

CDC PUBLIC HEALTH GRAND ROUNDS

Overcoming Barriers to Medication Adherence for Chronic Diseases



February 21, 2017



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

Understanding Barriers to Medication Adherence



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Extent of Nonadherence Across the Population

For every 100 prescriptions written:

100



Filled by the pharmacy

50-70



Picked up from the pharmacy

48-66



Taken properly

25-30



Refilled as prescribed

15-20



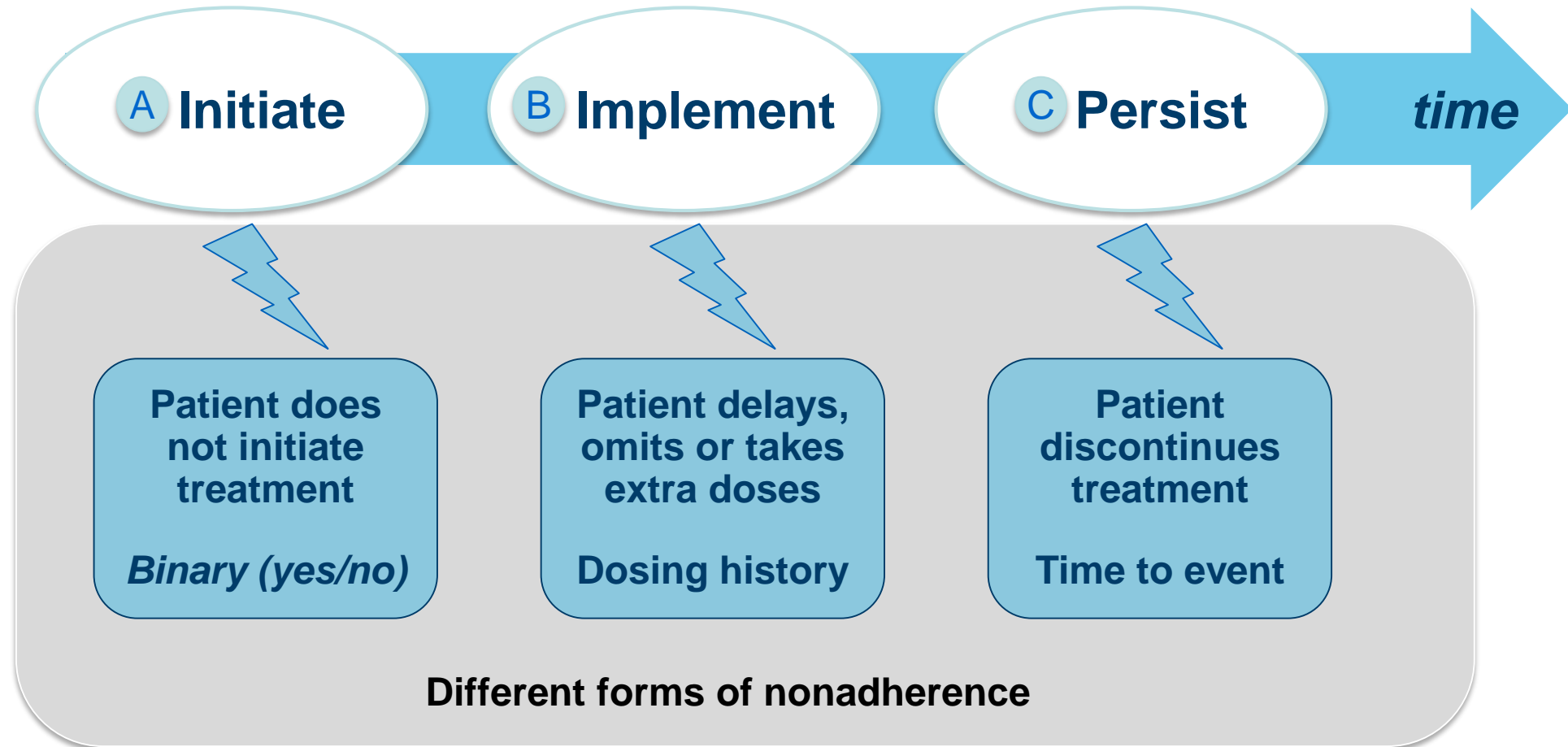
At any given time
~50% of patients are non-adherent

National Association of Chain Drug Stores Pharmacies: Improving Health, Reducing Costs. July 2010. Based on IMS Health data.

Image courtesy of Zullig L.

Christensen A, Osterberg LG, Hansen EH. *J Hypertens*. 2009 Aug;27(8):1540-51.

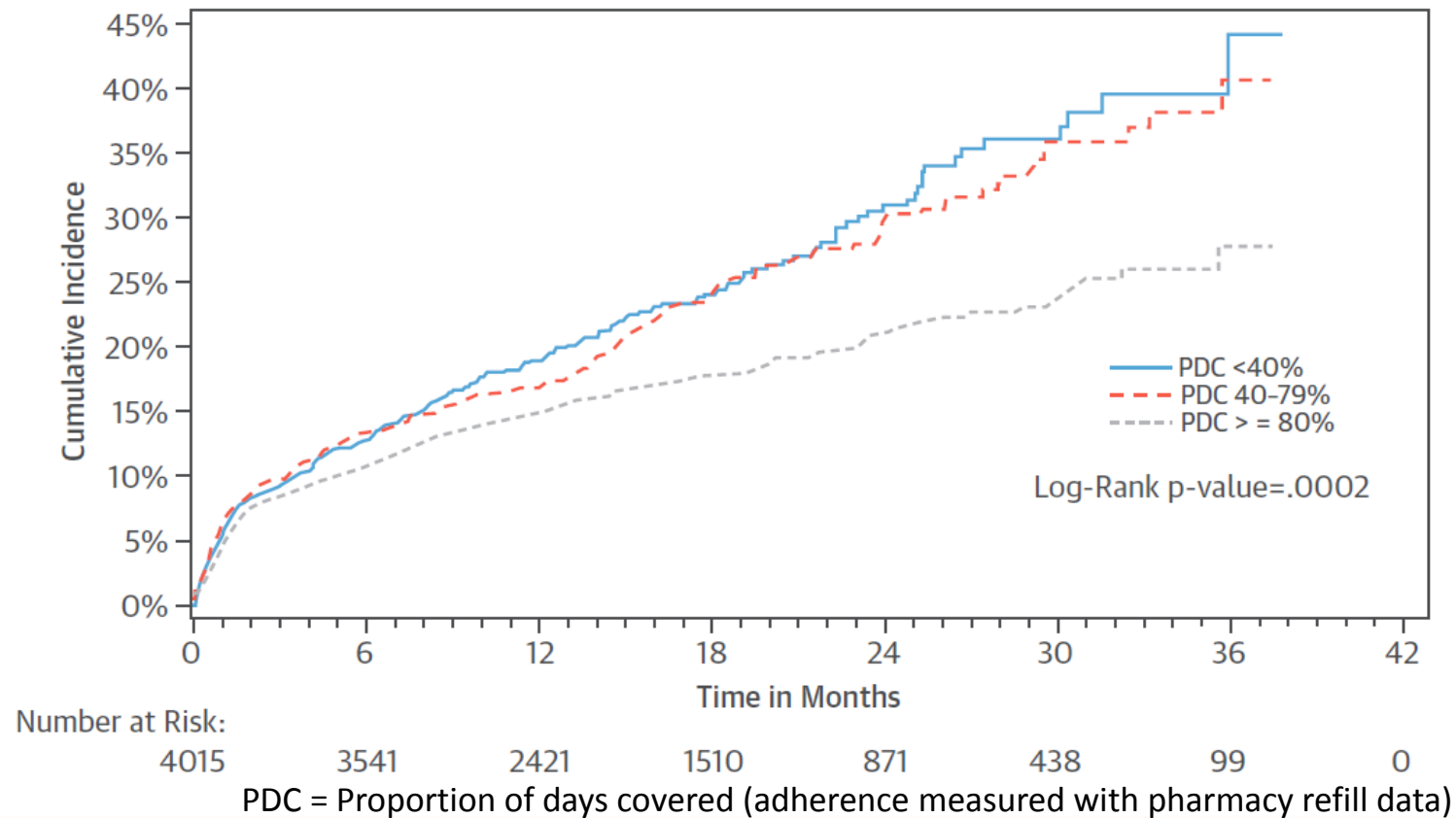
Adherence Is The Process by Which Patients Take Their Medications as Prescribed



Adherence is Linked to Clinical Outcomes

- Medication nonadherence in the U.S. costs \$100 billion–\$300 billion per year
- 33%–69% of hospital admissions are due to nonadherence
- Good adherence reduces adverse events and mortality

Lower Adherence Associated with Greater Risk of Major Adverse Cardiac Event



Vlasnik JJ, Aliotta SL, DeLor B. *Case Manager*. 2005 Mar-Apr;16(2):47-51.

Simpson SH, Eurich DT, Majumdar SR, et al. *BMJ*. 2006 Jul 1;333(7557):15.

