

# Translating Research Into Action for Diabetes: **TRIAD**

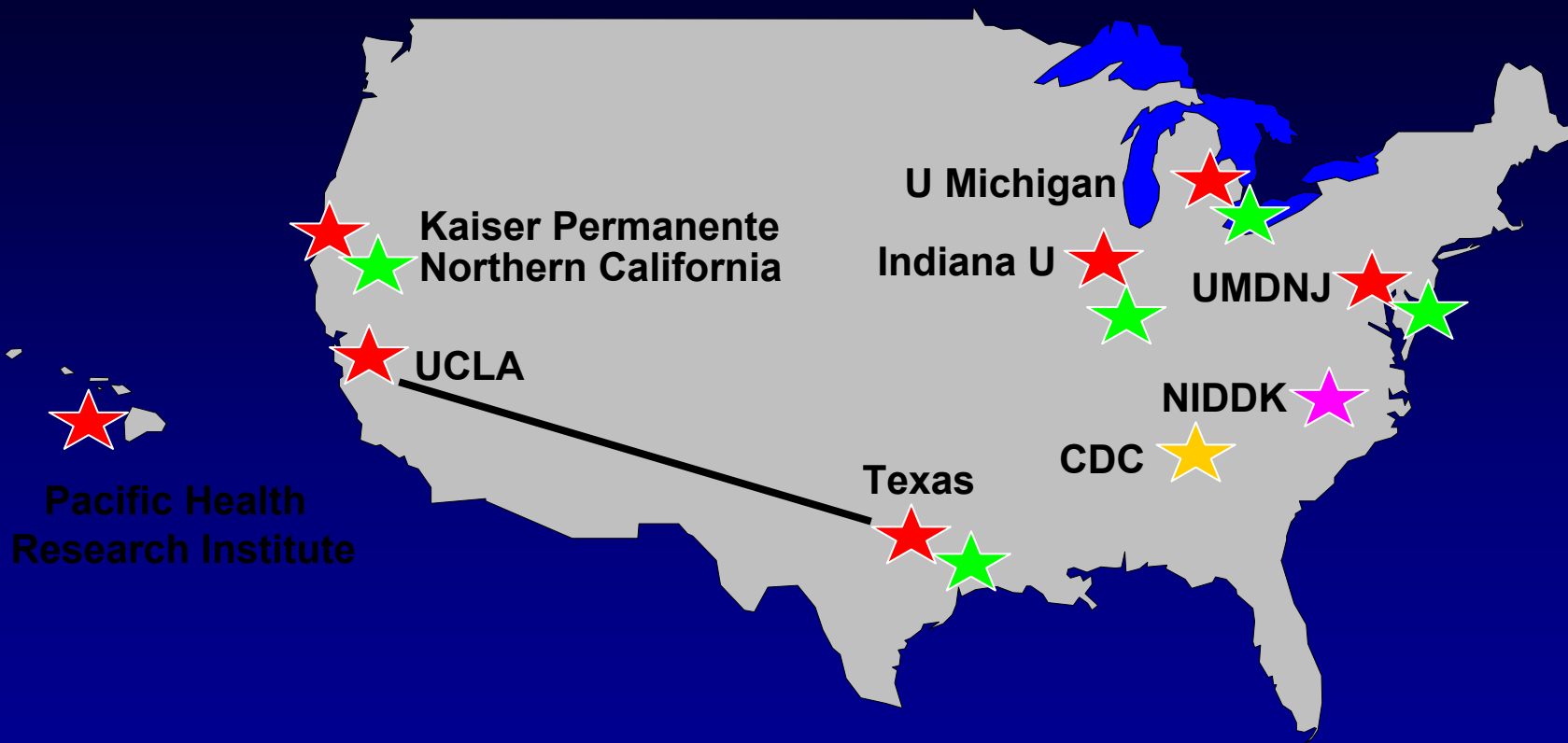
*A Multi-Center Study of Diabetes Care  
in Managed Care Settings*



## Rationale for TRIAD - 1998

- Diabetes is a large, growing, costly and complicated challenge for the U.S. health care system.
- Many effective interventions are not being optimally implemented, indicating missed opportunities to reduce the burden of diabetes.
- Systems approaches (e.g., disease management) offer possibilities for improving diabetes care and outcomes.
- Managed care was an important setting in which to study the system-level barriers and facilitators to better care and outcomes.

# TRIAD Sites and Sponsoring Agencies



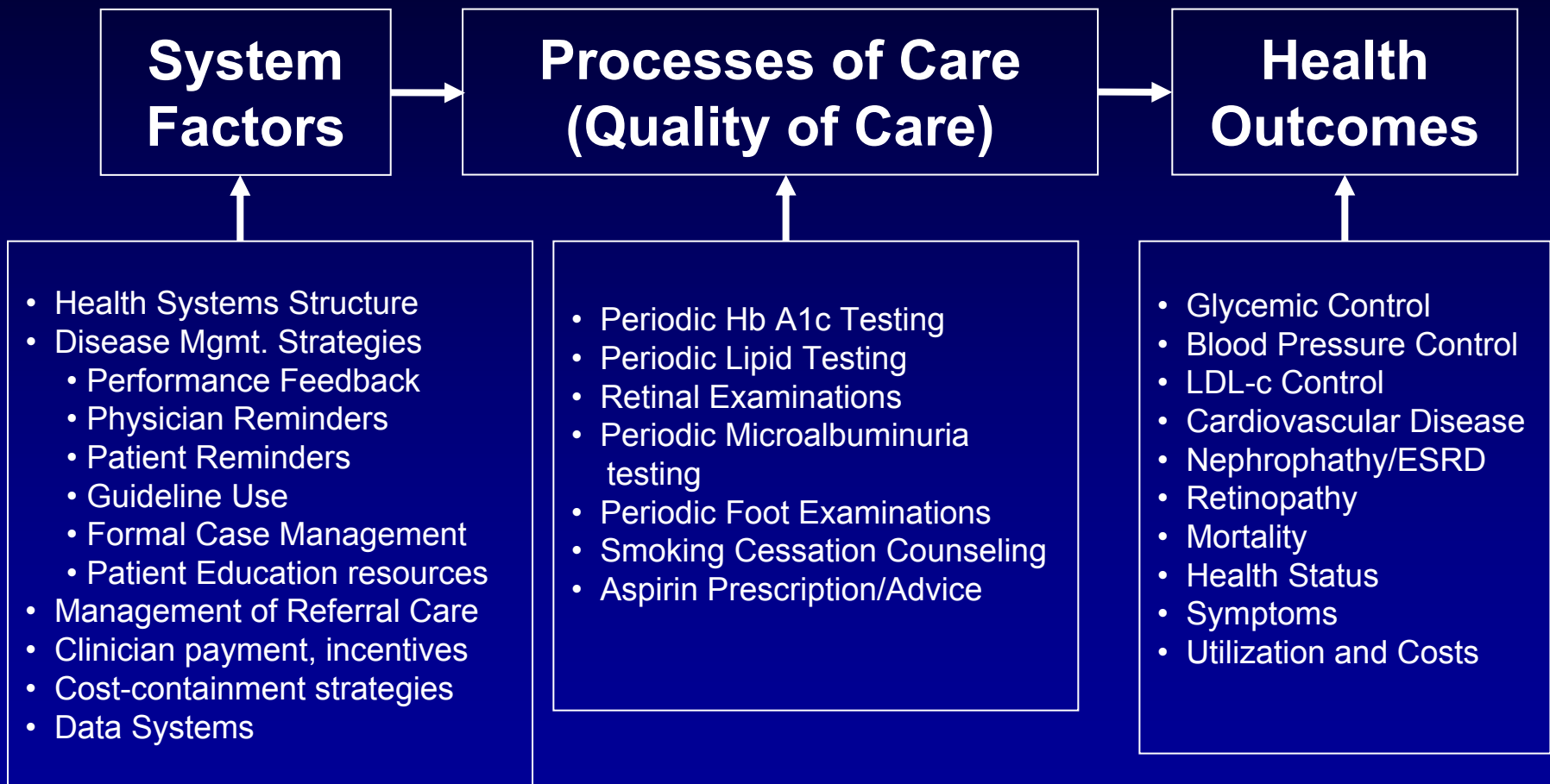
 Translational Research Centers / TRIAD Study Sites

