Knoebel Institute for Healthy Aging

Quality in Life, Wellness and Community

Dr. Lotta Granholm-Bentley, PhD/DDS
Executive Director
KIHA Strategic Goals

• **The mission** is to create and implement solutions for aging issues through multidisciplinary research, education and outreach.

• Interdisciplinary research programs

• Competency of current and future workforce

• Support business innovation

• Intergenerational programs
The silver “Tsunami”

• The age group over 75 increases the most
• Life span has increased
• Cure for some age-related conditions
• Huge lack of work force
• Technology, service, and infrastructure

Age group growth from 2010 to 2050

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Growth from 2010 to 2050 (%)</th>
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</thead>
<tbody>
<tr>
<td>75 or older</td>
<td>158%</td>
</tr>
<tr>
<td>60 to 75 years</td>
<td>66%</td>
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<tr>
<td>45 to 60 years</td>
<td>17%</td>
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<tr>
<td>30 to 45 years</td>
<td>34%</td>
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<tr>
<td>15 to 30 years</td>
<td>30%</td>
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<tr>
<td>younger than 15</td>
<td>35%</td>
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What is Aging?

1) Increase in mortality with age
2) Physiological changes/functional decline
3) Increased disease
4) … but aging is also wisdom and experience

Ageism
Workforce needs in aging

- Health care and social assistance
- Hospitality
- Transportation
- Technology
- Financial Industry

![US National Supply and Demand Projections for RNs](chart.png)

- Projected RN Demand
- Projected RN Supply
- Projected shortage of over 1,000,000 nurses in 2020
Centenarians

- Jean Calment
- Oldest recorded
- 1875–1997

Jeanne Louise Calment: longest confirmed human lifespan on record, living to the age of 122 years, 164 days
Most important trait:

Is the glass half full or half empty?

- Physical activity
- Plant-based diet
- Family
- Social network
- Gardening
- No smoking

Comic written by Larry Lambert; illustrated by Jerry King.
To make it to age 100, you have to have won the genetic lottery. But most of us have the capacity to make it well into our early 90’s and largely without chronic disease. As the Centenarians demonstrate, the average person’s life expectancy could increase by 10-12 years by adopting a Blue Zones lifestyle.
10 Common Chronic Conditions for Adults 65+

Quick Facts:
- 80% have at least 1 chronic condition
- 68% have 2 or more chronic conditions

Conditions:
- Hypertension (High Blood Pressure): 58%
- High Cholesterol: 47%
- Arthritis: 31%
- Ischemic Heart Disease (or Coronary Heart Disease): 29%
- Diabetes: 27%
- Chronic Kidney Disease: 18%
- Heart Failure: 14%
- Depression: 14%
- Alzheimer's Disease and Dementia: 11%
- Chronic Obstructive Pulmonary Disease: 11%

Source: Centers for Medicare & Medicaid Services, Chronic Conditions Prevalence State/County Table: All Fee-for-Service Beneficiaries, 2015
Neurological disorders increase with aging

Stroke

Alzheimer

10% of people 65+
50% of people 85+

Parkinson’s disease

Incidence of Parkinson's disease per 100,000

Iceland
Rochester
Finland, Turku
England, Carlisle

[Graphs and charts showing incidence rates and trends for Alzheimer's, Stroke, and Parkinson's disease]
Alzheimer’s Disease

- 5.4 million Americans
- SC high incidence
- African Americans vulnerable
- One in five women and one in 10 men AD by age 85
Pathology

LOSS OF BRAIN TISSUE
AD risk factors:
'AD Gene Panel'

- Some believe one can calculate risk for AD
- Panel uses 9 genes for inflammation and cholesterol metabolism
- Categorize as low-high risk for AD
- Wide range of predisposition genes

http://www.matrixgenomics.com/resources-alzheimers.php
Gene therapy and Alzheimer’s

Using NGF-viral vectors to replace a neuro-hormone that is lost in the Alzheimer brain.

Replenishing this protein can increase survival rate and slow progression of disease.

Lancet Neurology
DeWitt et al
2011
Alzheimer treatment

• Some drugs available to slow progression
• 90 experimental treatments being tested
• Take care of your cardiac disease and diabetes
• Exercise
• Eat less cholesterol/more antioxidants
• Train the brain
New early detection method

- MRI or PET imaging
- Biomarkers in blood or CSF
- Postmortem studies of brain

Ante-mortem Blood/CSF

Post-mortem Blood/CSF/Brain

Lumbar Puncture
Lying Position
Sitting Position
What are exosomes?

