# High Value Health Information Technology (HIT): Applications for Lowering Cost & Improving Quality

February 25, 2019
Fourteenth National Value-Based Payment and Pay for Performance Summit 2019

Stanford MEDICINE | Clinical Excellence Research Center

# Overview

① Introduction to Stanford Clinical Excellence Research Center (CERC)

② Overview of CERC Healthcare Design Fellowship and Methodology

③ Design Fellowship in Practice: High Value Applications of Health Information Technology for Outpatient and Inpatient Care

# Stanford Clinical Excellence Research Center

We apply science to create a continuous supply of scalable methods to safely close the gap between growth in health care spending and growth in the nation's gross domestic product.

*—Arnold Milstein, M.D., M.P.H.*

# Stanford Clinical Excellence Research Center

## OUR VISION

A health system that yields improved patient care and outcomes while lowering population-wide spending



## OUR MISSION

Generate robust scientific evidence demonstrating how lower cost, high quality care delivery can be achieved

## Our Portfolio

**BRIGHT SPOTS RESEARCH**
Discover scalable attributes of high-value clinical teams

**AI-ASSISTED CARE RESEARCH**
Discover methods to assure reliable delivery of high-value care

**HEALTHCARE DESIGN FELLOWSHIP**
Train the next generation in healthcare value improvement



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# Healthcare Design Fellowship

Creating **healthcare value sleuths** - training early-career fellows to discover value-improving care innovations.

- Multi-disciplinary teams of post-doctoral fellows
- **Mission**: distill existing evidence to pinpoint the highest impact and overlooked opportunities to reduce healthcare spending in the target area
- Design a **care delivery model** that can be **subsequently implemented and iterated** at partner healthcare systems/sites

| Year | Fellowship Target Areas |
|---|---|
| 2011-12 | • Chronic kidney disease<br>• Cancer care |
| 2012-13 | • Pediatric chronic illness transitions to adult care<br>• Stroke care |
| 2013-14 | • Ambulatory surgery |
| 2014-15 | • Critical care<br>• Spine care |
| 2015-16 | • Cancer 2.0<br>• Maternity care<br>• Early childhood care |
| 2016-17 | • Cognitive impairment<br>• Prescription medications |
| 2017-18 | • Late life<br>• High need high cost |

# CERC Healthcare Delivery Model Design

## Phase 1: "Open" Chevron

**Boot Camp** → **Literature Review** → **Observations and Expert Interviews**

- Key opinion leaders in value-based care, health policy and economics
- Clinical experts for the target area

- Peer-reviewed and "grey" literature
- Focus on key **cost drivers** for target area
- Identify site visits

- Ethnographic observation
- Semi-structured interviews
- Focus on **unmet needs** and key **stakeholder challenges**

# CERC Healthcare Delivery Model Design

## Phase 1: "Open" Chevron

**Boot Camp** → **Literature Review** → **Observations and Expert Interviews**

- Nuanced understanding of the **clinical and economic features** of the target population/condition
- Identification of **key challenges** for stakeholders (particularly patients)
- Identification of **solutions** with the potential to address these needs

# CERC Healthcare Delivery Model Design

## Phase 2: "Closed" Chevron

### Care Model Iteration

- Solutions are prioritized based on:
  - Improved patient experience and outcomes
  - Cost reduction
  - Ease of implementation
- Top solutions are iterated based on feedback from a panel of clinicians and content matter experts
- Top 3 solutions are incorporated into healthcare delivery model

### Cost Modeling

- Net healthcare savings for proposed model estimated using:
  - Previously observed savings for each solution
  - Known implementation costs
  - Size and baseline spending of the target population nationally
- Sensitivity analyses conducted to determine impact of key parameters (target population reach and effect size for selected solutions)

# CERC Healthcare Delivery Model Design

## Phase 2: "Closed" Chevron

**Care Model Iteration** → **Cost Modeling**

- Healthcare delivery **model comprised of 3 solutions** for the target space
- Estimated **impact on national healthcare spending** (with scaling)
- **Implementation guide** to assist with launch/iteration of care model at partner health organizations

# Model Dissemination and Iteration

## Examples of current and past efforts to disseminate CERC's care delivery models:

**Department of Veteran's Affairs**: completed randomized study in **late stage oncology model**, resulting in lower heath care costs within 30 days of patients' death ($1,048 vs. $23,482)[1]

**Virginia Mason's Rapid-Access TIA clinic:** utilizing **stroke care model** to relocate low-risk patients from the hospital setting to outpatient setting and improve outcomes at lower costs

**CareMore**: trialed **cancer care model,** yielding >20% per capita net savings

**Desert Oasis Healthcare**: undergoing rapid pilot testing of **late life care model**

**Kaiser Permanente**: adopted and rapidly disseminated **acute stroke care** attributes

**Brigham and Women's, Vanderbilt and Honor Health**: testing multi-state pragmatic trial on **spine care model**

[1]Patel, Manali I., et al. Effect of a Lay Health Worker Intervention on Goals-of-Care Documentation and on Health Care Use, Costs, and Satisfaction Among Patients With Cancer: A Randomized Clinical Trial. *JAMA Oncology* (2018).

# The 2018-2019 CERC Design Challenge:

What are the top three applications of health information technology (HIT) to *reduce cost* and *improve quality* in American healthcare?

# 2018-2019 CERC Design Fellows

**Clare Purvis, PsyD**

**Courtenay Stewart, DO**

*Focus:*
*Outpatient Care*

**Anoop Rao, MD, MS**

**Natalia Leva , MD**

*Focus:*
*Inpatient Care*

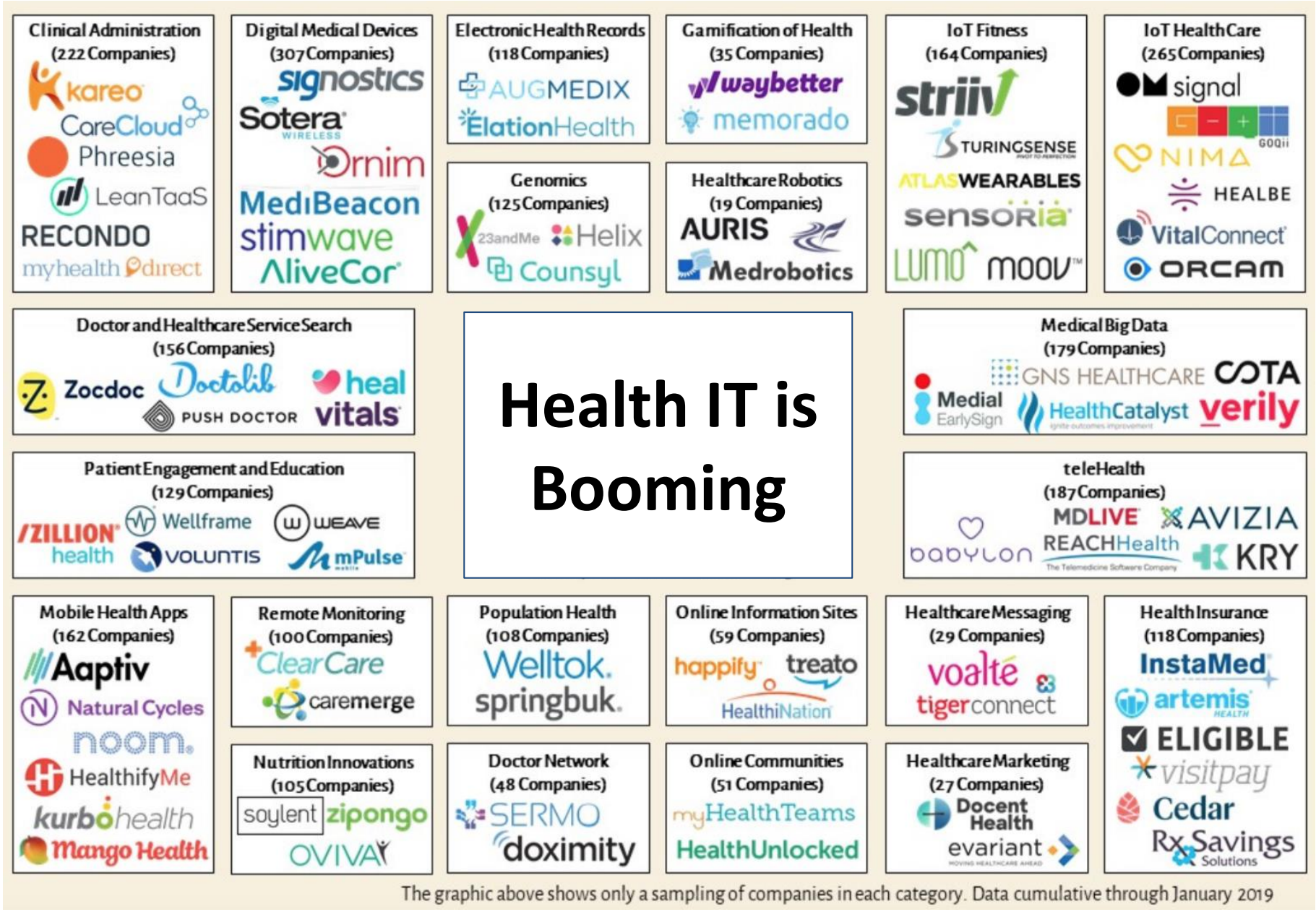


Image source: venture scanner


Image source: Unsplash

# Major Cost Drivers Identified

Healthcare is Fragmented

Unaddressed Barriers to Care

Healthcare is Reactive

# Outsized Spending On Chronic Conditions

Total US healthcare spending = $3.4 Trillion


Sources: Centers for Disease Control; National Association of Chronic Disease





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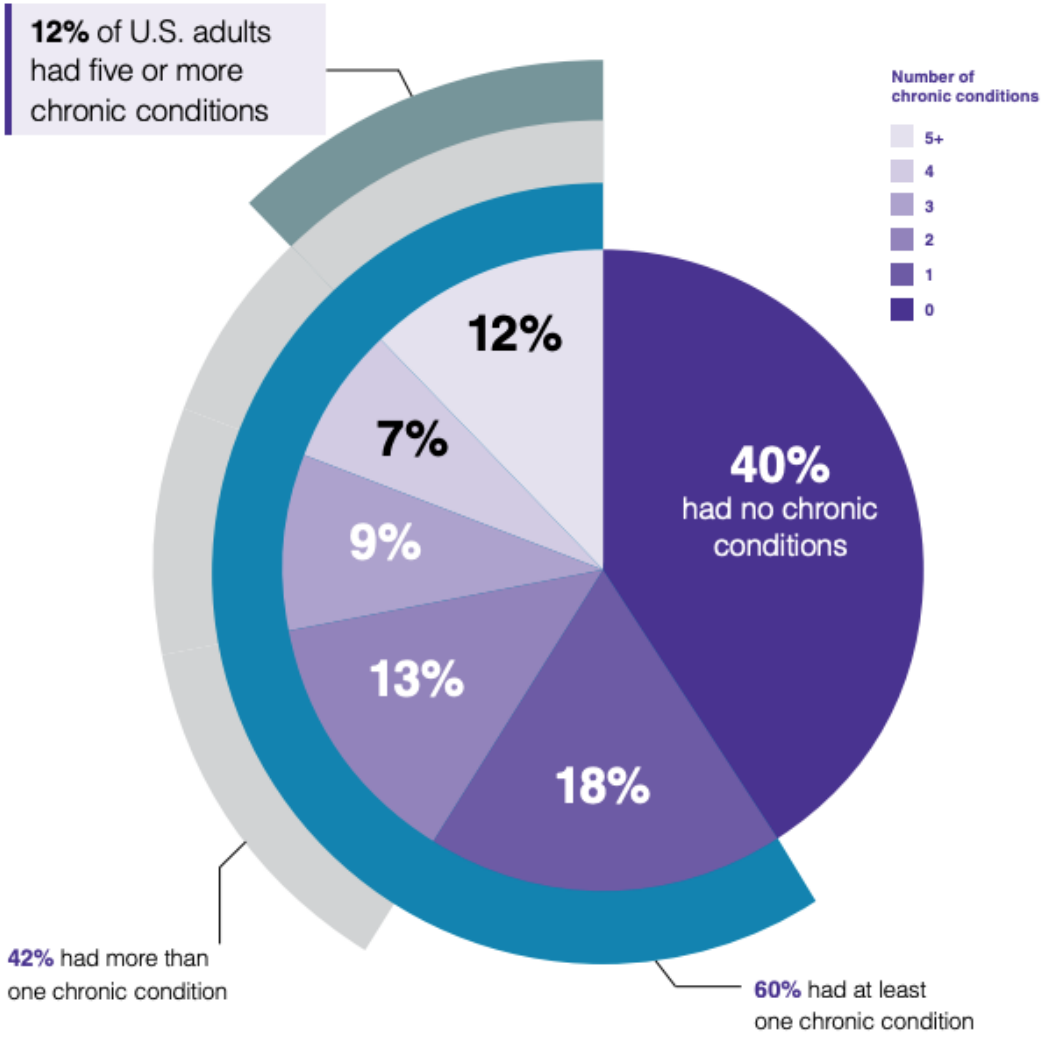
# 42% of US Adults Have >1 Chronic Condition

## Percentage of US Adults with Multiple Chronic Conditions (2014)




Source: Buttorff C, et al. *Multiple Chronic Conditions in the United States*. Rand Corp., (2017).

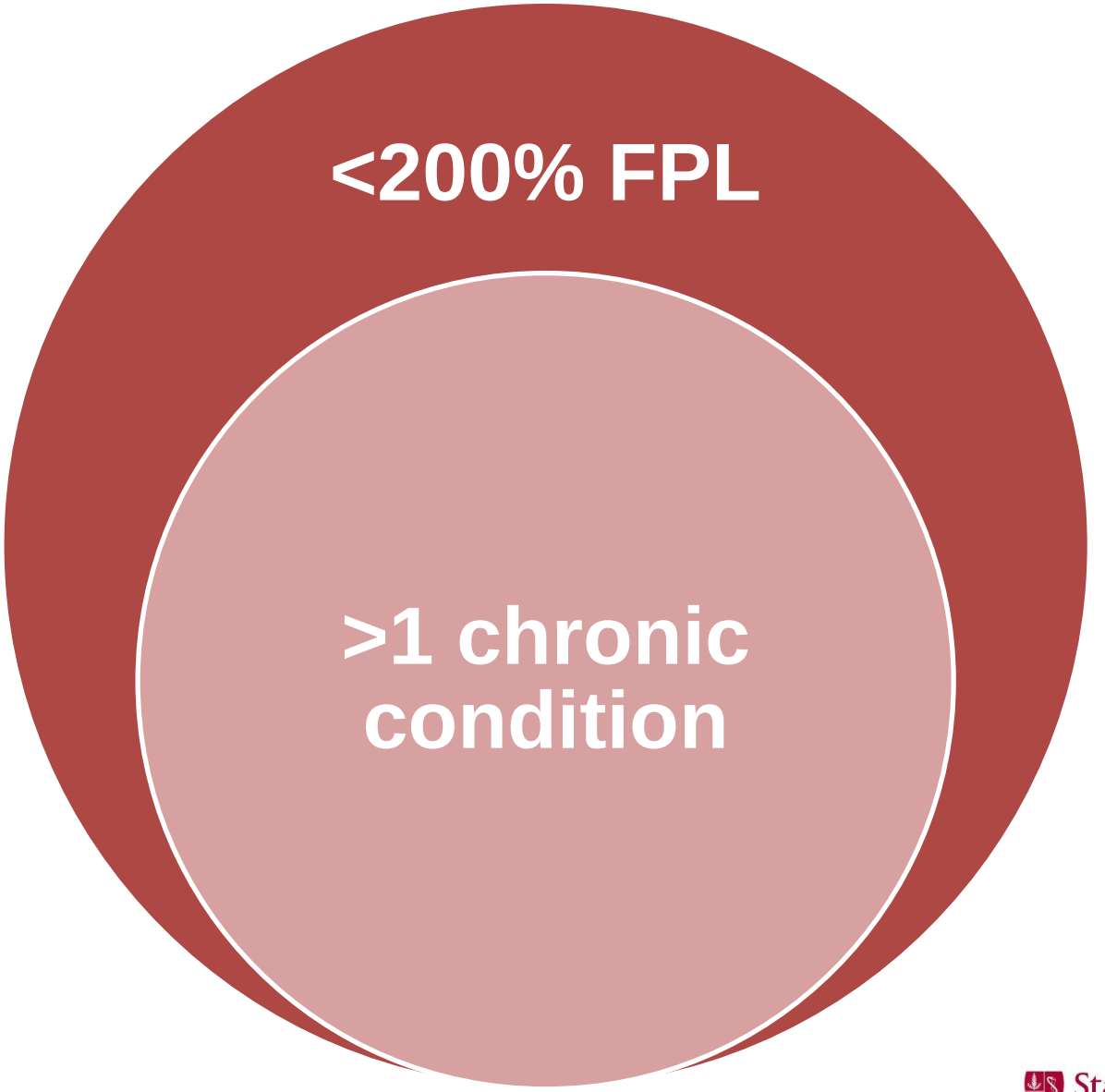
***"Among people who have chronic medical and behavioral health conditions, those with low incomes have higher health care spending compared to patients with higher incomes."***

