Health Systems: The Next Generation 2019

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November 12th, 2019

Health Systems: The Next Generation 2019

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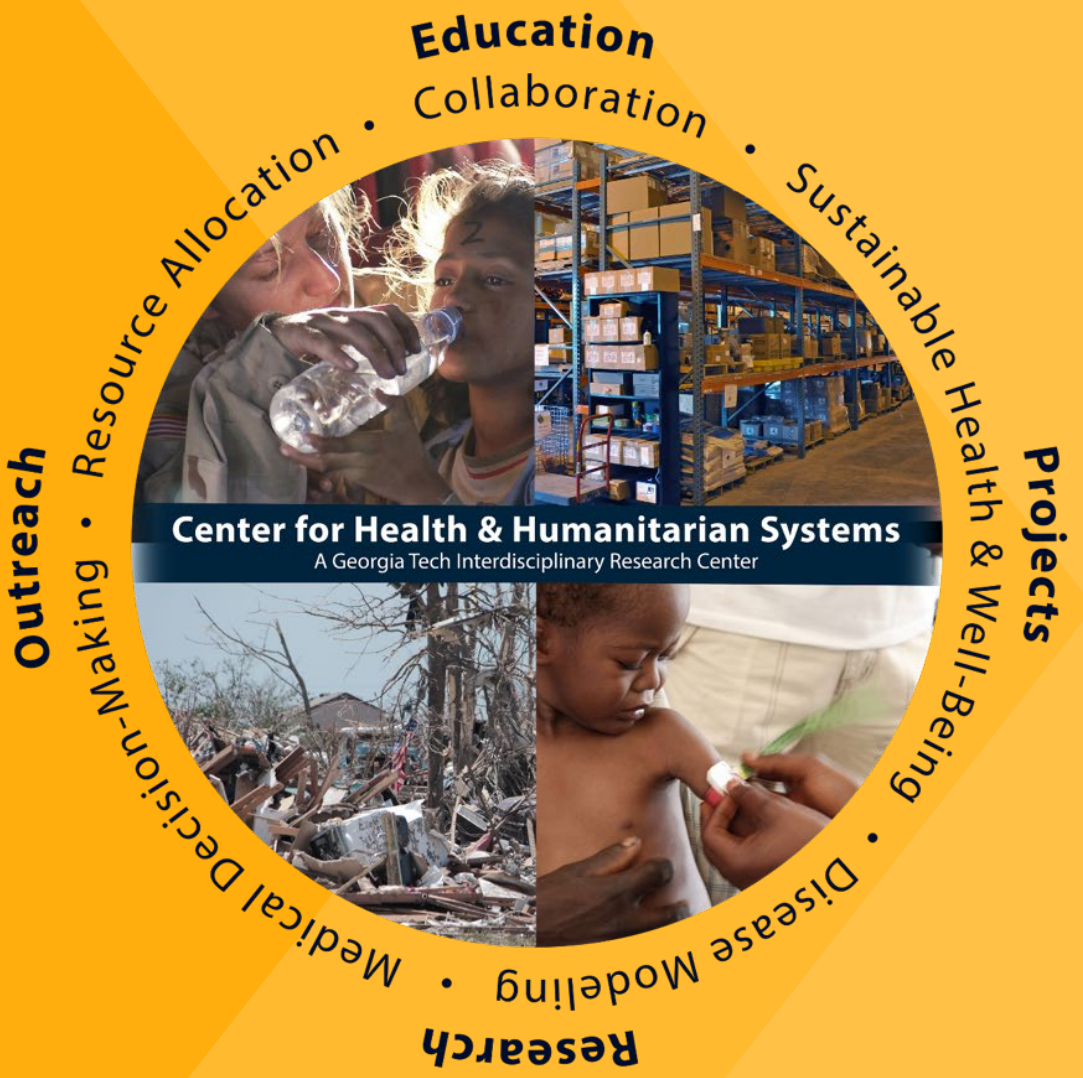
Pinar Keskinocak, PhD

William W. George Chair and Professor, School of Industrial and Systems Engineering
Director, Center for Health & Humanitarian Systems
ADVANCE Professor, College of Engineering

Dima Nazzal, PhD

H. Milton Stewart School of Industrial and Systems Engineering
Research Director of Healthcare Operations,
Center for Health and Humanitarian Systems

Welcome



Vision

To improve the human condition and promote wellness through the development of tools and collaborations that **TRANSFORM DECISION MAKING**, as well as **ENHANCE EFFICIENCY** and **EFFECTIVENESS OF HEALTH AND HUMANITARIAN SYSTEMS.**

Mission

To transform health and humanitarian systems and carry out its vision through the following key action areas: **education, outreach, projects and innovative research and solutions.**

CHHS@GaTech.edu

@CHHSgatech

Georgia Tech Health & Humanitarian Systems

Meet the CHHS Leadership

Pinar Keskinocak
CHHS Director
William W. George Chair and Professor, ISyE and ADVANCE Professor, College of Engineering

Turgay Ayer
CHHS Research Director of Business Intelligence and Healthcare Analytics

David Goldsman
CHHS Research Director for Simulation Modeling and Applications

Dima Nazzal
CHHS Research Director of Healthcare Operations

Thank you to our support team!

Joscelyn Cooper
CHHS Program and Operations Manager

Andy Haleblian
Director of Media and Technology, SCL

Soribinta Diallo
General Operations Undergraduate Student Assistant

Tayler Carter
Graphic Designer Undergraduate Student Assistant

Abigail Chambless
Database and Research Undergraduate Student Assistant

History of Healthcare in the US

LATE 1800's

Sick Protection
- Manufacturing Workers
- No structure, trial-and-error

Organized medicine led by AMA

1900's

1910's

AALL drafted insurance legislation was opposed by AMA and private insurance industry

1920's

- Healthcare costs rise post WWI
- General Motors signs a contract with Metropolitan Life to insure 180,000 workers

History of Healthcare in the US

1930's

Great Depression
- FDR attempted a health insurance bill
- Failed due to opposition and turned to "old age" benefits

1940's

- Employer-sponsored health benefits
- Truman tried and failed to expand "old age" and poor people benefits

1950's

Advances in medicine: Polio vaccine, kidney transplant, Penicillin
Hospital care doubled

1960's

- NHE were 5% of GDP
- JFK tried and failed to pass a healthcare plan for senior citizens
- LBJ signs the Social Security Act of 1965

History of Healthcare in the US

1970's

Expansion of Medicare under Nixon
HMO Act of 1973

1980's

- NHE is 8.9% of GDP
- Reagan signs COBRA

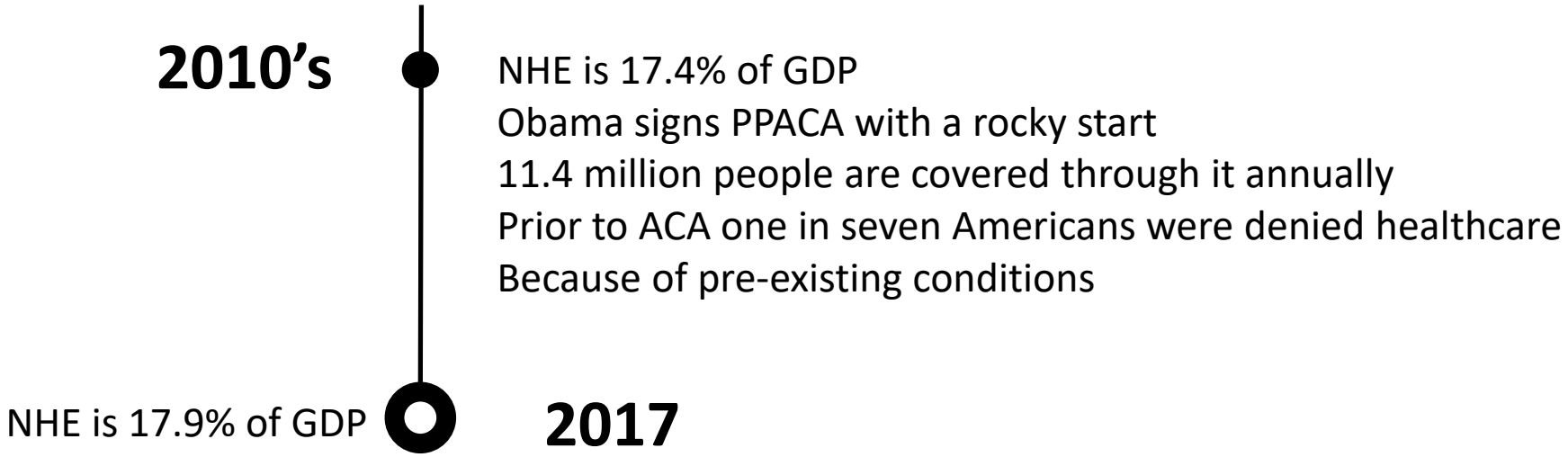
1990's

NHE is 12.1% of GDP
Clinton signs HIPAA and CHIP to expand Medicaid

2000's

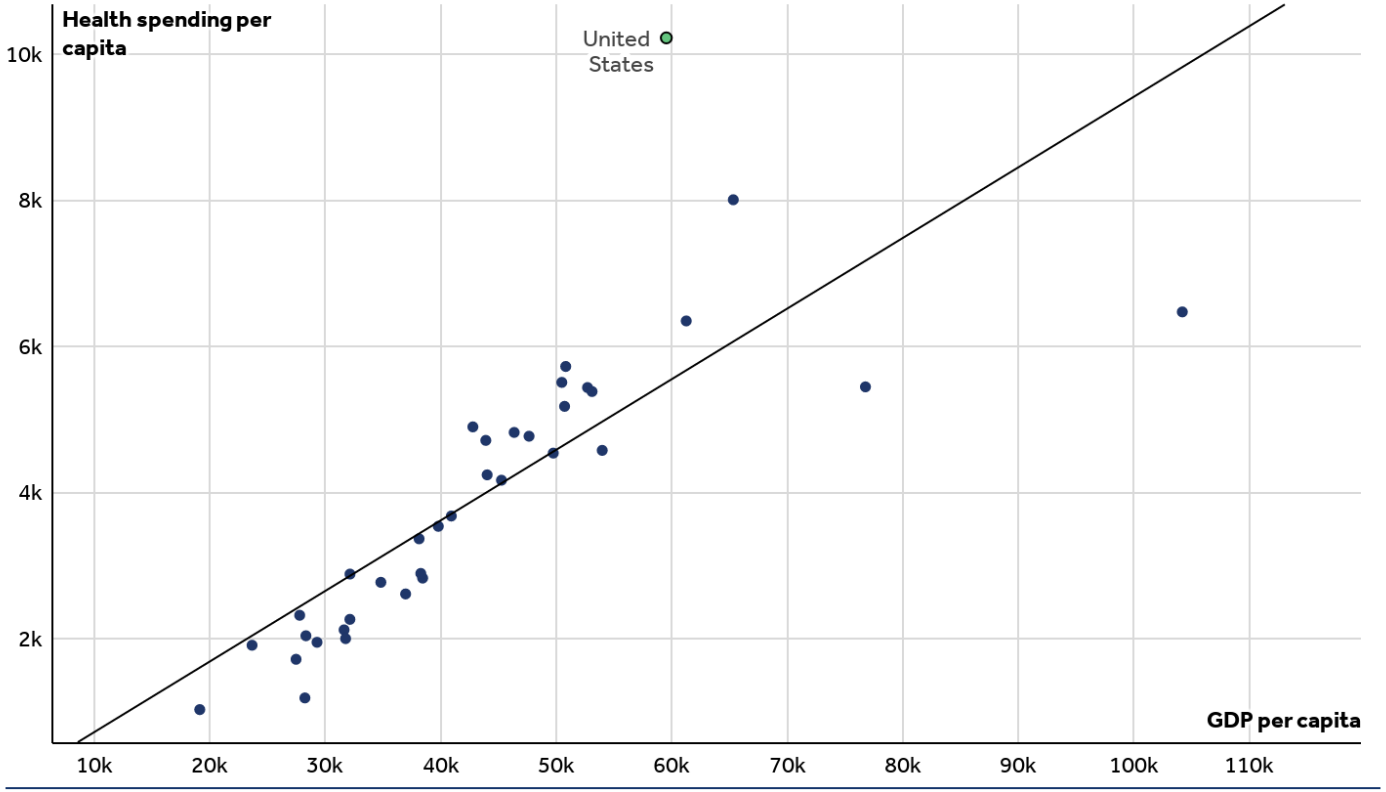
- NHE were 13.3% of GDP
- George W. Bush expanded Medicare to include prescription drugs

History of Healthcare in the US



NHS vs. GDP 2017 – US vs. comparable countries

Relative to the size of its wealth, the U.S. spends a disproportionate amount on health care

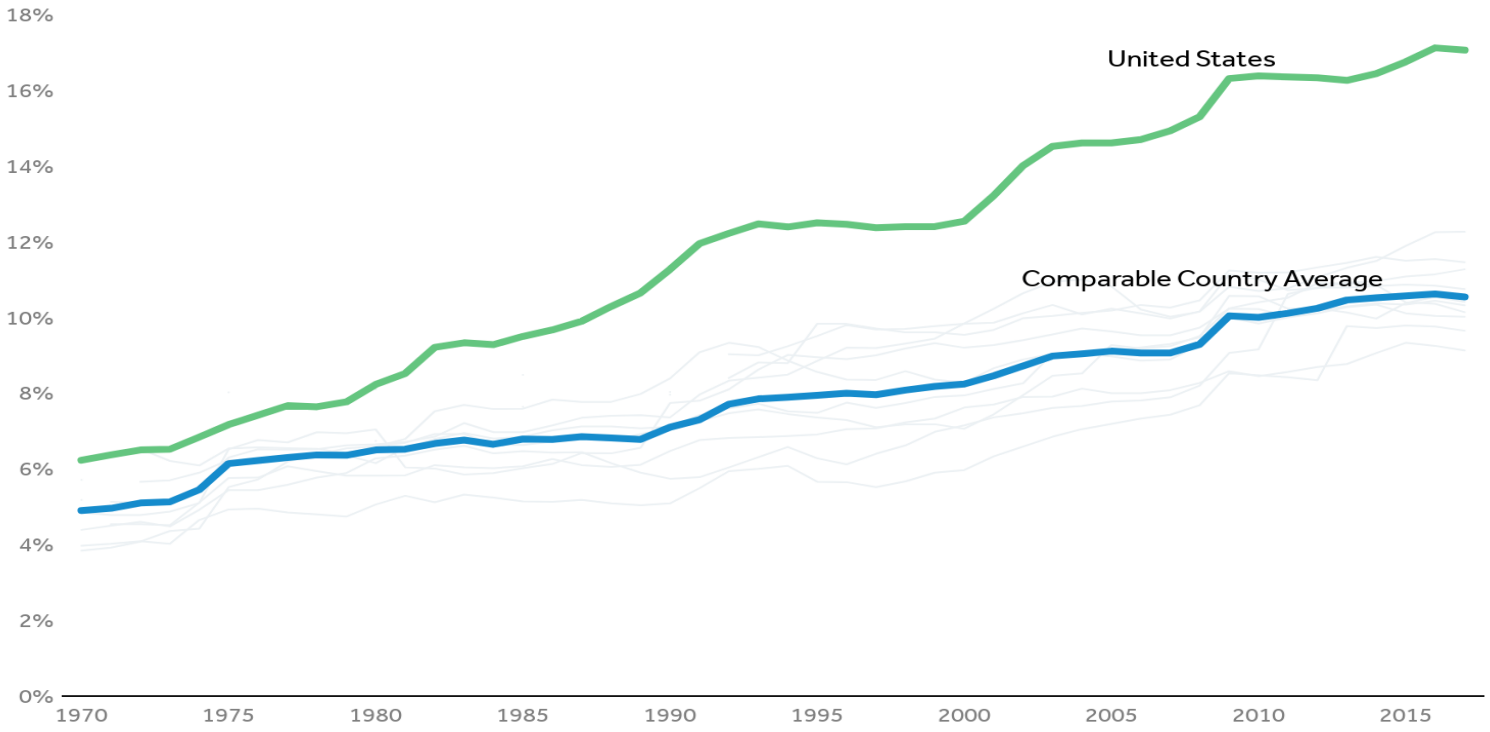


Source: KFF analysis of data from National Health Expenditure Accounts and OECD • Get the data • PNG

