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A PREEMINENT RESEARCH UNIVERSITY

" The Future of Pharmacy – Embracing Change "

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Dean and Professor, USF Health Taneja College of Pharmacy

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The Future of Pharmacy – Embracing Change
Objectives:

- Discuss the implementation of Proactive Analytics in the profession of Pharmacy
- Discuss new technologies that will impact implementation of clinical pharmaceutical care
- Discuss the impact of digital Artificial Intelligence (AI) in healthcare
- Discuss the health equity challenges with AI in the future

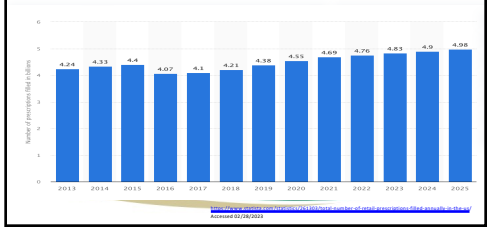
2

Clinicians MUST Embrace the "Opportunities" of Disruption in Healthcare (TCOP Does!!)

- **Transportation***, **Education** and **Healthcare** have been lacking in adoption of disruptive technologies and transformational change
- Medication ***OPTIMIZATION*** is imperative to achieve the most advantageous health metrics
- We are currently working on advanced technologies, health system transformation (**PROACTIVE ANALYTICS = Monitoring & Measuring the EFFECTIVENESS of Medications in Real Time**) : '**Data/ Analytics**'
- New Model → New **Workforce Development** (21st Century Higher Education)

3

Total number of retail prescriptions filled annually in the United States from 2013 to 2025 (in billions)*



Accessed 02/28/2023

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Discuss the implementation of Proactive Analytics in the profession of Pharmacy

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How Will Proactive Analytics/ Biometric Data Collection Work?

- Clinical Case – Application
- 45 yr old male presents to office for a PE.
  - scheduled by pts spouse because pts father died at age 60 yrs due to acute MI.
- patient has not seen a doctor in 5 yrs:
  - Recent CMP and HgA1C revealed:
- CMP
  - Glucose: **170** mg/dl
  - Creatinine: 1.04 – nl ref (0.70-1.10)
  - Electrolytes normal
  - LFTs: ALT - 27 AST – 33 NL
  - HgA1C: **9.3%**
- CBC: completely normal
- **DIAGNOSIS: DMT2**

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How Will Proactive Analytics/ Biometric Data Collection Work?

- His physician applies the **MD/PHARMACIST DIABETIC COLLABORATIVE PROTOCOL**
  - Prescribe a ***MEDICATION***, Prescribe an ***APP (mHealth)***, Prescribe ***KNOWLEDGE***
- What initial **MEDICATION** should this recently diagnosed diabetic patient receive?
  - Metformin 500 mg Twice Daily
- What **APPS** will the patient receive?
  - Mobile **FITNESS TRACKER, GLUCOMETER, BLOOD PRESSURE CUFF, WEIGHT SCALE**; share information using mHealth (encouraged to achieve 10,000 steps daily, 2500 calorie/day diet, lose 2-4 lbs per month)
- Biometric Information provides **OBJECTIVE, CLINICAL DECISION-MAKING SUPPORT DATA** to share with the prescribing healthcare provider
- Prescribe a $400/ month medication **vs.** provide a HEALTH COACH
  - Actual Insulin Receptor Resistance vs Non-adherence to medication intake/ exercise/ dietary restrictions
- GOAL: achieve ↑ healthcare outcome, leading to enhanced $$ for services

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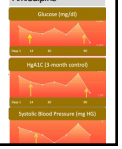
mHealth/ Telehealth Biometric Data Collection Platform – managed by Hal 9000 (2001 Space Odyssey)

Name	GLUCOSE	HGA1C	BP	WEIGHT	INDICATORS
Capt. Kirk	88	5.7	150/88	175	Anxiety (women)
Capt. Picard	92	6.2	150/90	160	Stiff back
Luke Skywalker	215	10.2	145/84	180	Joint Pain
Darth Vader	350	12.4	180/96	300	RA
Bones McCoy	75	5.7	120/80	160	Anxiety (Capt Kirk)
Obi Wan	185	9.3	120/80	220	The Force
Lando Calrissian	180	9.1	150/84	215	Joint pain
Spock (142)	70	4.9	110/75	120	OA

Darth Vader (meds)
Rosuvastatin
Irbesartan
Metformin
Amlodipine



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How Will Biometric Data Collection Work?