 Veterans Health Administration / TRIAD Study Sites

 Centers for Disease Control - Sponsor

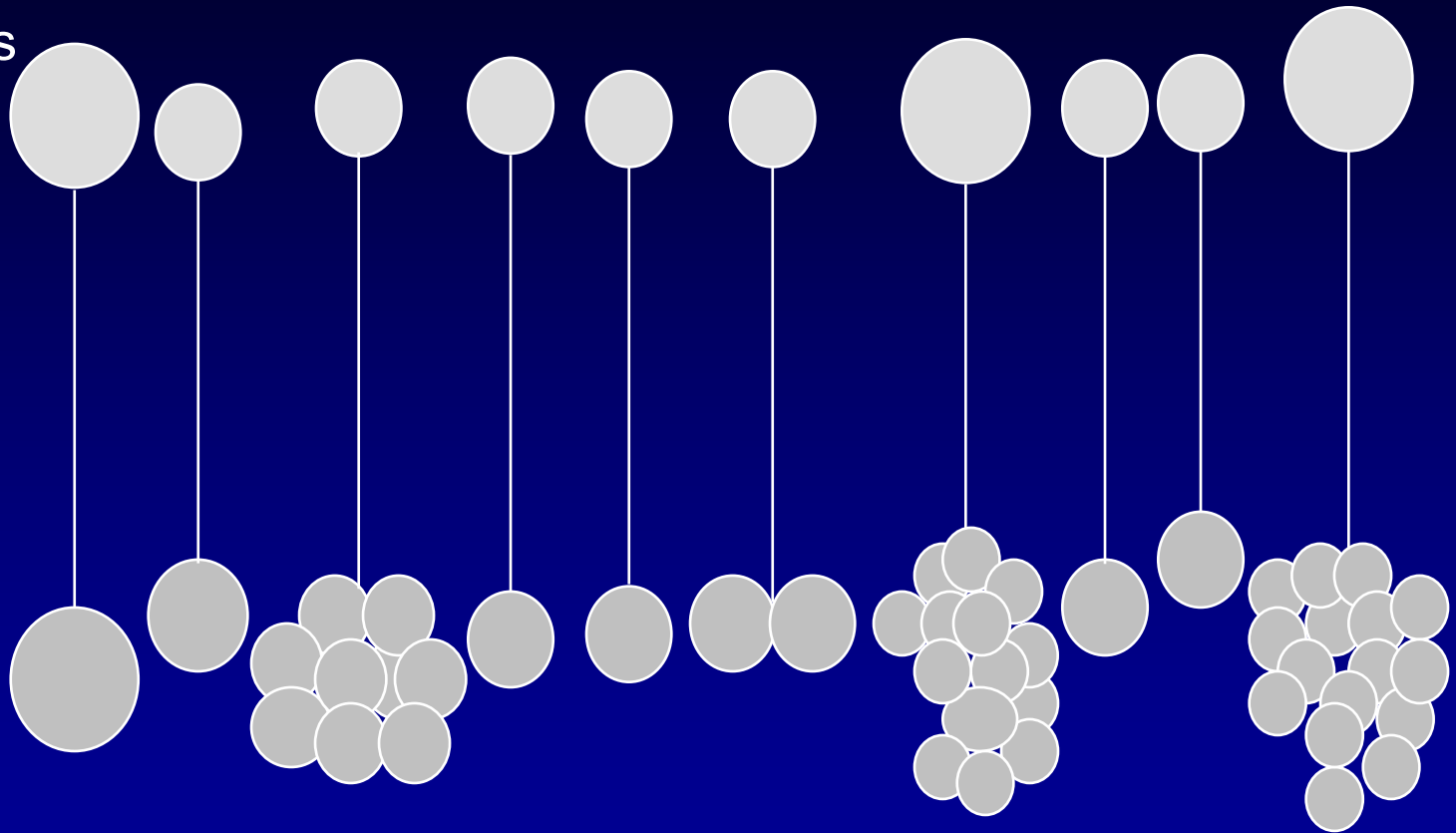
 National Institute of Digestive and Diabetes and Kidney Disorders - Sponsor

# TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



# TRIAD Nested Sampling Scheme

10 health plans  
(n = 500 to  
2000 per plan)



68 physician  
groups with  
> 50 members  
in sampling  
frame

50 - 1500 per physician group; Total Sample = 11,297  
Patients

## Health Systems, Patients Factors, and Quality of Care for Diabetes

A synthesis of findings from the TRIAD Study

THE TRIAD STUDY GROUP\*

Health care systems have played a central role in the public health response to the growing problem of diabetes (1–2) and its complications. During the 1990s, managed care organizations (MCOs) began seeking system-level approaches to improve diabetes outcomes and control costs in covered populations. Although previous clinical trials (3–6) had demonstrated that several clinical interventions could reduce complication rates and possibly control costs, these findings were not being systematically applied (7,8).

Performance-reporting initiatives, such as the National Committee on Quality Assurance's Diabetes Quality Improvement Program (9), led MCOs to develop disease management programs that used diabetes registries, internal performance monitoring and feedback, physician and patient reminder systems, case management, and provider incentives to improve quality (10,11). Simultaneously, MCOs introduced cost-containment strategies, including utilization review, preauthorization requirements, cost-related incentives, and patient cost-sharing (12).

MCO structures ranged from decades-old not-for-profit group/staff model HMOs to contractual arrangements between traditional indemnity insurers and newly formed provider groups or individual providers. Provider groups ranged from relatively integrated multi-specialty group practices to loosely affiliated physician networks or independent practice associations (IPAs). This heterogeneity persists today, however, neither structural variation nor disease management strategies have been carefully stud-

ied for their associations with diabetes care quality or patient outcomes.

In 1998, the Centers for Disease Control and Prevention and the National Institute of Diabetes and Digestive and Kidney Diseases launched a multicenter, prospective observational study, the Translating Research into Action for Diabetes (TRIAD) Study (13). The TRIAD Study Group includes investigators from six translational research centers that partnered with ten health plans. These plans contracted with 68 provider groups to deliver primary and specialty care to more than 180,000 diabetic enrollees in 1998. From this population, TRIAD assembled one of the largest cohorts of diabetic patients ever studied, collecting and linking data from patients, providers, provider groups, and health plans.

TRIAD assessed associations between system-level structures and strategies and the quality of diabetes care and patient outcomes using Donabedian's paradigm (14) (Fig. 1). TRIAD also studied patient-level characteristics that may influence outcomes, either directly by affecting patients' abilities to self-manage diabetes or indirectly by affecting interactions with health care systems (Fig. 2). In Fig. 2, we synthesize published TRIAD studies that addressed the influences of either system-level or patient-level characteristics on processes or outcomes for diabetic patients.