Commonwealth Fund Report, 2018

# Target Population - Outpatient

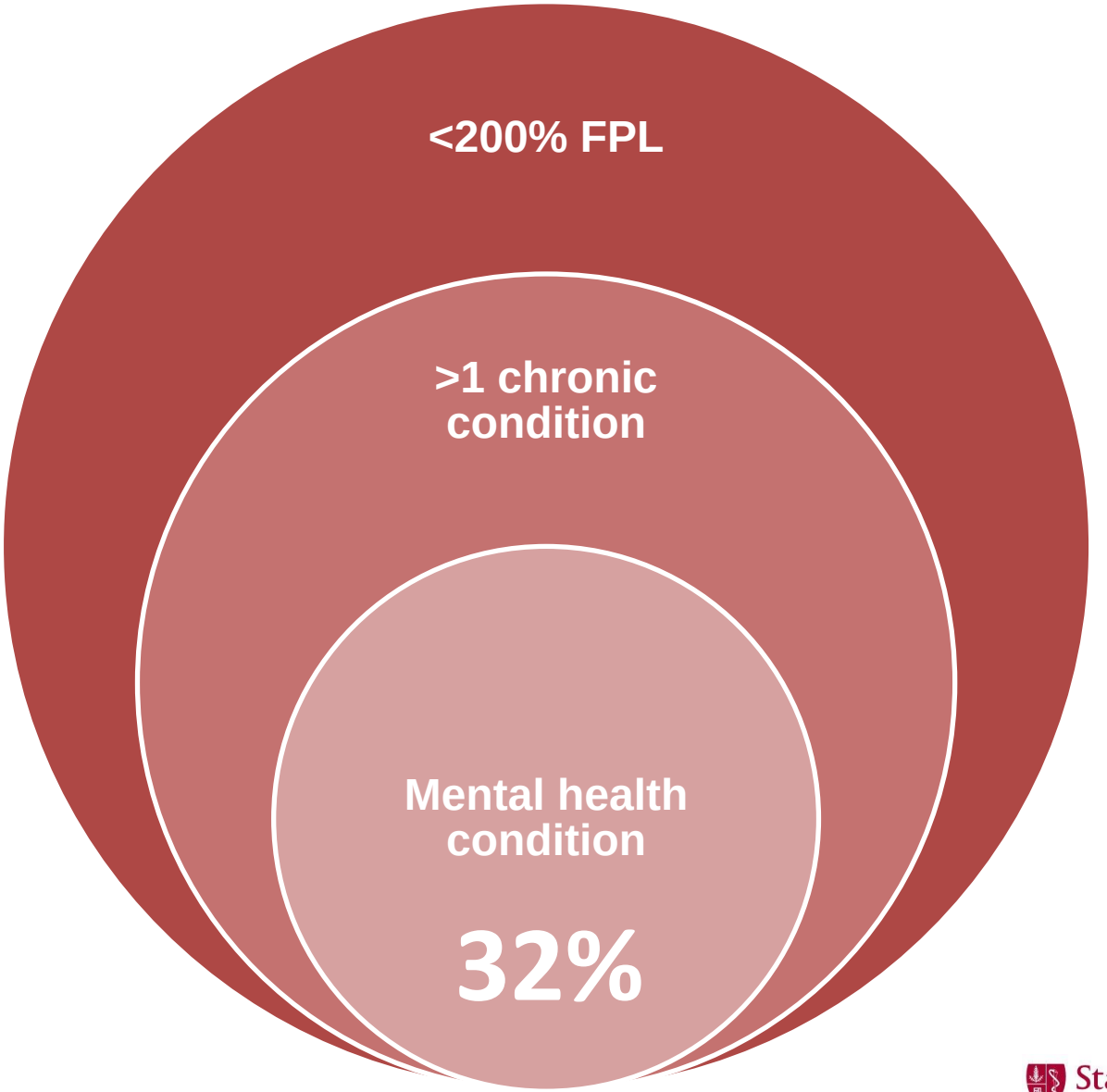

Source: 2011-2014 MEPS Data

# Target Population - Outpatient



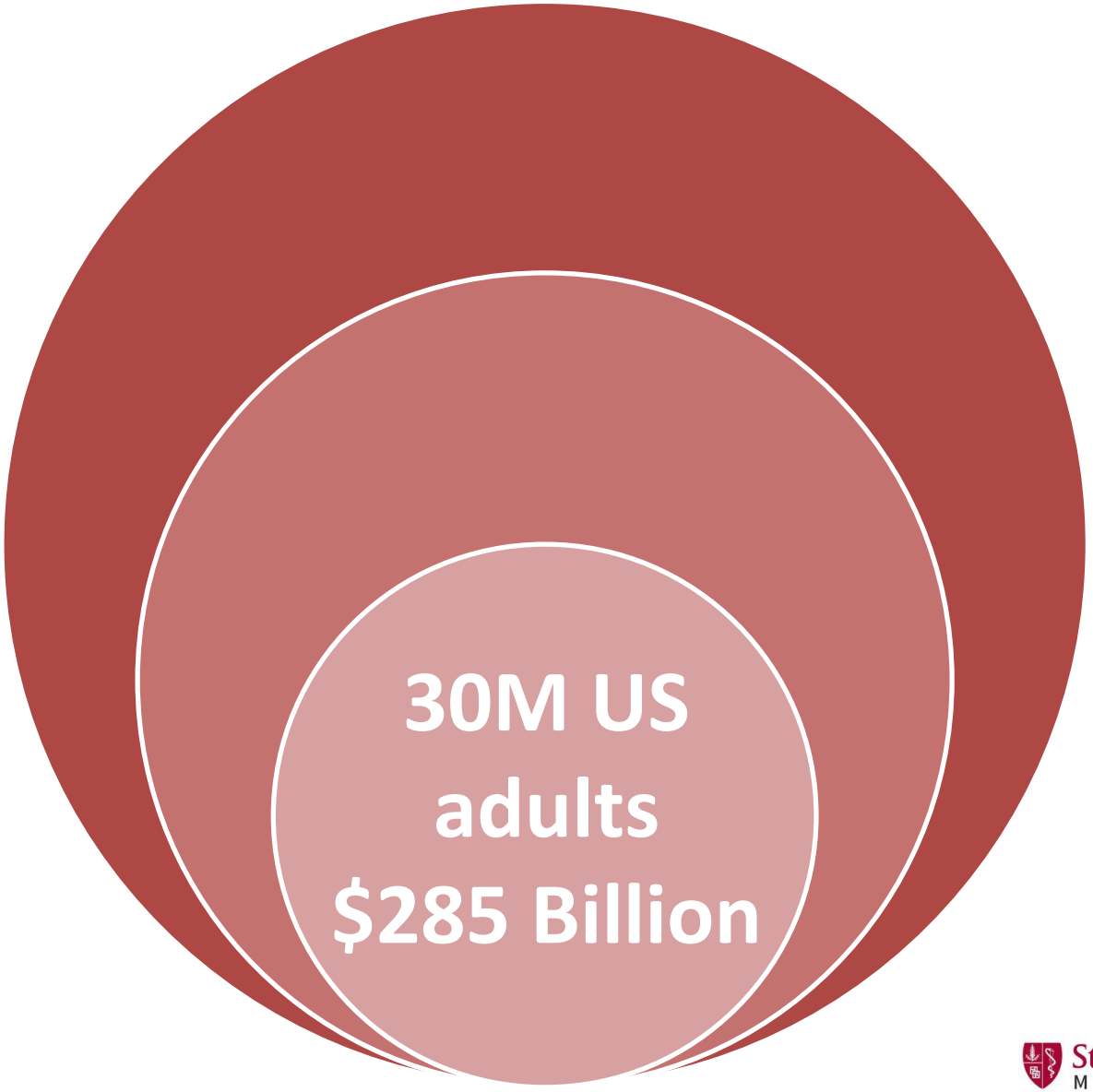

Source: 2011-2014 MEPS Data

# Target Population - Outpatient




Source: 2011-2014 MEPS Data

# Target Population - Outpatient

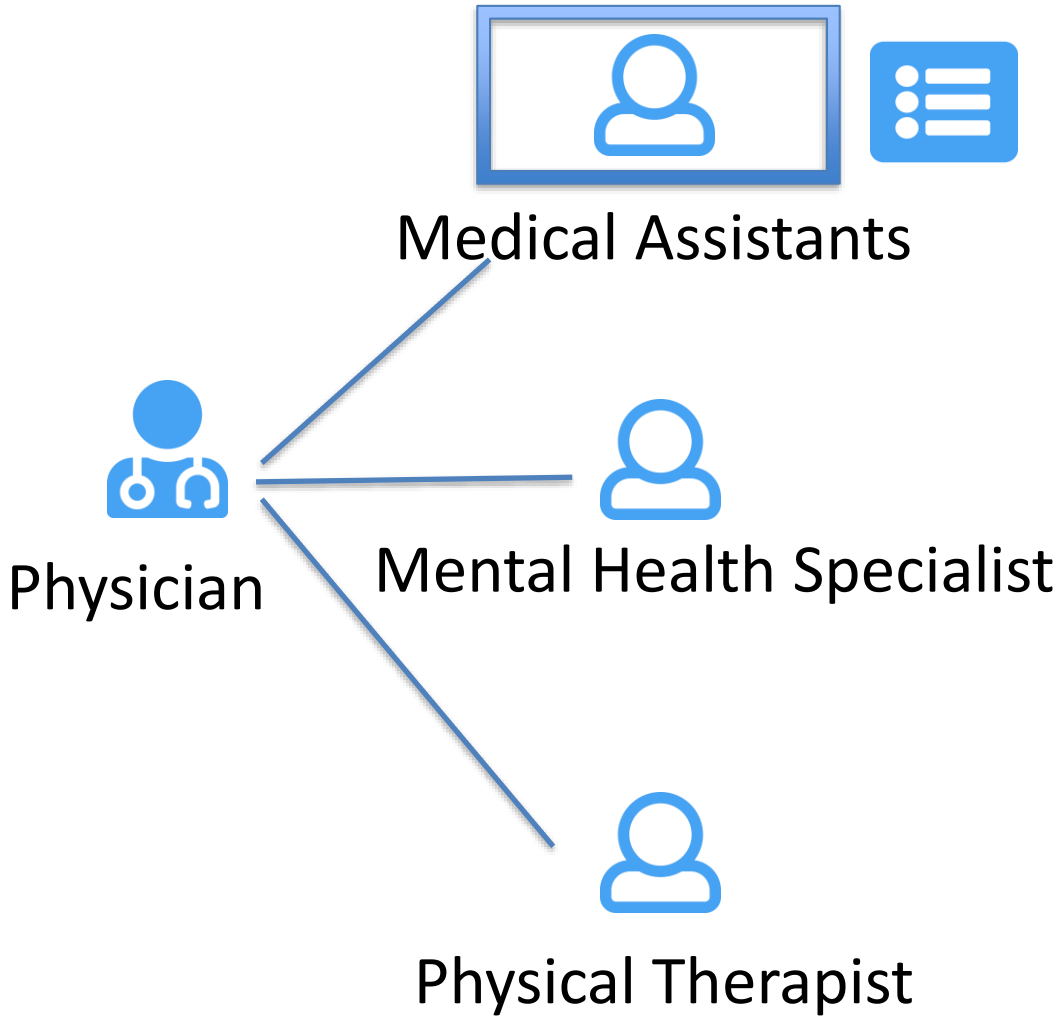



Source: 2011-2014 MEPS Data

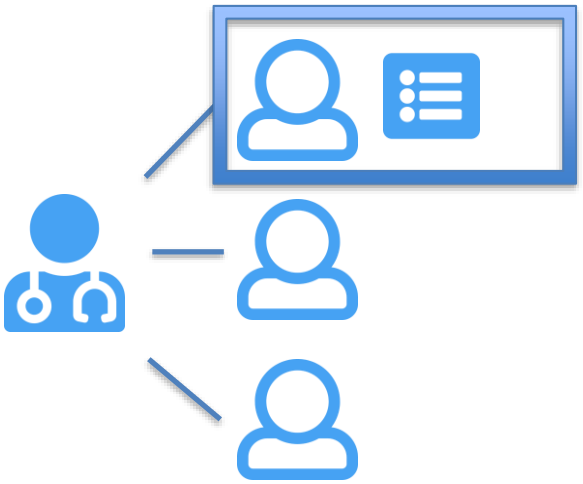
# Primary Care


Source: unsplash

# Expanded Medical Assistant Role: Technology



# Improving Satisfaction, Quality and Cost

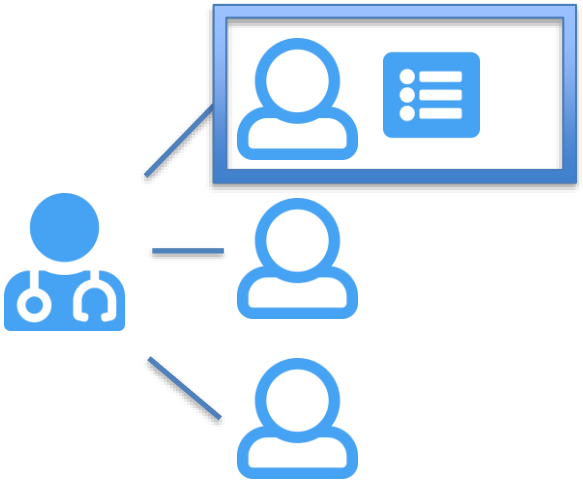


>25% reduction in hospital admissions

99th percentile patient satisfaction

Source: Case Example #1: Stanford Coordinated Care. November 2016. Agency for Healthcare Research and Quality, Rockville, MD.

# Improving Satisfaction, Quality and Cost



13-28% cost savings

>25% reduction in hospital admissions

99th percentile patient satisfaction

Source: Case Example #1: Stanford Coordinated Care. November 2016. Agency for Healthcare Research and Quality, Rockville, MD.

# Cost Drivers

Healthcare is Fragmented

Unaddressed Barriers to Care

Healthcare is Reactive

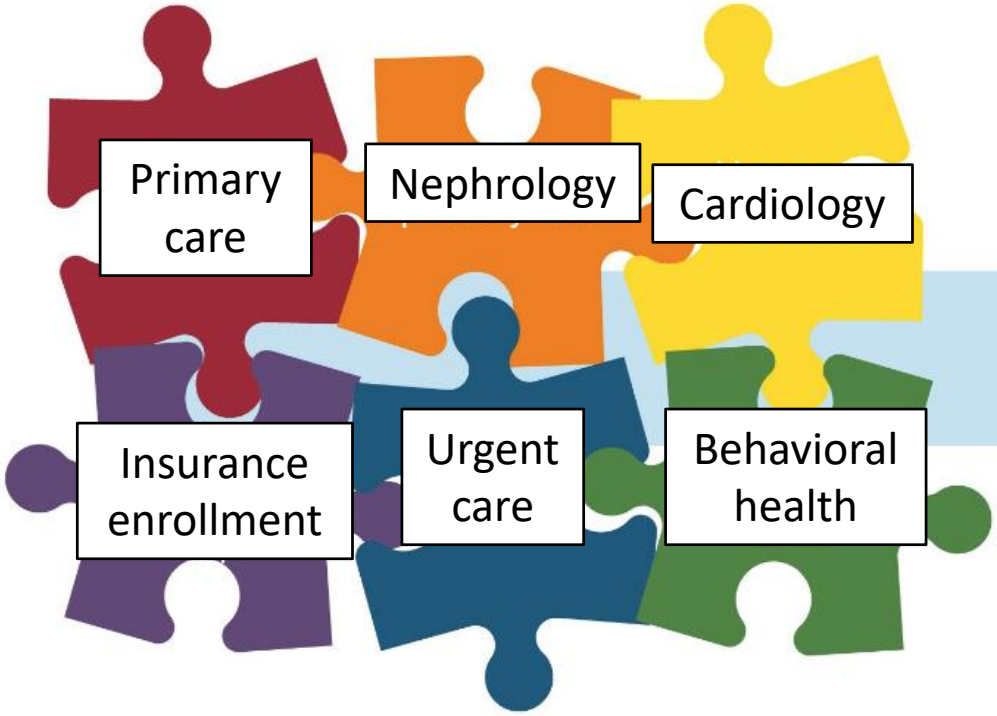
# Cost Drivers

**Healthcare is Fragmented**

Unaddressed Barriers to Care

Healthcare is Reactive

# Healthcare is Fragmented




Lack of Appropriate Follow-up Testing

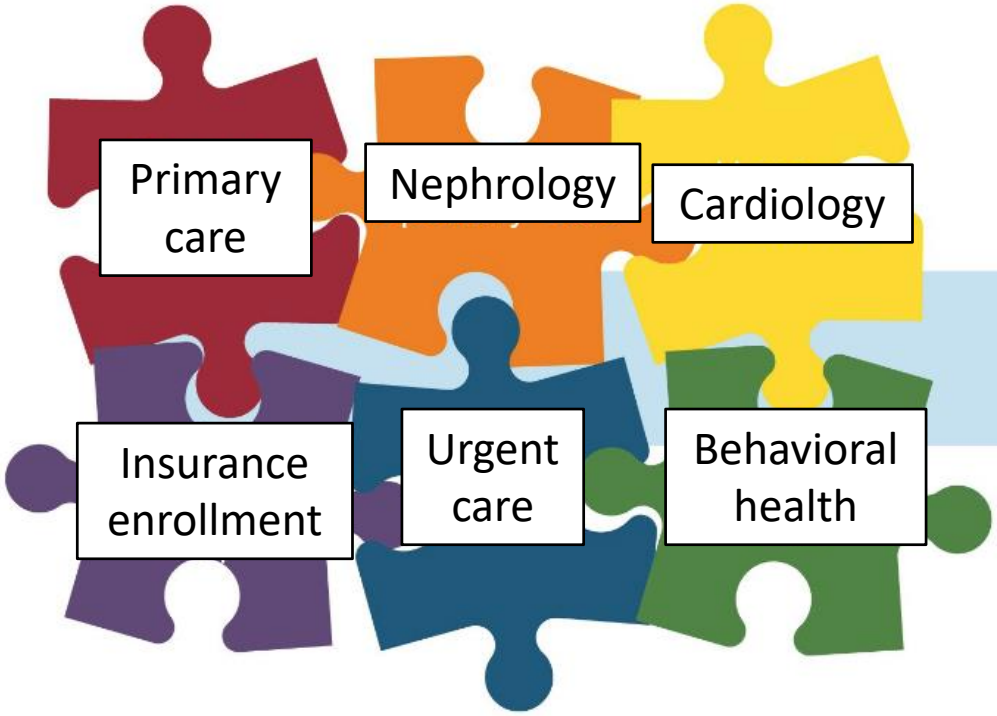
Diagnostic Errors

Hospital Readmission

Avoidable ER visits[1]

Source: Kern LM et al. *Am J Manag Care*, (2018).

# Fragmentation Leads To Wasteful Spending




$25-45 Billion[1]

[1]Source:Berwick DM et al. *JAMA*, (2012).

# Solutions

**Healthcare is Fragmented**

Unaddressed Barriers to Care

Healthcare is Reactive

# Solutions

~~Healthcare is Fragmented~~

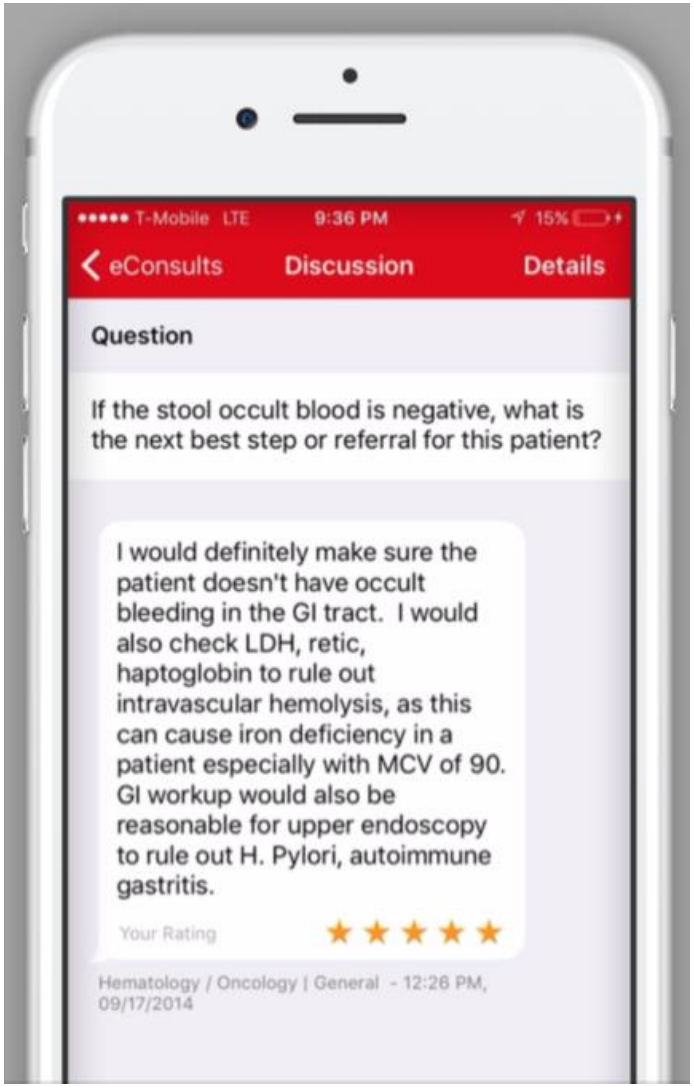
TEAM

Specialty e-consults

Unaddressed Barriers to Care

Healthcare is Reactive

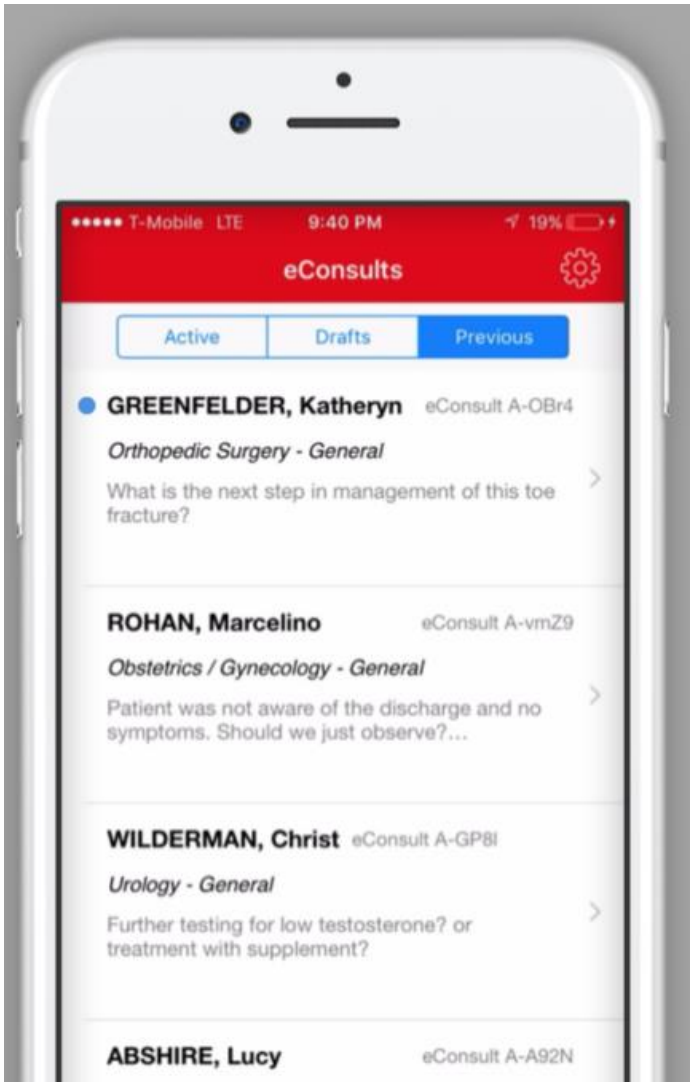
# Specialty e-Consults




What is the next best step for this patient?