- How will we assess and track the patient's **KNOWLEDGE** of the MEDICATIONS?
  - Use of Health counseling videos
- After 3 months, his HgA1C improves to **8.7%**; Assess Daily Steps, Caloric Intake, Weight Loss
- Biometric Information provides OBJECTIVE, CLINICAL DECISION-MAKING SUPPORT DATA to share with the prescribing healthcare provider
- Prescribe a $300/ month medication vs. provide a HEALTH COACH
  - Actual Insulin Receptor Resistance vs Non-adherence to medication intake/ exercise/ dietary restrictions
- GOAL: achieve healthcare outcome, leading to enhanced $$ for services

9

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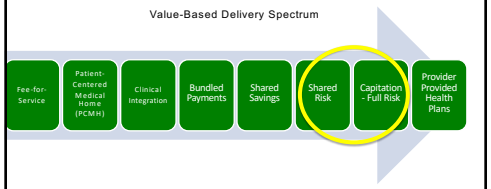
What Payment System Will be Adopted?

Value-Based Delivery Spectrum



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Capitation makes a Return?

- **PMPM** – Per Member Per Month – amount paid to a primary care medical provider or a medical system that manages primary care services
- Example – each provider is paid **$20/** member, regardless of care provided. 350/ plan max.
- Addt'l contracted services available

	Provider 1	Provider 2	Provider 3	TOTAL
Humza	$84K	$84K	$84K	**$252K**
Pink Shield	$84K	$84K	$84K	**$252K**
Twigma Health	$84K	$84K	$84K	**$252K**
Natl Song	$84K	$84K	$84K	**$252K**
Totals	**$336K**	**$336K**	**$336K**	**$1.008M**

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Example of Value-Based Reimbursement

- Each Provider earns $260K = **$780K 3 MDs**
- Overheads total $180/ yr
- Capitation yields earnings of $48K for that year.

	Provider 1	Provider 2	Provider 3	TOTAL
Humza	$84K	$84K	$84K	$252K
Pink Shield	$84K	$84K	$84K	$252K
Twigma	$84K	$84K	$84K	$252K
Natl Song	$84K	$84K	$84K	$252K
Totals	$336K	$336K	$336K	**$1.008M**

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Health Metrics Achieved = $$

- Suppose accountability metrics were **Outstanding**?
- Additional $75K earned through shared savings with payers. (Saved $200K with reduced utilization of ER/Hosp, tests, home health, etc…
- Each Provider earns **$278K = $260K + $18K**

	Provider 1	Provider 2	Provider 3	TOTAL
Humza	$84K	$84K	$84K	$252K
Pink Shield	$84K	$84K	$84K	$252K
Twigma	$84K	$84K	$84K	$252K
Natl Song	$84K	$84K	$84K	$252K
Totals	$336K	$336K	$336K	**$1.008M**

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Health Metrics Not Achieved = (-)$$

- Suppose accountability metrics were **not met**?
- PMPM decreased next year. (Inc. $200K with ↑ utilization of ER/Hosp, tests, home health, etc…
- Each Provider earns **$288K** vs $336K

	Provider 1	Provider 2	Provider 3	TOTAL
Humza	$72K	$72K	$72K	$216K
Pink Shield	$72K	$72K	$72K	$216K
Twigma	$72K	$72K	$72K	$216K
Natl Song	$72K	$72K	$72K	$216K
Totals	$288K	$288K	$288K	**$865M**

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Parameter	Star Ratings	HEDIS	Typical Accountable Care Measures	Quality Rating System (QRS)	Value-Based Purchasing
Author	CMS	NCQA	CMS	CMS	CMS
Affects	Health Plans	Health Plans	Health Plans ACOs PCMHs	Health Plans	Hospitals
Patient Population	Medicare	Commercial Insurance	ACOs/Medical Homes	Obama Care	Medicare
Total Measures	48	41	33	50	38
Rx Measures	15	15	17	16	21