### RESEARCH DESIGN AND METHODS

The original TRIAD cohort consisted of a geographically, racially, and socioeconomically diverse group of U.S. adult (aged 18 and above)

diabetic patients. They were selected, using a standardized algorithm, (13) from diabetic patients who, in 1999, had been enrolled in one of the ten participating health plans for at least 18 months. The cohort was surveyed three times by computerized telephone or mailed survey in 2000–2001, 2002–2003, and 2005 (Fig. 3). The numbers of participants (and response rates adjusted for inability to contact and mortality) were 11,927 (69%), 8,781 (83%), and 5,751 (75%), respectively. The majority of the participants' medical records were obtained and reviewed at the first two surveys. The cohort was linked to the U.S. Census Bureau's Census 2000 block groups to obtain measures of neighborhood socioeconomic status (SES) and annually to the Centers for Disease Control and Prevention's National Death Index to obtain mortality.

For the first survey, each participating health plan's medical director and a representative from 63 of the 68 provider groups were interviewed. For the second, participants' primary care physicians were surveyed by mail for physician demographics, knowledge, and attitudes toward MCO structure and strategies ( $n = 1,248$  physician respondents, 54% response rate). TRIAD survey instruments are available at <http://www.triadstudy.org>.

In 2005, TRIAD findings led study researchers to develop a Cardiovascular Disease (CVD) Risk Survey focused on patient-level determinants of risk factor control for blood pressure, A1C, and LDL cholesterol in seven of the original ten TRIAD plans. Using telephone or mail, researchers surveyed patients who were either in "good control" of all three risk factors (i.e., A1C <8%, LDL cholesterol <130 mg/dl, and systolic blood pressure [SBP] <140 mmHg) or in "poor control" of at least two risk factors (i.e., values at or above these cut points). Data were collected on patients' perceptions of risks, self-efficacy, communication with their providers, access to care, cost barriers, self-reported adherence to a regimen of prescribed medications, and reasons for nonadherence.

In 2006, TRIAD investigators

Corresponding author: Joe V. Selby, [joe.selby@kcp.org](mailto:joe.selby@kcp.org)

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\*A complete list of the TRIAD Study Group members is available in the online appendix at <http://care.diabetesjournals.org/cgi/content/full/33/4/940-1820/DC1>.

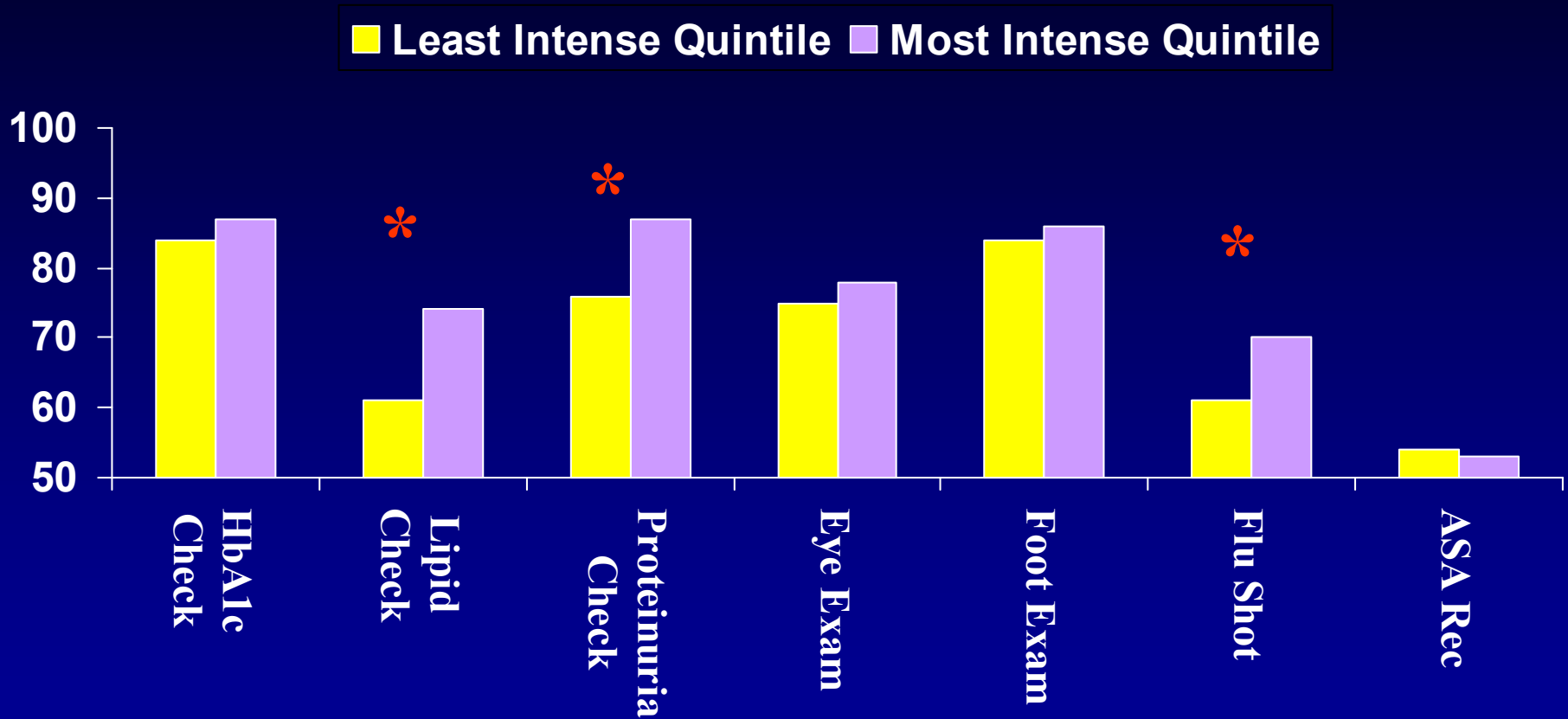
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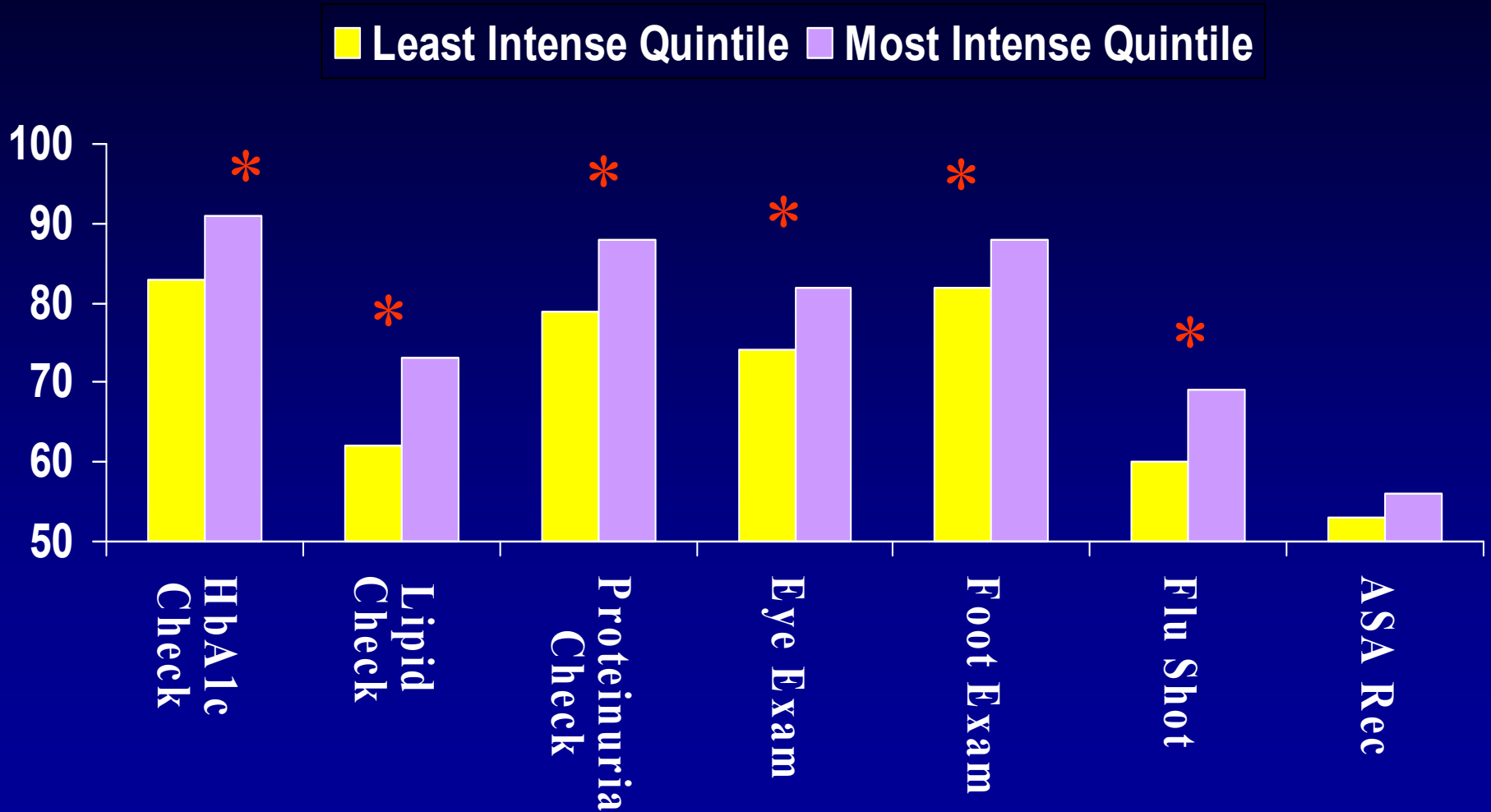
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# **TRIAD I Findings: Structural and System Factors**