Image source: RubiconMD

# Specialty e-Consults




- Pharmacy
- Psychiatry
- Cardiology
- Nephrology

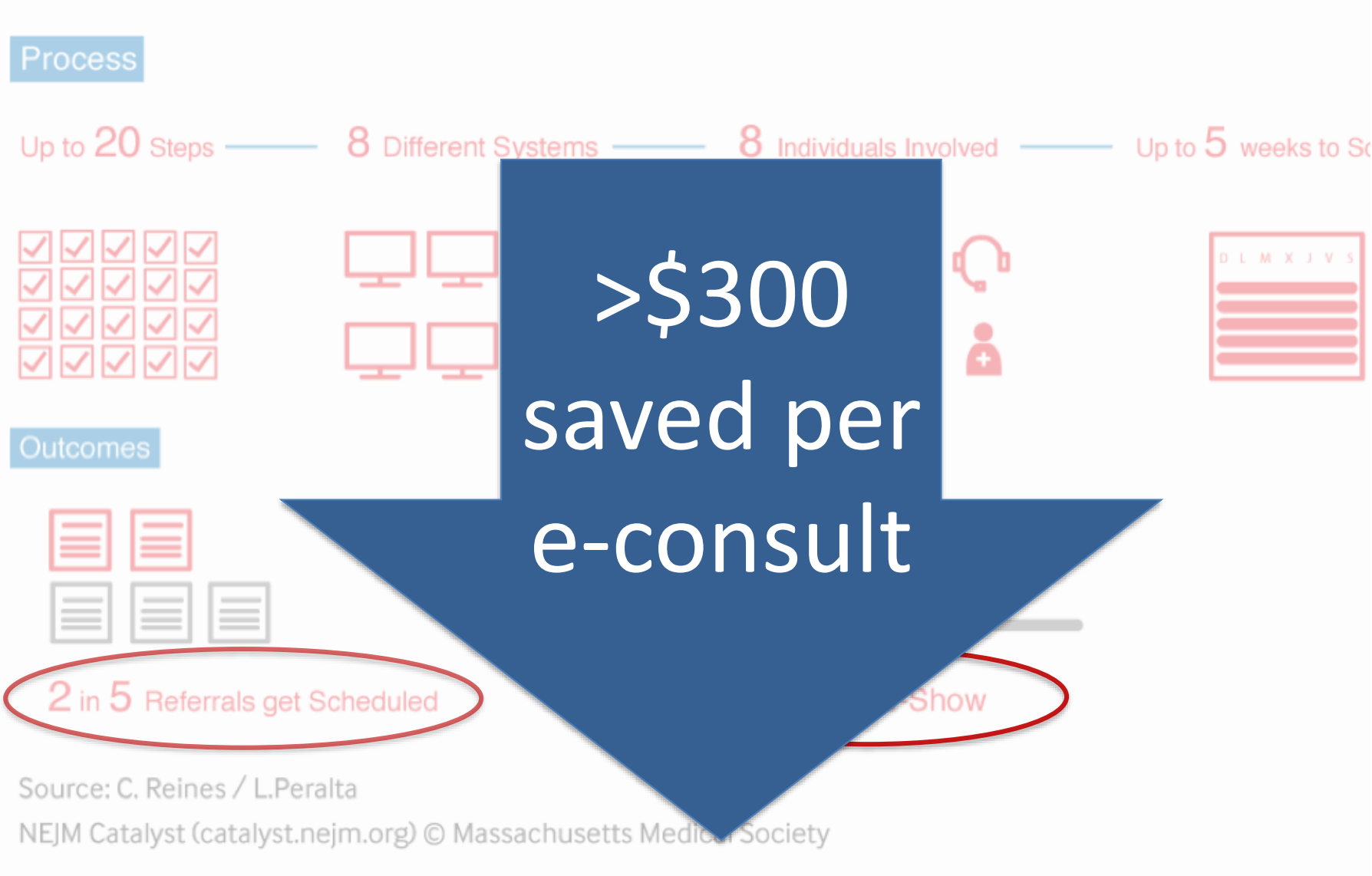
Image source: RubiconMD

# Traditional Consults Are Complex


Source: C. Reines / L.Peralta

NEJM Catalyst (catalyst.nejm.org) © Massachusetts Medical Society

# Specialty e-Consults Yield Savings




>$300 saved per e-consult

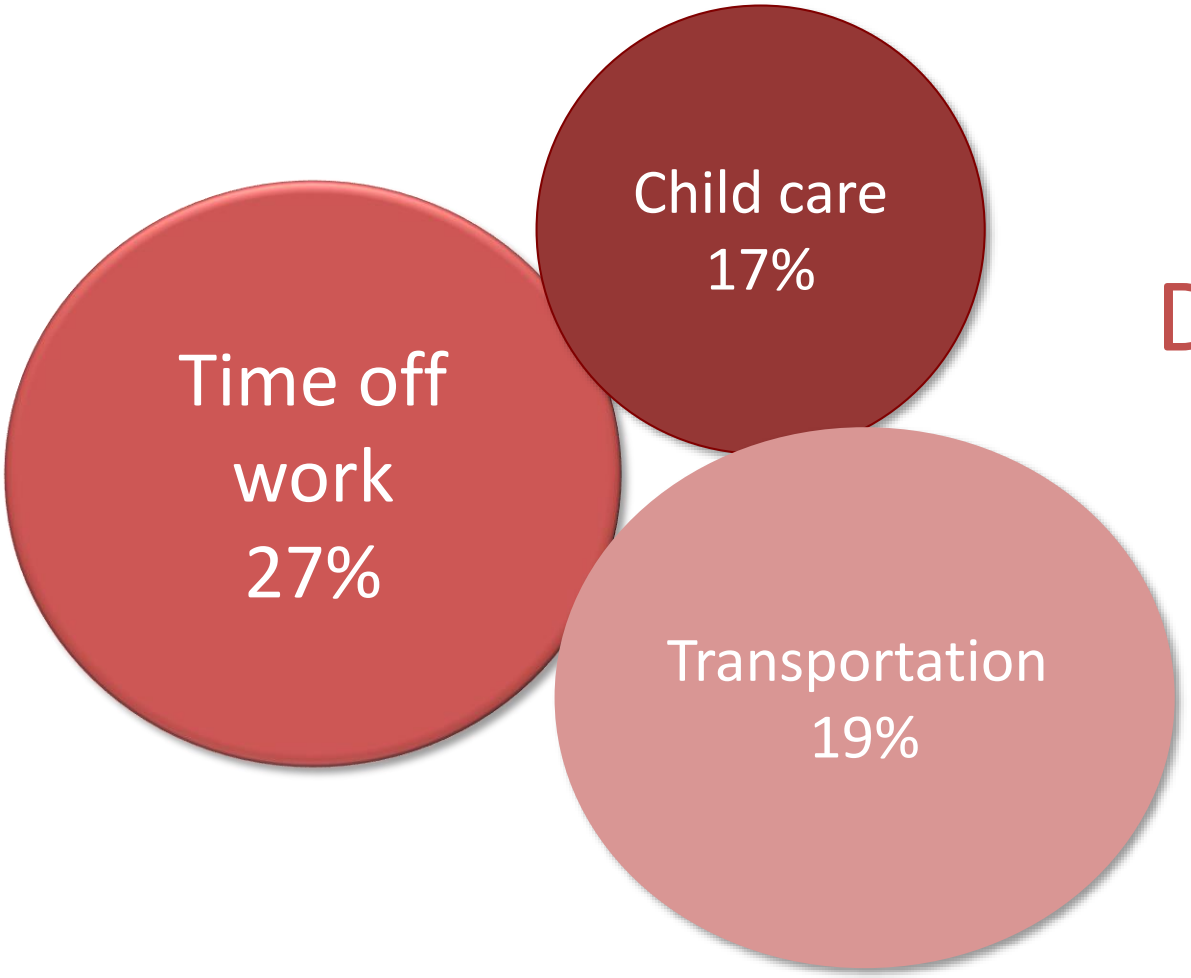
# Cost Drivers

Healthcare is Fragmented

**Unaddressed Barriers to Care**

Healthcare is Reactive

# Lower Income Individuals Experience More Barriers to Care

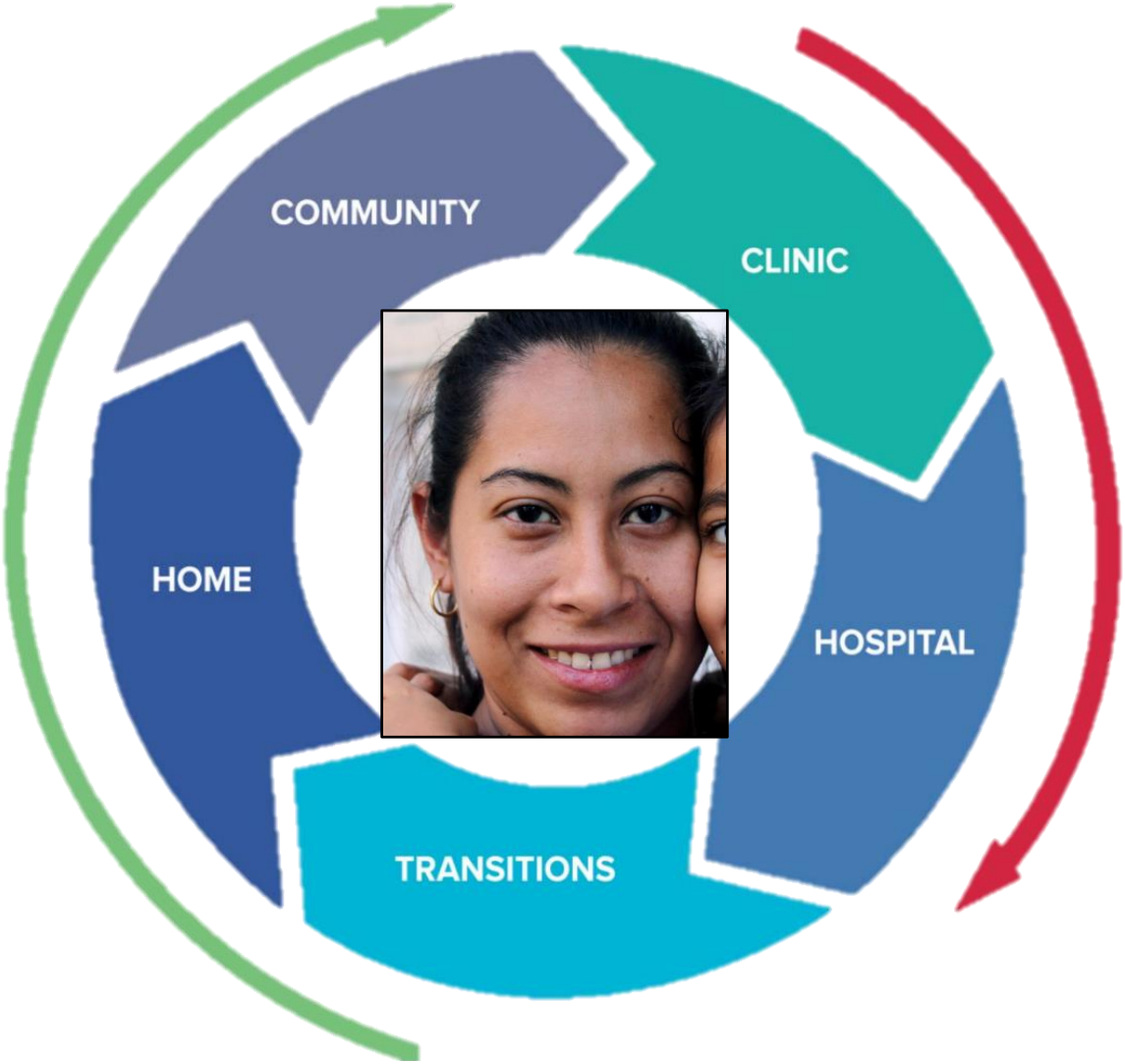



Delayed or avoided care

Source: Kaiser Family Foundation, 2017

# Cost Driver- Unaddressed Barriers to Care

**80% Cost Impact**




**80% Effort**

# Solutions

Healthcare is Fragmented

**Unaddressed Barriers to Care**

Healthcare is Reactive

# Solutions

Healthcare is Fragmented

~~**Unaddressed Barriers to Care**~~

**TARGET**

Social services platform

Patient goal-directed care

Healthcare is Reactive

# TARGET SOCIAL DETERMINANTS

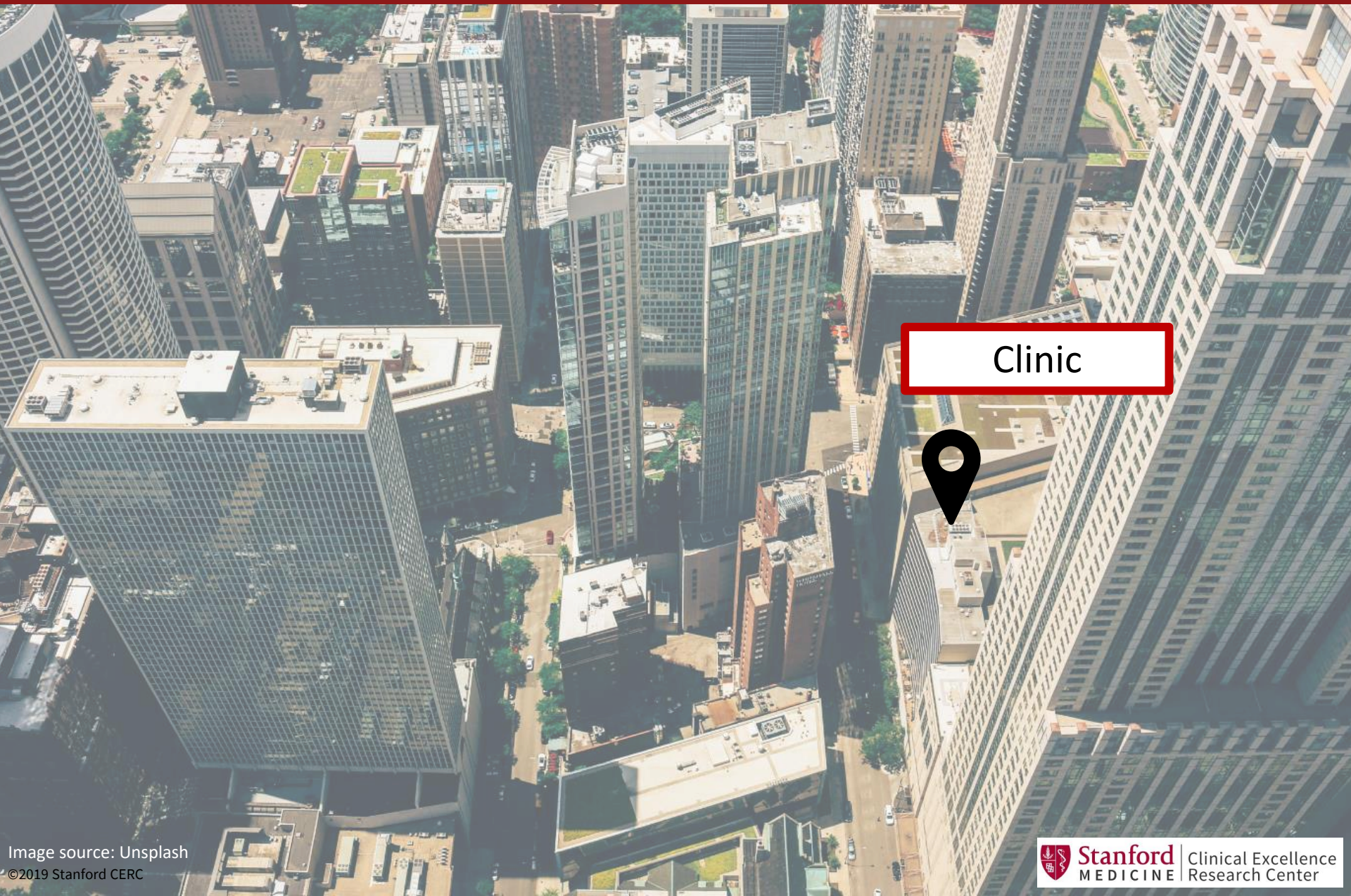



Image source: Unsplash



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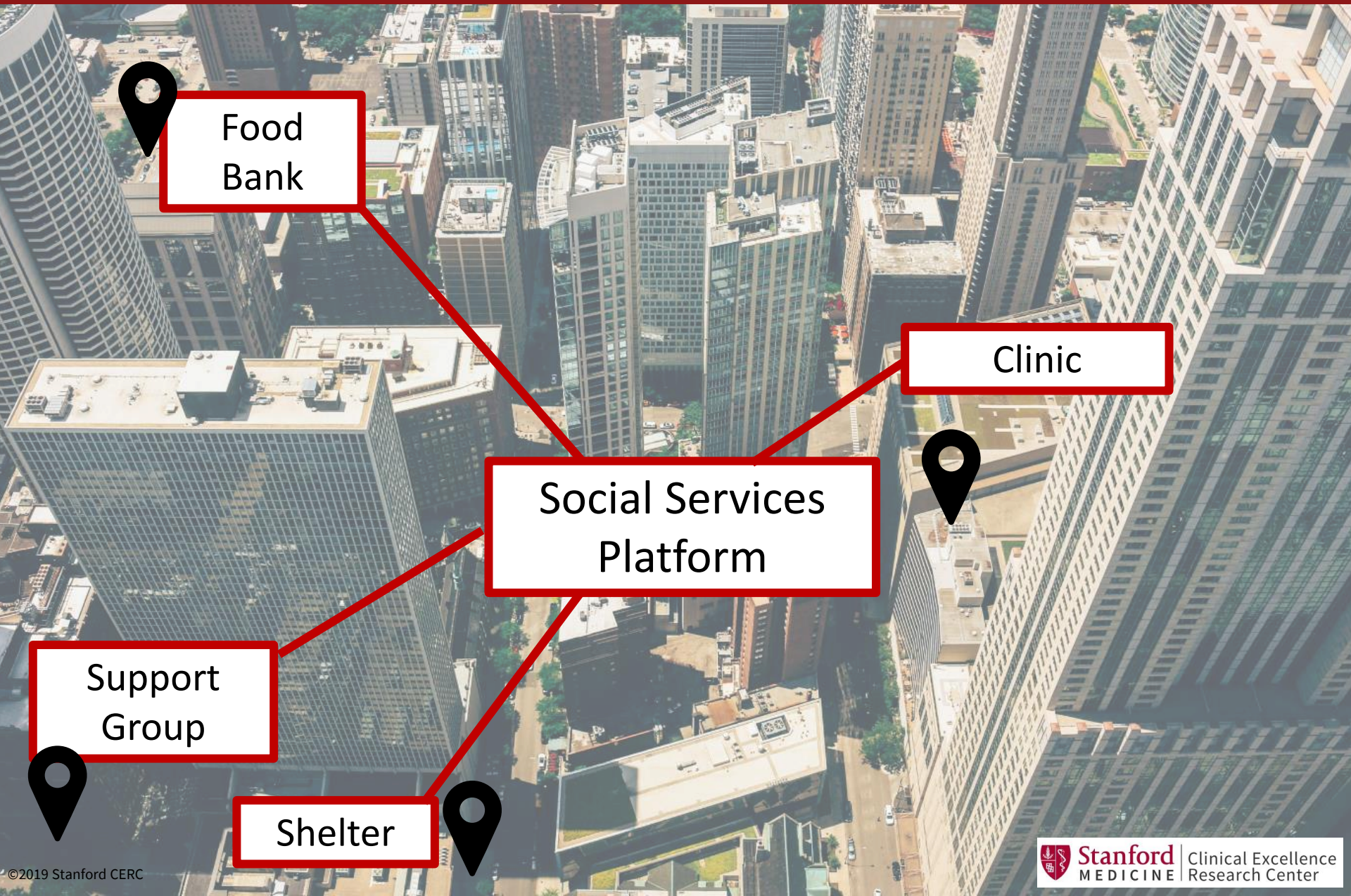