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	Star Rating Rx Measure	Wt.
C08	Annual Flu Vaccine	1
C10	Care for Older Adults – Medication Review	1
C12	Care for Older Adults – Pain Management	1
C13	Osteoporosis Management in Women with a Fracture	1
C16	Diabetes Care – Blood Sugar Controlled	3
C17	Diabetes Control – Cholesterol Controlled	3
C18	Controlling Blood Pressure	3
C19	Rheumatoid Arthritis Management	1
C20	Improving Bladder Control	1
D08	Getting Needed Medications	1.5
D10	High Risk Medication	3
D11	Diabetes Treatment	3
D12	Medication Adherence – Diabetes	3
D13	Medication Adherence – Hypertension (RAS Antagonists)	3
D14	Medication Adherence – Cholesterol (Statins)	3

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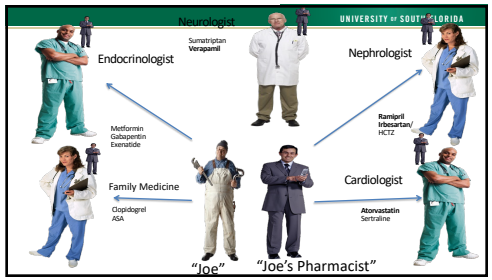

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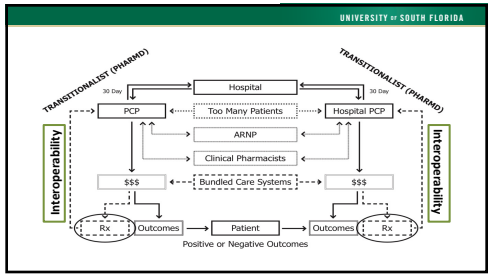

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Discuss new technologies that will impact implementation of clinical pharmaceutical care

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Technology for Pharmacists is Here

- Telehealth/ telemedicine involving pharmacists has been shown to be effective and accepted[1,2]
  - 73% of BP participants recorded & reported the BP 6x/ week
  - 88% maintained scheduled telephone appointments
  - A team-based approach to healthcare involving pharmacists is now being implemented
- EHRs/ EMRs/ Mobile Applications (mApps) are changing how healthcare is delivered

1. Kerby TJ, Asche SE, Maciosek MV, O'Connor PJ, Sperl-Hillen JM, Margolis KL. Journal of Clinical Hypertension. 2012;14(10):668-74.
2. Carter BL, Bosworth HB, Green BB. Journal of Clinical Hypertension. 2012;14(1):51-65.
3. Ronquillo JG, Hsia RY. How the electronic health record will change the future of health care. Yale Journal of Biology & Medicine. 2012;85(2):179-84.
4. Kolachinski J. Mobile medics' apps changing healthcare technology. Biomedical Instrumentation & Technology. 2011;45(6):482-6.

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The Case for Enhanced Pharmacists' Involvement in Collaborative Patient Care

- Multiple studies show the value of team-based care in improving the health of patients when pharmacists are involved.
- Chronic-care conditions with patients are a specific target for collaborative care (DM, HTN, HF, etc…)
- Enhancements in technology can create the trust necessary for effective team communication between clinicians
- **Medicare patients & chronic-care patients are positioned to bankrupt the healthcare system (Transition to PCMHs & ACOs)**

1. St Peter WL, Fairley TM, Carter BL. Current Opinion in Nephrology & Hypertension. 2011;20(5):484-504. Jacobsen PG,
2. Jaowoski SA. Journal of General Internal Medicine. 2011;26(8):934-7.
3. Sey RM, de Vries MJ, Basnov-Antzoulch S. International Journal of Pharmacy Practice. 2011;19(1):25-9.

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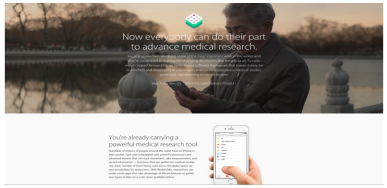
Research Data Collection by the…..