Figure: Bansilal S, Castellano JM, Garrido E, et al. *J Am Coll Cardiol*. 2016 Aug 23;68(8):789-801

Nonadherence Is Multifactorial

➤ **Socioeconomic factors**

- Lower social economic status associated with lower adherence

➤ **Health care system factors**

- Team-based care and post-hospital follow-up improve adherence

➤ **Medical condition-related disease factors**

- Concomitant conditions and comorbidities can impact adherence

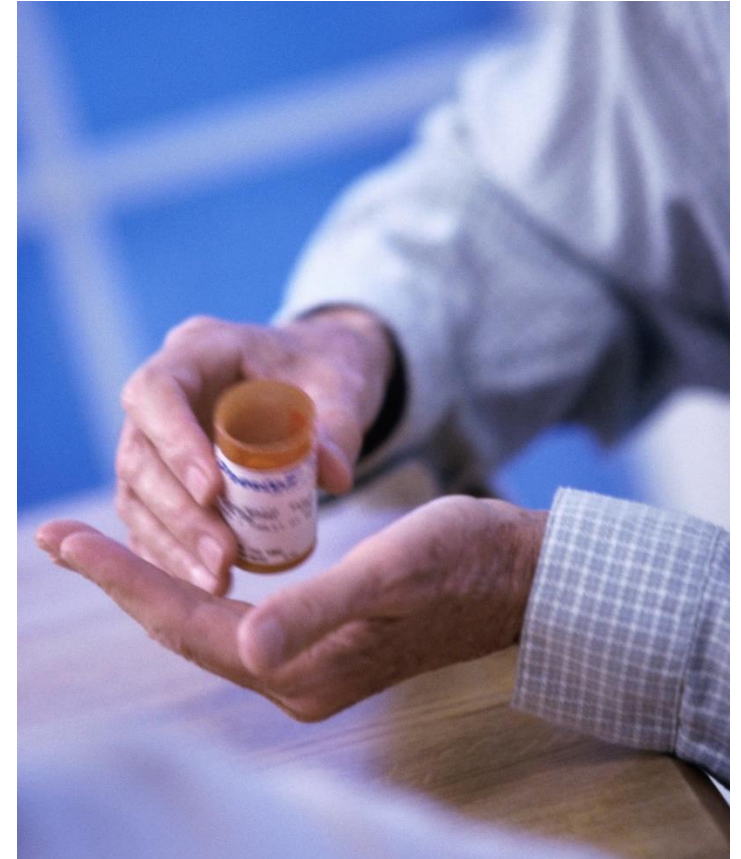
More Factors that Impact Adherence

➤ **Therapy-related factors**

- Side effects of medications
- Number and different types of pills to be taken
- Complexity or changes to regimen

➤ **Patient-related factors**

- Understanding of disease, its course and possible complications
- Expectations of improvement on medication
- Perceptions of symptoms, either improving or worsening



Medication Adherence Interventions Can Impact Nonadherence

Meta-Analyses of Medication Adherence Intervention Outcomes

Condition	Number of Studies	Total Number of Patients	Effect size	95% C.I.	P-value
Hypertension	112	34,272	0.42	0.32, 0.52	<.001
Coronary artery disease	28	18,839	0.23	0.14, 0.32	<.001
Heart failure	29	4,285	0.29	0.09, 0.48	.004

Conn VS, Ruppap TM, Chase JA, et al. *Curr Hypertens Rep*. 2015 Dec;17(12):94.

Chase JA, Bogener JL, Ruppap TM, et al. *J Cardiovasc Nurs*. 2016 Jul-Aug;31(4):357-66.

Ruppap TM, Delgado JM, Temple J. *Eur J Cardiovasc Nurs*. 2015 Oct;14(5):395-404.

Understanding Interventions Impact on Nonadherence

- **Evaluating the effect of an intervention on adherence**
 - Medication adherence needs to be measured in valid, reliable and cost-effective ways
 - Lack of valid, reliable, and cost-effective ways to measure the impact of an intervention on medication adherence prevents scale-up of interventions to wider clinical practice



Target Adherence Interventions to Non-adherent Patients

- Adherence intervention studies often include a mix of adherent and non-adherent patients
- For patients with good adherence, little or no room to improve
 - Limits the effect when measuring outcomes
 - Allocates intervention resources poorly



Unintentional vs. Intentional Nonadherence

- **Most interventions are not designed to assess the reasons for nonadherence**
- **Unintentional nonadherence will require a different approach than intentional nonadherence**

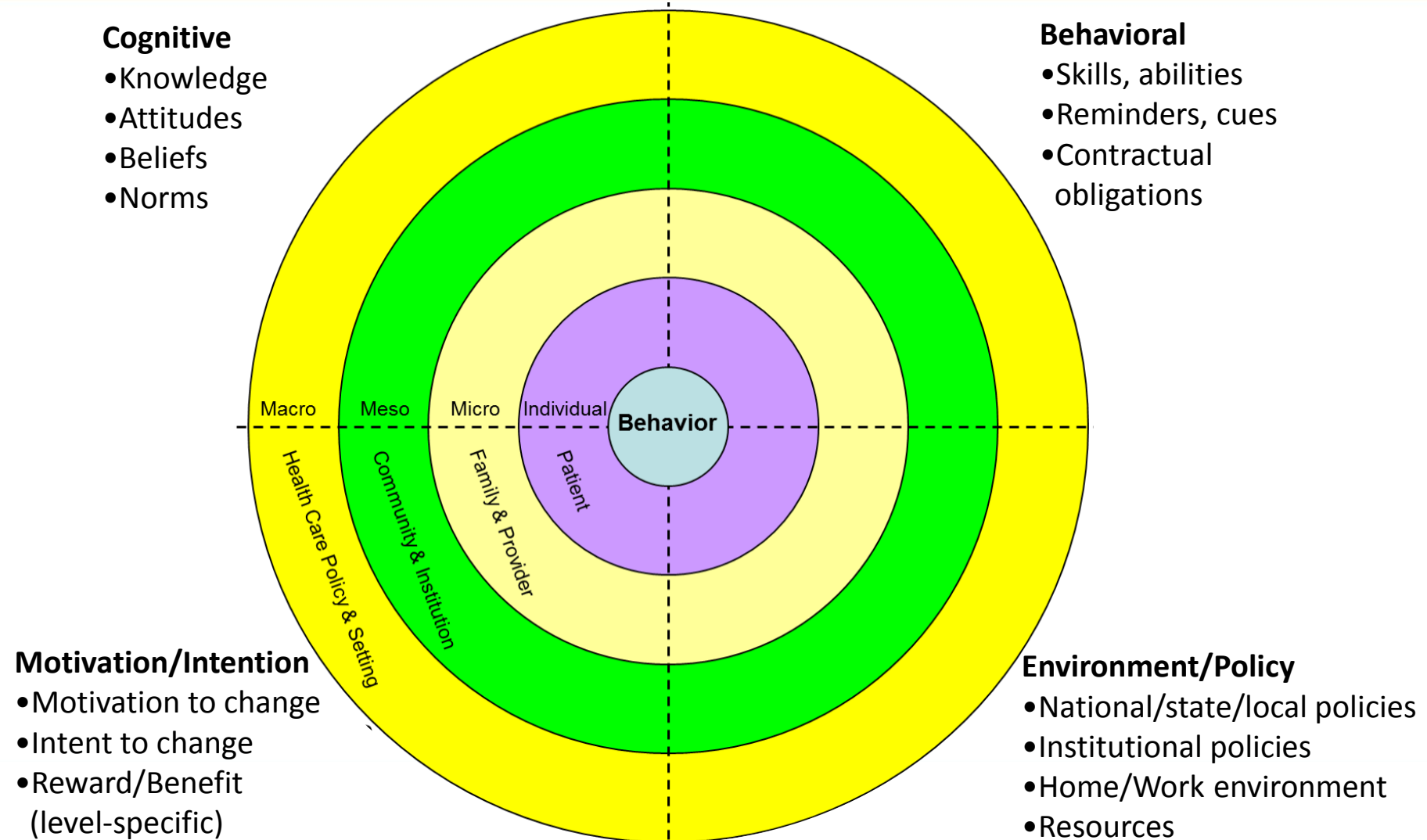
Intervention Effects Will Vary Based on Intervention Type



- **Education and cognitive-focused interventions tend not to change behavior**
- **Need more innovative social support interventions**
- **Need better understanding of variation in adherence by diseases and type of patients**

Intervention Effects Will Vary Based on Intervention Type

- **Multilevel interventions are needed**
- **Focus beyond providers**
- **Barriers exist at patient, provider, and systems levels**



Overcoming Unintentional Nonadherence

- **For patients with unintentional nonadherence, packaging interventions are cost-effective first steps**
 - Pillboxes
 - Blister packs
- **Integrating medication taking into existing habits and routines can be helpful**
 - Uses behavior prompt to remember medication
 - Can be external reminder, phone alarm or medication log



Larger Intervention Doses Tend to Be More Effective

➤ **Intervention delivery method matters**

- Face-to-face are more effective, but more expensive
- Trials of face-to-face with mobile health follow-up may be more effective than just making mobile health tools available

➤ **Intervention dose makes a difference**

- Measured as either number of times or length of time meeting with patient

➤ **How to sustain improved adherence beyond the intervention?**



Challenges

- **Need interventions that incorporate health disparities**
 - Same disparities seen in disease are seen in adherence
- **Further distinguish between reasons for nonadherence**
 - Unintentional vs. intentional
 - Social determinants of health