Peterson-Kaiser Health System Tracker

NHE as % of GDP

Since 1980, the gap has widened between U.S. health spending and that of other countries



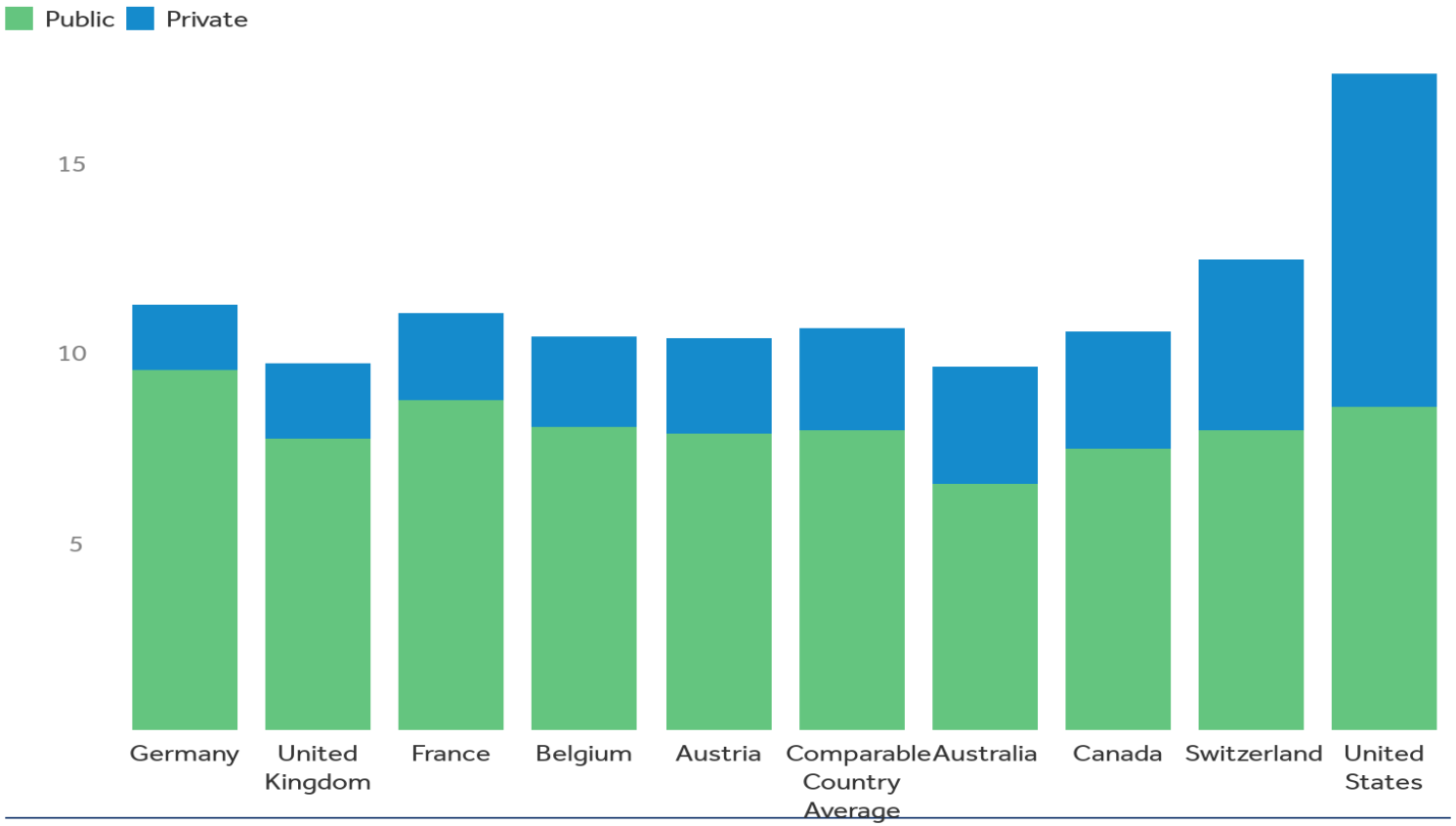
Notes: U.S. value obtained from National Health Expenditure data. Health consumption does not include investments in structures, equipment, or research.

Source: KFF analysis of OECD and National Health Expenditure (NHE) data • Get the data • PNG

Peterson-Kaiser
Health System Tracker

Total Health Spending as % of GDP by public vs. private spending in 2016

While the U.S. has similar public spending, its private sector spending is triple that of comparable countries



Source: KFF analysis of OECD data • Get the data • PNG

Peterson-Kaiser Health System Tracker

Interesting Statistics on the Costs of US Healthcare Systems

- Administrative costs represent 25% of healthcare costs

- CDC reports that Approximately 50% of all chronic diseases are linked to preventable problems including smoking, obesity, and physical inactivity
- Missed appointments cost the U.S. healthcare system more than $150 billion a year

https://www.consumerreports.org/cro/magazine/2014/11/it-is-time-to-get-mad-about-the-outrageous-cost-of-health-care/index.htm
https://www.investopedia.com/articles/personal-finance/080615/6-reasons-healthcare-so-expensive-us.asp
https://www.pbs.org/newshour/economy/why-does-health-care-cost-so-m

However, US Leads in Innovation

GII: GLOBAL INNOVATION INDEX 2019 - Creating Healthy Lives—The Future of Medical Innovation

Cornell SC Johnson College of Business

INSEAD

WIPO WORLD INTELLECTUAL PROPERTY ORGANIZATION

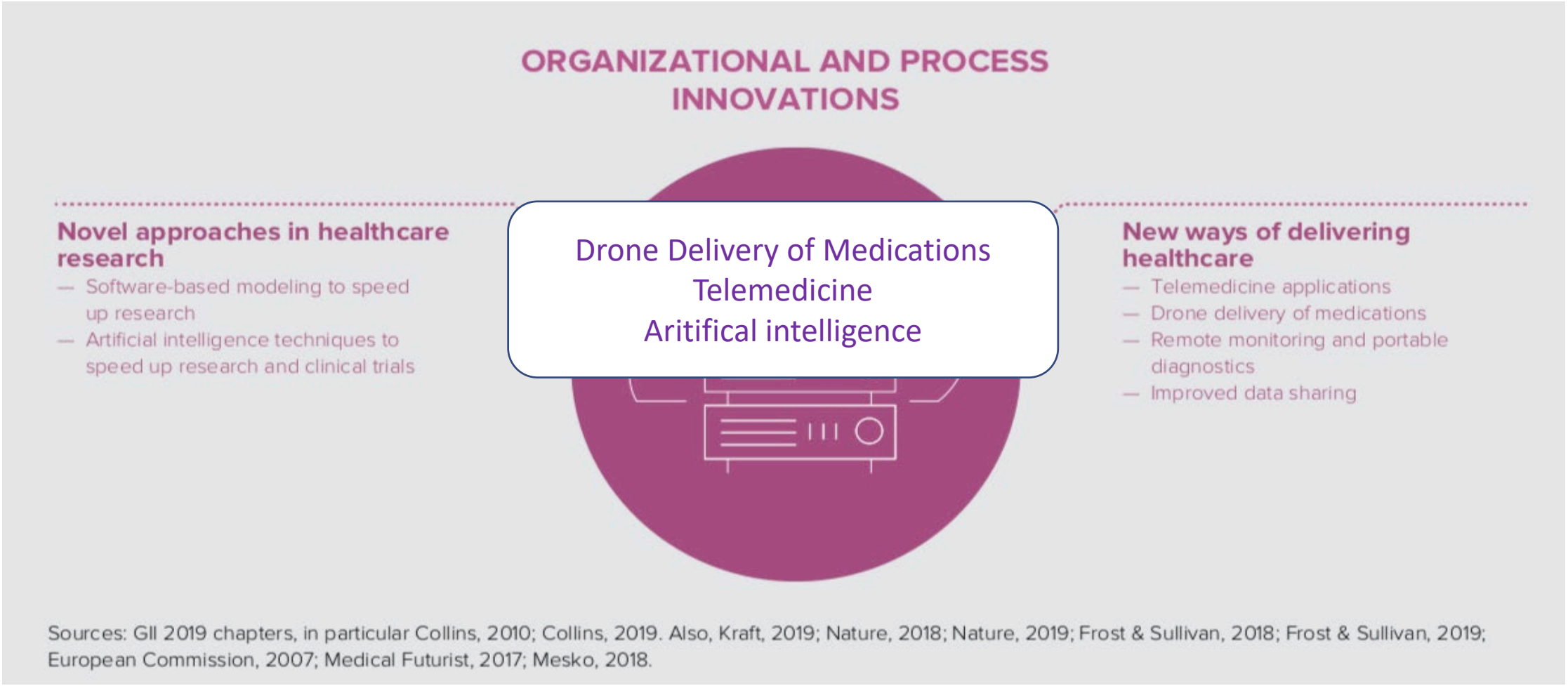
GII 2019

Rankings

2019 Rank	Economy	2018 Rank	Change
1	Switzerland	1	0
2	Sweden	3	1
3	United States of America (the)	6	3
4	Netherlands (the)	2	-2
5	United Kingdom (the)	4	-1
6	Finland	7	1
7	Denmark	8	1
8	Singapore	5	-3
9	Germany	9	0
10	Israel	11	1

Source: https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII_2019_EN_English.pdf

Promising Fields for Medical Innovation and Technologies



Source: https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII2019-keyfinding-E-Web3.pdf

- Complex: multiple stakeholders, multiple interdependent subsystems, physical spaces, different organizations, limited resources, etc.

- Dueling objectives: multiple, often conflicting objectives/incentives, unintended consequences

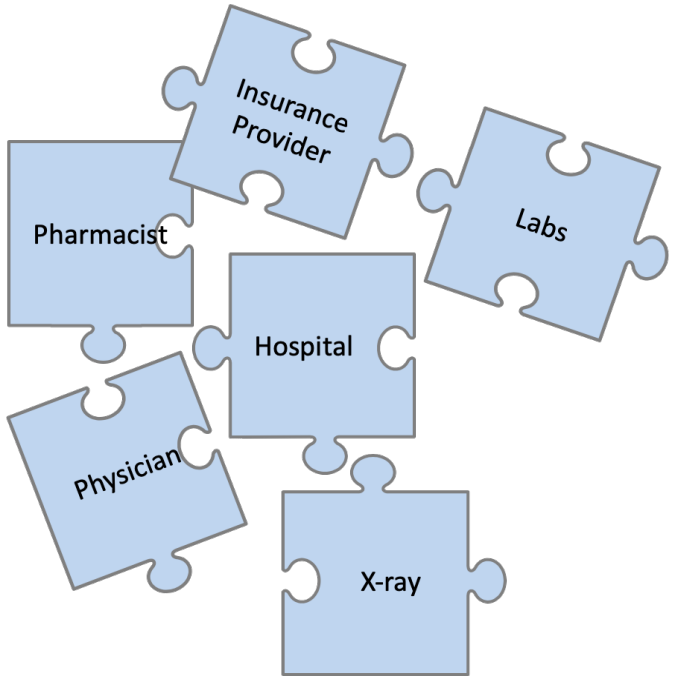
- Data complexity: information limitations or asymmetry, uncertainty

Better Health Care and Lower Costs through **Systems Engineering**

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

- "… 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."

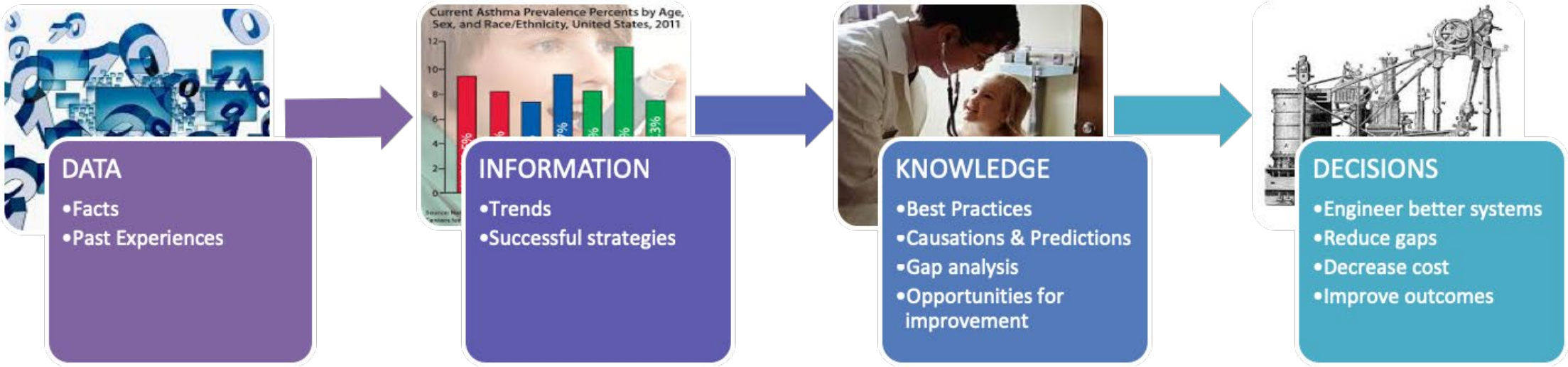
Source: White House PCAST Report
https://www.whitehouse.gov/blog/2014/05/29/new-pcast-report-says-systems-engineering-can-improve-health-care



Systems Engineering

Coordinated and Integrated Healthcare Delivery System

Challenge to You



What knowledge can I take away for myself, my colleagues, my organization, the constituents we serve?