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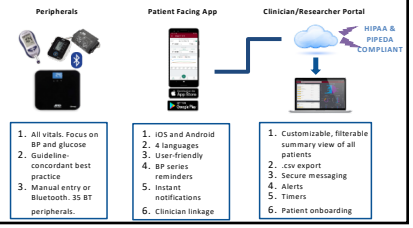
Remote Patient Monitoring



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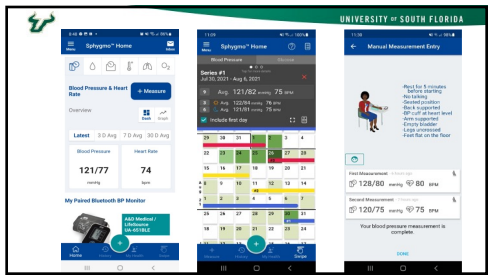
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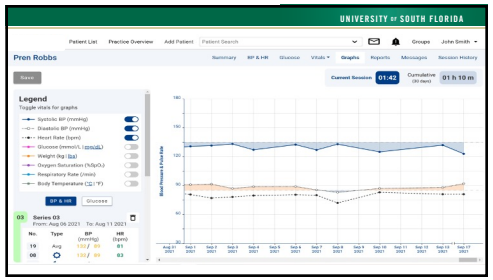
Sphygmo™ Home
Blood Pressure & Heart Rate
+ Measure
121/77
74
My Paired Bluetooth BP Monitor
Manual Measurement Entry
128/80
80
120/75
75
Your blood pressure measurement is complete.
DONE

25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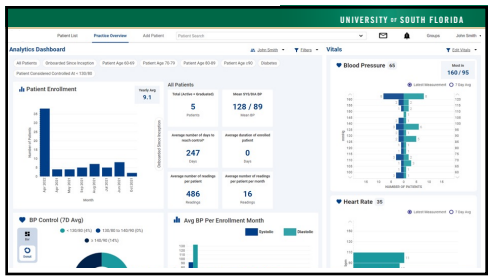
Patient List
Practice Overview
Add Patient
Pren Robbs
Summary
BP & HR
Glucose
Vitals
Graphs
Reports
Messages
Session History
Save
Current Session 01:42
Cumulative 01 h 10 m
Legend
Toggle vitals for graphs
Systolic BP (mmHg)
Diastolic BP (mmHg)
Heart Rate (bpm)
Weight (kg | lbs)
Oxygen Saturation (%SpO2)
Respiratory Rate (/min)
Body Temperature (°C | °F)
BP & HR
Glucose
Series 03
From: Aug 06 2021 To: Aug 11 2021
No.
Type
BP (mmHg)
HR (bpm)
19
Avg
08
03

26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Patient List
Practice Overview
Add Patient
Analytics Dashboard
Vitals
Patient Enrollment
All Patients
5
128 / 89
247
0
486
16
Blood Pressure
160 / 95
Heart Rate
BP Control (7D Avg)
Avg BP Per Enrollment Month

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Discuss the impact of digital Artificial Intelligence (AI) in healthcare

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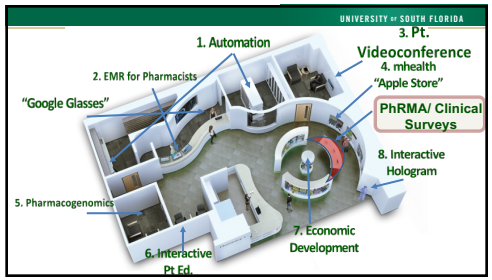

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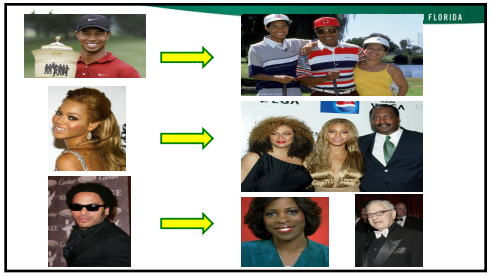

