Role of E-Health Technologies in managing chronic health care conditions in an Ageing population

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A mud map of Australia
1. Chronic Disease, Technology and Care:

2. Paradigm shifts in older adults’ care:
   - individual and system levels

3. Technology responses: enablers OR gadgets & gizmos
   - Dementia assessment, monitoring and support

4. Key questions

5. Stakeholder reactions and moving forward
Changing models of health care

• New models of care emerging to address chronic illness (80% of current burden of disease)
  – multidisciplinary teams
  – supported self-management
  – home-based and ambulatory care
  – care plans, recalls, reminders
  – remote monitoring

• These models of care are heavily dependent on access to and sharing of information
E-health (IT /IM) & Assistive technology:
• Provide opportunities to enable responses to these pressures,
• Need to be aligned in a structural context with health financing, workforce and system management
Technology, housing and healthcare

Coordinate……Connect….. Communicate……… Cue behaviour
Diagnose……..Detect
Telecare services

Social inclusion

Information & communication
e.g. health advice, triage, access to self-help groups

Mitigating risk

Personal monitoring:
• Physiological signs e.g. COPD, symptom change, oxygen saturation, weight and temperature
• Activities of daily living e.g. detecting falls, room occupancy, use of appliances

Electronic assistive technology
e.g. environmental controls, doors opening/closing, control of beds

The individual in their home or wider environment

Improving functionality
Outline

1. Chronic Disease, Technology and Care:
   - Aged and chronic care

2. Paradigm shifts- older adults care:
   - system level
   - individual level

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Healthcare Networks

c1888

Paradigm shift:

building centres of efficient, effective service delivery

enabling optimisation of community health & well-being

2008
"Primary" — Community Support

"Secondary" — Community Centres

"Tertiary" — Doctor’s Office

"Tertiary" — Smart Medical Home / RCF

Investment & Support

Funding Lags?

Technology & Skill

Center for Future Health
University of Rochester
The need for ICT

- **The back end**: innovation in administration and management
- **The front end**: innovation in the delivery of care – greater use of home care and other community based models
From centralised care to distributed care:
What are the new value streams?
Home care value stream: roles and activities

**Data providers**
- Providers of relevant individual patient information including response protocols
- Key activity is consolidation of patient information from different data sources

**Service providers**
- Responsible for monitoring end user interface and managing the response using patient information
- Responsible for integration of activities along value chain
- Responsible for coordinating telecare with other health & social care services

**Infrastructure providers**
- Telecoms and other network and access providers
- Providers of physical facilities

**Device suppliers**
- Manufacturers of devices for monitoring patients
How should we come together?

Potential Collaborative Partners

- Public
- Aged care Providers
- Technology Companies
- University Researchers
- Consumer product Companies
- Government / NGOs etc.

And Move Forward
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Molecular medicine with 3 Ps:

Medicine is going to be:

• Predictive
• Personalized, and
• Preventive.
3P’s in the home

• **Monitoring** in the home for early detection of the onset of medical conditions and dynamic management of chronic disease

• Context-aware sensing to **motivate** health-conscious behaviour over extended periods of time

• Interface technologies allowing information **exchange** between healthy adults and preventative health advising teams
Preventative / Self management “at home”

- **Risk stratification** *(cardiovascular, cognitive, falls prevention)* via personal and home sensors to inform individual and population health management

- **Point-of-care** diagnostic and decision-support systems *(e.g. diabetes mellitus)* for individuals *NOT* just health professionals

- **Integration** of lifelong personal medical records with health system EHR/ EMRs
Person-centred & health-connected
The New Health Care Relationships: Me, My Doctor, the Internet, and My Chat Group
Chronic Conditions Management

Improve self-care for any chronic condition.

BEHAVIOURAL MODIFICATION

Components of a personal health information system

Self-Monitoring

Personal Health Record

Decision Support

Communication

Who puts it together??
1. Chronic Disease, Technology and Care:
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   Example –
   *Dementia assessment, monitoring and support*

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Continuous Assessment and Early Diagnosis

How well do they sleep?

Mitigate wandering

How active?

Weight gain/loss?

