

Kaiser Permanente Research Brief

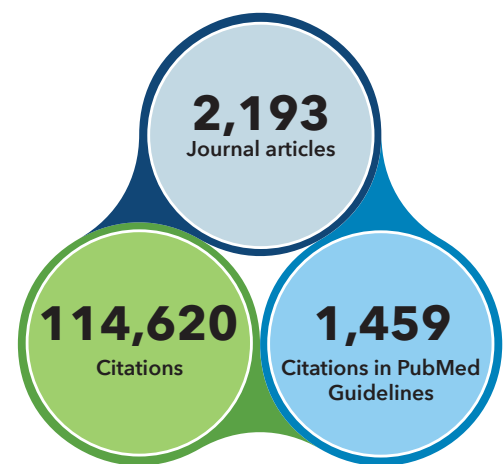
Cardiovascular disease

This brief summarizes the contributions of Kaiser Permanente Research since 2007 on the topic of cardiovascular disease. Although CVD encompasses a wide array of health conditions, this brief will focus primarily on research related to stroke, coronary heart disease, and heart failure.

According to the Centers for Disease Control and Prevention, cardiovascular disease is responsible for nearly 700,000 deaths in the United States each year.¹ Though mostly preventable, it remains the leading cause of death in both men and women, and across nearly all racial and ethnic groups nationally.¹ Coronary heart disease, or the accumulation of atherosclerotic plaque within the arterial vessels of the heart, is the most common form of heart disease, and is associated with more than 380,000 deaths each year.¹ An estimated 6.2 million Americans also suffer from heart failure, or the heart's inability to pump sufficient blood and oxygen to the body's organ systems.² Heart failure is considered a contributing cause in approximately 1 in 9 deaths, and up to half of patients with heart failure may die within 5 years of diagnosis.² Stroke, or a disruption in the blood supply to the brain caused by a burst or blocked blood vessel, occurs in nearly 800,000 Americans each year.³ Stroke kills approximately 140,000 Americans annually,⁴ and is a leading cause of significant long-term disability, with consequences that often require long-term skilled nursing care.³

Cardiovascular disease is an active area of study for Kaiser Permanente Research. Scientists across the organization have used our rich, comprehensive, longitudinal data to advance knowledge in the areas of understanding risk, improving patient outcomes, and translating research findings into policy and practice. We have published nearly 2,200 articles related to CVD since 2007.⁵ Together, these articles have been cited over 114,000 times. These articles are the product of observational studies,

Kaiser Permanente publications related to CVD since 2007



Source: Kaiser Permanente Publications Library and Scite metrics, as of November 17, 2022.

This brief summarizes a selection of the publications contained within the Kaiser Permanente Publications Library, which indexes journal articles and other publications authored by individuals affiliated with Kaiser Permanente. The work described in this brief originated from across Kaiser Permanente's 8 regions and was supported by a wide range of funding sources including internal research support as well as both governmental and nongovernmental extramural funding.

randomized controlled trials, meta-analyses, and other studies led by Kaiser Permanente scientists. Our unique environment – a fully integrated care and coverage model in which our research scientists, clinicians, medical groups, and health plan leaders collaborate – enables us to contribute important knowledge about CVD, and many other research topics.

Understanding Risk

Who is at risk for developing cardiovascular disease?

Kaiser Permanente scientists have assessed a variety of cardiovascular disease risk factors in adults,⁶⁻⁸ including diabetes,⁹⁻¹⁴ atrial fibrillation,^{15;16} high blood pressure,^{9;12;17-25}

high cholesterol,^{11;12;20;26-28} smoking,^{12;17;29} obesity,^{11;30;31} insulin resistance,³¹ kidney disease,³²⁻³⁷ HIV,^{38;39} infection with respiratory viruses,^{40;41} diet,⁴²⁻⁴⁶ physical activity,⁴⁷⁻⁵⁰ stressful life events and social isolation,⁵¹⁻⁵³ environmental factors,⁵⁴⁻⁵⁶ biomarkers,⁵⁷⁻⁶⁰ age,⁶¹ race,⁶¹ and genetics.⁶²⁻⁶⁹ Our researchers have also studied CVD risk factors within pediatric populations,⁷⁰ including challenges in the family environment,⁷¹ poor maternal cardiovascular health,⁷² congenital heart defects,⁷³ high blood pressure,⁷⁴⁻⁷⁶ and obesity.⁷⁷⁻⁷⁹ Recent studies have also suggested that neighborhood and socioeconomic factors are implicated in the development of CVD.^{80;81}

In large part because of Kaiser Permanente's emphasis on prevention,^{82;83} persistently high cholesterol⁸⁴ and uncontrolled blood pressure⁸⁵⁻⁸⁷ are much less common among our members than in the broader U.S. population. In addition, the racial, ethnic, and socioeconomic disparities in these risk factors seen nationally are notably smaller among our members.⁸⁸⁻⁹³

What other health risks do people with cardiovascular disease face?

People with CVD face several associated health risks. While death is a well-known consequence of many cardiovascular diseases,⁹⁴⁻¹⁰⁰ superior risk-factor control within Kaiser Permanente has reduced fatal and nonfatal CVD rates among our members.¹⁰¹⁻¹⁰⁸ Nevertheless, CVD carries other significant risks, including cognitive decline,¹⁰⁹⁻¹¹³ long-term disability^{114;115} and the need for long-term post-acute care following stroke,^{88;116-119} repeated hospitalization among patients with heart failure,¹²⁰⁻¹²⁷ and dementia¹²⁸⁻¹³¹ and diabetes^{132;133} among heart failure and coronary heart disease patients. Our scientists have highlighted the unique challenges the COVID-19 pandemic has posed for optimal management of cardiovascular illness.¹³⁴⁻¹⁴³

Moreover, the medications used to treat various cardiovascular diseases carry significant risks and side effects.^{144;145} Patients receiving anticoagulants for prevention of stroke may be at increased risk of severe bleeding events,¹⁴⁶⁻¹⁵¹ myocardial infarction,¹⁵² and death.¹⁵³ In addition, common treatments for heart failure and high

Physical fitness insights

Kaiser Permanente researchers have published important insights about physical fitness using data from CARDIA, a 30-year study of CVD risks and causes in 5,115 young adults in 4 U.S. cities.