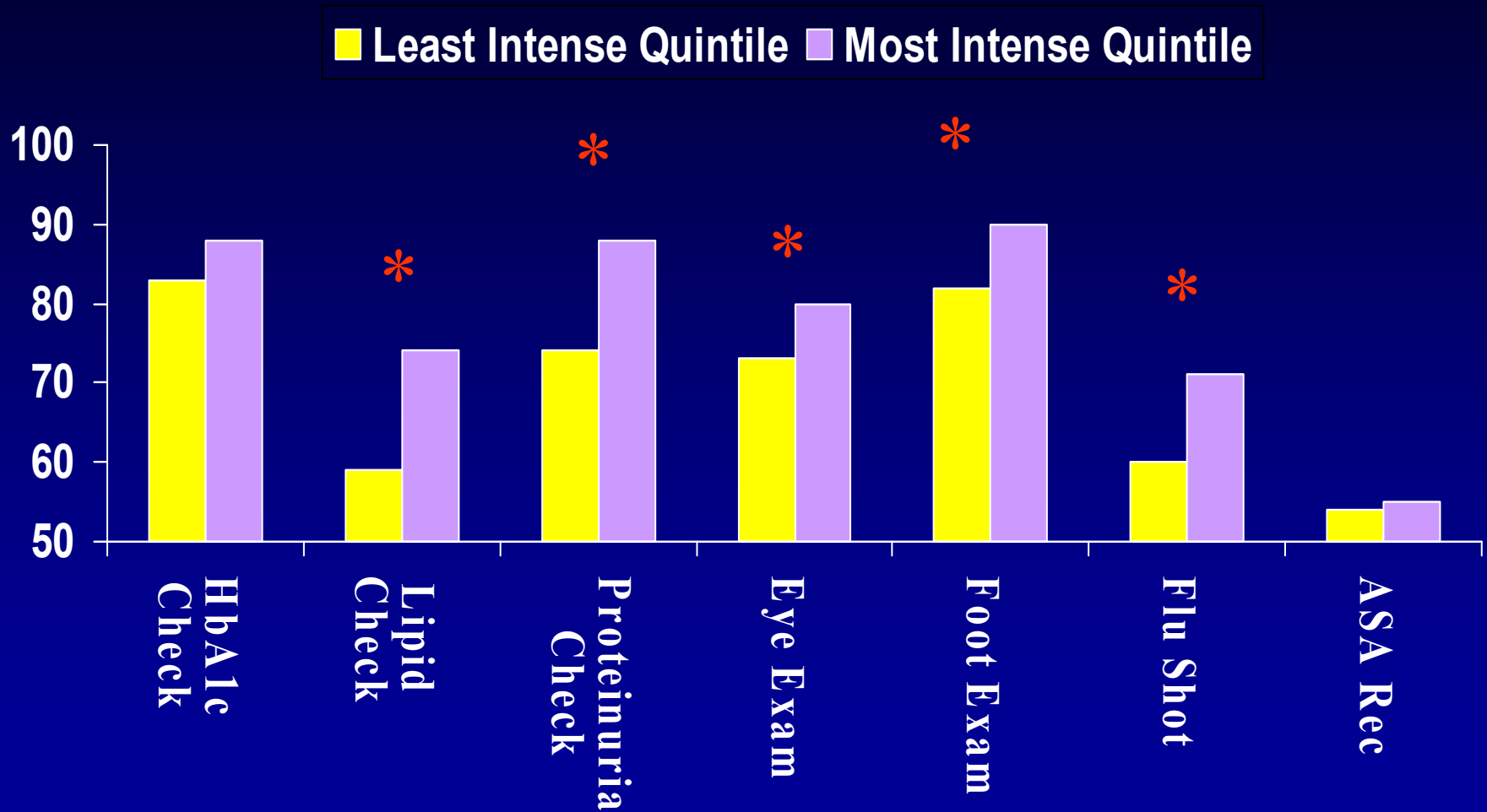
# Predictor: PG Diabetes Registry Use



# Predictor: PG Physician Feedback



# Predictor: PG Diabetes Care Management



Mangione et al., Ann Intern Med, 2006 \* significant  $p \leq 0.05$

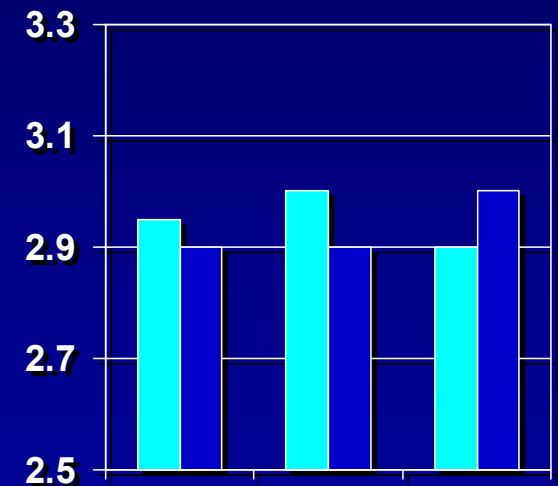
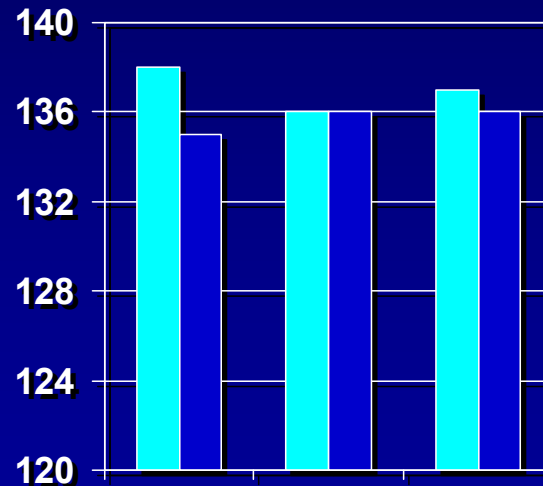
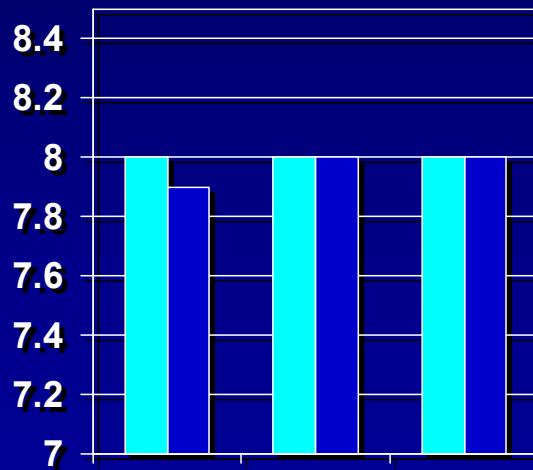
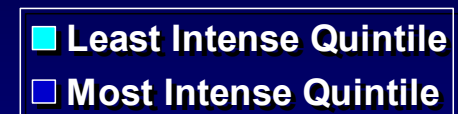
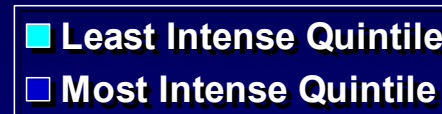
DIVISION OF DIABETES TRANSLATION • [WWW.CDC.GOV/DIABETES](http://WWW.CDC.GOV/DIABETES)

