

Why Tabula Rasa Healthcare?

*The Application of Personalized
Medication Science has Advanced...*



MOORESTOWN, NJ | BOULDER, CO | CHARLESTON, SC | SAN FRANCISCO, CA | ST LOUIS, MO | PHOENIX, AZ

And, using Personalized Medication reduces:

*Adverse Drug Events, Falls, CNS Impairment, Heart
Arrhythmias, Hospitalizations, Re-hospitalizations,
Morbidity / Mortality and...*



Total Healthcare Costs

MOORESTOWN, NJ | BOULDER, CO | CHARLESTON, SC | SAN FRANCISCO, CA | ST LOUIS, MO | PHOENIX, AZ

Background on TRHC

Our Outcomes

How do we harvest these Outcomes?

Our Science

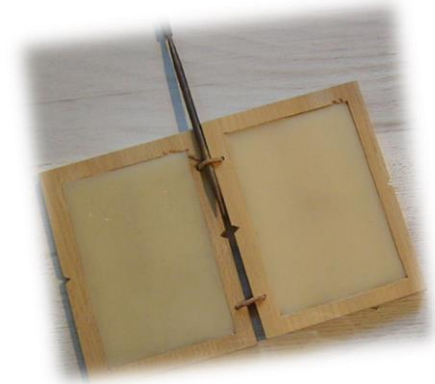
Our Patient Healthcare Literacy Aids

Our Synchronized Reminder Packaging

**How At-risk are Severn Trent's employees,
dependents and retirees?**



Why Tabula Rasa?



TABULARASATM

HEALTHCARE

“Tabula rasa” means “blank slate” in Latin. Roman wax tablet used for notes were blanked by heating the wax and then smoothing it, to give a tabula rasa.

Contemporary translation includes “fresh start” or “new beginning.”



Using the TRHC's Medication Risk Identification and Mitigation platform and services:

- ***Clients reduce downstream medical expenditures (e.g., costs for falls, ER visits, and hospitalizations),***
- ***Patients see a decrease in the number of chronic medications, the number of trial and error medication regimen changes, and increased concordance and adherence with their medication regimen.***



- 1. Programs for All-inclusive Care of the Elderly (solely, 2011 to 2014)**
- 2. CMS “enhanced Medication Therapy Management” (eMTM), due to an invitation from the ClearStone and the Northern Plains Alliance (i.e., six Blue Cross program surrounding Minnesota)**
- 3. At-risk (e.g., financial risk) Health Plans, Health Systems, Healthcare Payers**






1. Market Leader in PACE

Decades of experience, five years+ solely focused on PACE, today serving >60 PACE Centers in 20 States
Approximately 10,000 participants served on daily census
Growing Organically >25% / yr



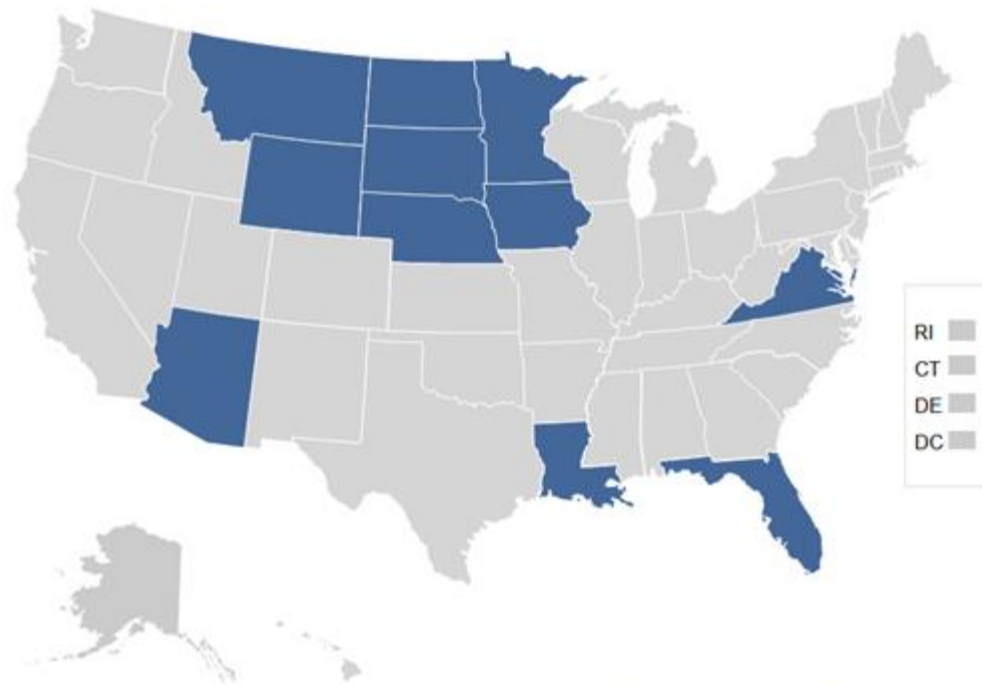
CAREKINESIS™
PACE Pharmacy

-  CareKinesis Headquarters & PACE Pharmacies
-  CareKinesis PACE Clients
-  States where we are licensed



2. CMS Enhanced MTM (eMTM) 5-YR PILOTS

- **Region 7 (Virginia)**
- **Region 11 (Florida)**
- **Region 21 (Louisiana)**
- **Region 28 (Arizona)**
- **Region 25 (Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Wyoming), 240,000 patients, starting 1/1/2017**



Source: Centers for Medicare & Medicaid Services

3. At-risk (financial) Health Plans and Systems



*A Community
for Healthcare*



TABULARASA
HEALTHCARE

For immediate release

Tabula Rasa HealthCare and NJHA Form Strategic Alliance NJHA Member Organizations now have Access to Medication Risk Mitigation™

Moorestown and Princeton, NJ (March 20, 2016) –Tabula Rasa HealthCare, Inc. (TRHC), a healthcare technology company providing patient-specific, data-driven technology and solutions for health care organizations, and NJHA Healthcare Business Solutions Inc. (HBS), a wholly owned subsidiary of the New Jersey Hospital Association (NJHA), have entered into a strategic alliance to deliver TRCH's Medication Risk Mitigation products and services to NJHA member organizations. The strategic alliance will continue for three years, commencing March 2016.



TABULARASA
HEALTHCARE

Tabula Rasa HealthCare and The Greater Philadelphia Business Coalition on Health To Study Medication Risk in Workforce Populations

Moorestown, NJ, and Philadelphia, PA, (February 1, 2016) - Tabula Rasa HealthCare (TRCH), a healthcare technology company that is a leader in providing patient-specific, data-driven technology and solutions for health care organizations, and The Greater Philadelphia Business Coalition on Health (GPBCH), an employer organization focused on healthcare benefits best practices, have entered into a collaboration to underscore the importance to employers of workforce medication safety.

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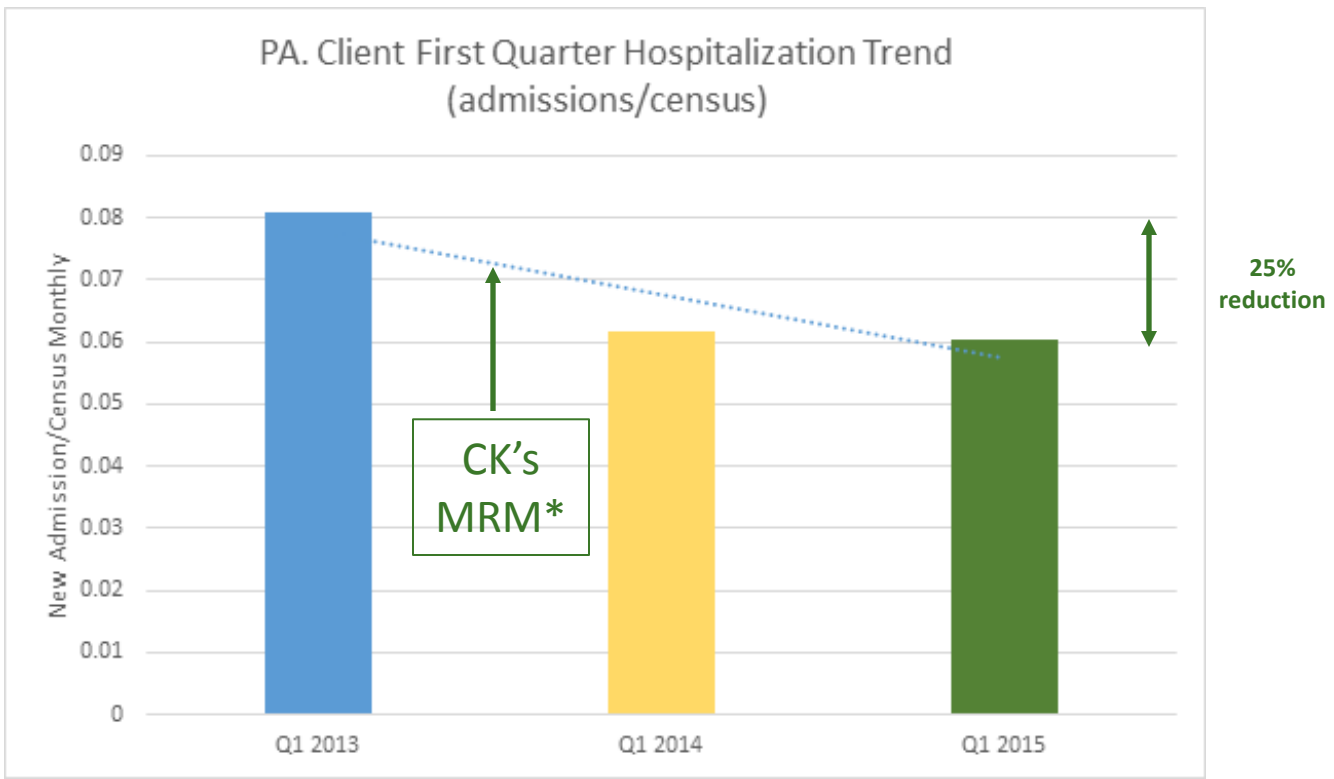
Our Synchronized Reminder Packaging