One year of blister packs for one patient

Next Steps

- **Need better ways to measure adherence, especially for clinical settings**
 - Integration of pharmacy data and patient-reported data
 - Communication between electronic monitoring and electronic health records
- **Move from interventions to long-term solutions that support patients**



Multifaceted Interventions Improve Adherence



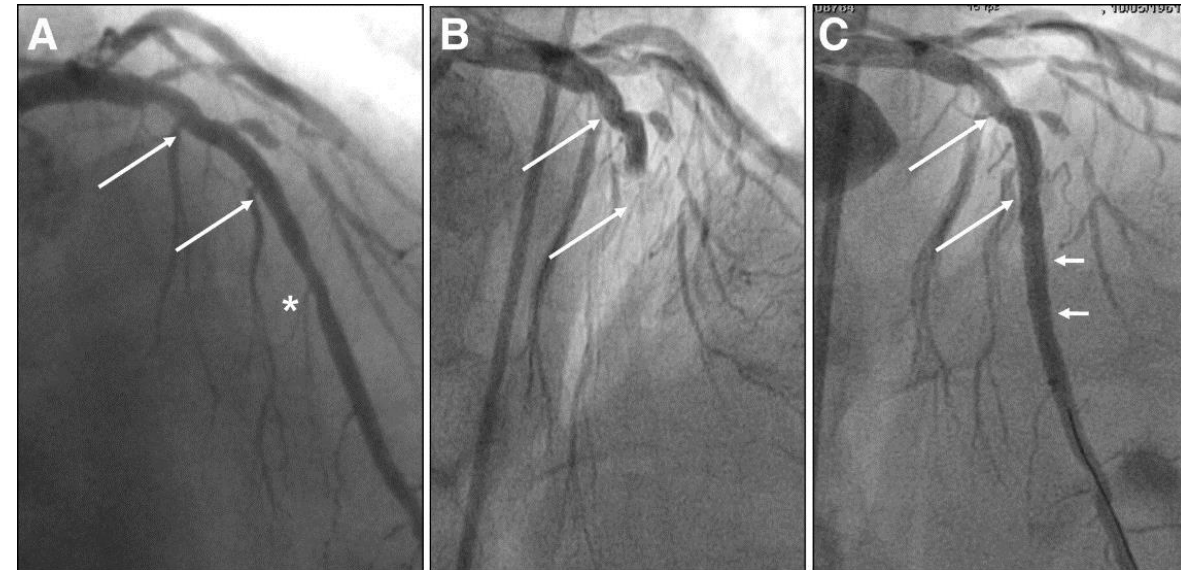
P. Michael Ho, MD, PhD

Staff Cardiologist, VA Eastern Colorado Health Care System

Professor of Medicine, University of Colorado Anschutz Medical Campus

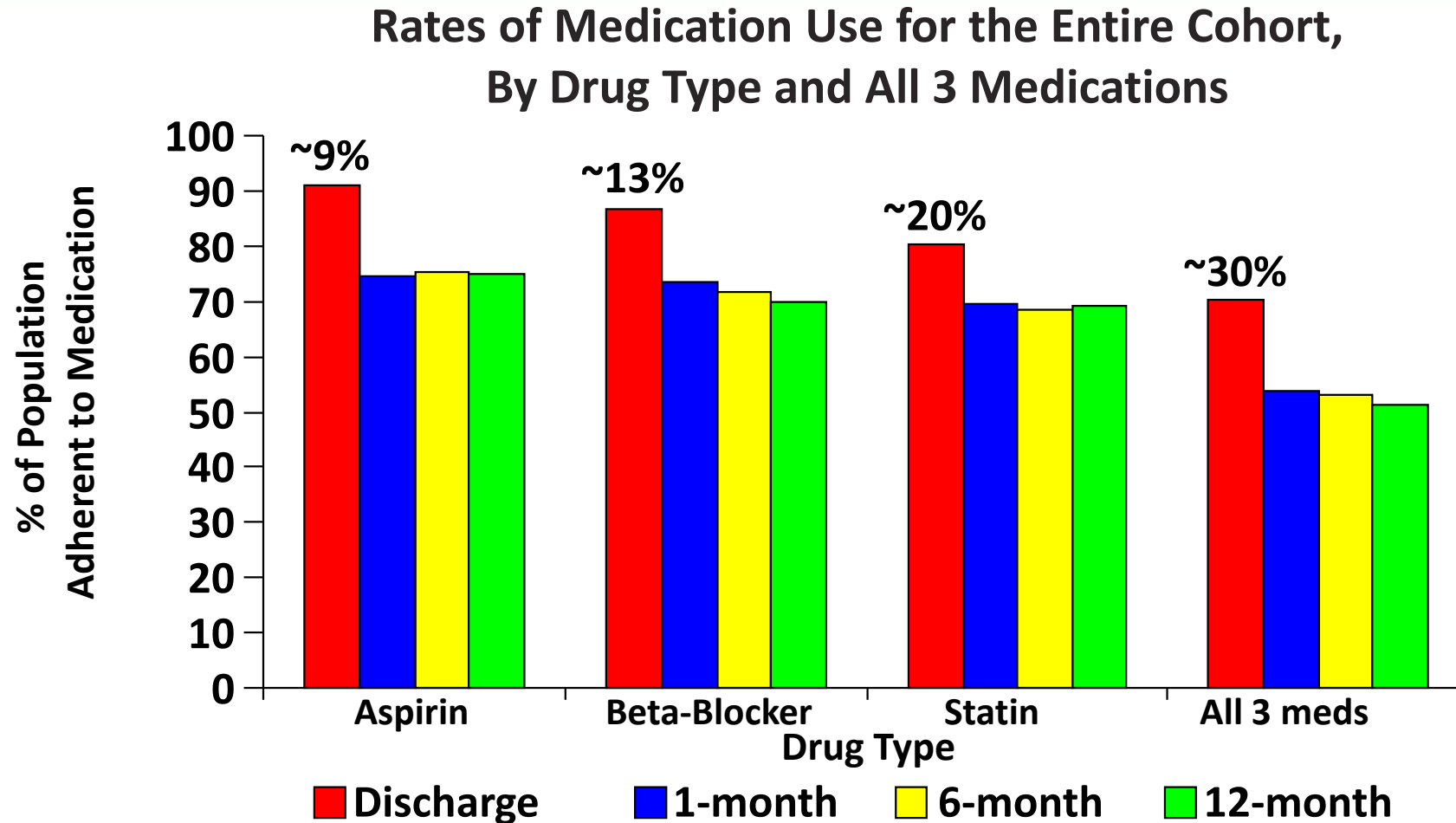
Patient Case: Mr. A

- Dec 2010: Presents with initial heart attack; stent placed and started on antiplatelet medication
- May 2011: Second heart attack; different stent type placed
- Nov 2011: Third heart attack; switched to different antiplatelet medication
- June 2012: Fourth heart attack



Angiograms from May 2011

Medication Discontinuation Occurs Earlier Than Expected

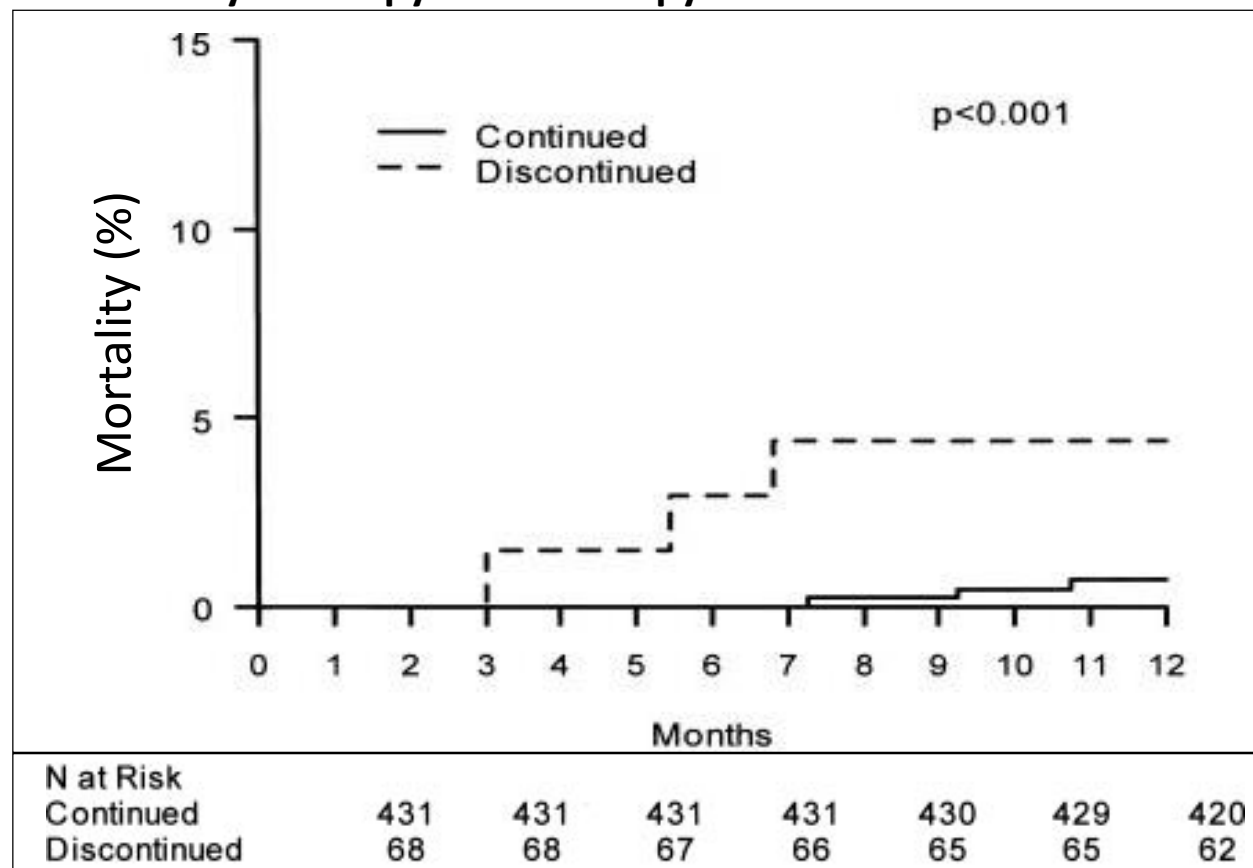


Prematurely Stopping Therapy Is Associated with Subsequent Mortality

1 in 7 patients with heart attack who receive a stent are no longer taking clopidogrel by 30 days