What action can I take?

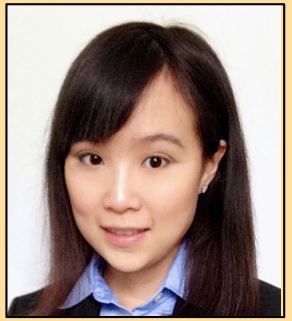
What action can I motivate others to take?

Rapid Fire Presenters

Nisha Botchwey, PhD, MCRP, MPH
Associate Professor of City and Regional Planning
Director of the Healthy Places Lab
College of Design, Georgia Institute of Technology
Center for Advanced Communications Policy, GA Tech

Leanne West, MS
Chief Engineer Pediatric Technologies, Georgia Institute of Technology
President, International Children's Advisory Network

Yajun Mei, PhD
Associate Professor
Milton Stewart School of Industrial and Systems Engineering
Georgia Institute of Technology



Yao Xie, PhD
Associate Professor
Milton Stewart School of Industrial and Systems Engineering
Georgia Institute of Technology

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Pediatric Research at GT

Leanne West

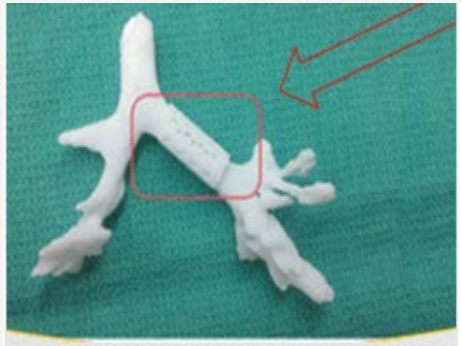
Chief Engineer of Pediatric Technology, Georgia Tech

President, International Children's Advisory Network

Pediatric Technology Center

The Pediatric Technology Center was stood up in 2012 with a $10 million gift from Children's Healthcare of Atlanta

Current Pediatric Effort Areas



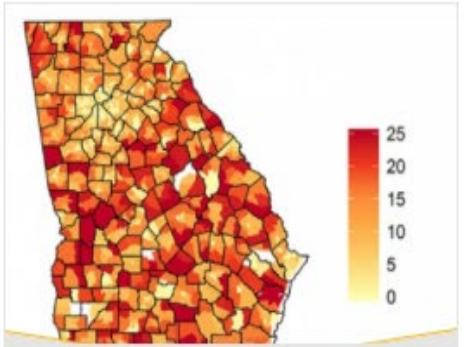
Medical Devices & Tools

Nanotechnology

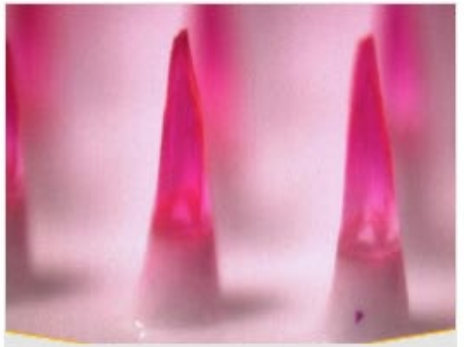
Regenerative Medicine

Diagnostics & Imaging

Mobile Health



Health Analytics



Drug Delivery

Petit Scholars

We only work on

Clinician-driven Problems

Example Funding Mechanisms

Example funding mechanisms that deploy technology solutions to solve pediatric health challenges

Enabling Research	Quick Wins	Child Health Impact Grants & Competitions	Innovation Fund
Grand challenges in pediatric health areas	Clinician-driven applied research producing solutions (in< 18 months)	Targeted RFPs in strategic pediatric health areas	Clinical impact solutions focused on bridging funding gaps

UNDERSTANDING, SOLVING, CURING

- Mobile Health
- Data Analytics
- Regenerative Medicine
- Materials
- Sensors
- Medical Devices
- Modeling
- Drug Delivery

Any area of research on campus

Developing Next Gen Researchers

Capstone (undergraduate), TI:GER (graduate), FHIR (undergraduate), academic courses, BIO ID (graduate), student organizations (pediatric device business club)

Petit Scholars (undergraduate)

- Competitive research scholarship program
- 18 years
- 22 scholars in 2016
- Historically Bioengineering & Bioscience
- Any Atlanta area university student
- Independent research January through December

2017 Petit Children's Research Scholars

Global Center for Medical Innovation

- Established 2012
- Multi-disciplinary ecosystem of expertise & resources
- FDA registered for orphan pediatric device manufacturing
- Concept to commercialization
- Animal trials facility
- Incubator facility
- >50 startups assisted

More Hospitals

- Children’s Mercy in Kansas City
- Shriner’s Hospitals
- Children’s National
- Cincinnati Children’s

Making Kids Our Partners in Research

- They are the experts of their condition.
- They know what it's like to live and deal with their condition.
- They are the ones who face the complications and hassles every day.
- In order to change healthcare, we need a more holistic approach - everyone working together.
- When we need to listen to the experts, we learn amazing things.

Georgia Tech

International Children's Advisory Network

iCANresearch.org

Empowering pediatric patients worldwide

Our Mission

To foster greater global understanding about the importance of the pediatric patient and caregiver voices in healthcare, clinical trials, and research.

Barcelona Summit 2015

The International Society of Pediatric Innovation

iSPI4KIDS.org

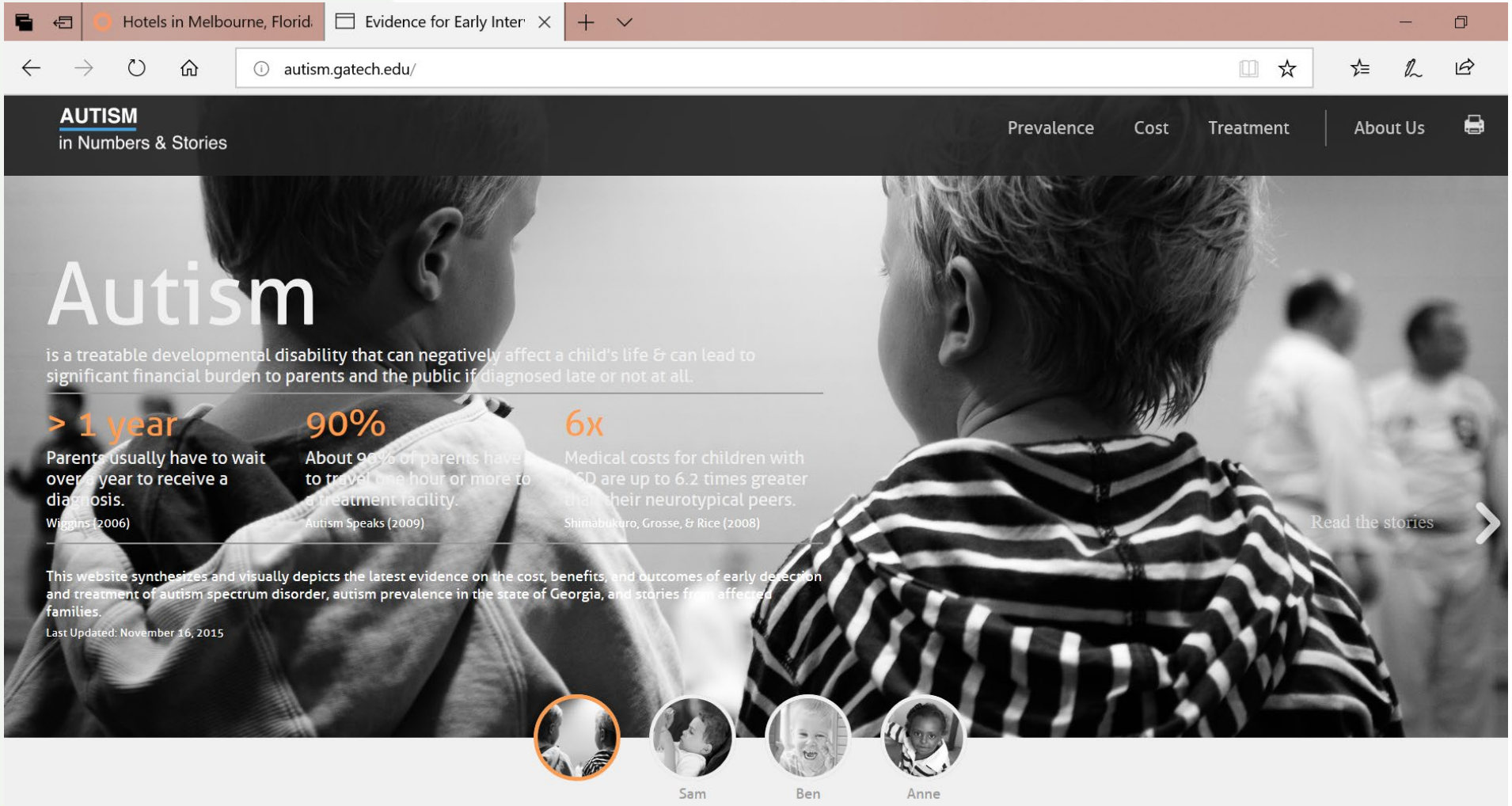
Vice President,
Sherry Farrugia

Community partners

Big Solutions for Little Patients

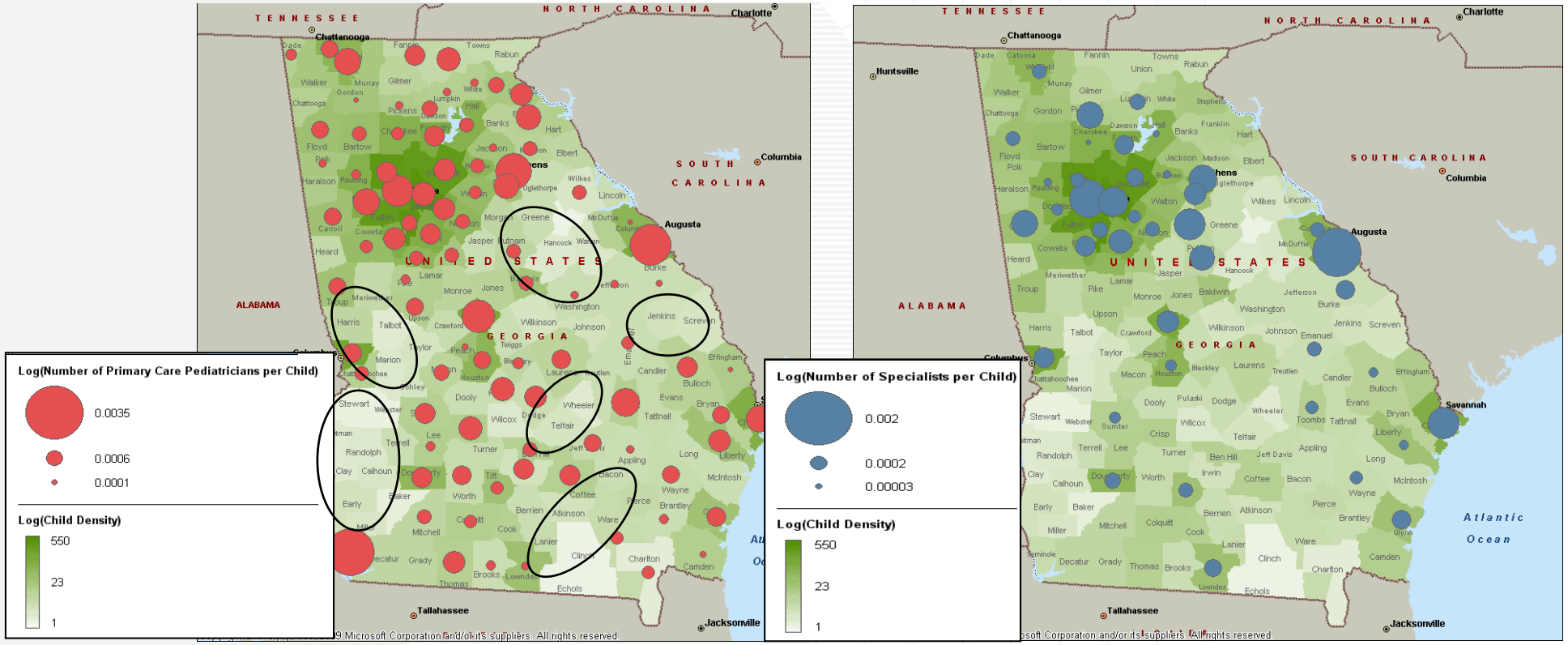
Example projects funded by Children's Healthcare of Atlanta

Evidence for Early Intervention



Pediatricians Per Child in Georgia

- Many counties have no pediatricians
- Specialists are even sparser

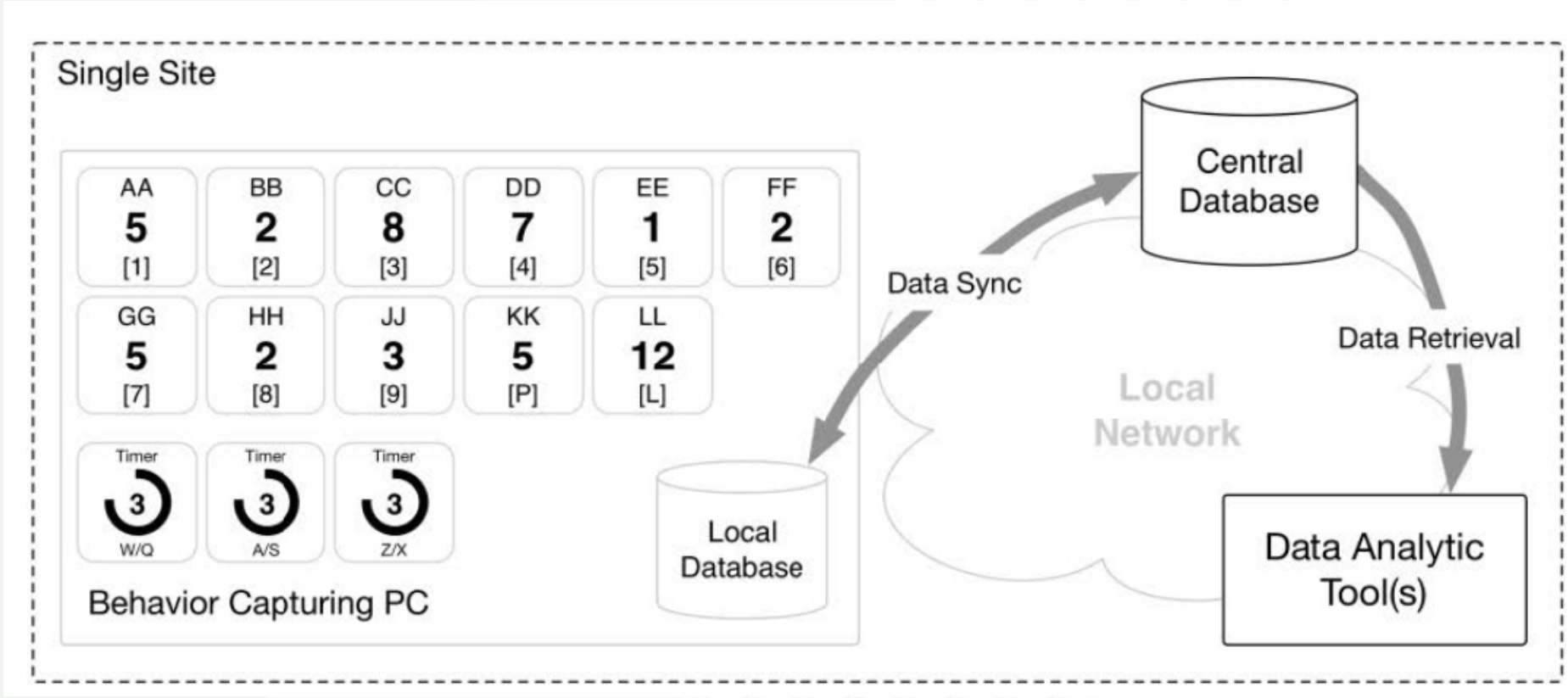


What role does spatial access play in health outcomes?