**How At-risk are Severn Trent's employees,
dependents and retirees?**



Impact of Personalized Medication Risk Mitigation

A Large PA PACE Client

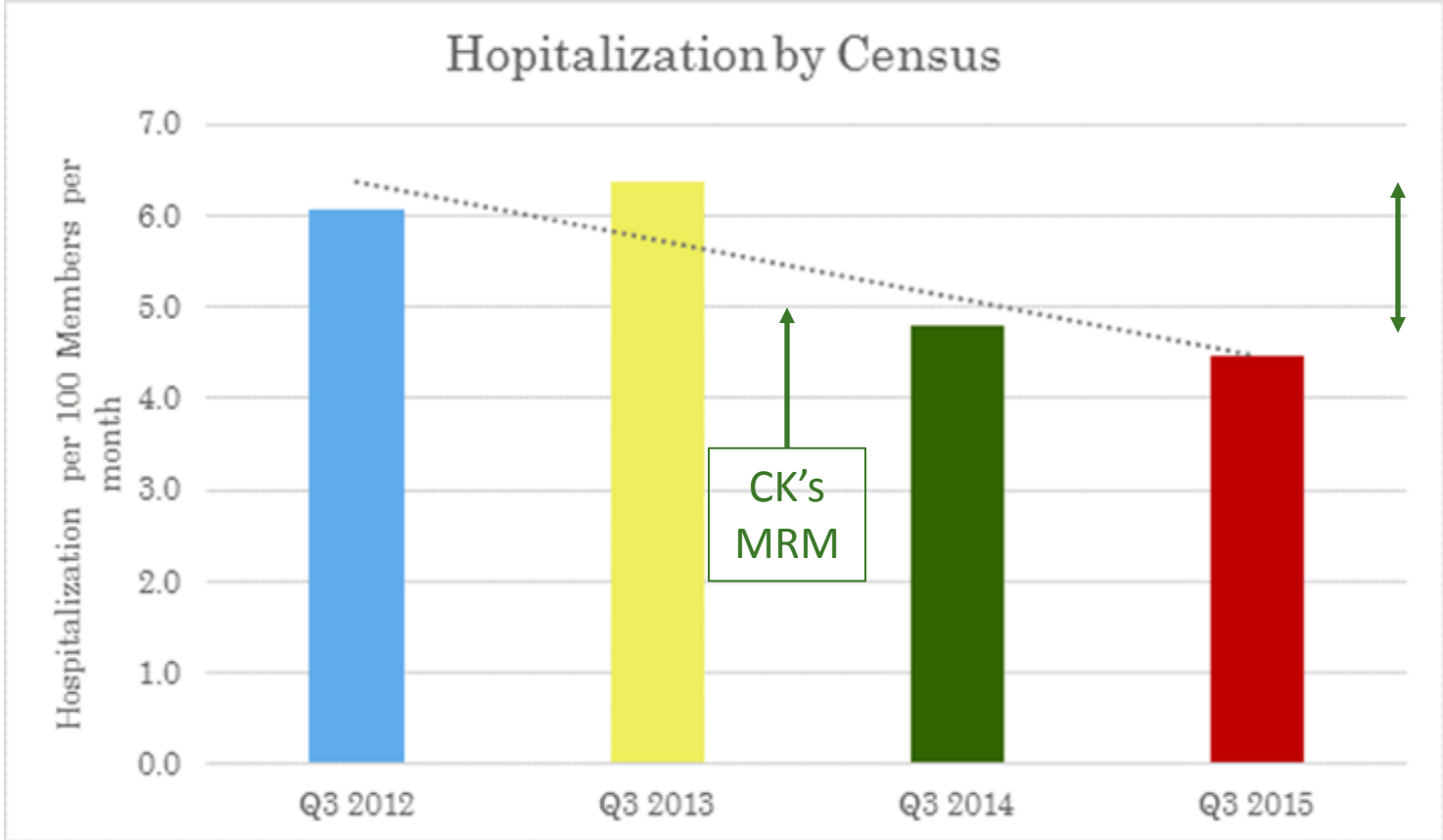


Reducing ER Visits, Number of Meds, Number of Med Changes and/or Hospitalizations is a QOL and an ROI matter.

*CareKinesis' Medication Risk Mitigation

Impact of Personalized Medication Risk Mitigation

Another Large PA PACE Client

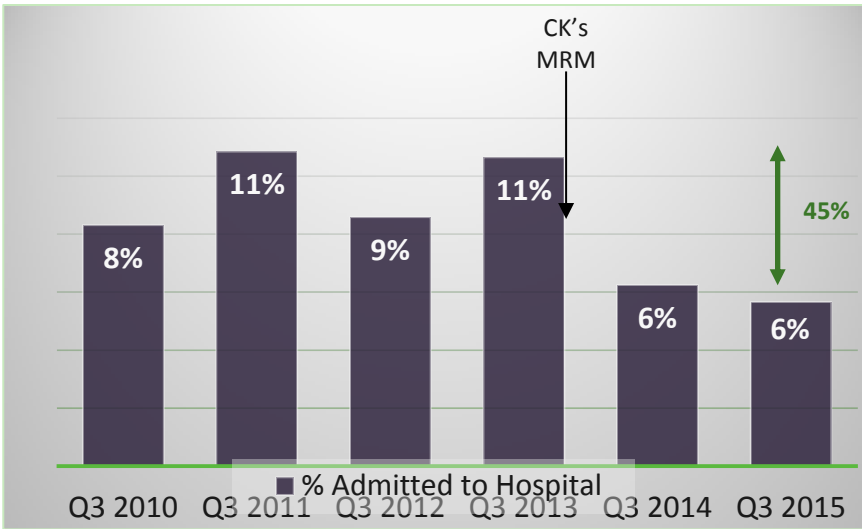


Reducing ER Visits, Number of Meds, Number of Med Changes and/or Hospitalizations is a QOL and an ROI matter.

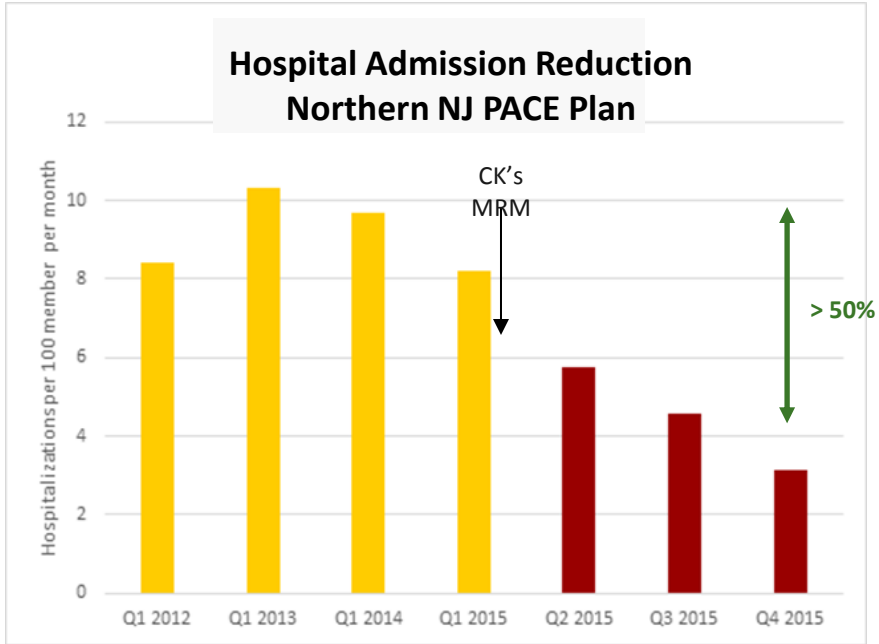
Impact of Personalized Medication Risk Mitigation

Two NJ PACE Clients

Hospital Admission Reduction Southern NJ PACE Plan



Hospital Admission Reduction Northern NJ PACE Plan



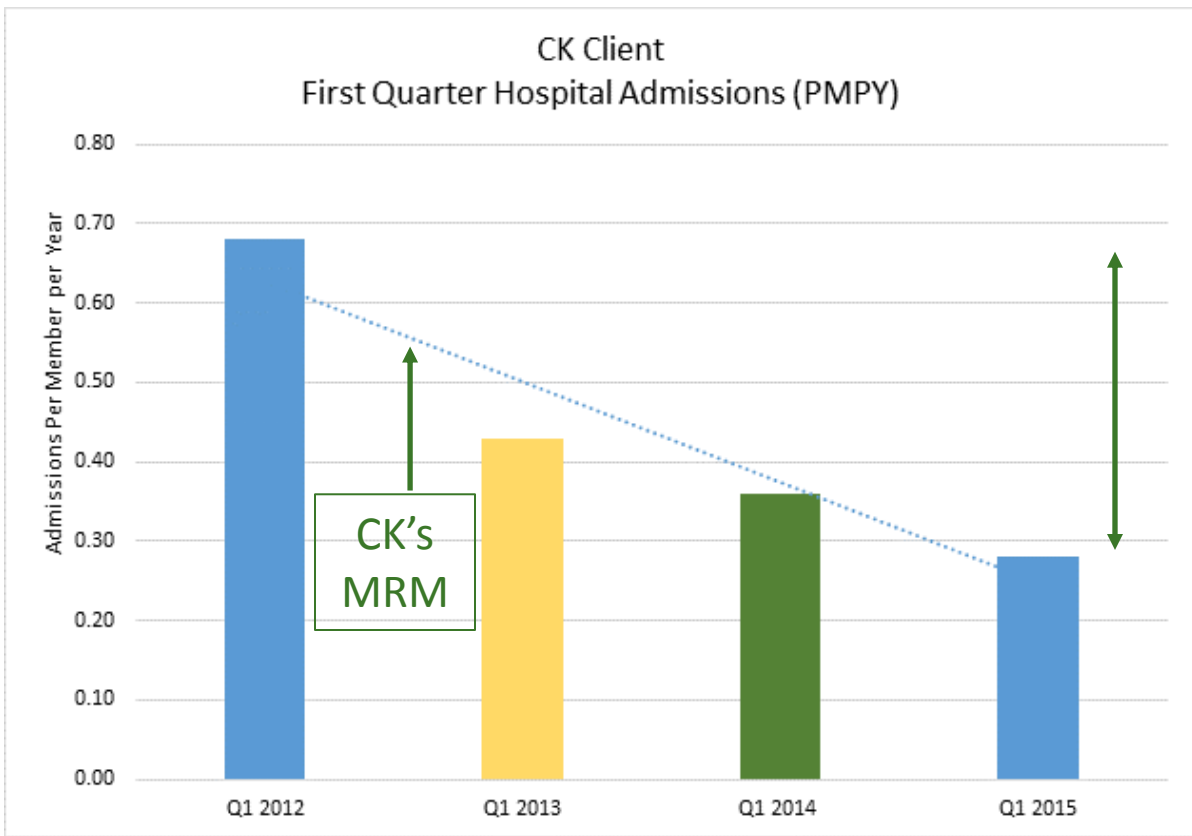
Reducing ER Visits, Number of Meds, Number of Med Changes and/or Hospitalizations is a QOL and an ROI matter.