# Association Between Disease Management Intensity and Levels of Risk Factor Control (Mangione et al., Ann Intern Med, 2006)

A1c

Systolic Blood Pressure

Serum LDL



Care Management

Feedback

Reminders

Care Management

Feedback

Reminders

Care Management

Feedback

Reminders

# TRIAD I Findings: Structural Factors

1. Traditional Disease management strategies strongly associated with processes of care, patient satisfaction, and patient perceptions of quality, but not A1c, BP, or lipid levels - (Mangione et al, Ann Intern Med 2006; Ackermann et al., Diab Care, 2006).
2. Processes of care differ little by race/ethnicity but non-whites have higher A1c and African-Americans have higher BP (Brown et al, Diab Care, 2005.)
2. Group/network model provider groups have higher quality scores than IPA models - (Kim et al, Diabetes Care 2004)
3. Physician re-imburement by salary or capitation and incentives related to quality are associated with higher quality (processes) scores than FFS - (Ettner et al, Health Services Res 2006)

# Diabetes Care Quality in the Veterans Affairs Health Care System and Commercial Managed Care: The TRIAD Study

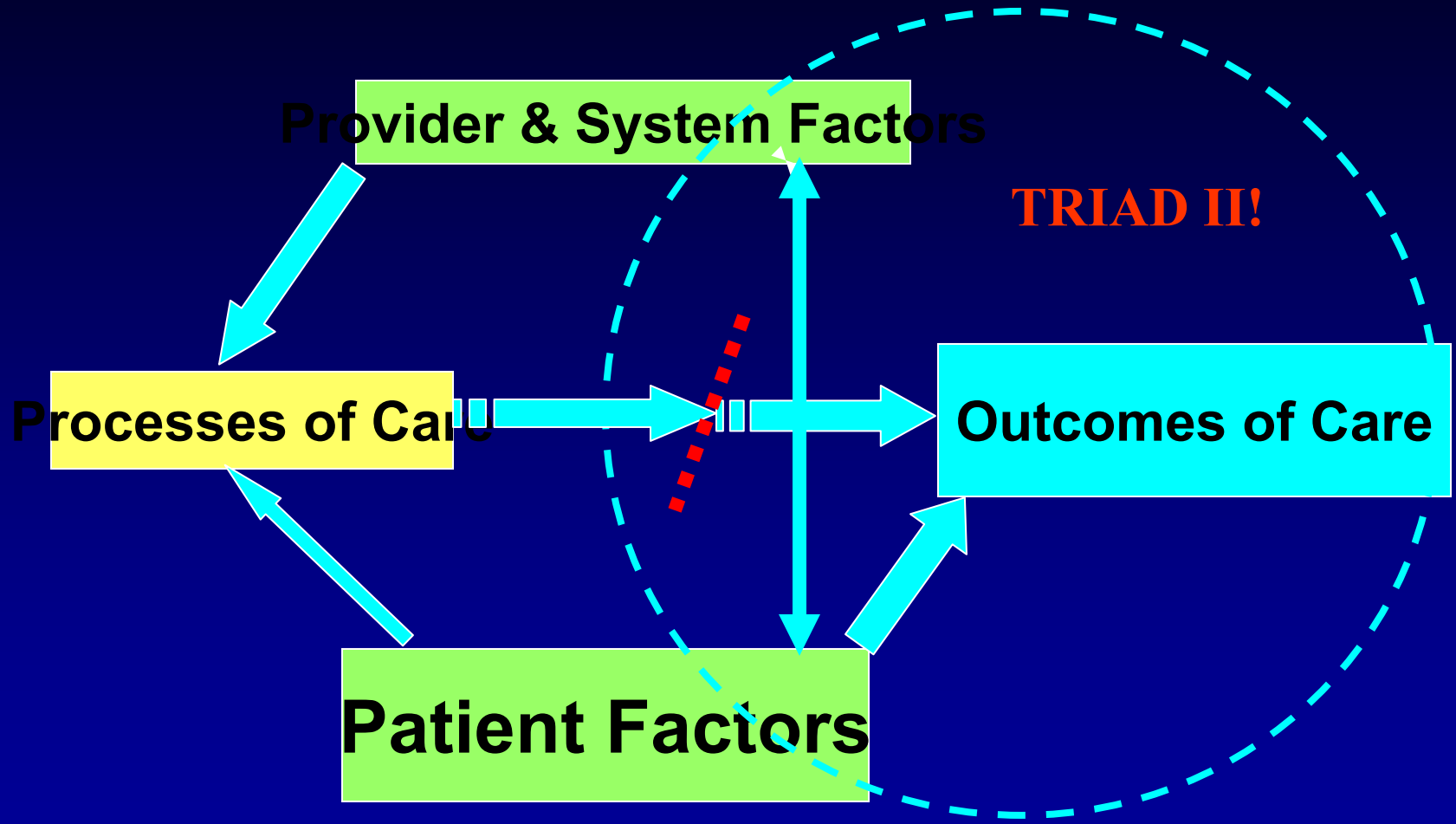
Eve A. Kerr, MD, MPH; Robert B. Gerzoff, MS; Sarah L. Krein, PhD, RN; Joseph V. Selby, MD, MPH; John D. Piette, PhD; J. David Curb, MD, MPH; William H. Herman, MD, MPH; David G. Marrero, PhD; K.M. Venkat Narayan, MD, MSc, MBA; Monika M. Safford, MD; Theodore Thompson, MS; and Carol M. Mangione, MD, MSPH

Table 3. Adjusted Quality-of-Care Rates for Veterans Affairs and Commercial Managed Care Participants\*

