

***Translating Research Into
Action for Diabetes***

TRIAD

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

Outline

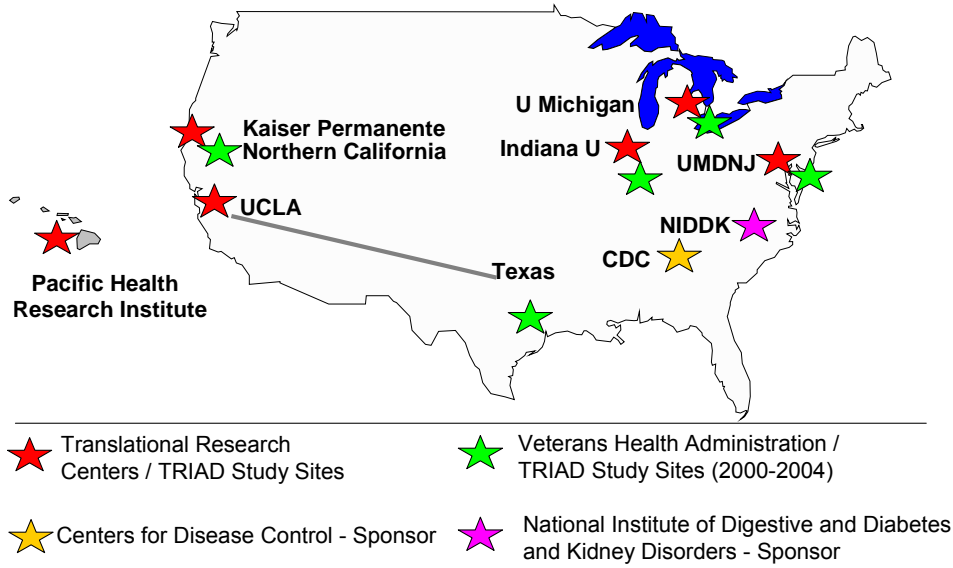
- TRIAD Study Overview
- Original Cohort & CVD Risk Studies
- Findings/Studies
 - Methodologic
 - Health System & Structural Factors
- Implications
- Next Phase of TRIAD
 - Site-specific Studies/Focused Studies
 - Natural Experiments
- Findings
 - Patient Factors
- Conclusions/Achievements
- Next Steps/Future Needs

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.

Do not need to use all of these “rationale slides”, can pick and choose. Refer to supplementary slides that bolster argument for studying diabetes if desired (such as iceberg slide).

TRIAD Sites and Sponsoring Agencies



Note: UCLA partnered with managed care plans in both Texas and Southern California. One of the 5 VA sites was in Texas. See alternate slide in Appendix A for map without the VA.

TRIAD Study Group: Principal Investigators and Sponsors

- **Indiana University**
David Marrero, PhD
- **Kaiser Permanente, N. California**
Joe Selby, MD, MPH
- **University of Michigan**
William Herman, MD, MPH
- **Pacific Health Research Institute**
David Curb, MD, MPH
- **University of Medicine and Dentistry of New Jersey**
Jesse C. Crosson, PhD
(Formerly Norman Lasser, MD, PhD)
- **UCLA School of Medicine**
Carol Mangione, MD, MSPH
- **Centers for Disease Control & Prevention - Sponsor**
Ed Gregg, PhD
Ted Thompson, MS
- **National Institute of Diabetes and Digestive and Kidney Diseases - Sponsor**
Sanford Garfield, PhD
- **VA TRIAD Study (5 sites)**
Eve Kerr, MD

Summary of TRIAD Objectives

1. **Descriptive** – Baseline and over time patient health status (quality of care), quality of life, health service use and health-related costs, with special attention to care among vulnerable populations
2. **Analytic** – Effectiveness of diabetes disease management strategies by health plans or provider groups; characteristics of plans, provider groups, and patients that enhance or impede the quality of diabetes care and/or the health status of members with diabetes

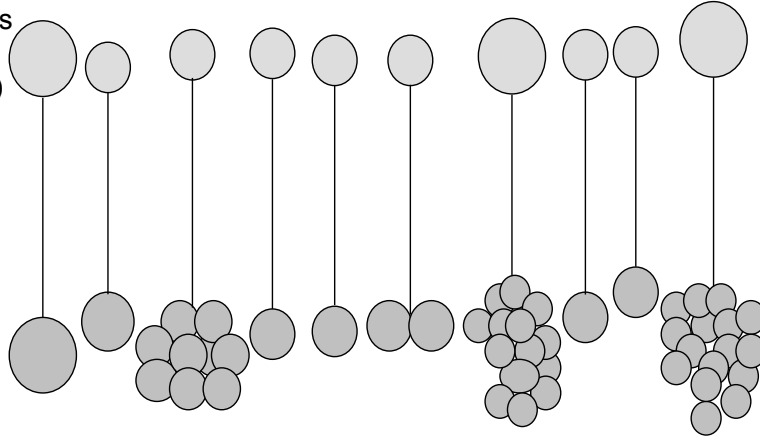
TRIAD Design and Structure

- **Multi-center study:** 10 managed care health plans.
- **Multi-level study:** diabetes outcomes study with assessment of 11,927 diabetic patients, linked to measurement of 68 provider groups, 10 health plans, and hundreds of communities that serve them.
- **Multi-design study:** Unified, multi-center cohort study with focused evaluations and natural experiments overlaid on broader structure.
- Diverse in age, gender, race/ethnicity, socioeconomic status, geography, and type of system.

TRIAD Nested Sampling Scheme

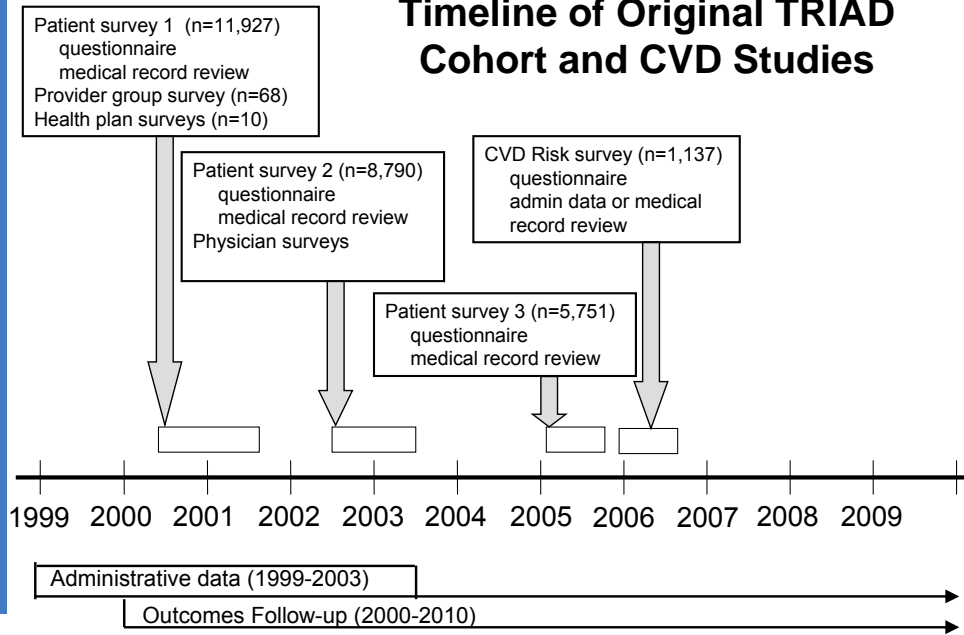
10 health plans
(n = 500 to
2000 per plan)

68 physician
groups with
> 50 members
in sampling
frame



Sampling scheme: Aimed for equal numbers from each physician group within health plan, so from 50 - 1500 per physician group

Timeline of Original TRIAD Cohort and CVD Studies



Original TRIAD Focus

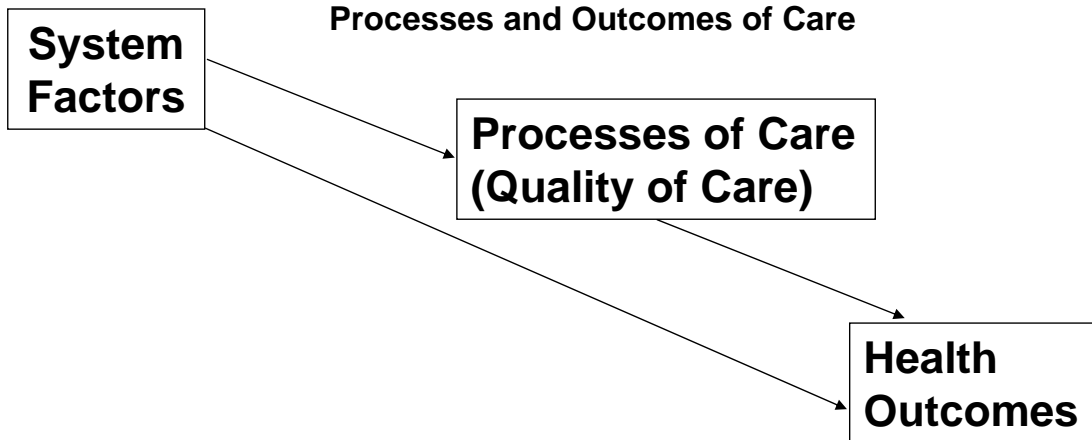
“System-level” analyses of managed care organizational characteristics and services:

- impact of diabetes interventions in everyday practice
- possibility that managed care creates barriers to care

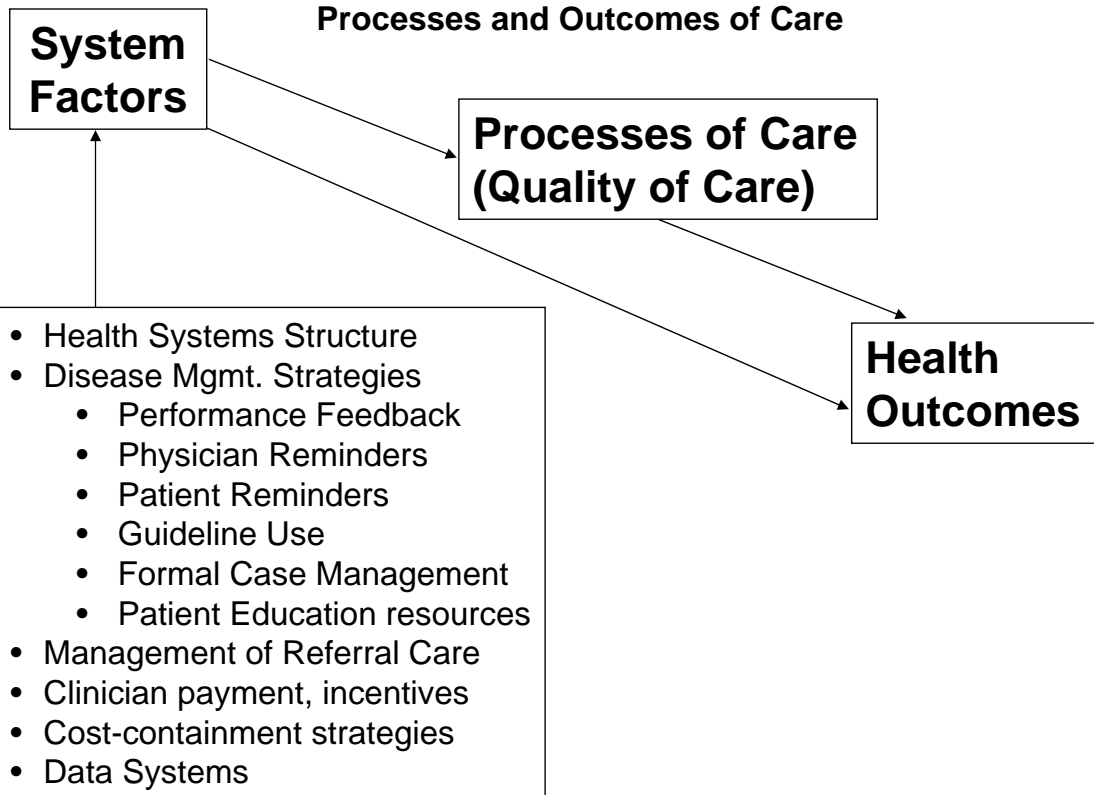
“Patient-level” factors in this large and diverse cohort of diabetic patients:

- variation in quality of care across diverse populations
- role of socioeconomic position on health status, health behaviors, diabetes complications, comorbidities

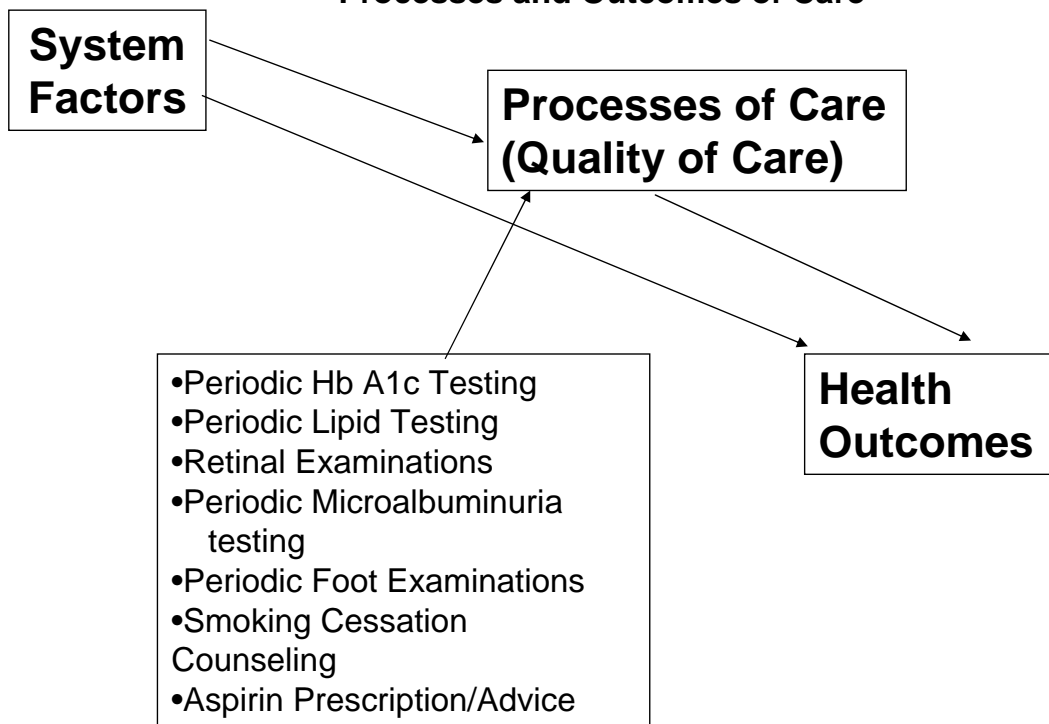
**TRIAD Conceptual Model for Relationships of System-Level Factors,
Processes and Outcomes of Care**



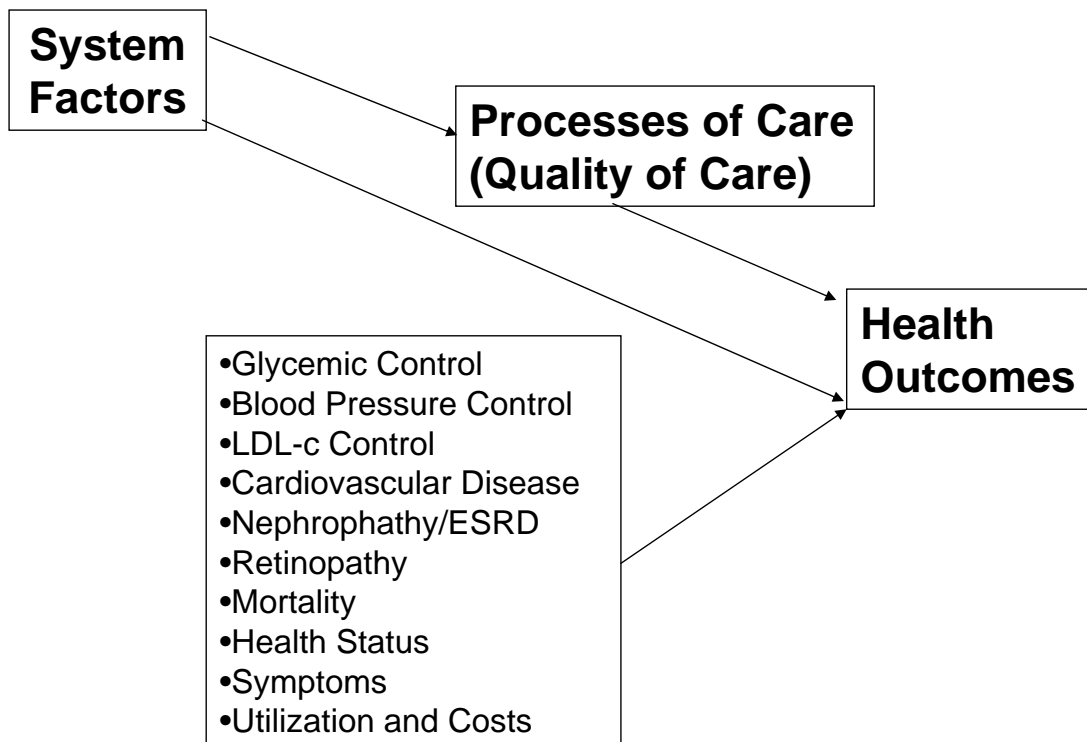
TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



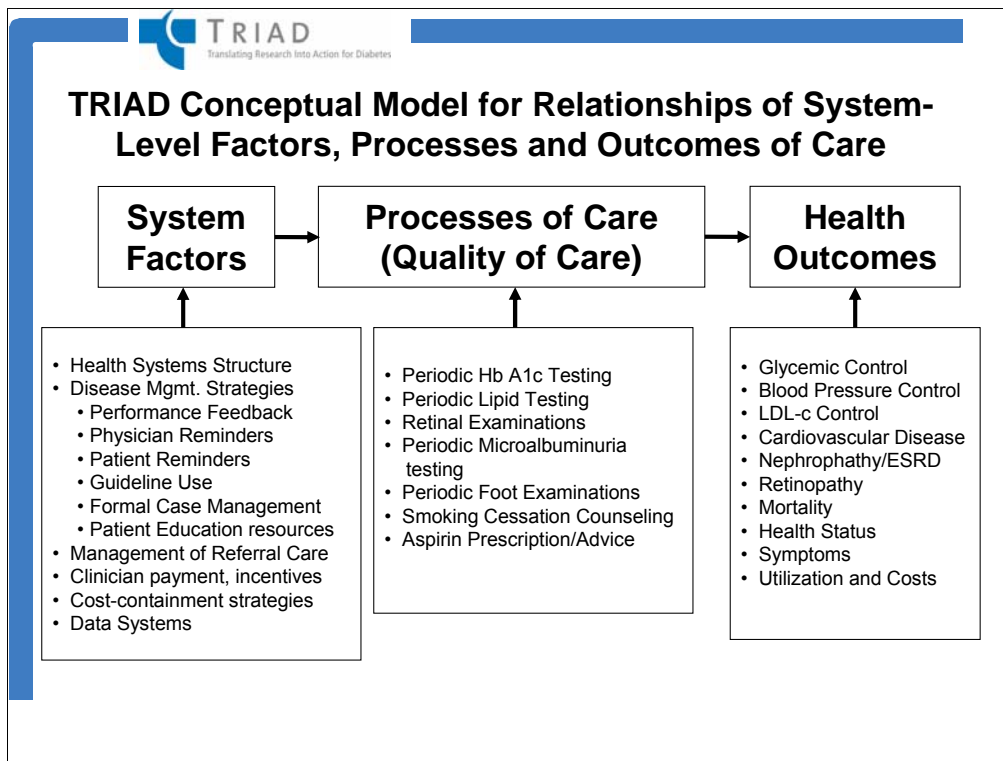
TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



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



From: Donabedian, A. The Definition of Quality. In: *Explorations in Quality Assessment and Monitoring*. Vol. 1. 1985



An alternate version reflecting the data collection tools is in the appendix.

This slide reflects the thinking when TRIAD was first designed. It can be used instead of slide entitled, TRIAD “Catalog” of Health Plan Interventions. TRIAD assembled one of the largest cohorts of diabetic patients ever studied and was unique in linking four levels: patients, providers, provider groups, and health plans. Within the TRIAD framework, both disease management strategies and managed care structural characteristics could be examined using Donabedian’s classic paradigm [Donabedian A. *The definition of quality. In Explorations in Quality Assessment and Monitoring. Vol. 1. Ann Arbor, MI, Health Administration Press, 1985*]. In this framework, these system-level factors are hypothesized to influence the processes of patient care and through these processes, the patients’ outcomes.

We assessed whether the features and intensity of use of disease management strategies within provider groups were associated with better diabetes care processes, cardiometabolic risk factor control, patient-reported satisfaction with care, and health status. We studied provider groups more extensively than health plans because of the greater number of provider groups than plans (68 vs. 10). The disease management strategies studied included performance feedback to physicians, reminders to physicians, use and dissemination of clinical guidelines, patient reminders, formal care management/case management by non-physician providers, and provision of health education resources. Based on high inter-correlations among the latter four strategies, they were grouped into a single variable called “structured care management.” Greater use of any of three strategies (performance feedback, physician reminders, or structured care management) was strongly and significantly associated with better clinical care processes.

TRIAD Medical Director Surveys

	Total # Directors	Response Rate
Health Plan Directors (or designee)	10	100%
Physician Group Directors (or designee)	68	76%

TRIAD Cohort Size, Response Rates

	Total # Participants	Adjusted* Response Rate	Participation Rate in Contacted Eligibles
Time 1	11,927	0.68	92%
Time 2	8,790	0.80	96%
Time 3	5,751	0.75	93%

*Adjusted for probable # of ineligible among those who could not be contacted (CASRO rate)

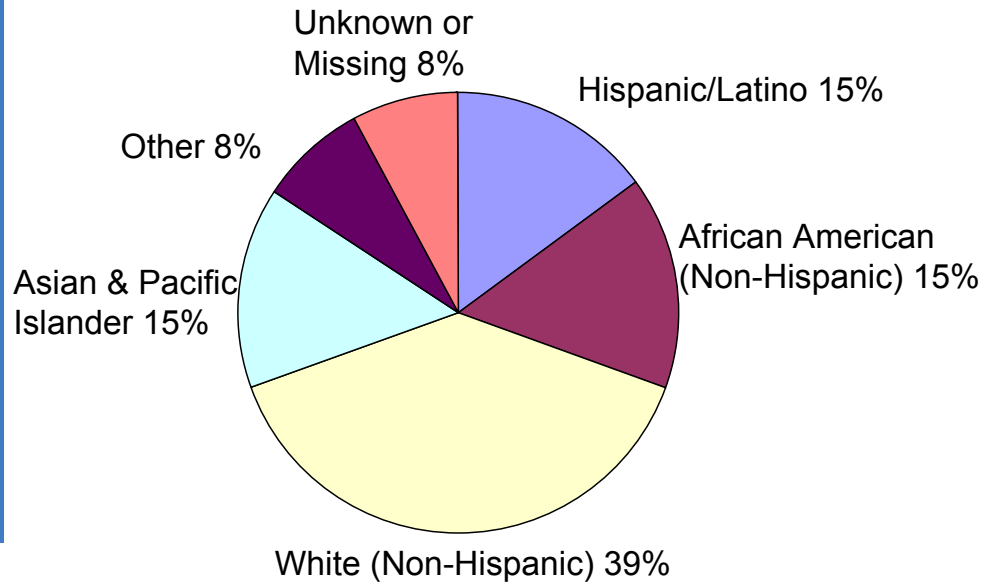
CASRO: 1982 Special Report *On the Definition of Response Rates*, issued by the Council of American Survey Research Organizations methodically defined response rates and disposition categories.