Impact of Personalized Medication Risk Mitigation

A large CO PACE Client

**Hospitalization
Usage Reduction
from \$623 PMPM
to \$224 PMPM**

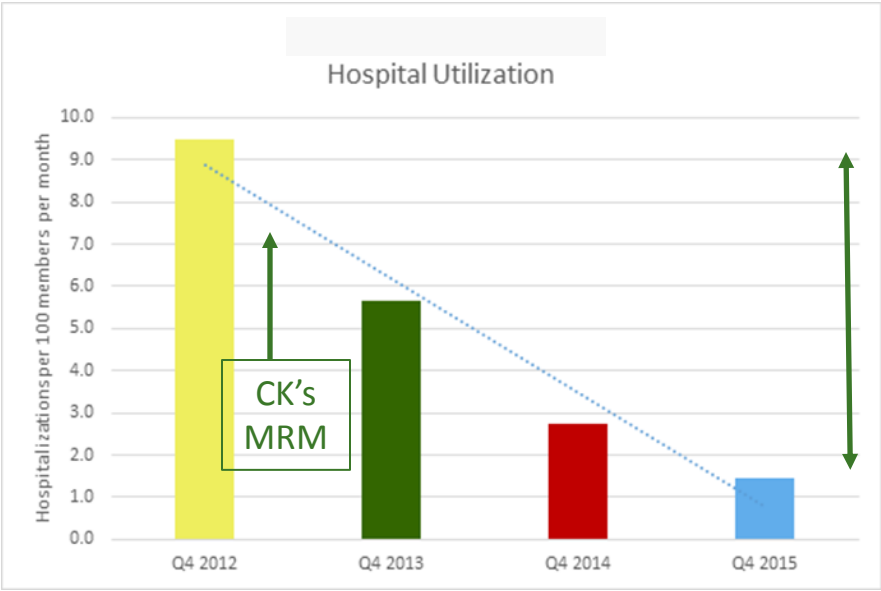
**\$1.2 mln Increase
Bottom Line, or
5.7%**



**Reducing ER Visits, Number of Meds, Number of Med Changes
and/or Hospitalizations is a QOL and an ROI matter.**

Impact of Personalized Medication Risk Mitigation

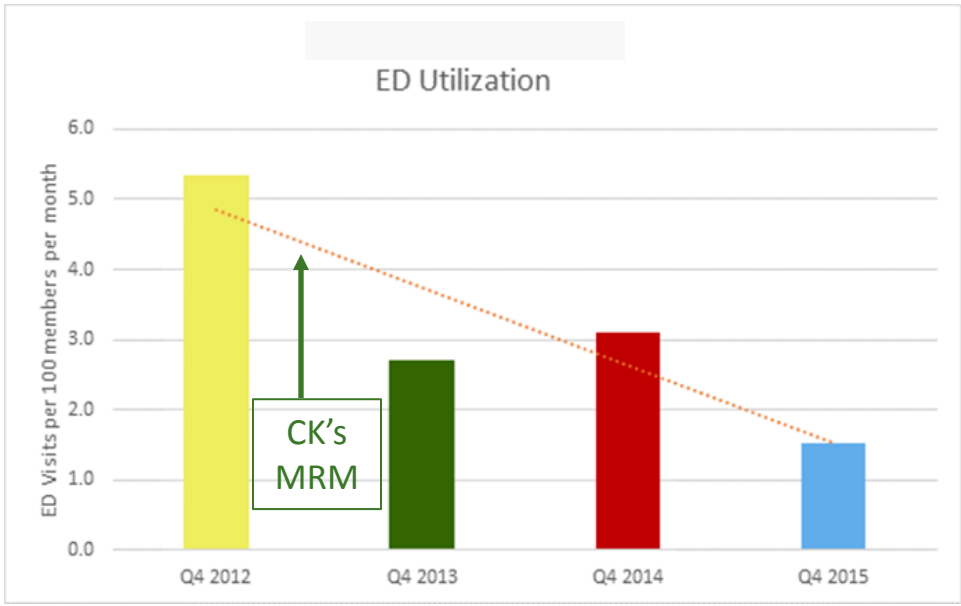
A Southern PACE Client



82%
reduction

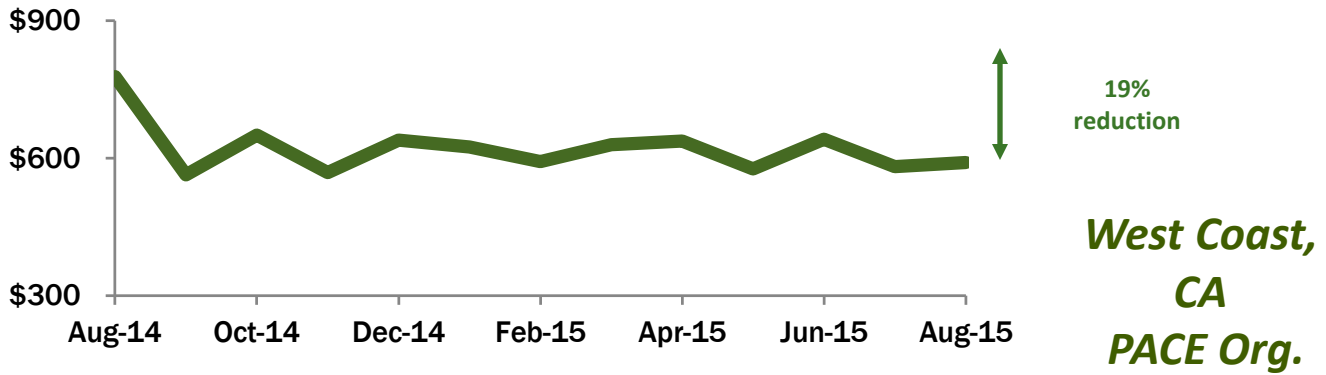
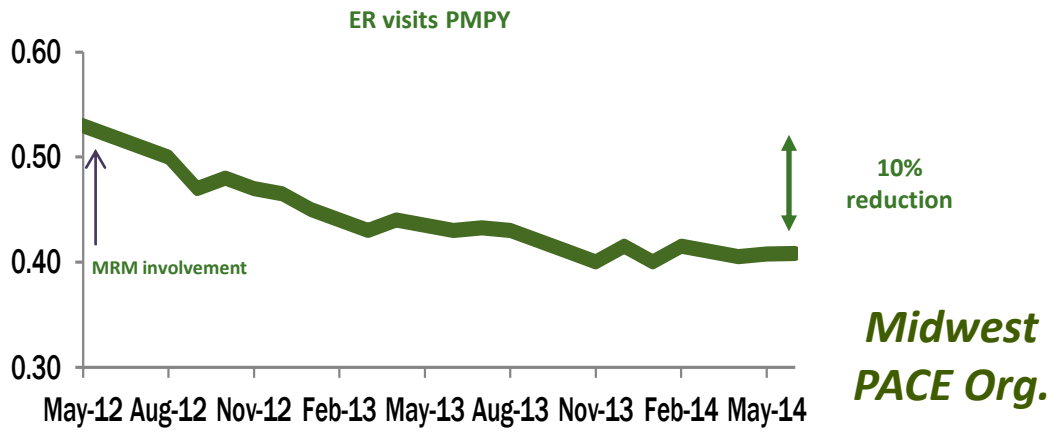
“Indeed, the medication risk strategies, and the front line tolls like ACB and sedative burden definitely are an important part of our cost reduction and care optimization strategies. As always, I appreciate the help of the entire CareKinesis team.”

Medical Director



Impact of pMRM on ER Visits and Part D Cost

Midwest and West Coast PACE Clients



Reducing ER Visits, Number of Meds, Number of Med Changes and/or Hospitalizations is a QOL and an ROI matter.



Impact of pMRM on Care Transitions

A Phila Hospital/HHA Care Transitions Pilot

Pharmacist-directed medication reconciliation and regimen review for Clients discharged from Acute Care hospital to home with Home Health Care

- 3 Month Project
- 57 Clients in Intervention Group; 457 Control Group
- 191 Recommendations (3.4/patient)

The control group consists of clients who met pilot criteria but who were in non-pilot offices.

Re-Hospitalizations	Falls	LUPAs*
<ul style="list-style-type: none">• Pilot: 14.0%• Control: 20.4%• 31% Reduction	<ul style="list-style-type: none">• Pilot: 3.5%• Control: 4.4%• 20% Reduction	<ul style="list-style-type: none">• Pilot: 13.0%• Control: 20.8%• 37.5% Reduction

**Low Utilization Payment Adjustment*

Care Transitions, Hospital to Home with a Home Health Agency



Why Personalized Medication Risk Mitigation?

\$374B U.S. spending on prescriptions in 2014

4.3B prescriptions filled in 2014

15% of Americans take **five** prescription medications in any given month

50% of individuals aged 65+ take **five** or more medications/month

82% risk of an adverse drug event (ADE) with seven or more medications

- **45 – 50 million ADEs** from prescription medications per year in the United States
- **ADEs represent the 4th leading cause of death in the United States**

- **> 40%** of nursing home admissions are associated with medication misadventuring



Impact of adverse drug events annually in the United States



>100,000
Deaths



1 million
Emergency department visits



2 million
Affected hospital stays



125,000
Hospitalizations



3.5 million
Physician office visits



1.7 to 4.6
Increased days per affected
hospital stay

CMS Nov 2014



What are the Implications with Adverse Drug Events for You?

Quality of Life?

Presenteeism?

Absenteeism?

Productivity?

Pharmacy costs?

Medical costs?



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**How At-risk are Severn Trent's employees,
dependents and retirees?**



- **New study reveals link between ACh medication use and community-acquired pneumonia (CAP) in elderly**
 - Paul KJ, et al. J Am Geriatr Soc, March 2015; doi:10.1111/jgs.13327
- **Possible mechanism**
 - Central effects of ACh medications – sedation & altered mental status
 - May contribute to poor pulmonary hygiene, atelectasis, & aspiration



Risk of Injury in Older Adults Using Gastrointestinal Antispasmodic and Anticholinergic Medications

Michele M. Spence, PhD, Fatima A. Karim, PharmD,† Eric A. Lee, MD,‡ Rita L. Hui, PharmD,§ and Nancy E. Gibbs, MD||*

J Am Geriatr Soc 63:1197–1202, June 15, 2015

PARTICIPANTS: Healthcare system members aged 65 and older (N = 260,010; 54,152 cases, 205,858 controls).

MEASUREMENTS: Cases were identified as individuals with an injury resulting in a hospitalization, emergency department, or urgent care visit (index date) from January 2009 through December 2010.

CONCLUSION: Older adults using GI antispasmodic and anticholinergic drugs have a 16% greater risk of injury. These findings support recommendations to limit the prescribing of GI antispasmodics and anticholinergics in elderly adults.



For Instance: High Anticholinergic Burden Effect on Falls

- **Use of Medications with Anticholinergic Activity and Self-Reported Injurious Falls in Older Community-Dwelling Adults**

Richardson K, Bennett, K. Maidment, ID, et al. J Am Geriatri Soc 2015, July

- N = 2,696
- Self-reported fall(s) 2 years after baseline interview
- Matched with Irish Health Service pharmacy dispensing records (N=1,553)
- Of the matched cohort, **the adjusted relative risk** for medications with **anticholinergic activity** dispensed in the month before baseline and a **subsequent injurious fall(s)** for men was **2.53** (95% CI = 1/15 -5/54).

<http://onlinelibrary.wiley.com/doi/10.1111/jgs.13543/pdf>



Cumulative Use of Strong Anticholinergics and Incident **Dementia** A Prospective Cohort Study

Shelly L. Gray, PharmD, MS; Melissa L. Anderson, MS; Sascha Dublin, MD, PhD; Joseph T. Hanlon, PharmD, MS;
Rebecca Hubbard, PhD; Rod Walker, MS; Onchee Yu, MS; Paul K. Crane, MD, MPH; Eric B. Larson, MD, MPH

CONCLUSIONS AND RELEVANCE Higher cumulative anticholinergic use is associated with an increased risk for dementia. Efforts to increase awareness among health care professionals and older adults about this potential medication-related risk are important to minimize anticholinergic use over time.