1 in 6 patients who receive a stent do not fill clopidogrel prescription

Kaplan-Meier Mortality Curves 1 to 12 months after MI, By Thienopyridine Therapy at 1 Month after MI



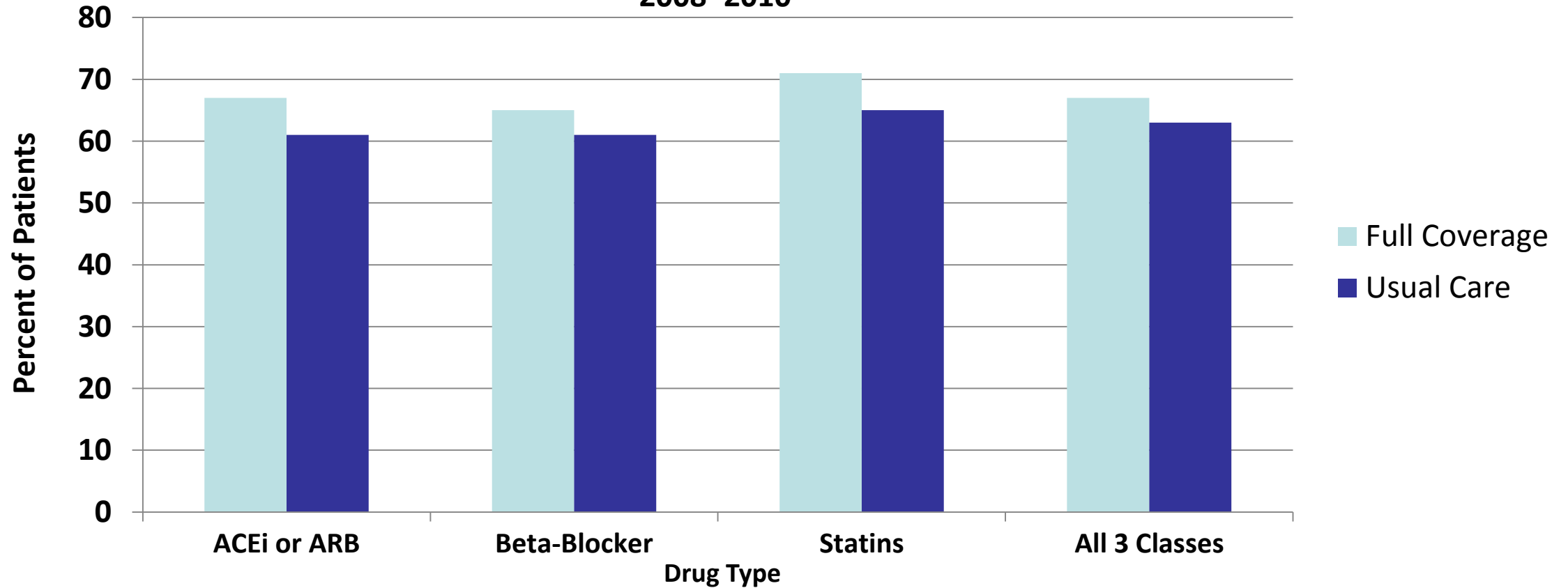
The origin is at the time of the patient's heart attack, but the lines begin at the 1-month assessment point.

Spertus JA, Kettelkamp R, Vance C, et al. *Circulation*. 2006 Jun 20;113(24):2803-9.

Ho PM, Tsai TT, Maddox TM, et al. *Circ Cardiovasc Qual Outcomes*. 2010 May;3(3):261-6.

Eliminating Co-pays and Costs Can Improve Adherence But Still There is Room for Improvement

Medication Adherence During Follow-up Among Patients Filling At Least One Prescription,
2008–2010

