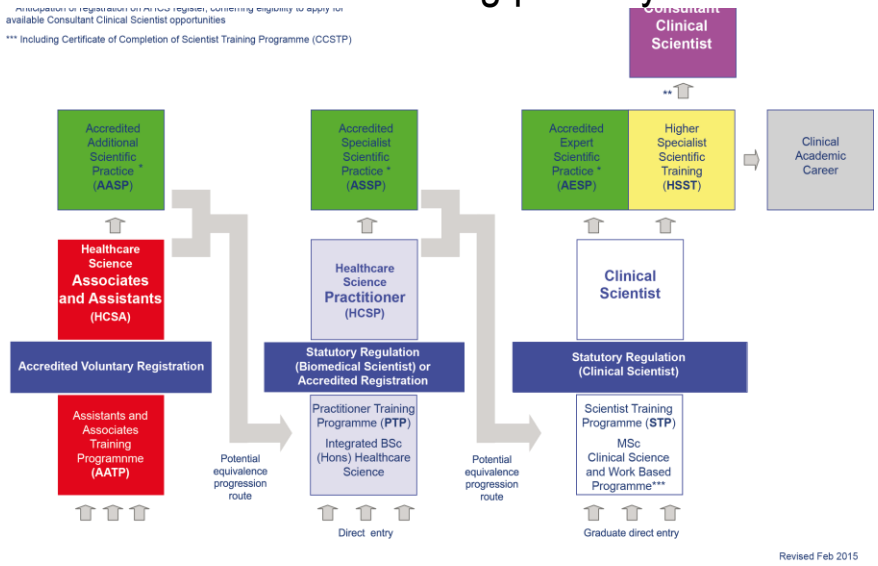
Capacity and Capability

New Curricula for Healthcare Scientists

Aligned to national healthcare scientist training pathway



Clinical Scientists in Genomic Sciences

- Genomics (2016)
- **Genomic Counselling** (2016)
- Molecular Pathology (2017)

Clinical Bioinformatics

- **Genomics**
- Physical Sciences
- Health informatics

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Clinical Bioinformatics

Establishing a new profession

2013

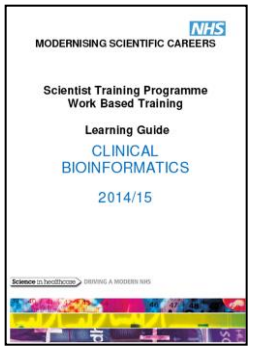
- Curriculum for STP training in Clinical Bioinformatics
- Competence based workplace training
- Academic Master's
- Three cohorts: first cohort of 8 trainees to exit in Sept 2016
- Registration with Health Care Professions Council
- Equivalence process established

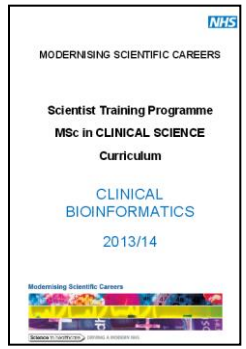
2015

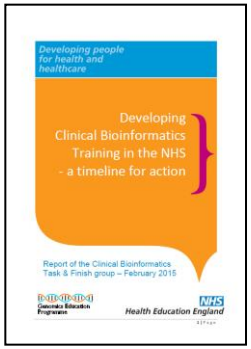
- Published HEE report on Developing Clinical Bioinformatics
- Developed Bioinformatics Modules in the national Genomic Medicine Master's

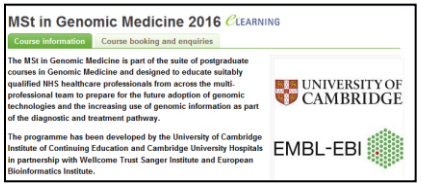
2016

- Curriculum for HSST training in Clinical Bioinformatics
- Academic Doctoral level – HEI currently under procurement
- Competence workplace based assessment
- HEE GEP funded 12 places starting October 2016









