Health Systems: The Next Generation

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#GT_HealthSystems, #HSNG17 or #TechHSNG
## Organizers

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Affiliation</th>
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</thead>
<tbody>
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<td>Research Director of the Medical Decision-Making, Center for Health and Humanitarian Systems</td>
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<td>Mark Braunstein</td>
<td>Professor of Practice, College of Computing</td>
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<td>Director, Health Analytics and Informatics, College of Computing</td>
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<td>Associate Vice President for Health IT, Enterprise Innovation Institute</td>
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Special Thanks to...

- Georgia Tech Staff
  - Joscelyn Cooper
  - Andy Halebian

- Panelists and Moderators
- Other Volunteers
- Participants
Ambulance

Chest X-ray

Iron lung

Anesthesia, 1913

Medical theatre, 1902

Developing vaccines in 1917

-ray machine, 1929

Sun therapy, 1929

Source: http://www.huffingtonpost.com/entry/history-of-medicine-photos_us_568d8382e4b0cad15e6330c4
World’s Most Challenging Problems

- Food
- Water
- Shelter
- Education
- **Health**
- Energy
- Environment
- ...
US Leads in Per Capita Health Spending

Source: Squires, Commonwealth Fund. 2011


Average spending on health per capita ($US PPP)

Total expenditures on health as percent of GDP

Note: PPP = purchasing power parity—an estimate of the exchange rate required to equalize the purchasing power of different currencies, given the prices of goods and services in the countries concerned.
Source: OECD Health Data 2010 (Oct. 2010).
U.S. HEALTH CARE RANKS LAST AMONG WEALTHY COUNTRIES

A recent international study compared 11 nations on health care quality, access, efficiency, and equity, as well as indicators of healthy lives such as infant mortality.

Overall Health Care Ranking

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Aging Population and Care Needs

Elderly Adults As a Share of the U.S. Population, 2000 to 2050

Representative timeline of a patient’s experiences in the U.S. health care system

Source: http://www.nationalacademies.org/hmd/~/media/Files/Activity%20Files/Quality/LearningHealthCare/Release%20Slides.pdf
Disparities in Access to Care

Figure 6

Disparities in Access to Care for Selected Groups

Percent of access measures for which groups experienced worse, same, or better access to care:

- Poor vs. High Income: 89% worse, 11% better
- Hispanic vs. White: 63% worse, 21% same, 16% better
- AI/AN vs. White: 62% worse, 38% same, 1% better
- Black vs. White: 32% worse, 64% same, 21% better
- Asian vs. White: 17% worse, 44% same, 39% better
- 65+ vs. 18-44: 9% worse, 18% same, 73% better

Disparities based on income

The Richest American Men Live 15 Years Longer than the Poorest 1 Percent

The challenges underlying the disparities in the use of clinical preventive services are complex and reach beyond the traditional health care arena of patient-provider interactions. Combining forces of the public health infrastructure, aging services network, community-based organizations, and linking to health systems affords a real opportunity to make a difference.

CDC Report: Enhancing the Use of Clinical Preventive Services Among Older Adults (CPS): Closing the Gap
How to transform health systems from reactive to proactive to better meet the human needs

Facilitate dialogue across organizations & sectors to:

- Articulate challenges and successes
- Identify opportunities for new practices, research, or technology solutions
- Improve the education for tomorrow’s leaders in health systems
Better Health Care and Lower Costs through **Systems Engineering**

“*Systems engineering* has been widely used in other industries, such as manufacturing and aviation, to improve efficiency, reliability, productivity, quality, and safety of systems. It has begun to be used to good effect in health care … United States would benefit from more widespread adoption.”

“The benefits of systems engineering can be realized at the community level … engaging public and private community entities in improving the delivery of care and/or promoting health can enhance the quality of care and the health of communities.”

“… the need for the United States to build a health-care workforce that has the necessary “know-how,” … systems engineering concepts should be embedded in education and training for a wide variety of people involved in health care, from clinicians to administrators to public-health officials.”

