E-Health: one giant leap for the health system

Frank Sullivan
Australian Primary Health Care Research Institute
International visiting Fellow

General Practitioner, Arthursone Medical Centre
Professor of R&D in GP, University of Dundee
Director, Scottish School of Primary Care
A healthier Future for all Australians (123 recommendations)

121. We recommend that the Commonwealth Government takes responsibility for, and accelerates the development of a national policy and open technical standards framework for e-health, and that they secure national agreement to this framework for e-health by 2011-12. These standards should include key requirements such as interoperability, compliance and security. The standards should be developed with the participation and commitment of state governments, the IT vendor industry, health professionals, and consumers, and should guide the long-term convergence of local systems into an integrated but evolving national health information system.
‘Smart use of data, information and communication’

- Integrated, Comprehensive, Multidisciplinary Primary Health Care services
- PHC connected to acute and post-acute care
- Performance indicators
- Quality monitoring
- Person-Controlled Electronic Health record
Scotland
5M People
1007 Practices
40 Community Health Partnerships
Perspectives

• **Clinical**
  - Electronic Patient Records since 1984, Paperless since 2005

• **Research**
  - Health Informatics Centre Dundee HIC
  - Scottish Health Informatics Programme SHIP
  - Translational Medicine and Patient Safety in Europe TRANSFoRm

• **Policy**
  - UK Office for the Strategic Coordination of Health Research eHealth Records Research Group OSCHR
  - External Reference group of Connecting for Health CfH
2 weeks in Australia

• Visits to General Practices in:
  – Aboriginal Medical Service Western Sydney
  – Hamilton, Victoria
  – Mt. Gambier S.A.

• Discussions with Primary Care Academics in:
  – Adelaide,
  – Canberra,
  – Greater Green Triangle,
  – Melbourne,
  – Sydney
The next 45 Minutes

- What is eHealth?
- Primary care data
- Improved care with linked records
  - Clinical
  - Quality improvement
  - Research
- Security and Confidentiality issues
- Reflections on E-Health in Australia
A Definition (from 51)

“e-health is the use of emerging information and communication technology, to improve or enable health and healthcare.”

Better informed decisions

Local insights

New knowledge

Higher quality care

Patient data

Storage System

Retention

Patient records

Comparison with targets

Relevant patient data

Local insights

Grouped analysis

New knowledge

Research

Quality improvement

Sullivan and Wyatt ABC of Health Informatics 2006
GP Electronic Patient Records (EPR)

- Demographics
- Prescribing
- Diagnoses
- Tests
- Free Text
Long-Term Follow-up of the West of Scotland Coronary Prevention Study

Ian Ford, Ph.D., Heather Murray, M.Sc., Chris J. Packard, D.Sc., James Shepherd, M.D., Peter W. Macfarlane, D.Sc., and Stuart M. Cobbe, M.D., for the West of Scotland Coronary Prevention Study Group

**A** Death from Any Cause

<table>
<thead>
<tr>
<th>Years since Randomization</th>
<th>Placebo</th>
<th>Pravastatin</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>24</td>
</tr>
</tbody>
</table>

No. at Risk

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>3293</td>
</tr>
<tr>
<td>Pravastatin</td>
<td>3302</td>
</tr>
</tbody>
</table>

**B** Death from Cardiovascular Causes

<table>
<thead>
<tr>
<th>Years since Randomization</th>
<th>Placebo</th>
<th>Pravastatin</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

No. at Risk

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>3293</td>
</tr>
<tr>
<td>Pravastatin</td>
<td>3302</td>
</tr>
</tbody>
</table>

**Figure 1.** Kaplan–Meier Time-to-Event Analyses for Deaths, According to the Originally Assigned Study Group.
Panel A shows the Kaplan–Meier estimates for death from any cause, and Panel B the estimates for death from cardiovascular causes.

**Initial Trial**

A$60M

Over 5 years

**Follow up**

A$60K

Over 15 years
High levels of Patient and Professional Acceptance for Shared Records

- 37/5M opted out
- Consent model approved by the BMA, the GMC and EU lawyers

news release

NHSScotland Emergency Care Summary marks 1 million patient consultations and national award commendation

NHSScotland’s Emergency Care Summary (ECS) programme has reached a major milestone with over 1 million ECS records used in patient consultations in Scotland, since its launch in 2006.

