Interactive Elder Care for Patients with Dementia:
Virtual Assistant for Dementia

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## Human Brain and Cognitive Computing

<table>
<thead>
<tr>
<th>Human Brain</th>
<th>Watson</th>
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<tbody>
<tr>
<td>1.5 kg</td>
<td>Wt? Occupies 3 rooms</td>
</tr>
<tr>
<td>86 billion neurons, 250 petabytes</td>
<td>2880 Power7 cores, 16 Terabytes RAM</td>
</tr>
<tr>
<td>10W power consumption</td>
<td>85kW power consumption</td>
</tr>
<tr>
<td>1000 Petaflops</td>
<td>80 Teraflops</td>
</tr>
<tr>
<td>Electricity, chemistry, hydraulics, optics etc. based on every field of science</td>
<td>Si based</td>
</tr>
<tr>
<td>Priceless!</td>
<td>Estimated $3 million dollars</td>
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Dr. John Kelly, IBM talk at ET Conference in AMAT, 2013
Alzheimer’s Dementia Not Normal Aging

Amyloid plaques, Neurofibrillary tangles

- Dementia is not a disease.
- It's a combination of symptoms called syndrome

Currently there is no drug, therapy or treatment for Dementia
Industry Change Hypothesis

• With no cure in near future, Alzheimer’s dementia caregiving will present economic challenges.

• Although caregiving products and services industry is growing there are opportunities for innovation.

• Caregiving services which include assistive technology solutions for safety, alerts, emotional and behavioral management etc will create maximum value for caregivers.
Economic Cost of Dementia

224% Global increase in Dementia by 2050

Caregiving
- Provide 952 M hours of unpaid care per year
  - Economic value of slightly above $10B
- Working families provide 75% of caregiving
  - $72B out of estimated $102B caregiving cost

Caregivers
- 21% report missing work
- 8% reduce work hours
- 11% quit jobs
- 4% change jobs

Current Players

- Services: in-home, respite, skilled nursing, long term living etc
- Revenue ~ $2.5 Billion
- Special memory care programs
- Provides care for all stages of Alzheimer’s

- Therauptic robot product company
- $6000 per robot
- > 2000 sold worldwide since 2005
Dementia Caregivers

- Volunteers
- Female family members
- 20hrs a week for 4 years

Greater burden than other caregivers
- Financial
- Social isolation
- Health
- High rate of depression

Women who are caregivers are more likely to have health problems.

*Defined as hypertension, heart disease, asthma, cancer, diabetes, or arthritis diagnosed by a doctor in the last five years.

Source: The Commonwealth Fund 2008 Survey of Women’s Health

Caregivers and health activities

% of caregivers vs. non-caregivers who do the following health-related activities...

- Consult online reviews of drugs: 13% Non-caregiver, 24% Caregiver
- Got information, care, or support from others with the same condition: 21% Non-caregiver, 30% Caregiver
- Go online for a diagnosis: 28% Non-caregiver, 46% Caregiver
- Participate in any online social activity related to health in past year: 33% Non-caregiver, 52% Caregiver
- Got information, care, or support from friends and family: 54% Non-caregiver, 70% Caregiver
- Gather health information online: 50% Non-caregiver, 72% Caregiver

Source: Pew Internet, Health Tracking Survey, August 07 – September 06, 2012. Total number ("n") of interviews: 3,014 adults ages 18+. Interviews were conducted in English and Spanish and on landline and cell phones. Margin of error is +/- 2 percentage points for results based on all adults.
Dementia Care Devices & Caregivers

Care Team Navigator

Daily remainders

iPad Apps

Wearables

Alerts

Care Team Network (CTN) Portals for communication between the CTN, care team, and the patient and family.

Therapeutic

Caregiver
Does Assistive Technology Help?

- **Patients**: 75% helped a lot, 24% helped a little, 1% did not help, 0% made things worse.
- **Caregivers**: 35% helped a lot, 32% helped a little, 12% did not help, 21% made things worse.
- **Home Safety Devices**: 73% helped a lot, 1% helped a little, 0% did not help, 0% made things worse.

**Assistive technology improves patient care & safety; helps caregivers socially & financially.**
Dementia Products and Services

https://drive.google.com/file/d/0B0UVFy0elB9HTVRUN094WVIFM00/view?usp=sharing
Technology Integrated Customized Service

- Wearable
  - GPS/Accelerometer
  - Medication remainder
  - Phone
  - Emergency Intervention

- Safety
  - Doors
  - Stove
  - Alerts and remainders
  - Activity monitoring

- Virtual Environment
  - Interactive videos
  - Video games
  - Interactive Known Voice

- Educational/Help
  - Movies
  - Books
  - Personal Videos
  - Help tools

- Therapeutic
  - PARO
  - Therapeutic robot
  - Reduce patients stress
  - Reduce caregiver stress
  - Relaxation/motivation
  - Improve social interaction

- Cognitive
  - Assessment & feedback
  - Memory game
  - Learning tool
  - Memory tracking

Personalized care / cost effective / Continuous monitoring/Specialists/medication/safety/Therapeutic
Summary

• More diseases have been diagnosed early and controlled.
• Declining trend
• But death by Alzheimer’s continue to increase

A need of “Technology Driven Integrated Care” that provides QOL for patients and benefits caregivers

Technological Challenges
• Innovation, integration, stability, etc.
• Data gathering, assessing, and to provide the clinical trials
• Implementation Issues & business models

Ethical Challenges
• Informed consent
• Privacy issues, restriction of freedom
• Improved autonomy or reduced care?
• Safety risks
• Responsibility
THANK YOU