Data Analytics, CMS data

Designing Cancer Care for Kids by Kids

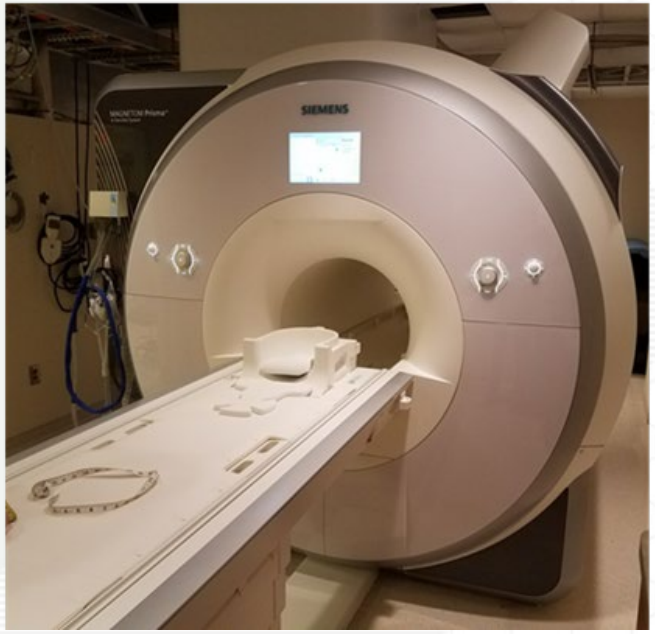
Data Collection and Analysis Tool to Facilitate Research and Treatment of Severe Problem Behavior in Children with ASD



MRI Training System

Modified MRI Simulator

Real MRI Scanner



iEAT

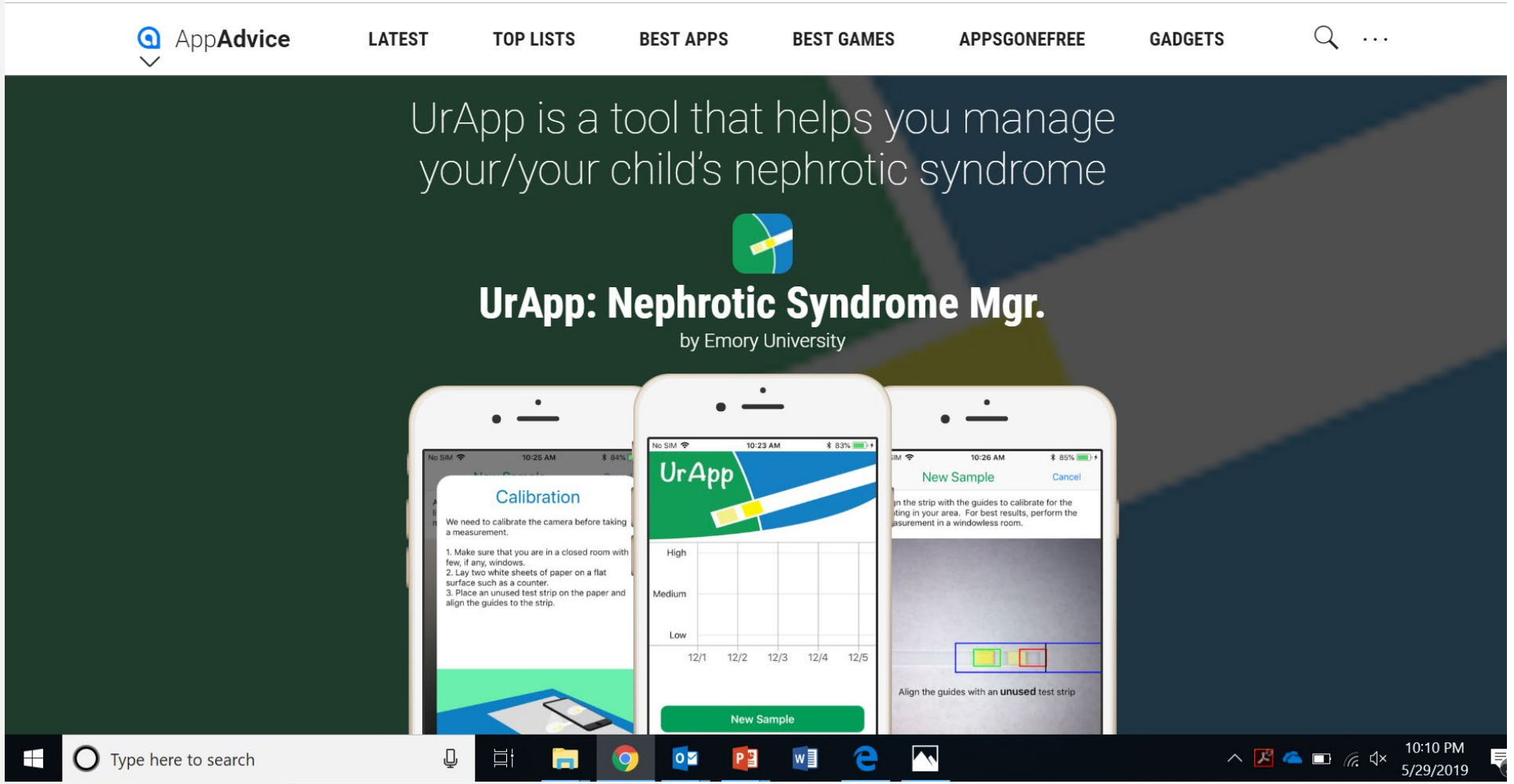
Developed and tested treatments for feeding problems in young children that are exportable and cost effective. From this work, the first mobile platform decision support tool for behavioral intervention was created.

- Treatment takes 6 weeks
- $60,000/child
- Delivered App in February 2014
- 100% effective in trial
- App can take care of 90% of patients, leaving Clinical time for the most severe 10%
- Through private donations, starting a version for home therapy after evaluation

We didn't just create a new tool. We changed the way the doctor thought about delivering care.

Apps, Decision Support Tool

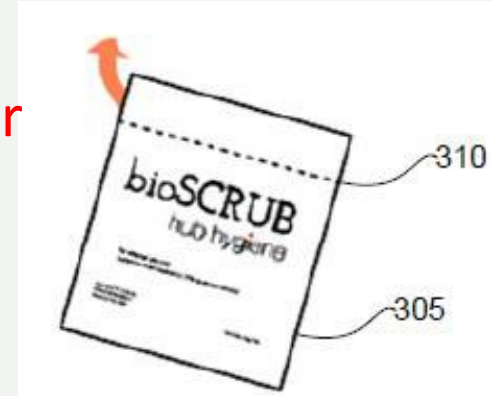
App for Symptom Mgmt



Preventing CLABSI

bioSCRUB hub hygiene

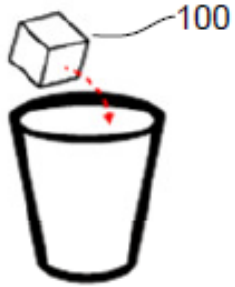
tear

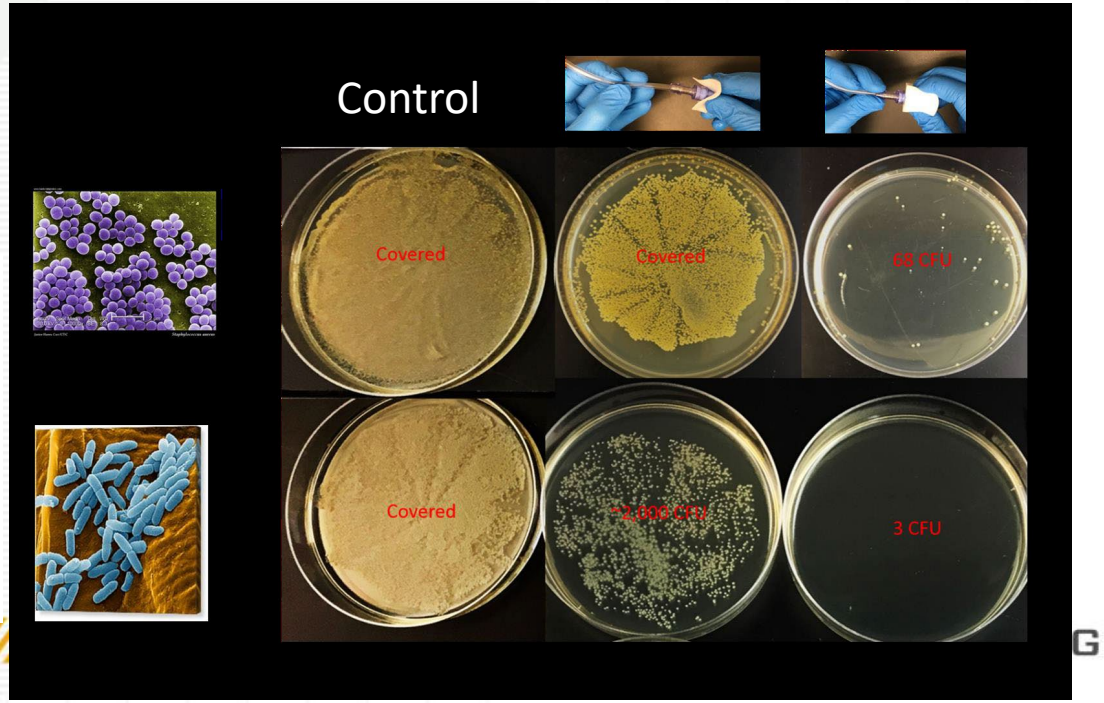


Materials, CLABSI

twist

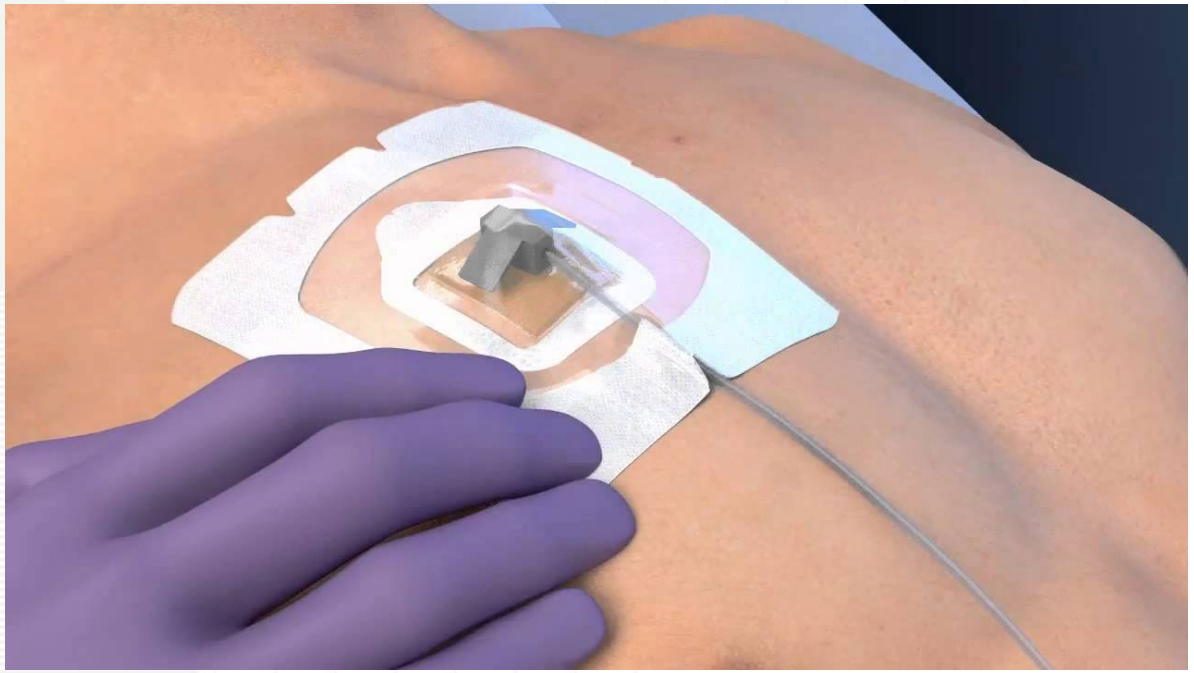
toss





IV Infiltration Detection

Medical Device, Sensors,
Flexible electronics



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Biostatistical Consulting and My Research Interests

Yajun Mei (Pronounced as “YA-JUNE MAY”)

Associate Professor of Statistics

H. Milton Stewart School of Industrial and Systems Engineering (ISyE)

Georgia Institute of Technology

November 12, 2019

Biostat Consulting Sessions

- This academic year my students and I hold free weekly biostatistical consulting sessions during **10:30-11:30am on Mondays in IBB #1317.**
- **Assistance Area:** Design of Experiments ,Sample Size Estimation, Power Analysis, Longitudinal Data Analysis, Time Series, Classification and Prediction, Data Mining, Machine Learning, etc.

