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Technology Enabled Care and Wellbeing @ Home

“Silver Surfing Home on the Seven Waves”

Kevin Doughty
University of Cumbria, Carlisle
Wednesday, 1st. March, 2017

The Four Eras of Care

Institutional focus (1st Era)
Geriatric hospitals replacing the Workhouse and Public Assistance Institutions
The Four Eras of Care

1st Era

Community focus (2nd Era)
Sheltered housing, residential care homes, home helps and domiciliary care in the home, and personal assistants

2nd Era

Person focussed (3rd Era)
Use of technology to support health, well-being and independence, and to avoid the need for long-term care

3rd Era

This is a transition – ALWAYS difficult to achieve – it involves a change in culture
Person-Centred Care

<table>
<thead>
<tr>
<th>is...</th>
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<tbody>
<tr>
<td>Person-centred</td>
<td>Practitioner-based</td>
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<td>Strengths</td>
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<td>Skills</td>
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<td>Goals</td>
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<td>Values</td>
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<td>Abilities</td>
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This can help answer the question: “What matters to you?”

The Four Eras of Care

Cybercare (4th. Era)
Use of new intelligent systems and data to support self-care and DIY healthcare; to improve Quality of Life and well-being
The Cost of Care

The diagram illustrates the cost of care in different settings, ranging from hospitals to care homes, and the impact on quality of life.

- **Hospital**:
  - Intensive care unit: £1,000 per day
  - General ward: £100 per day

- **Care homes**:
  - Nursing homes: £10 per day
  - Residential care homes: £1 per day

- **Home care**:
  - 3 days = £18K
  - 5 months = £18K
  - 2 years = £18K
  - 30 years = £18K

- **Self-care**:
  - 30 years = £18K

- **Assisted Living Facilities**:
  - Sheltered Housing

**Maximise Quality of Life**

Assistive Technologies

- **Fixed AT** (Home adaptations): mainly electronic
  - Expensive or slow to provide

- **Portable AT** (Tools for Living): mainly mechanical
  - Quick/cheap to provide

- **Electronic AT** (Sensory & functional support): mainly electronic
  - Expensive or slow to provide

- **Connected AT** (Remote support): mainly mechanical
  - Quick/cheap to provide

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Fixed Assistive Technologies

The focus is on the property – make it fit for the person

Many installations funded by LAs through Disabled Facility Grants

Av. cost to buy & install - £2000
Av. cost to remove - £1000

Big role for Home Improvement organisations

Assistive Technologies

Fixed AT (Home adaptations)  Portable AT (Tools for Living)

Electronic AT (Sensory & functional support)  Connected AT (Remote support)
Tools 4 Living & Equipment Stores

Fixed AT (Home adaptations)
Portable AT (Tools for Living)
Electronic AT (Sensory & functional support)
Connected AT (Remote support)
Sensory & Functional A.T.

- Activity support
- Prosthetics
- Speech deficits
- Environmental controllers
- Mobility devices
- Sensory aids
This is effectively an electronic “seeing aid” which amplifies the levels of light which fall on the eyes. It works particularly well in cases where visual acuity has been reduced through age, and is suited to use at night. User can control contrast, zoom and colour display.

Sensory & Functional A.T.

- Activity support
- Prosthetics
- Speech deficits
- Environmental controllers
- Mobility devices
- Sensory aids
- Muscle control and amplification
Wearable Solutions to a Lack of Mobility

The Honda Assist system straps on over the hips and legs, giving a mechanical boost to frail people who have reduced muscle strength. It can help someone to get upstairs without relying on a stairlift.

Mind-controlled Prosthetic Allows Movement of Individual Fingers

The fingers of a prosthetic limb could be controlled by thought with 76% accuracy. This could be boosted to 88% by grouping the ring and pinkie fingers together.
Assistive Technologies

- Fixed AT (Home adaptations)
- Portable AT (Tools for Living)
- Electronic AT (Sensory & functional support)
- Connected AT (Remote support)

THESE ARE ALL “TECHNOLOGY ENABLED CARE @ HOME” APPLICATIONS

The TEC@Home Journey

Community alarm systems

1st wave
2nd wave
3rd wave
4th wave
5th wave
6th wave
7th wave

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Community Alarm Systems

Sometimes known as a ‘button & a box’ approach

Active devices - press or pull in emergency

The TEC@Home Journey

Telecare alarm services
Community alarm systems

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How alarm-based telecare works

Example: Fall detection

1. Sensor automatically raises alarm to dispersed unit
2. Help! Ouch!
3. Call handler talks to service user to work out what help is needed
4. Call handler follows protocol and arranges appropriate response

Individual's home
Telecare hub / Dispersed Alarm Unit

Telecare Monitoring Centre (TMC)

Response

service user id, alarm type & location info

The TEC@Home Journey

DIGITAL TECHNOLOGIES

Vital signs & activity monitoring

Telecare alarm services

Community alarm systems

ANALOGUE TECHNOLOGY

1st wave
2nd wave
3rd wave
4th wave
5th wave
6th wave
7th wave

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Telemonitoring of Vital Signs

Activity Monitoring Systems

- Systems such as Just Checking and Canary can be installed in minutes to enable room and door activities to be recorded and viewed remotely over the Internet.