Response rates as defined by the American Association for Public Opinion Research. 2006. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 4th edition*. Lenexa, Kansas: AAPOR.

Original TRIAD Cohort Demographics

Category	Time 1	Time 2	Time 3
N (# of study participants)	11,927	8,790	5,751
Male (%)	47%	47%	46%
Female (%)	53%	54%	54%
Ages (avg.)	60 years	62 years	64 years
Age Groups:			
18-44	12%	10%	6%
45-64	49%	48%	45%
≥ 65	39%	42%	50%
BMI (avg.)	31.1	31	31.2
Duration of diabetes (avg. years)	12 years	13 years	16 years
HbA1c (avg.)	8.0%	7.8%	7.8%
Total Cholesterol (avg.)	197.5 mg/dl	191.6 mg/dl	191.6 mg/dl

Original TRIAD Cohort Ethnicity



Ethnicity of Original TRIAD Cohort Over 3 Rounds of Surveys*

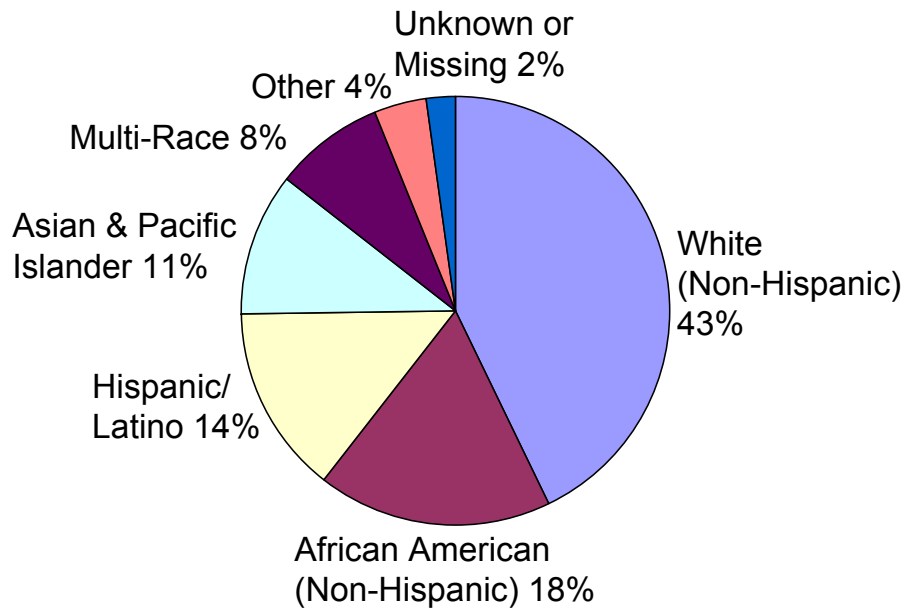
	Total # Participants	White (Non- Hispanic)	African American (Non- Hispanic)	His- panic/ Latino	Asian and Pacific Islander	Other
Time 1	11,927	39%	15%	15%	15%	8%
Time 2	8,790	41%	14%	15%	15%	8%
Time 3	5,751	43%	14%	14%	15%	8%

*8%, 7% and 6% were unknown or missing in Times 1, 2, and 3, respectively

CVD Risk Factor Study Demographics

Category	CVD Risk Factor Survey
N (# of study participants)	1,137
Male (%)	43%
Female (%)	57%
Ages (avg.)	63 years
Age Groups:	
18-44	5%
45-64	51%
≥ 65	44%
BMI (avg.)	32.5
Duration of diabetes (avg. years)	13 years
HbA1c (avg.)	7.6%
Total Cholesterol (avg.)	107.4 mg/dl

CVD Risk Factor Study Ethnicity



TRIAD Methodologic Studies

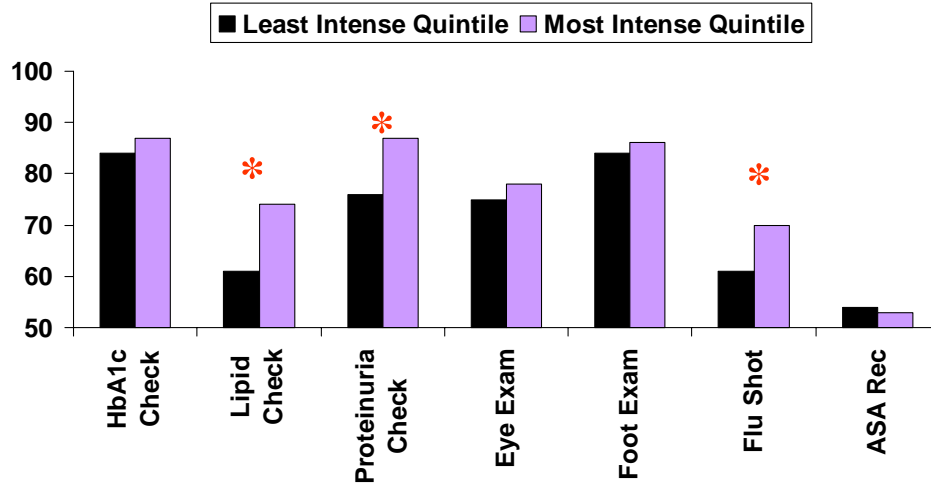
1. The TRIAD Study is a multicenter study designed to determine how the structure and organization of managed care systems influence the processes and outcomes of diabetes care – The TRIAD Study Group, Diabetes Care, 2002.
2. A conceptual framework for the mechanisms linking SEP to the health of persons with diabetes – Brown et al., Epidemiology Review, 2004.

1. The TRIAD Study Group. The Translating Research Into Action for Diabetes (TRIAD): a Multi-center Study of Diabetes in Managed Care. *Diabetes Care*; 2002;25:386-9.
2. Brown AF, Ettner SL, Piette J, Weinberger M, Gregg E, Shapiro MF, Karter AJ, Safford M, Waitzfelder B, Prata PA, Beckles GL. Socioeconomic position and health among persons with diabetes mellitus: a conceptual framework and review of the literature. *Epidemiol Rev.* 2004;26:63-77.

Health System and Structural Factors Findings

- Quality-Related
- Cost-Related
- Data System Related

Predictor: Practice Group (PG) Diabetes Registry Use

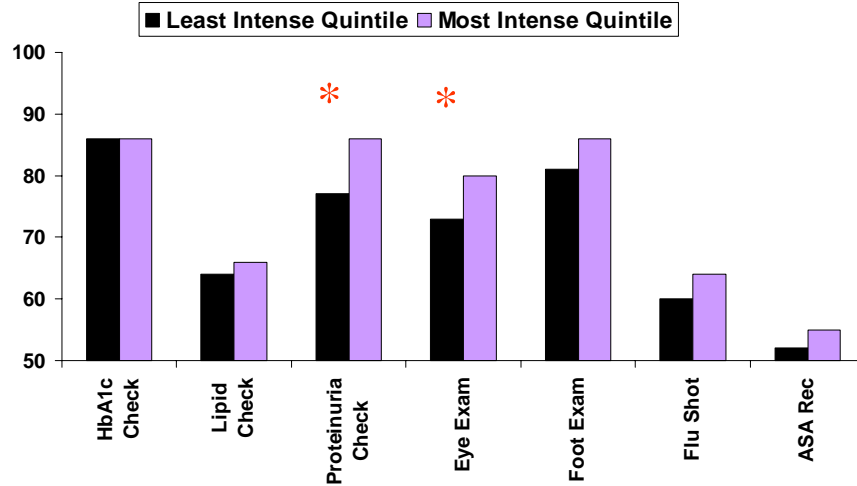


Mangione et al., *Ann Intern Med*, 2006

* significant $p \leq .05$

Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

Predictor: PG Physician Reminders

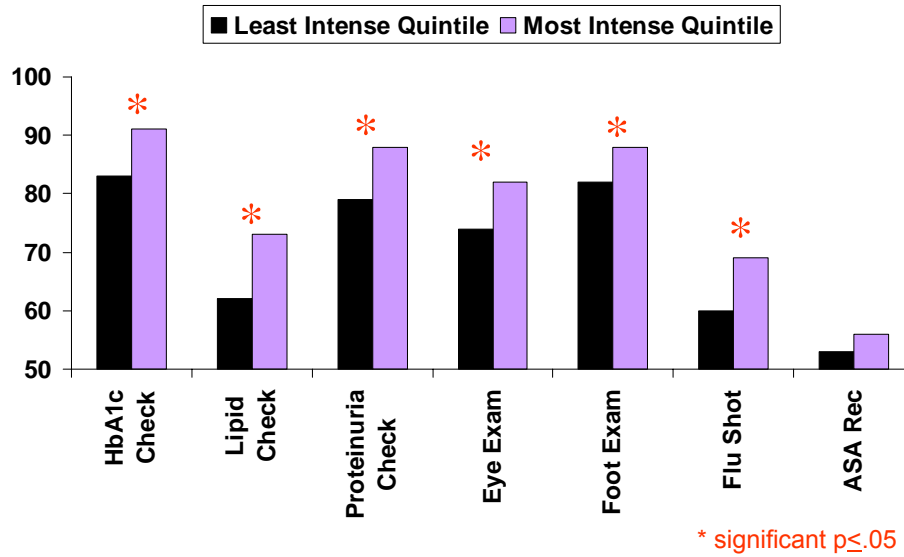


* significant $p \leq .05$

Mangione et al., *Ann Intern Med*, 2006

Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

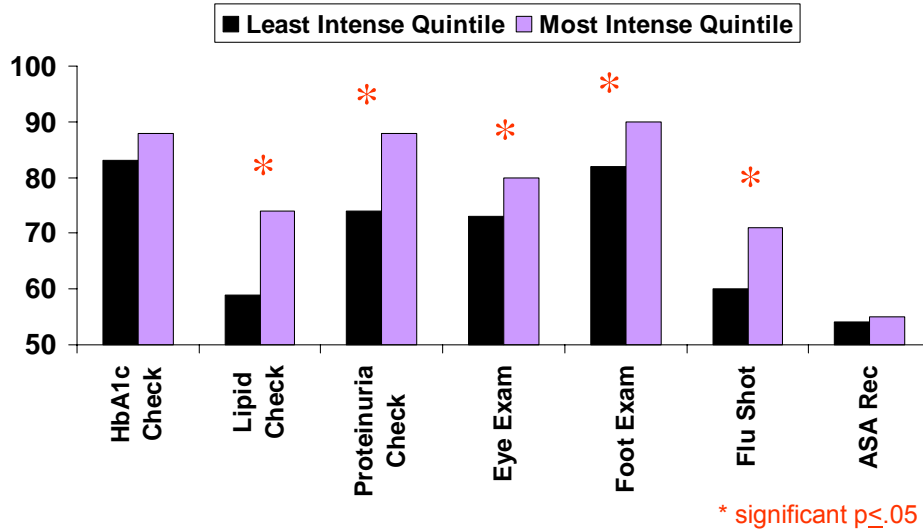
Predictor: PG Physician Feedback



Mangione et al., *Ann Intern Med*, 2006

Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

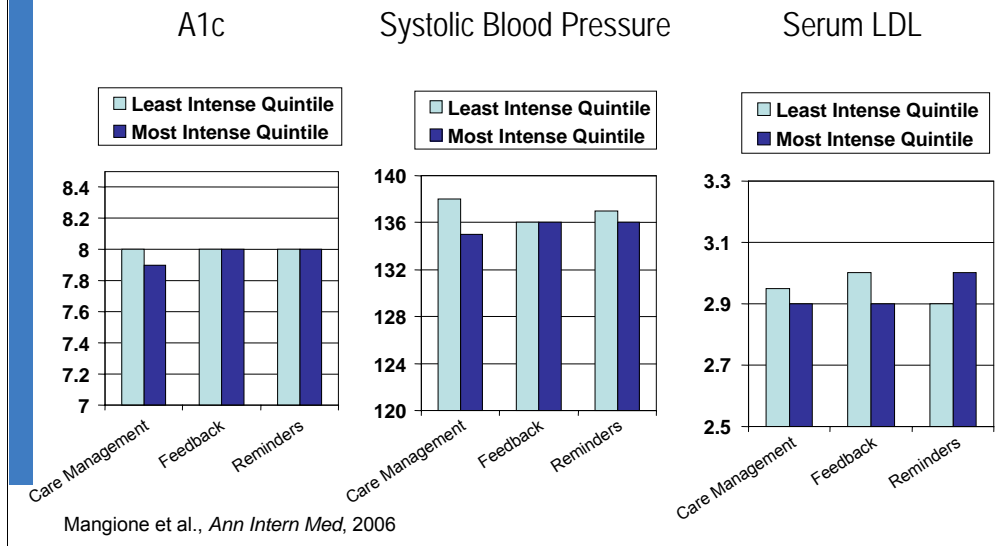
Predictor: PG Diabetes Care Management



Mangione et al., *Ann Intern Med*, 2006

Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

Association Between Disease Management Intensity and Levels of Risk Factor Control



Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

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
Processes of Care			
Annual eye exam (hybrid)	91 (87–93)	75 (69–80)	<0.001
Eye exam (medical record)	57 (38–75)	28 (16–46)	0.03
Eye exam (survey)	88 (84–92)	72 (67–77)	<0.001
Annual hemoglobin A1c test	93 (89–96)	83 (76–87)	0.005
Annual lipid screening	79 (69–86)	63 (51–73)	0.02
Annual foot exam (hybrid)	98 (96–99)	84 (79–88)	<0.001
Foot exam (medical record)	87 (80–91)	50 (40–60)	<0.001
Foot exam (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
Intermediate Outcomes			
	[# of Patients]	[# of Patients]	
Blood pressure < 140/90 mm Hg	53 (46–60) [1222]	52 (47–57) [6161]	>0.2
Blood pressure < 130/85 mm Hg	29 (23–35) [1222]	29 (25–34) [6161]	>0.2
Hemoglobin A1c value <9.5%	92 (87–95) [1173]	80 (72–86) [5769]	0.006
Hemoglobin A1c value <8.5%	83 (75–89) [1173]	65 (54–75) [5769]	0.009
LDL cholesterol level <3.37 mmol/L (<130 mg/dL)	86 (81–90) [995]	72 (68–76) [4398]	0.002
LDL cholesterol level <2.59 mmol/L (<100 mg/dL)	52 (45–59) [995]	36 (32–40) [4398]	0.003

* Higher rates represent higher quality. CMC = commercial managed care; LDL = low-density lipoprotein; VA = Veterans Affairs.

Models are adjusted for patients' demographic characteristics (age, race, education, and income), self-reported clinical characteristics (duration of diabetes and general health status), self-reported number of doctor visits in the last year, BMI, number of prescription meds for specific conditions (diabetes, CV conditions, hyperlipidemia, and depression), and number of medical comorbid conditions defined by using the Charlson index.

Kerr EA, Gerzoff RB, Krein SL, Selby JV, Piette JD, Curb JD, Herman WH, Marrero DG, Narayan KM, Safford MM, Thompson T, Mangione CM. Diabetes care quality in the Veterans Affairs Health Care System and commercial managed care: the TRIAD study. *Ann Intern Med.* 2004;141:272-81.

Health System and Structural Factors Findings - Quality-Related (cont.):

1. Quality of care, A1c and LDL-c control were substantially better in the VA system than in TRIAD centers. Blood pressure and patient satisfaction did not differ – Kerr et al., Ann Intern Med, 2004.
2. Disease management is strongly associated with processes of care but not risk factor control – Mangione et al., Ann Intern Med, 2006.

1. Kerr EA, Gerzoff RB, Krein SL, Selby JV, Piette JD, Curb JD, Herman WH, Marrero DG, Narayan KM, Safford MM, Thompson T, Mangione CM. Diabetes care quality in the Veterans Affairs Health Care System and commercial managed care: the TRIAD study. *Ann Intern Med*. 2004;141:272-81.
2. Mangione CM, Gerzoff RB, Williamson DF, et al. Association of Diabetes Disease Management Programs' Intensity with Process and Outcomes Measures of Quality of Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Ann Intern Med*. 2006; 145:107-116.

Quality-Related (cont.):

3. Processes of care at the provider group level are related to patient satisfaction and perceptions of quality, but not HbA1c or SBP – Ackermann et al., Diabetes Care, 2006.
4. Among for-profit plans, group/network model provider groups have higher quality scores than IPA models – Kim et al., Diabetes Care, 2004.

3. Ackermann RT, Thompson TJ, Selby JV, et al. Is the number of documented diabetes process-of-care indicators associated with cardio-metabolic risk factor levels, patient satisfaction, or self-rated quality of diabetes care. *Diabetes Care*. 2006; 29:2108-13.

4. Kim C, Williamson DF, Mangione CM, Safford MM, Selby JV, Marrero DG, Curb JD, Thompson TJ, Narayan KM, Herman WH; Translating Research Into Action for Diabetes (TRIAD) Study. Managed care organization and the quality of diabetes care: the Translating Research Into Action for Diabetes (TRIAD) study. *Diabetes Care* 2004;27:1529-34.

Quality-Related (cont.):

5. Only 20-23% of patients in poor control appeared to have poor medication adherence, whereas 30-47% of patients had good adherence but pharmacotherapy had not been intensified in response to the poor control – Schmittiel et al., J Gen Intern Med, 2008.
6. Health plan referral management practices are not related to rates of retinal exams or access to specialty care or to patient satisfaction or perception of difficulty getting referrals– Kim et al., Am J Managed Care, 2004.

5. Schmittiel JA, Uratsu CS, Karter AJ, Heisler M, Subramanian U, Mangione CM, Selby JV. Why don't diabetes patients achieve recommended risk factor targets? Poor adherence vs. lack of treatment intensification. *J Gen Intern Med* 2008 May; Vol. 23; No. 5; 588-94.

6. Kim C, Williamson DF, Herman WH, Safford MM, Selby JV, Marrero DG, Curb JD, Thompson TJ, Narayan KM, Mangione CM, and the TRIAD Study Group. Referral management and the care of patients with diabetes: the Translating Research Into Action for Diabetes (TRIAD) study. *Am J Manag Care* 2004;10:137-43.

Cost-Related:

1. Physician reimbursement by salary or capitation is associated with higher quality (processes) scores than FFS – Ettner et al., Health Services Res, 2006.
2. After adjustment, physicians who reported getting more than 90% of compensation from salary were not more likely to perform common diabetes processes of care than physicians in fee-for-service models– Kim et al., J Gen Intern Med, 2007.

1. Ettner S, Thompson TJ, Stevens MR, Mangione CM, Kim C, Steers WN, Goewey J, Brown AF, Chung RS, Narayan KMV, and the TRIAD Study Group. Are Physician Reimbursement Strategies Associated with Processes of Care and Patient Satisfaction for Patients with Diabetes in Managed Care? *Health Services Res* 2006;41:1221-41.
2. Kim C, Steers N, Herman WH, Mangione CM, Narayan KMV, Ettner SL. Physician Compensation from Salary and Quality of Diabetes Care. 2007 April; Vol. 4; 448-52.

Cost-Related (cont.):

3. Greater out-of-pocket costs (through co-pays, non-coverage) are associated with lower rates of retinal exams, health education, and self-monitoring of blood glucose – Karter et al., Diabetes Care, 2003.
4. Respondents reported using less medication than recommended because of costs – Tseng et al., Diabetes Care, 2008.

3. Karter AJ, Stevens MR, Herman WH, Ettner S, Marrero DG, Safford MM, Engelgau MM, Curb JD, Brown AF; Translating Research Into Action for Diabetes Study Group. Out-of-pocket costs and diabetes preventive services: the Translating Research Into Action for Diabetes (TRIAD) study. *Diabetes Care* 2003;26:2294-9.
4. Tseng CW, Tierney E, Gerzoff RB, Dudley AR, Waitzfelder BE, Ackermann RT, Karter AJ, Piette J, Crosson J, Ngo-Metzger Q, Chung R, Mangione CM. Race/Ethnicity and Economic Differences in Cost Related Medication Underuse among Insured Adults with Diabetes. The TRIAD study. *Diabetes Care*; 2008 Feb; Vol. 31; No. 2; 261-66.

Data System Related:

1. Case-cohort designs can be useful for large-scale community trials, or for studies that utilize concurrent registry data that record health or vital outcomes, such as the example from TRIAD data – Lu et al., Biometrics, 2006.
2. Concordance between self-report and medical records for recent retinal exams was poor. Self-reports indicated a higher performance of annual dilated eye examinations than did medical records – Beckles et al., Medical Care, 2007.

1. Lu SE, Shih, JH. Case-Cohort Designs and Analysis for Clustered Failure Time Data. *Biometrics*; 2006 December ; Vol. 62; No. 4; 1138-48.
2. Beckles GLA, Williamson DF, Brown AF, Gregg EW, Karter AJ, Kim C, Dudley RA, Safford MM, Stevens MR, Thompson TJ. Agreement between self-reports and medical records was only fair in a cross-sectional study of performance of annual eye examinations among adults with diabetes in managed care. *Medical Care*. 2007;45:876-83.

Data System Related (cont.):

3. Diabetes is much more likely to be reported on the death certificates of diabetic individuals who die of cardiovascular causes – McEwen et al., Diabetes Care, 2006.
4. There is a strong association between recording of diabetes on the death certificate and the certifying physician being the PCP after adjustment for covariates– McEwen et al., Diabetes Care, 2008.

3. McEwen LN, Kim C, Haan M, Ghoshi D, Lantz PM, Mangione CM, Safford MM, Marrero D, Thompson TJ, Herman WH. Diabetes reporting as a cause of death. *Diabetes Care*. 2006;29:247-253.

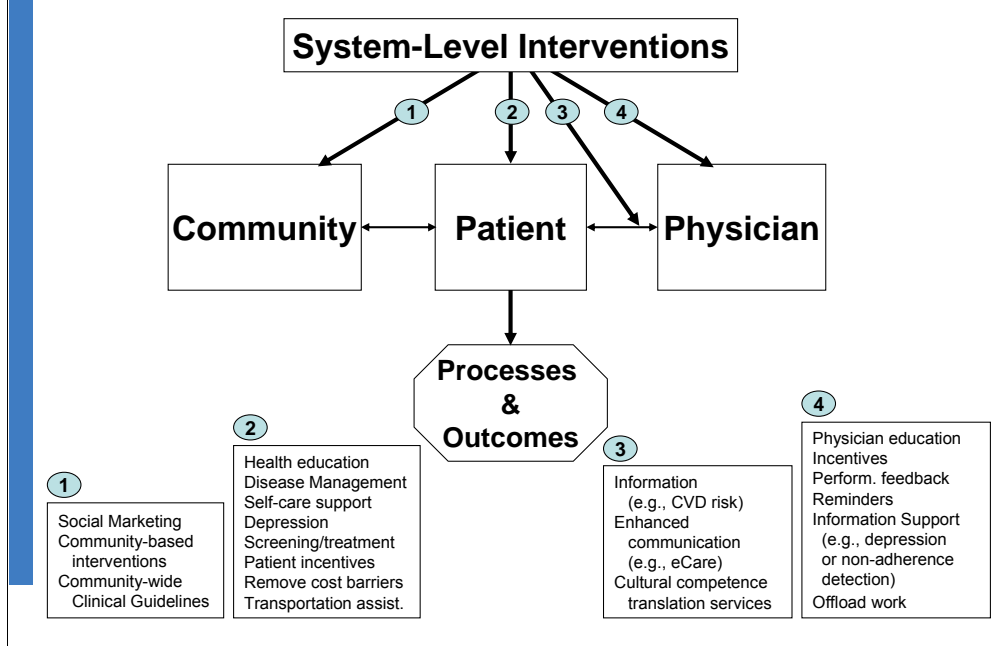
4. McEwen LN, Pomeroy NE, Onyemere K, Herman WH. Are primary care physicians more likely to record diabetes on death certificates? *Diabetes Care*; March 2008; Vol 31; No. 3; 508-510.