The Emergency Care Summary enables clinicians with patient consent to access crucial patient information 24 hours a day, helping with more accurate diagnosis and treatment and reducing time taken to obtain important information, ultimately saving lives.

NHSScotland, the national health service in Scotland, has developed the ECS programme on behalf of NHSScotland, and have worked in partnership with the Atos Origin Alliance. The programme, which forms part of the wider NHSScotland e-Health strategy, now securely holds over 5 million patient records with each record containing key medical details of prescribed medication and allergy information.
High levels of Patient and Professional Acceptance for Shared Aggregate Data on Quality

Similar to: Canning Division Tool Pen Computing Tools
Quality of Primary Care in England with the Introduction of Pay for Performance

Stephen Campbell, Ph.D., David Reeves, Ph.D., Evangelos Kontopantelis, Ph.D.,
Elizabeth Middleton, M.Sc., Bonnie Sibbald, Ph.D., and Martin Roland, D.M.

Figure 1. Mean Scores for Clinical Quality at the Practice Level for Coronary Heart Disease, Asthma, and Type 2 Diabetes, 1998 to 2005.
More detailed analyses at Practice level
Drilling down into detail
Smarter alternatives to league tables
Combating the ‘Rule of Halves’ with better feedback

**E Mitchell, F Sullivan, JM Grimshaw, et al**

**Improving management of hypertension in general practice:**
a randomised controlled trial of feedback derived from electronic patient data

*Elizabeth Mitchell, Frank Sullivan, Jeremy M Grimshaw, Peter T Donnan and Graham Watt*

---

**ABSTRACT**

**Background**
Although absolute risk of death associated with raised blood pressure increases with age, the benefits of treatment are greater in older patients. However, fewer patients in this group are identified, treated, and controlled.

**INTRODUCTION**
Hypertension in all age groups is a major risk factor for stroke, cardiovascular disease, and renal failure. Although absolute risk of death associated with raised blood pressure increases with age, the benefits achieved through treatment are greater in...
Safety measures

- Nov 2007 Tayside methotrexate data
  - 1% of patients had a ‘daily’ dose instruction
  - 1% had no dose instruction
  - Both potentially lethal, both ‘banned’
  - 15-20% prescribed both 10mg and 2.5mg tablets

- Have to act (although can still study)
  - Informed NHS Tayside who organised manual review of all patient records
  - NHS QIS letter to all Boards
Testing Quality Improvement interventions

Change in local guidelines:
- Safety alert in General Practice prescribing advice
- Modification of clinical letters recommending methotrexate treatment
Health board had 539 drugs errors

HUNDREDS of mistakes have been made by a health board when issuing drugs over the last three years, it has been revealed.

More than 500 errors were made by NHS Tayside, including prescribing the wrong medicine, delays in getting drugs to wards and paperwork issues.

NHS Tayside said not all the mistakes were a serious threat to patients and that they reported even minor errors.

But Margaret Watt, of the Scotland Patients Association, said: “People forget there are people like me who are allergic to so many drugs.

“It’s really quite worrying but equally it’s not the fault of the doctors. The doctors are doing their best but, if they could spend a wee bit more time with our patients and maybe double check the prescriptions, that might help the situation.”

A spokeswoman for NHS Tayside said: “The 539 drug errors recorded...
Each person in the world creates a Book of Life. This book starts with birth and ends with death. Its pages are made of records of the principal events in life. Record linkage is the name given to the process of assembling the pages of this book into a volume.

Dunn H: Record linkage. JAMA 1946, 36: 1412-6
Information from cradle to grave...