Exosomes secreted from neurons into blood stream
Purification of neuron-specific exosomes in blood

NEURON

Tau oligomerization

Neuronal dysfunction
Cell death

Tau filaments

Exosome cargo:
- p-Tau
- amyloid
- Inflammation?
- Other pathology?

Y = neuronal surface marker

Aurelie Ledreux

Eric Hamlett
Alzheimer biomarkers in Down syndrome

Aβ1-42 levels by Age

P-(S396)-Tau levels by Age
Other areas of tech development

• Robotics (social bots, health care, transportation)
• Transportation (autonomous vehicles, Uber, Lyft, etc.)
• Financial industry (Easier online banking, assessment of financial acuity, money management, etc.)
• Potential barriers towards using computerized systems
Dementia and Driving

- Early stages some people are able to keep driving
- People with dementia often do not know they are having driving problems
- Navigation problems
- Autonomous vehicles could prolong driving
Not just negative effects of aging on driving

• Older drivers have wisdom and experience
• Aware of limitations and impairments
• An Advanced driver assistance system (ADAS) more effective in older than younger drivers (Dotzauer et al., 2015)
• No driving in rush hour or darkness
Technology to help older drivers

- Car can identify objects and movement patterns
- Issue warning of collision
- Prepare for impact (safety features)
- Vehicle to vehicle communication
- Robotics and artificial intelligence
- Infrastructure communication

Volvo Cars Safety Center — Thomas Broberg
Autonomous vehicles and aging

• AVs will make "aging in place" more possible for the elderly – close mobility gap

• Japan's first extensive tests of autonomous cars in 2016 – target older citizens

• The goal is to give the aging nation's elderly citizens a way to get around

• The Drive Me trial in Gothenburg (automated XC90s)

• Intellisafe Autonomous Driving program

• The first drivers will receive their cars in Dec. 2017. Volvo CEO Håkan Samuelsson
Aging in Place

- Travel needs by categories:
  - **Primary mobility needs** (shops, services, health care)
  - **Secondary mobility needs** (social needs, independence)
  - **Tertiary mobility needs** (relaxation, visiting nature)

Isolation
Smart Home technology

• Home automation or **domotics** = a smart home
• Control and automation of lighting, heating, ventilation, air conditioning, and security
• Test homes are being created for SMARTHome™ research (USC)
Minka house

Dr. Bill Thomas: A compact, digitally native, modular, panelized house that is both affordable and easy to live in. It seemed right to call this model the “Minka” because that is the Japanese word for “a house for regular people.”

https://changingaging.org/blog/minka/
Financial acuity and dementia

- Reduced financial acuity earliest sign of dementia
- Develop novel technology to measure financial planning capacity in older adults
- Develop new and better measurements and tools

Dr. Eric Chess, Director
Concussion and dementia

- The link between brain injury and dementia controversial
- May lead to increased risk for Alzheimer’s disease
- Develop new technology to measure long-term effects of concussions on balance and brain health
- **Collaboration**: Athletic Dep, Psychology, Engineering, KIHA, Chemistry
What are we hoping to do?

- Determine when safe to return to play
- Determine future risk for Alzheimer/CTE
- Find new technology for side-line diagnosis

Changes in:
- Dynamic Balance
- Impulse control
- Biomarkers for Alzheimer
Thriving, not surviving

• Innovations addressing isolation, life purpose, food, healthcare quality, safety, and transportation

• Wearable devices, coupled with analytics, can improve passive communication between older adults and caregivers

• Changes in activities of daily living (ADLs), as tracked by CarePredict’s system

Social robot Ryan
Dr. Mohammad Mahoor
University of Denver
Technology development

- Aging in place technology watch
- https://www.ageinplacetech.com
Technology positively affects the bottom line

• How can senior housing and communities put innovation into action today?
• How can developers make it easier for them to adopt innovation?
• create a positive impact on both the operations and financial health of senior living communities
• determine best practices, deliver care outcomes, manage risk in outcome-based risk-sharing care models, and retain staff
Resources

• Aging2.0 OPTIMIZE, 14-15 November, annually attracts the top thinkers and doers in innovation and aging.

• Brings together academia, designers, developers, investors, and senior care executive visionaries to revolutionize the aging experience.

• Project X-ITE - http://www.projectxite.org/about-us/

• Interdisciplinary project allowing students and faculty the opportunity to explore innovation, technology, and entrepreneurship
If you want one year of prosperity, grow grain. If you want 10 years of prosperity, grow trees. If you want 100 years of prosperity, grow people.

*Ancient Chinese proverb*