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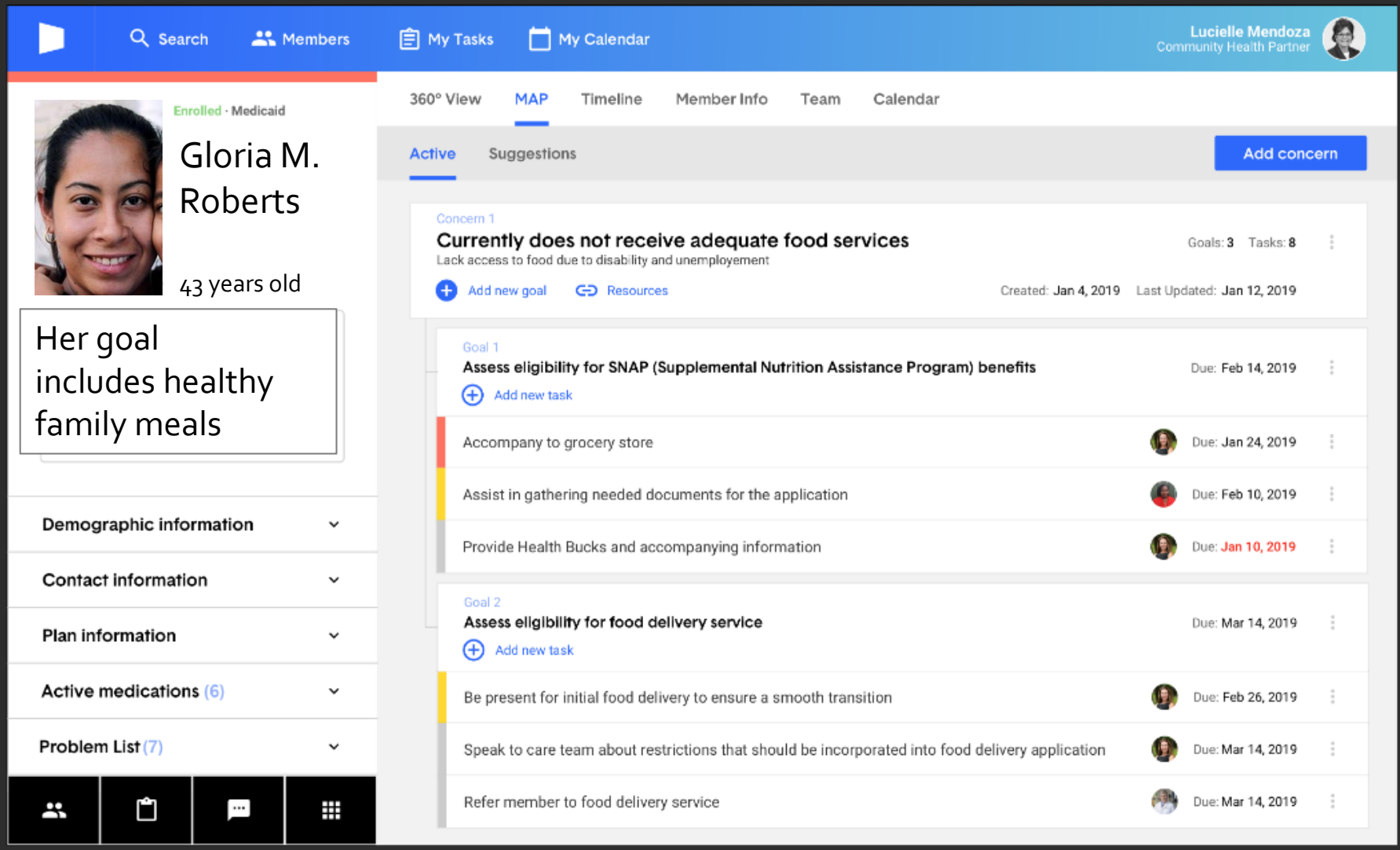
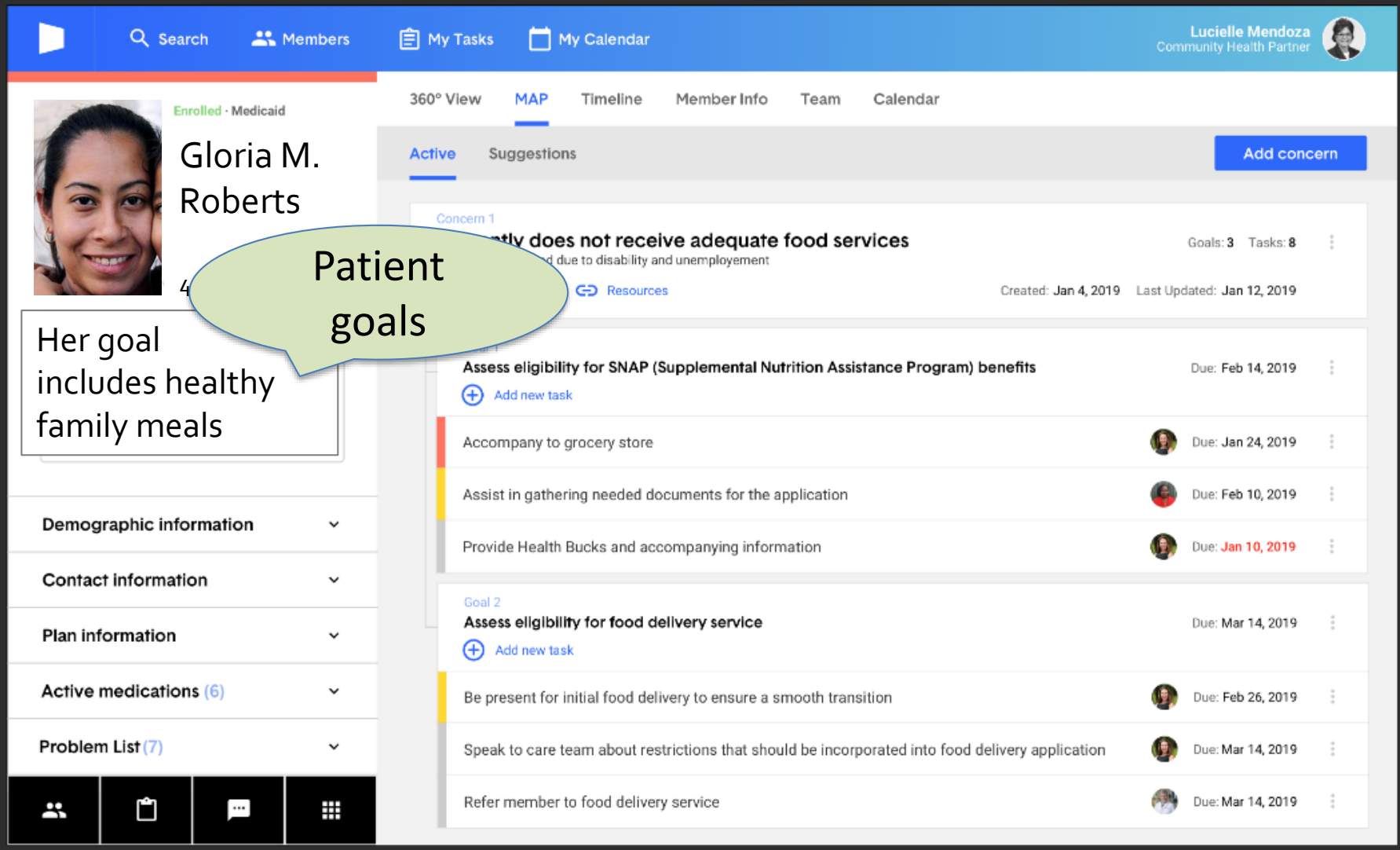



Image source: City Block

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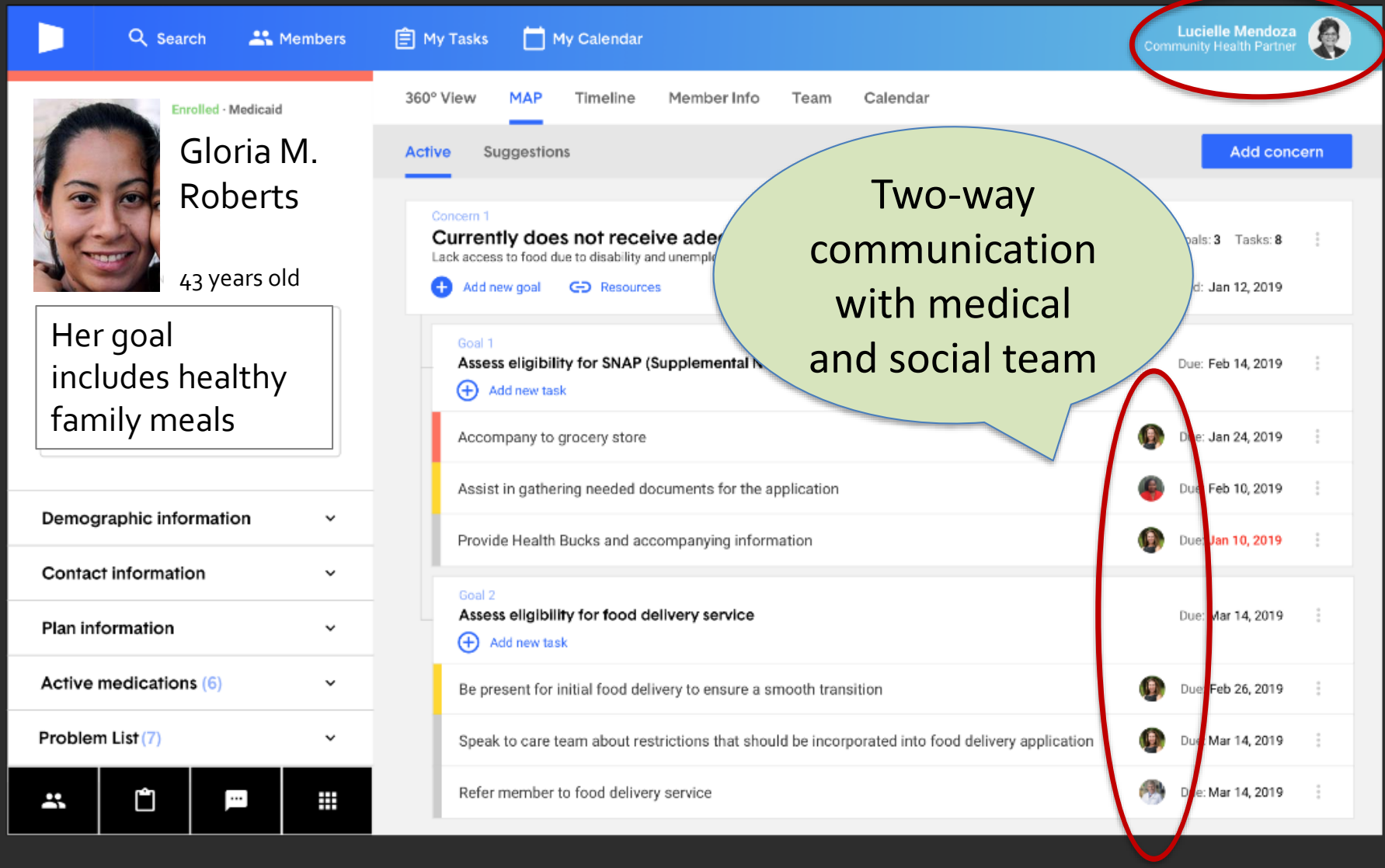


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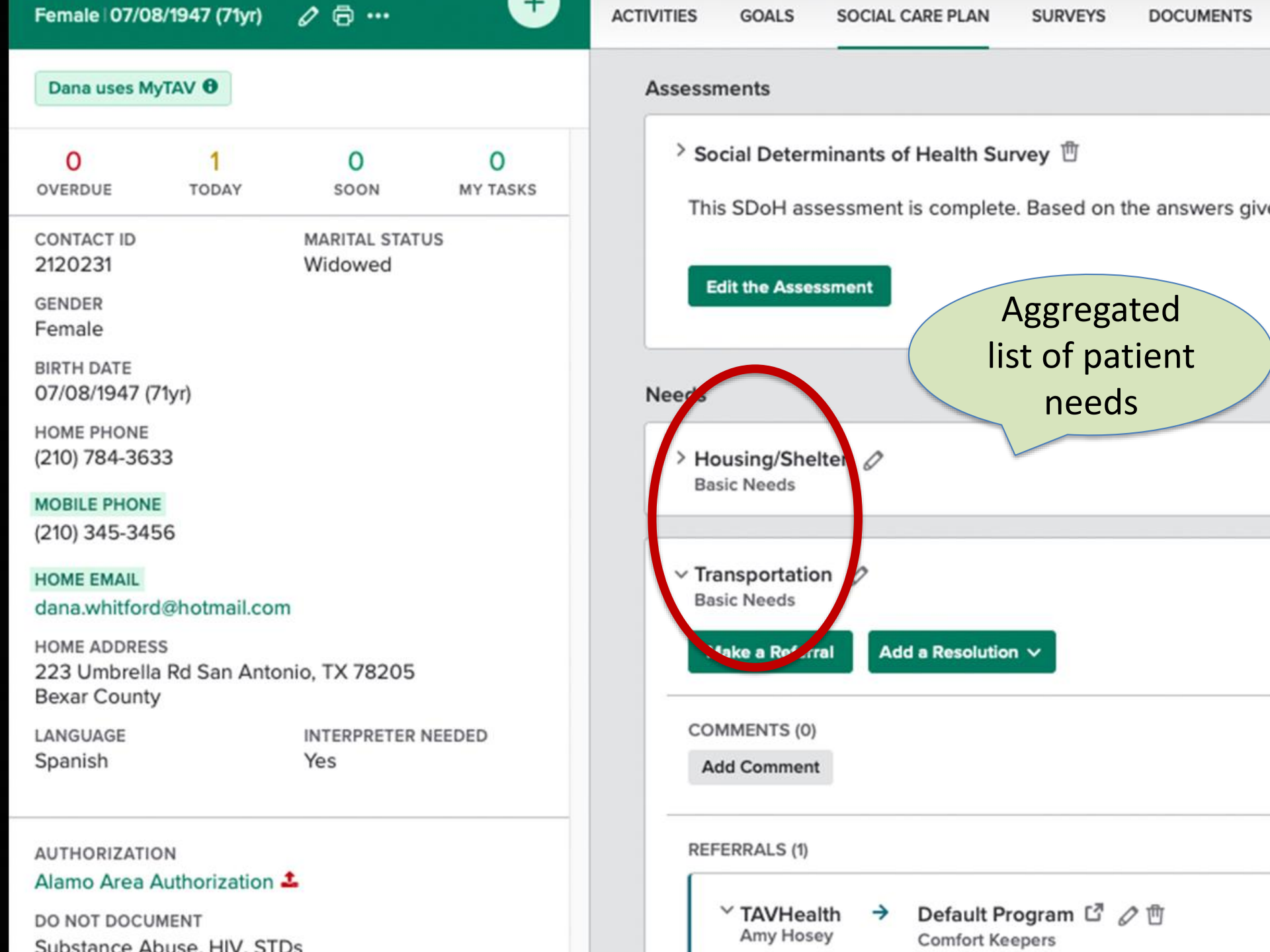
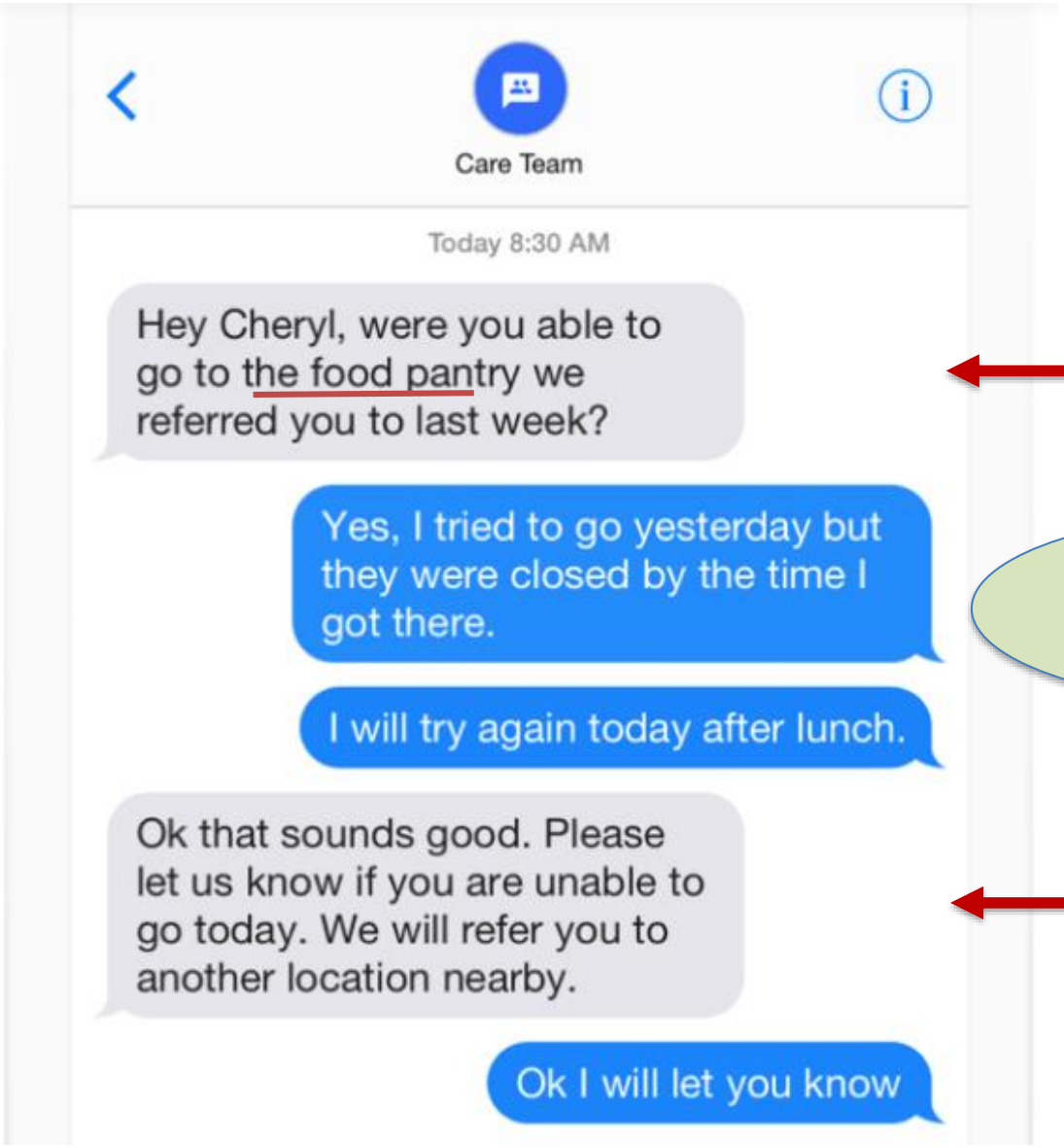