- Mothers ante-natal records
- Maternity
- Neonatal record
- Register birth - NHS number
- Register with GP - CHI
- GP Appointments
- Dental Appointments
- Outpatients
- A&E attendance
- General hospital admission
- Prescribing
- Cancer registration
- Cancer treatment
- Coronary heart disease
- Community care
- Death
Deterministic linkage

- Lab Data
- CHNo
- Hospital SMR
- Investigations
- Screening
- Dental
- Primary Care
- Social Services
- Pharmacy
Record-Linked Data
Completing the Jigsaw
Individual data extraction in Scotland of Read Coded data

Data extracts are specified using a predefined set of READ codes to define the patient population, then for the patients identified diagnostic, therapeutic and activity codes can be extracted. These codes can be updated nightly using an extract definition file.

Data are sent from the practice to the regional Gateway server via eLinks and then loaded into SQL Server.
SCI-DC NETWORK

Scottish Health Statistics
The website of ISD Scotland
Better Information, Better Decisions, Better Health

inps
Protechnic Exeter
Gpass
iSOFT
emis
12% of lab tests in Australia are repeated unnecessarily.
Patient Summary for clinicians

**LONG TERM CONDITIONS MANAGEMENT**
Clinic: DSN Clinic Dundee

### Patient
- **Patient Identifier**: 131032LNYL
- **Hospital Identifier**: CHI
- **Name**: GOWANS, SARAH
- **Date of Birth**: 13 Oct 1932
- **Sex**: Female
- **Address**: A RESIDENCE SOMEWHERE IN TAYSIDE DUNDEE

### Clinical Concerns
#### Clinical Summary
- **Smoking Status**: Ex - 14 Dec 2004
- **Blood Pressure**: 145/77 mmHg - 14 Jan 2005
- **BMI**: 31.39kg/m² - 14 Jan 2005
- **Influenza Vacc**: Given / Prescribed - 25 Nov 2004

### Biochemistry
- **Total Cholesterol**: 5.48 mmol/L - 14 Dec 2004
- **HbA1c**: 96 μmol/L - 14 Dec 2004

### Tests
- **ETT Test**: 01 Aug 2000
- **Retinal Screening**: 30 Jun 2004
- **Peripheral Pulses**: Right: Absent 14 Jan 2005 Left: Absent 14 Jan 2005
- **FEV1**: Base: 70 Post: 87 -21 Jan 2004
- **Neuropathy Test**: Right: Normal 14 Jan 2005 Left: Normal 14 Jan 2005 (Foot Sensation)
- **LVD Confirmed by Echo**: 20 Jan 2003 - Abnormal septal motion secondary, Abnormal septal motion secondary, to cardiac surgery, Normal diastolic size, Normal systolic function

### Prescriptions:
- 7 repeat prescription(s) and acute prescription(s)

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Preparation</th>
<th>Dose</th>
<th>Quantity</th>
<th>Frequency</th>
<th>Last Date</th>
<th>Acute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pantoprazole</td>
<td>TABS 20MG</td>
<td>1 Tab</td>
<td>56</td>
<td>Daily</td>
<td>26 Jan 2005</td>
<td>False</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Dispersable TABS 75MG</td>
<td>1 Tab</td>
<td>56</td>
<td>In the morning</td>
<td>26 Jan 2005</td>
<td>False</td>
</tr>
<tr>
<td>Tildi perfume</td>
<td>CAPS 200MG</td>
<td>1 Cap</td>
<td>56</td>
<td>In the morning</td>
<td>26 Jan 2005</td>
<td>False</td>
</tr>
<tr>
<td>Atenolol</td>
<td>TABS 25MG</td>
<td>1 Tab</td>
<td>56</td>
<td>In the morning</td>
<td>26 Jan 2005</td>
<td>False</td>
</tr>
</tbody>
</table>
Summary for patients

• NHSTayside IT for managed clinical networks
  – DARTS
  – HEARTS
  – TARDIS
    • COPD
  – TEARS
    • Endocrine
Scottish Diabetes Survey 2002-2007

Recording of Key Biomedical Markers

Data recorded within the previous 15 months

Source: Scottish Diabetes Survey
Recent UK-Wide Recommendations

1. Mandate common patient identifier
2. Communicate the relevance of research to healthcare
3. Federate existing databases
4. Improve data quality
5. Initiate governance discussions
6. Engage key stakeholders
“Research is a core part of the NHS. Research enables the NHS to improve the current and future health of the people it serves. The NHS will do all it can to ensure that patients, from every part of England, are made aware of research that is of particular relevance to them. The NHS is therefore putting in place procedures to ensure that patients are notified of opportunities to join in relevant ethically approved research and will be free to choose whether they wish to do so.”