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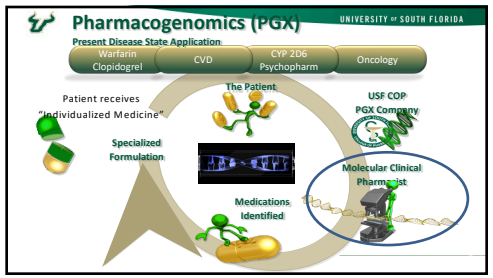
Pharmacogenomics (PGX)
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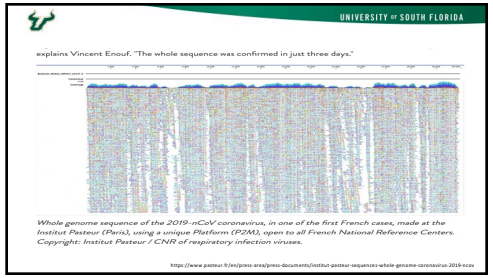
Present Disease State Application
Warfarin
Clopidogrel
CVD
CYP 2D6
Psychopharm
Oncology
Patient receives
"Individualized Medicine"
The Patient
USF COP
PGX Company
Specialized
Formulation
Molecular Clinical
Pharmacist
Medications
Identified

31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explains Vincent Enouf. "The whole sequence was confirmed in just three days."
Whole genome sequence of the 2019-nCoV coronavirus, in one of the first French cases, made at the Institut Pasteur (Paris), using a unique Platform (P2M), open to all French National Reference Centers. Copyright: Institut Pasteur / CNR of respiratory infection viruses.
https://www.pasteur.fr/en/press-area/press-documents/institut-pasteur-sequences-whole-genome-coronavirus-2019-ncov

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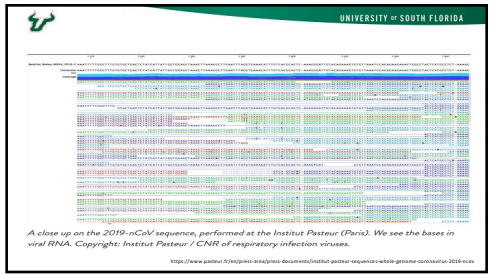
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A close up on the 2019-nCoV sequence, performed at the Institut Pasteur (Paris). We see the bases in viral RNA. Copyright: Institut Pasteur / CNR of respiratory infection viruses.
https://www.pasteur.fr/en/press-area/press-documents/institut-pasteur-sequences-whole-genome-coronavirus-2019-ncov

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HUMIRA WORKS INSIDE
HUMIRA
adalimumab
taltz
(ixekizumab)
injection
80 mg/mL
taltz.com
1-844-TALTZ-4U

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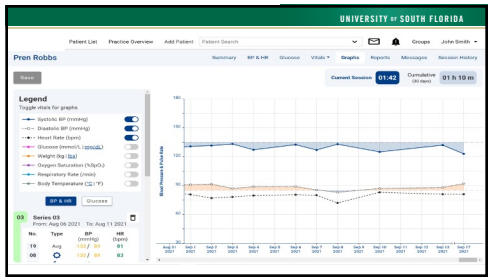
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Pren Robbs
Legend

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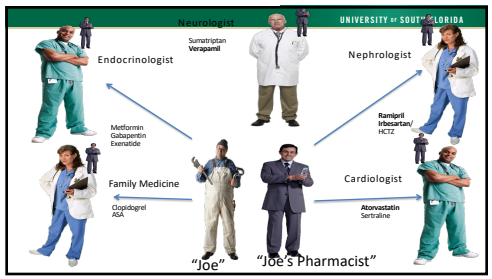
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Neurologist
Sumatriptan
Verapamil
Endocrinologist
Metformin
Gabapentin
Exenatide
Nephrologist
Ramipril
Irbesartan/
HCTZ
Family Medicine
Clopidogrel
ASA
Cardiologist
Atorvastatin
Sertraline
"Joe"
"Joe's Pharmacist"