Greater fitness

in young adulthood is associated with superior heart function in middle age.¹⁶¹



Short bursts of exercise

(<10 minutes) can reduce the risk of high blood pressure.¹⁶²



Active commuting





to work is associated with lower BMI, blood pressure, and cholesterol.¹⁶⁴



Walking or cycling

to neighborhood amenities is associated with lower BMI and lower lifetime CVD risk.¹⁶³

Kaiser Permanente employs effective strategies to help patients with CVD

 <p>Email</p>	 <p>Telestroke</p>	 <p>Refills by mail</p>	 <p>Interactive voice response</p>
<p>Email communication between physicians and patients with high blood pressure and/or diabetes was associated with improved performance scores.²⁰²</p>	<p>Rates of tissue plasminogen activator administration for acute stroke increased in emergency departments with an on-call neurologist available by phone.^{286;287}</p>	<p>Patients enrolled in a mail-order pharmacy program were more likely to adhere to recommended hypertension treatment.¹⁷¹</p>	<p>In a randomized trial, statin adherence and cholesterol control were enhanced by IVR reminders.^{251;255-258}</p>

blood pressure can have serious side effects, including high blood potassium,¹⁵⁴ serious injuries from falls,¹⁵⁵ and risk of birth defects.¹⁵⁶

Improving Patient Outcomes

What strategies are effective in preventing cardiovascular disease?

Prevention strategies in CVD focus primarily on measuring and treating risk factors. Kaiser Permanente tracks nearly all of the American Heart Association’s “Life’s Essential 8” cardiovascular health metrics,¹⁵⁷ including physical activity,¹⁵⁸⁻¹⁶⁶ obesity,^{11;167} blood pressure,^{85-87;168-172} blood glucose,^{11;170;173;174} cholesterol,^{11;26;169;170;175} and smoking,¹⁵⁸ and uses them to measure treatment response and perform ongoing surveillance.¹⁷⁶ This work is conducted by teams led by primary care physicians.^{168;177-179} Screening also plays a significant role in CVD prevention. For example, early identification of elevated blood pressure has been shown to improve outcomes in adult patients.^{180;181} Our researchers have also studied prehospital screening strategies for patients with suspected strokes,¹⁸² risk scoring and

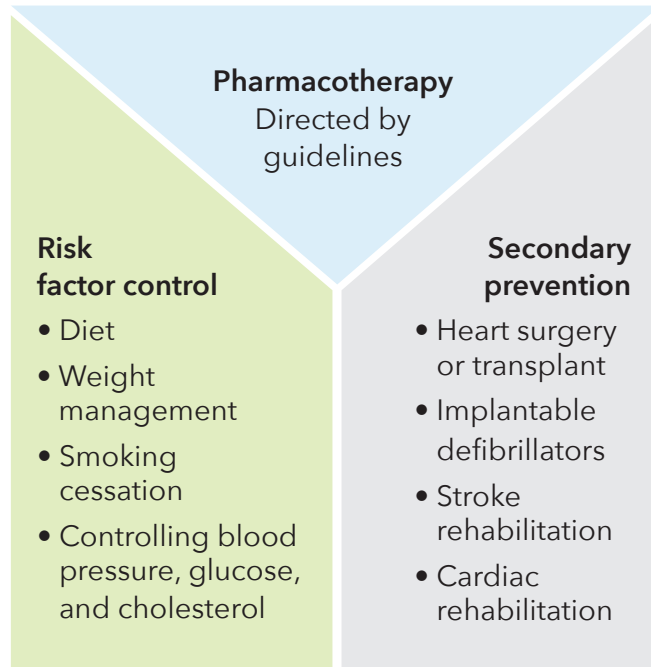
care pathway systems for evaluating patients entering the emergency department with chest pain,^{183;184} and targeted cholesterol screening in pediatric patients.^{185;186}

What are the key factors in effective treatment of people with cardiovascular disease?

Risk-factor management: In addition to direct treatment of CVD, ongoing risk-factor management is a critical component of the care of these patients. Studies conducted in Kaiser Permanente have found improved outcomes from smoking cessation interventions,^{187;188} dietary advice,¹⁸⁸⁻¹⁹⁷ and physical activity^{159;188;189;198-201} interventions in patients with CVD. Increased use of secure email between patients and clinicians has been associated with improved outcomes in patients with high blood pressure and diabetes.²⁰² Other programs associated with improved risk factor control include self-monitoring in conjunction with counseling, education, and assistance with medication management,^{197;203-207} disease management for heart failure patients in skilled nursing facilities,^{208;209} home-based cardiac

CVD management

CVD management involves pharmacotherapy, risk factor control, and other secondary prevention.



rehabilitation,²¹⁰ and the provision of additional support to primary care physicians.²¹¹

Pharmacotherapy: Medications are an established component of evidence-based care for both CVD management and control of risk factors. While a discussion of specific medications is beyond the scope of this brief, our researchers have led or collaborated on key studies exploring the efficacy and safety of numerous medications in CVD populations. These have included key studies of glucose-lowering medications for control of type 2 diabetes and prevention of cardiovascular complications of diabetes,^{173;174;212-216} drugs to lower blood pressure,^{85;217-228} and cholesterol-lowering medications,^{221;222;229-233} as well as recent studies of anticoagulant treatments for stroke prevention among patients with atrial fibrillation,^{152;234-237} and medications for acute heart failure.²³⁸⁻²⁴⁴

Given its importance in the care of patients with CVD, medication adherence has also been a significant focus of research in Kaiser

Permanente. Large cohort studies conducted by our scientists have found that nonadherence to medications such as ACE inhibitors, oral anticoagulants, statins, and beta-blockers is associated with increased risks for all-cause and cardiovascular mortality, revascularization (an invasive medical procedure that restores blood flow to blocked or narrowed coronary arteries), cardiovascular hospitalization, and other serious cardiovascular events.²⁴⁵⁻²⁴⁷ A large study of at-risk members starting statins found that 84% were still receiving them 1 year later, but only 42% had experienced no treatment gaps during that time.²⁴⁸ The trend of suboptimal preventive use of statins has proven difficult to reverse, as shown by a national-level study conducted by Kaiser Permanente scientists.²⁴⁹ Furthermore, patients at lower CVD risk are less likely to comply with prescribed statin therapy.²⁵⁰ We have evaluated several medication-adherence interventions for patients with CVD involving clinical pharmacist^{168;230;251;252} or community health worker^{253;254} outreach, interactive voice response calls and reporting,^{251;255-258} mail-order pharmacy programs,¹⁷¹ or web-based medication self-management.²⁵⁹ A

In several studies, Kaiser Permanente researchers found that the absence of appropriate treatment intensification was more common than medication nonadherence in CVD patients with uncontrolled risk factors.^{170;173;215;218;225;245}

