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21st Century Diagnostics

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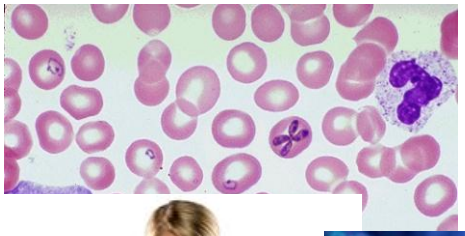
FUTURE is DIAGNOSTICS (Pathology & Radiology)







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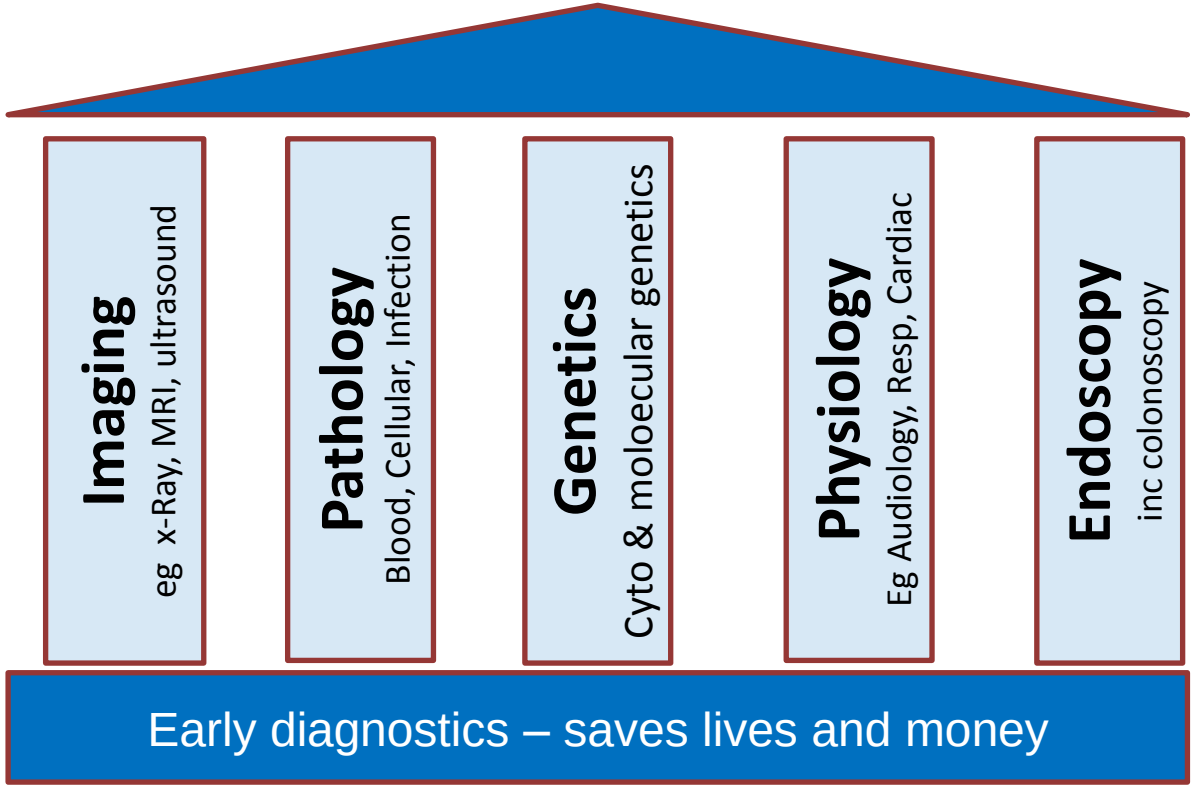
The five pillars of diagnostics



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Delivering diagnostics day after day

- Over 800 million Pathology tests and 0.5million specialist genetics tests pa
- Over 40 million Imaging investigations pa
- Approx 20 million Physiological measurement tests pa
- Approx 2 million Endoscopy investigations pa

Equates to £1 in 10 of NHS spending

Delivered across most episodes of care

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East Kent Annual Activity Data

- Pathology – 10,200,000 tests per year
  - 45% for GP's
  - 55% for the Acute

- Radiology – 575,000 examinations per year
  - 27% for GP's
  - 73% for the Acute