Source: White House PCAST Report
https://www.whitehouse.gov/blog/2014/05/29/new-pcast-report-says-systems-engineering-can-improve-health-care
Fix when it breaks
Fragmented care

Systems engineering

Promoting Health & Wellbeing

-healing the whole person-

Emotional Health
Movement & Exercise
Relationships
Mind-Body Connection
Health Behavior
Life Meaning & Purpose
Nutrition
Challenge to You

• **What knowledge can I take away for myself and/or my colleagues?**

• **What action can I take?**

• **What action can I ask others to take?**
MISSION

Make a positive “impact” through improved health & humanitarian systems worldwide

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Health Systems: The Next Generation

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Health & Humanitarian Systems
Interdisciplinary Research Center
Georgia Tech ISyE
Stewart School of Industrial & Systems Engineering

Organizers
Georgia Tech Enterprise Innovation Institute
Georgia Tech College of Computing
Georgia Tech Institute for People and Technology
Georgia Tech Health & Humanitarian Systems

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Panel - Technology, Data, and Analytics for Efficient and Effective Health Systems

- **Julie Hollberg, MD**, Chief Medical Information Officer, Emory Healthcare and Associate Professor, Division of Hospital Medicine, Department of Medicine, Emory University School of Medicine
- **Denise Hines**, Executive Director, Georgia Health Information Network
- **Lucienne (Lucie) Ide**, M.D., Ph.D., Healthcare innovator and CEO, Rimidi Inc.

**Moderator:** Mark Braunstein, M.D., Professor of the Practice, School of Interactive Computing, Georgia Institute of Technology
Rapid Fire Presentations

- **Munmun De Choudhury, PhD**, Assistant Professor, School of Interactive Computing | Georgia Institute of Technology
- **Shatakshee Dhongde, PhD**, Associate Professor, Provost Teaching Learning Fellow, School of Economics | Georgia Institute of Technology
- **Margarita Gonzalez**, Branch Chief of the Policy and Usability Branch (PUB) in the Information and Communications Lab (ICL) at GTRI | Georgia Institute of Technology
- **Jennifer Singh, PhD**, Associate Professor of Sociology in the School of History and Sociology | Georgia Institute of Technology
- **Turgay Ayer, PhD**, Research Director of the Medical Decision-Making, Center for Health and Humanitarian Systems George Family Foundation Assistant Professor, H. Milton Stewart School of Industrial & Systems Engineering | Georgia Institute of Technology

**Moderator:** Turgay Ayer, PhD
End-to-end Health Systems: From Treatment to Management to Prevention to Wellness

Mohammed K. Ali MD, MSc, MBA, Associate Professor, Associate Director, Joint Faculty, Emory University

Jean C. O’Connor, J D, DrPH, FACHE Chronic Disease Prevention Director, Georgia Department of Public Health

James W. Curran, MD, MPH, Dean of Public Health, Emory University Rollins School of Public Health

Moderator: Margaret Wagner-Dahl, Associate Vice President for Health IT, Enterprise Innovation Institute
Extra Slides
Context

- Ongoing problems about health, nutrition, etc.
- Natural and manmade disasters
- Many “actors” but often limited resources
Top 10 Problems Facing Humanity in Next 50 Years

1. Energy
2. Water
3. Food
4. Environment
5. Poverty
6. Terrorism and War
7. Disease
8. Population
9. Education
10. Democracy

Problems are global... but many are also in the US, especially for subpopulations or subregions

(Prof Richard Smalley, http://cnst.rice.edu/content.aspx?id=246)
Increase human resource capacity and effectiveness with innovative training

- Project courses
  - MSHS, Senior Design, etc.
- Educational materials
  - Case studies
    - Malaria prevention, Breastmilk distribution in Africa, management of refugee camps with technology
  - Simulation “games” and tools
- Professional education certificate program
Outreach

Improve dissemination of knowledge and best practices, collaborations, and organizational effectiveness

- Annual conference
- Campus events
- Ongoing meetings with NGOs, government, and industry
- Site visits world-wide
  - Identify system needs and performance indicators
Health and Humanitarian Logistics Conference

- 2009-2011: Atlanta
- 2012: Hamburg, Germany
- 2013: Kuala Lumpur, Malaysia
- 2014: Mexico City, Mexico
- 2015: Johannesburg, South Africa
- 2016: Atlanta, Georgia
- 2017: Copenhagen, Denmark (in collaboration with UNICEF)

Partners:
- INSEAD Humanitarian Research Group
- MIT Humanitarian Response Lab
- Northeastern University
Research & Projects

Advance science and technology to improve the long-term, while working closely with organizations to improve their operations in the short-term.