Female | 07/08/1947 (71yr)
ACTIVITIES
GOALS
SOCIAL CARE PLAN
SURVEYS
DOCUMENTS
Dana uses MyTAV
0 OVERDUE
1 TODAY
0 SOON
0 MY TASKS
CONTACT ID
2120231
MARITAL STATUS
Widowed
GENDER
Female
BIRTH DATE
07/08/1947 (71yr)
HOME PHONE
(210) 784-3633
MOBILE PHONE
(210) 345-3456
HOME EMAIL
dana.whitford@hotmail.com
HOME ADDRESS
223 Umbrella Rd San Antonio, TX 78205
Bexar County
LANGUAGE
Spanish
INTERPRETER NEEDED
Yes
AUTHORIZATION
Alamo Area Authorization
DO NOT DOCUMENT
Substance Abuse, HIV, STDs
Assessments
Social Determinants of Health Survey
This SDoH assessment is complete. Based on the answers give
Edit the Assessment
Aggregated list of patient needs
Needs
Housing/Shelter
Basic Needs
Transportation
Basic Needs
Make a Referral
Add a Resolution
COMMENTS (0)
Add Comment
REFERRALS (1)
TAVHealth
Amy Hosey
Default Program
Comfort Keepers

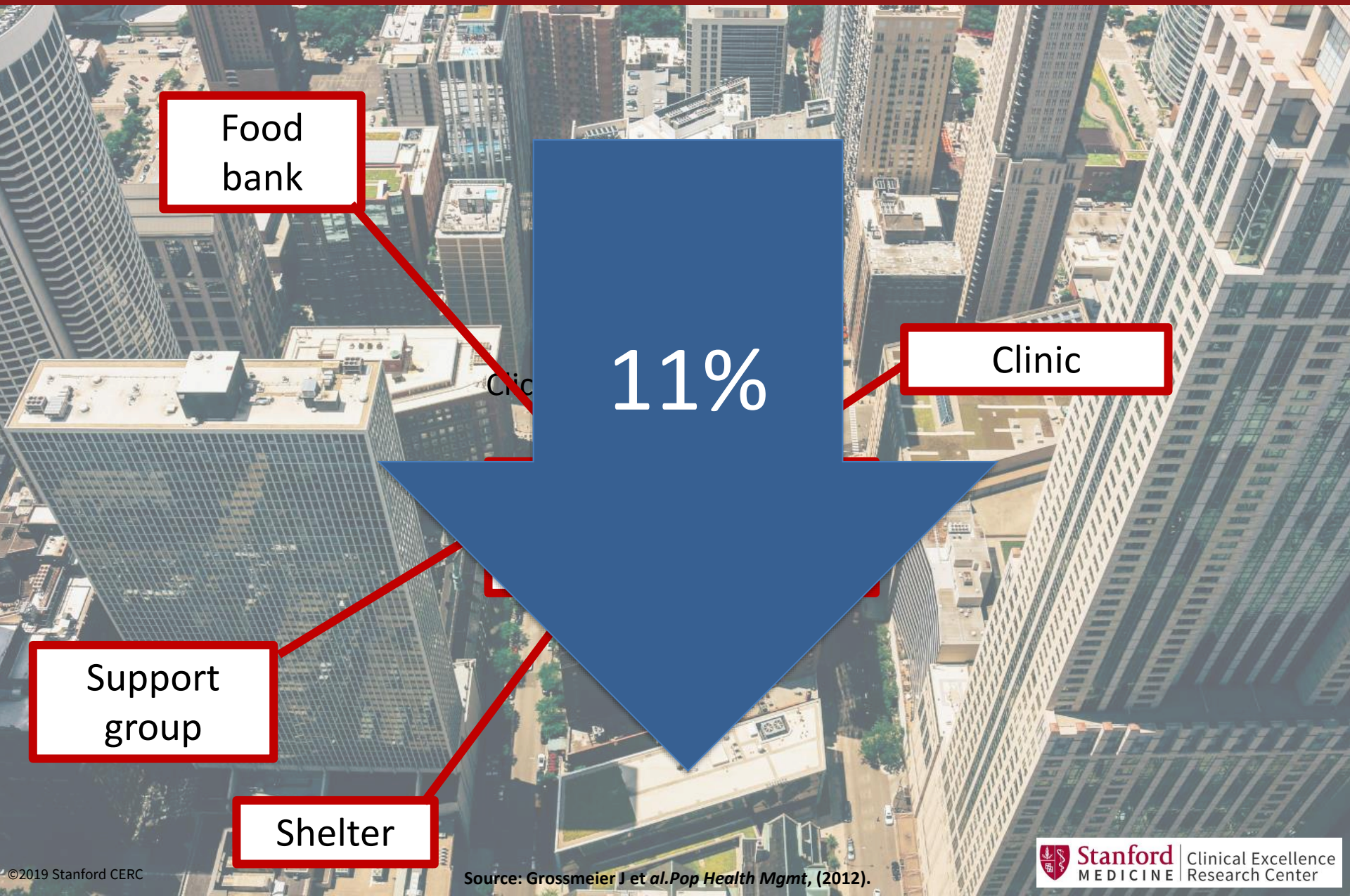
# TARGET SOCIAL DETERMINANTS




Direct communication

Image source: City Block

# TARGET SOCIAL DETERMINANTS






Source: Grossmeier J et *al.Pop Health Mgmt*, (2012).

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# Cost Drivers

Healthcare is Fragmented

Unaddressed Barriers to Care

**Healthcare is Reactive**

# Cost Driver- Healthcare is Reactive

"sick care" ⬆ costs ⬇ quality

**$45 Billion**[1]

**13-27% more ED visits**[2]

Avoidable **Admissions**[2]

[1]The Healthcare Imperative: Lowering Costs and Improving Outcomes National Academies Press, (2011).
[2]Frandsen, BR. *Am J Manag Care.* (2015).

# Solutions

Healthcare is Fragmented

Unaddressed Barriers to Care

**Healthcare is Reactive**

# Solutions

Healthcare is Fragmented

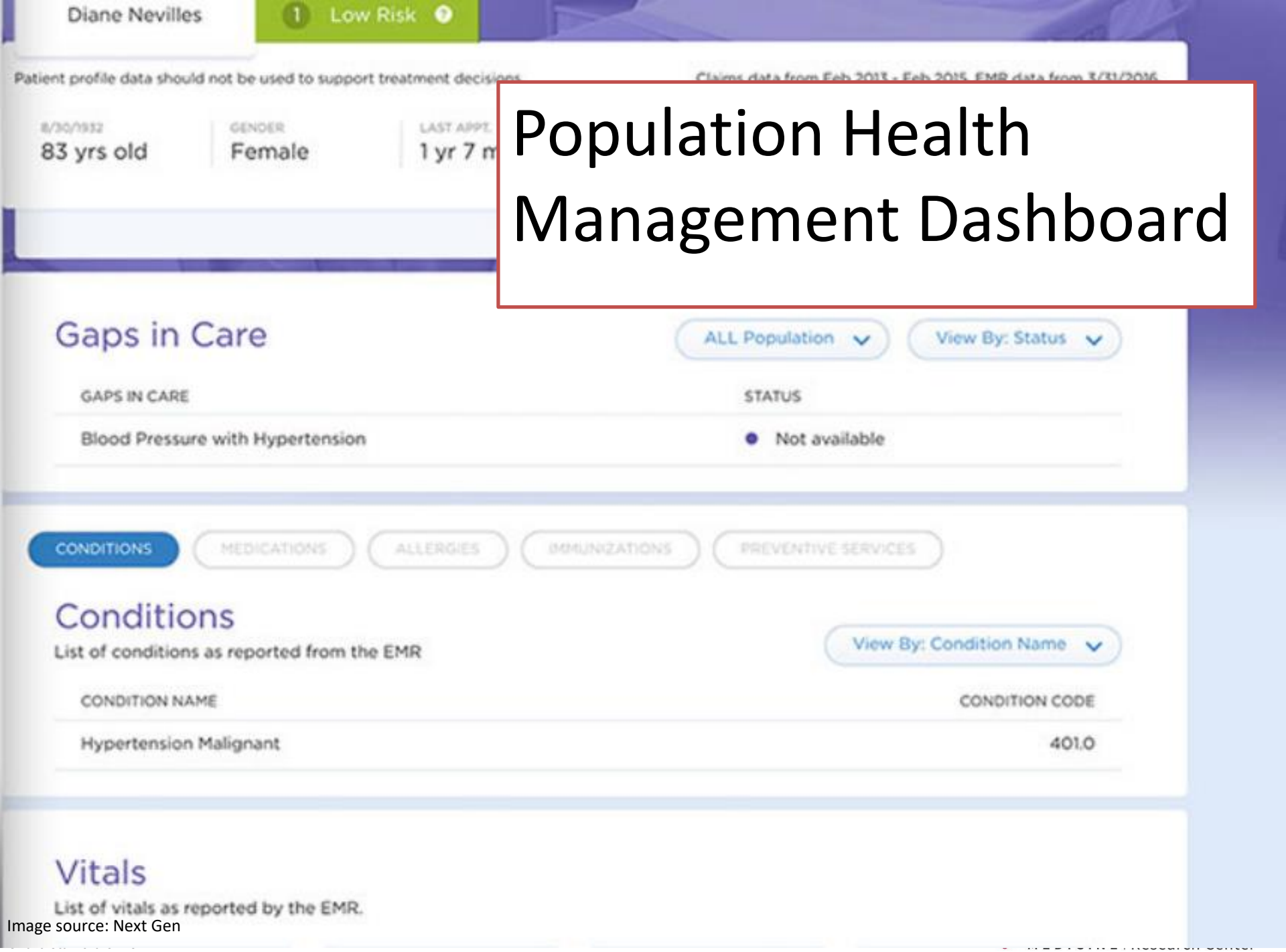
Unaddressed Barriers to Care

~~Healthcare is Reactive~~

**TIMELY**

Population health management platform

24/7 communication tools




# Population Health Management Dashboard

Image source: Next Gen

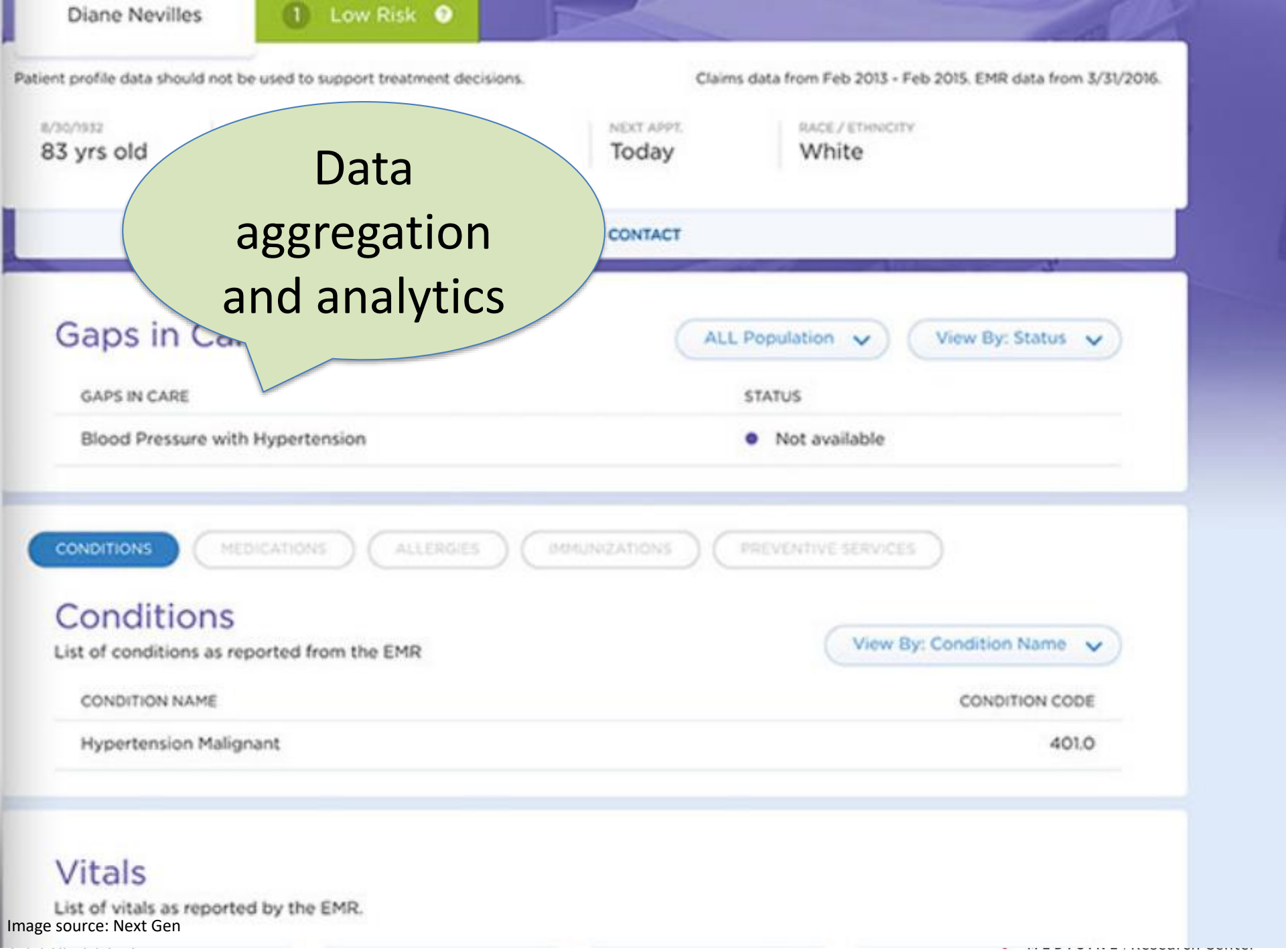
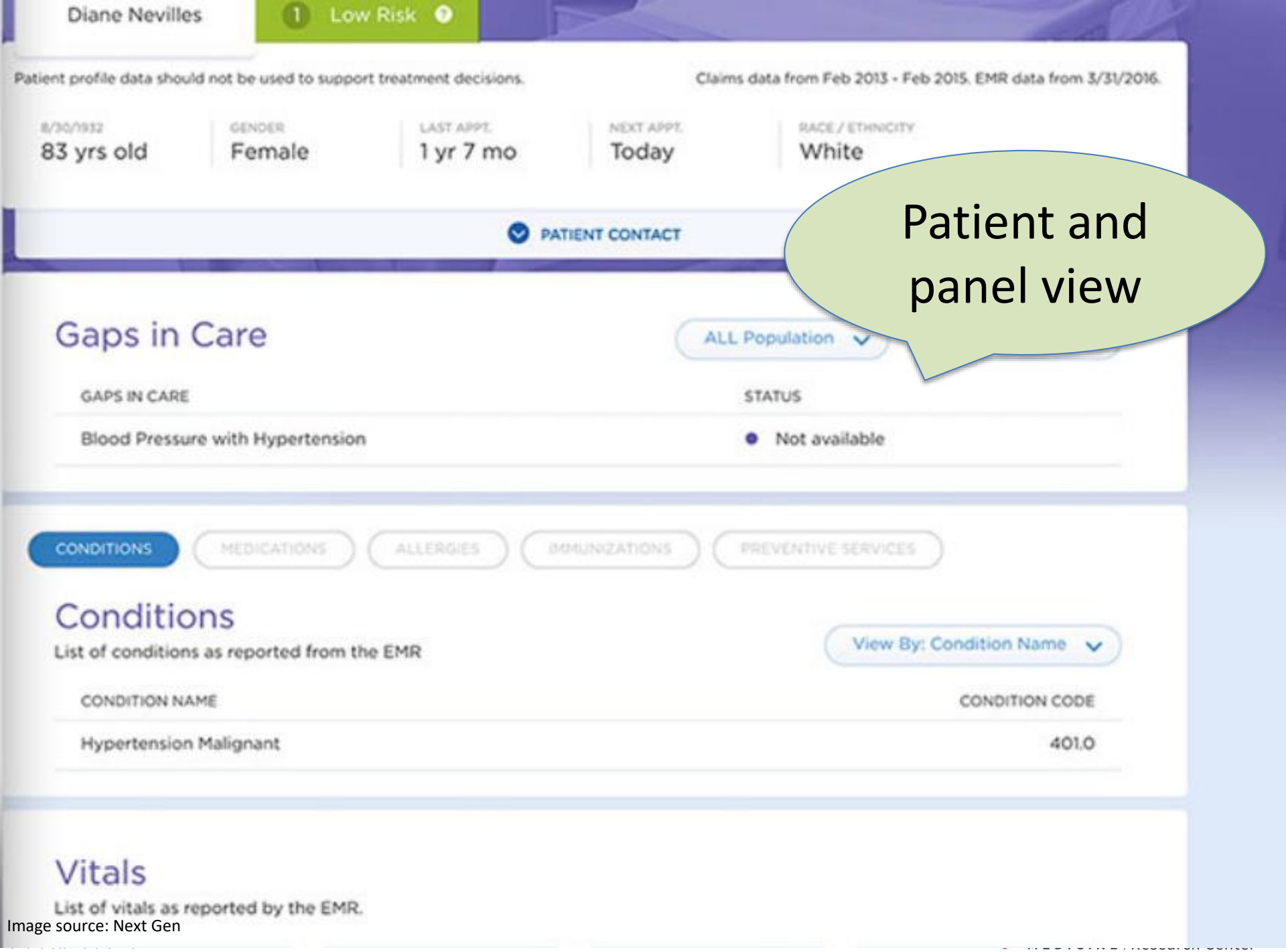