Uncontrolled risk factor	Non-adherence	Treatment not escalated
Blood pressure	19% to 42%	26% to 78%
Blood sugar	18% to 42%	26% to 47%
Cholesterol	19% to 49%	25% to 55%

study conducted with our members who have diabetes found that addressing undertreatment in addition to nonadherence could significantly improve outcomes for people with uncontrolled blood glucose, cholesterol, or blood pressure.¹⁷³

Other secondary prevention: In addition to medication and lifestyle modifications, surgical procedures (including heart transplantation) and device implantation are also components of CVD management in targeted patients. Coronary revascularization has been studied extensively within Kaiser Permanente. Our researchers have explored the adoption²⁶⁰ of this family of technologies and geographic variations in their use.²⁶¹ Studies have found that improved patient outcomes are associated with the appropriate use of specific invasive procedures,²⁶²⁻²⁶⁹ particular clinical characteristics,^{270;271} surgeons who perform more procedures,²⁷² and improved practices for managing blood clots.²⁷³

For patients with certain severe heart conditions, heart transplantation is an important treatment strategy. Our researchers have found that receiving a heart from a donor with diabetes mellitus,²⁷⁴ having a history of transplant rejection,²⁷⁵ and experiencing longer wait times before transplantation²⁷⁶ are associated with poorer heart transplant outcomes. Another study described a DNA-based method for noninvasive diagnosis of heart transplant rejection,²⁷⁷ increasing the ease of post-transplant monitoring. Our research on implantable cardiac defibrillator, or ICD, usage has explored how often these devices are used in off-label^{278;279} or non-guideline-directed fashion.²⁸⁰ Scientists at Kaiser Permanente have also found that preventive ICD implantation is not consistently performed in patients at high risk of sudden cardiac death.²⁸¹ Other studies have found that mortality outcomes in patients with ICDs are associated with heart function, the heart's structure,¹²² and higher BMI (body mass index),²⁸² and have evaluated algorithms for the prediction of survival and sudden death in these patients.^{283;284}

Translating Research Findings Into Policy and Practice

As part of a learning health care organization that uses research to inform and improve practice, Kaiser Permanente's research, clinical, and operational partners have tested a range of interventions to reduce the risk of CVD and improve outcomes for patients with established CVD. For example, research supporting the efficacy of combining ACE inhibitors and thiazide diuretics in a single pill for blood pressure management and protocol-driven medication and dose adjustments²²² led to broad adoption of these practices in Kaiser Permanente's blood pressure management program.⁸⁶ The spread of single-pill blood-pressure-lowering therapy also increased the ease of removing beta blockers as a first-line treatment, a transition prompted by our research data questioning the benefits of these medications.²²⁴ Our research in acute stroke management²⁸⁵ has led to implementation of effective telestroke programs with an on-call neurologist available via telemedicine technology to emergency department physicians in our Northern California²⁸⁶ and Southern California regions.²⁸⁷ More recently, our scientists have used artificial intelligence techniques to develop a risk prediction tool for

Heart attacks and high blood pressure rates

Thanks to interventions validated by our researchers, rates of heart attacks and high blood pressure dropped sharply in Kaiser Permanente Northern California between 1999 and 2014.

	1999	2014
% with high blood pressure ²²⁶	54%	10%
Heart attacks per 100,000 members ^{103;104}	274	185

patients entering the emergency department with acute heart failure.^{288;289} However, our work has also underscored many of the barriers to the use of similar risk calculators in primary care settings.²⁹⁰

Collectively, research from Kaiser Permanente authors has been cited nearly 1,500 times within recent consensus statements and clinical practice guidelines published by a wide range of entities, including the American Stroke Association and American Heart Association.²⁹¹ In addition, our researchers and clinician scientists have directly contributed as authors of 3 hypertension guidelines,²⁹²⁻²⁹⁴ as well as other guidelines published by the American College of Chest Physicians,²⁹⁵ the American College of Cardiology, the American Heart Association, and The Obesity Society,²⁹⁶ the American College of Cardiology and other societies,²⁹⁷ the American Heart Association,²⁹⁸⁻³⁰⁴ the Western Vascular Society,³⁰⁵ the Society for Vascular Surgery,^{306;307} the Lancet Commission on Hypertension,³⁰⁸ the American Academy of Neurology,³⁰⁹ and the U.S. Preventive Services Task Force.³¹⁰⁻³¹⁸ Kaiser Permanente researchers have also taken part in the Implementation Science Work Group on CVD guidelines convened by the National Heart, Lung, and Blood Institute (NHLBI),³¹⁹ a workshop on hypertension control sponsored by the NHLBI and the CDC,³²⁰ NHLBI workshops on research into heart failure and atrial fibrillation,³²¹⁻³²⁴ an expert panel on cardiac rehabilitation for patients with heart failure,³²⁵ and the “Bending the Curve in Cardiovascular Disease Mortality” symposium sponsored by NHLBI and the American Heart Association.³²⁶ Our scientists have also participated in regional health collaboratives in the city of San Diego and in Sonoma County, California, aimed at reducing the burden of cardiovascular disease.^{327;328} Finally, the hypertension management efforts implemented in our California regions^{85;86} have received widespread recognition,³²⁹ particularly with respect to reducing racial disparities in blood pressure control.³³⁰

Kaiser Permanente has shown considerable leadership in the field of CVD research. We have endorsed and actively supported the Department of Health and Human Services’ Million Hearts Initiative,³³¹ and our Colorado,³³² Northern California,³³³ and Georgia³³⁴ regions have been recognized as Million Hearts Hypertension Control Champions. Kaiser Permanente has supported the care improvement efforts of safety net health care providers that operate in the same communities.^{335;336} Our researchers have led or collaborated on many notable studies related to epidemiology, prevention, risk factors, and treatment of CVD, including the Coronary Artery Risk Development in Young Adults (CARDIA) study, the Cardiovascular Research Network (CVRN), the Effectiveness of Gastric Bypass Versus Gastric Sleeve for Cardiovascular Disease (ENGAGE CVD) study, and the Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA) study, all of which have been sponsored by the NIH’s National Heart, Lung, and Blood Institute.

Kaiser Permanente’s 185 research scientists and 1,530 support staff members are based at 9 research centers. There are currently 2,355 studies underway, including clinical trials. Since 2007, our research scientists and clinicians have published more than 19,000 articles. Kaiser Permanente currently serves more than 12.6 million members in 8 states and the District of Columbia.