Implications

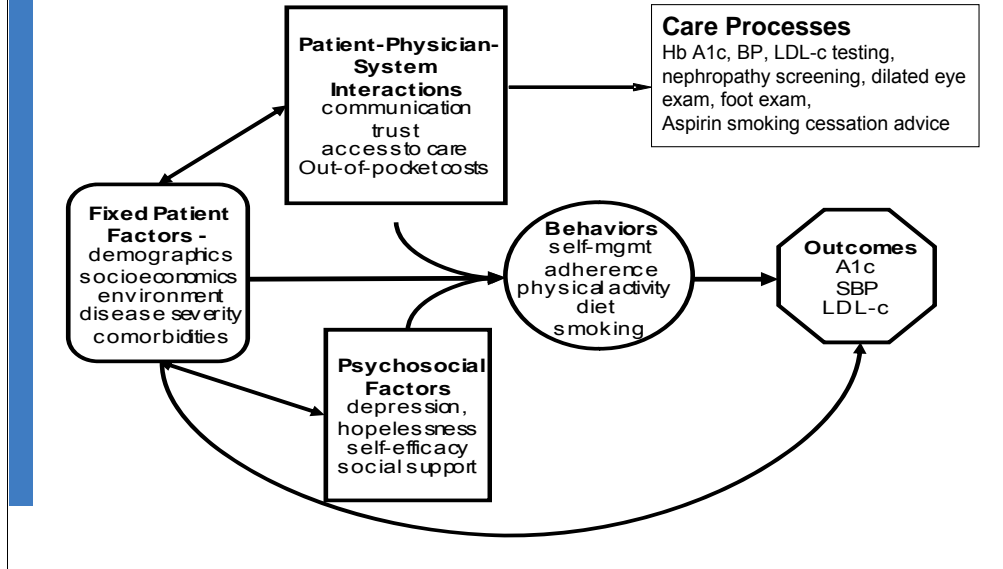
- Disease management is effective, but needs to be better linked to:
 - Intermediate health outcomes
 - Processes of care that more directly affect health outcomes
 - Patient characteristics
- Are we ready for a new generation of quality of care indicators?

Models that Explain Relationships Between Systems and Patient Factors

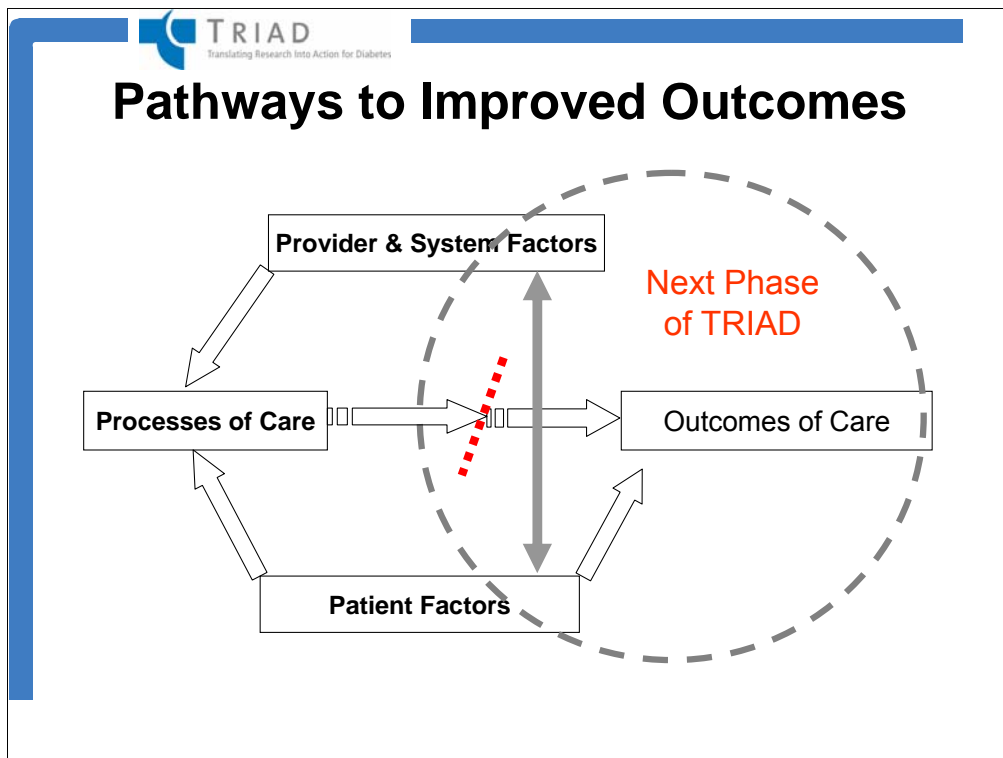
TRIAD “Catalog” of Health Plan Interventions



Possible Relationships of Patient Factors and Patient-System Interactions with Processes and Outcomes of Care



This slide can be used in place of slide 'TRIAD "Catalog" of Health Plan Interventions' and/or "TRIAD Conceptual Model Including Patient Factors." Candidate correlates were grouped *a priori* into 4 domains: 1) demographic, socioeconomic, and clinical factors; 2) psychosocial factors; 3) patient-provider-system relationship factors; and 4) behavioral factors (Figure 2). Factors in the first domain are considered to be relatively fixed from the health system perspective at the time of the study. The remaining 3 domains include factors that may be modifiable by a health care provider or system. A principal aim of the study was to determine the extent to which these mutable factors may explain at least in part observed associations with factors classified as fixed. Factors in the first domain were assumed to be mediated in part through behaviors, but also to have possible direct effects on outcomes. Although BMI was treated as a fixed clinical variable, it may certainly have mutable behavioral aspects as well.



What we found in the original TRIAD cohort studies was that health plan and provider group clinical care structure was strongly associated with the delivery of diabetes processes of care, but was not associated with the levels of important intermediate outcomes such as A1C, LDL-c, or blood pressure. The process of care variables did not differ by patient level factors such as race/ethnicity and education. However, these patient level factors were strongly associated with levels of the intermediate outcomes. Importantly, as demonstrated in the last presentation, organizational clinical care strategies may benefit some patients at higher risk for poor outcomes such as African Americans more than others.

These findings have informed and greatly influenced the research plan in TRIAD II which will focus on studying the interplay between patient, physician, and system level factors on control of intermediate outcomes, with a particular emphasis on the factors that may explain poor control.

The Next Phase of TRIAD 2006-2010

- Site-Specific Studies
- Focused-Theme Studies
- Natural Experiments

Site-Specific Studies and Focused Theme Topics

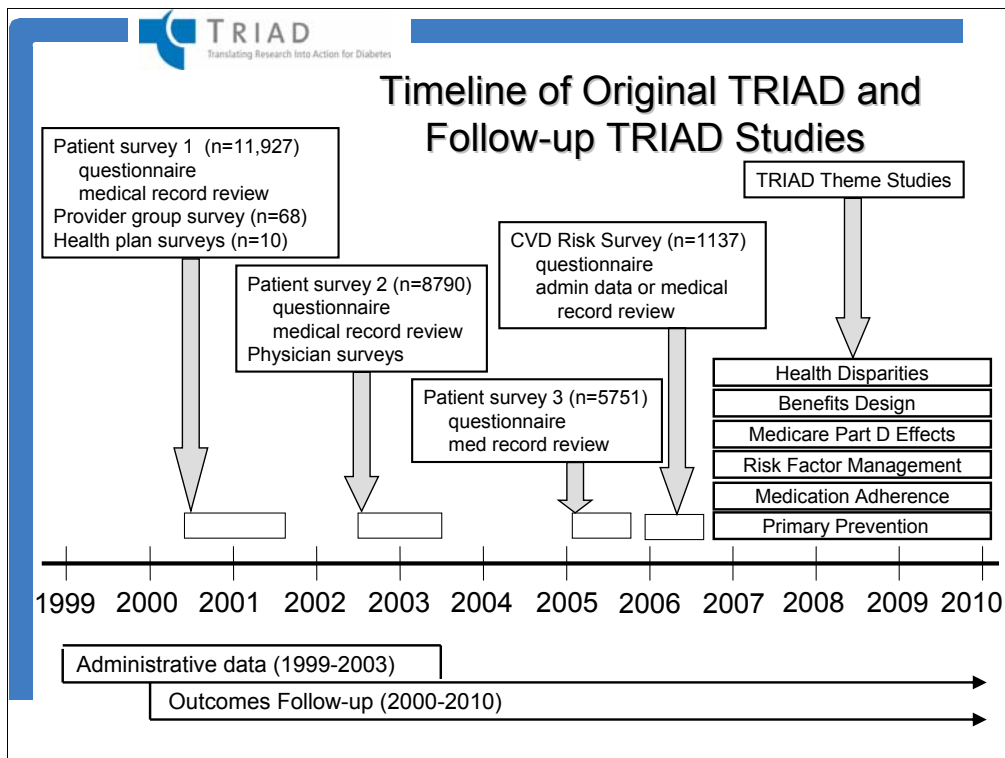
- Patient and provider factors in CVD risk factor control
 - qualitative and quantitative research
- Medication adherence
- Evaluation of the effects of Medicare Part D policy
- Barriers to insulin initiation and treatment intensification
- Factors underlying health care disparities
- Managed care-community partnerships to prevent DM
- Development and evaluation of high risk identification approaches for primary prevention
- Gestational diabetes care
- Aging and diabetes

Natural Experiments

- Copayment reduction: University of Michigan *Focus on Diabetes Program*
- Disease Management and prevention of chronic kidney disease
- Medicare Part D coverage gap
- Pay-for-Performance
- Mail-order pharmacy

Natural Experiments (cont.)