Pathology & Radiology around 80 years ago

Pathology

Radiology

Big Diagnostic Advances

research informing new ways of working

- Genetic profiling
- Personalised medicine
- Integrated & multimodality imaging
- Enhanced Point of Care Testing
- Frugal and hand held technologies
- Portable and home monitoring - Smart homes
- Data fusion & bioinformatics
- Personalised physiological models

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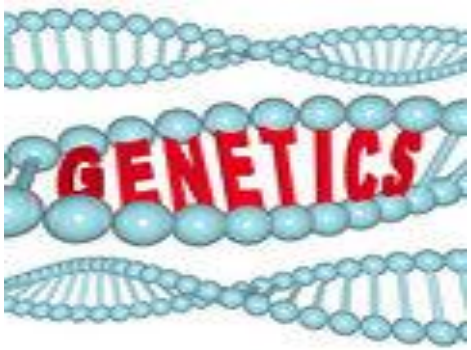
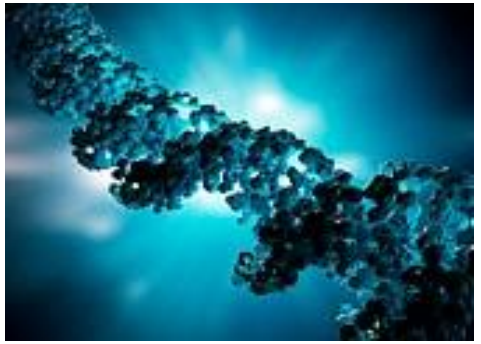
Pathology – Genetics
(the stuff of life)





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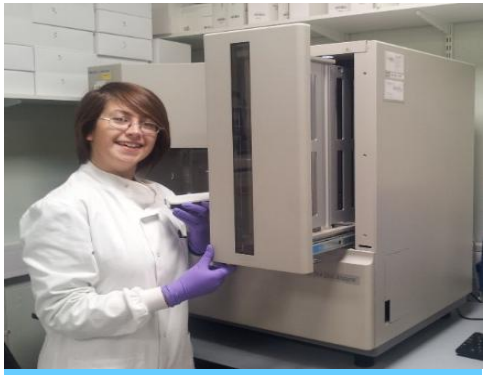
Next Generation Genetic Sequencing - a game changer



Capillary 2005
10 genes

MiSeq
>20,000 genes

HiSeq
2 whole genomes

LIMITED IMPACT SIGNIFICANT IMPACT **GAME CHANGER**

SO -- GAME CHANGER + BIG DATA = NEW WORLD

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Benefits of Genetics

- Next generation sequencing (NGS) will offer a single technology platform that will be applicable to all disciplines in Pathology and thus a major saver in costs
- Increased understanding of disease processes
- Identify mutations linked to various cancers.
- Ability to identify disease pathways sooner
- Ability to identify individuals disease profiles
- Ability to prevent disease by life changes matching genetic forecast
- Ability to develop customized targeted treatments/drugs
- Develop specific targeted screening programs to match individuals genetic profile
- Reduce waste and so costs by improved disease targeting
- Improve the nations health through PERSONALISED MEDICINE

Point-of-Care Testing Technologies
some example applications

- **Wearable devices:** transdermal devices, skin patches, smart tattoos, contact lens sensors, implanted devices, smart clothes
- **Handheld devices:** reagent strips, pads, needles linked to a docking/reading/transmitting station; often single use disposable cartridge
- **Cart devices:** handheld or bench top device(s) taken to bedside
- **Bench top devices:** single or multiple test unit often including reagent reservoirs, for multiple use
- **Small analysers:** larger multiple test capability used in side room or remote unit e.g. small hospital as part of care network (hub and spoke – or private provider)

Johnson, Laszlo, Price & Jones, 2011

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Transforming chalmydia testing and treatment using modern diagnostics