Image source: Next Gen



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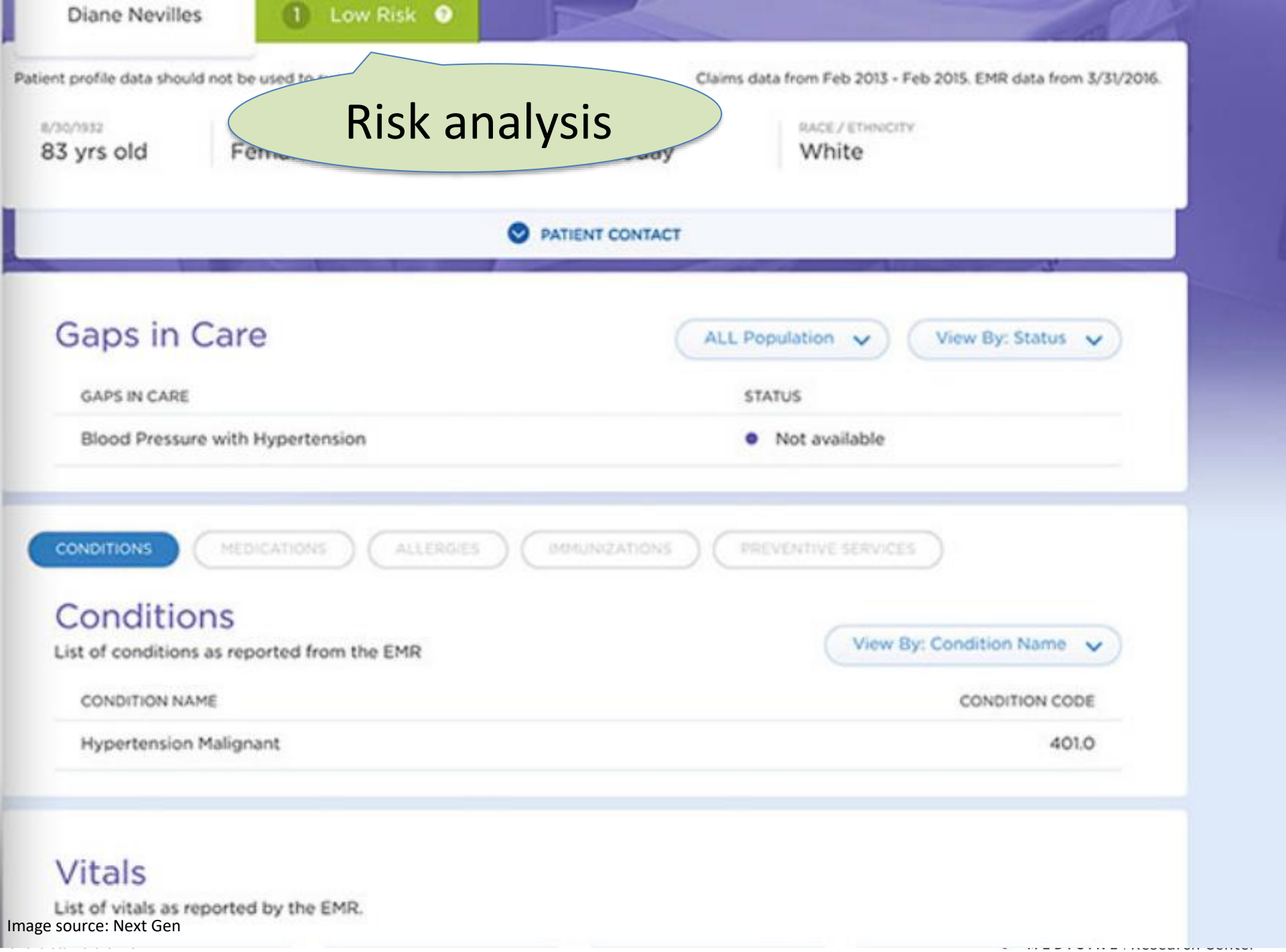

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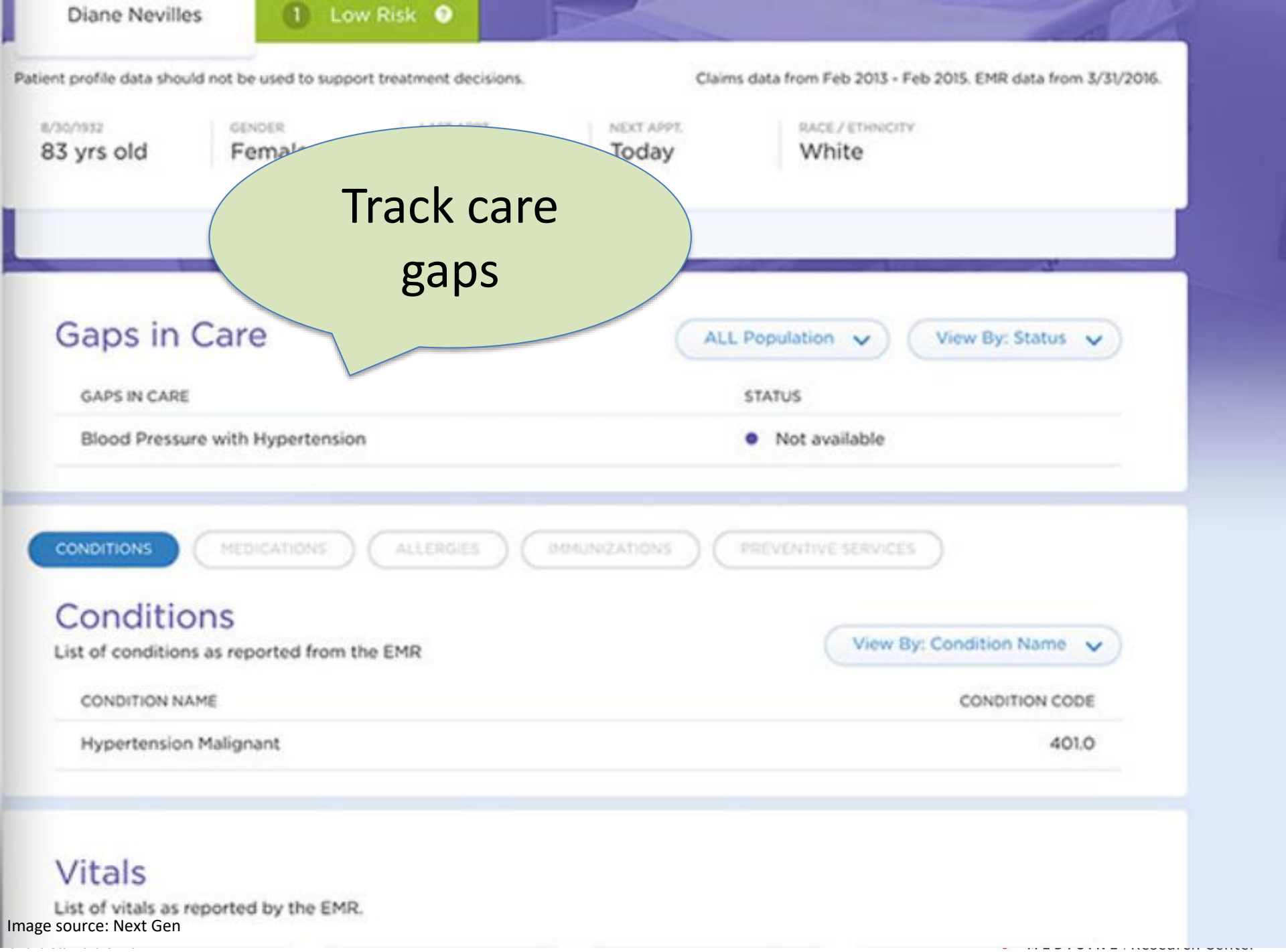

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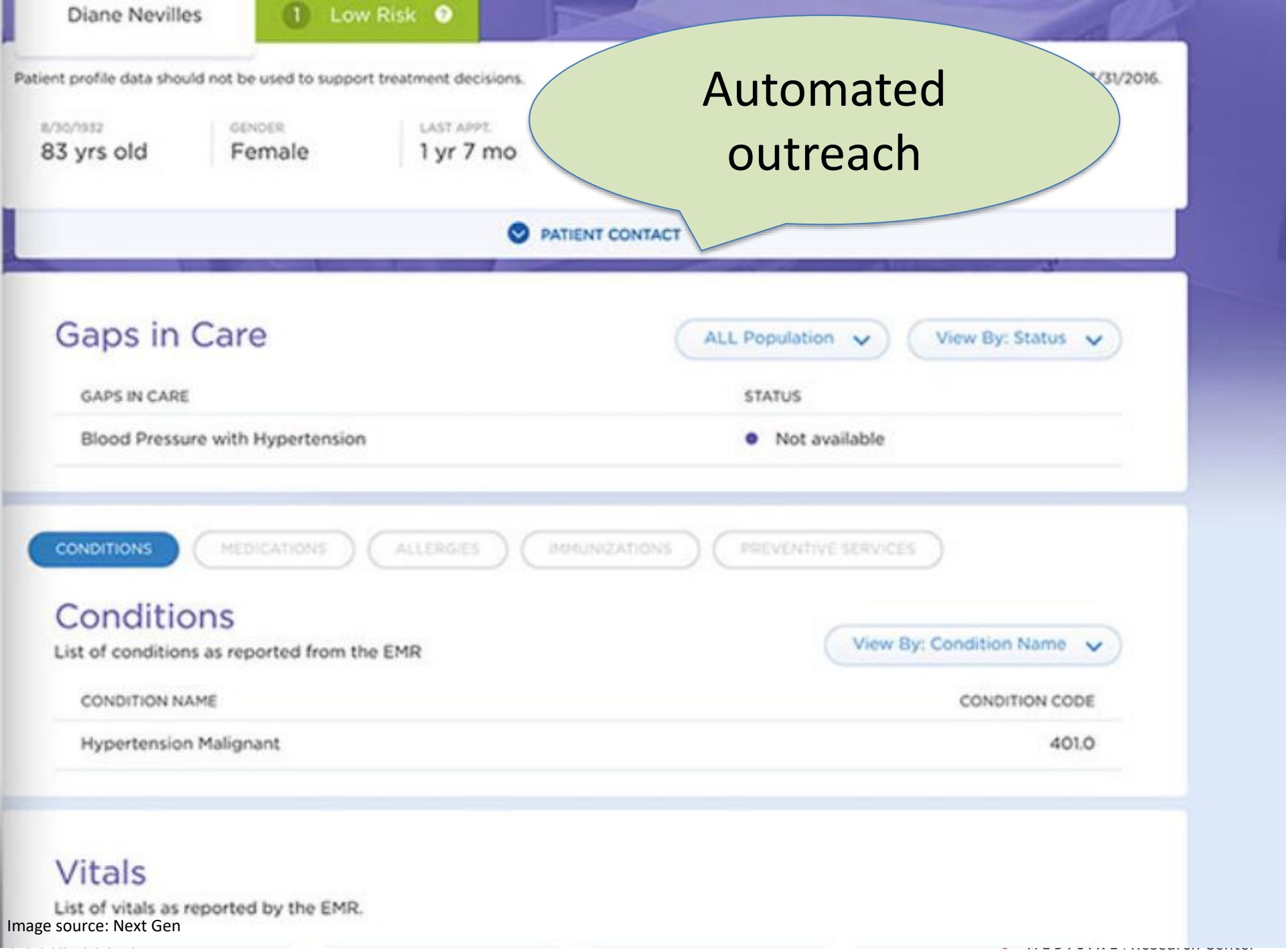
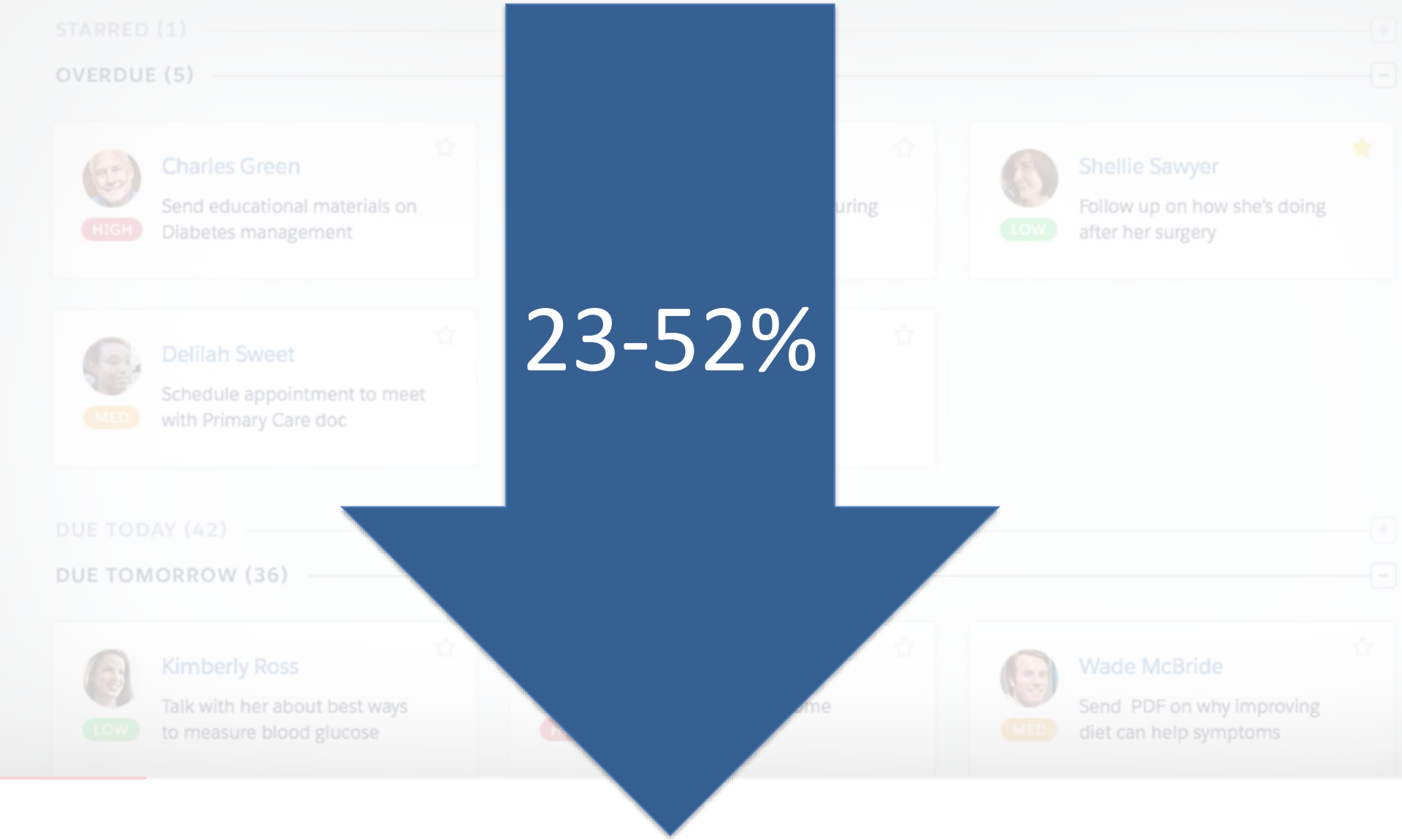



Image source: Next Gen

# TIMELY POPULATION HEALTH




Source: The Australian Commission on Safety and Quality in Health Care (2016).



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# TIMELY COMMUNICATION

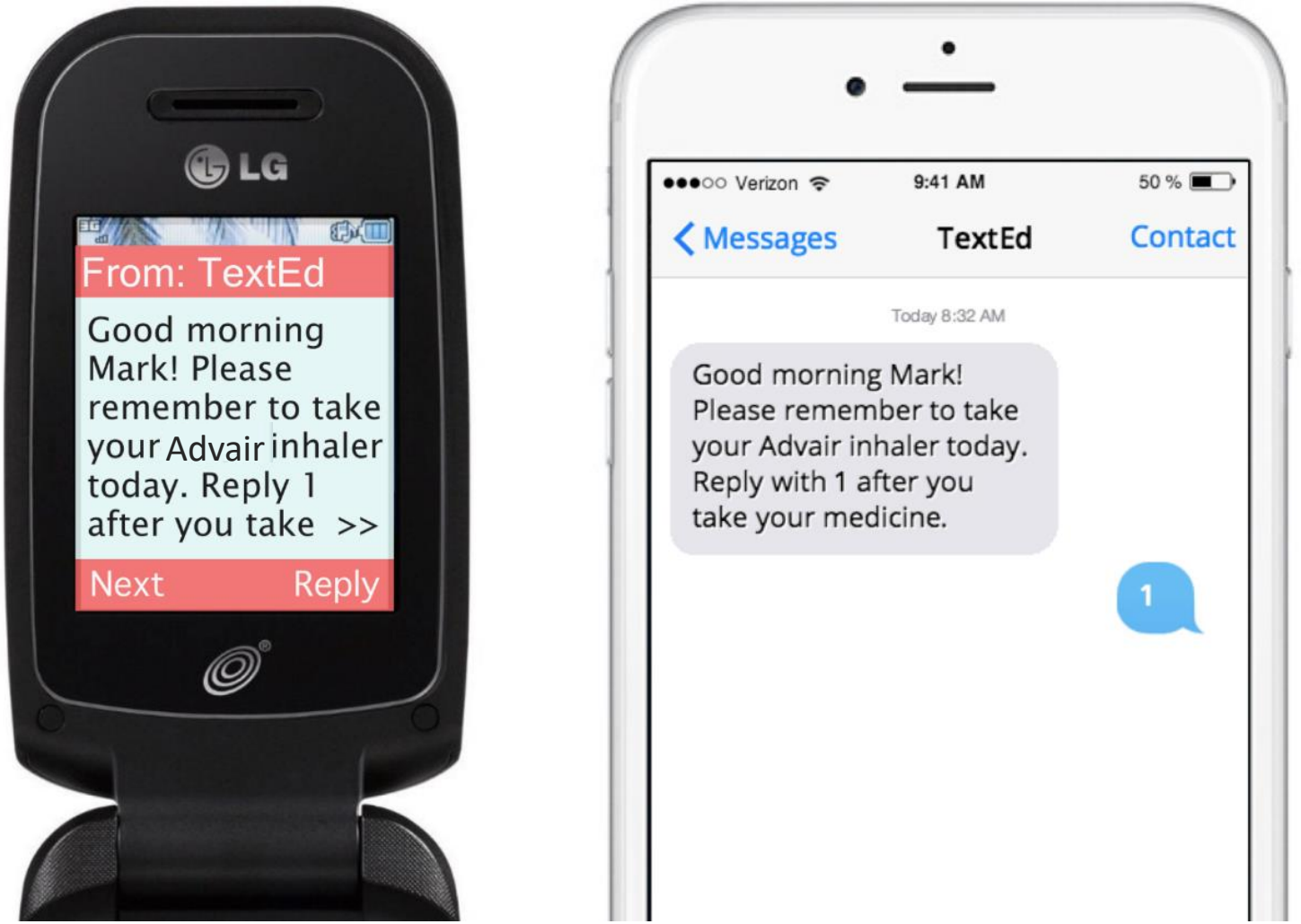


Image Source: www.innovatewithama.com

# TIMELY COMMUNICATION

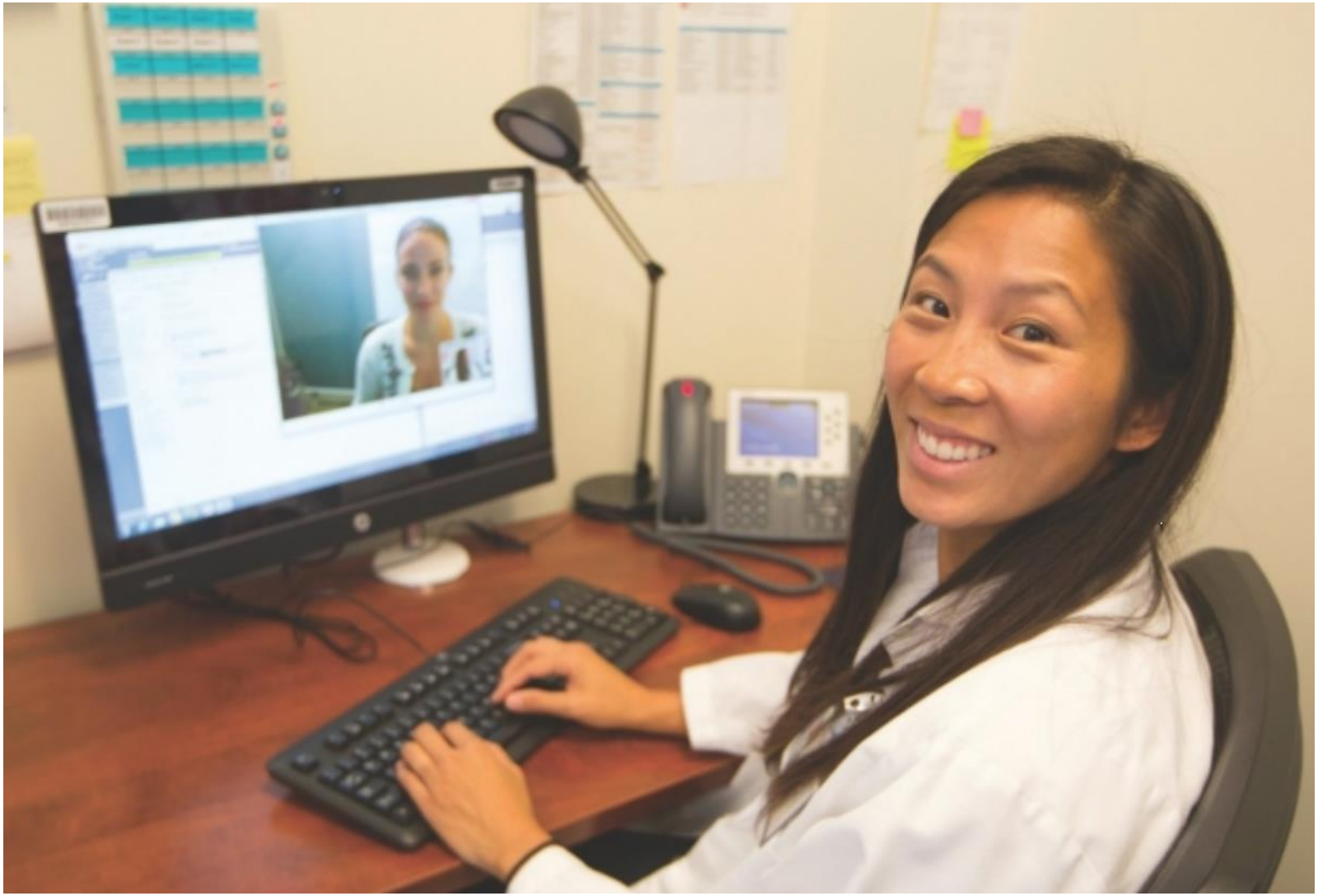

Image Source: medicine.stanford.edu

# TIMELY COMMUNICATION


Source: Data from Stanford ClickWell Clinic

# High Value HIT for Outpatient Care

Healthcare is Fragmented

**TEAM**

Specialty e-consults

Unaddressed Barriers to Care

**TARGET**

Social services platform

Patient goal-directed care

Healthcare is Reactive

**TIMELY**

Population health management Platform

24/7 communication tools

# High Value HIT for Outpatient Care

Healthcare is Fragmented

**TEAM**

Specialty e-consults

**>$300/ consult**

Unaddressed Barriers to Care

**TARGET**

Social services platform

Patient goal-directed care

**11%**

Healthcare is Reactive

**TIMELY**

Population health management Platform

24/7 communication tools

**23-52%**



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# The 2018-2019 CERC Design Challenge:

What are the top three applications of health information technology (HIT) to *reduce cost* and *improve quality* in American healthcare?