This brief was written by Nicholas P. Emptage, Anna C. Davis, and Elizabeth A. McGlynn. It is available online from about.kaiserpermanente.org/health-and-wellness/health-research/research-briefs. The authors wish to thank the following researchers for their contributions to the development of this brief: Alan S. Go and Kristi Reynolds.

References

1. Centers for Disease Control and Prevention. Heart Disease Facts. 2022; <https://www.cdc.gov/heartdisease/facts.htm>. Accessed October 6, 2022.
2. Virani SS, Alonso A, Aparicio HJ, et al. Heart Disease and Stroke Statistics-2021 Update: A Report From the American Heart Association. *Circulation*. 2021;143(8):e254-e743.
3. Centers for Disease Control and Prevention. Stroke Facts. 2022; <https://www.cdc.gov/stroke/facts.htm>. Accessed October 6, 2022.
4. Yang Q, Tong X, Schieb L, et al. Vital Signs: Recent Trends in Stroke Death Rates - United States, 2000-2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(35):933-939.
5. Kaiser Permanente Publications Library (KPPL) Search conducted on November 17, 2022: (dc.title:cardiac OR dc.title:cardiovascular OR dc.title:cerebrovascular OR dc.title:heart OR dc.title:stroke OR dc.subject.mesh:"aortic diseases" OR dc.subject.mesh:aneurysm OR dc.subject.mesh:"atrial fibrillation" OR dc.subject.mesh:"brain infarction" OR dc.subject.mesh:"brain ischemia" OR dc.subject.mesh:"cardiovascular abnormalities" OR dc.subject.mesh:"cardiovascular diseases" OR dc.subject.mesh:"cardiovascular infections" OR dc.subject.mesh:cerebrovascular OR dc.subject.mesh:"embolism and thrombosis" OR dc.subject.mesh:"heart diseases" OR dc.subject.mesh:hypertension OR dc.subject.mesh:"intracranial arterial diseases" OR dc.subject.mesh:"intracranial hemorrhages" OR dc.subject.mesh:"pregnancy complications, cardiovascular" OR dc.subject.mesh:stroke OR dc.subject.mesh:"vascular diseases") AND dc.type:"Journal Article" AND dc.date.issued:[2007 2023].
6. Mosley JD, Gupta DK, Tan J, et al. Predictive Accuracy of a Polygenic Risk Score Compared With a Clinical Risk Score for Incident Coronary Heart Disease. *JAMA*. 2020;323(7):627-635.
7. Suthahar N, Lau ES, Blaha MJ, et al. Sex-Specific Associations of Cardiovascular Risk Factors and Biomarkers With Incident Heart Failure. *J Am Coll Cardiol*. 2020;76(12):1455-1465.
8. Hussain A, Lee M, Rana J, Virani SS. Epidemiology and risk factors for stroke in young individuals: implications for prevention. *Curr Opin Cardiol*. 2021;36(5):565-571.
9. Johnston SC, Rothwell PM, Nguyen-Huynh MN, et al. Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. *Lancet*. 2007;369(9558):283-292.
10. Kelly TN, Bazzano LA, Fonseca VA, et al. Systematic review: glucose control and cardiovascular disease in type 2 diabetes. *Ann Intern Med*. 2009;151(6):394-403.
11. Weycker D, Nichols GA, O'Keefe-Rosetti M, et al. Risk-factor clustering and cardiovascular disease risk in hypertensive patients. *Am J Hypertens*. 2007;20(6):599-607.
12. Vazquez-Benitez G, Desai JR, Xu S, et al. Preventable Major Cardiovascular Events Associated With Uncontrolled Glucose, Blood Pressure, and Lipids and Active Smoking in Adults With Diabetes With and Without Cardiovascular Disease: A Contemporary Analysis. *Diabetes Care*. 2015;38(5):905-912.
13. Reis JP, Allen NB, Bancks MP, et al. Duration of Diabetes and Prediabetes During Adulthood and Subclinical Atherosclerosis and Cardiac Dysfunction in Middle Age: The CARDIA Study. *Diabetes Care*. 2018;41(4):731-738.
14. Modjtahedi BS, Wu J, Luong TQ, et al. Severity of diabetic retinopathy and the risk of future cerebrovascular disease, cardiovascular disease, and all-cause mortality. *Ophthalmology*. 2021;128(8):1169-1179.
15. Go AS, Reynolds K, Yang J, et al. Association of Burden of Atrial Fibrillation With Risk of Ischemic Stroke in Adults With Paroxysmal Atrial Fibrillation: The KP-RHYTHM Study. *JAMA Cardiol*. 2018;3(7):601-608.
16. Lowres N, Olivier J, Chao TF, et al. Estimated stroke risk, yield, and number needed to screen for atrial fibrillation detected through single time screening: a multicountry patient-level meta-analysis of 141,220 screened individuals. *PLoS Med*. 2019;16(9):e1002903.
17. Dunlay SM, Weston SA, Jacobsen SJ, Roger VL. Risk factors for heart failure: a population-based case-control study. *Am J Med*. 2009;122(11):1023-1028.
18. Yano Y, Reis JP, Tedla YG, et al. Racial Differences in Associations of Blood Pressure Components in Young Adulthood With Incident Cardiovascular Disease by Middle Age: Coronary Artery Risk Development in Young Adults (CARDIA) Study. *JAMA Cardiol*. 2017;2(4):381-389.
19. Flint AC, Conell C, Ren X, et al. Effect of Systolic and Diastolic Blood Pressure on Cardiovascular Outcomes. *N Engl J Med*. 2019;381(3):243-251.
20. Zhang Y, Vittinghoff E, Pletcher MJ, et al. Associations of Blood Pressure and Cholesterol Levels During Young Adulthood With Later Cardiovascular Events. *J Am Coll Cardiol*. 2019;74(3):330-341.
21. Vemulapalli S, Inohara T, Kim S, et al. Blood Pressure Control and Cardiovascular Outcomes in Patients With Atrial Fibrillation (From the ORBIT-AF Registry). *Am J Cardiol*. 2019;123(10):1628-1636.
22. Whelton SP, McEvoy JW, Shaw L, et al. Association of Normal Systolic Blood Pressure Level With Cardiovascular Disease in the Absence of Risk Factors. *JAMA Cardiol*. 2020;5(9):1011-1018.