Traditional route

Test Results & Treatment
Up to 10 days

5. Follow-up appointment

4. Contact positive patients & arrange follow-up

3. Sample sent to lab for analysis

2. Sample collected

1. Initial appointment with clinician

Using rapid molecular testing for infectious diseases

3. Sample processed at POC

Test Results & Treatment
<1 hour

2. Sample collected

1. Single appointment with clinician

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Radiology – PET CT scanning

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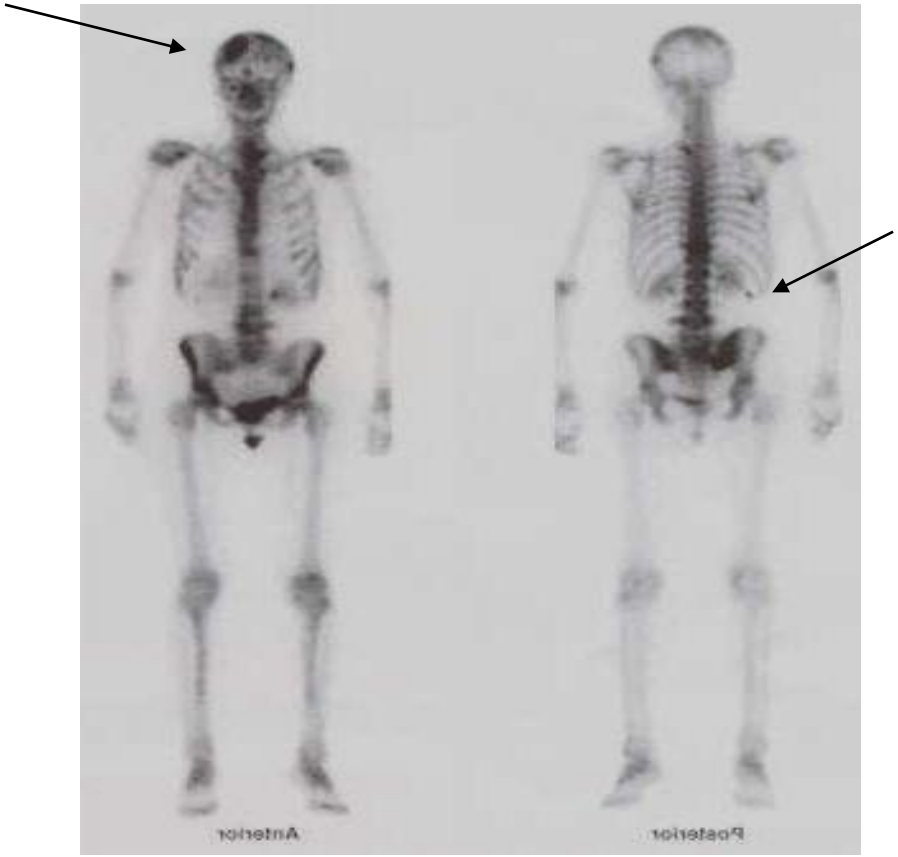
Radiology – Conventional Nuclear Medicine

- Radioisotopes (Radioactive substances – Technetium 99, Iodine 123 etc) detect functional changes in the body
- Isotope injected into patient
- Nuclear Medicine Gamma Camera detects uptake of Radioisotope and generates a 2D or 3D image
- Gives functional information about the organ being scanned, i.e. Cancer spread to bones, loss of functioning Cardiac tissue, Renal scarring and blockages.