- Enhancing patient-provider communication about CVD risk factors.
- Understanding physician and patient attitudes about poor CVD risk factor control.
- Predictors, barriers, and outcomes of treatment intensification
- Hawaii Diabetes Data Network
- Diabetes and Aging Work Group (polypharmacy, treatment intensification, depression, cost)

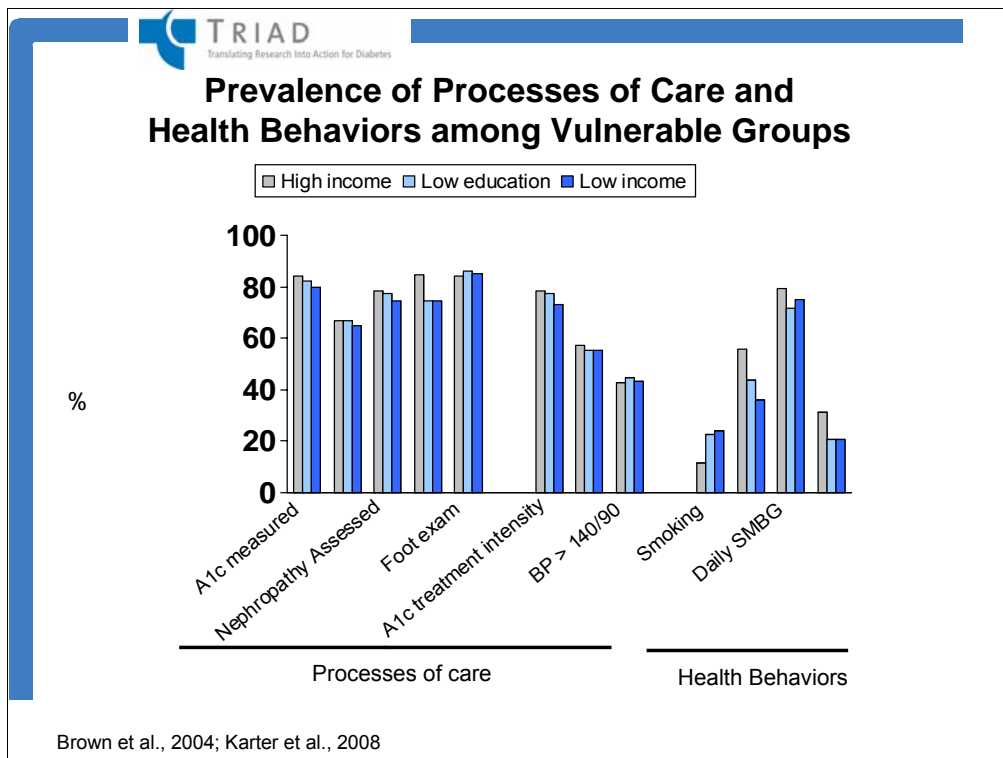


The cohort was surveyed three times via computerized telephone or mailed survey. Survey response rates, adjusted for inability to contact and for mortality, were 92%, 96%, and 93%, respectively. Administrative data (membership, hospital discharges, ambulatory care utilization, and prescription dispensing) were obtained for the 18 months prior to the initial interview and through the end of 2003. At the first survey, structured in-person interviews were conducted with medical directors (or their designees) of each participating health plan and with the directors (or their designees) of 63 of the 68 provider groups. For neighborhood measures of socioeconomic position, the entire cohort was linked (geocoded) to the U.S. Census 2000 block group data. Since 2003, National Death Index searches have been conducted annually for the entire cohort. With the second cohort survey, participants' primary care physicians were surveyed by mail to obtain information on physician demographics, knowledge, and attitudes (n=1248 physician respondents, 54% response rate). All TRIAD study instruments are available at <http://www.triadstudy.org>.

In 2005, findings from the TRIAD cohort led to a new survey in a new patient sample focused on control of cardiovascular disease risk factors (the CVD Risk Survey), designed to understand additional patient-level predictors of control. The survey used both telephone and mailed data collection methods and a "case-control" approach, sampling patients who were either in "good control" (hemoglobin A1c <8%, LDL-cholesterol < 130 mg/dL, and systolic blood pressure <140 mm Hg) or poor control (at least 2 factors above these cutpoints). Beginning in 2006, TRIAD investigators launched more than 20 smaller studies, typically involving one to four health plans.

Patient Factor Findings

- Disparities
- Pain and/or Depression
- Gestational Diabetes
- Physician Factors
- Intensity of Treatment



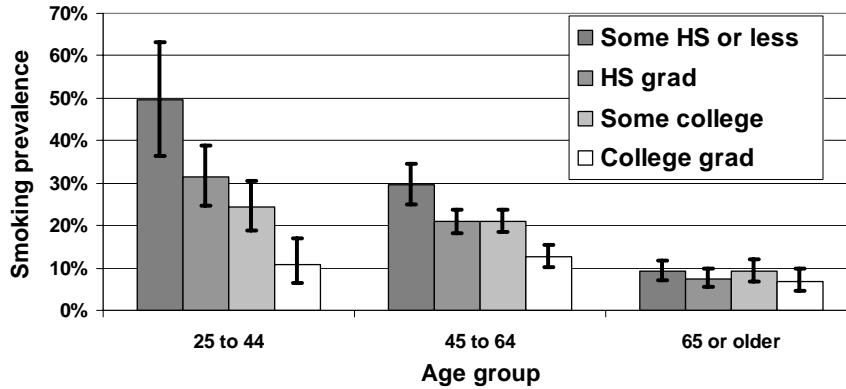
Brown AF, Ettner SL, Piette J, Weinberger M, Gregg E, Shapiro MF, Karter AJ, Safford M, Waitzfelder B, Prata PA, Beckles GL. Socioeconomic position and health among persons with diabetes mellitus: a conceptual framework and review of the literature. *Epidemiol Rev.* 2004;26:63-77.

Karter AJ, Stevens M, Gregg E, Brown A, Tseng C-W, Marrero D, Duru OK, Gary T, Piette JD, n D, Waitzfelder B, Herman W, Beckles G, Safford M, Ettner S. High rates of smoking among poorly educated young adults with diabetes in the Translating Research Into Action for Diabetes Study. *AJPH* 2008;98:365-70.

Brown AF, Ettner SL, Piette J, Weinberger M, Gregg E, Shapiro MF, Karter AJ, Safford M, Waitzfelder B, Prata PA, Beckles GL. Socioeconomic position and health among persons with diabetes mellitus: a conceptual framework and review of the literature. *Epidemiol Rev.* 2004;26:63-77.

Karter AJ, Stevens M, Gregg E, Brown A, Tseng C-W, Marrero D, Duru OK, Gary T, Piette JD, n D, Waitzfelder B, Herman W, Beckles G, Safford M, Ettner S. High rates of smoking among poorly educated young adults with diabetes in the Translating Research Into Action for Diabetes Study. *AJPH* 2008;98:365-70.

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



*Prevalence (95% confidence intervals) based on predicted probabilities generated from the hierarchical logistic regression model (accounting for clustering within health plan) and adjusted for age group, sex, race/ethnicity, Spanish-speaking, employment status, duration of diabetes, type of diabetes treatment, health education class attendance in past year, presence of depressive symptoms, and presence of a cardiovascular risk. There was a significant age-by-education interaction ($p=0.0025$).

Karter AJ, Stevens M, Gregg E, Brown A, Tseng C-W, Marrero D, Duru OK, Gary T, Piette JD, n D, Waitzfelder B, Herman W, Beckles G, Safford M, Ettner S. High rates of smoking among poorly educated young adults with diabetes in the Translating Research Into Action for Diabetes Study. *AJPH* 2008;98:365-70.

Patient Factor Findings

Disparities:

1. Processes of care differ little by race/ethnicity but non-white patients have higher A1c levels and African Americans have higher SBP levels than whites – Brown et al., Diabetes Care, 2005.
2. Few differences exist between Spanish-speaking and English-speaking Latino patients for processes of care; however, mean A1c levels were somewhat higher for Spanish-speaking than English-speaking Latinos – Brown et al., Am J Publ Hlth, 2003.

1. Brown AF, Gregg EW, Stevens MR, Karter AJ, Weinberger M, Safford MM, Gary TL, Caputo DA, Waitzfelder B, Kim C, Beckles GL. Race, ethnicity, socioeconomic position, and quality of care for adults with diabetes enrolled in managed care: the Translating Research Into Action for Diabetes (TRIAD) study. *Diabetes Care* 2005;28:2864-70.
2. Brown AF, Gerzoff RB, Karter AJ, Gregg E, Safford M, Waitzfelder B, Beckles GL, Brusuelas R, Mangione CM; TRIAD Study Group. Health behaviors and quality of care among Latinos with diabetes in managed care. *Am J Public Health*. 2003;93:1694-8.

Disparities (cont.):

3. Both African Americans and Latinos reported spending “more extra time” than whites on several diabetes self-care behaviors, including foot care, shopping for and cooking diabetic meals, and exercising to manage diabetes – Ettner et al., Health Econ, 2008.
4. Greater intensity of 3 disease management strategies was associated with smaller racial/ethnic disparities for some, but not all, care process measures, but these disparities were quite small overall. It did not appear to reduce the somewhat larger disparities in risk factor control – Duru et al., Medical Care, 2006.

3. Ettner SL, Cadwell BL, Russell LB, Brown A, Karter AJ, Safford M, Mangione C, Beckles G, Herman WH, Thompson TJ; and The TRIAD Study Group. See Appendix A for complete list. Investing time in health: do socioeconomically disadvantaged patients spend more or less extra time on diabetes self-care? Health Econ. 2008.
4. Duru OK, Mangione CM, Steers NW, et al. The association between clinical care strategies and the attenuation of racial/ethnic disparities in diabetes care: the Translating Research Into Action for Diabetes (TRIAD) Study. Med Care 2006;44:1121-8.

Disparities (cont.):

5. Living in an impoverished neighborhood was associated with lower rates of blood pressure control, higher rates of smoking, and slightly lower physical and emotional well being scores, after adjustment for individual SES – Gary et al., Diabetes Care, 2008.

6. Among people with diabetes and access to medical care, older age, male sex, smoking, and renal disease are important predictors of mortality - McEwen et al., Diabetes Care, 2007.

5. Gary TL, Safford MM, Gerzoff RB, Ettner SL, Karter AJ, Beckles GL, Brown AF. Perception of neighborhood problems, health behaviors, and diabetes outcomes among adults with diabetes in managed care: the Translating Research Into Action for Diabetes (TRIAD) study. *Diabetes Care*. 2008 Feb;31(2):273-8.

6. McEwen LN, Kim C, Karter AJ, Haan MN, Ghosh D, Lantz PM, Mangione CM, Thompson TJ, Herman WH. Risk Factors for Mortality Among Patients With Diabetes The Translating Research Into Action for Diabetes (TRIAD) Study. *Diabetes Care* 30:1736–1741, 2007.

Disparities (cont.):

7. Patients, ages 25 and over, with less education were significantly more likely to smoke, and less likely to engage in regular exercise or in other health-seeking activities (diabetes health education, website, or support group) – Karter et al., BMC Public Health, 2007.

8. Women with diabetes are less likely to be on aspirin and statins and to have LDL tested – Ferrara et al., Diabetes Care, 2004.

7. Karter AJ, Stevens MR, Brown AF, et al. Educational disparities in health behaviors among patients with diabetes: the Translating Research Into Action for Diabetes (TRIAD) Study. *BMC Public Health*. 2007 Oct 29;7:308.

8. Ferrara A, Williamson DF, Karter AJ, Thompson TJ, Kim, C. Sex Differences in Quality of Health Care Related to Ischemic Heart Disease Prevention in Patients with Diabetes: Translating Research into Action for Diabetes (TRIAD) study, 2000-2001. *Diabetes Care*; 2004 Dec; Vol. 27; No. 12; 2974-76.

Disparities (cont.):

9. Slightly worse levels of several cardiovascular disease care processes and intermediate outcomes were found in diabetic women compared with men – Ferrara et al., Diabetes Care, 2008.
10. Even among patients receiving appropriate processes of care, younger persons were less likely to have good control of risk factors (combined measure of A1c, LDL, and SBP control) – Selby et al., Med Care, 2007.

9. Ferrara A, Mangione CM, Kim C, Marrero DG, Curb D, Stevens M, Selby JV. Translating Research Into Action for Diabetes Study Group. Sex disparities in control and treatment of modifiable cardiovascular disease risk factors among patients with diabetes: Translating Research Into Action for Diabetes (TRIAD) Study. *Diabetes Care*. 2008;31:69-74.

10. Selby JV, Swain BE, Gerzoff RB, Karter AJ, Waitzfelder BE, Brown AF, et al. Understanding the Gap Between Good Processes of Diabetes Care and Poor Intermediate Outcomes: Translating Research Into Action for Diabetes (TRIAD). *Med Care*. 2007;45:1144-53.