**INPATIENT SETTING**

# Inpatient Care is Expensive

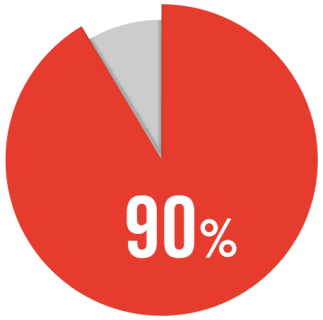
**$381.4 Billion**

**35.6 Million hospitalizations/year**

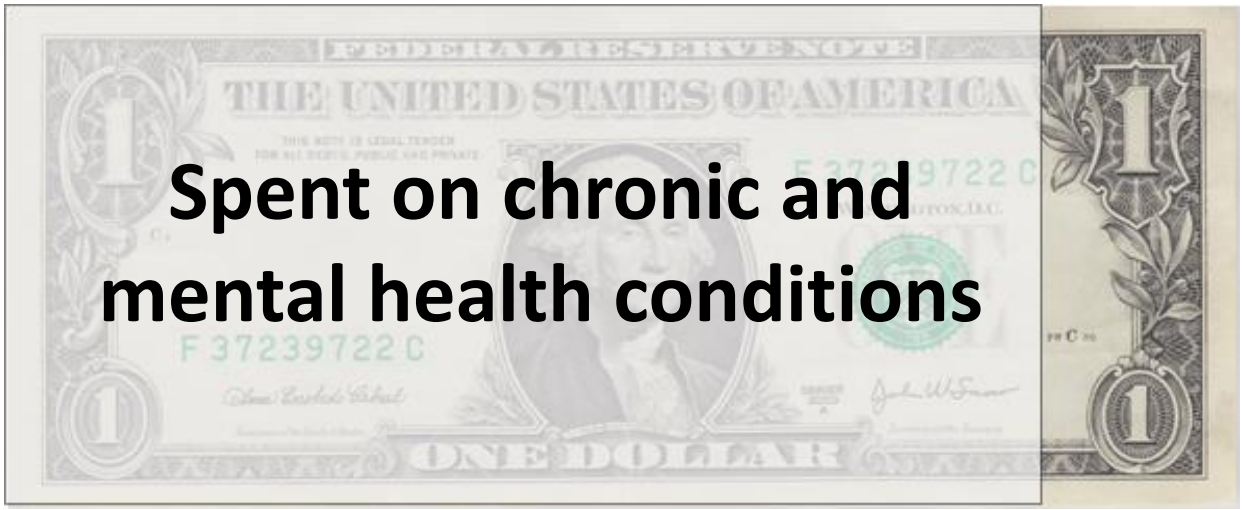
**$18,000 per hospitalization**

Source: HCUP 2013

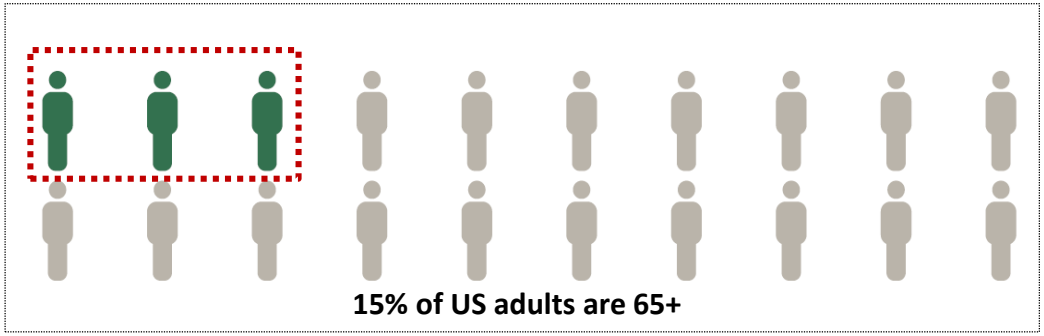
# Focus: Patients Over 65




3.4 Trillion
(Total US Healthcare Spend)




**Spent on chronic and mental health conditions**

**15% of US adults are 65+**

Sources:
https://www.cdc.gov/chronicdisease/about/costs/index.htm;
Buttorff C, et al. *Multiple Chronic Conditions in the United States*. Rand Corp., (2017);
CMMS National Health Expenditure Data (2016)



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# Mental Health Diagnoses Amplify Medical Costs

## Medicare Patients

### Without Mental Health Diagnosis


**$740 PMPM**

### With Mental Health Diagnosis


**$2000 PMPM**

**Medical Costs**

Source: Melek S, et al. Milliman Group, (2018).



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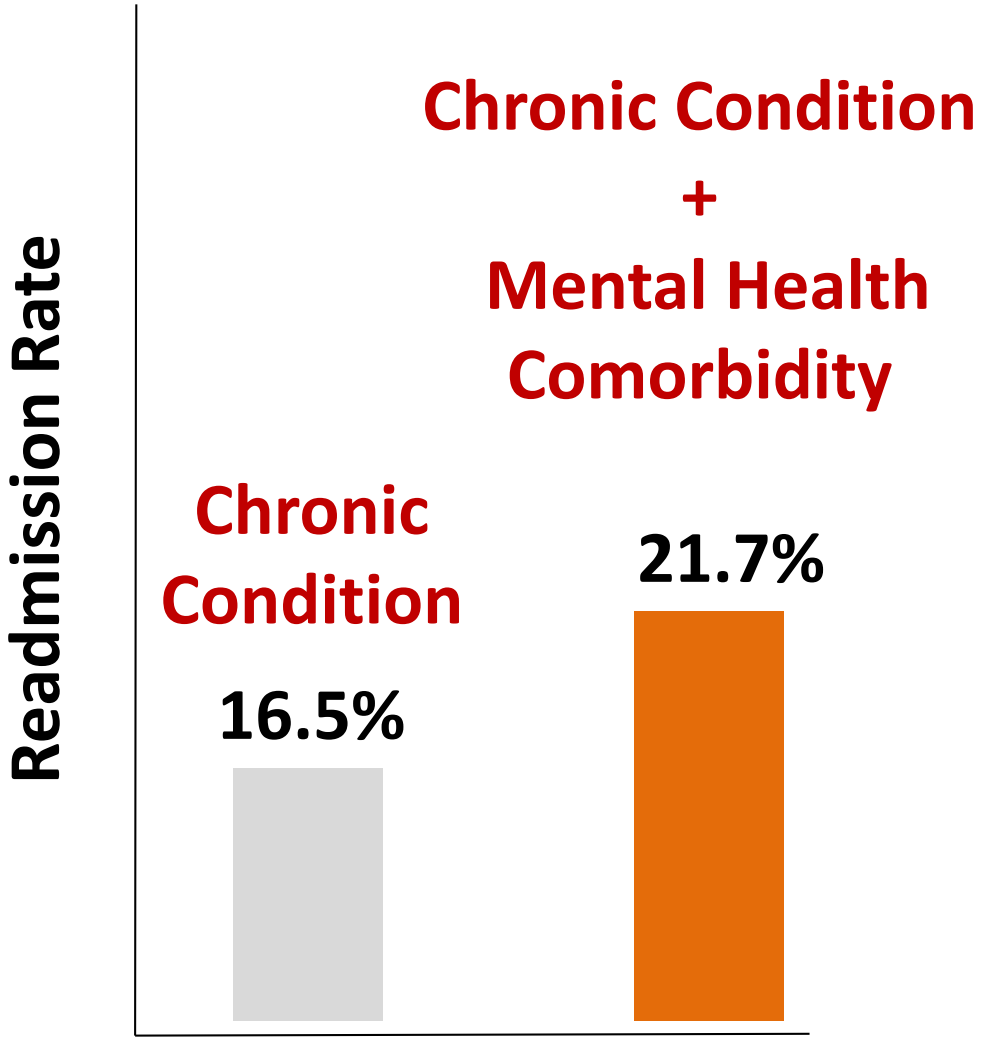
# Comorbid Mental Health Conditions Amplify Readmission Rates




Source: Ahmedani BK, et al. *Psychiatr. Serv.*, (2014).

# Behavioral Health Diagnoses Amplify Medical Costs

**1.7-3X ED Utilization**


**2X Preventable Admissions**


Sources: Melek S, et al. Milliman Group, (2018); Freeman et al. *Med Care*, (2014).



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# Target Population- Inpatient

## 42 million adults

**65+, with at least 1 chronic condition (<u>includes</u> a mental health condition)**

# Cost Drivers

Unmet Mental Health Needs Amplify Medical Costs

Inefficient Inpatient Resource Utilization

Post-acute Care Transition Gaps

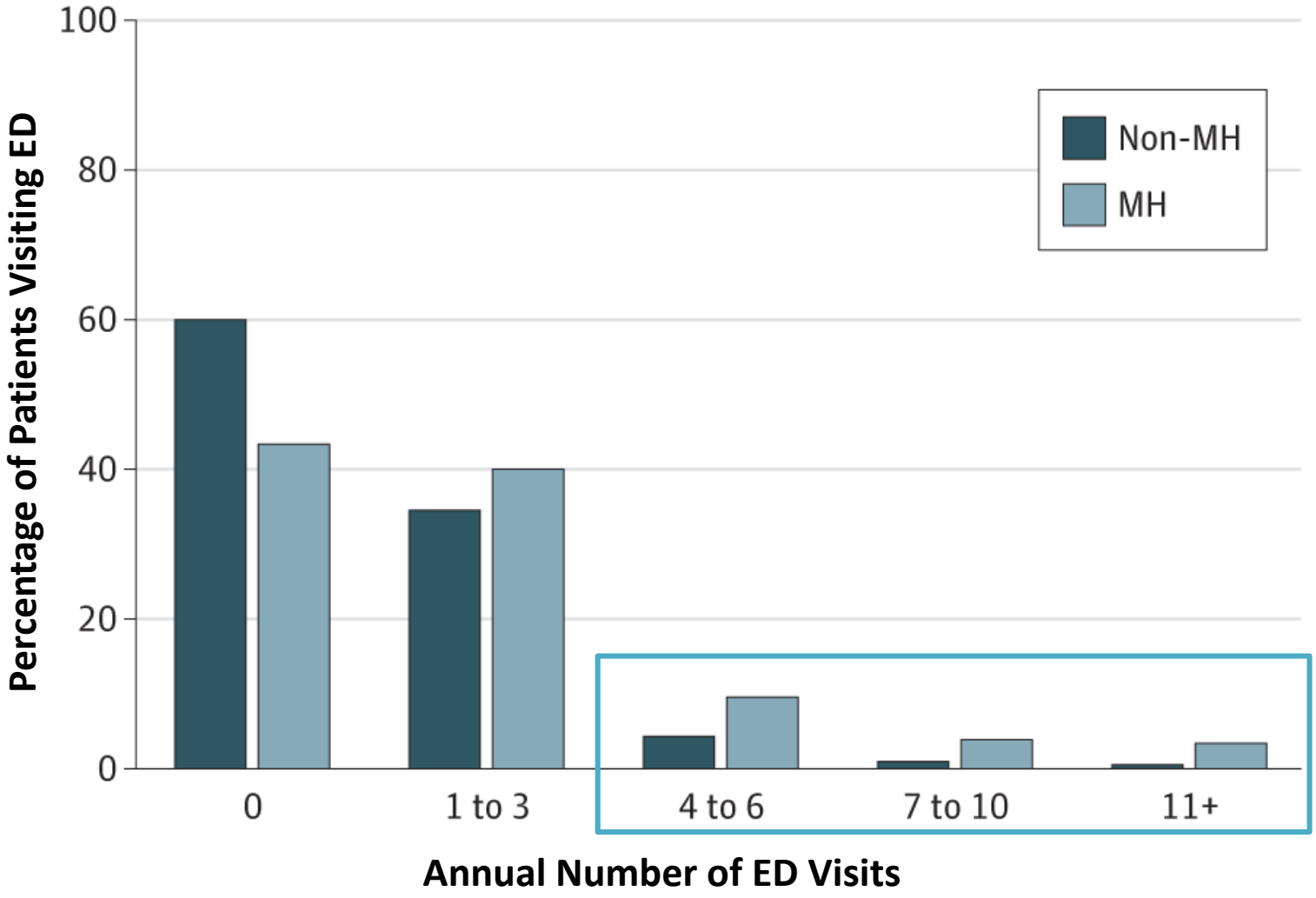
# Cost Drivers

**Unmet Mental Health Needs Amplify Medical Costs**

Inefficient Inpatient Resource Utilization

Post-acute Care Transition Gaps

# Unmet Mental Health Needs Drive ED Utilization




Source: Niedzwiecki et al. *JAMA Network*, (2018).