Early signs of dementia

Possible adverse events - falling

Unobtrusively, and without taxing the overworked caregivers...
Detecting Slow Changes

- Mr. Green
- Mrs. Rosen

Activity [ft/day]

Time [days]
Cognitive testing

1. Formal neuropsychological testing

2. Computerised
   • Supervised, centre or clinic-based
   • Web-based self-assessment/ screening

Examples:
   • CogState, Cantab, NeuroTrax-Mindstreams

Embedded assessment

Monitoring  Prevention  Compensation

Embedded Assessment
Community-wide home-based assessment “The ORCATECH Living Laboratory”

Secure Internet

ORCATECH
Oregon Center for Aging and Technology

www.orcatech.org
Variability in walking speed increases with early cognitive impairment

Years to onset of dementia

Year-to-year change in timed walk results (secs)
Smart home: Maintaining independence

(source: Ross, 2004, IEEE Spectrum online)
Family Portal

Transparency of care: keeping families “in touch”
Falls and safety......
 .............key issues in dementia care

**Fall and Find “Guardian Angel”**

- Track and locate vulnerable “wanderers” and
- Detect falls and stumbles
- Allow voice communication
- Alert emergency services

[Diagram of Fall and Find device]

CLIENT

CARER
One Day........

"I'm old. What's good for that?"

"CogAssist"

Intel Plug & Care
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It’s not the technology!
Technology not the issue........

- **Change management** (workflow, roles, skills) is critical in making the most of these opportunities

- **Leadership** is required to optimise the gains enabled by AT/ IT/ IM to respond to health system needs
Where are the broader, integrated solutions / innovations?

“Existing and developing technologies offer the opportunity to envision new ways to live as we age.”

**Question:**
So, why are we not investing more in how they all fit together to improve the lives of older adults?

i.e. sub-serving a hierarchy of needs with ageing
Connecting Health to..... Living

IT- IM - Design

Chronic Disease

Cognitive Impairment

Older Adults
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Older Adults

Providers

Health Professionals

Government

Perspectives on Technological Innovations
“High Tech – High Touch”

Foreign or Familiar territory?
Already lining up to surf..... waiting for us to catch up to their expectations...!!!!
Older Adults

Providers

Health Professionals

Government

Ethical Perspectives on Technological Innovations
Integrated Viable Models of Care

- Business Models
- Consumer Expectations
- Financial Strategies
Older Adults
Providers
Health Professionals
Government
Ethical Perspectives on Technological Innovations
Managing data overload !!!!

The challenge →
What do health professionals want?

• raw data
• trend analyses
• alarm notification
• predictive early warnings?

And consumers?

Challenge for Commercialisation

And consumers?
Residents

Providers

Health Professionals

Government

Ethical Perspectives on Technological Innovations
Timing of investment….?

Riding the Wave or Settling the Tsunami:
The Future of Technology in Aged and Chronic Care Service Delivery
Timescales of change are mismatched

- **Context**
  - Policy
  - Demography
  - Morbidity
  - Geography

- **Services**
  - (Acute, Primary, Social, etc.)
  - Treatment
  - Prevention
  - Flow
  - Pathways
  - Services change almost constantly (~ yearly)

- **Technology**
  - (Science base, medical, ICT, etc.)
  - Development
  - Functionalities
  - Integration
  - High rate of technical change (~ a few years)

- **Infrastructure**
  - (Built environment, large technical systems)
  - Size / capacity / resources
  - Type / deployment
  - Options / flexibility
  - PFI contracts: 25 to 30 years

**Professor James Barlow, London, 2007**
TAKE HOME MESSAGES……..

ALWAYS LOOK ON THE BRIGHT SIDE

Michael Leunig SMH March 2005
Need for collaboration

PRIORITIES
Improving the Older Person’s Journey through Life and the Health system!!
Connecting the Present while Creating the future.

Linking care across the Community
INVESTMENT OPPORTUNITIES?
Ageing well collaboration

Diagnostic Assistive and Monitoring Data → HISS*

HISS* = Health, Information, Safety, Security

ADULTS
Regional Health Service

Connectivity and interoperability

End-user applications e.g. home monitoring

Aust. Dept of Health and Ageing
Research Databases
Aust. Inst. of Health & Welfare
National Soc. & Econ. Modelling
Aust. Bureau of Statistics
Etc

Resources
Integrating Ageing well & technological innovation

"Ageing Well"- hierarchy

Connectivity

Legacy

Contribution

Safety & Security

Health

"Ageing Well"- hierarchy

Technical Innovations

Legacy

Contribution

Connectivity

Health

"Ageing Well"- hierarchy

Technical Innovations

2008

Legacy

Contribution

Connectivity

Health

"Ageing Well"- hierarchy

Technical Innovations

Telemedicine; wearable computing

smart housing; alarms; robotics; ubiquitous computing

transport etc.

communications

Education etc. technologies

Cross-generational

Education etc. technologies

Smart housing; alarms; robotics; ubiquitous computing

Telemedicine; wearable computing

Communications

Transport etc.