Handbook (2009)
UK's families put on fraud alert

Two computer discs holding the personal details of all families in the UK with a child under 16 have gone missing.

The Child Benefit data on them includes name, address, date of birth, National Insurance number and, where relevant, bank details of 25 million people.

The chancellor urged people to monitor their bank accounts.
Data Sharing Review recommendations

Recommendations 15 + 16:

• Develop ‘safe havens’ as environment for population-based research and statistical analysis
• Create system for accrediting approved researchers
• Government departments wishing to develop, share and hold should work with academic and other partners to create safe havens

Government response:

• Accept recommendation that ‘safe havens’ should be developed – DH and RCP working with NHS Information Centre to deliver this.
• System should be devised to ensure only accredited people work within safe havens
• Government will commission a code for the use of safe havens and a scheme for accrediting researchers
GPs consensus: overarching principles

• **Safeguarding patient confidentiality**
  – Use best available technologies to ensure security
  – Mechanisms for accreditation and accountability

• **Improving public awareness**
  – Transparency: ‘no surprises’
  – National campaign to raise awareness
  – Provision of information at local practice level
  – Opportunity to opt-out of use of identifiable information

• **Role of GP as patient’s advocate**
  – Provide advice and feedback
  – May need training, support and resources
Staff may use some of your personal health information in research and staff training. Healthcare staff may use information from their patients to help them find the causes of disease and the effects of treatment and for planning new treatments. If the research involves you personally you will be contacted and asked for your consent.
Categories of confidentiality in Scotland

- Clinical care, governance
- Epidemiology
- Patient specific
- Inform and allow opt-out
- Ethics and Caldicott approval
- Signed consent from practices and patients
Current SOP for access to patients with pre-existing conditions in Scotland

1. SPCRN staff undertake to search practice records for potentially eligible patients on behalf of individual practices and working under practice staff supervision.
2. There is a current generic non-disclosure agreement with each practice.
3. SPCRN staff must have a current NHS substantive or honorary contract.
4. Each practice should have formally agreed to collaborate in a study.
5. Normally all searches and mail outs will be done from within the practices, and no identifiable data will be removed from the practice without explicit patient consent. These circumstances will have been specified to the ethics cttee and Caldicott.
6. In exceptional circumstances, an encrypted electronic file containing patient identifiable data can be taken from the premises provided that it is kept secure by password protection, and destroyed as soon as invitations to take part in a study have been issued. These circumstances will have been specified to the ethics cttee and Caldicott.
Scottish Primary Care Research Network

Recruitment of patients with pre-existing conditions Using GP records

- ISD/HIC search and provide aggregate data by practice
  - Practices sent Info about study. Request to participate
  - Practice agrees to participate
    - SPCRN
    - List of eligible patients
      - Practice screens data
      - Practice / SPCRN prepare & send invitations

GP data
ISD/HIC data
Acute Recruitment Tool
The Scottish Diabetes Research Network

unintrusive epidemiology  SCI-DC  clinical trials

anonymisation  consent

With proactive consent for trial participation
Pharmacogenetics of the response to Sulphonylureas (SU)

Data from DARTS, Tayside, Scotland
Defining Drug Response

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12

Baseline HbA1c
BMI

Treatment HbA1c

Other measures
Lipids, Biochemistry, BP, Other treatment

SU treatment in 1200 patients
Metformin treatment in 1400 patients (with DNA)
Using GP phenotypic data in DARTS to look at genetic determinants of response in type 2 diabetes

TCF7L2
- Large population attributable risk
- Likely effect on beta-cell function (direct or indirect)

Hypothesis
Variants in TCF7L2 (rs7903146) will affect response to sulphonylureas but not metformin

Pearson et al
Diabetes 2007
TCF7L2 genotype modulates SU response.