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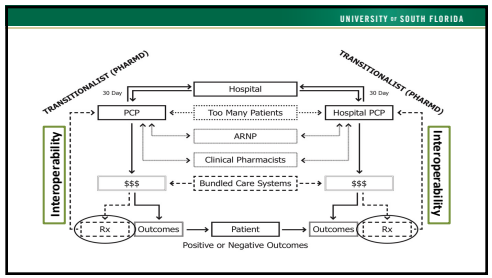
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TRANSITIONALIST (PHARMD)
TRANSITIONALIST (PHARMD)
30 Day
30 Day
Hospital
PCP
Too Many Patients
Hospital PCP
ARNP
Clinical Pharmacists
$$$
Bundled Care Systems
$$$
Interoperability
Interoperability
Rx
Outcomes
Patient
Outcomes
Rx
Positive or Negative Outcomes

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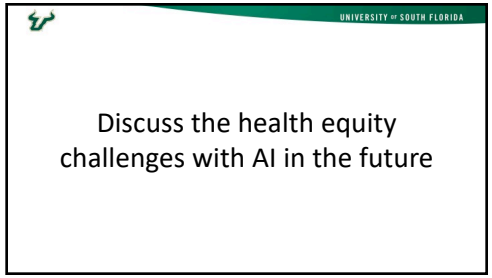
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Discuss the health equity challenges with AI in the future

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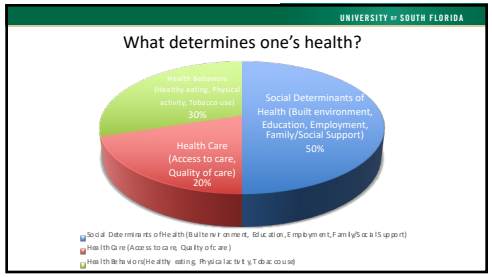
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What determines one's health?
Health Behaviors (Healthy eating, Physical activity, Tobacco use) 30%
Social Determinants of Health (Built environment, Education, Employment, Family/Social Support) 50%
Health Care (Access to care, Quality of care) 20%
Social Determinants of Health (Built environment, Education, Employment, Family/Social Support)
Health Care (Access to care, Quality of care)
Health Behaviors (Healthy eating, Physical activity, Tobacco use)

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The Health Equity Problem – Zip Code Matters

Nearly one-fifth of all Americans live in low income neighborhoods that offer fewer opportunities for **healthy living** than residents in adjacent higher wealthy communities

Low-income zip codes have 25% fewer chain **supermarkets** and 1.3 times as many convenience stores compared to middle income zip codes

Children from low-income families are less likely to have access to high quality early **education** and less likely to be prepared to succeed in school

In distressed urban communities, the large numbers of blighted and vacant **homes** depress property values

Adapted from AHA Health Equity Cmte – SE Region 2019

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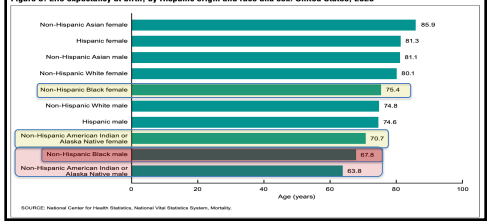
8 National Vital Statistics Reports, Vol. 71, No. 1, August 8, 2022

Figure 3. Life expectancy at birth, by Hispanic origin and race and sex: United States, 2020



SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

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Digital Divide – The Impact is Real

- *Digital Divide*: gaps between individuals, communities, or larger populations of people that do or do not have access to critical technologies, including health technology. [1]
- Mobile Health technologies are a growing tool to assist in the remote monitoring of patients in their own settings
  - **Remote Patient Monitoring**
  - **Remote Therapeutic Monitoring**
- The "**Infrastructure Investment and Jobs Act**" is positioned to provide needed broadband in communities, eventually resulting in enhanced abilities to **administer healthcare in the patient's own settings**[2]

1. Lawrence K. Digital Health Equity. In: Linwood SL, editor. Digital Health [Internet]. Brisbane (AU): Exon Publications; 2022 Apr 29. Chapter 9.
2. www.cnpp.usda.gov/home/food-plans accessed 02/15/2023

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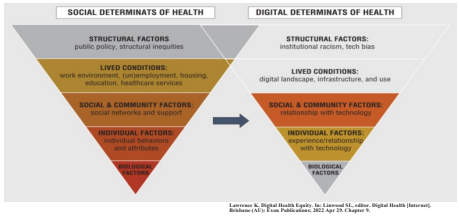
Social Determinants of Health -> Digital Determinants of Health



Lawrence K. Digital Health Equity. In: Linwood SL, editor. Digital Health [Internet]. Brisbane (AU): Exon Publications; 2022 Apr 29. Chapter 9.