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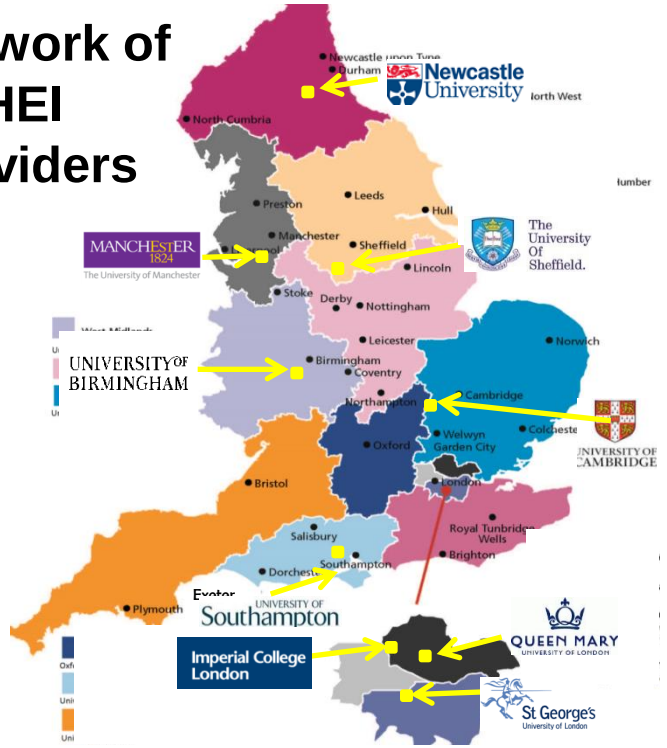
The Master's in Genomic Medicine

- Masters 550 funded places
- PGDip
- PGCert
- CPPD 900 funded places

Network of 10 HEI providers




Applications for Master's and CPPD funding now open for 2016/17 start

Rate this item (1 Vote)

Genomics study programme aimed at all NHS healthcare professionals in England

Health Education England's Genomics Education Programme (GEP) is now accepting applications for funded places on the Master's in Genomic Medicine course and individual continuing professional and personal development (CPPD) for the coming 2016/17 academic year.

"The Master's will help prepare NHS staff for the future of genomics in contemporary healthcare"

www.genomicseducation.hee.nhs.uk/genomicsmsc/

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Providing modules to support staff across the breadth of genomic medicine

Core Modules 15 credits	Optional Modules 15 credits
• An introduction to genomics • Omics techniques and their application to medicine • Genomics of common and rare disease • Molecular pathology of cancer • Pharmacogenetics and stratified healthcare • Application of genomics to infectious disease • Bioinformatics and interpretation • Research dissertation (60 /30 credits)	• Advanced bioinformatics • Ethical legal and social (ELSI) • Counselling skills for genomics • Economic models and genomics • Professional and research skills • Epigenetics • Work-based learning

Reaching out across the professions

- GEP has developed a model with specialist diabetes nurses, with a network model for sharing genomic potential, knowledge and implications within a specialist clinical group.
- Looking to develop and roll out this model with other specialist groups

- Techniques and interventions for Nurses/ AHPs /Public Health will require further development to ensure relevance & effectiveness – Need to establish and set out the patient pathway so can determine ‘touch points’ for genomic technologies and competence requirements

Tailored work for primary care

- Alongside multiprofessional work the GEP is specifically looking at the needs of more generalist groups such as primary care
- GEP has recruited a GP Adviser to lead on identifying the core genomic clinical activities and competencies required by primary care practitioners
- This will inform the development of the education and training resources specifically required to support this role across the specific professional groups (eg GPs, Physician Associates, Nurses)

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Education & Training GeCIP

Key indicative functions (aims)

- Oversight and coordination of HEE commissioned courses (including MSc programme)
- Embedding learning from 100K Genomes Project into mainstream education, training and workforce programmes
- Inform development of future cutting edge education and training
- Promote innovation in education and training and demonstrate its impact through pedagogic research