- Other systems such as Lively, Sense and 3 Rings use smaller sensors that can detect specific actions enabling alerts to be generated if routine tasks are not performed on time.
GPS Devices to Find People

- Latest GPS devices also provide:
  - Fall detection alerts
  - Geofence breach alerts
  - High speed travel alerts
  - Lack of movement alerts
- They can be used by:
  - Children, lone workers, people at risk of getting lost & care staff
GPS in Practice

Create safe and unsafe ‘zones’ known as ‘geofences’

Other GPS Wearables

- **Invisible**: the discreet and comfortable insoles cannot be spotted or interfered with.
- **Discrete monitoring**: the person is only tracked when they leave a pre-defined geozone that is deemed to be safe, such as the garden or street.
- **Personalised updates**: choose the alert frequency (e.g., 5-min, 10-min, 1 hour), share the monitoring portal with multiple family members or carers and generate reports as and when you need them.
Smartphones – We will all have one!

**Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Sensors, actuators and connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powerful processors</td>
<td>Microphone</td>
</tr>
<tr>
<td>Large touch-screen colour display</td>
<td>High quality audio</td>
</tr>
<tr>
<td>Large memory and storage capacity</td>
<td>Accelerometers</td>
</tr>
<tr>
<td>Telephone and text-messaging</td>
<td>GPS and GSM location</td>
</tr>
<tr>
<td>Versatile apps</td>
<td>Magnetometer</td>
</tr>
<tr>
<td>In-App notifications and messaging</td>
<td>Temperature</td>
</tr>
<tr>
<td>Familiar interface options</td>
<td>Camera(s)</td>
</tr>
<tr>
<td>Lightweight and always available</td>
<td>Vibration unit</td>
</tr>
<tr>
<td>Battery life improving</td>
<td>Bluetooth and Wi-Fi for connectivity</td>
</tr>
<tr>
<td>Contactless and touch ID</td>
<td>NFC and proximity sensor</td>
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</table>

Ideal platform for **mCare** and **mHealth** applications
Vulnerable people can now go out and feel protected!

Health and well-being apps

Join the community and help it grow

Lend your eyes to the blind through live video chat

Help blind people with everyday tasks

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The TEC@Home Journey

Community alarm systems
Telecare alarm services
Vital signs & activity monitoring
Mobile devices, apps & wearable alarms
Home video services

The 5th wave – Video-based Services

Systems can overcome social isolation by linking people with their families many miles away
• TV set-top boxes or tablet devices for people living alone or in care homes

Teleconference technology can help avoid visits to A&E, to GP surgeries and to specialist consultations
• Teleconferencing allows scheduled and on-demand services to improve efficiency and reduce the need to travel for staff and patients

Providing security and access to properties
• New teleconcierge services will provide access and to screen potential bogus callers

Offering enhanced welfare checks, lifestyle advice and service reviews
• Identifying changing support needs at an early stage

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Home & Virtual Therapy Services

They open up opportunities for people who need physiotherapy, occupational or speech & language therapy to perform exercises and participate in observed competitions in their own homes.

Gaming platforms such as Microsoft Xbox & Kinect, Nintendo Wii and Playstation

The TEC@Home Journey

<table>
<thead>
<tr>
<th>1st wave</th>
<th>2nd wave</th>
<th>3rd wave</th>
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<th>7th wave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community alarm services</td>
<td>Telecare alarm services</td>
<td>Mobile devices, apps &amp; wearable alarms</td>
<td>Personal care technologies</td>
<td>Vital signs &amp; activity monitoring</td>
<td>Home video services</td>
<td>Increasing Uncertainty</td>
</tr>
</tbody>
</table>

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Collecting Health & Well-being Data

The TEC@Home Journey

- Community alarm systems
- Telecare alarm services
- Vital signs & activity monitoring
- Mobile devices, apps & wearable alarms
- Home video services
- Personal care technologies
- Social robotics, digital assistants, artificial intelligence, & Internet of Things

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Robotic Devices
- From Companions to Butlers!

Personal Assistants & Chatbots

Amelia
Your first Digital Employee

Amelia is a cognitive agent who can take on a wide variety of service desk roles and transform customer experience. Just like a human she communicates with customers using natural language.

Unlike other AIs, Amelia emulates human intelligence making her capable of completely natural interaction with people. She can understand human language, learn through observation and determine what actions to take in order to fulfill a request or solve a problem.

Amelia works for Enfield Council, answering telephone questions. She can answers many calls at the same time – so no capacity issues.
Where Are We on the Journey?

HOUSING

WISER Homes
Smart assistive technologies can make a home WISER:
• Watchful – able to monitor activities & well-being of individual
• Intelligent (and Informed) – able to recognise problems & take action
• Safe (and Secure) – able to prevent accidents and crime
• Empowering – support individual to participate in events & tasks
• Responsive – quick to react sympathetically to changing circumstances or need.

All properties for older or disabled people in Cumbria could become WISER Homes (but when?)