- The biostat consulting sessions were initialized by Prof. Brani Vidakovic to support junior researchers.
- They are supported by Biostatistics, Epidemiology & Research Design (**BERD**) of Georgia Clinical & Translational Science Alliance (**Georgia CTSA**).
  (Dr. Andrés J. García, GT and Dr. John Hanfelt, Emory)

My Recent Research Areas

- **Statistical Methodologies**: Sequential analysis and change-point detection (CAREER DMS-0954704)

- **Bio and Healthcare**: gonorrhea (NSF DMS-1830344), behavior Sciences (AFOSR FA9550-08-1-0376)

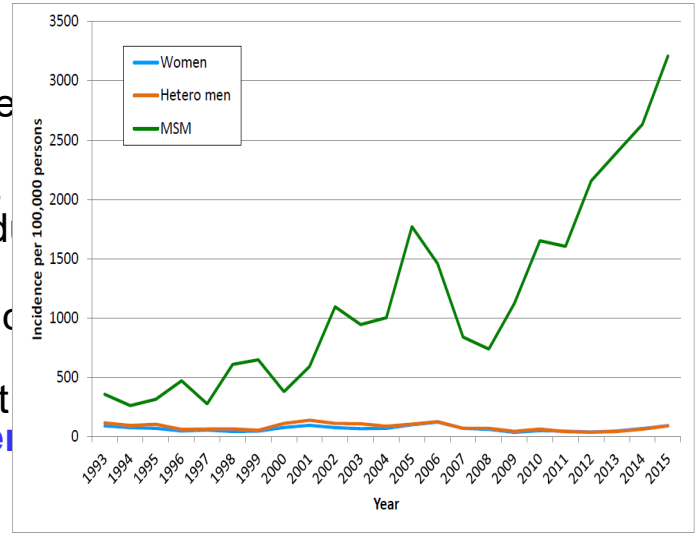
- **Engineering Applications**: quality control (NSF CMMI-1362876), sensor networks (CCF-0830472)

Application: MDR Gonorrhea

(Collaborators: Dr. Sarah Holte, Seattle, Dr. Hao Yan, ASU)

Multi-drug-resistant (MDR) gonorrhea

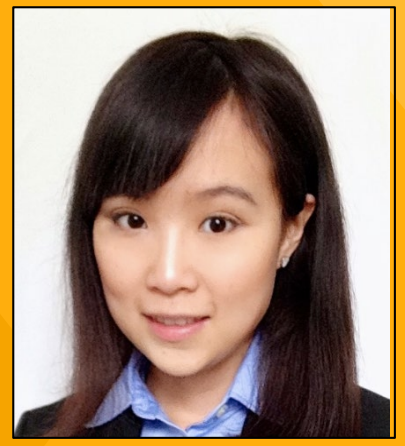
- Gonorrhea is the second most commonly reported notifiable disease
- Increased rates over years
- Higher rate among men, esp. men who have se men
- CDC had five recommended treatment options 2006, but now has only one option remaining d MDR
- CDC's National Notifiable Diseases Surveillanc (NNDSS) since 1944
- CDC's Gonococcal Isolate Surveillance Project **conducts drug resistance test to first 25 mer** month at each of its clinic



Ongoing Projects:

- **Hot-spot detection via Tensor Decomposition**
  (Ms. Yujie Zhao, 3rd year PhD student)
- **Bandit Change-point Detection**
  (Ms. Wanrong Zhang, 4th year PhD student)

(Courtesy from our collaborator, **Dr. Roxanne Kerani**, FHCRC, Seattle)



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Supported by Carlos and Marguerite Mason Trust Foundation and Laura and John Arnold Foundation.

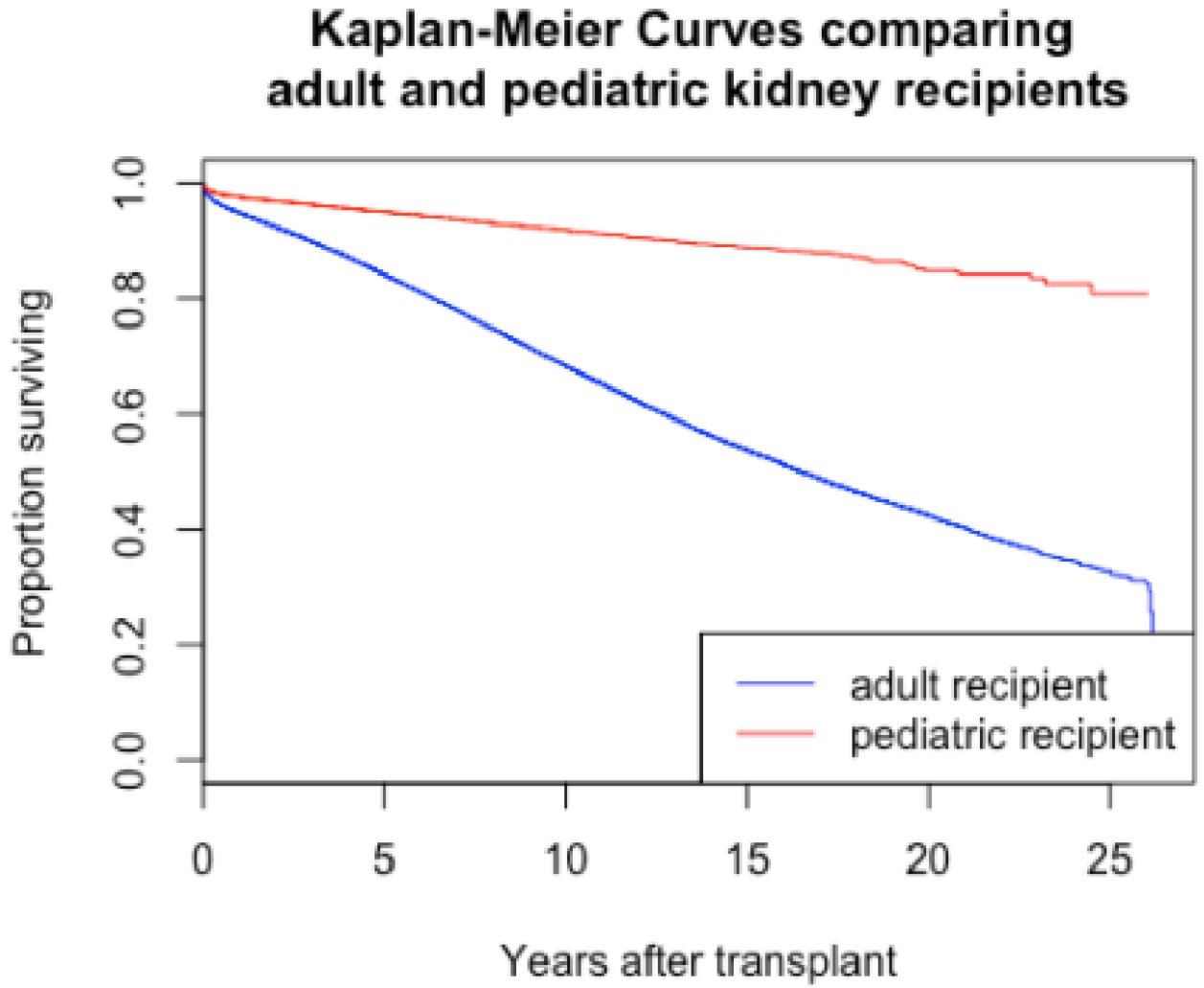
Pediatric Kidney Transplant Survival Analysis

Yao Xie

Joint work with Xi He, Liyan Xie, Joel Sokol, Pinar Keskinocak

Motivation

- Many existing studies focus on overall survival trend [Rees 2009] [Shapiro and Sarwal 2010] using general population data
- Customized prediction tool for pediatric kidney transplant recipient is not available
- Existing models based on all-age/adults have less predictive accuracy for pediatric recipiant



Goals

- Predicting post-transplant survival probability over years for pediatric patients
- Identify the most important variables (donor and recipient) for predicting the survival probabilities

Contributions

- New survival model dedicated to pediatric patients
- New statistical method: variable -selection using graph-based regularizer to account for complex prior medical knowledge

Methodology

Data source: UNOS (United Network for Organ Sharing)

Data description: 19,291 cases and 486 features of pediatric kidney transplant in the US from 1987 to 2014.

Survival analysis: (statistical) Cox proportional hazard model and (machine learning) Random Survival Forest

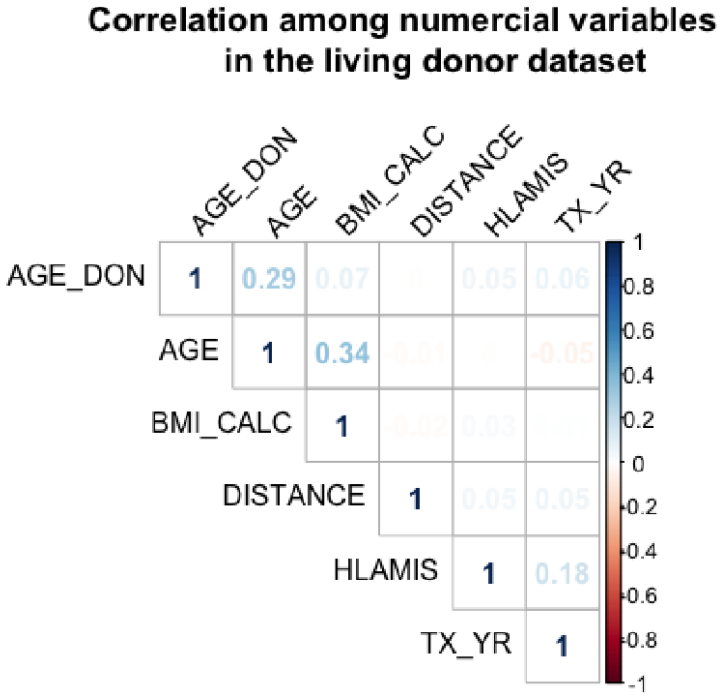
Performance metric: C-index and Integrated Brier Score.

Variable section: Group lasso and our new graph regularized.

Age group: Change-point detection to decide age-groups.

Graph-based variable selection

- Medical variables usually are correlated
- Prior knowledge may be used to find such connection



$$l(\beta) = \sum_{i}^{n} \delta_i \left(\beta^T x_i - \log \sum_{j:y_j \geq y_i} \exp(\beta^T x_j) \right).$$

$$\min_{\beta} -l(\beta) + g(\beta)$$

Graph regularizer

Results

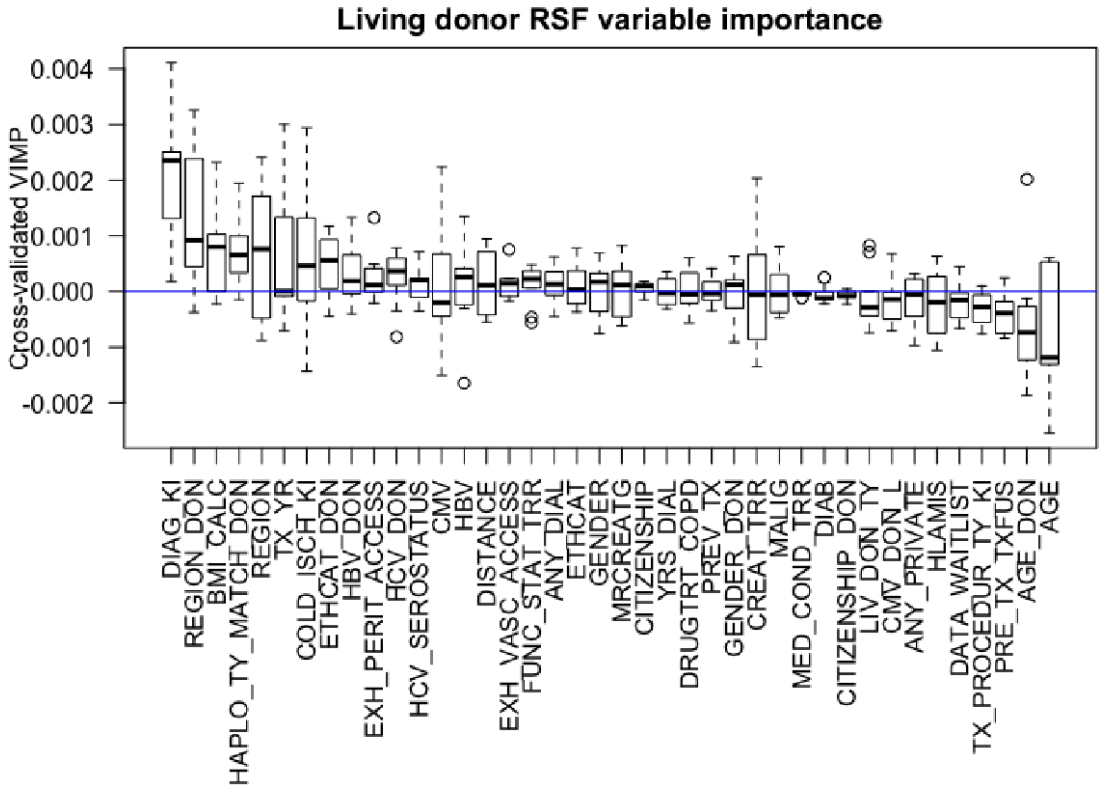
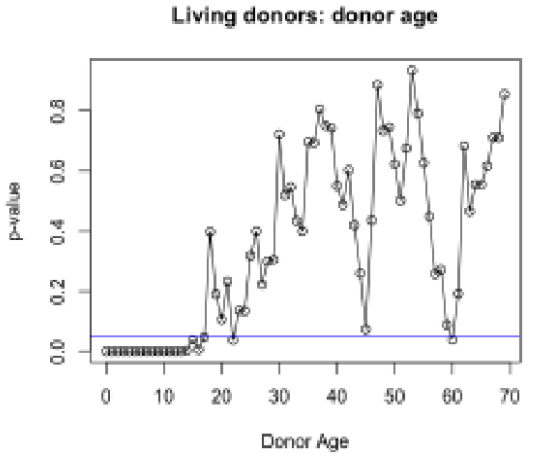


Table: Model performance comparison from 5-fold cross validation.