Stakeholders and roles

GMC EnT leads	GeCIP EnT leads	HEI representatives	Int'l expert networks	Industry internships	Programme alumni
Flexibility to train in current posts	Peer review and project supervision	Current experience and ability to feedback	Network to establish int'l programme of excellence	Internship and immersion in industry	Advocacy of genomic med programme

Faculty of genomic medicine

Foundation to build on

- Dynamic and collaborative environment of GeCIP
- Existing wealth of knowledge and experience within the education system
- Funding opportunities

HEE

HEE GEP

- Support staff in GMCs to deliver 100kGP
- Increase workforce capacity and capability in genomic medicine and bioinformatics
- Funding Research and Innovation projects
- Legacy and transformation

GMC E+T leads network

- One lead in each GMC
- 13 Local HEE leads
- Support 100k GP + wider workforce development
- Sustainability and transformation

Education & Training GeCIP

- Co-ordinating Group
- Education & Training leads from all 39 GeCIP domains
- Crucial to the Legacy
- International network
- Membership open to others via submission of online form

(*www.genomicsengland.co.uk/join-a-gecip-domain/*)

HEI provider network

- Deliver the commissions for masters and CPPD
- Collaborate to maximise the benefits to the NHS & exploit institutional expertise
- Partnership with the NHS/GMCs to support research and excellence in genomic medicine

Faculty in Genomics Medicine

- All professionals who complete GEP training will be brought together to form a Faculty of Genomic Medicine
- This will serve two key purposes:
  - forming a community of practice to build and maintain genomic knowledge
  - act as champions within the wider workforce to drive forward the mainstreaming of genomic technologies across the NHS

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Resource development and evaluation plans for the 100,000 Genomes Project

Resource	Mode of delivery	Assessment method	Evaluation outcomes
Eligibility wheels	Fact sheets (just-in-time) *GEP website*	None	Impact on practice (quantitative)
The consent conversation	E-learning (education) Asynchronous learning *GEP website*	Knowledge based (Formative)	Knowledge Impact on practice (mixed methods)
Tumour assessment tool	E-learning (training) *GEP website*	Competence based (Formative)	Knowledge and skills Impact on practice (mixed methods)
Sample preparation & DNA extraction	Video (training) *GEP website*	Reflection exercise	Knowledge and skills Impact on practice (mixed methods)
What is WGS	MOOC (education) Synchronous learning *FutureLearn platform*	Knowledge based (Formative) and Reflection exercise	Knowledge (mixed methods)

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Evaluation plans for the Masters in Genomic Medicine

To ensure content is 'fit-for-purpose'

1. Student feedback via usual HEI channels
2. Educator feedback through formal meetings with the GEP
3. This information will Inform review of curricula (1st review date Autumn 2016)
4. Implement any recommended (and appropriate) changes

e.g. inclusion of 'clinical education' module as an optional module

To measure the impact of the Faculty of Genomic Medicine

Longitudinal study (using mixed methodology) to explore the:

1. Consolidation of the Faculty into a strong and effective community of practice
2. Role the Faculty have played in:
   - Awareness raising
   - Educational activities
   - Acting as a champion for their professional group
3. Impact of the Faculty on changing practice within the NHS

Reflections on GEP progress

- **Importance of networks** in driving change - interpersonal contact and influence is key to penetration of knowledge through the workforce
- Central role of GEP in **fostering collaboration** between network members (providers or professionals) – pushing against the natural desire for autonomy
- Collaboration will have a crucial **international dimension**. England can't and won't deliver the best by working in isolation
- **Measuring/Assessing competence** – GEP training programmes are tools to help people achieve competence. Many are formative learning experience, rather than summative
- Key challenge is **predicting the future** in a fast moving area of disruptive change. Need to be constantly identifying gaps & analyzing possibilities.
- Education has to evolve alongside technologies – so **evaluation must be an ongoing process**. eg Postgraduate scientist qualification in Genetics had to be reviewed in <5 years as change in science had been so great
- **Curricula need to be flexible, adaptable and empowering** giving staff the skills to respond as technologies and services change