JAMA Intern Med. doi:10.1001/jamainternmed.2014.7663
Published online January 26, 2015.

Common medications (doxepin, oxybutinin, diphenhydramine, antidepressants) taken for over three years in a study of 3,434 elderly found...

- **23% developed Dementia, majority Alzheimer's type**
- **Highest doses of anti-cholinergic drugs 54% higher risk for Dementia and 64% for Alzheimer's**



Association Between Anticholinergic Medication Use and Cognition, Brain Metabolism, and Brain Atrophy in Cognitively Normal Older Adults

Shannon L. Risacher, PhD^{1,2}; Brenna C. McDonald, PsyD, MBA^{1,2,3}; Eileen F. Tallman, BS^{1,2}; John D. West, MS^{1,2}; Martin R. Farlow, MD^{2,3}; Fredrick W. Unverzagt, PhD^{2,4}; Sujuan Gao, PhD^{2,5}; Malaz Boustani, MD, MPH^{2,6,7,8}; Paul K. Crane, MD, MPH⁹; Ronald C. Petersen, MD, PhD¹⁰; Clifford R. Jack Jr, MD¹¹; William J. Jagust, MD¹²; Paul S. Aisen, MD¹³; Michael W. Weiner, MD^{14,15}; Andrew J. Saykin, PsyD^{1,2} ; [for the Alzheimer's Disease Neuroimaging Initiative](#)
[\[+\] Author Affiliations](#)

JAMA Neurol. Published online **April 18, 2016**. doi:10.1001/jamaneurol.2016.0580

Center for Neuroimaging, Department of Radiology and Imaging Sciences, Indiana University School of Medicine, Indiana University Health Neuroscience Center, Regenstrief Institute Inc,

Conclusions and Relevance **The use of AC medication was associated with increased brain atrophy and dysfunction** and clinical decline. Thus, use of AC medication among older adults should likely be discouraged if alternative therapies are available.



Patient outcomes

- **Our clients have reported reduced:**
 - **Number of prescription medications**
 - **Hospital admission rates**
 - **Hospital re-admission rates**
 - **Emergency room visits**



Financial outcomes

- **Our clients have reported:**
 - **Reduced unnecessary healthcare utilization**
 - **Reduced pharmacy costs**
 - **Reduced hospital costs**
 - **Improved ROI**



The Secret Sauce is accessed via Proprietary cloud-based software solutions



(for “closed” health systems)

EireneRx

- E-Prescribing platform
- Patient risk evaluation
- EHR interoperability
- Secure messaging between prescriber and pharmacist
- Optional automated dispensing and delivery tracking
- Meaningful-use and EPCS certified

(for Pharmacists and for
Population Risk Stratification)



MEDWISE
ADVISOR

- Modular use of EireneRx components
- Applicable to broad healthcare audience
- Primary and Secondary Medication Risk Stratification
- Embedded pMRM
- **My MedWise Advisor (patient engagement tool)**



Highly scalable AWS technology platform



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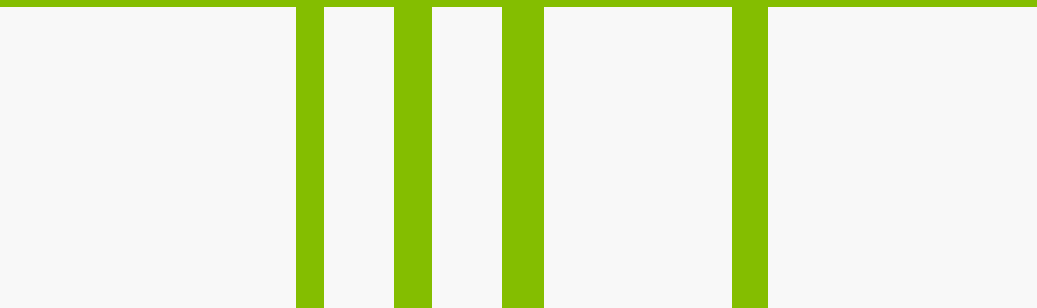
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Risk Stratification Strategy

for Members of



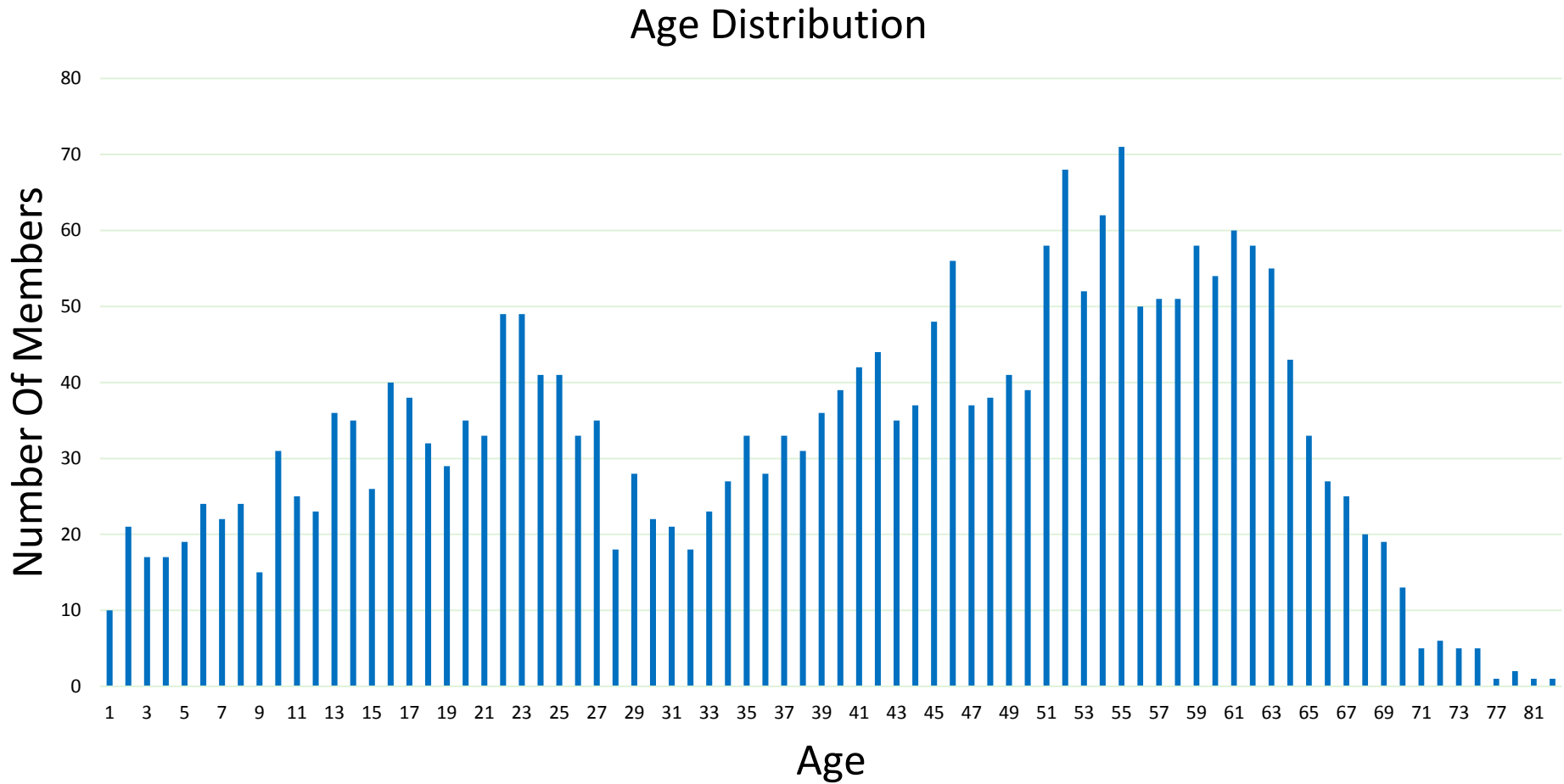
May 2016

Overview of the Data

- We received medication data for 2540 individuals, and successfully analyzed 2528
- In total, 15911 medications were identified in the data
- The average number of Medications per person was 6 meds/member
- The median number of Medications per person was 5
 - The number of Medications per person ranged from 1 to 48 Meds/member
- For the members in the data, the average age was 40
 - The median age was 43
 - The ages ranged from 1 to 85 years old.
- This was aggregate data, spanning 15 months