Donor type	Metric	proposed Cox	proposed RSF	EPTS	all-age RSF [Mark et al., 2019]
Deceased	C-index	0.65	0.65	0.56	0.63
	5 year integrated Brier score	0.036	0.036	0.036	0.036
Living	C-index	0.561	0.541	0.477	0.489
	5 year integrated Brier score	0.018	0.018	0.018	0.018



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Return By 2:40pm

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Data-Driven Quantitative Methods for Improving Efficiency, Quality, and Outcomes in Healthcare Delivery Systems

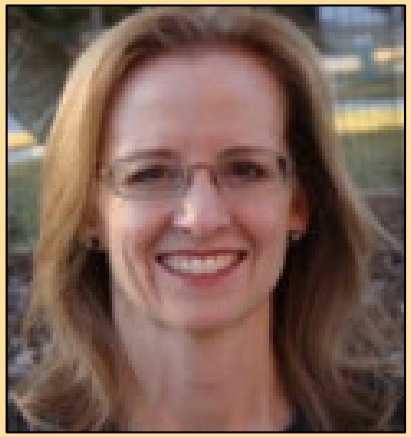
Panel Discussion

Pinar Keskinocak, PhD

William W. George Chair and Professor
H. Milton Stewart School of Industrial and Systems Engineering
Director, Center for Health and Humanitarian Systems

Moderator

Panelists



Joyce T. Siegele, FACHE, FIISE, DSHS
Northside Hospital
Director, Productivity Management

Victoria Jordan, PhD, MS, MBA
Emory Healthcare
Vice President, Quality and Patient Safety

Gregory J. Esper, MD, MBA
Emory Healthcare
Associate Chief Medical Officer

Tarun Mohan Lal
Navicent Health
Vice President, Chief Analytics and Solutions Officer

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Georgia Tech Health Systems:
The Next Generation Forum 2019

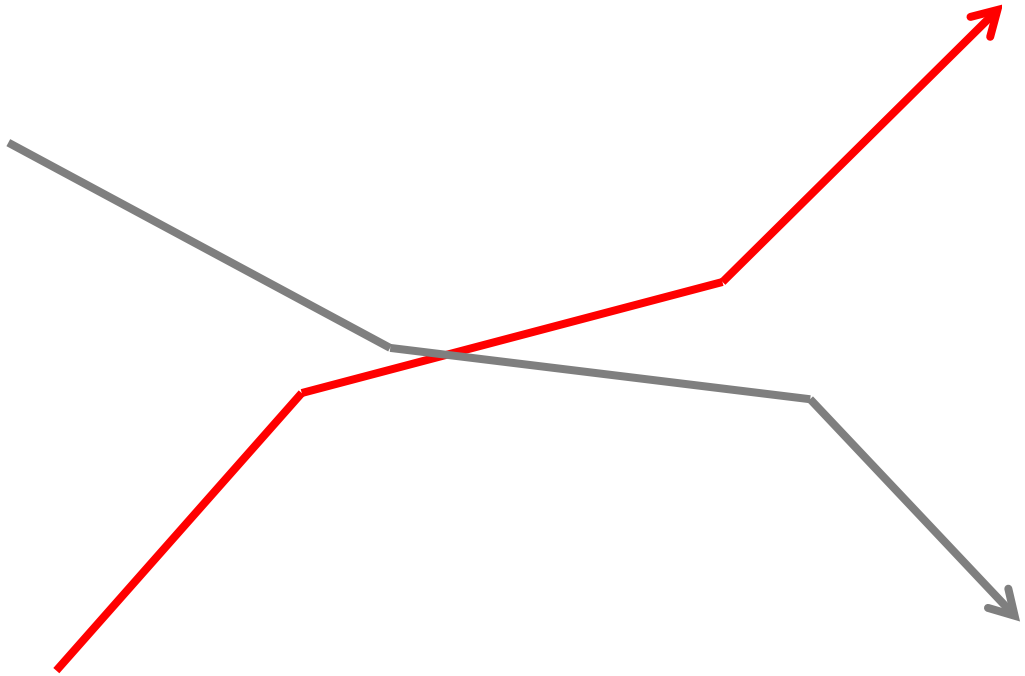
Improving Efficiency in Healthcare Systems

Joyce T. Siegele, FACHE, FIISE, DSHS

Director, Productivity Management

NORTHSIDE HOSPITAL

Introduction



Health Care Costs

- Aging Population
- Patients with Multiple Chronic Conditions
- End of Life Care
- Technology
- Drugs & Procedures

Reimbursement

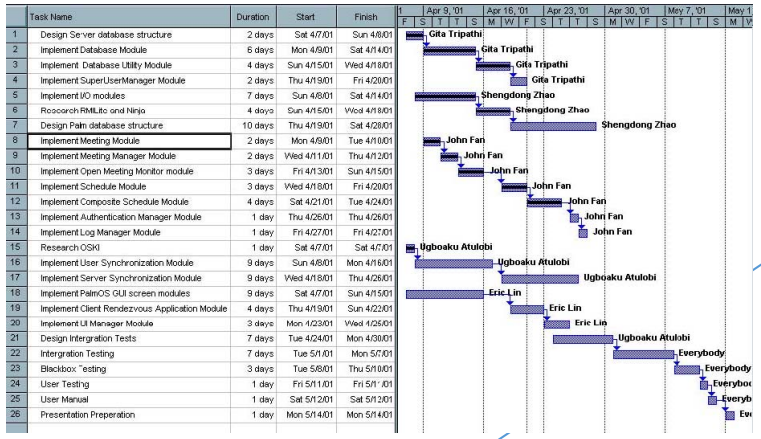
- Affordable Care Act
  - ACO's
  - Bundled Payments
  - Value Based Purchasing
  - Insurance Exchanges
- Federal Deficit
  - 2% Medicare Reimbursement

Methodologies

- Process Redesign
- Layout Optimization
- Lean / Six Sigma
- Forecasting
- Simulation
- Benchmarking
- Observations / Time Studies

Projects

- Staffing Analysis
- Operations Improvement
- Workflow / Throughput
- Capacity Analysis
- Facility Design



	Task Name	Duration	Start	Finish
1	Design Server database structure	2 days	Sat 4/7/01	Sun 4/8/01
2	Implement Database Module	6 days	Mon 4/9/01	Sat 4/14/01
3	Implement Database Utility Module	4 days	Sun 4/15/01	Wed 4/18/01
4	Implement SuperUserManager Module	2 days	Thu 4/19/01	Fri 4/20/01
5	Implement I/O modules	7 days	Sun 4/8/01	Sat 4/14/01
6	Research RMLite and Ninja	4 days	Sun 4/15/01	Wed 4/18/01
7	Design Palm database structure	10 days	Thu 4/19/01	Sat 4/28/01
8	Implement Meeting Module	2 days	Mon 4/9/01	Tue 4/10/01
9	Implement Meeting Manager Module	2 days	Wed 4/11/01	Thu 4/12/01
10	Implement Open Meeting Monitor module	3 days	Fri 4/13/01	Sun 4/15/01
11	Implement Schedule Module	3 days	Wed 4/18/01	Fri 4/20/01
12	Implement Composite Schedule Module	4 days	Sat 4/21/01	Tue 4/24/01
13	Implement Authentication Manager Module	1 day	Thu 4/26/01	Thu 4/26/01
14	Implement Log Manager Module	1 day	Fri 4/27/01	Fri 4/27/01
15	Research OSKI	1 day	Sat 4/7/01	Sat 4/7/01
16	Implement User Synchronization Module	9 days	Sun 4/8/01	Mon 4/16/01
17	Implement Server Synchronization Module	9 days	Wed 4/18/01	Thu 4/26/01
18	Implement PalmOS GUI screen modules	9 days	Sat 4/7/01	Sun 4/15/01
19	Implement Client Rendezvous Application Module	4 days	Thu 4/19/01	Sun 4/22/01
20	Implement UI Manager Module	3 days	Mon 4/23/01	Wed 4/25/01
21	Design Intergration Tests	7 days	Tue 4/24/01	Mon 4/30/01
22	Intergration Testing	7 days	Tue 5/1/01	Mon 5/7/01
23	Blackbox Testing	3 days	Tue 5/8/01	Thu 5/10/01
24	User Testing	1 day	Fri 5/11/01	Fri 5/11/01
25	User Manual	1 day	Sat 5/12/01	Sat 5/12/01
26	Presentation Preperation	1 day	Mon 5/14/01	Mon 5/14/01

Healthcare Labor Management

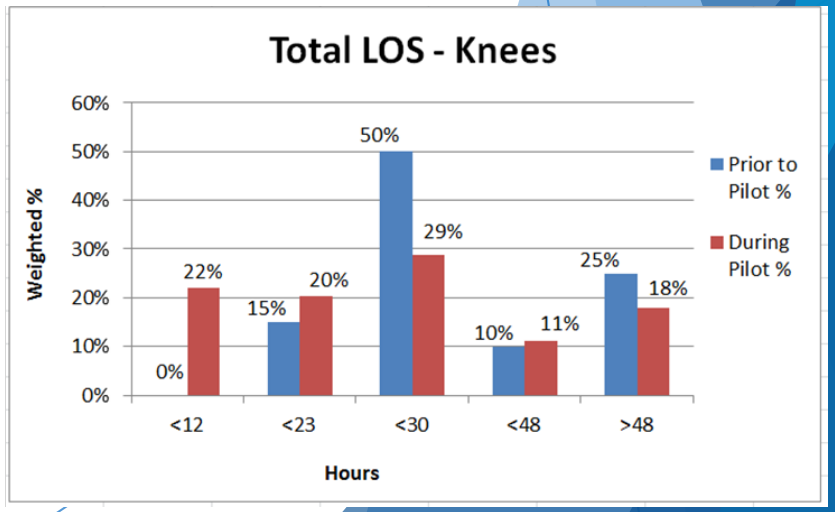
- Ensure Right People in the Right Place @ the Right Time
  - Measuring and Ensuring Appropriate Input to Obtain Expected Output
  - Productivity and Position Management
  - Number of Staff
  - Volume of Patients (Procedures, Tests, Cases)
  - Skill Mix

IHI (Institute of Healthcare Improvement) Joint Replacement Project

- Multidisciplinary Team Approach
- Goal: To be Able to Perform Same-Day Total Joint Replacement Surgeries
- Started in 2014
- In 2019, 92% of Patients are Discharged <8 Hours

Pt LOS <23 hours prior to pilot = 15%

Pt LOS <23 hours during pilot = 42%

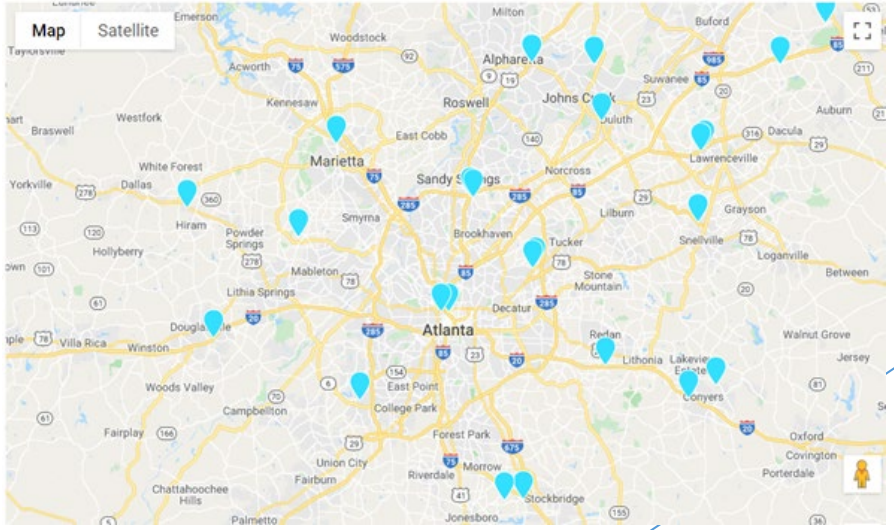


Emergency Department Throughput

- Decrease Wait Time for Patients
- Decrease Length of Stay (LOS) for Patients
- Change Staffing Model within Care Team
- “Discharge to Exit” Time Decreased by 20%

Northside Hospital Cancer Institute

- Access to Care Geographically
- Evaluate Services Provided by Location
- Comprehensive Program
- Ensure Appropriate
  Staffing & Equipment
  @ Each Location



Expansion of Facility

- Inpatient Nursing Units
- Emergency Department
- Surgical Services
- Outpatient Center
- Replacement Hospital

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Sustain the Gains

Victoria Jordan, PhD, MS, MBA

Vice President – Quality and Patient Safety

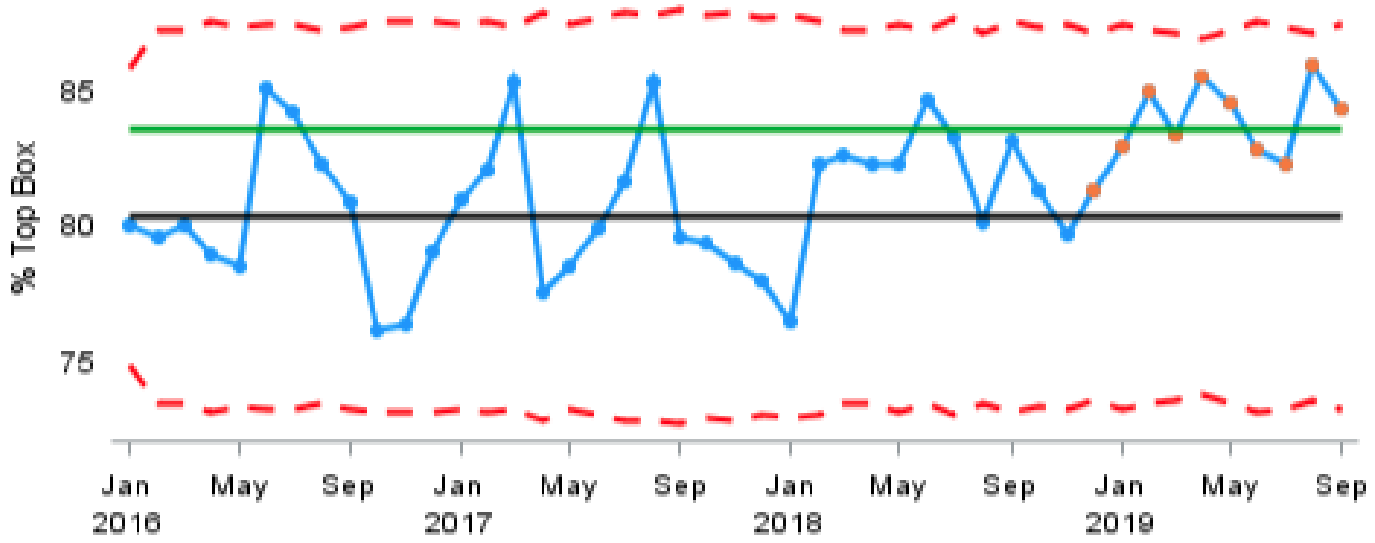
EMORY HEALTHCARE

Track Metrics

Patient Experience

Metric	Unit of Measure	Desired direction		EHC	EUH	EUHM	EJCH	ESJH
Communication about medicines	% Top Box responses	↑	Target					
			Current					
			YTD					
Communication w/ doctors	% Top Box responses	↑	Target					
			Current					
			YTD					
Communication w/ nurses	% Top Box responses	↑	Target					
			Current					
			YTD					
Discharge information	% Top Box responses	↑	Target					
			Current					
			YTD					
Rate hospital/ provider from 0-10	% Top Box responses	↑	Target					
			Current					
			YTD					
Likelihood to recommend	% Top Box responses	↑	Target					
			Current					
			YTD					