Quality-of-Care Measure (Data Source)	VA Rate (95% CI) (n = 1273), %	CMC Rate (95% CI) (n = 6901), %	P Value
<b>Processes of care</b>			
Annual eye examination (hybrid)	91 (87–93)	75 (69–80)	<0.001
Eye examination (medical record)	57 (38–75)	28 (16–46)	0.03
Eye examination (survey)	88 (84–92)	72 (67–77)	<0.001
Annual hemoglobin A <sub>1c</sub> test	93 (89–96)	83 (76–87)	0.005
Annual lipid screening	79 (69–86)	63 (51–73)	0.02
Annual foot examination (hybrid)	98 (96–99)	84 (79–88)	<0.001
Foot examination (medical record)	87 (80–91)	50 (40–60)	<0.001
Foot examination (survey)	92 (88–95)	76 (69–82)	<0.001
Annual proteinuria screening	92 (89–95)	81 (75–86)	0.005
Aspirin use counseling	75 (69–79)	49 (44–53)	<0.001
Influenza vaccination	72 (66–77)	64 (60–68)	0.04
<b>Intermediate outcomes</b>			
Blood pressure < 140/90 mm Hg	53 (46–60) (1222 patients)	52 (47–57) (6161 patients)	>0.2
Blood pressure < 130/85 mm Hg	29 (23–35) (1222 patients)	29 (25–34) (6161 patients)	>0.2
Hemoglobin A <sub>1c</sub> value < 9.5%	92 (87–95) (1173 patients)	80 (72–86) (5769 patients)	0.006
Hemoglobin A <sub>1c</sub> value < 8.5%	83 (75–89) (1173 patients)	65 (54–75) (5769 patients)	0.009
LDL cholesterol level < 3.37 mmol/L (<130 mg/dL)	86 (81–90) (995 patients)	72 (68–76) (4398 patients)	0.002
LDL cholesterol level < 2.59 mmol/L (<100 mg/dL)	52 (45–59) (995 patients)	36 (32–40) (4398 patients)	0.003

\* Higher rates represent higher quality. Models are adjusted for all covariates reported in Table 2 except for sex and date of survey administration. CMC = commercial managed care; LDL = low-density lipoprotein; VA = Veterans Affairs.

# Pathways to Improved Outcomes



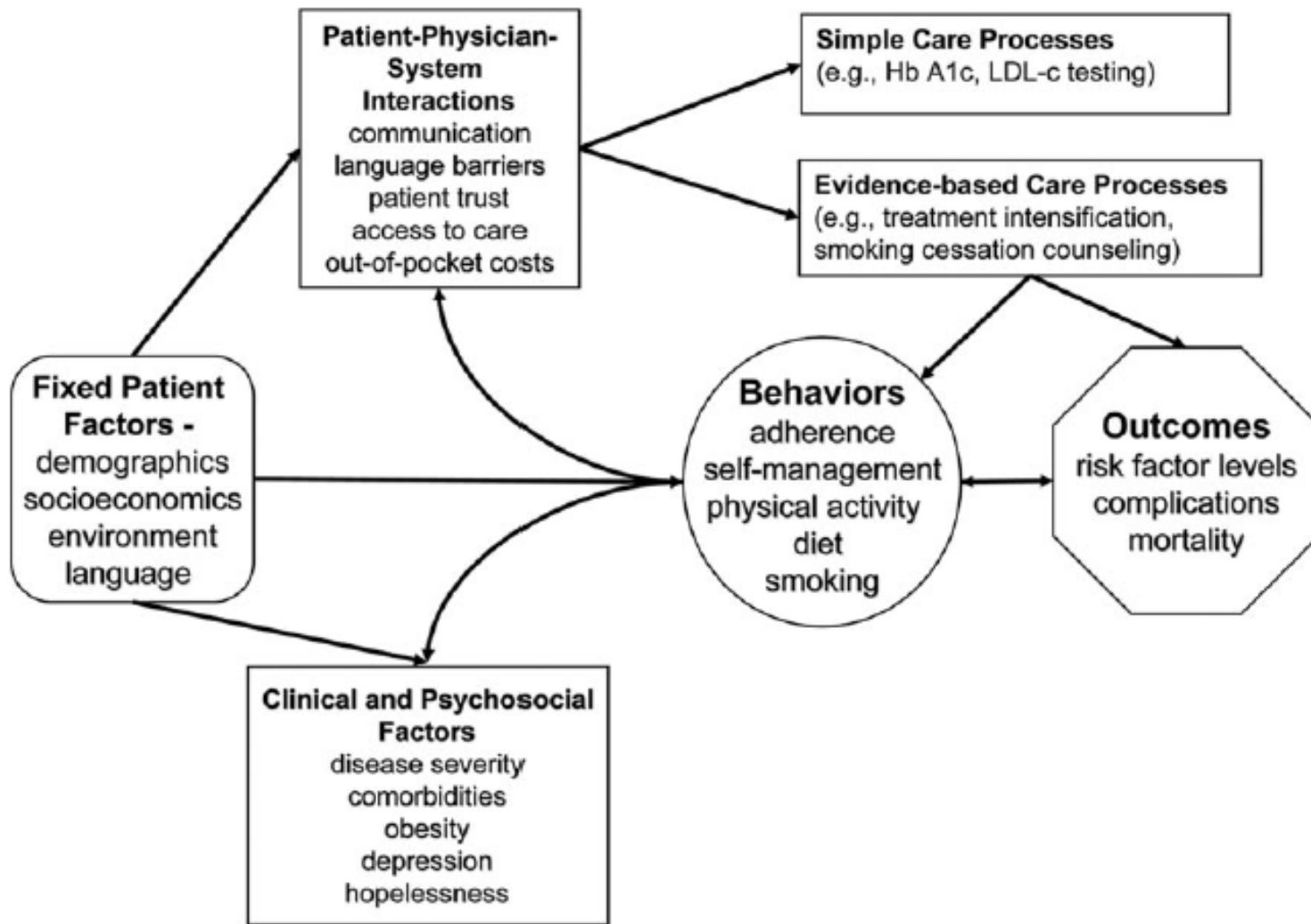


Figure 2—TRIAD conceptual model for relationships of patient factors and patient-system interactions with processes and outcomes of care. LDL-c, LDL cholesterol.

## Findings: Patient Factors

1. Greater out-of-pocket costs (thru co-pays, non-coverage) associated with lower rates of retinal exams, health education, and self-management. (Karter, 2003)