Education etc. technologies

Cross-generational

Communications

Transport etc.

Education etc. technologies

Cross-generational
THE MANAGEMENT OF PATIENTS WITH COMPLEX CHRONIC CONDITIONS

NATIONAL HEALTH REFORM PROPOSAL

Target Group (3% of the population ~ 600,000 people, mainly 65+ years old)

Very High Risk – Patients have multiple, complex health care needs, are at a very high risk for experiencing an acute event and need help managing their condition and coordinating services.

High Risk - Patients are, or are at high risk of being, frequent presenters to ED, have recently experienced major health event, have multiple care gaps, often need pain management, medication coaching or biometric monitoring.

Lower Risk – One or more chronic conditions and some identified care gaps. May need help understanding treatment plans and likely to benefit from education and support to encourage healthy behaviours.

Well Population – Basically healthy with no detectable chronic disease. Focus on prevention screening and healthy behaviours; Low intensity strategies to prevent or reduce incidence of health events through broad dissemination of information and tools to help individuals understand their health conditions, risks, treatment options and available resources.
Nano House UTS

No switches, fittings, blinds

NO falling from ladders!!

No window cleaning

Nano House UTS
TELECONSULTING:
clinicians → clinicians

TELEDIAGNOSIS:
clinicians → physicians

TELEMONITORING:
clinical centers → patients

TELESURVEILLANCE:
health structure → patients

TELE- EMERGENCY:
first aid → health operators (ambulances) → patients
E-Health Technologies

Applications include:

- health information networks,
- electronic health record systems and PHR,
- Telecare and telemedicine services, and
- personal wearable and portable devices for monitoring and supporting patients
Telehealth Wireless Solutions

Continua Health Alliance

Telemedcare Server Technology
- Communication
- Storage
- Analysis
- Knowledge management

Bluetooth Portal
Wireless Data Collection

Mobile Phone

Broadband or Telephone Connection

PreventaFall Monitor
Spirometer
Blood Pressure Monitor
Weight Scale
1 Lead & 12 Lead ECG Monitors
Pulse Oximeter
Digital Camera

PC

Bluetooth Clinical Monitoring Devices

The User at home...or anywhere!

Health & Fitness
Community Nursing
Personal Lifestyle Management
Residential Care
Primary Care Team
Hospitals and Research
Occupational Health & Safety
MARKET

Telehealth Wireless Solutions

Bluetooth Portal
Wireless Data Collection

Mobile Phone

Broadband or Telephone Connection

PreventaFall Monitor
Spirometer
Blood Pressure Monitor
Weight Scale
1 Lead & 12 Lead ECG Monitors
Pulse Oximeter
Digital Camera

PC

Bluetooth Clinical Monitoring Devices

The User at home...or anywhere!
Remote Monitoring of individuals with chronic disease

- An example: Diabetes/Hypertension Monitoring
  - TMC CleverCHEK (BP + BGL monitor) + TeleHUB
OVERALL CHALLENGE of Integration & Co-ordination

ACROSS SECTORS

Preventative (1°, 2°)
Acute Insult Management
Chronic Disease Management

LOCATION

HOME
Residential Care
Hospital

ACROSS DOMAINS

Clinical
Research
Education
Disease OR Discipline-based Units

Assessment and Protection-based approaches across the Community

MEDICINE

HEALTH

Well-being

Evolution not Revolution
Web-based cognitive testing
Molecular Medicine

In Vitro Diagnosis
Leverage novel molecular technologies for early detection of disease

Molecular Imaging
Visualize and localize molecular processes in vivo for diagnosis and therapy

Knowledge-Driven IT
Integrate medical information and enable knowledge-driven clinical applications

Source: Siemens Medical Solutions
Ageing well collaboration

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- Etc.

ADULTS
Regional Health Service

Connectivity and interoperability

End-user applications e.g. home monitoring
Easy Find Alert..............

Hotel Room Key ?