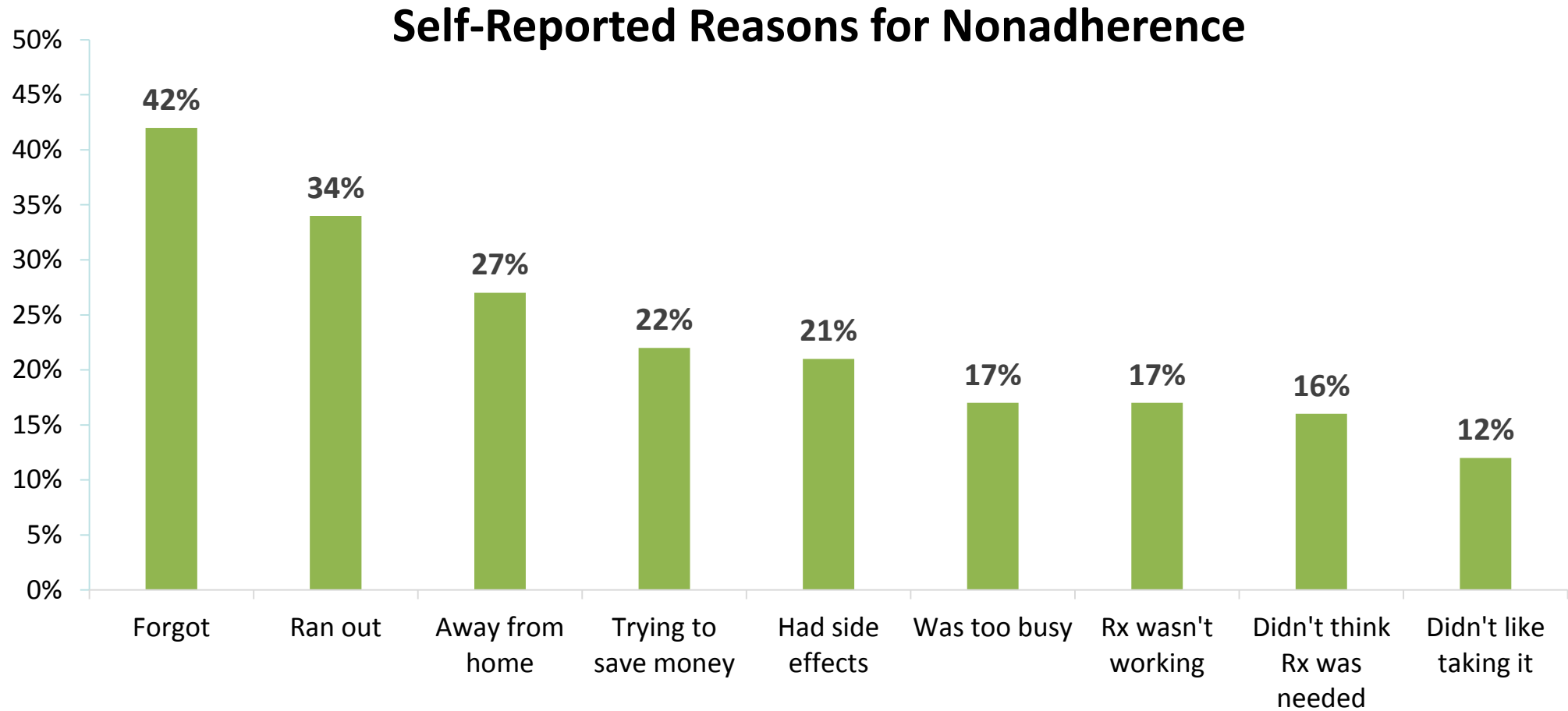


ACEi: Angiotensin-converting-enzyme inhibitors

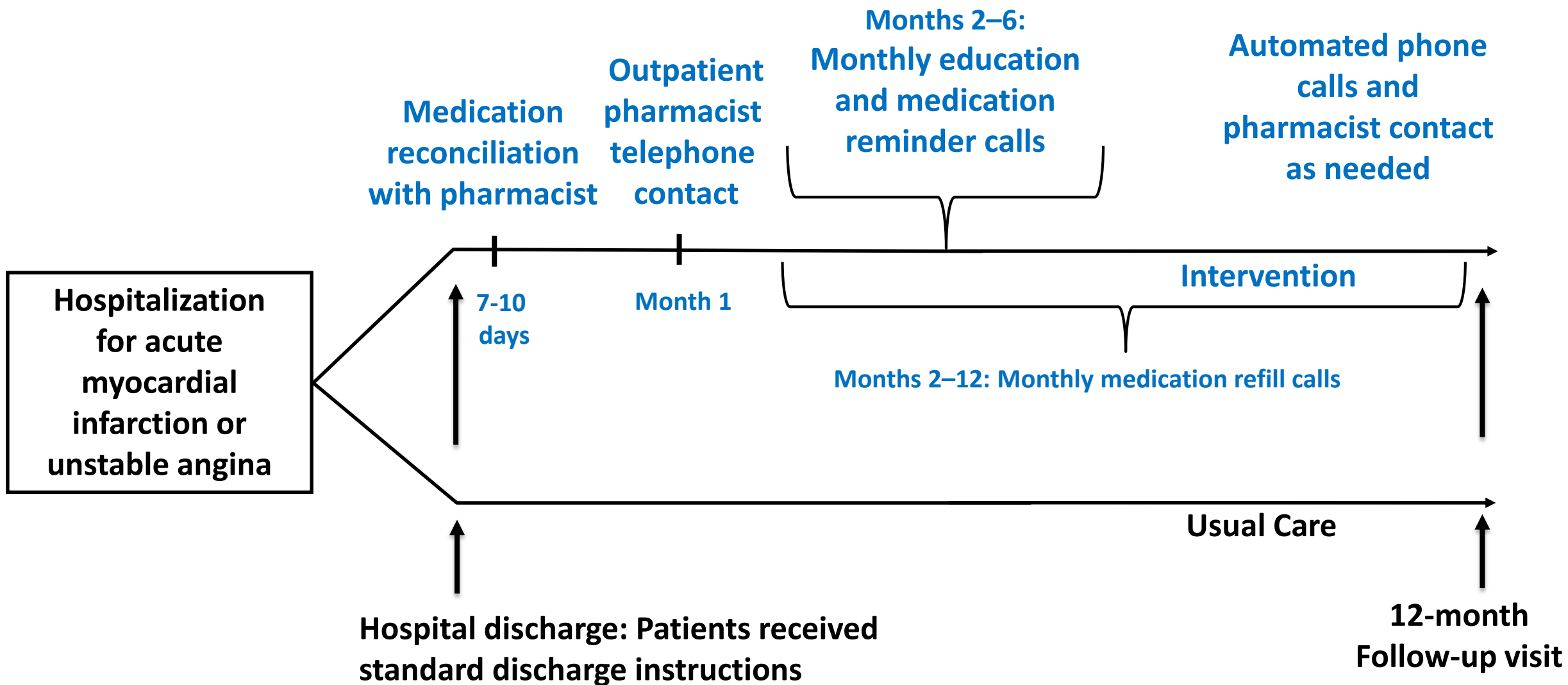
ARB: Angiotensin-receptor blockers

Choudhry NK, Avorn J, Glynn RJ, et al. *N Engl J Med.* 2011 Dec 1;365(22):2088-97.

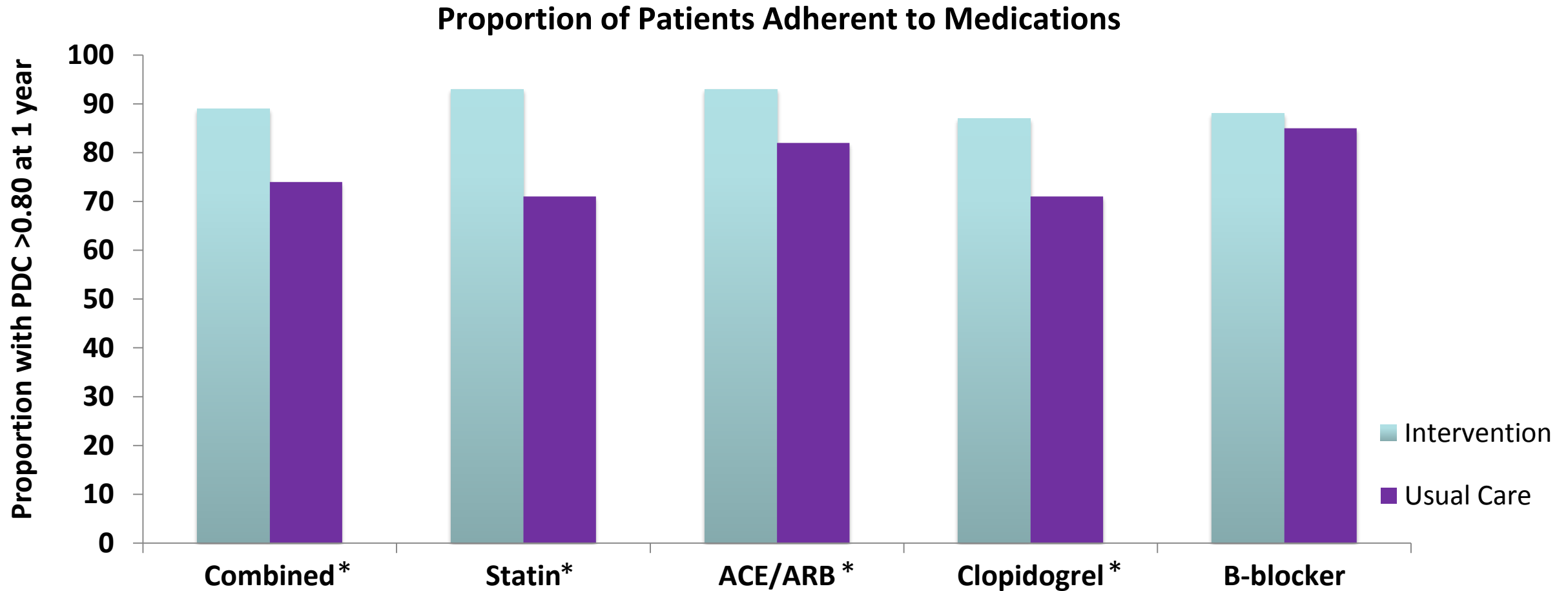
Intentional and Unintentional Reasons for Nonadherence



Multifaceted Intervention to Improve Cardiac Medication Adherence and Secondary Prevention Measures (MEDICATION) Study



Higher Adherence in Patients Receiving Multifaceted Intervention



PDC: Proportion of days covered. The number of days the member is covered by at least one medication prescription of appropriate intensity, divided by the number of days in the treatment period. * $p < 0.05$

Ho PM, Lambert-Kerzner A, Carey EP, et al. *JAMA Intern Med.* 2014 Feb 1;174(2):186-93.

Modest Intervention Costs and Similar Total Costs at 12 Months

Costs	Usual Care	Intervention	P-value
Intervention	\$0	\$360	
Cardiac medications	\$663	\$722	0.70
Total medications	\$2,724	\$2,887	0.43
Total outpatient	\$11,691	\$13,086	0.53
Total inpatient	\$14,287	\$11,294	0.68
Total (intervention, medication, outpatient, and inpatient)	\$19,989	\$19,901	0.56

Positive Relationships With Providers

Bidirectional Communication Key to Improving Adherence

- **Mutually respectful collaboration with their providers**
- **Importance of hearing the patients' perspectives and concerns**
- **Patients became comfortable disagreeing with the providers' recommendations or asking clarifying questions**
- **Patients became active participants in the development of their treatment plan, which they believed was essential for high-quality care**

Frequent Interactions With Study Pharmacists and Medication Refill Reminder Calls Improved Adherence

“... it made me think that it musta’ been more important than I thought it was ... to have these people contact me on a regular basis to make sure I was takin’ it.”

Two-thirds of the intervention arm had positive experiences, specifically with the study pharmacists, who were seen as supportive providers and caring people

Additional Factors That Improved Adherence

- **Important in improving their lives**
 - Social support from family and friends
 - Medication-taking routines
 - Specific adherence tools



Multimodal and Team-based Interventions Can Improve Adherence

- **Medication non-adherence is common**
- **Reasons for non-adherence are multifactorial and change over time**
- **Multimodal and team-based interventions that address different reasons for nonadherence are more likely to be successful**
- **Mutually respectful collaborations encourage patients to become active participants in the development of their treatment plan, and led to better adherence**
- **Interventions leveraging data and technology are needed to improve adherence while remaining cost-effective**

Promoting Medication Adherence Through High-Tech and High-Touch



Larry Garber, MD

Medical Director, Informatics

Associate Medical Director for Research

Reliant Medical Group

- **Over 500 provider multi-specialty group practice in central Massachusetts**
 - Not affiliated with any hospitals and not-for-profit
 - Over 50% Pay-for-Performance
- **20,000 hypertensive patients**
 - In 2011, only 68% of hypertensive patients were under control, but nationally 90th percentile for control was over 72% of patients
 - In 2012, Reliant initiated a hypertension control program
 - Included focus on medication adherence

How to Promote Medication Adherence



- **Ensure that patient understands the benefits**
- **Choose lower cost medications and ones that are easier to take**
- **Minimize medication side effects**
- **Show the effectiveness of the medications in lowering blood pressure**
- **Monitor medication adherence**