# Out-of-Pocket Costs and Diabetes Preventive Services

The Translating Research Into Action for Diabetes (TRIAD) study

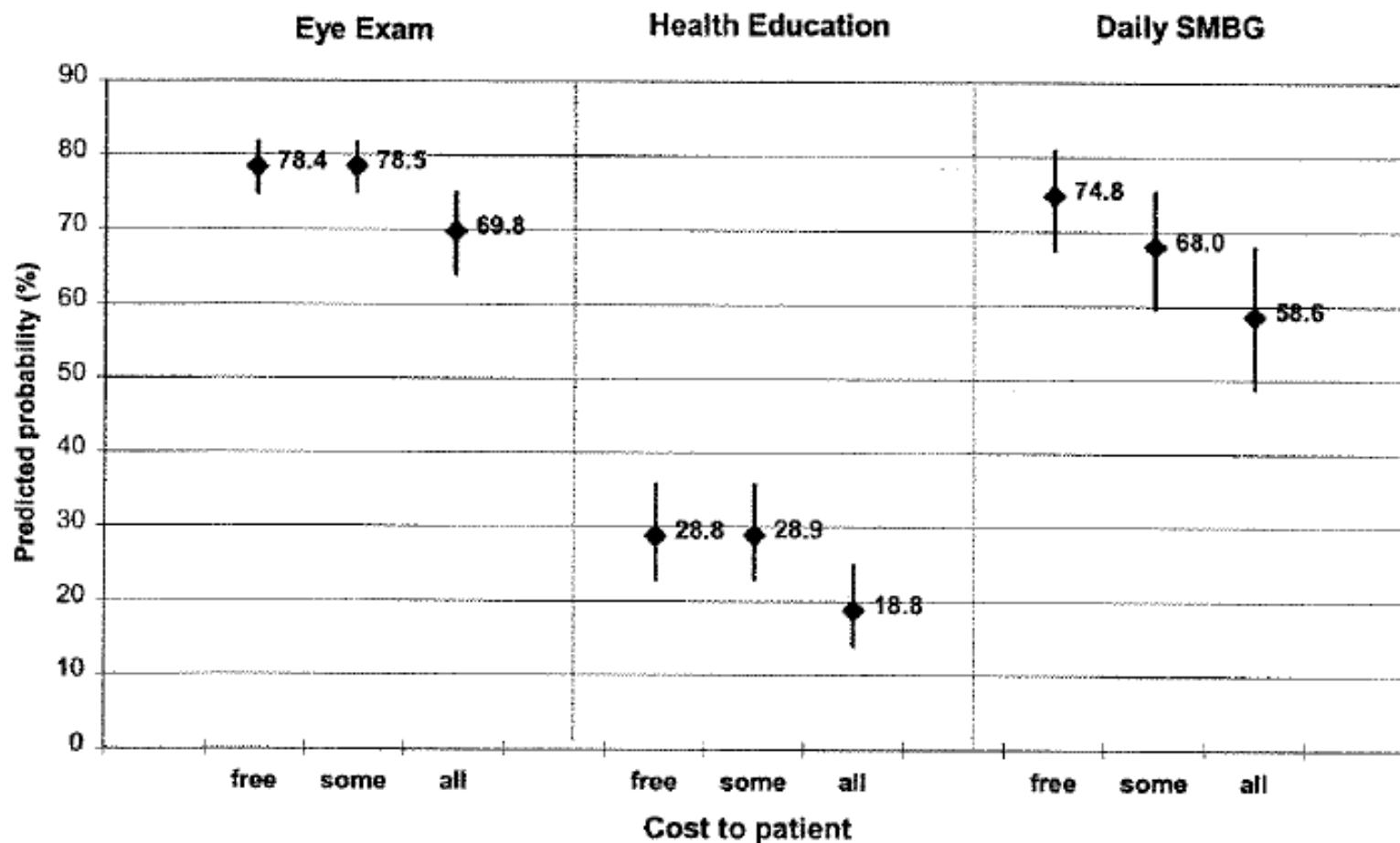


Figure 1—Conditional probabilities of utilization of diabetes preventive health care generated from the hierarchical logistic regression model (accounting for clustering within health plan). Bars indicate 95% CI.

## Findings: Patient Factors

1. Greater out-of-pocket costs (thru co-pays, non-coverage) associated with lower rates of retinal exams, health education, and self-management. (Karter, 2003)
2. Greater out-of-pocket costs associated with medication underuse and worse risk factor control (Tseng, 2008; Selby, 2008).
3. Cost-related medication underuse much higher in people of lower income (Tseng, 2009).
4. Cost concerns, trust in physicians, current smoking, and physical inactivity are key predictors of control of risk factors — (Selby, 2007).

## Findings: Patient Factors

5. Depression was a strong predictor of poor risk factor control in African Americans (Duru et al., 2009).
6. Diabetic women are less likely to processes of care to manage and control CVD risk factors (Ferrara, 2004).
7. Young adults with diabetes are particularly likely to have persistent lapses in care and have worse risk factor care (Gregg et al., 2010)

# Key Implications and Recommendations for the U.S. and Other Developing Health Systems

- Integrated care for diabetes connecting health systems, providers is crucial.
- Future efforts need to look beyond simple “processes of care” to improve and measure care.
- Reduce costs to the individual, especially for cost-effective interventions that health systems are trying to promote.
- Future population disease management systems need to tailor their approaches to diverse, culturally-linked barriers.

Listed in alphabetical order by primary authors last name:

Patient Level: .

Published

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# www.triadstudy.org



## TRIAD

Translating Research Into Action for Diabetes

### Toolkit

TRIAD would like to introduce all health and research professionals to this "toolkit" section of the site. These tools were developed by assimilating materials created and utilized by TRIAD investigators since TRIAD began in 1998. The toolkit materials were designed by a multi-disciplinary group of junior and senior investigators across six translational research centers who partnered with 68 provider groups within 10 managed care health plans. We hope you find the toolkit items both informative and useful. Please feel free to download documents that meet your specific professional needs.

*Study Participant Newsletters* – were created and mailed to participants as a means of sharing important news, updates and progress about the study. The newsletters were sent to participants to help with recruitment and as a useful way to help retain contact with study participants. Our last newsletter, distributed in the Summer and Fall of 2008, provided past study participants with a summary of important TRIAD findings.

- TRIAD Newsletter Summer/Fall 2008
- TRIAD Newsletter Spring 2004
- TRIAD Newsletter Summer/Fall 2002
- TRIAD Newsletter Winter 2001

*Study Instruments* – were developed at different times during the study. They include several patient surveys, as well as clinician, health plan, and provider group questionnaires. Please [click here](#) to download and learn more about the instruments used, the information collected, and types of data sources used to help with the data analysis process. Some instruments are also available in Spanish.

*Study Summary Slides* – were developed for the purpose of presenting important study information, including a description of the original focus of study (TRIAD I), what investigators learned (findings from TRIAD I), a continuation of study research (TRIAD II), along with overall study achievements. The slides are organized from different presentations given by study investigators through the years. These slides are arranged chronologically to show how the study evolved over the past ten years.

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# EXTRAS

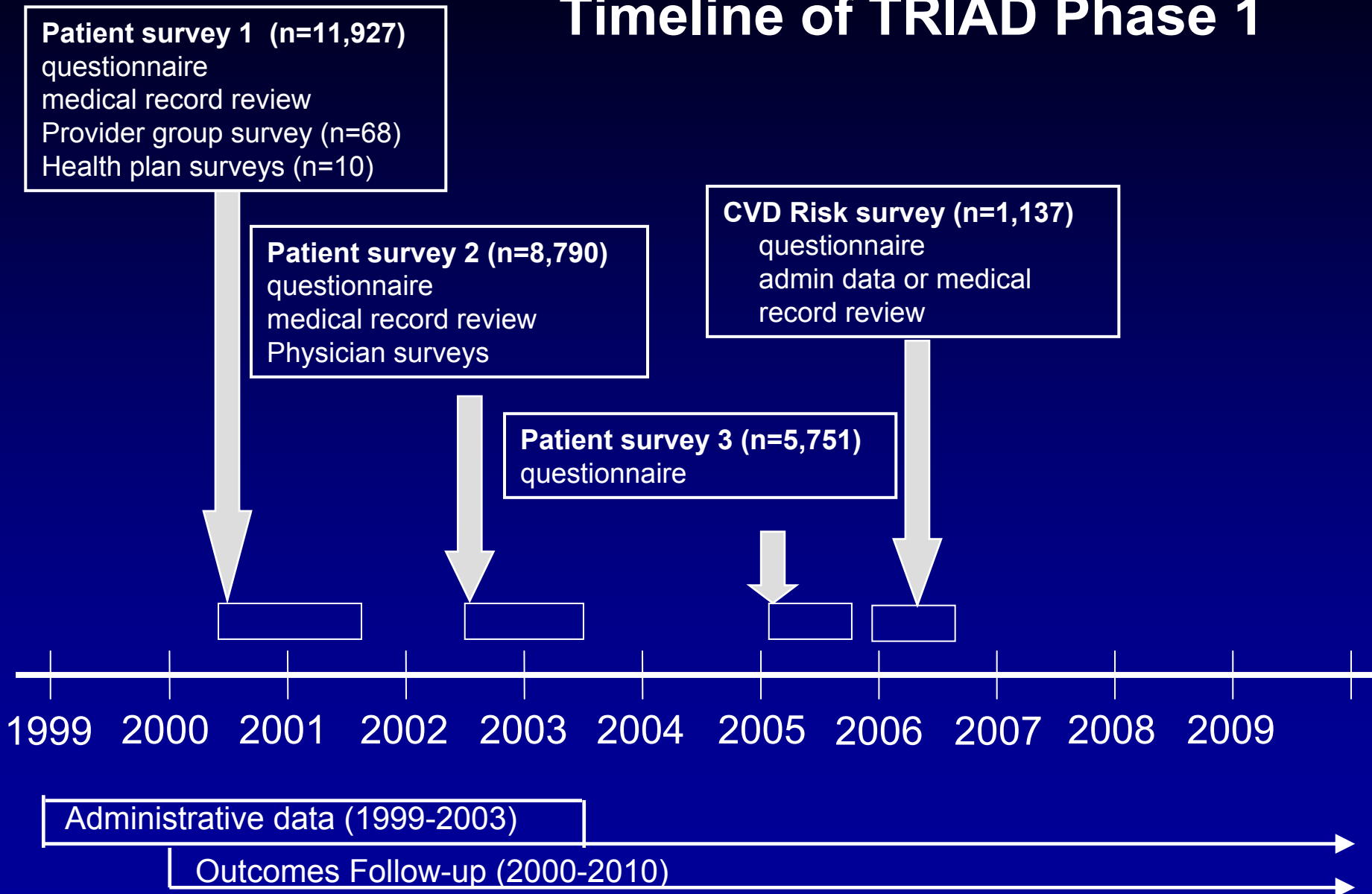
# 12 years later, in our Health Systems.....