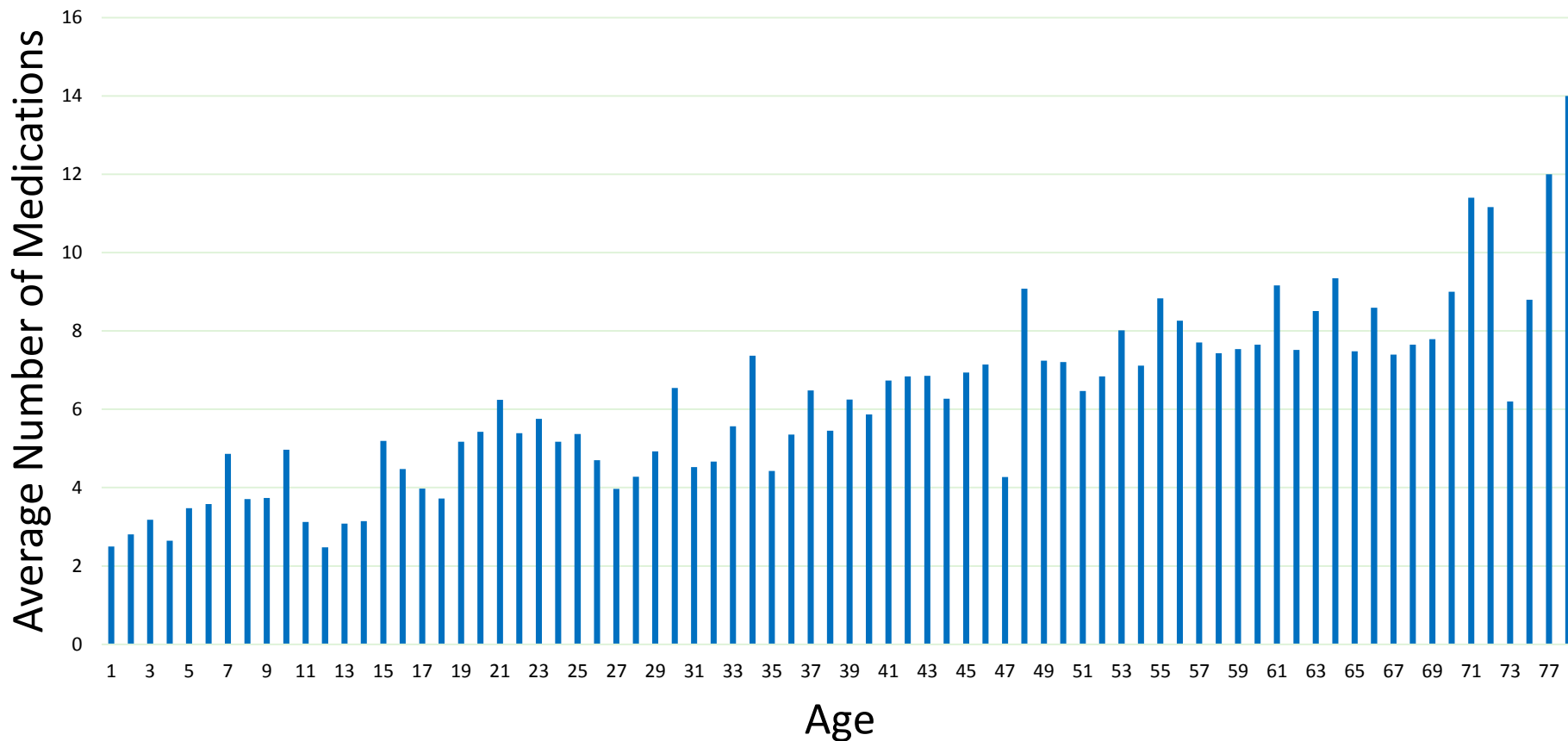


Age Distribution



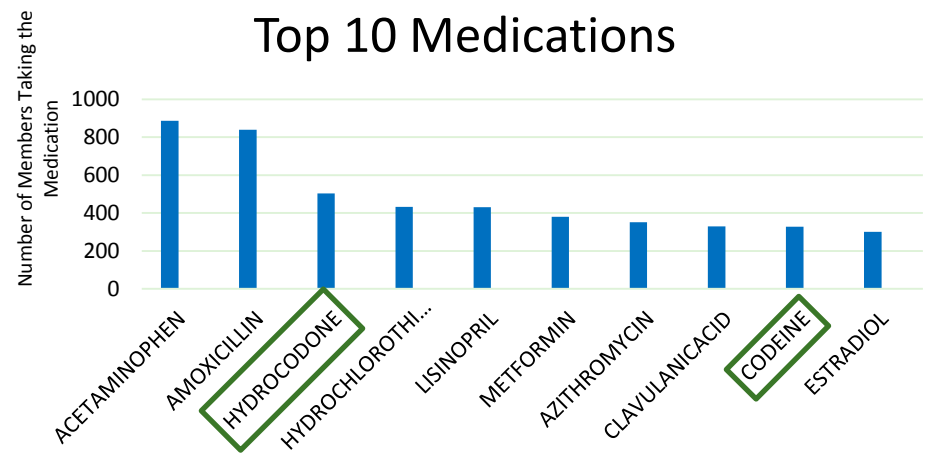
Number of Medications Based on Age

Average Number of Medications by Age

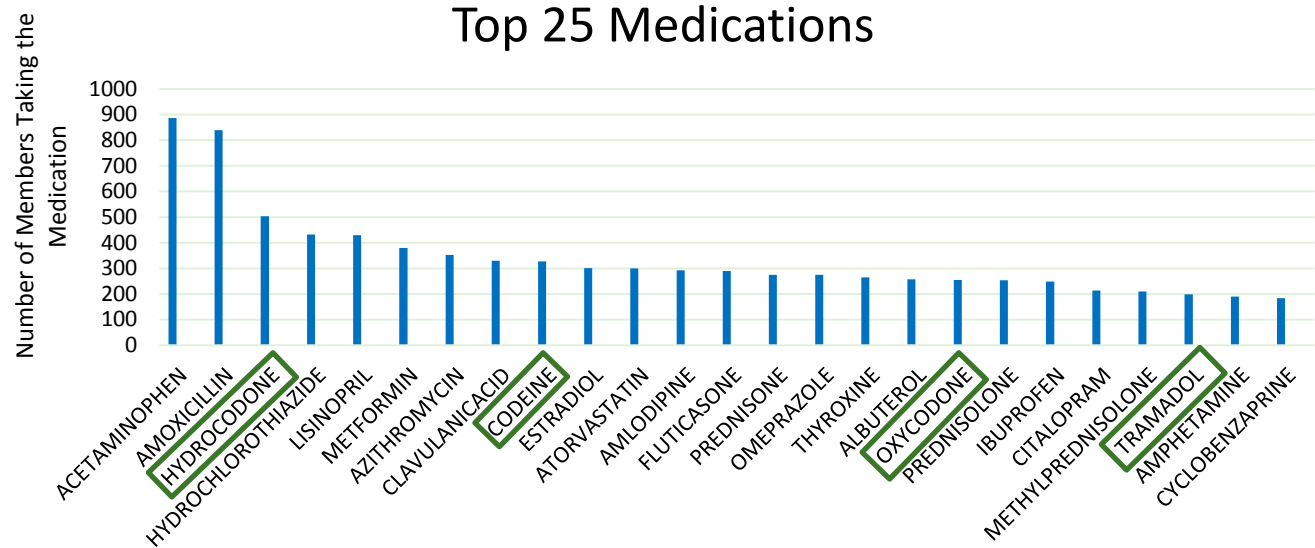


Medication Distribution

Top 10 Medications



Top 25 Medications



Risk Stratification Factors Used in the Analysis

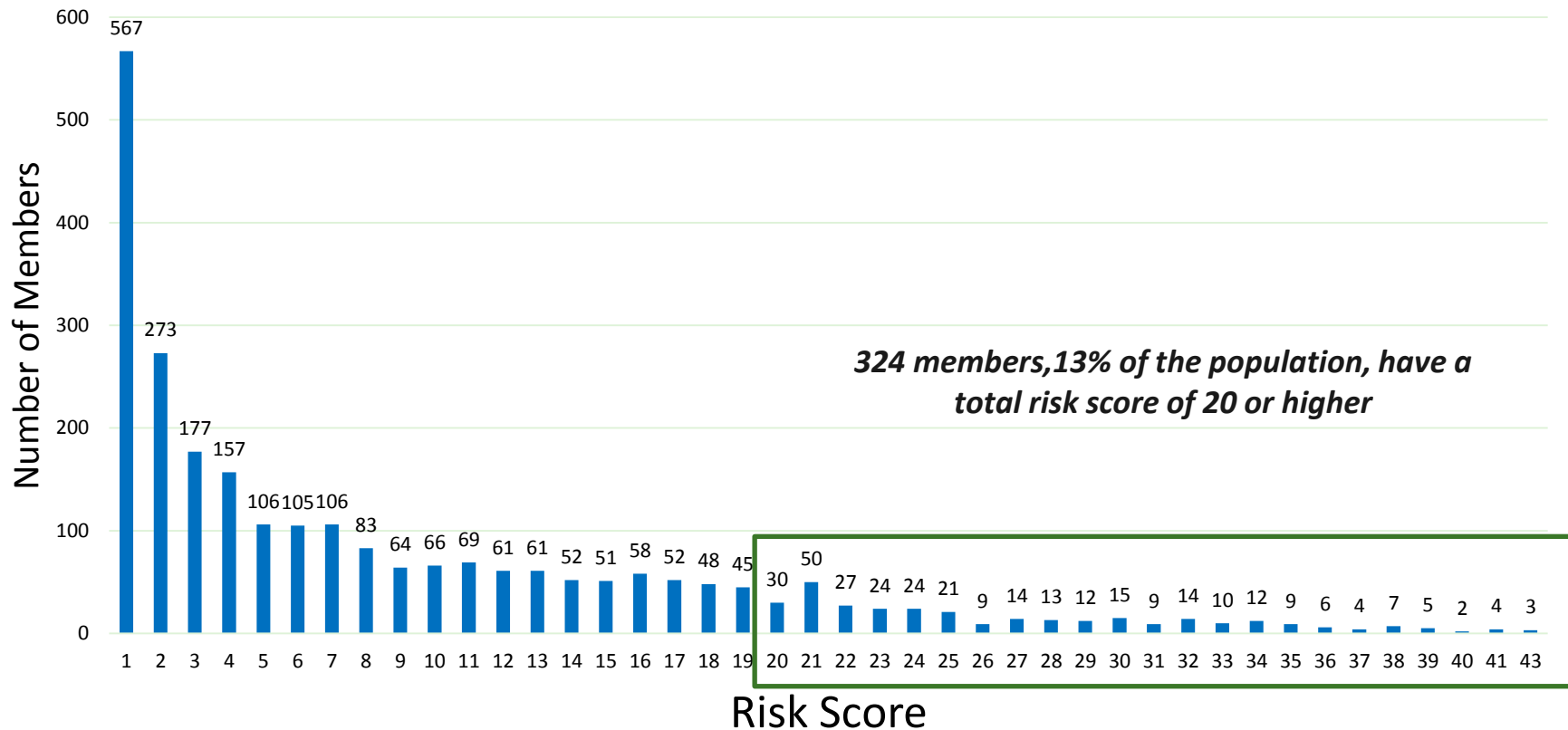
There are many ways to stratify patients in order to assess the highest medication risk segment

- Dispensed Medication History
- Frequent-flyers for Falls, ED visits, and/or Hospitalizations/Re-hospitalizations
- High medication cost patients
- High medical cost patients
- ??