Empower the Patient Through Education

- Educate on the harms of uncontrolled hypertension and the benefits of controlling hypertension
- Make education materials widely available
 - On Reliant's trusted website
 - Automatically print on the After-Visit Summary if diagnosis of hypertension
 - Available within EHR and adjustable computer monitors designed to be visible to the patient
- Demonstrate that alternatives have failed
 - Graph of blood pressure trends within EHR prior to medications



Empower the Provider to Choose Appropriate and Lower Cost Medications

- **Use step-therapy protocols**
 - Developed by multidisciplinary team
 - Standardized across organization
- **Control access to pharmaceutical marketing**
- **Show patient's payer-specific formulary in EHR**
- **Generic substitution mandated in state**

Hypertension Medication Protocol Pathways	
Patient Characteristic	Path to Follow
Black (unless presents with fluid overload)	Path #1
Clinical fluid overload at presentation	Path #2
>60 years old	Path #3
<60 or Diabetes or Renal disease (if fluid overload - go to pathway #5)	Path #4
Diabetic/Renal disease with fluid overload initially	Path #5

Empower the Provider to Minimize Medication Complexity and Expense

- **Choose once-a-day and combos for convenience**
- **Engage in dialogue about costs vs convenience**
 - Pill-splitting can reduce cost but can be inconvenient for patient to split them
- **Provide assistance in paying for medications**
 - RxAssist.org website hyperlink within EHR
 - Consult Reliant's social workers



Minimize Medication Side Effects

- **Be creative in addressing concerns**
 - Concern about swollen feet → use a diuretic
 - Concern about medication causing too high or too low potassium level → combine ACE-Inhibitor + diuretic to normalize potassium
- **Monitor side effects**
 - At visits
 - At renewals, using standard template
 - After hospital discharge – automated warnings
- **Consult Reliant's pharmacists**
 - Complex medication regimens or problems
 - After hospital discharge

Show Effectiveness of Medications in Lowering Blood Pressure

- **Empower patient to record BPs at home**
 - Provide booklets to record readings
 - For financial hardship, give out free monitors
- **Free BP clinics at Reliant**
- **Automatically upload BP readings into EHR via Microsoft HealthVault®**
- **Show graphs of trends in EHR**
- **Patients can view graphs of trends at home**



Monitor Medication Adherence

- **Surescripts® medication fill history**
- **Payer medication claims**
 - Loaded into EHR nightly
 - Shows dates and days of supply picked up
- **Review during visits**
 - Knowing that clinician can be watching adherence is at least as important as seeing the results
- **Automate compliance monitoring?**

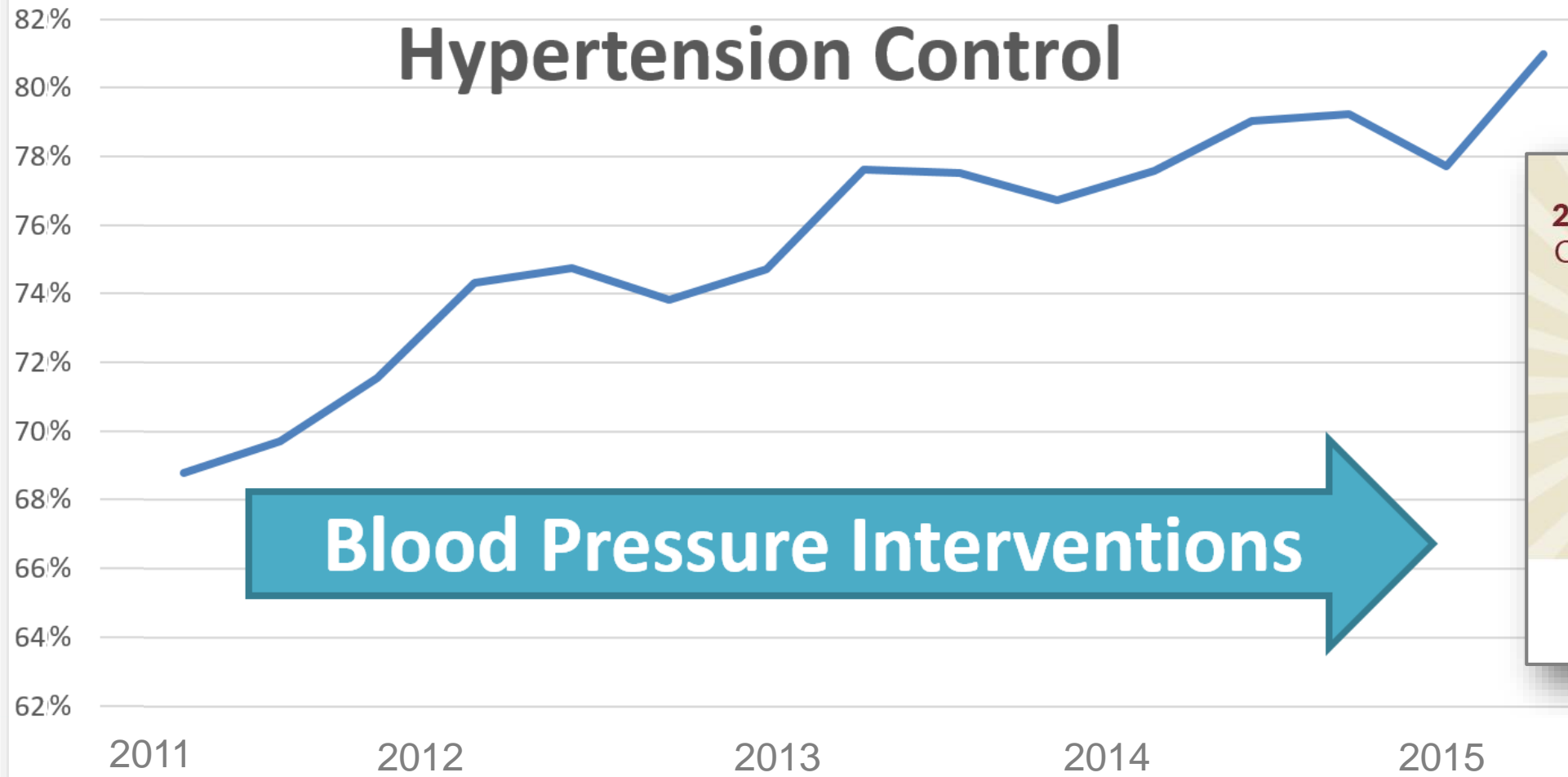
Display of Pharmacy Refills

▼ Lisinopril			
12/6/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
11/5/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
10/9/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
9/10/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
8/8/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
7/13/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
6/4/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
5/8/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	
4/9/2016	Outside name: LISINOPRIL 5 MG TABLET Local name: LISINOPRIL 5 MG OR TABS	30	

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Hypertension Interventions' Outcome

Reliant Medical Group Hypertension Control



Lessons Learned

- **Educate and empower patients**
- **Make medication adherence and BP monitoring easy for the patient**
- **Offload work from physician to other team members**
- **Patients knowing that you can monitor medication adherence may be more important than actually monitoring medication adherence**