23. Nwabuo CC, Appiah D, Moreira HT, et al. Long-term cumulative blood pressure in young adults and incident heart failure, coronary heart disease, stroke, and cardiovascular disease: The CARDIA study. *Eur J Prev Cardiol.* 2021;28(13):1445-1451.
24. Yano Y, Reis JP, Lewis CE, et al. Association of Blood Pressure Patterns in Young Adulthood With Cardiovascular Disease and Mortality in Middle Age. *JAMA Cardiol.* 2020;5(4):382-389.
25. Gerber Y, Rana JS, Jacobs DR, et al. Blood Pressure Levels in Young Adulthood and Midlife Stroke Incidence in a Diverse Cohort. *Hypertension.* 2021;77(5):1683-1693.
26. Colantonio LD, Bittner V, Reynolds K, et al. Association of Serum Lipids and Coronary Heart Disease in Contemporary Observational Studies. *Circulation.* 2016;133(3):256-264.
27. Nichols GA, Philip S, Reynolds K, et al. Increased Cardiovascular Risk in Hypertriglyceridemic Patients with Statin-Controlled LDL Cholesterol. *J Clin Endocrinol Metab.* 2018;103(8):3019-3027.
28. Nichols GA, Philip S, Reynolds K, et al. Increased Residual Cardiovascular Risk in Patients with Diabetes and High versus Normal Triglycerides Despite Statin-Controlled LDL Cholesterol. *Diabetes Obes Metab.* 2019;21(2):366-371.
29. Gottdiener JS, Buzkova P, Kahn PA, et al. Relation of Cigarette Smoking and Heart Failure in Adults ≥ 65 Years of Age (From the Cardiovascular Health Study). *Am J Cardiol.* 2022;168:90-98.
30. Nichols GA, Horberg M, Koebnick C, et al. Cardiometabolic Risk Factors Among 1.3 Million Adults With Overweight or Obesity, but Not Diabetes, in 10 Geographically Diverse Regions of the United States, 2012-2013. *Prev Chronic Dis.* 2017;14:E22.
31. Savji N, Meijers WC, Bartz TM, et al. The Association of Obesity and Cardiometabolic Traits With Incident HFpEF and HFrEF. *JACC Heart Fail.* 2018;6(8):701-709.
32. Matsushita K, Mahmoodi BK, Woodward M, et al. Comparison of risk prediction using the CKD-EPI equation and the MDRD study equation for estimated glomerular filtration rate. *JAMA.* 2012;307(18):1941-1951.
33. Fox CS, Matsushita K, Woodward M, et al. Associations of kidney disease measures with mortality and end-stage renal disease in individuals with and without diabetes: a meta-analysis. *Lancet.* 2012;380(9854):1662-1673.
34. Piccini JP, Stevens SR, Chang Y, et al. Renal Dysfunction as a Predictor of Stroke and Systemic Embolism in Patients with Nonvalvular Atrial Fibrillation: Validation of the R2CHADS2 Index in the ROCKET AF and ATRIA Study Cohorts. *Circulation.* 2013;127(2):224-232.
35. Lash JP, Go AS, Appel LJ, et al. Chronic Renal Insufficiency Cohort (CRIC) Study: baseline characteristics and associations with kidney function. *Clin J Am Soc Nephrol.* 2009;4(8):1302-1311.
36. Park M, Hsu CY, Go AS, et al. Urine Kidney Injury Biomarkers and Risks of Cardiovascular Disease Events and All-Cause Death: The CRIC Study. *Clin J Am Soc Nephrol.* 2017;12(5):761-771.
37. Go AS, Hsu CY, Yang J, et al. Acute Kidney Injury and Risk of Heart Failure and Atherosclerotic Events. *Clin J Am Soc Nephrol.* 2018;13(6):833-841.
38. Go AS, Reynolds K, Avula HR, et al. Human Immunodeficiency Virus Infection and Variation in Heart Failure Risk by Age, Sex, and Ethnicity: The HIV HEART Study. *Mayo Clin Proc.* 2022;97(3):465-479.
39. Mefford MT, Silverberg MJ, Leong TK, et al. Multimorbidity Burden and Incident Heart Failure Among People With and Without HIV: The HIV-HEART Study. *Mayo Clin Proc Innov Qual Outcomes.* 2022;6(3):218-227.
40. Lo Re V, Dutcher SK, Connolly JG, et al. Association of COVID-19 vs Influenza With Risk of Arterial and Venous Thrombotic Events Among Hospitalized Patients. *JAMA.* 2022;328(7):637-651.
41. Tobler DL, Pruzansky AJ, Naderi S, et al. Long-Term Cardiovascular Effects of COVID-19: Emerging Data Relevant to the Cardiovascular Clinician. *Curr Atheroscler Rep.* 2022;24(7):563-570.
42. Marklund M, Wu JHY, Imamura F, et al. Biomarkers of Dietary Omega-6 Fatty Acids and Incident Cardiovascular Disease and Mortality. *Circulation.* 2019;139(21):2422-2436.
43. Sun Y, Liu B, Snetselaar LG, et al. Association of Major Dietary Protein Sources With All-Cause and Cause-Specific Mortality: Prospective Cohort Study. *J Am Heart Assoc.* 2021;10(5):e015553.
44. Choi Y, Larson N, Steffen LM, et al. Plant-Centered Diet and Risk of Incident Cardiovascular Disease During Young to Middle Adulthood. *J Am Heart Assoc.* 2021;10(16):e020718.
45. Zhao Y, Naumova EN, Bobb JF, et al. Joint Association of Multiple Dietary Components on Cardiovascular Disease Risk: A Machine Learning Approach. *Am J Epidemiol.* 2021;190(7):1353-1365.
46. Shivakoti R, Biggs ML, Djoussé L, et al. Intake and Sources of Dietary Fiber, Inflammation, and Cardiovascular Disease in Older US Adults. *JAMA Netw Open.* 2022;5(3):e225012.
47. Bellettiere J, LaMonte MJ, Evenson KR, et al. Sedentary behavior and cardiovascular disease in older women: The Objective Physical Activity and Cardiovascular Health (OPACH) Study. *Circulation.* 2019;139(8):1036-1046.
48. LaCroix AZ, Bellettiere J, Rillamas-Sun E, et al. Association of Light Physical Activity Measured by Accelerometry and Incidence of Coronary Heart Disease and Cardiovascular Disease in Older Women. *JAMA Netw Open.* 2019;2(3):e190419.