Outcome = HbA1c <7%

SU response
HR = 1.56, p = 0.03

Metformin response
P = 0.82

Pearson et al. Diabetes, Aug 2007
Drinking from the hosepipe
Vogel L  AMIA 2009
Realising the potential of genomic medicine will require the storage and interpretation of very large amounts of genetic information within the NHS, in turn requiring skills and facilities in bioinformatics and the establishment of information management systems to link genomic databases with medical patient records.
International Advisory Board

C2: Governance
C3: Engaging Researchers
C4: Engaging the Public

C1: Provisioning datasets for research
A hybrid model for provisioning datasets for research. SHIS acts as a centralised repository of Scottish datasets funded and quality assured by NHS Scotland. Other clinical and research datasets are federated and linked.

MRC
ESRC
EPSRC

Chief Scientist Office

A$10.1M over 4 years
Translational Medicine and Patient Safety in Europe (TRANSFoRm)

- A$13.2 M European FP 7 Integrated project
- 15 partners from 8 EU countries
- Aims to integrate clinical and research activities in primary care via
  - Rich capture of clinical data via a generic dynamic interface
  - Distributed interoperability
  - Controlled vocabulary and standardised data elements
The EU policy context

• I2010: Greater safety and productivity for EU healthcare via advanced ICT
• Cross-border interoperability (COM 3282)
• Empowerment and evidence-based care (COM 630) “together for health”
• Desire to improve uptake and ease of use of the eHR
• Standards: Archetypes, templates and controlled vocabulary.
### Some differences between Scotland and Australia

<table>
<thead>
<tr>
<th>Scotland</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHI Number</td>
<td>No Unique ID</td>
</tr>
<tr>
<td>NHS – GP’s familiar with health research – track record</td>
<td>Private general practice – easier to say no.</td>
</tr>
<tr>
<td>GP system accreditation (~ 6 GP systems in UK – formerly ~100)</td>
<td>No accreditation - ~20 GP systems in Australia</td>
</tr>
<tr>
<td>GP’s have comfort in the quality of their systems</td>
<td>At procurement, GP system quality and cost can be difficult to quantify</td>
</tr>
<tr>
<td>Mandated interface standards</td>
<td>Standards but no mandate</td>
</tr>
<tr>
<td>Mandated clinical dataset definitions and coding system</td>
<td>No standards – SNOMED-CT possibly on the way</td>
</tr>
<tr>
<td>Quality and Outcomes Framework (QOF) in-depth data reporting and care standards linked to payment</td>
<td>Very minor reporting requirements, payments minor.</td>
</tr>
<tr>
<td>Population concerned about privacy but in general expect data to be used for research</td>
<td>Confidentiality &amp; privacy – especially in indigenous communities is a major public debate</td>
</tr>
</tbody>
</table>
‘There is apparently limited recognition of the highly sensitive nature of identifiable health data, and the ensuing range of potentials for harm to individuals and to confidence in the medical record system which may arise from flaws in the design and execution of such monolithic systems.’

## Changes Implied in ‘Partial Takeover Option’

<table>
<thead>
<tr>
<th><strong>Australia now</strong></th>
<th><strong>Australia in 6m-3years</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No Unique ID</td>
<td>Person-Controlled Electronic Health record likely to require a unique ID</td>
</tr>
<tr>
<td>Private general practice – easier to say no.</td>
<td>Increased accountability</td>
</tr>
<tr>
<td>No accreditation - ~20 GP systems in Australia</td>
<td>System accreditation</td>
</tr>
<tr>
<td>At procurement, GP system quality and cost can be difficult to quantify</td>
<td>National Standards</td>
</tr>
<tr>
<td>Standards but no mandate</td>
<td>Mandated interface standards</td>
</tr>
<tr>
<td>No standards – SNOMED-CT possibly on the way</td>
<td>Mandated clinical dataset definitions and coding system</td>
</tr>
<tr>
<td>Very minor reporting requirements, payments minor.</td>
<td>Performance related pay</td>
</tr>
<tr>
<td>Confidentiality &amp; privacy – especially in indigenous communities is a major public debate</td>
<td>Population concerned about privacy</td>
</tr>
</tbody>
</table>
Record Linkage in Australia

- WA Data Linkage System since 1995
- QoF data in Mt. Gambier
- GHRANITE
• Generic interfacing / communication with GP and other databases (Current standards e.g. HL7 not sufficient for research)
• Comprehensive patient consent management
• Scheduled extraction of data
• Data provider control of data flows (data inspection prior to transmission)
• Secure information exchange
• Ethical Record Linkage
• Scalable support mechanisms
Consent management

Different types of consent can be managed.