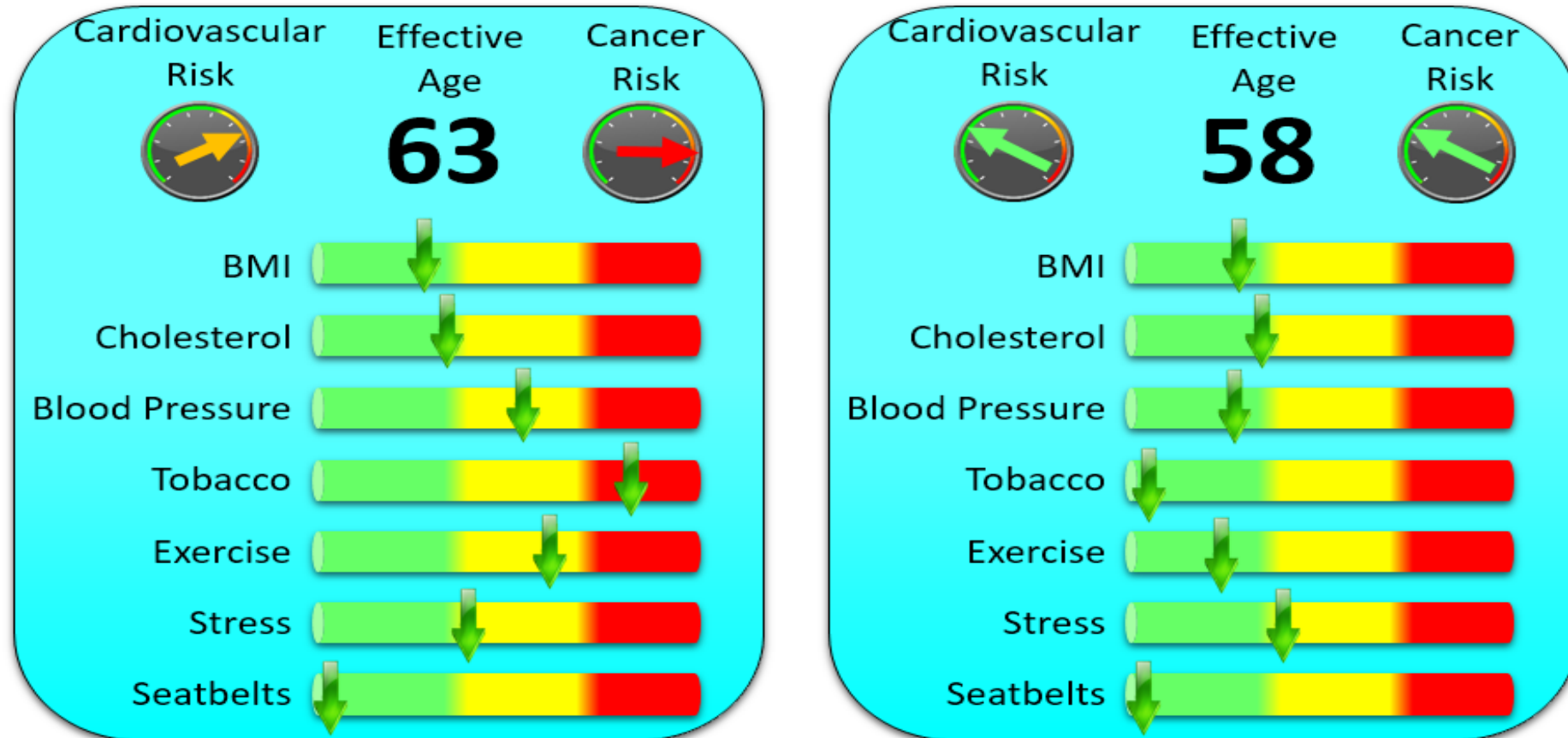


Next Steps

- **Expand home BP monitoring options to include smartphone authentication and aggregation**
- **Consider financial incentives to patients and care team for hypertension control**

Looking to the Future: Personalize Health Risk

Patient-friendly Health Risk Assessment Tools



BMI: Body mass index

Broadening Public Health Approaches to Medication Adherence for HIV



CAPT Paul J Weidle, PharmD, MPH

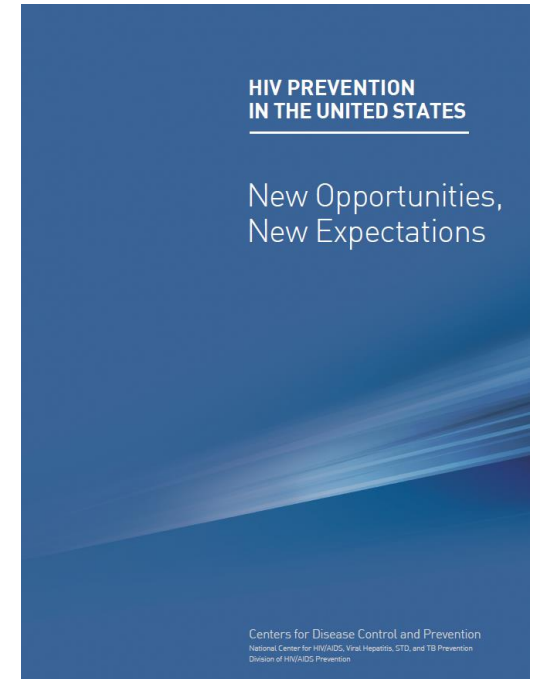
Team Lead, Health Services Research for Prevention with HIV Positive Persons

Division of HIV/AIDS Prevention

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention

Medication Adherence Is Important for Treatment and Prevention in HIV Disease

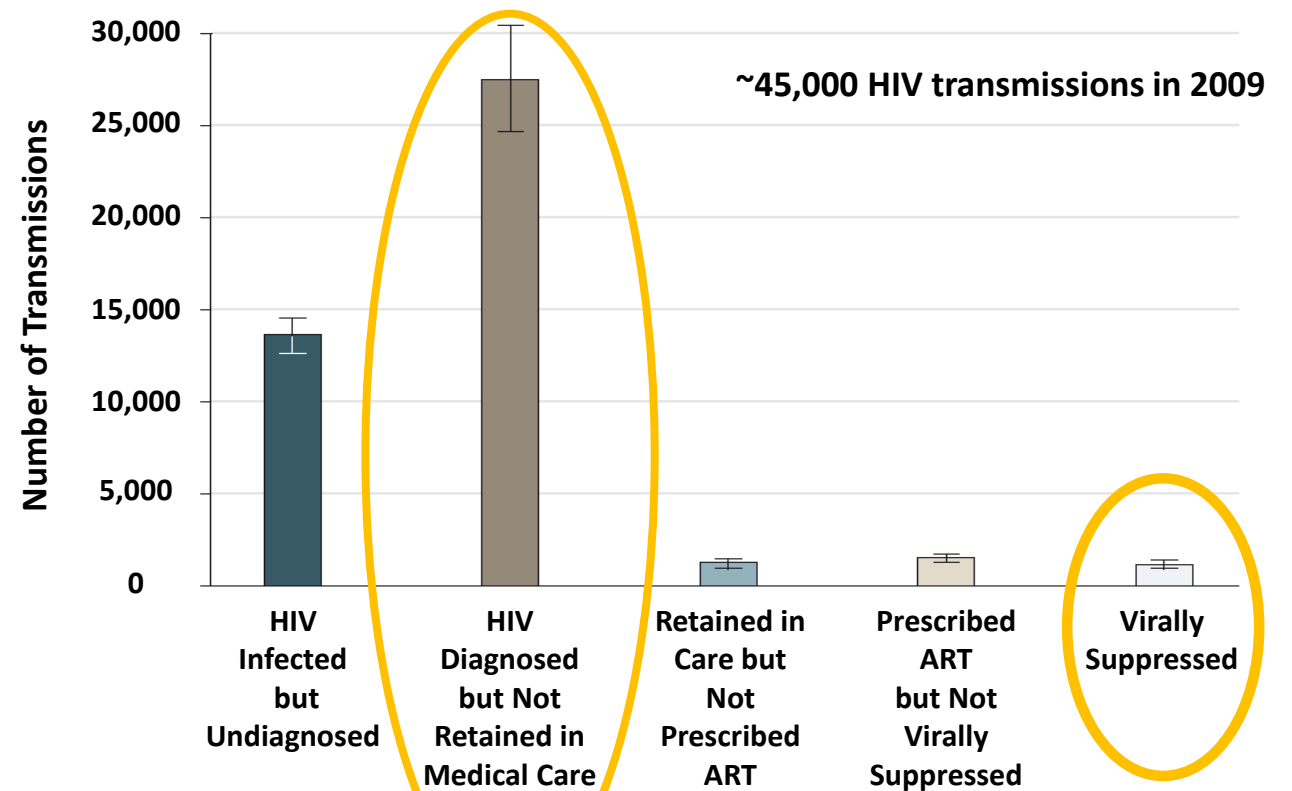
- **Antiretroviral treatment reduces the amount of HIV virus circulating in the blood**
 - Improve immune function and health of people with HIV
 - Reduce transmission by 90% or more
 - Since 2012, recommended for all persons living with HIV in the United States
- **To maximize health and prevent HIV transmission, medication adherence must achieve viral suppression**
 - HIV viral load is a direct proxy for adherence to treatment and is typically tested at least twice per year



HIV Treatment That Leads to Viral Suppression Reduces HIV Transmission

- **3 out of every 5 new HIV infections can be attributed to people who have been diagnosed with HIV but are not in care**
- **Few HIV transmissions occur when care is optimized and viral suppression is achieved**

Estimated Number of HIV Transmissions Along the HIV Care Continuum, U.S., 2009



ART: Antiretroviral treatment

Skarbinski J, Rosenberg E, Paz-Bailey G, et al. *JAMA Intern Med.* 2015 Apr;175(4):588-96.

National HIV/AIDS Strategy Goals by 2020

- **Reduce new HIV infections**
- **Increase access to HIV care and improve health outcomes for people living with HIV**
- **Reduce HIV-related health disparities and health inequities**

NATIONAL HIV/AIDS STRATEGY for the **UNITED STATES:**

UPDATED TO 2020

JULY 2015



National HIV/AIDS Strategy Goals by 2020 for the Newly Diagnosed

- **Goal: At least 85 percent of newly diagnosed persons are linked to HIV medical care within one month of their HIV diagnosis**
 - In 2014, 74.5% of persons newly diagnosed with HIV were linked to HIV medical care within one month of diagnosis



National HIV/AIDS Strategy Goals by 2020 for Retention in Care and Viral Suppression

- **Goal: At least 90 percent of persons with diagnosed HIV infection are retained in HIV medical care**
 - In 2013, more than half (56.5%) of persons with diagnosed HIV infection were retained in HIV medical care
- **Goal: At least 80 percent of persons with diagnosed HIV infection are virally suppressed**
 - In 2013, more than half (54.7%) of persons with diagnosed HIV infection were virally suppressed



“HIV, taking my meds makes you undetectable.
And that makes me unstoppable.”

Aaron - St. Louis, MO
Living with HIV since 2011.
[Hear his story >](#)

Get in care. Stay in care. Live well. 