49. Whitaker KM, Pettee Gabriel K, Buman MP, et al. Associations of Accelerometer-Measured Sedentary Time and Physical Activity With Prospectively Assessed Cardiometabolic Risk Factors: The CARDIA Study. *J Am Heart Assoc.* 2019;8(4):e010586.
50. Full KM, Whitaker KM, Gabriel KP, et al. Cardiovascular risk and functional burden at midlife: Prospective associations of isotemporal reallocations of accelerometer-measured physical activity and sedentary time in the CARDIA study. *Prev Med.* 2021;150:106626.
51. Miao Jonasson J, Hendryx M, Shadyab AH, et al. Social Support, Social Network Size, Social Strain, Stressful Life Events, and Coronary Heart Disease in Women With Type 2 Diabetes: A Cohort Study Based on the Women's Health Initiative. *Diabetes Care.* 2020;43(8):1759-1766.
52. Mefford MT, Mittleman MA, Li BH, et al. Sociopolitical stress and acute cardiovascular disease hospitalizations around the 2016 presidential election. *Proc Natl Acad Sci U S A.* 2020;117(43):27054-27058.
53. Golaszewski NM, LaCroix AZ, Godino JG, et al. Evaluation of Social Isolation, Loneliness, and Cardiovascular Disease Among Older Women in the US. *JAMA Netw Open.* 2022;5(2):e2146461.
54. Alexeeff SE, Deosaransingh K, Liao NS, et al. Particulate Matter and Cardiovascular Risk in Adults with Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2021;204(2):159-167.
55. Alexeeff SE, Liao NS, Liu X, et al. Long-Term PM2.5 Exposure and Risks of Ischemic Heart Disease and Stroke Events: Review and Meta-Analysis. *J Am Heart Assoc.* 2021;10(1):e016890.
56. Liao NS, Sidney S, Deosaransingh K, et al. Particulate Air Pollution and Risk of Cardiovascular Events Among Adults With a History of Stroke or Acute Myocardial Infarction. *J Am Heart Assoc.* 2021;10(10):e019758.
57. de Boer RA, Nayor M, deFilippi CR, et al. Association of Cardiovascular Biomarkers With Incident Heart Failure With Preserved and Reduced Ejection Fraction. *JAMA Cardiol.* 2018;3(3):215-224.
58. Bhambhani V, Kizer JR, Lima JAC, et al. Predictors and outcomes of heart failure with mid-range ejection fraction. *Eur J Heart Fail.* 2018;20(4):651-659.
59. Lemaitre RN, Jensen PN, Hoofnagle A, et al. Plasma Ceramides and Sphingomyelins in Relation to Heart Failure Risk. *Circ Heart Fail.* 2019;12(7):e005708.
60. Lemaitre RN, McKnight B, Sotoodehnia N, et al. Circulating Very Long-Chain Saturated Fatty Acids and Heart Failure: The Cardiovascular Health Study. *J Am Heart Assoc.* 2018;7(21):e010019.
61. An J, Zhang Y, Muntner P, et al. Recurrent Atherosclerotic Cardiovascular Event Rates Differ Among Patients Meeting the Very High Risk Definition According to Age, Sex, Race/Ethnicity, and Socioeconomic Status. *J Am Heart Assoc.* 2020;9(23):e017310.
62. International Consortium for Blood Pressure Genome-Wide Association Studies, Ehret GB, Munroe PB, et al. Genetic variants in novel pathways influence blood pressure and cardiovascular disease risk. *Nature.* 2011;478(7367):103-109.
63. Malik R, Chauhan G, Traylor M, et al. Multiancestry genome-wide association study of 520,000 subjects identifies 32 loci associated with stroke and stroke subtypes. *Nat Genet.* 2018;50(4):524-537.
64. Choi SH, Weng LC, Roselli C, et al. Association Between Titin Loss-of-Function Variants and Early-Onset Atrial Fibrillation. *JAMA.* 2018;320(22):2354-2364.
65. Hoffmann TJ, Ehret GB, Nandakumar P, et al. Genome-wide association analyses using electronic health records identify new loci influencing blood pressure variation. *Nat Genet.* 2017;49(1):54-64.
66. Christophersen IE, Rienstra M, Roselli C, et al. Large-scale analyses of common and rare variants identify 12 new loci associated with atrial fibrillation. *Nat Genet.* 2017;49(6):946-952.
67. Shah S, Henry A, Roselli C, et al. Genome-wide association and Mendelian randomisation analysis provide insights into the pathogenesis of heart failure. *Nat Commun.* 2020;11(1):163.
68. Agha G, Mendelson MM, Ward-Caviness CK, et al. Blood Leukocyte DNA Methylation Predicts Risk of Future Myocardial Infarction and Coronary Heart Disease. *Circulation.* 2019;140(8):645-657.
69. Keene KL, Hyacinth HI, Bis JC, et al. Genome-Wide Association Study Meta-Analysis of Stroke in 22 000 Individuals of African Descent Identifies Novel Associations With Stroke. *Stroke.* 2020;51(8):2454-2463.
70. Urbina EM, Isom S, Bell RA, et al. Burden of Cardiovascular Risk Factors Over Time and Arterial Stiffness in Youth With Type 1 Diabetes Mellitus: The SEARCH for Diabetes in Youth Study. *J Am Heart Assoc.* 2019;8(13):e010150.
71. Pierce JB, Kershaw KN, Kiefe CI, et al. Association of Childhood Psychosocial Environment With 30-Year Cardiovascular Disease Incidence and Mortality in Middle Age. *J Am Heart Assoc.* 2020;9(9):e015326.
72. Perak AM, Lancki N, Kuang A, et al. Associations of Maternal Cardiovascular Health in Pregnancy With Offspring Cardiovascular Health in Early Adolescence. *JAMA.* 2021;325(7):658-668.
73. Fox CK, Sidney S, Fullerton HJ. Community-Based Case-Control Study of Childhood Stroke Risk Associated With Congenital Heart Disease. *Stroke.* 2015;46(2):336-340.
74. Daley MF, Reifler LM, Johnson ES, et al. Predicting Hypertension Among Children With Incident Elevated Blood Pressure. *Acad Pediatr.* 2017;17(3):275-282.