<table>
<thead>
<tr>
<th>Clinic ID</th>
<th>Surname</th>
<th>Forename</th>
<th>DoB</th>
<th>Medicare ID</th>
<th>Veterans ID</th>
<th>Address</th>
<th>Global Research Consent</th>
<th>Research Consent</th>
<th>Clinical Sharing Consent</th>
<th>Global Consent DENIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>NERK</td>
<td>FRED</td>
<td>12/05/1955</td>
<td></td>
<td></td>
<td>12 MY HOM...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>7</td>
<td>NERK</td>
<td>SALLY</td>
<td>12/12/1987</td>
<td></td>
<td></td>
<td>5 JEFFERS...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>1</td>
<td>ANDREWS</td>
<td>MELISSA</td>
<td>19/01/1993</td>
<td>65002252211</td>
<td></td>
<td>23 TANNER...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>2</td>
<td>ANDREWS</td>
<td>MICHAEL</td>
<td>08/05/1954</td>
<td></td>
<td></td>
<td>21 BEST ST...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>8</td>
<td>ANDREWS</td>
<td>SALLY</td>
<td>12/05/1998</td>
<td></td>
<td></td>
<td>21 BEST ST...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>9</td>
<td>LOLLIE</td>
<td>OLLIE</td>
<td>01/01/1800</td>
<td></td>
<td></td>
<td>THE EUCA...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>10</td>
<td>WAGTAIL</td>
<td>WILLY</td>
<td>01/01/1800</td>
<td></td>
<td></td>
<td>THE EUCA...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>11</td>
<td>DUCK</td>
<td>DONALD</td>
<td>01/01/1800</td>
<td></td>
<td></td>
<td>THE EUCA...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>12</td>
<td>ANDREWS</td>
<td>ANNA</td>
<td>08/12/1998</td>
<td></td>
<td></td>
<td>2 KENNEDY...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>13</td>
<td>Andrews</td>
<td>John</td>
<td>17/06/1955</td>
<td></td>
<td></td>
<td>2 KENNEDY...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>14</td>
<td>SMITH</td>
<td>FRED</td>
<td>23/08/1998</td>
<td></td>
<td></td>
<td>2 KENNEDY...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>16</td>
<td>ANDREWS</td>
<td>JENNIFER</td>
<td>20/04/1970</td>
<td>3500225212</td>
<td></td>
<td>2 KENNEDY...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>17</td>
<td>ANDREWS</td>
<td>JULIE</td>
<td>03/03/1956</td>
<td>6500225223</td>
<td></td>
<td>5 JEFFERS...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>18</td>
<td>DONNELLY</td>
<td>GEORGE</td>
<td>02/07/1922</td>
<td>2294724441</td>
<td></td>
<td>43 MAIN ST...</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>19</td>
<td>DILLON</td>
<td></td>
<td>04/08/1935</td>
<td></td>
<td></td>
<td></td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>20</td>
<td>ANDERSON</td>
<td>DAVID</td>
<td>04/01/1955</td>
<td>41334082751</td>
<td></td>
<td></td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
<tr>
<td>21</td>
<td>ANDERSON</td>
<td>PENNY</td>
<td>04/07/1993</td>
<td></td>
<td></td>
<td></td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
<td>🗓️</td>
</tr>
</tbody>
</table>
GRHANITE – current installations

[Map of Australia with marked locations]
E-Health can be a giant leap: or a series of small steps for a health system

Higher quality care

Patient records

Patient data

Storage System

Retrieval

Relevant patient data

Comparison with targets

Quality improvement

Grouped analysis

Local insights

New knowledge

Research

Better informed decisions

Sullivan and Wyatt ABC of Health Informatics 2006