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# Solution

~~**Unmet Mental Health Needs Amplify Medical Costs**~~

**First Responder Assist**

Integrated platform for timely referrals

Tele-visits with MH provider

Inefficient Inpatient Resource Utilization

Post-acute Care Transition Gaps

# Timely Referrals From The Field

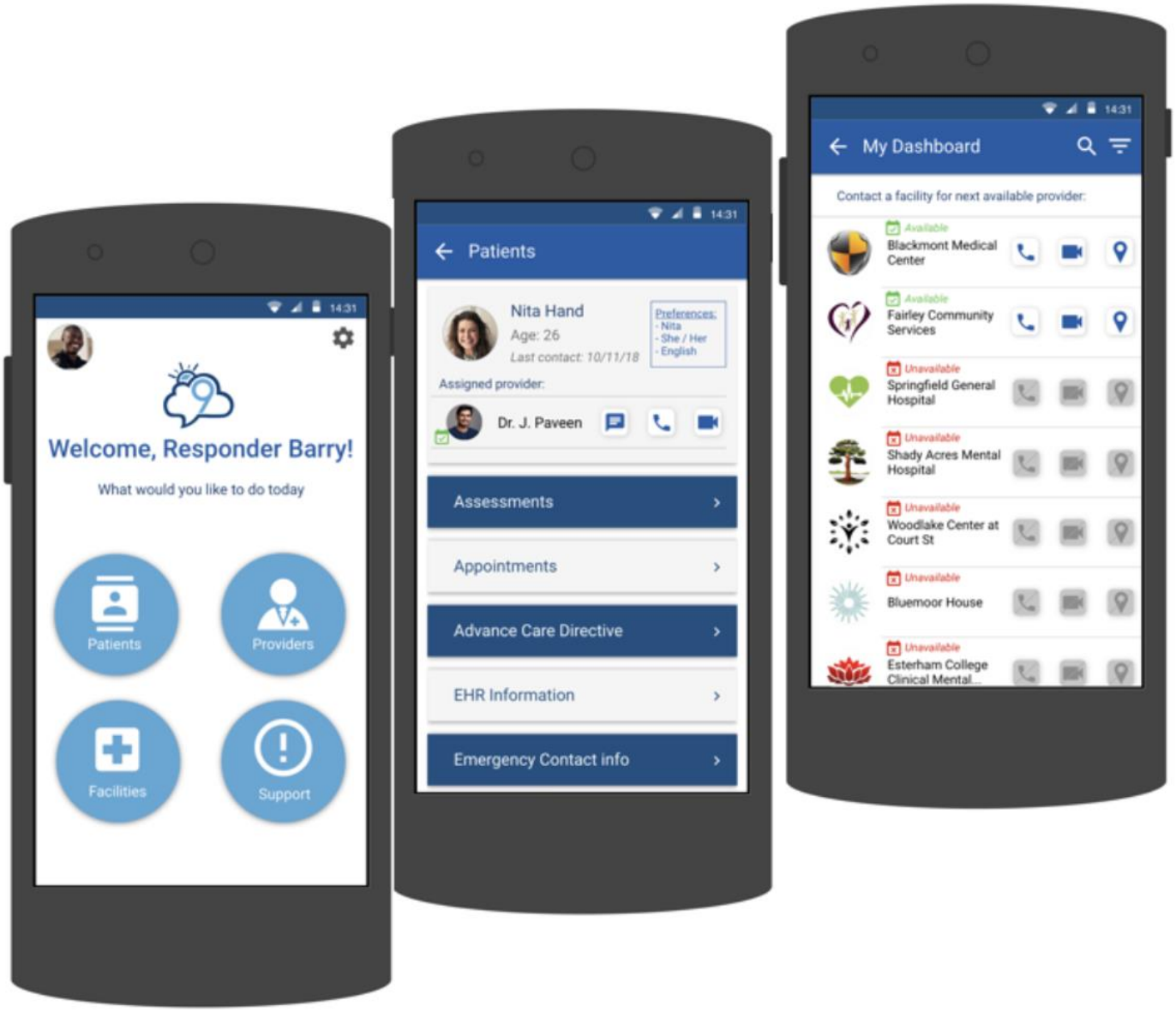



Image source: Cloud9

# Tele-visits with MH Providers Extend Access

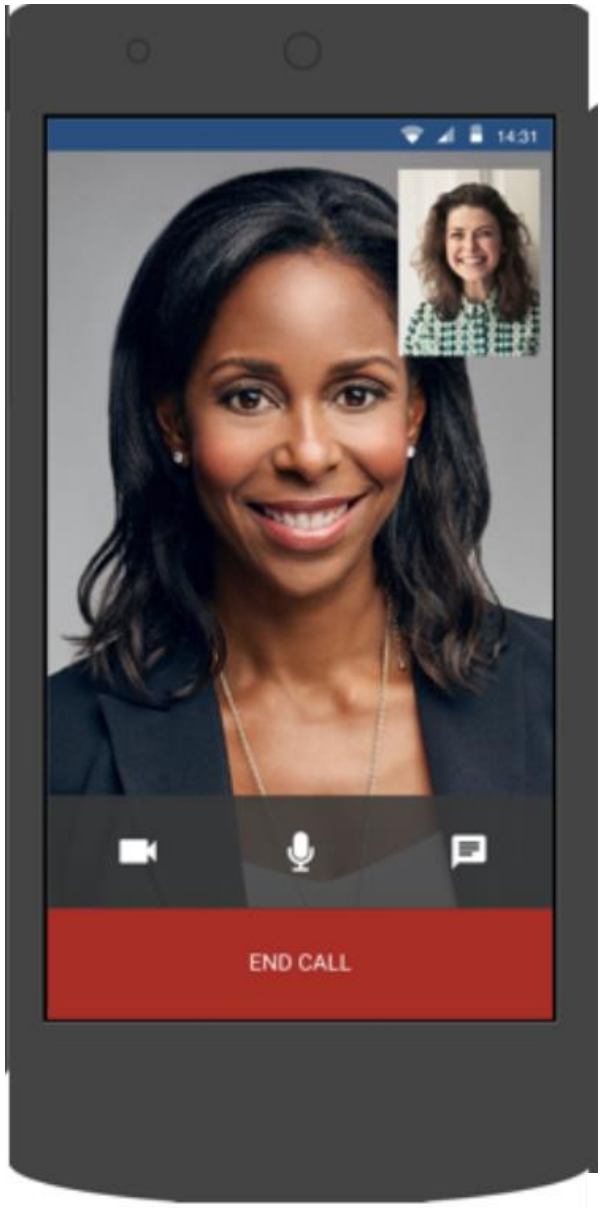
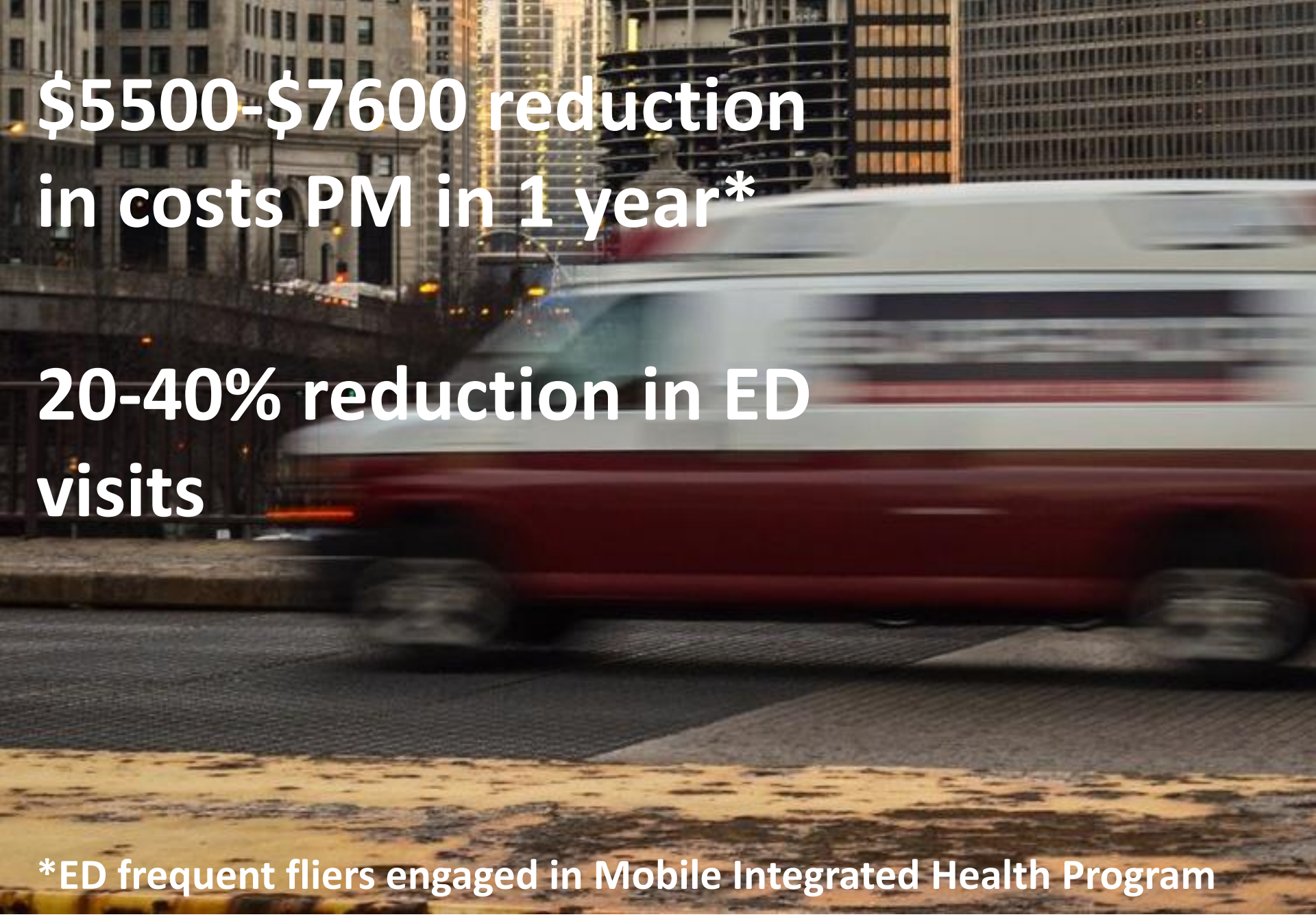



Image source: Cloud9


Sources: Nejtek VA , et al. *Am J Em Med*, (2017); Choi BY, et al. *Annals Em Med*, (2016); Zavadsky, M et al. *AHRQ Healthcare Innovations Exchange*, (2013).




Sources: Interview with JC Adams, Cloud9 (2019); Choi BY, et al. *Annals Em Med*, (2016); Zavadsky, M et al. *AHRQ Healthcare Innovations Exchange*, (2013); MedStar Mobile Healthcare; (2015).

# Cost Drivers

Unmet Mental Health Needs Amplify Medical Costs

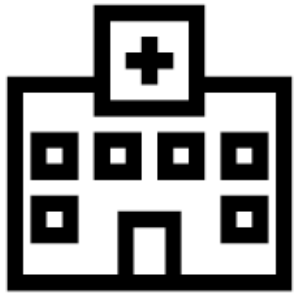
**Inefficient Inpatient Resource Utilization**

Post-acute Care Transition Gaps

# Cost Driver- Inefficient Resource Utilization

**Dissatisfied Patients And Care Team[1]**

Labor costs account for > 50% Inpatient spending[2]



**Increased LOS[4]**

**$583 PPPY, Wasted Healthcare Spending[3]**

Sources: [1]Obrien JJ, et al. *Am J Roentology,* (2017) [2]Hospital Costs Distribution by Type of Expense U.S. 2016 | Statistic. [3]Long P, et al. *National Academies Pr*, (2017); [4]Durvasula, Quality Man in Healthcare, (2015)

# Patients with co-morbid mental health diseases use more inpatient resources

Increased risk of **readmission** in patients with chronic disease and depression[1,2]

Patients with mental health diagnosis admitted for medical disease have **longer LOS** than those without[2,3]

Sources: [1]Eisner, MD, *Ann Allergy Asthma Immun*, (2005); [2]Subramaniam M, *Gen Hosp Psychiatry* (2009) [3]Siddiqui, *BMC Health Services*, (2018)



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# Solution

Unmet Mental Health Needs Amplify Medical Costs

~~**Inefficient Inpatient Resource Utilization**~~

**Smart Resource Allocation**

Predictive and Workforce Analytics

Centralized Resource Management

Post-acute Care Transition Gaps

# Tech Solutions To Maximize Resources

**Predictive Analytics**

*Forecast of non-personnel resource utilization (e.g. OR block time)*

**Workforce Analytics**

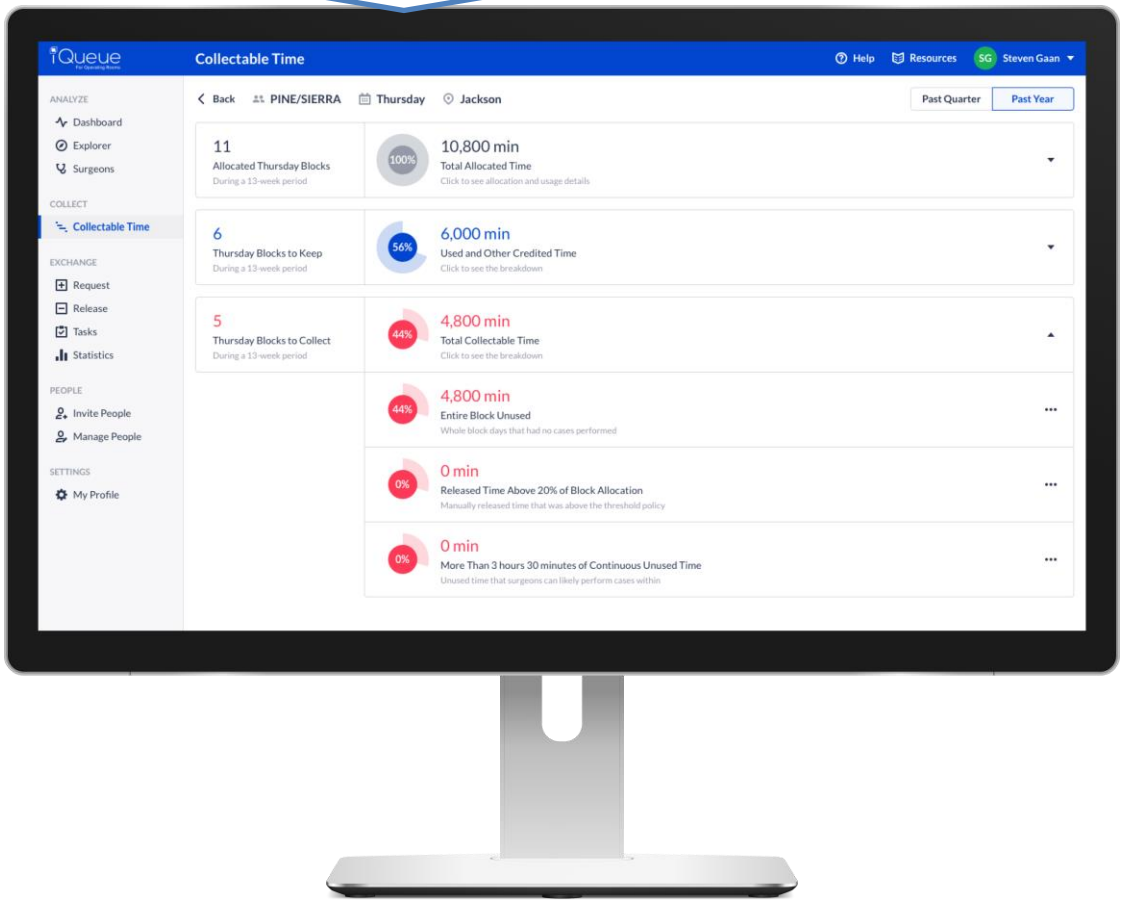
*Insights to optimize allocation of core and contingency staff*

**Centralized Resource Management**

*Routes staff, supplies and other resources based on need in real-time*

# Ex: Operating Room Capacity Management

- Actionable, surgeon-centric utilization metrics
- Insights to optimize case scheduling and use of OR block time




**4-9%** in procedure volume[1,2]

**76%** in wasted OR time[3]

**13%** in hospital LOS[1]

Image Source: iQueue

Sources: [1]Levine WC, et al. *Anesthes Clin*, (2015); [2]LeanTaas Proprietary Data(2019); [3]Fairley M, et al. *Health Mgmt Sci*, (2018).

# Ex: Allocation Of Inpatient Staffing

**Analyze** current practices

**Balance** Supply and Demand


**Coordinate** staff scheduling between hospital units

**7-25%** wait times[1,2]

**120** hours per week in labor saved[3,4]

Sources: [1]Levine WC, et al. Anesth Clin, (2015). [2]Obrien JJ, et al. *Am J Roentology,* (2017); [3]LeanTaas Proprietary Data; [4]Avantas Proprietary Data.



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# Cost Drivers

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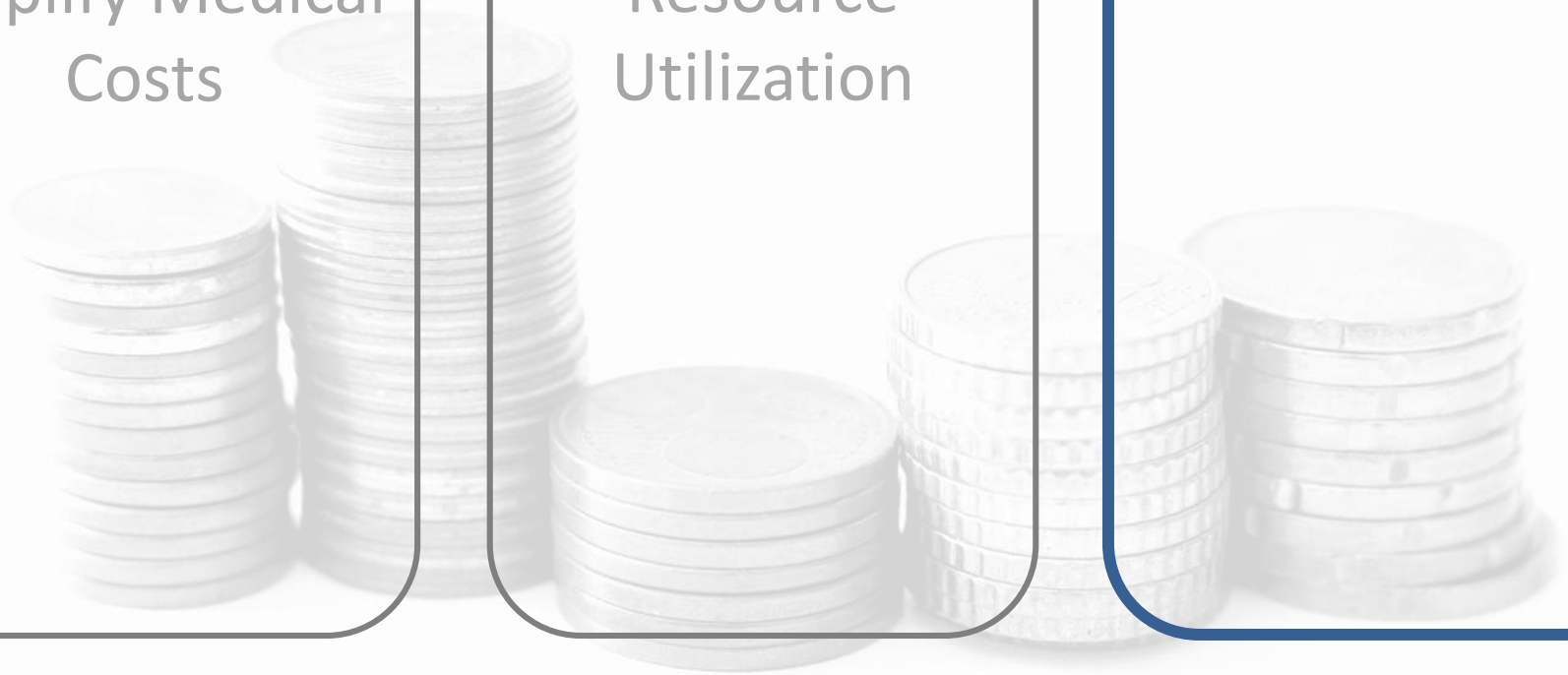
Inefficient Inpatient Resource Utilization

**Post-acute Care Transition Gaps**



# Solution

Unmet Mental Health Needs Amplify Medical Costs

Inefficient Inpatient Resource Utilization

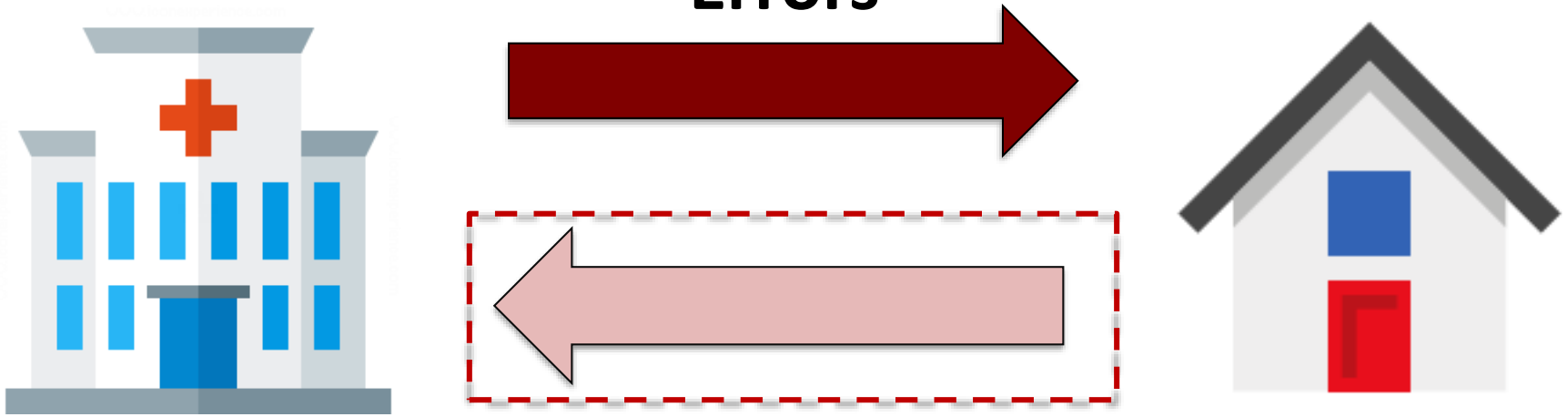
~~**Post-acute Care Transition Gaps**~~

**Pharmacy Led, Tech-enabled Transitions**

Inpatient population-level monitoring via Dashboard

Tele-pharmacy check-ins and follow-up

# Source Of Errors: Hospital To Home Transition




**$46 Billion**

# Root Causes for Readmissions

**Inadequate Care Coordination**

**Poor Medication Management**

**Social, Environmental Risks**

**Cultural/Language Barriers**

# Tech-enabled, Pharmacy-driven Care Transitions

***Inpatient Admission:***

**Hospital Admission**

- Pharmacist monitors high-risk inpatient population via **Dashboard**
- Automatic **Generic Substitution** if appropriate

- **Bedside Check-in**
- Discuss **Red Flags**
- Create **Personalized Medication Record**
- **Fall Risk assessment**

***After Discharge:***

- Pharmacy technician performs **Tele Check-in** within 48-72h of discharge

- **Follow-up teaching** with Pharmacist as required

# Pharmacists Lower Readmissions, Cost Of Care

**4%-14.3%** 30-day readmissions

**10%** Length of Stay

**30-70%** Labor cost (tele-pharmacy)

Source: Kilcup 2013, et al. *J Am Pharm Assoc*, (2013); Polinski JM, et *al. Health Aff*, (2016).



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# High Value HIT for Inpatient Care

~~Unmet Mental Health Needs Amplify Medical Costs~~

**First Responder Assist**

Integrated platform for timely referrals

Tele-visits with MH provider

**↓26-40% ED Visits**

~~Inefficient Inpatient Resource Utilization~~

**Smart Resource Allocation**

Predictive and workforce analytics

Centralized resource management center

**↓13% Hospital LOS**

~~Post-acute Care Transition Gaps~~

**Pharmacy Led, Tech-enabled Transitions**

Inpatient population-level monitoring via Dashboard

Tele-pharmacy check-ins and follow-up

**↓4-14% 30-day Readmissions**

# Acknowledgements

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# Questions and Feedback