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Social Determinants of Health -> Digital Determinants of Health

- DDoH - the unique elements of people's experiences with the digital health ecosystem that impact their experience of health and healthcare. Like their SDOH counterparts, DDOH incorporate individual, community, and systems level factors*
  - Individual's experiences with digital health technology, including use patterns and habits
  - Community/ Social - includes cultural beliefs and communal attitudes such as:
    - perceptions of usability and usefulness
    - trust
    - privacy and security,
    - surveillance, and
    - experiences with tech bias or discrimination.
  - **Access vs Adoption**?

* Lawrence K. Digital Health Equity. In: Linwood SL, editor. Digital Health [Internet]. Brisbane (AU): Exon Publications; 2022 Apr 29. Chapter 9.

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Social Determinants of Health -> Digital Determinants of Health

- What is necessary for Digital Determinants of Health to thrive?
  - Access to technological tools;
  - Digital literacy;
  - Community infrastructure like ***broadband internet***
- DDoH operates at the individual, interpersonal, **community**, and **societal** levels.
- Digital health equity
  - Access to digital healthcare;
  - Equitable outcomes from and experience with digital healthcare;
  - Equity in the design of digital health solutions

* Richardson, S., Lawrence, K., Schoenthaler, A.M. *et al.* A framework for digital health equity. *npj Digit. Med.* **5**, 119 (2022). https://doi.org/10.1038/s41746-022-00663-0

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Connected Devices? We Must First Connect!

- Advancing Broadband Connectivity as a Social Determinant of Health Initiative
  - *"Based on December 2015 data, counties in any quintile of broadband access have on average 9.6% lower diabetes prevalence than those counties in the next lower quintile of access. This change in diabetes prevalence remains when we control for education (8.7%) and income (8.4%) separately or together with age (6.0%)."*
- The evidence supporting a strong relationship between broadband access, Internet adoption, and health outcomes is overwhelming
- The goals of the Connect2HealthFCC Task Force are to (abbreviated):
  - inform current and future FCC policies and programs (e.g., broadband, telehealth, etc.);
  - **support government-wide interest in leveraging broadband in improving population health and reducing health inequities**;
  - pursue collaborative projects with public and/or private stakeholders;
  - encourage other studies and research in this area; and
  - **foster competitive innovation in the Health IT sector related to the construct of broadband as a social determinant of health, including measurement and evaluati**on.

https://www.fcc.gov/health/SDOH accessed 02/15/2023

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Digital Health Inequities Revealed during Covid-19