- Public or global health
- Humanitarian & development (long-term)
- Disasters & emergency management
- Interdisciplinary efforts
- Synergistic with educational efforts
Healthcare decisions

Policy Level
- Disease modeling, prevention, and treatment (e.g., screening/vaccination policies)
- Education, health and wellness programs

System Level
- Design of care networks (what services to provide, where, and by whom)
- Resource allocation

Hospital/Clinic Level
- Facility design and layout, patient flow management
- Capacity/resource allocation
- Care practices
Thank you!

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Extra slides
Decision makers & Stakeholders

Providers

Efficient, Effective, and/or Equitable Health

Schools, NGOs, others

Patients & Caregivers

Employers

Govt Orgs (State & Local Health departments, CDC, etc.)

Payors

International Orgs
2006 – “Disparities” overview

- Hospitalization rates for potentially preventable conditions were highest among residents in poorer communities but lowest among residents from wealthier communities.
- Hospital admission rates for diabetes without complications was more than 400 percent higher in the poorest communities than the rate in the wealthiest communities.
Trends (2005-2010)

- **Good news**
  - Number of potentially preventable hospital admissions (-6.2%) for adults and children (-40%)
  - For children, preventable hospital admission rates for gastroenteritis (-64%) and pediatric urinary tract infection (-19%). Related costs -55% and -21%, resp.

- **Not so good news**
  - Potentially preventable hospital admissions for short term diabetes complications (+23%) and hypertension (+33%). Total hospital costs +32% and +62%, resp.

https://www.hcup-us.ahrq.gov/reports/statbriefs/sb151.pdf
Is all of this “care” necessary?

Low-value (or no-value) care

- Medicare beneficiaries commonly receive care leading to minimal or no benefit
  - EEG for an uncomplicated headache
  - CT or MRI scan for low-back pain in patients without any signs of a neurological problem
  - coronary-artery stent in patients with stable cardiac disease
- Low-value care may affect 25-42% of Medicare beneficiaries

→ Overtesting, Overdiagnosis, Overtreatment

Observations based on recent study published in JAMA Internal Medicine
2006 – “Health” overview

- Hospital costs for potentially preventable conditions totaled ~$30.8 billion
- 4.4 million hospital stays could possibly have been prevented with better ambulatory care, improved access to effective treatment, or patient adoption of healthy behaviors
- 1 in 5 (18%) Medicare admissions was for a potentially preventable condition.
- Most common reasons for potentially preventable hospitalizations: congestive heart failure and bacterial pneumonia. $15.6 billion in hospital costs
- Among children, pediatric asthma ($293 million) and pediatric gastroenteritis (133 million admissions) were in the lead
Missed Opportunities

Now

- Science: Insights poorly managed
- Evidence: Evidence poorly used
- Care: Experience poorly captured

Missed Opportunities, Waste, and Harm

Source: http://www.nationalacademies.org/hmd/~/media/Files/Activity%20Files/Quality/LearningHealthCare/Release%20Slides.pdf
Annual Health and Humanitarian Logistics Conference

- Speakers and attendees from all over the world
  - Academia, industry, government, non-governmental organizations, military, foundations, etc.
- Sponsors
  - UPS Foundation, Coca-Cola Foundation, Focus/AKDN, Kuehne & Nagel, Walmart, Ryder Mexico, Imperial Logistics, …
- Locations
- 8th annual conference in Atlanta, August 2016
  
  https://hhscenter.gatech.edu/conference/

HHS pictures of 2014 conference
Annual HHL Conference

- Plenary panels and keynotes
  - Global public health; long term development; education & capacity building; disaster response; infrastructure
  - Example speakers: CDC, DHS, JSI, Salvation Army, WFP, UPS, CARE, Walmart, US AFRI COM, MSF, Red Cross, USAID, Army Corps, Emergency Visions, etc.

- Poster presentations
- Workshops for targeted discussions
- Site visits