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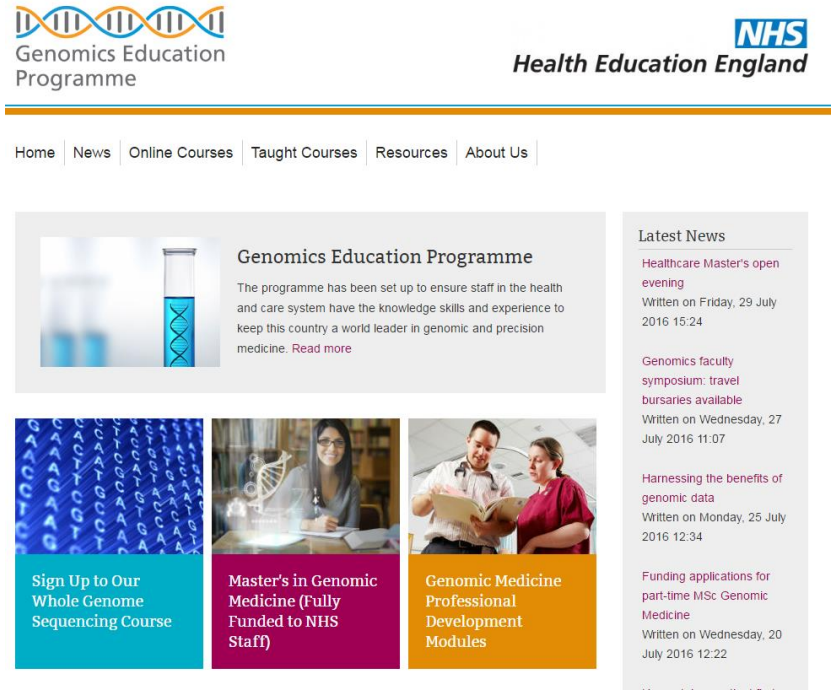
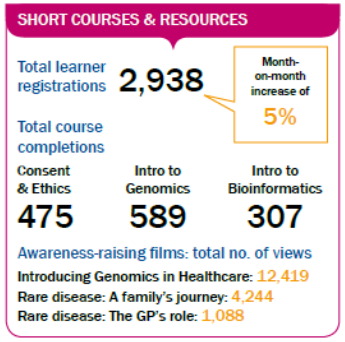
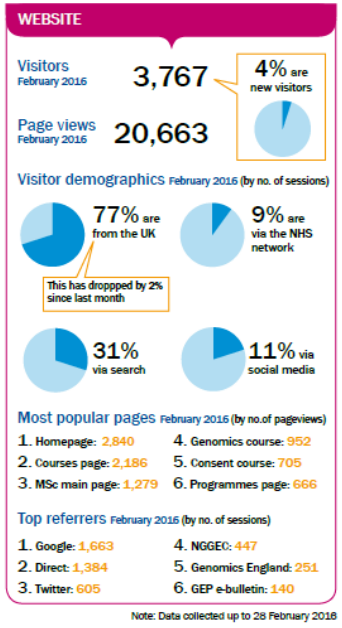
Genomics Education Website

A single repository for GEP work







www.genomicseducation.hee.nhs.uk

Additional Slides

Health Education England - strategic role

HEE is one of the key national partners in the UK health and care system

It exists for one reason: to improve the quality of care delivered to patients. It ensures the workforce has the right skills, values and behaviours, in the right numbers, at the right time and in the right place.

Key areas of HEE Activity

- Workforce planning and commissioning
- Attracting & recruiting
- Developing the existing workforce
- Hospitals, primary & community care
- Research, learning and innovation

While the NHS is a more structured and integrated system than elsewhere in the world, the success of HEE's approaches is not through areas of direct control but through being recognised as an authoritative body that major stakeholders (eg Medical Royal Colleges) recognise and are influenced by.