A big IoT application?
WISER Homes

Smart Kitchen – Technology all interconnected

- Personalised menu suggestion based on activity levels and bio data
- Cooking suggestions and recipes from celebrity chefs online using ingredients in the smart fridge
- All food is automatically ordered by the smart fridge, using local sources

WISER Homes

- Prompts on medication
- Remote urine analysis
- Monitoring of pallor and skin blemishes
- Display of vital signs and hydration advice for the weather
- Messages for the day

Smart Bathroom – Technology all interconnected
Where Are We on the Journey?

HOUSING
SOCIAL CARE

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1st wave
2nd wave
3rd wave
4th wave
5th wave
6th wave
7th wave


Maslow’s Hierarchy of Needs

1 PHYSICAL
2 SAFETY
3 BELONGING
4 SELF-ESTEEM
5 SELF-ACTUALISATION

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Hierarchy of TEC@Home Needs

1 PHYSICAL/PHYSIOLOGICAL
- Smart thermostats
- Curtain/Window controls
- Medication reminders
- Automated lighting
- Heart-rate/ECG
- Respiratory rate
- Body temperature
- Blood glucose
- Door entry
- Body weight
- Hydration
- Nutrition

2 SAFETY

3 SOCIAL CAPITAL/NETWORKS

4 ESTEEM/INDEPENDENCE

5 SELF-FULFILLMENT

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Hierarchy of TEC@Home Needs

1 PHYSICAL/PHYSIOLOGICAL
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2 SAFETY

3 SOCIAL CAPITAL/NETWORKS

4 ESTEEM/INDEPENDENCE

5 SELF-FULFILLMENT

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Hierarchy of TEC@Home Needs

2 SAFETY
- Pendant alarms
- Intruder monitoring
- Video doorbells
- Bed sensors
- Fall detectors
- Flood detectors
- Gas detectors
- Door/Property Exit
- Reminder alarms
- GPS localisation
- Timers
- Prompting aids

3 SOCIAL CAPITAL/NETWORKS
- Telephone
- Specialist phones
- Call centre
- Videophone/Skype
- Messaging apps/services
- Photo sharing
- Internet
- Social networks
- Robotic assistants
- Virtual events and services

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Hierarchy of TEC@Home Needs

### ESTEEM/INDEPENDENCE

- Activity planners & schedulers
- Internet shopping apps
- Electronic banking
- Public transport timetables
- Meal planners
- Prompts/reminders
- Location alerts
- GPS backtrackers
- Alexa queries

### SELF-FULFILLMENT

- Simple radio/music player
- Reminiscence tools
- New augmented reality techniques
- Virtual volunteering
- Learning and using new languages using Skype

**Challenge for researchers**

– find new applications of TECC that make people feel better in themselves

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Hierarchy of TEC@Home Needs

1. PHYSICAL/PHYSIOLOGICAL
2. SAFETY
3. SOCIAL CAPITAL/NETWORKS
4. ESTEEM/INDEPENDENCE
5. SELF-FULFILLMENT

Assessment is key to success
- Know the person
- Know ALL the technology

Where Are We on the Journey?

HOUSING
SOCIAL CARE
HEALTHCARE

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The Better Care Fund, and the TEC@Home Savings Clock – Avoidance Objectives

Stressed family carers
- Need for mental health services
- Personal accidents such as falls
- Police/Fire services for emergencies
- Ambulance presentation to A&E
- Hospital readmission (for same cause)

Short-term admission to a care home
- Long-term admission to a care home
- Long-term care services
- More use of primary care
- Delayed transfers of care
- Unnecessary hospital admission

Where Are We on the Journey?

HOUSING
SOCIAL CARE
HEALTHCARE

DIY CARE – Self Management – the 3rd and 4th Eras of Care

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The DIY Care & Support Market – Personal Budgets

Walgreens partners with Iagnos to offer teledermatology through web, mobile app

By Heather Mack | September 20, 2016

Walgreens’ website and mobile app will now feature access to skin care services for those looking to get quick, affordable dermatology questions answered when they can’t get access to a skin care specialist.

Through a partnership with teledermatology provider Iagnos, Walgreens will offer visitors the site or app access to DermatologistOnCall, Iagnos’ flagship program featuring dermatology consultations with US-based, board-certified specialists.

DermatologistOnCall features online dermatology scheduling and consultations, information about common skin conditions (such as eczema or acne) from content partner WebMD, and basic product recommendations through Walgreens Pharmacy Chat service, which offers live, online chat 24/7 with pharmacy staff.

Independent TEC@Home Information

• The Vivo Guide from the Liverpool dallas project supports users to find their own TEC@Home solutions (and services)
• Vivo Pro helps health & social care staff to find tried and test products to advise patients to buy and use, sharing opinions of solutions
• It provides the basis of self-assessment using the principles of the New Care Act
Finally - Where Do We Draw the Line?

Japanese bathing system for older people

RI-MAN robot is equipped with sensors that show a body’s weight, position, smell!

Thank you for your attention

For more information, or for copies of slides or other papers on which this presentation has been based, please contact me:

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icuhtec.org