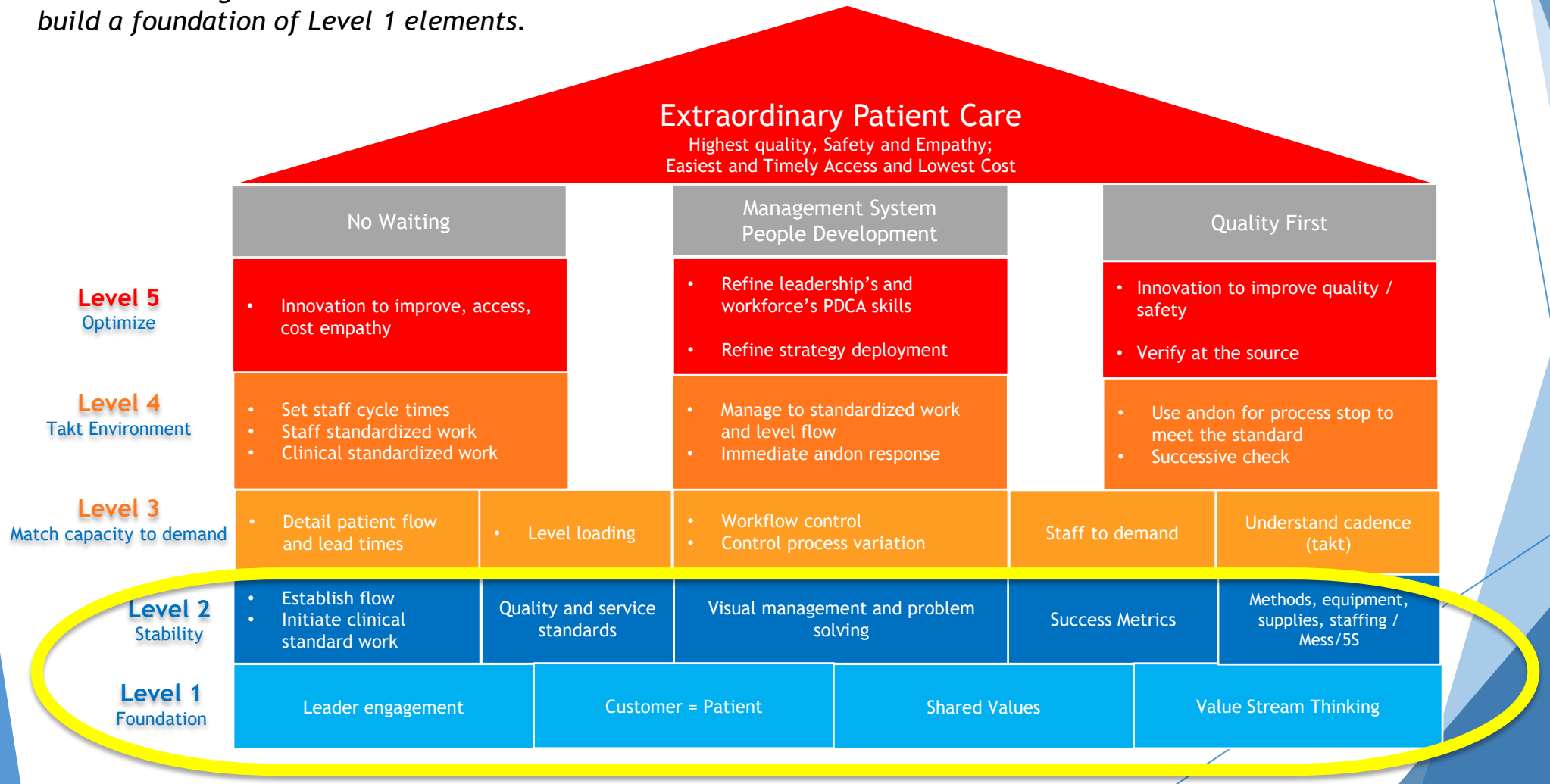
Track Metrics



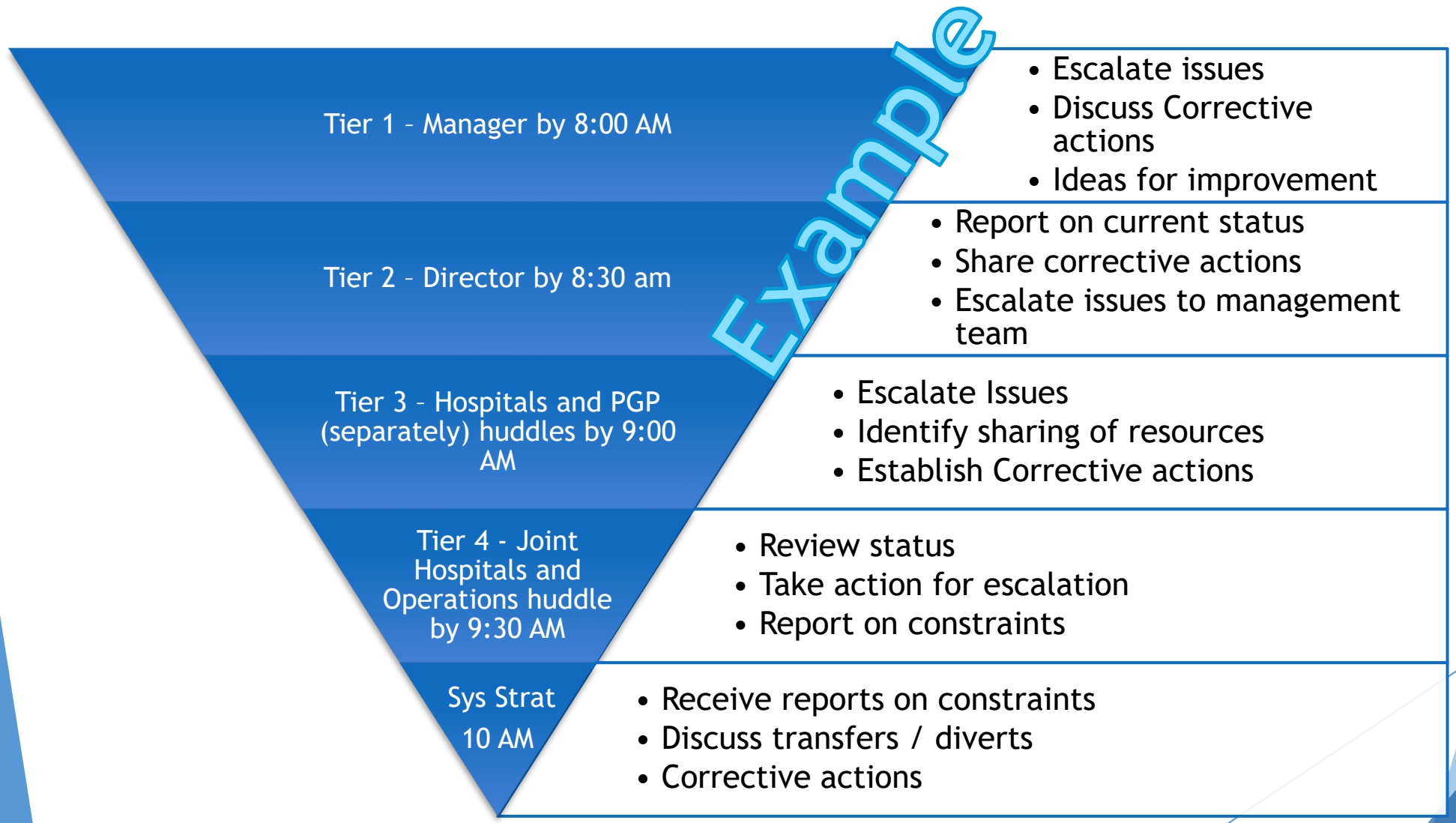
But there's more….

Levels of a Lean Operating System

Our work as organizational leaders must build a foundation of Level 1 elements.



Tiered System of Readiness Huddles



Daily Management System (DMS)

- DMS is not just huddles
- Leaders learn to use a system of visual management and specific methods for operational consistency and improvement
- This system is about developing leaders and engaging the whole organization in problem solving and improvement

Elements of Daily Management

DMS Element	Characteristics	Leader Standard Work
Daily Readiness Huddles with Problem Escalation	Safety + methods, equipment, supplies, staffing + 5S checks Meeting Free Zone	Lead Huddles Attend 'one up and one down' Seniors' Stacked Huddles
Metrics with Problem Solving	Unit metrics linked to organizational strategy & goals	Daily metrics check, trends and progress against plan check, Improvement Rounds
Standard Work with Confirmation	Critical processes standardized	Job instruction & coaching, standard work confirmation
Improvement Ideas	Suggestions for improvement	Problem solving coaching, improvement ideas response
Planned Work Cadence & Response to Flow Interruption	"Real time" methods to identify "glitches" during daily work and address the causes	"Flow manager" and "stop and fix"

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System Governance of Clinical Standardization

Gregory J. Esper, MD, MBA

Associate Chief Medical Officer, Emory Healthcare

EMORY HEALTHCARE

What is a clinical practice council?

A clinician oriented, multidisciplinary council that assumes the responsibility of ensuring the delivery of safe, timely, effective, efficient, equitable, and patient centered care across the health care enterprise

Purpose

- Oversee the proper balance between **clinical standardization** across the EHC system and the need for **appropriate, justifiable local variation;**
- Advise leadership on **funding decisions** for initiatives essential to further best medical care;
- Address the **prioritization** of the implementation of competing clinical initiatives;
- Facilitate system-wide resolutions to gaps in care through **enhancing coordination between interdisciplinary providers** of care;
- Provide a system-wide forum for **quality and safety data review**;
- Ensure that **"Joy of Practice"** for all clinical personnel is appropriately considered in administrative decision making.

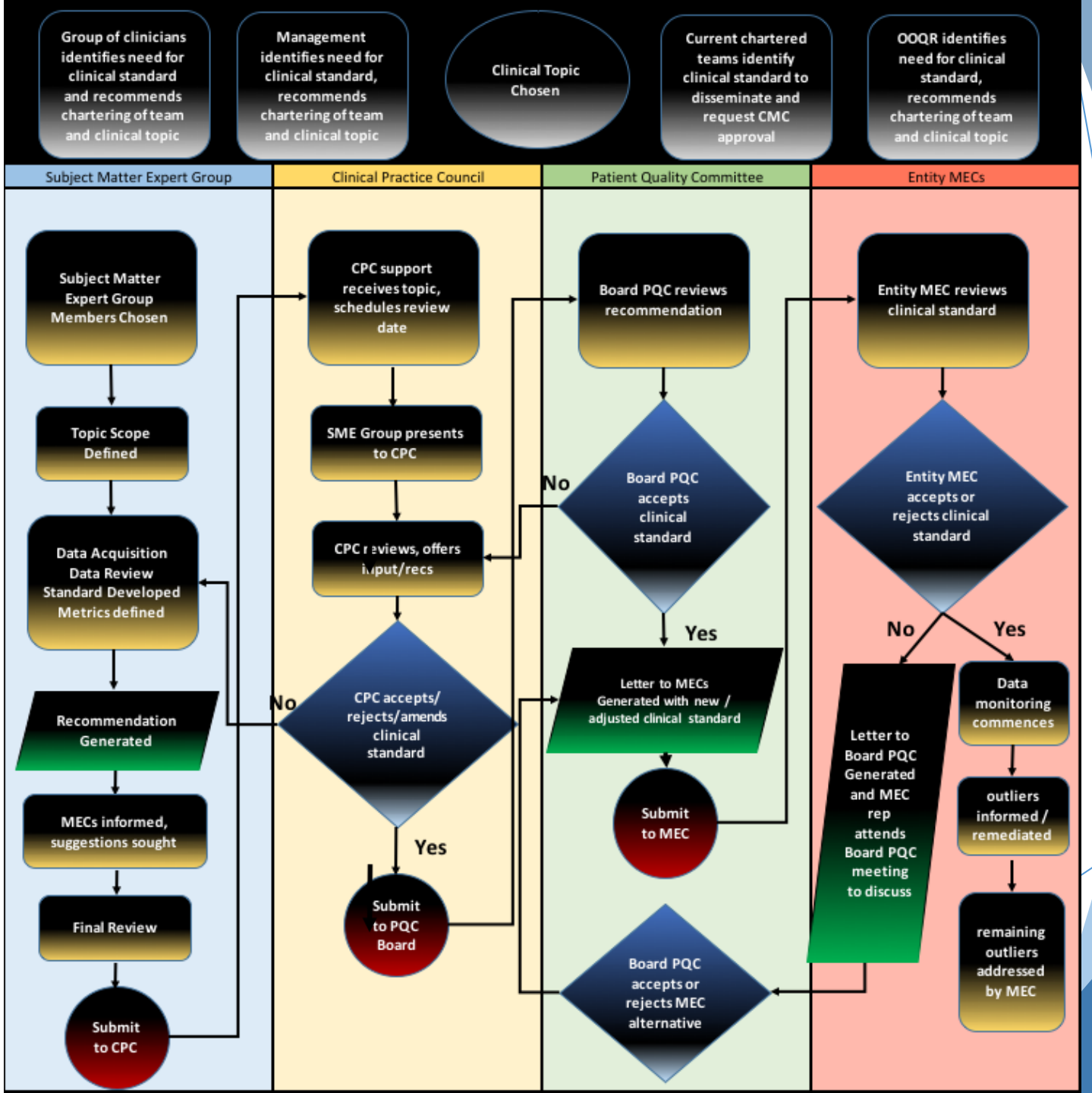
Who's on the Clinical Practice Council?