Disparities (cont.):

11. Young diabetic patients (25-44 years) with less than HS education are much more likely to smoke than college grads – Karter et al., Am J Publ Health, 2008.
12. Among adult patients with Type 1 diabetes, those who had been diagnosed between 10 and 13 years of age had higher odds of smoking as adults than those diagnosed either earlier or later, and higher myocardial infarction risk than patients diagnosed earlier – Carroll et al., Diabetes Care, 2007.

11. Karter AJ, Stevens M, Gregg E, Brown A, Tseng C-W, Marrero D, Duru OK, Gary T, Piette JD, n D, Waitzfelder B, Herman W, Beckles G, Safford M, Ettner S. High rates of smoking among poorly educated young adults with diabetes in the Translating Research Into Action for Diabetes Study. *AJPH*. 2008;98:365-370.

12. Carroll A Carroll AE, Ackermann RT, Brizendine EJ, Shen C, Marrero DG. Does age at diabetes diagnosis influence long-term physical and behavioral outcomes? *Diabetes Care* 2007;30:2859-60.

Pain and/or Depression:

13. Pain, obesity, and new comorbidities were moderately associated with decreases in sustained walking, especially in patients ≥ 65 years – Duru et al., J Gen Intern Med, 2008.
14. Self-reported depression was more frequent and a much stronger predictor of poor risk factor control for African Americans, and more frequently untreated – Duru et al., in press at Medical Care, 2008.

13. Duru OK, Gerzoff RB, Brown AF, Karter AJ, Kim C, KountzD, Narayan K MV, Schneider SH, Tseng C-W, Waitzfelder B, Mangione CM. Predictors of Sustained Walking among Diabetes Patients in Managed Care: The Translating Research into Action for Diabetes (TRIAD) Study. *Journal of General Internal Medicine*; 2008 Aug; Vol 23; No. 8; 1194-99.

14. Duru OK, Gerzoff RB, Brown AF, Selby JV, Ackermann RT, Karter AJ, Ross S, Steers N, Herman WH, Waitzfelder B, Mangione CM. Identifying Risk Factors for Racial Disparities in Diabetes Outcomes: the Translating Research into Action for Diabetes (TRIAD) Study. Submitted to *Medical Care* *publication pending*.

Gestational Diabetes:

15. More than 80% of women with a history of gestational diabetes (GDM) reported receiving counseling on lifestyle modification and postpartum screening during the pregnancy but less than one-third reported receiving postpartum diabetes screening – Kim et al., Diabetes Care, 2007.

16. 90% of women with a history of GDM recognized that GDM was a risk factor for future diabetes, but only 16% believed that they themselves had a high chance of developing diabetes – Kim et al., Diabetes Care, 2007.

15. Kim C, McEwen LN, Kerr EA, Piette JD, Chames MC, Ferrara A, et al. Preventive counseling among women with histories of gestational diabetes mellitus. *Diabetes Care*. 2007;30:2489-95.

16. Kim C, McEwen LN, Piette JD, Goewey J, Ferrara A, Walker EA. Risk perception for diabetes among women with histories of gestational diabetes mellitus. *Diabetes Care* 2007;30:2281-6.

Gestational Diabetes (cont.):

17. Women had low self-efficacy and social support for a healthy diet and physical activity.– Kim et al., Diabetes Educ, 2008.
18. In women of childbearing age, older age, higher BMI, and no insulin use were associated with lower likelihood of pre-conception counseling regarding glucose control and family planning – Kim et al., Am J Ob Gyn, 2005.

17. Kim C, McEwen LN, Kieffer EC, Herman WH, Piette JD. Self-efficacy, social support, and associations with physical activity and body mass index among women with histories of gestational diabetes mellitus. *Diabetes Educ* 2008;34:719-28.

18. Kim C, Ferrara A, McEwen LN, Marrero DG, Gerzoff RB, Herman WH, et al. Preconception care in managed care: the translating research into action for diabetes study. *American Journal of Obstetrics & Gynecology*. 2005 Jan;192(1):227-32.

Gestational Diabetes (cont.):

19. Stress urinary incontinence is common among women with a history of GDM but does not appear to be associated with physical activity levels or BMI – Kim et al., J Women's Health, 2008.

19. Kim, Stress Urinary Incontinence in Women with Histories of Gestational Diabetes Mellitus; *Journal of Women's Health*; 2008; Vol 17; NO 5; 783-792.

Physician:

20. Physician sex was not associated with processes of care, intermediate outcomes or patient satisfaction – Kim et al., Diabetes Care, 2005.
21. Neither physician age, sex, number of years in practice, or specialty were important determinants of mammography or Pap smear screening – Tabaei et al., Diabetes Care, 2005.

20. Kim C, McEwen LN, Gerzoff RB, Marrero DG, Mangione CM, Selby JV, et al. Is physician gender associated with the quality of diabetes care? *Diabetes Care* 2005;28:1594-8.

21. Tabaei BP, Herman WH, Jabarin AF, Kim C. Does diabetes care compete with the provision of women's preventive care services? *Diabetes Care* 2005;28:2644-9.

Physician (cont.):

22. Physicians who believed they received direct reimbursement for ordering outpatient tests were not any more likely to order these tests, with the single exception of electrocardiograms - Kim et al., Am J Manag Care, 2008.

22. Kim C, Tierney EF, Herman WH, Mangione CM, Narayan KMV, Gerzoff RB, Bilik D, Ettner SL. Physician reimbursement perception for outpatient procedures and procedures among managed care patients with diabetes. *Am J Manag Care* 2009 Jan; Vol. 15, No. 1; 32-38.

Intensity of Treatment:

23. Patients with diabetes are under-treated with CADE/ARB after screening for microalbuminuria – Johnson et al., Diabetes Care, 2006.
24. Relatively high rates of failure to intensify treatment in the face of poor risk factor control may prove to be a useful process measure of quality. Higher treatment intensification rates have been linked to better risk factor control – Selby et al., Medical Care, 2008.

23. Johnson SI, Tierney EF, Onyemere KU, Tseng C-W, Safford MM, Karter AJ, Ferrara A, Duru OK, Brown AF, Narayan KMV, Thompson T, Herman WH. Who Is Tested for Diabetic Kidney Disease and Who Initiates Treatment? The Translating Research Into Action for Diabetes (TRIAD) study. *Diabetes Care* 2006; 29:1733–1738.

24. Selby JV, Uratsu CS, Fireman B, Schmittiel JA, Peng T, Rodondi N, Karter AJ, Kerr EA. Treatment intensification and risk factor control: Toward More Clinically Relevant Quality Measures *Med Care* 2008? *Can't find*

Conclusions

1. Processes are easier to influence than outcomes, so develop, measure, and incent clinically effective process measures: e.g., treatment intensification, use of statins, ACE-inhibitors, aspirin, smoking cessation advice.
2. Disease management strategies were associated with better processes of diabetes care but not with improved intermediate outcomes.
3. Poor “reach” or penetration of programs may help to explain apparent lack of effectiveness for outcomes.

Conclusions (Continued)

4. Greater integration (better data systems, stronger culture, aligned incentives, effective communication) appear to lead to better processes and possibly to better outcomes (VA comparison).
5. Cost-shifting to patients invariably leads to reduced adherence, worsening outcomes.
6. Younger age and few, if any, comorbidities identify patients who may need special targeting.

Conclusions (Continued)

7. Racial/ethnic and socioeconomic disparities in outcomes persist within these insured populations – especially for African American patients.
8. Monitoring/reporting quality measures by race/ethnicity and educational level is a first step in understanding and eliminating them.

Conclusions (Continued)

9. Factors identified in TRIAD that may explain poor outcomes and disparities in outcomes:
 - possible differences in cost-sensitivity
 - poorer self-care behaviors
 - higher frequency of depression with lower rates of treatment
 - possible diminished trust in physicians/systems
 - neighborhood poverty
 - less frequent physician visits
 - less attention to risk factor control by health care providers
 - more severe disease among younger persons in the cohort
 - effects of family and work obligations of younger patient
 - possible effects of poorer quality of patient-provider communications

Conclusions (Continued)

10. Interventions to support behavior change in gestational diabetes and increase postpartum screening are promising and needed.
11. Greater system-level attention to weight management/lifestyle interventions in patients with type 2 may be critical to improving outcomes.

TRIAD Achievements

- First multi-agency collaboration in diabetes multi-disciplinary translation research: CDC, NIDDK, VA.
- Major training ground for junior and minority public health researchers.
- > 100 investigators plus several contractors.
- Major influence on health policy and public health response to diabetes:
 - 41 peer-reviewed articles published or in press, with dozens more in preparation.
 - Has influenced disease management practices in participating managed care health plans.

Next Steps

- Continued use of TRIAD data
 - TRIAD Legacy Studies
 - NIDDK R18 Mechanism

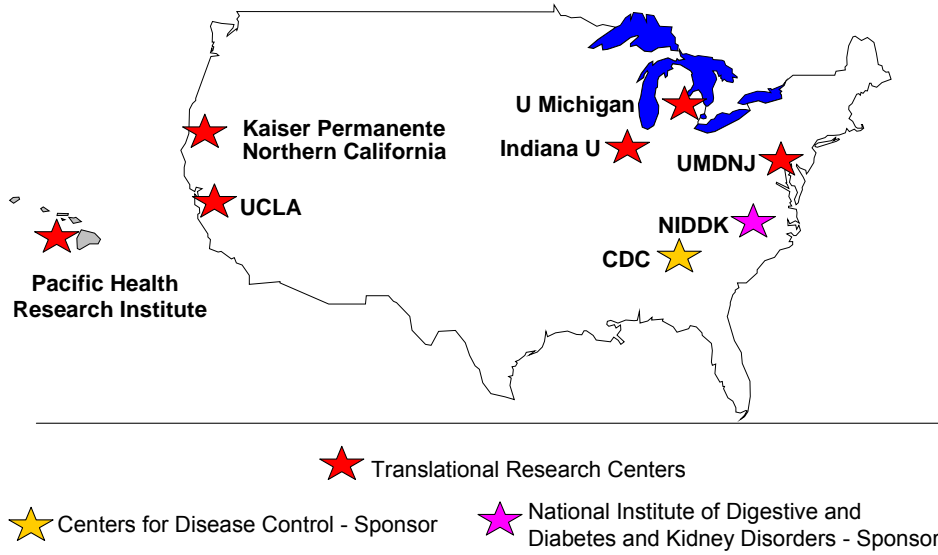
Future Needs

- New mechanisms to study innovations in systems and organizations of care.
- Research platforms that permit efficient study of natural experiments.
- Studies of health system-patient interactions.
- Application of health services research to primary prevention and behavioral change.
- Influence and adaptation of electronic medical records into health services research.

Appendix A

Additional slides that may be of use or
can replace slides in the main body

TRIAD Sites and Sponsoring Agencies



TRIAD map of sites without VA.

TRIAD Rationale and Objectives

- Rationale: Effective interventions for preventing diabetes complications are not optimally implemented and are missed opportunities to reduce the burden of diabetes.
- Objective: To determine the system-level disease management strategies and patient factors that influence the processes and outcomes of diabetes care, with special attention to vulnerable populations.