Digital determinant of health	Older adults	Migrants	Mental health service users	High users of health services	The unemployed
(1) Access to digital resources	Lack of basic computer skills Lack of suitable devices to use digital health services Lack of support and training to take advantage of digital health services Hearing disability reducing the capability to use remote option	Lack of strong electronic identification (e-ID) Insufficient local language skills to use digital health services Lack of specific digital skills required for digital health services.	Inadequate digital skills to take advantage of a variety of digital health services	Inadequate digital skills to access and use digital health services Insufficient English language skills challenging the Internet use Poor health complicates learning and using digital health services Learning to use digital health services requires too much effort	Usability issues challenge finding information on the websites of some health services Dysfunctional, too old or otherwise inappropriate devices hinder the possibilities of using digital health services Dysfunctional internet connections at home
(2) Use of digital resources for health seeking	Digital health services are not applicable for all health care needs	Handling more demanding and complex issues is poorly managed in a digital environment Risk of being misunderstood in a digital environment due to language issues	In the digital environment, interaction and communication are perceived poor Lack of private space complicates the use of digital health services		Lack of private space induces privacy issues and difficulties to concentrate on discussing with a health professional
(3) Digital health literacy					
(4) Beliefs about potential of digital health to be helpful or harmful	Fear of using and making mistakes in digital health services Distrust for the quality of remote health services	Security concerns and lack of trust in digital health platforms Fear of making mistakes that can have serious consequences	Security issues complicate the use of digital health services Lack of an incentive to go out of the house when using digital health services	Insufficient data security skills	
(5) Values and cultural norms/preferences for use of digital resources	Preferring face-to-face services when living next to a service provider Lack of interest to use computer or smartphones Hesitative attitude towards digital health services	In a digital environment, valued nonverbal and personal communication is lacking	Preferring face-to-face consultation because remote feels unusual	Digital health services are not seen to have added value Identifying the service needs remotely by a health care professional requires more time and patients' effort "An old-school mind" preferring face-to-face services	Preferring face-to-face consultations because seeing a person's face makes communication easier Lack of interest in using or learning how to use digital devices
6) Integration of digital resources into community and health infrastructure	Lack of awareness of available digital health services and their value	Lack of digital health services and websites in participants' native language	Remote option is not always available in health services	Not being informed about a remote option for health services	Digital health consultations not always available Information transfer between different systems does not always function properly Not always possible to interact with the service provider

- Kaihlanen, AM., Virtanen, L., Buchert, U. *et al.* Towards digital health equity - a qualitative study of the challenges experienced by vulnerable groups in using digital health services in the COVID-19 era. *BMC Health Serv Res* **22**, 188 (2022)

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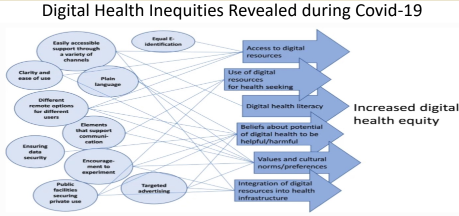
Digital Health Inequities Revealed during Covid-19



- Kaihlanen, AM., Virtanen, L., Buchert, U. *et al.* Towards digital health equity - a qualitative study of the challenges experienced by vulnerable groups in using digital health services in the COVID-19 era. *BMC Health Serv Res* **22**, 188 (2022)

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Artificial/ Augmented Intelligence and Health Equity…Intentionality is Key!

- Bias of data input can lead to (un)intentional harms. (GIGO!)
- Transparency and stewardship of AI algorithms are imperative
  - There is a general lack of inventory accessibility and upkeep, leading to insufficient third-party databases
- Users of healthcare AI may find it hard to trust a model without understanding how it works.
- AI can be a force for advancing health equity, if applied with care, can mitigate persistent inequalities that plague our healthcare through fair and unbiased evaluation.

Thomasian NM, Eickhoff C, Adashi EY. Advancing health equity with artificial intelligence. J Public Health Policy. 2021 Dec;42(4):602-611.

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Artificial/ Augmented Intelligence and Health Equity…Intentionality is Key!

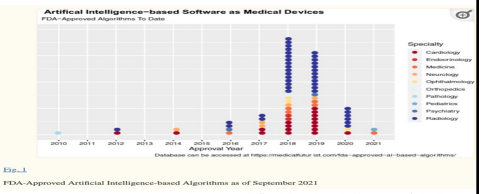

Fig. 1

FDA-Approved Artificial Intelligence-based Algorithms as of September 2021

Thomasian NM, Eickhoff C, Adashi EY. Advancing health equity with artificial intelligence. J Public Health Policy. 2021 Dec;42(4):602-611.

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Summary-> Digital Determinants of Health, AI, and Health Equity

- Social Determinants of Health are well known and well understood
- Artificial/ Augmented Intelligence will continue to Rapidly immerse into all aspects of society
- Digital Determinant of Health must become another vital component for evaluation of patient readiness to receive health care therapies (particularly mobile health technologies)
- AI, Digital Determinants, and Mobile Health Technologies should be implemented to promote interprofessional healthcare for patient.

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Questions?

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