75. Parker ED, Sinaiko AR, Daley MF, et al. Factors Associated With Adherence to Blood Pressure Measurement Recommendations at Pediatric Primary Care Visits, Minnesota and Colorado, 2007-2010. *Prev Chronic Dis.* 2015;12:E118.
76. Koebnick C, Black MH, Wu J, et al. The prevalence of primary pediatric prehypertension and hypertension in a real-world managed care system. *J Clin Hypertens (Greenwich).* 2013;15(11):784-792.
77. Parker ED, Sinaiko AR, Kharbanda EO, et al. Change in Weight Status and Development of Hypertension. *Pediatrics.* 2016;137(3):e20151662.
78. Koebnick C, Black MH, Wu J, et al. High Blood Pressure in Overweight and Obese Youth: Implications for Screening. *J Clin Hypertens (Greenwich).* 2013;15(11):793-805.
79. Kim G, Divers J, Fino NF, et al. Trends in Prevalence of Cardiovascular Risk Factors from 2002-2012 among Youth Early in the Course of Type 1 and Type 2 Diabetes. The SEARCH for Diabetes in Youth Study. *Pediatr Diabetes.* 2019;20(6):693-701.
80. Shah NS, Ning H, Petito LC, et al. Associations of Clinical and Social Risk Factors With Racial Differences in Premature Cardiovascular Disease. *Circulation.* 2022;146(3):201-210.
81. Jain V, Al Rifai M, Khan SU, et al. Association Between Social Vulnerability Index and Cardiovascular Disease: A Behavioral Risk Factor Surveillance System Study. *J Am Heart Assoc.* 2022;11(15):e024414.
82. Schroeder EB, Hanratty R, Beaty BL, et al. Simultaneous Control of Diabetes Mellitus, Hypertension, and Hyperlipidemia in 2 Health Systems. *Circ Cardiovasc Qual Outcomes.* 2012;5(5):645-653.
83. Campbell N, Ordunez P, Jaffe MG, et al. Implementing standardized performance indicators to improve hypertension control at both the population and healthcare organization levels. *J Clin Hypertens (Greenwich).* 2017;19(5):456-461.
84. Olson KL, Delate T, Rasmussen J, et al. Outcomes of patients discharged from pharmacy-managed cardiovascular disease management. *Am J Manag Care.* 2009;15(8):497-503.
85. Jaffe MG, Lee GA, Young JD, et al. Improved blood pressure control associated with a large-scale hypertension program. *JAMA.* 2013;310(7):699-705.
86. Sim JJ, Handler J, Jacobsen SJ, Kanter MH. Systemic Implementation Strategies to Improve Hypertension: The Kaiser Permanente Southern California Experience. *Can J Cardiol.* 2014;30(5):544-552.
87. Shaw KM, Handler J, Wall HK, Kanter MH. Improving blood pressure control in a large multiethnic California population through changes in health care delivery, 2004-2012. *Prev Chronic Dis.* 2014;11:E191.
88. Chan L, Wang H, Terdiman J, et al. Disparities in outpatient and home health service utilization following stroke: results of a 9-year cohort study in Northern California. *PM R.* 2009;1(11):997-1003.
89. Bartolome RE, Chen A, Handler J, et al. Population Care Management and Team-Based Approach to Reduce Racial Disparities among African Americans/Blacks with Hypertension. *Perm J.* 2016;20(1):53-59.
90. Thomas SJ, Booth JN, Dai C, et al. Cumulative Incidence of Hypertension by 55 Years of Age in Blacks and Whites: The CARDIA Study. *J Am Heart Assoc.* 2018;7(14):07.
91. Valero-Elizondo J, Hong JC, Spatz ES, et al. Persistent socioeconomic disparities in cardiovascular risk factors and health in the United States: Medical Expenditure Panel Survey 2002-2013. *Atherosclerosis.* 2018;269:301-305.
92. Young DR, Fischer H, Arterburn D, et al. Associations of overweight/obesity and socioeconomic status with hypertension prevalence across racial and ethnic groups. *J Clin Hypertens (Greenwich).* 2018;20(3):532-540.
93. Savitz ST, Leong T, Sung SH, et al. Contemporary Reevaluation of Race and Ethnicity With Outcomes in Heart Failure. *J Am Heart Assoc.* 2021;10(3):e016601.
94. Allen LA, Matlock DD, Shetterly SM, et al. Use of Risk Models to Predict Death in the Next Year Among Individual Ambulatory Patients With Heart Failure. *JAMA Cardiol.* 2017;2(4):435-441.
95. Tsao CW, Lyass A, Enserro D, et al. Temporal Trends in the Incidence of and Mortality Associated With Heart Failure With Preserved and Reduced Ejection Fraction. *JACC Heart Fail.* 2018;6(8):678-685.
96. Sidney S, Quesenberry CP, Jaffe MG, et al. Heterogeneity in national U.S. mortality trends within heart disease subgroups, 2000-2015. *BMC Cardiovasc Disord.* 2017;17(1):192.
97. Sidney S, Go AS, Jaffe MG, et al. Association Between Aging of the US Population and Heart Disease Mortality From 2011 to 2017. *JAMA Cardiol.* 2019;4(12):1280-1286.
98. Shah NS, Molsberry R, Rana JS, et al. Heterogeneous trends in burden of heart disease mortality by subtypes in the United States, 1999-2018: observational analysis of vital statistics. *BMJ.* 2020;370:m2688.
99. Sidney S, Lee C, Liu J, et al. Age-Adjusted Mortality Rates and Age and Risk-Associated Contributions to Change in Heart Disease and Stroke Mortality, 2011-2019 and 2019-2020. *JAMA Netw Open.* 2022;5(3):e223872.
100. Sax DR, Mark DG, Rana JS, et al. Risk adjusted 30-day mortality and serious adverse event rates among a large, multi-center cohort of emergency department patients with acute heart failure. *J Am Coll Emerg Physicians Open.* 2022;3(3):e12742.