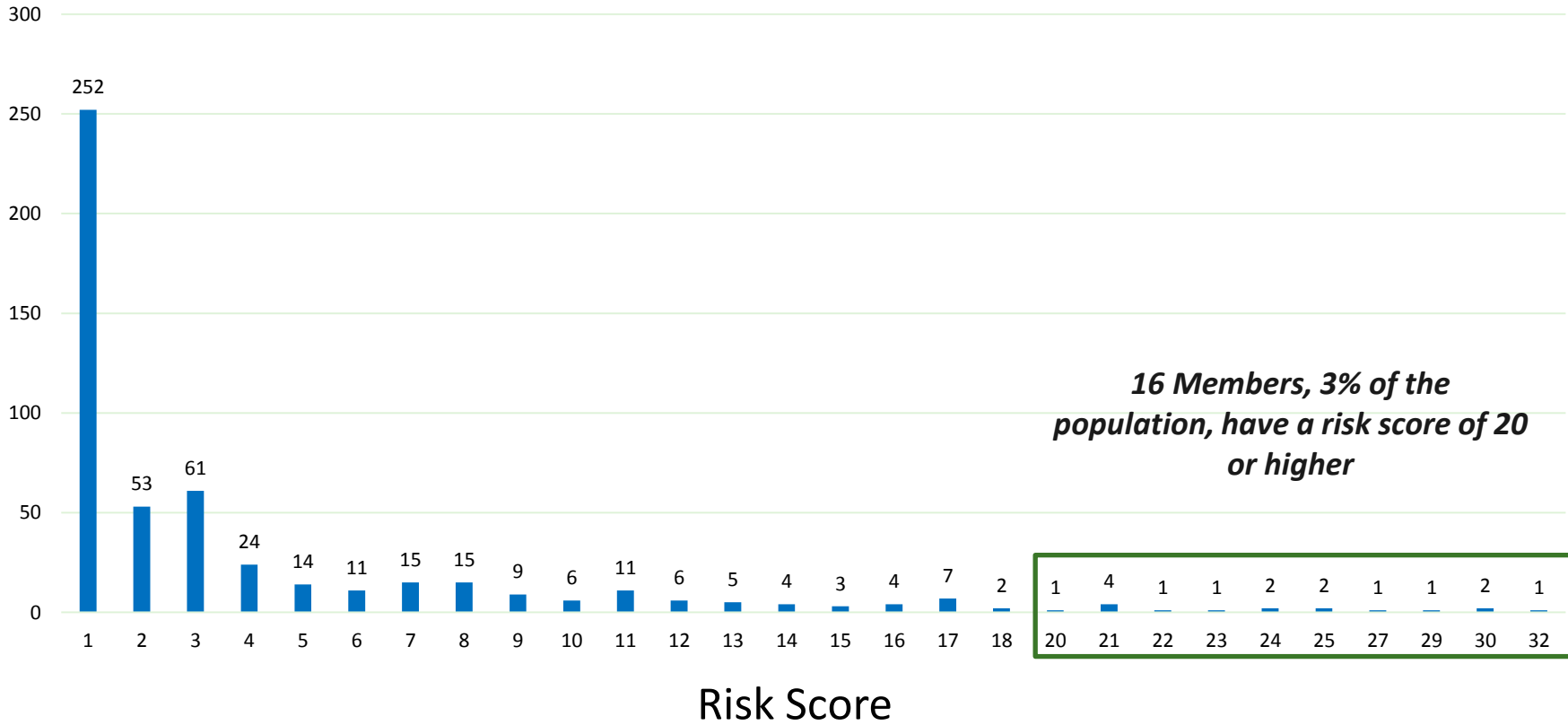
Total Risk Score Distribution

Total Risk Score Distribution



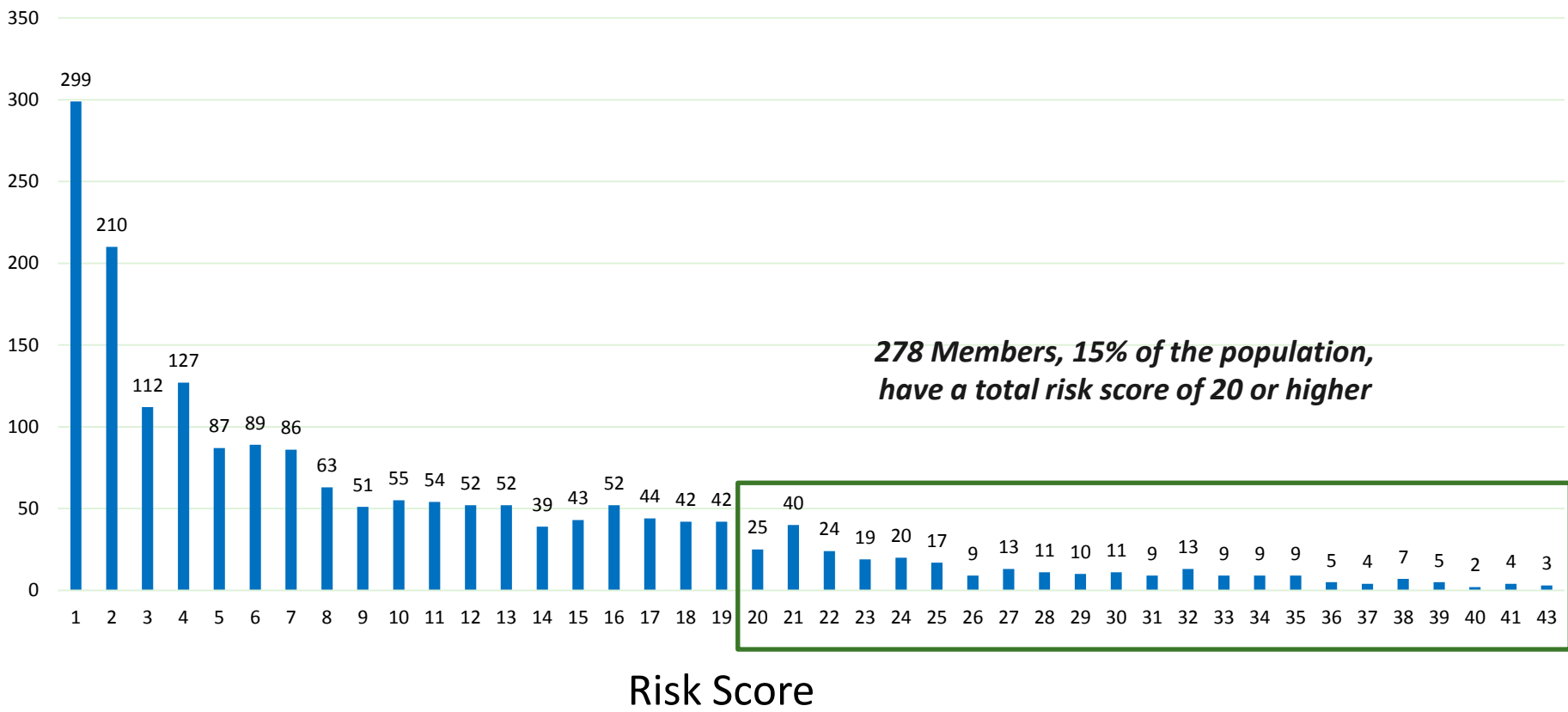
Risk Score Distribution by Age Groups

Total Risk Score Distribution **Ages 1-20**



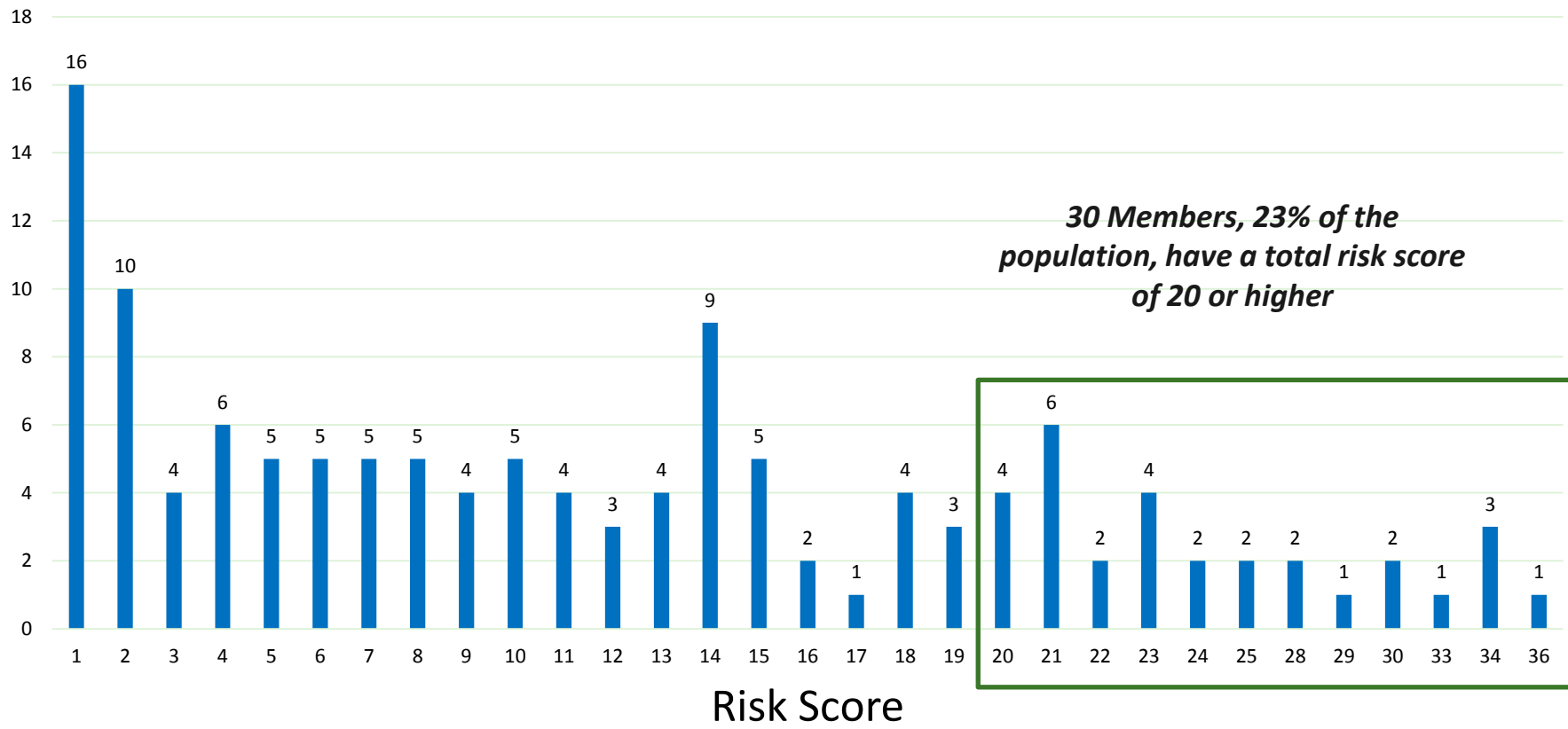
Risk Score Distribution by Age Groups

Total Risk Score Distribution **Ag**es 21-65



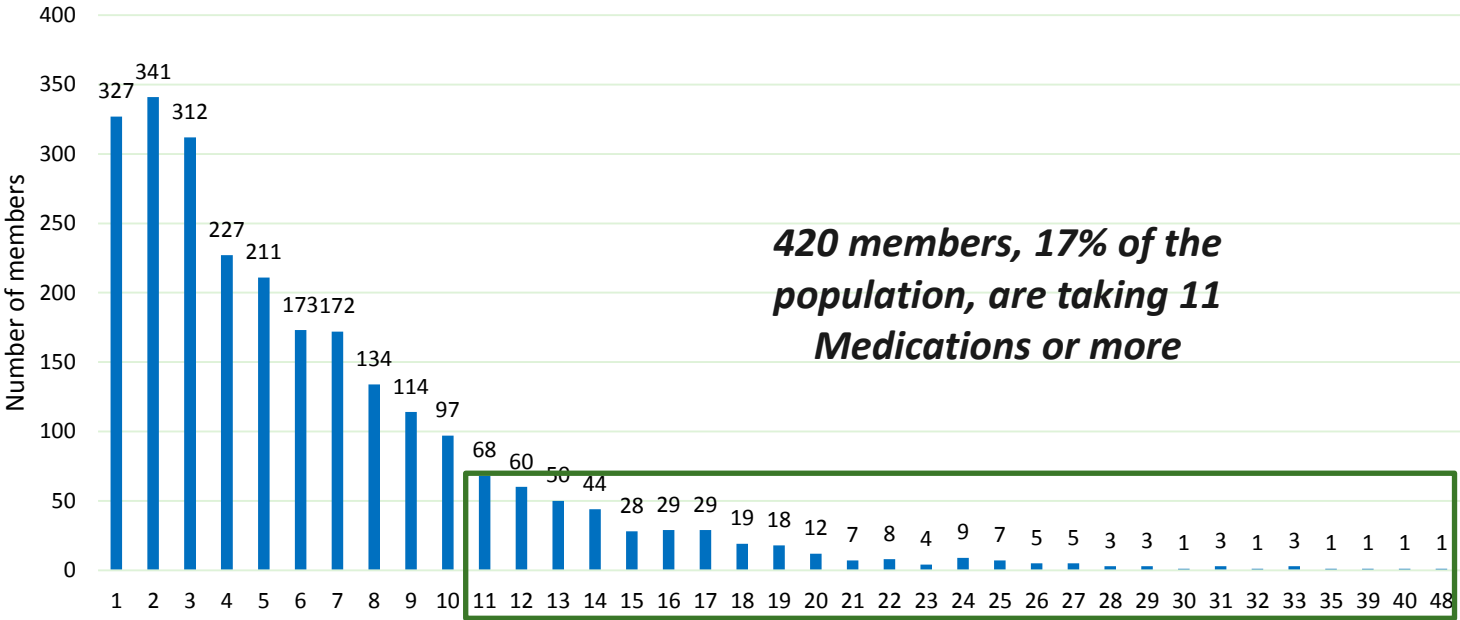
Risk Score Distribution by Age Groups

Total Risk Score Distribution Ages 65+



Factor 1: Number of Medications

Actual Number of Meds Distribution



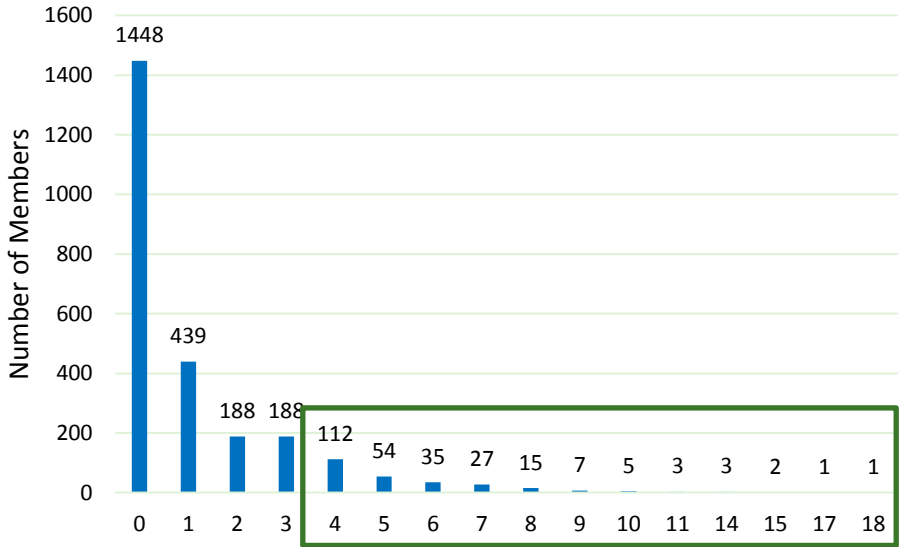
420 members, 17% of the population, are taking 11 Medications or more

**Of this 420,
 4.8% (25) are between the ages of 1-20,
 18.9% (357) are in the working age of 21-64, and
29.2% (38) are older than 65**



Risk Factor 2: Acetylcholine Burden

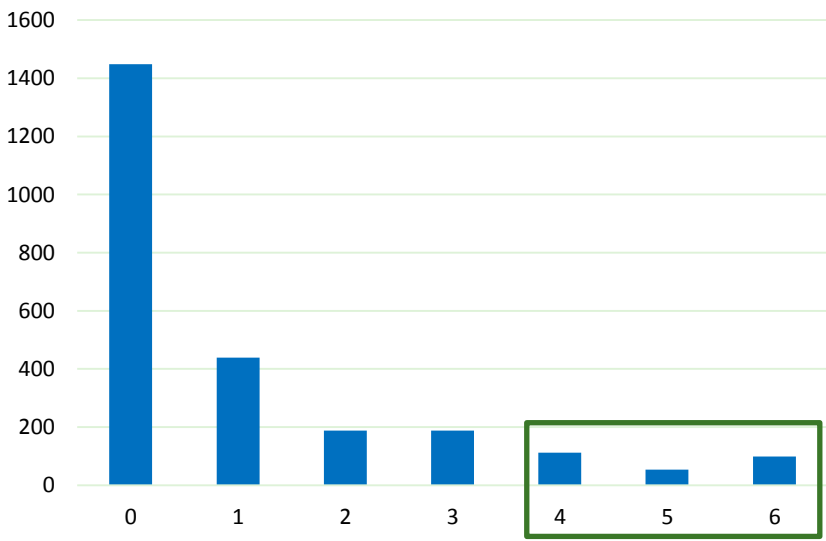
Actual AChB Distribution



Of this 265,
3.5% (18) are between the ages of 1-20,
12.3% (231) are in the working age of 21-64, and