HIV
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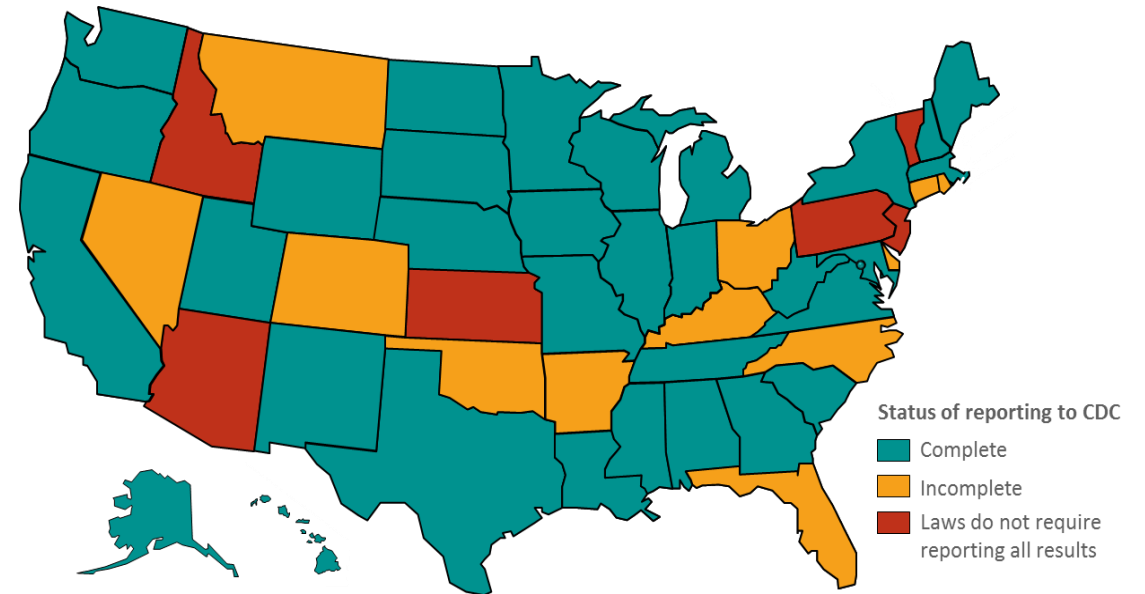
National HIV Surveillance System

➤ **Health departments collect laboratory data to monitor progress towards goals**

- HIV diagnostic tests
- CD4+ cell counts
- HIV viral load
- HIV resistance tests

➤ **As of December 2015, in 33 jurisdictions, at least 95% of tests are reported**

Jurisdictions Reporting, December 2015



Public Health Role to Improve Health of Persons Living with HIV and to Prevent Transmission of HIV

- **The Data to Care Strategy aims to use HIV surveillance data to identify persons diagnosed with HIV who are not receiving HIV care and link them to care**
 - Persons who either never linked to care after diagnosis
 - Persons who did not continue to receive care



*Using HIV Surveillance Data to Support the
HIV Care Continuum*

Three Models to Connect Individuals to HIV Care

➤ Health Department Model

- Health department-initiated linkage and re-engagement outreach

➤ Healthcare Provider Model

- Healthcare provider-initiated linkage and re-engagement outreach

➤ Combination Health Department and Healthcare Provider Model

Using HIV Surveillance Data to Support the HIV Care Continuum

- **Use health department HIV surveillance database to identify individuals who are probably not in HIV medical care currently**
 - Vital records status “Alive”
 - Currently residing in jurisdiction
 - HIV diagnosis at or before the end of a specified time period
- **No CD4+ cell count or viral load result during a specified time period**
 - Time interval can be as short as 6 months

Finding and Connecting People to HIV Care

➤ Investigate out-of-care list

- Fill in important information that might be missing from an individual's record (e.g., current telephone number or address)
- Check with the last known care provider
- Match out-of-care list to databases internal and external to health department

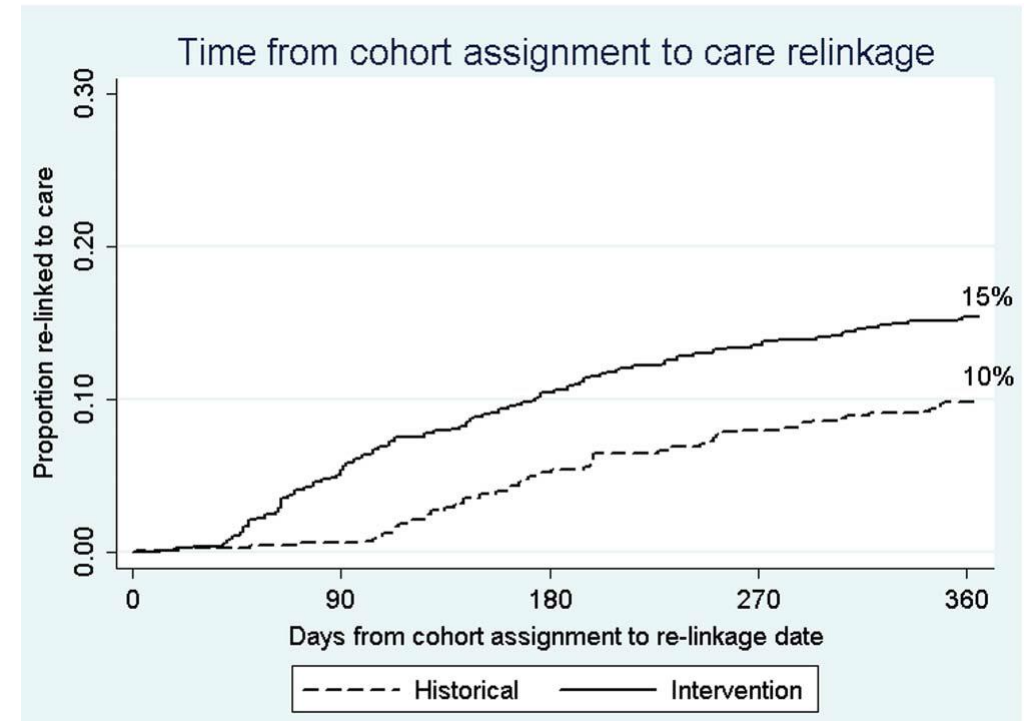
➤ Share key data with field services staff and care providers

➤ Reach out to individuals on the out-of-care list

- Identify barriers and link or re-engage into care

Evidence That the Data to Care Strategy Can Improve Re-linkage to Care

- **Combined healthcare provider and health department model**
- **Largest HIV clinic in Washington State**
 - Criteria: No visit > 12 months
- **Outreach**
 - Clinic-based linkage specialist
 - Phone call x 3, email x 1, call emergency contact
 - Department of health relinkage team
- **Shorter time to re-link and more re-linked to care**
 - Compared to historical controls



Data to Care Strategy

Cooperative Re-engagement in Care Controlled Trial (CoRECT)

- **Establish a data-sharing partnership between health departments and HIV care providers to identify HIV-infected persons who are out of care**
 - Necessary to share and protect data
- **Implement a health department field services intervention and identify barriers to care**
 - Link to an HIV clinic within 90 days
 - Remain in HIV medical care at least 12 months
 - Achieve HIV viral load suppression within 12 months
 - Achieve durable HIV viral load suppression for 12–18 months
 - Sites in Connecticut, Philadelphia, Massachusetts

Data to Care Strategy

Partnerships for Care (P4C)

- **Multi-agency federal partnership**
 - Co-led by CDC and HRSA's Bureau of Primary Health Care
- **Use HIV surveillance data and health-center EHR to improve HIV health outcomes for persons living with HIV who are not in care**
 - Sites in Florida, Maryland, Massachusetts, New York State

Partnerships for Care 

Health Departments and Health Centers Collaborating to Improve HIV Health Outcomes

CS254241-A

Data to Care Strategy

Targeted Highly Effective Intervention to Reverse the HIV Epidemic

- **Implements comprehensive HIV prevention and care services for men who have sex with men**
 - Includes a Data to Care strategy to re-engage them in care
 - Sites in Alabama, Baltimore, District of Columbia, Louisiana, New York City, Philadelphia, Virginia



Data to Care Strategy

Project PrIDE

- **Supports men who have sex with men and transgender persons not in HIV care and re-engage them in care**
- **Implementing Data to Care demonstration projects**
 - Sites in Baltimore, Chicago, Houston, Louisiana, San Francisco



By Re-engaging Persons Living with HIV In Care, Public Health Can Improve Their Health and Prevent HIV Transmission

“HIV, life’s a game,
and with treatment,
I’m winning it day by day.”

Christopher - Washington, DC
Living with HIV since 1987.

[Hear his story >](#)

HIV
TREATMENT
WORKS



Get in care. Stay in care. Live well.



“HIV, you may have tried to
take my life, but with
treatment I took it back.”

Katrina - Decatur, GA
Living with HIV since 2007.

[Hear her story >](#)

HIV
TREATMENT
WORKS



Get in care. Stay in care. Live well.



Together We Can Overcome Barriers to Medication Adherence and Improve Lives

- **Adhering to medications improves the lives of people with chronic diseases**
- **Nonadherence is common and multifactorial**
 - Up to half of persons on medications are non-adherent
- **Many ways to reduce barriers exist, but more ways are needed**
 - Along with better understanding of what works, and with whom
- **Working together, we can reduce these barriers and improve adherence and peoples lives**



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