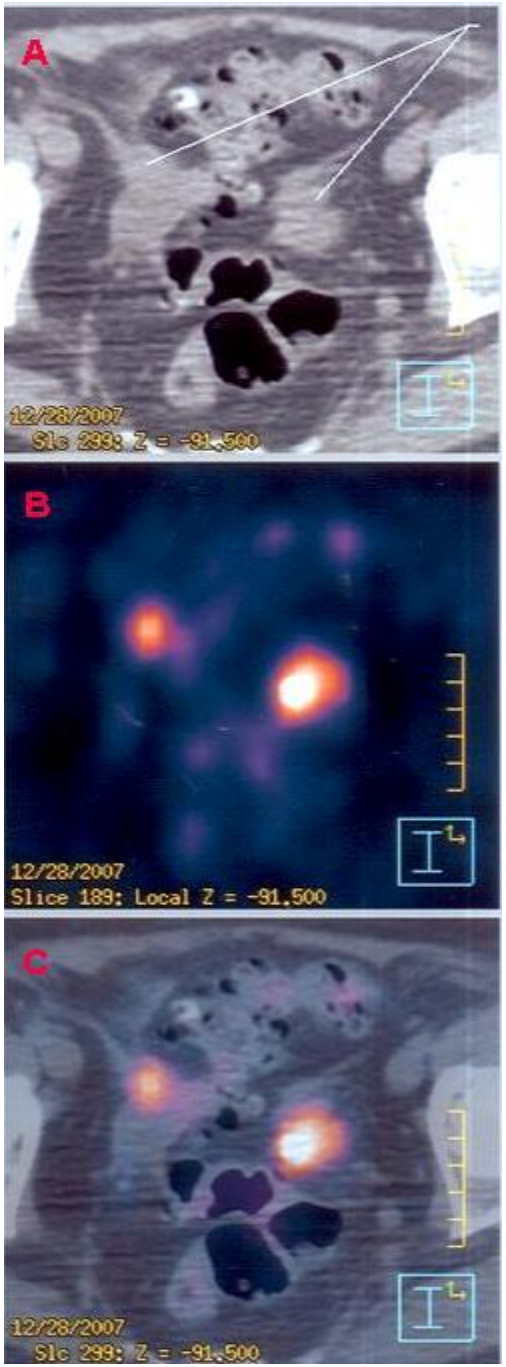
Nuclear Medicine – Bone scan

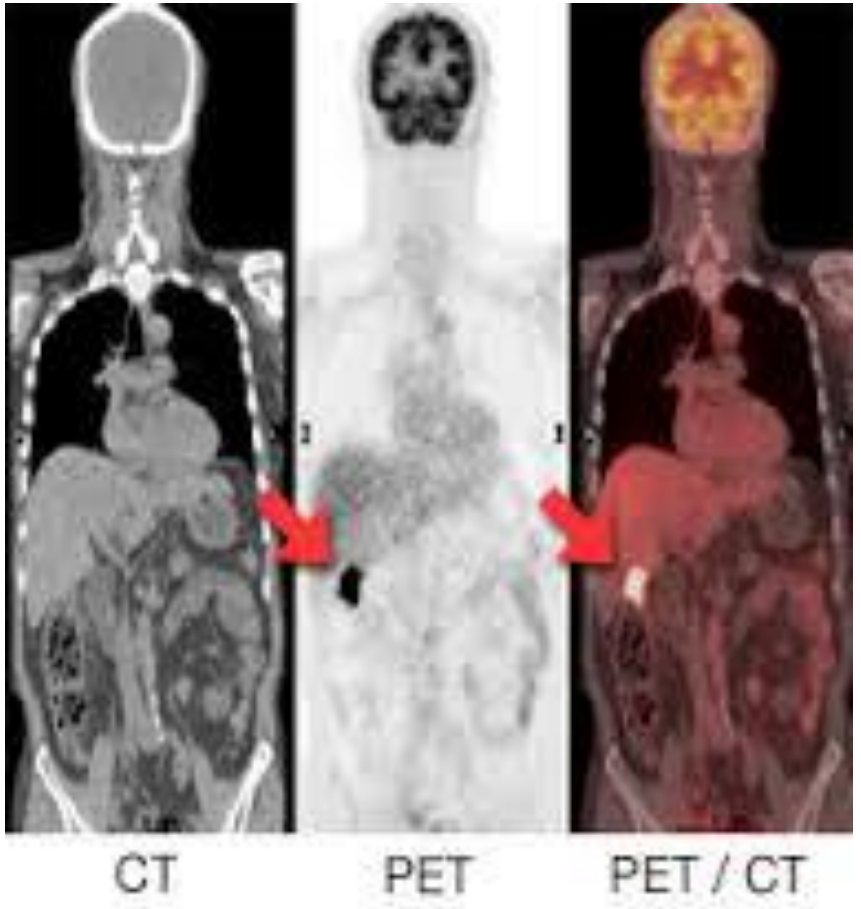


- Patient injected with Radioisotope 99mTechnetium.
- Imaged after 3 Hours
- Image shows increased uptake of injection, demonstrating spread of Cancer to Bones

PET CT SCANNING

- Positron Emission Tomography, combined with conventional CT in one machine.
- Two Diagnostic techniques combined which aides diagnosis.
- 3D Images
- Radioactive compounds are used called tracers – Fluoride 18, Rubidium 82. produced in a cyclotron.