12.3% (16) are older than 65

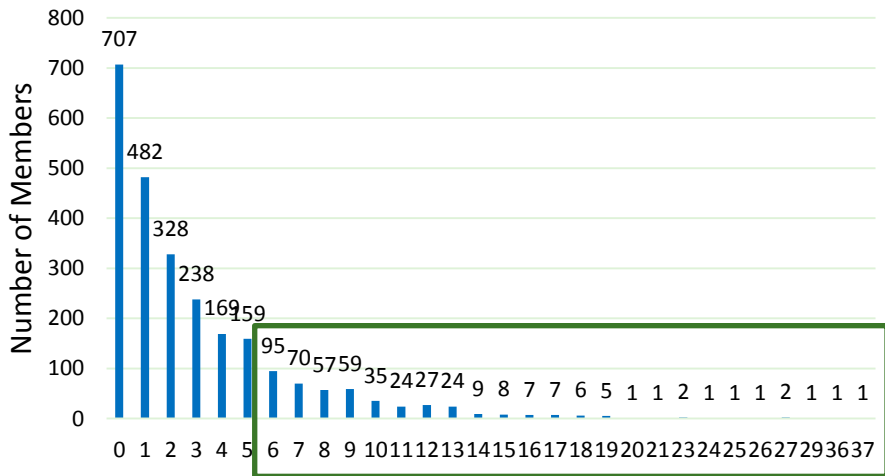
265 Members, 11% of the population, have an AC Burden of 4 or higher

AChB Risk Score Distribution



Risk Factor 3: Sedative Burden

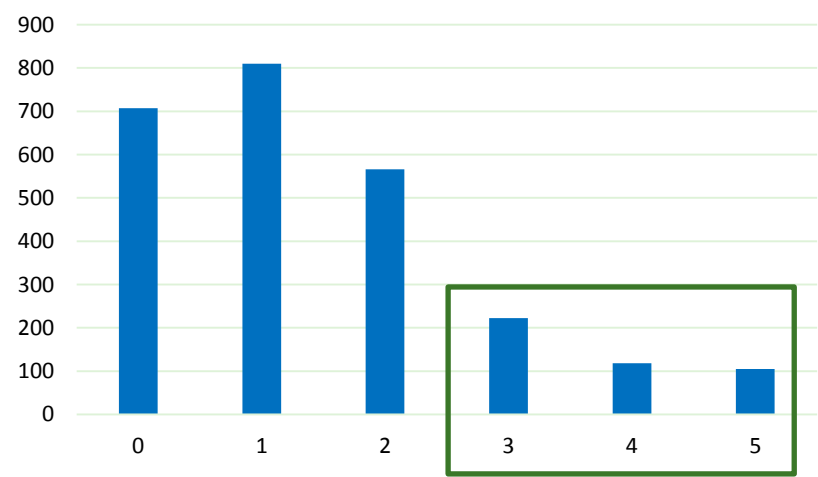
Actual SB Distribution



445 Members, 18% of the population, have a Sedation Burden of 3 or higher

Of this 445, 3.3% (17) are between the ages of 1-20, 21.2% (399) are in the working age of 21-64, and 22.3% (29) are older than 65

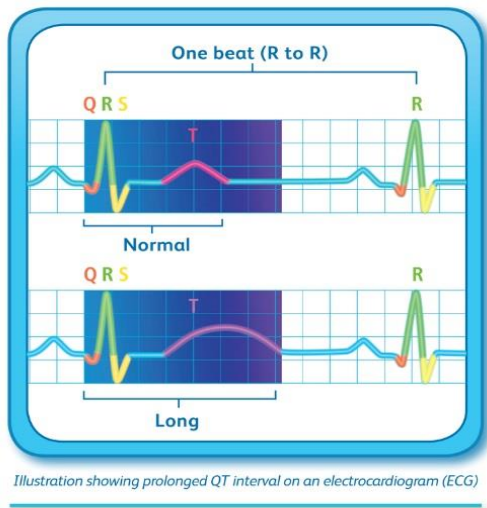
SB Risk Score Distribution



Risk Factor 4: Long QT Interval Risk

To review: Why it Matters?

- The human heart pumps blood via a series of electrical signals.
- We Measure these signals using an ElectroCardioGram(ECG)
- Many medications affect the T wave (potassium channel)
- This is the leading cause of FDA withdrawing medications from the market.

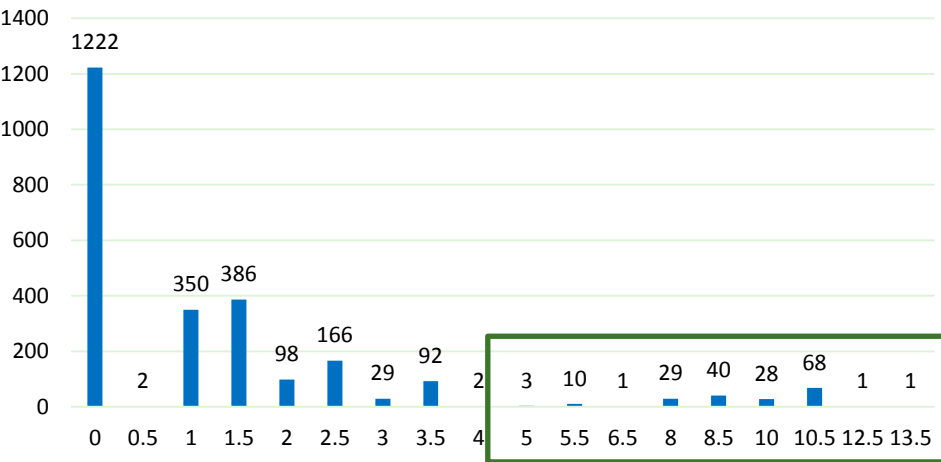


A Prolonged QT interval leads to a sudden quick and chaotic Heart Rate, which can result in:

