Caring for ‘my health’ & ‘our health’ in the digital economy

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Iain Buchan (Director)
Northwest Institute for BioHealth Informatics
www.nibhi.org.uk

Healthcare & Digital Economy

- Healthcare (Hippocrates → now)
  - Physician **gatekeeper**
  - High-level, **fear-oriented** public health
  - Humanity & **hope** > technology

- Bit-shifting healthcare (emerging?)
  - Physician **guide** (part-time)
  - Low-level, **opportunity-oriented** public health
  - Driving force is personal health **choice**
Do we choose health?

Can we choose health?
Obesogenic environments

Through millions of years of evolution, humans spent energy to get energy and stored it at times of plenty.

Through millennia of civilisation, energy-dense, pleasurable food is brought closer to people.

Type 2 diabetes incidence in a typical health economy
Appearance > Health

We demand rescue

‘Inverse-care’ (Tudor-Hart)

Healthcare systems tend to inequity
Grand Challenge

‘Engineering Digital Economies for Public Health’

Some high-level goals...

Citizen: Thriving market in wellbeing – ‘personalised public health’

Patient: Patient-carer-clinician unit driven by relevant information

Population: Natural health economies driven by relevant information

Natural Health Economies

Local economy of trusted allies

High-resolution, timely information

Wider economy:

Low-resolution, ‘share if we must’ information
E-Foundations: UK

- Requirements for local health economies
  - Integrated care e-records – ‘live to patient-carer-clinician’
  - Real-time intelligence for service development
  - Locally-owned research assets

- Hardware in place – looking for R.o.I.

- Culture, management and software developments required

Simple Economy-Wide Steps

Smart views of care e-records from multiple sources for clinicians and patients
Building on a clinically-led EPR via chronic disease management requirements

Pulling Primary Care information into the hospital EPR → toward shared care
Involving Patients

Bringing integrated care-record views to primary care, simply
Hyperlink paradigm for drilling-down longitudinally

Reducing Duplication for Patients and NHS

Incentivised Measurements in Primary Care

Specialist Care in Hospital

Coherent Management/Integrated e-Records & e-Lab

Nurse/GP

Auto-Payment (e.g. QoF)

More Time In-touch

Nurse/Consultant In-touch

1 Need 1 Test Involved

At last: just one needle!
Anonymised ‘e-Lab’ Extract

Data, methods and expertise for service development and research

Integrating Records → Care in Salford

EMIS & Vision

Optometrist
Eye screening
Community nurses
Podiatry

XML (HL7v3)

Integrated Database (at PCT)

Master Patient Index

Demographic Service

Research & Clinical Audit

XML Journal File

Pseudonymised Repository

Analysis Tools

Web view of Patient

Web Forms
Current position

• Hard to access basic clinical data
• Research fails to harness care data
• Artificially slow & expensive research
• Clinical creativity underused
• NHS business intelligence is poor value

Example of basic R&D blockage

• Question: Is tamoxifen ineffective in women also taking anti-depressants?

• Request to cancer registry →
  – Breast cancer recurrence data missing
  – Hormone therapy data unreliable

• The data are in GP systems
Enhancing Records

Example: Cardiovascular risk derived consistently and written back to GP record...

Developing Services

Real-time views of healthcare enriched by local knowledge...
Summarising care quality

Total Cholesterol

Systolic BP

1993 1995 1997 1999 2001 2003 2005 2007

Child poverty map

Wirral (0.3M), UK

(households with children: % on benefits in 2001-3)

Fifths of IDAC 2004
Red (light) = most deprived
Red (dark)
Purple
Blue (dark)
Blue (light) = most affluent
BMI of 3 yr olds
1996 - 1997

BMI of 3 yr olds
1998 - 1999

Fifths of BMI
SDS BMI fift
Red (light) = fattest
Red (dark)
Purple
Blue (dark)
Blue (light) = thinnest
Stimulating Clinical Research

Bringing clinicians closer to data, analytical tools and other investigators...
Anaemia in Salford Diabetics

Clinical quality origin: “is diabetes care picking up enough treatable anaemia in patients with mild kidney impairment?”
- Answer: No
- Care pathway improvements
- Next similar e-Lab query made easier
- Deeper research...

Anaemia at lower levels of kidney impairment than commonly thought
Bringing scientists to the clinical front line

Iterative shaping of hypothesis between biology and medicine, plus enhanced data collection

African cows to Salford ICU

High cholesterol in African cattle identified as a protective factor against death from trypanosomiasis

Is high cholesterol a protective factor in humans undergoing extreme inflammation?

ICU data and physicians in Salford ‘E-Lab’ accessible, and physiological ‘clamping’ reduces confounding

Data cleaning, meta-data capture, analysis
Local e-Lab & Biobank

Local research assets built around research-ready clinical data, consent and sample collections...
Local Biobank Stimulating Research

Microsoft Shared Genomics

- Back end (University)
  - Finding genetic patterns in new ways
  - New methods
  - Grid computation

- Front end (NHS & University)
  - Involving clinicians in interpreting patterns and steering research
1. Trial/study recruitment as a workflow

2. E-infrastructure for: rapid feasibility studies; recruitment; study management.

3. Involved Public and Patients

4. An e-Lab is built around a social contract with a local community...
e-Lab for a Health Community

- Research
- Service Development
- Academia Partners
- Health & Social Care Knowledge
- Industry Partners
- Social Contract &Governances
- Local Information Systems
- Population

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e-Labs for Public-Benefit

- Local-ownership/governance
- Clear local public-benefit from e-Lab uses of anonymised records
- Privacy protected record linkage and search *within* NHS firewall/governance
Making research more transparent, sharable, reproducible, and easily preserved
e-Lab Processes

Raw Data ➡ Enhanced Data ➡ Research

- GPs
- Hospital(s)
- Biobanks
- Surveys
- LA/Council
- National

Link records
Clean
Organise
Add metadata
Share algorithms

Safety
Real effectiveness
Efficient trials
Exploratory
Public health
Service models

Depersonalise

e-Labs Enrich Data & Skills

- The data alone, are not enough–interaction with local experts produces new metadata, e.g. when a lab assay changed – often critical to analysis

- Local playback of early results incorporates local knowledge, engages methodologists, and enhances local skills for analysis
Scaling-up e-Labs

A confederation of e-Labs provides:
economy of scale,
powerful e-infrastructure,
and a community of practice

Radical Steps: Citizen

‘Live to citizen’ health record

- Wellness partnerships across life-course

- Pre-morbid data for whole populations
  - Reliable epidemiology – myth-busting
  - Personalised preventive medicine
  - Agile service development
Radical Steps: Patient

‘Patient-involved, live care e-record’
- How I got on with that prescription
  - True clinical effectiveness
  - Effective pharmaco-vigilance

- Sharing signals from my glucose monitor, weighing scales, gait-cam, smart vest...

- How my purchases of wellness or self-care products & service purchases fit with my clinical and social care

Radical Steps: Population

Population-wide ‘e-Labs’
- Localisation of evidence
- Reliable scenario planning
- More preventive primary care
- Next-generation epidemiology
- Research and audit incubators
Conclusion

Beacon local health economies are ready to be connected, *internally*, toward the digital economy

*Grand aspirations at the tipping-point...*

*Citizen:* Thriving market in wellbeing – ‘personalised public health’

*Patient:* Patient-carer-clinician unit driven by relevant information

*Population:* Natural health economies driven by relevant information