A
12/28/2007
Slc 299: Z = -91.500
B
12/28/2007
Slice 189: Local Z = -91.500
C
12/28/2007
Slc 299: Z = -91.500


CT
PET
PET / CT

Vision for Diagnostics

- Innovative and technologically enabled
- Integrated, value and evidence based services
- Safeguarding Quality
- Equality of provision
- Greater collaboration and knowledge sharing
- Patient centered services
- Responsive education and training
  - diagnostic teams to match changing technology
  - broader healthcare team in utility and application
  - patients to inform choice and understanding

** From Diagnostic visioning Workshop 2012*

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Improving the patient experience – The challenge for diagnostics

- Providing diagnostics at accessible locations
- Further reducing waiting times
- Effective measures that relate to the experience of diagnostic services (eg friends and family test, PREMs)
- Patient Information on which to base choice and quality of provider
- Open and accessible test results and support to understand them

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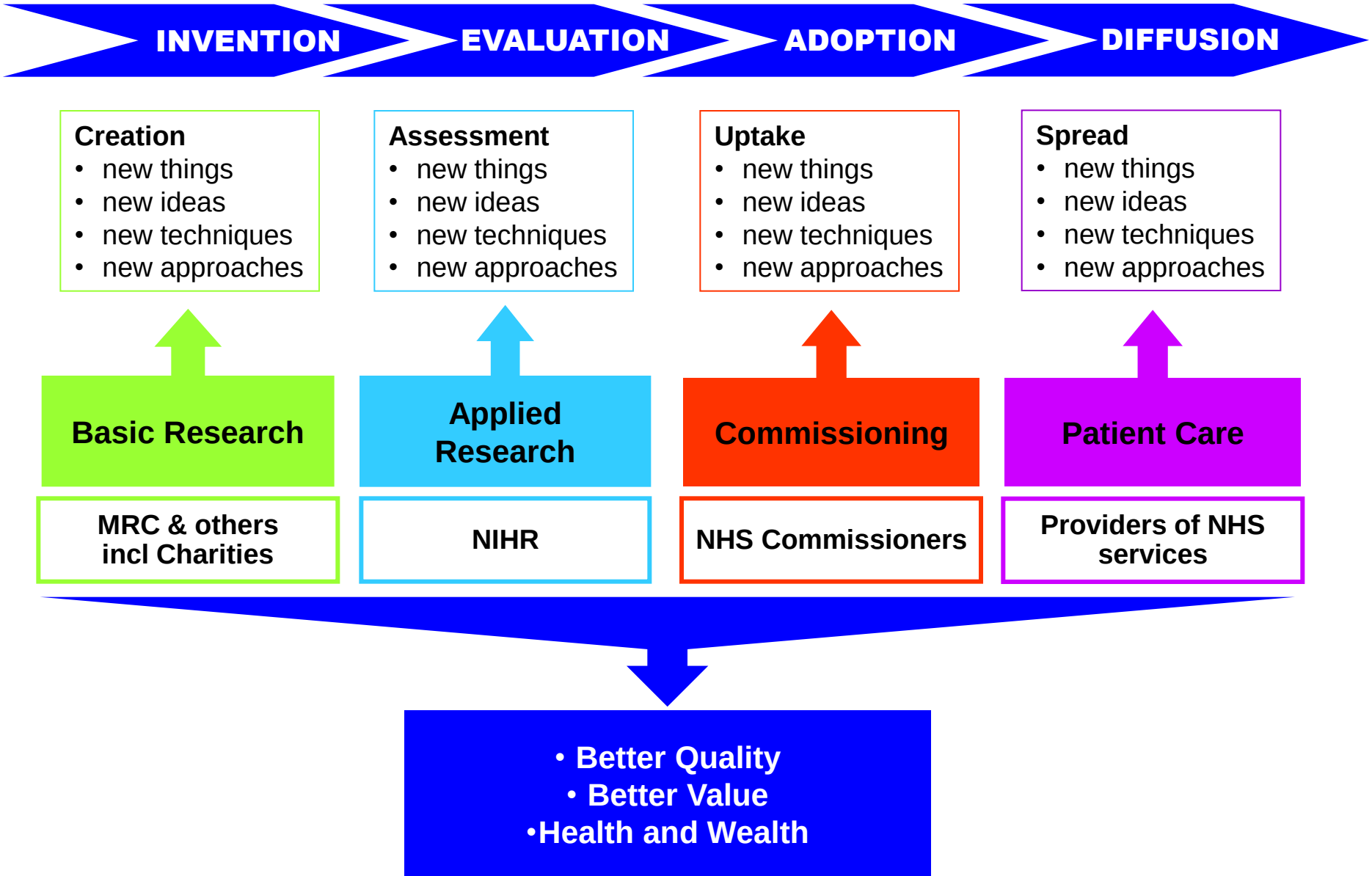
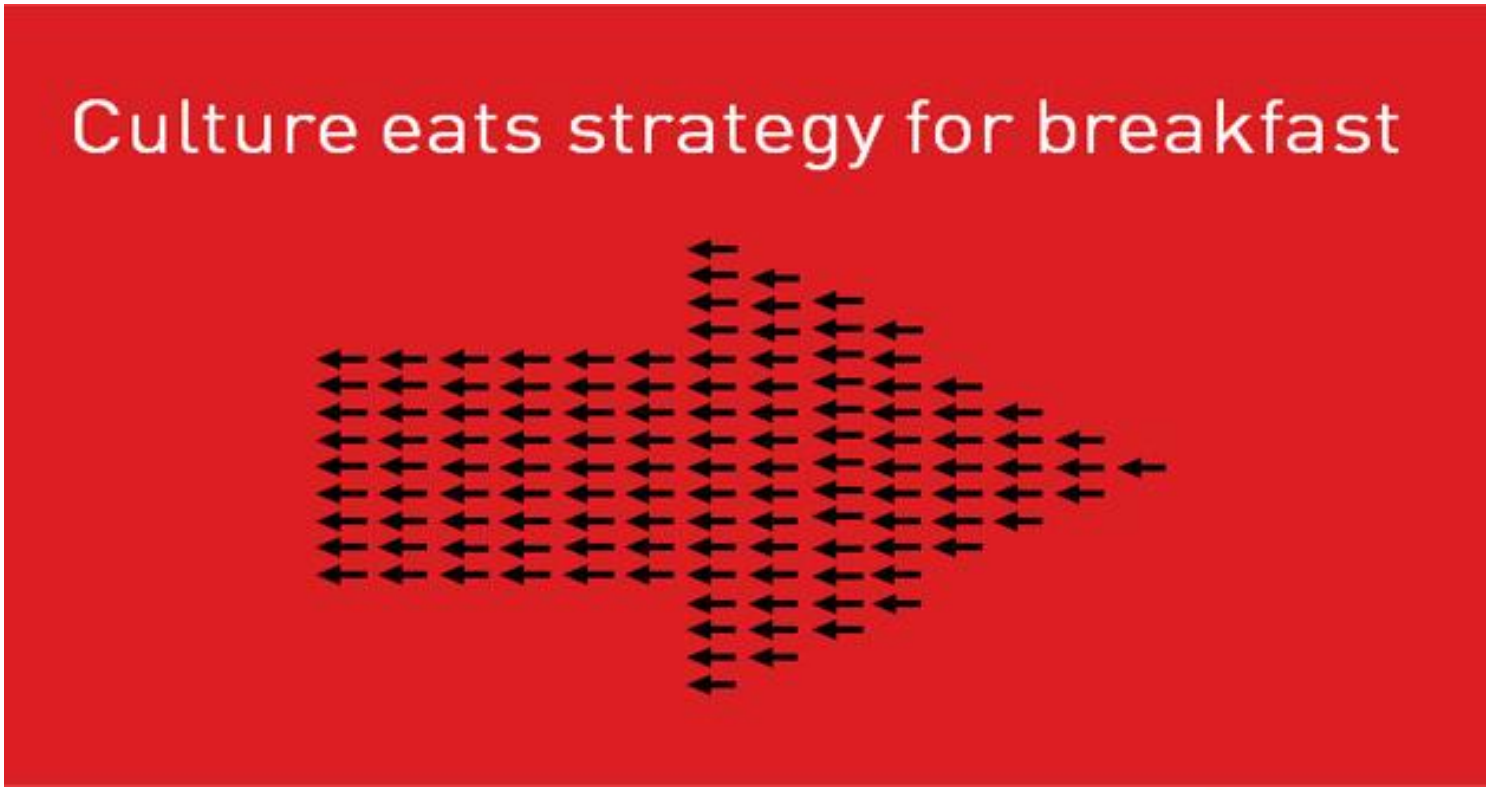
Embrace the Innovation Pathway



A final thought on culture



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Innovation, Health & Wealth

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Thank you