- ***Dizziness***
- ***Fainting***
- ***Seizure***
- ***Death***

Risk Factor 4: Long QT Interval Risk

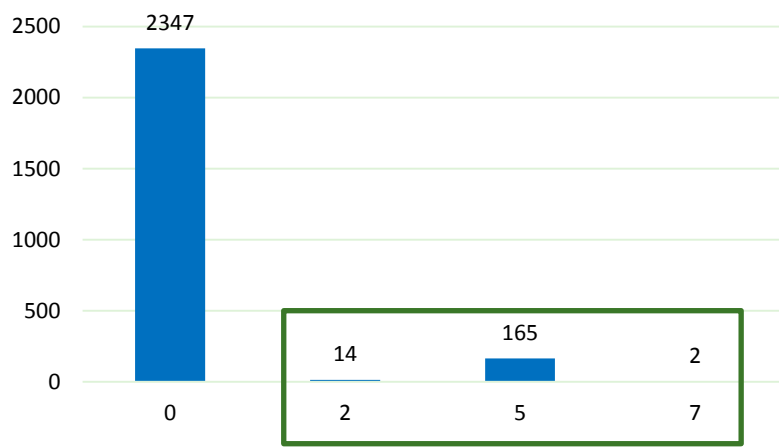
Acutal LQTS Distribution



181 members,
2.3% (12) are between the ages of 1-20,
8.1% (152) are in the working age of 21-64, and
13.1% (17) are older than 65

181 Members, 7.2% of the population, have a Long QT interval risk of 5 or higher

LQT Risk Score Distribution

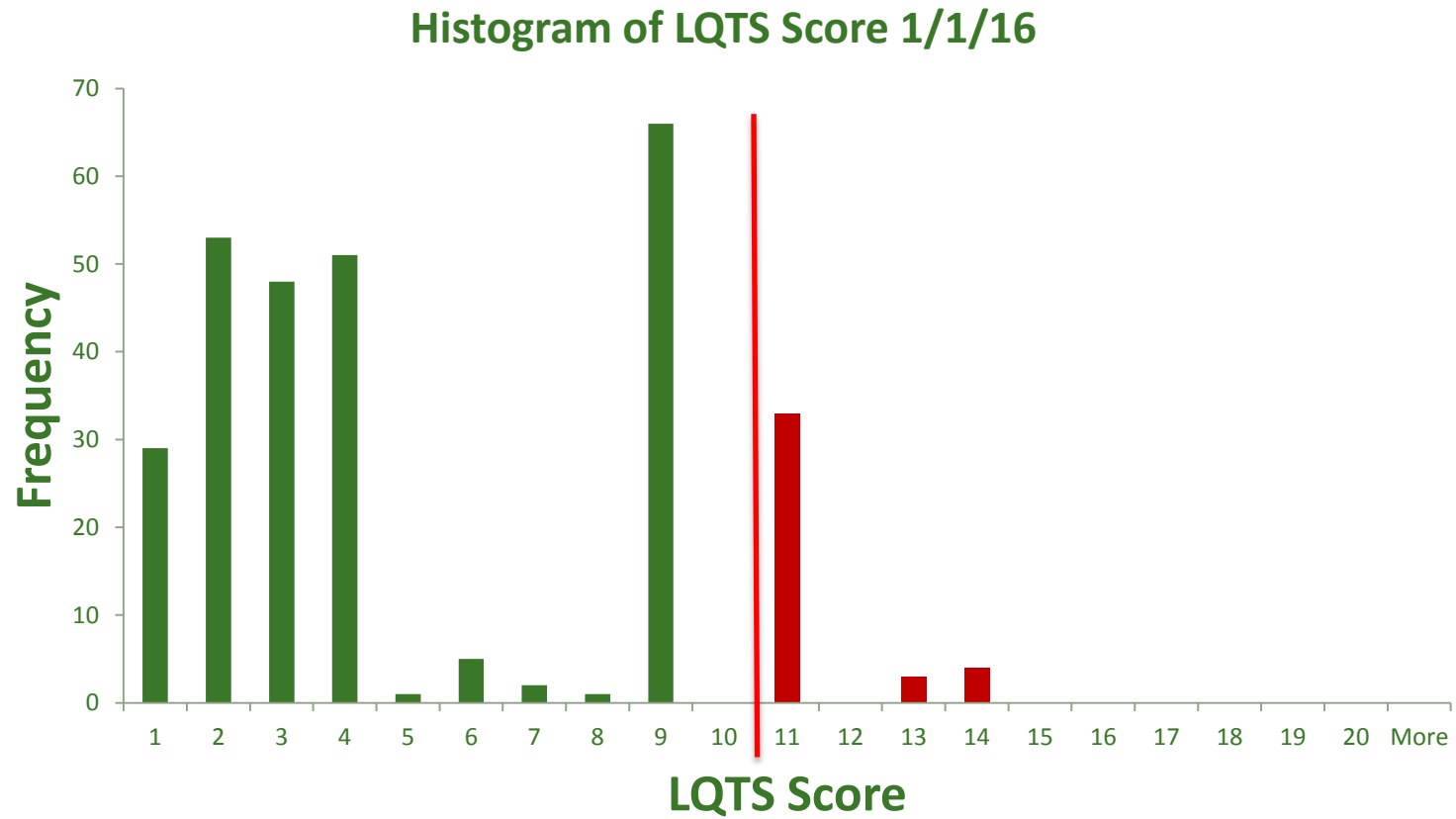


Of this 8%, 108 members, 60%, are Female



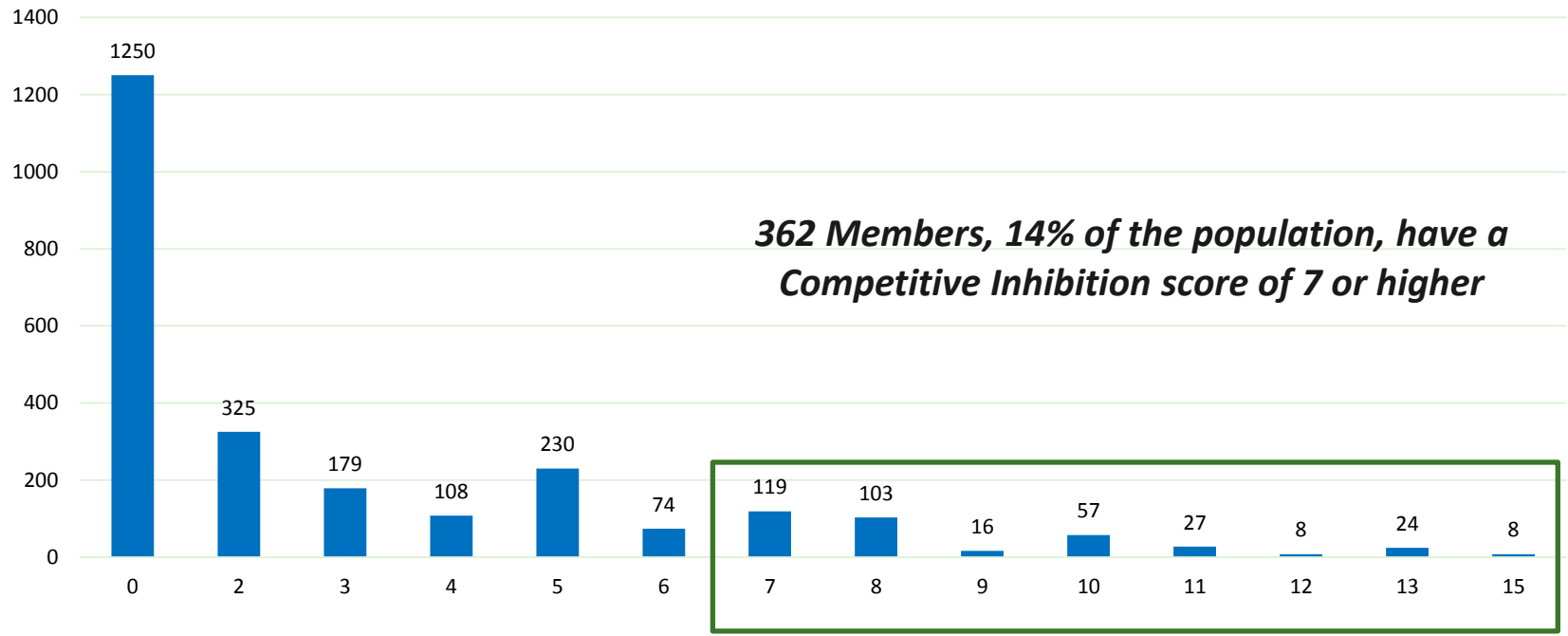
Risk Factor 4: Long QT Interval Risk

LQTS Score Distribution 1/1/16



Risk Factor 5: Competitive Inhibition

Combined CI Score Distribution



362 Members, 14% of the population, have a Competitive Inhibition score of 7 or higher

**Of this 362,
3.5% (18) are between the age of 1-20,
16.8% (316) are in the working ages of 21-64, and
21.5% (28) are older than 65**



Screening for Members Most At Risk

- To identify members who are most at risk, we perform an aggregate analysis of all risk factors.
- We use the analysis to identify members most at risk for each risk factor.
- Following this analysis, we perform another screening to see how many members, if any, are included in **all 5 high risk groups**.
- Based on this analysis for the data provided:
 - We identified a total of 61 members who are most at risk.



Why These Risks Matter: Impact in the Workplace

- Whether **Unintentional Overdose Risk** (e.g., can not excrete the medications) or **Additive Side Effects Risk** (e.g., too sedative, too anticholinergic, too Long QT Risk), these factors can significantly contribute to employee behavior.
 - Affecting Attentiveness, Productivity, and Safety while operating in the workplace.
 - Leading to Falls, ER visits, Hospitalizations, and Death.

Process Measures

1. **Static Descriptive Analytics**
2. **Business Intelligence, Dynamic Analytics—may be crossed-walked with Medical data (e.g., cost, utilization)**
3. **Personalization, Medication Risk Mitigation Interventions—
Comprehensive Medication Reviews**
 - *May include optional robotic reminder packaging for high-risk, multi-comorbid clients*



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 - *May include optional robotic reminder packaging for high-risk, multi-comorbid clients*
4. **Personalization, Patient Empowerment, My MedWise Advisor app**
 - *Includes web-based Health Literacy, Videos, Refrigerator Sheets, etc.*

Endpoints / Outcomes Metrics

- *Decrease and/or prevent negative health downstream effects (Presenteeism, etc.)*
- *Improve the quality of life for the individual*
- *Lower medical / pharmacy costs*
- *Avoid Falls, ER Visits, Hospitalizations*



To Summarize the Elephant-in-the-room Issue: What are the Implications of Adverse Drug Events for Your Team?

Quality of Life?

Presenteeism?

Absenteeism?

Productivity?

Pharmacy costs?

Medical costs?

*As we move toward “Population-based, Value-based Pricing of Medications,”
Personalization of the Regimen will Remain the Predictive Key to Optimizing
each Individual’s Medication Regimen.*



Thanks for the Interest!



May 2016

MOORESTOWN, NJ | BOULDER, CO | CHARLESTON, SC | SAN FRANCISCO, CA | ST LOUIS, MO | PHOENIX, AZ