Prevalence (%) of Diagnosed and Undiagnosed Diabetes and Impaired Fasting Glucose (IFG) Among Adults, Aged 65+ years*



15.8% Diagnosed

6.0% Undiagnosed

39.5% IFG

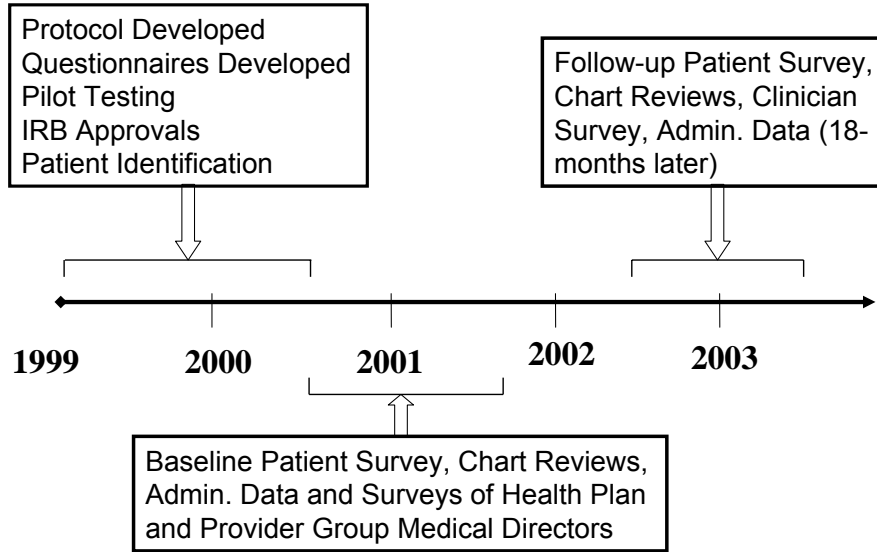
38.7% All others

} ~ 6
in 10

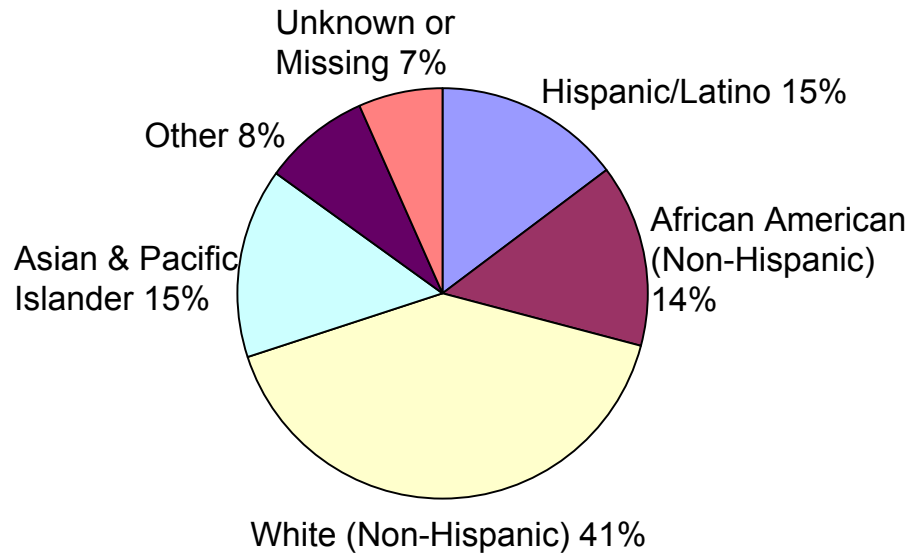
*NHANES 1999-2002, Cowie CC et al.. *Diabetes Care* 29(6):1263-1268, 2006

This slide may be used to introduce our interest in studying aging and diabetes.

TRIAD I Timeline

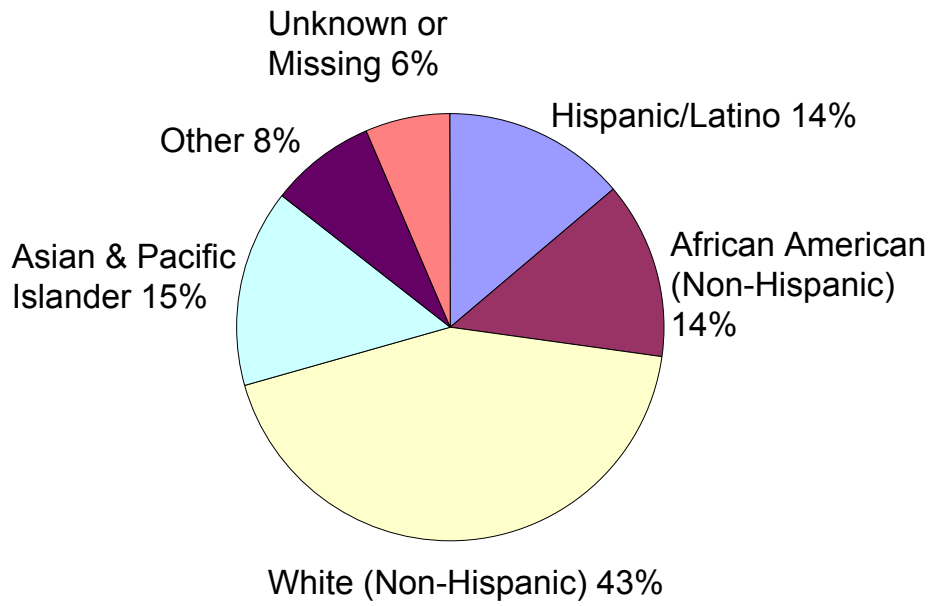


TRIAD I Sample by Ethnicity at Time 2



If used, belongs after “Original TRIAD Cohort Ethnicity”

TRIAD I Sample by Ethnicity at Time 3



If used, belongs after “TRIAD I Sample by Ethnicity at Time 2.”

Conclusions of TRIAD I

- Provider groups with the greatest intensity of diabetes care management and use of feedback to MDs had higher predicted percent compliance with 6 of the 7 process of care indicators.
- More intensive use of DM registries and MD reminders improved predicted compliance with 3 of the 7 process indicators.
- TRIAD has limited power to look at the impact of the same clinical care strategies implemented at the HP level.

Conclusions of TRIAD I (Cont.)

- Although the intensity of disease management was strongly related to several processes of care, it was not associated with lower levels of any CVD risk factor, nor with more appropriate treatment for elevated levels of any risk factor.
- Disease management programs may need to address CVD risk factor management more directly and intensively.

TRIAD Clinical Findings

- Pain among minorities with diabetes. Under review 2007
 - Moderate to extreme pain was present in 3 out of 4 patients
 - Those with pain were younger, more obese, more depressed, and reported poorer health status
- In a report that examined predictors of sustained walking over time, new pain was associated with stopping a walking program. Duru et al., 2007

These reports and others in TRIAD that have examined correlates of depression among those with diabetes support the need for the development and evaluation of system, provider, or patient level interventions to improve the detection and treatment of pain among persons with diabetes.

TRIAD Clinical Findings (cont.)

- Sub-optimal use of proteinuria screening and initiation of preventive treatments for CRF
- Gestational diabetes mellitus, prevalence and correlates of postpartum screening, costs per case of DM detected, and risk perception for DM
- Socio-demographic correlates of obesity and weight change in TRIAD
- Relationship between weight change and cardiovascular risk factors
- Poorer control of CVD risk factors among women with DM

Summary

- Reports in TRIAD have contributed to a better understanding of both the immutable and mutable factors that are driving poor outcomes in diabetes
- The mutable factors point to a number of potential system, provider, and patient level interventions that could improve intermediate outcomes and reduce health disparities – these need to be designed and tested in partnership with health plans and providers

Summary (Continued)

- TRIAD continues to demonstrate the value of carefully constructed observational studies, many with quasi-experimental designs, for tracking the influence of organizational structure and the “natural experiments” at the multiple levels that occur in real world health care settings

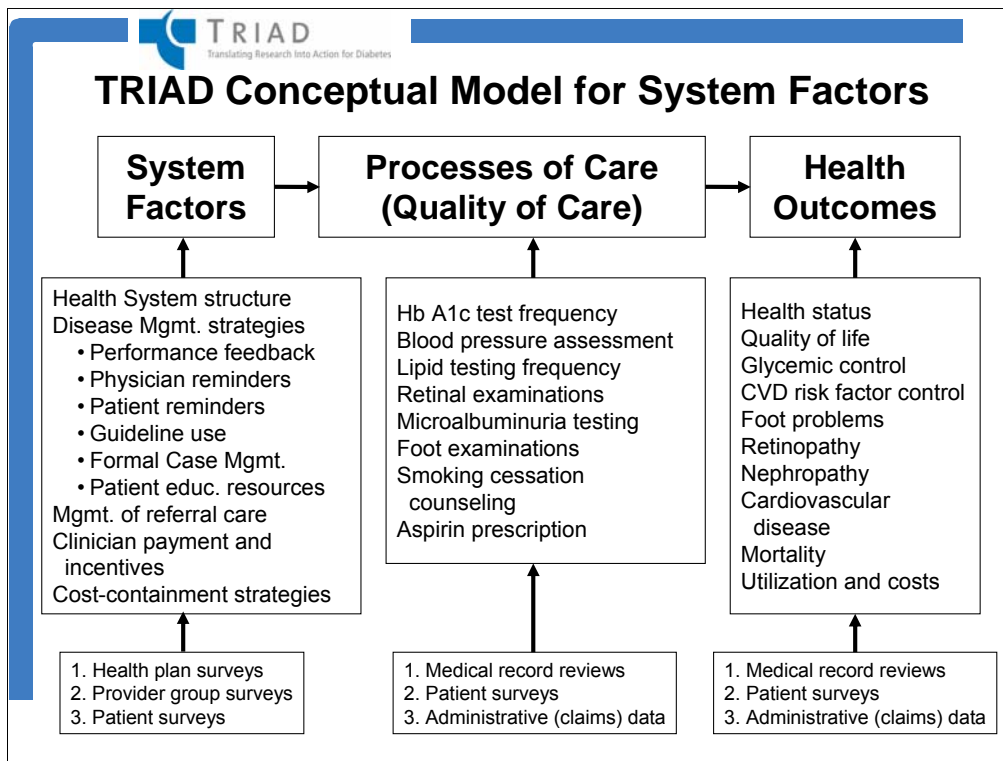
Summary (Continued)

- TRIAD has also provided the needed data to study a number of important clinical and methodological questions that inform both the practice of medicine and observational research.
- TRIAD has provided the needed support and data to advance the careers of many entry level researchers who have conducted the vast majority of analyses under the direction of senior researchers both at the TRCs and CDC.

Key Predictors of Cost-Related Medication Underuse (Tseng et al., Diabetes Care, 2008)

	%
Monthly out of pocket costs	
< \$50	9
\$50 to 100	14
\$100 to 149	20
> \$150	29
Age:	
18-44	23
45-64	15
> 64	6
Income:	
<25k	15
25 – 49k	12
> 50k	5

Tseng C-W, Tierney E, Gerzoff R, Mangione CM. and the TRIAD Study Group. Race/Ethnicity and economic differences in cost-related medication underuse among insured adults with diabetes. The TRIAD study. Diabetes Care; 2008 Feb; Vol. 31; No. 2; 261-66.



This slide reflects the thinking when TRIAD was first designed. TRIAD assembled one of the largest cohorts of diabetic patients ever studied and was unique in linking four levels: patients, providers, provider groups, and health plans. Within the TRIAD framework, both disease management strategies and managed care structural characteristics could be examined using Donabedian's classic paradigm [Donabedian A. *The definition of quality. In Explorations in Quality Assessment and Monitoring. Vol. 1. Ann Arbor, MI, Health Administration Press, 1985*]. In this framework, these system-level factors are hypothesized to influence the processes of patient care and through these processes, the patients' outcomes.

We assessed whether the features and intensity of use of disease management strategies within provider groups were associated with better diabetes care processes, cardiometabolic risk factor control, patient-reported satisfaction with care, and health status. We studied provider groups more extensively than health plans because of the greater number of provider groups than plans (68 vs. 10). The disease management strategies studied included performance feedback to physicians, reminders to physicians, use and dissemination of clinical guidelines, patient reminders, formal care management/case management by non-physician providers, and provision of health education resources. Based on high inter-correlations among the latter four strategies, they were grouped into a single variable called "structured care management." Greater use of any of three strategies (performance feedback, physician reminders, or structured care management) was strongly and significantly associated with better clinical care processes.