- Diabetes care and risk factors have improved.
- The rate of major diabetes complications has declined on average in the U.S.
  
- Major inadequacies, disparities, and variation in care and risk factors remain.
- Major areas of concern include:
  - Chronic kidney disease and hypertensive heart disease.
  - Stalled blood pressure and smoking.
  - Lack of system- approaches for primary prevention.
  - Young adults
  - Diabetes is economically disabling to systems, patients, and their families.

# Implications for Future Research Efforts

- Develop new research platforms that can efficiently construct “natural experiments” of policy and system-level interventions.
- Harness new technology to develop chronic disease surveillance systems that can serve the needs of health systems research.
- Bring health services and translation research to primary prevention.

# Timeline of TRIAD Phase 1

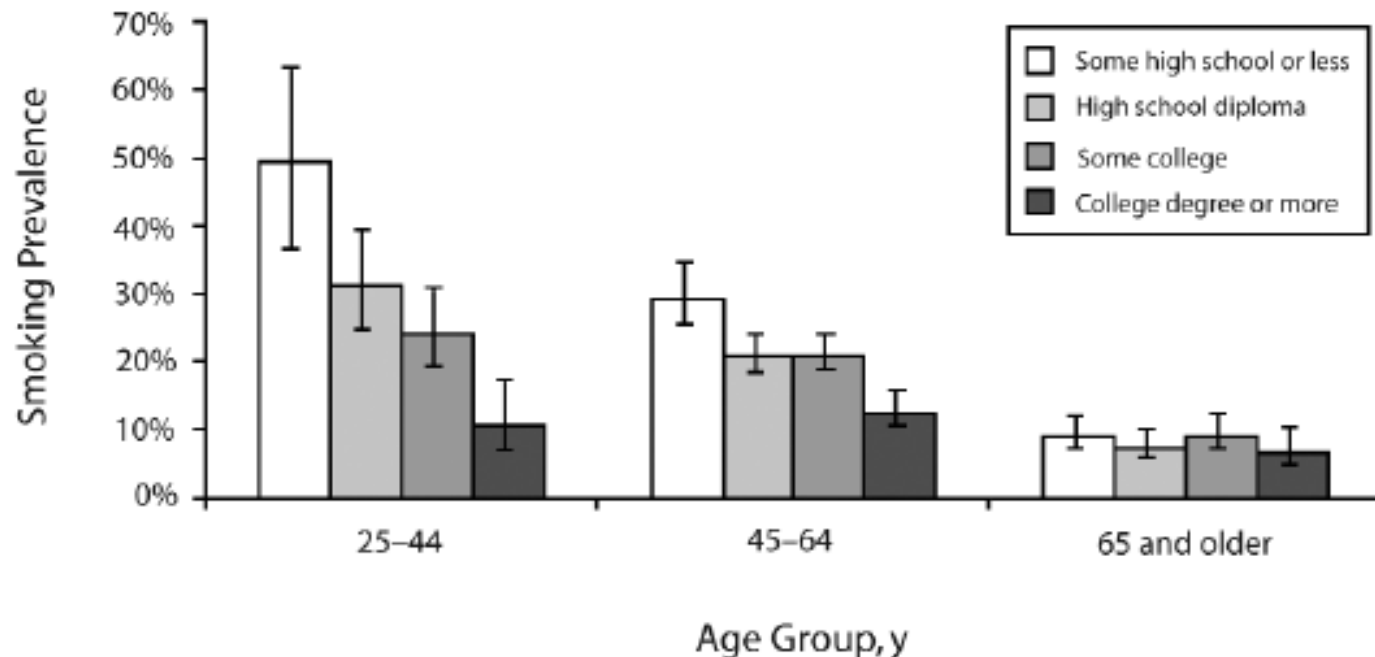


# Implications

- Disease management is effective, but needs to be better linked to:
  - Intermediate health outcomes.
  - Processes of care that more directly affect health outcomes.
  - Patient characteristics.
- Are we ready for a new generation of quality of care indicators?
- Are we ready for a new generation of individual targeted disease management strategies?
  - Findings suggest that individual patients need to be thought of as individuals who differ on SES, race/ethnicity, trust in their physician, depression, etc.

# Global Findings II

- New concerns in the risk of people with diabetes:
  - Smoking in lower educated young men.
  - Diabetes care of women, particularly for CVD risk management and pre-conception care.
  - Suboptimal care of people at risk for kidney disease.
  - Lipids and related care in African Americans.



Note. Prevalences (95% confidence intervals) are based on predicted probabilities generated from the hierarchical logistic regression model (accounting for clustering within health plan) and adjusted for age group, gender, race/ethnicity, Spanish-speaking, employment status, time since diabetes diagnosis, type of diabetes treatment, health education class attendance in past year, presence of depressive symptoms, and presence of a cardiovascular risk factor. There was a significant age-by-education interaction ( $P < .003$ ).

**FIGURE 1—Prevalence of smoking among adults with diabetes, across age groups and educational attainment: Translating Research Into Action for Diabetes (TRIAD) study survey, 2002–2003.**

# Conclusions and Recommendations from TRIAD

- Develop Integrated Disease Management that include an expanded set of processes that directly influence outcomes and tailor to individual differences:
  - Performance Feedback (e.g. use of appropriate treatment intensification)
  - Physician Reminders
  - Structured Care Management
    - Diabetes Self-management education
    - Case Management
    - Patient Reminders
- Avoid cost shifting to patients for evidence-based services.

# Key Accompanying Recommendations from TRIAD

- Develop and promote integrated care strategies that:
  - Focus on processes that move intermediate outcomes.
  - Tailor to individual differences, especially:
    - Gender related to CVD;
    - Race/ethnicity related to ABCs;
    - Persons of lower income;
    - Persons with high risk health behaviors.
    - Depression
    - Young and ostensibly healthy.

# Conclusions (Continued)

- Factors identified in TRIAD that may explain poor outcomes and disparities in outcomes:
  - Differences in cost-sensitivity
  - Poorer self-care behaviors
  - Depression
  - Less trust in physicians/systems
  - Neighborhood poverty