	EUH	EUHM	ESJH	EJCH	TEC/ESA	WCI	EHN	EDH	KP
CMO	Chad Ritenour	Jay Steinberg	Tom McGahan	Shawn Tritt	Penny Castellano	Sagar Lonial	N/A	Frank Brown	N/A
CQO	Frank Brown	Nicole Franks	Michael Balk	Hasan Shabbir	Nick Colovos	Viraj Master (for Charley Staley)	Joel Shu	"	Kate Koplan
CNO	Nancye Feistritzer	Tawanda Austin	Julie Swann	Heather Redrick	Deena Gilland	Lana Uhrig	N/A	Bob Dent	Kathleen Young
COS	Scott Boden	Larry Hobson	Gary Ludi	Seth Rosen	Ira Horowitz	Wally Curran	N/A	TBD	Matt Prout

CPC Voting Faculty, EHN, and System representatives		
Clinical Chairs	Dan Hunt (HMS)	TBD
EHN Private Practice	TBD	TBD
President APP Council	Melissa Campbell	
Director, APPs	Bonnie Proulx	
Clinical Nurse Council rep	Louis Baldino	Cynthia Oster
School of Medicine	Maria Aaron	
Medical Residents rep	Maria Braileanu	

CPC Non-Voting System Representativ		
ACMO, EHC	Gregory Esper	
CIO, EHC	Sheila Sanders	
Patient Safety Officer	David Murphy	
CNIQO, EHC	Jason Atkins	
CMIO, EHC	Julie Hollberg	
VP Quality	Victoria Jordan	
VP Pharmacy	Christy Norman	
VP Shared Surg Serv	LynnMarie Verzino	
Med Dir / VP Lab	John Roback	John Cardella
VC Quality, Radiology	Marta Heilbrun	
Patient Family Advisors	Tousey Wilson	
EUH ACMO	Adam Webb	
EUHM ACMO	Wendy Wright	

CPC Non-Voting Membership				
	EUH	EUHM	ESJH	EJCH
Entity CFOs	Carla Chandler	Greg Anderson	JoAnn Manning	JoAnn Manning
Entity COOs/Assoc Admin	Maloney / Schuck	Wimby / Bluestein	Kevin Andrews	Hansen/Henry


Group of clinicians identifies need for clinical standard and recommends chartering of team and clinical topic
Management identifies need for clinical standard, recommends chartering of team and clinical topic
Clinical Topic Chosen
Current chartered teams identify clinical standard to disseminate and request CMC approval
OOQR identifies need for clinical standard, recommends chartering of team and clinical topic
Subject Matter Expert Group
Clinical Practice Council
Patient Quality Committee
Entity MECs
Subject Matter Expert Group Members Chosen
Topic Scope Defined
Data Acquisition Data Review Standard Developed Metrics defined
Recommendation Generated
MECs informed, suggestions sought
Final Review
Submit to CPC
CPC support receives topic, schedules review date
SME Group presents to CPC
CPC reviews, offers input/recs
CPC accepts/ rejects/amends clinical standard
No
Yes
Submit to PQC Board
Board PQC reviews recommendation
Board PQC accepts clinical standard
No
Yes
Letter to MECs Generated with new / adjusted clinical standard
Submit to MEC
Board PQC accepts or rejects MEC alternative
Entity MEC reviews clinical standard
Entity MEC accepts or rejects clinical standard
No
Yes
Letter to Board PQC Generated and MEC rep attends Board PQC meeting to discuss
Data monitoring commences
outliers informed / remediated
remaining outliers addressed by MEC

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Emerging Trends

Tarun Mohan Lal

Vice President, Chief Analytics and Solutions Officer

Navicent Health

Atrium Health

Old world vs. New world

Volume	Value
Acute Care Hospitals	System of Care
Burnout	Joy
Provider Centric	Patient condition centric
EHR	Being digital

Provider Strategic Imperatives

Continue to seek the benefits of scale

- Expand reach and brand prominence
- Aggressively manage operating expenses
- Access capital to remain competitive in a changing environment

Provide differentiated services

- Build destination clinical programs or access through partnership
- Optimize services complement to local market demands
- Enhance and augment access points/"front doors" to the system

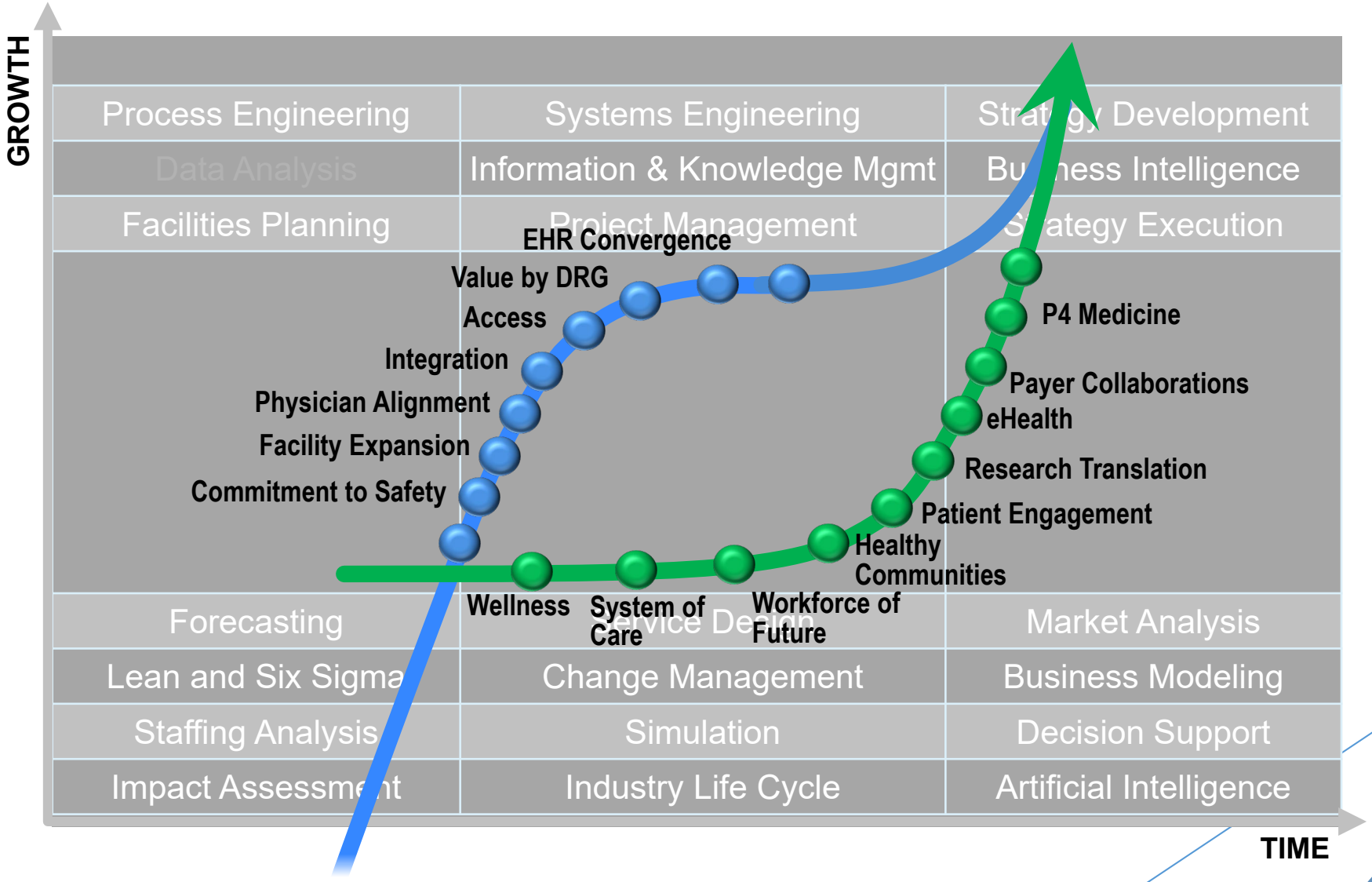
Access new capabilities on the value chain

- Access new capabilities through increasingly vertical partnership/ integration
- Build and invest in population health capabilities
- Realize promises of value-based care by aligning products and services

Experiment with new business models

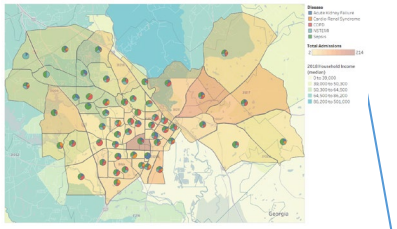
- Explore new revenue streams that align with local market needs
  - Virtual care
  - Home visits
  - Retail medicine
  - Urgent care
  - Concierge clinics
  - On-site employer clinics,
  - Direct-to-employer product offerings
  - Insurance product development

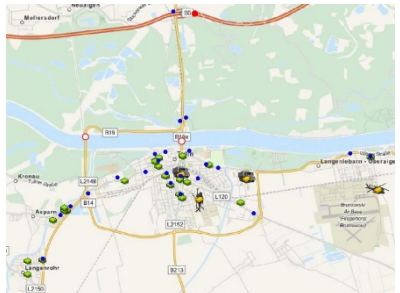
Descriptive to Predictive Analytics

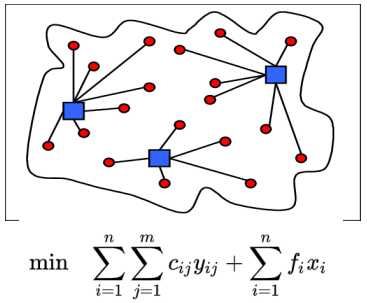


Emergency Room to Population Health

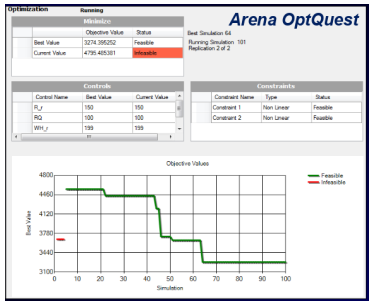
- Community health assessment
  - Analysis of disparities in health outcomes
  - Geospatial analysis of readmissions, distribution of chronic illnesses, ED utilization
- Identify individuals at risk of developing chronic illnesses
  - Identify social determinants of health through predictive models
  - Predict 30-day hospital readmissions
  - Identify the course of action that brings best future outcomes

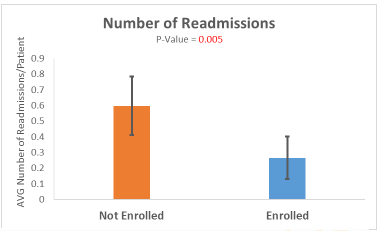


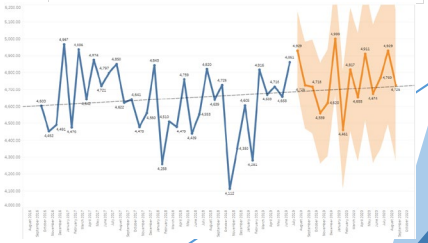




$$\min \sum_{i=1}^{n}\sum_{j=1}^{m} c_{ij}y_{ij} + \sum_{i=1}^{n} f_i x_i$$

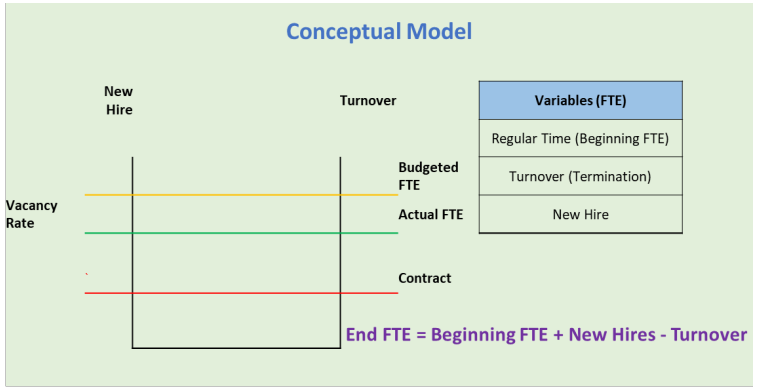


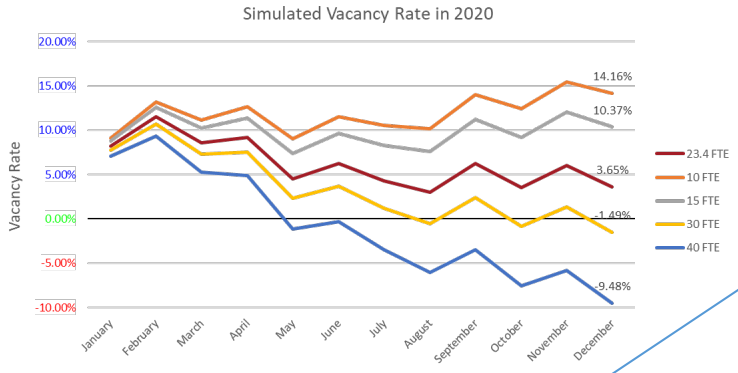




Labor Management to Workforce Planning

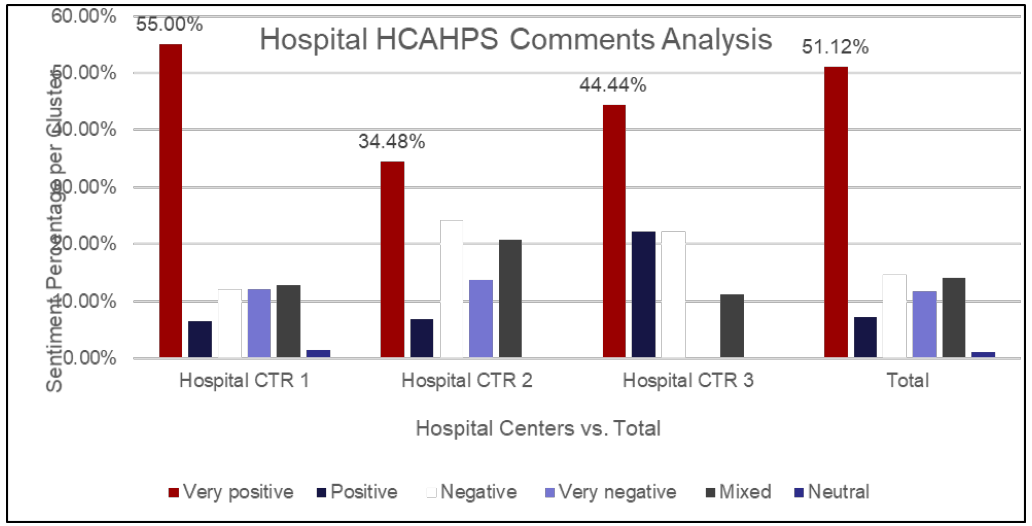
- High expenses related to contract labor
- Registered nurse (RN) vacancy rate is 8% across the nation in 2019 and hospitals are struggling to hire the top talents in today's competitive job market
- Determine the hire rate to minimize the vacancy rate





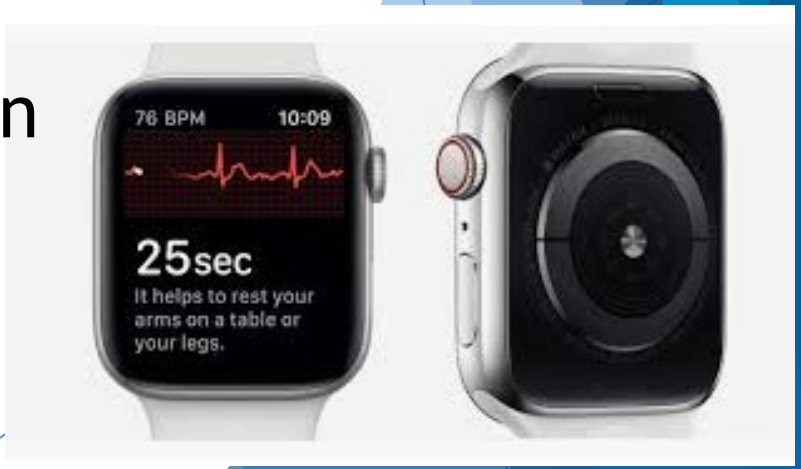
Patient Satisfaction to Experience

- Advanced sentiment analysis clusters 3 centers of the hospital into 6 categories (very positive, positive, negative, very negative, mixed, neutral) for better understanding
- Patient Journey Mapping



P4 Medicine
Personalized, Predictive, Preventive, Participatory

- Detect disease at an earlier stage, when it is easier and less expensive to treat effectively
- Stratify patients into groups that enable the selection of optimal therapy
- Reduce the time, cost, and failure rate of clinical trials for new therapies
- Shift the emphasis in medicine from reaction to prevention and from disease to wellness



IMAGINE
WHAT YOU CAN DO!

Discussion

Pinar Keskinocak, PhD

William W. George Chair and Professor, School of Industrial and Systems Engineering
Director, Center for Health & Humanitarian Systems
ADVANCE Professor, College of Engineering

Closing Remarks

Thank You!

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Closing Poster & Networking Session

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