101. Merenich JA, Olson KL, Delate T, et al. Mortality reduction benefits of a comprehensive cardiac care program for patients with occlusive coronary artery disease. *Pharmacotherapy*. 2007;27(10):1370-1378.
102. Nichols GA, Wang F, Pedula KL. Comparison of evidence-based versus non-evidence-based pharmacotherapy on the risk of cardiovascular hospitalization and all-cause mortality among patients with established cardiovascular disease. *Am J Cardiol*. 2010;105(6):786-791.
103. Solomon MD, Leong TK, Rana JS, et al. Community-Based Trends in Acute Myocardial Infarction From 2008 to 2014. *J Am Coll Cardiol*. 2016;68(6):666-668.
104. Yeh RW, Sidney S, Chandra M, et al. Population trends in the incidence and outcomes of acute myocardial infarction. *N Engl J Med*. 2010;362(23):2155-2165.
105. Sidney S, Sorel ME, Quesenberry CP, et al. Comparative Trends in Heart Disease, Stroke, and All-Cause Mortality in the United States and a Large Integrated Healthcare Delivery System. *Am J Med*. 2018;131(7):829-836.
106. Mefford MT, Li BH, Qian L, et al. Sex-Specific Trends in Acute Myocardial Infarction Within an Integrated Healthcare Network, 2000 Through 2014. *Circulation*. 2020;141(7):509-519.
107. Chen W, Yao J, Liang Z, et al. Temporal Trends in Mortality Rates among Kaiser Permanente Southern California Health Plan Enrollees, 2001-2016. *Perm J*. 2019;23:18-213.
108. Chi GC, Kanter MH, Li BH, et al. Trends in Acute Myocardial Infarction by Race and Ethnicity. *J Am Heart Assoc*. 2020;9(5):e013542.
109. Yaffe K, Bahorik AL, Hoang TD, et al. Cardiovascular Risk Factors and Accelerated Cognitive Decline in Midlife: the CARDIA Study. *Neurology*. 2020;95(7):e839-e846.
110. Derby CA, Hutchins F, Greendale GA, et al. Cardiovascular risk and midlife cognitive decline in the Study of Women's Health Across the Nation. *Alzheimers Dement*. 2021;17(8):1342-1352.
111. George KM, Gilsanz P, Peterson RL, et al. Impact of Cardiovascular Risk Factors in Adolescence, Young Adulthood, and Midlife on Late-Life Cognition: Study of Healthy Aging in African Americans. *J Gerontol A Biol Sci Med Sci*. 2021;76(9):1692-1698.
112. Peterson RL, George KM, Gilsanz P, et al. Racial/Ethnic Disparities in Young Adulthood and Midlife Cardiovascular Risk Factors and Late-life Cognitive Domains: The Kaiser Healthy Aging and Diverse Life Experiences (KHANDLE) Study. *Alzheimer Dis Assoc Disord*. 2021;35(2):99-105.
113. van Dalen JW, Brayne C, Crane PK, et al. Association of Systolic Blood Pressure With Dementia Risk and the Role of Age, U-Shaped Associations, and Mortality. *JAMA Intern Med*. 2022;182(2):142-152.
114. Chan L, Sandel ME, Jette AM, et al. Does Post-Acute Care Site Matter? A longitudinal study assessing functional recovery after a stroke. *Arch Phys Med Rehabil*. 2013;94(4):622-629.
115. Wang H, Camicia M, Terdiman J, et al. Time to inpatient rehabilitation hospital admission and functional outcomes of stroke patients. *PM R*. 2011;3(4):296-304.
116. Sandel ME, Wang H, Terdiman J, et al. Disparities in stroke rehabilitation: results of a study in an integrated health system in northern California. *PM R*. 2009;1(1):29-40.
117. Wang H, Sandel ME, Terdiman J, et al. Postacute care and ischemic stroke mortality: findings from an integrated health care system in northern California. *PM R*. 2011;3(8):686-694.
118. Camicia M, Lutz BJ, Harvath TA, Joseph JG. Using the Preparedness Assessment for the Transition Home After Stroke Instrument to Identify Stroke Caregiver Concerns Pre-discharge: Uncertainty, Anticipation, and Cues to Action. *Rehabil Nurs*. 2021;46(1):33-42.
119. Camicia M, Lutz B, Summers D, et al. Nursing's Role in Successful Stroke Care Transitions Across the Continuum: From Acute Care Into the Community. *Stroke*. 2021;52(12):e794-e805.
120. Krumholz HM, Lin Z, Keenan PS, et al. Relationship between hospital readmission and mortality rates for patients hospitalized with acute myocardial infarction, heart failure, or pneumonia. *JAMA*. 2013;309(6):587-593.
121. Fitzgerald AA, Powers JD, Ho PM, et al. Impact of medication nonadherence on hospitalizations and mortality in heart failure. *J Card Fail*. 2011;17(8):664-669.
122. Peterson PN, Greiner MA, Qualls LG, et al. QRS duration, bundle-branch block morphology, and outcomes among older patients with heart failure receiving cardiac resynchronization therapy. *JAMA*. 2013;310(6):617-626.
123. Retrum JH, Boggs J, Hersh A, et al. Patient-Identified Factors Related to Heart Failure Readmissions. *Circ Cardiovasc Qual Outcomes*. 2013;6(2):171-177.
124. Ahmedani BK, Solberg LI, Copeland LA, et al. Psychiatric Comorbidity and 30-Day Readmissions After Hospitalization for Heart Failure, AMI, and Pneumonia. *Psychiatr Serv*. 2015;66(2):134-140.
125. Go AS, Yang J, Gurwitz JH, et al. Comparative effectiveness of beta-adrenergic antagonists (atenolol, metoprolol tartrate, carvedilol) on the risk of rehospitalization in adults with heart failure. *Am J Cardiol*. 2007;100(4):690-696.
126. McNaughton CD, Collins SP, Kripalani S, et al. Lower Numeracy Is Associated with Increased Odds of 30-Day Emergency Department and Hospital Recidivism for Patients with Acute Heart Failure. *Circ Heart Fail*. 2013;6(1):40-46.

127. Salah HM, Minhas AMK, Khan MS, et al. Trends in Hospitalizations for Heart Failure, Acute Myocardial Infarction, and Stroke in the United States from 2004-2018. *Am Heart J.* 2022;243:103-109.
128. Li NC, Lee A, Whitmer RA, et al. Use of angiotensin receptor blockers and risk of dementia in a predominantly male population: prospective cohort analysis. *BMJ.* 2010;340:b5465.
129. Exalto LG, Biessels GJ, Karter AJ, et al. Risk score for prediction of 10 year dementia risk in individuals with type 2 diabetes: a cohort study. *Lancet Diabetes Endocrinol.* 2013;1(3):183-190.
130. Whitmer RA. Type 2 diabetes and risk of cognitive impairment and dementia. *Curr Neurol Neurosci Rep.* 2007;7(5):373-380.
131. Hammond CA, Blades NJ, Chaudhry SI, et al. Long-Term Cognitive Decline After Newly Diagnosed Heart Failure: Longitudinal Analysis in the CHS (Cardiovascular Health Study). *Circ Heart Fail.* 2018;11(3):e004476.
132. Nichols GA, Moler EJ. Cardiovascular disease, heart failure, chronic kidney disease and depression independently increase the risk of incident diabetes. *Diabetologia.* 2011;54(3):523-526.
133. Nichols GA, Hillier TA, Brown JB. Normal fasting plasma glucose and risk of type 2 diabetes diagnosis. *Am J Med.* 2008;121(6):519-524.
134. Nguyen-Huynh MN, Tang XN, Vinson DR, et al. Acute Stroke Presentation, Care, and Outcomes in Community Hospitals in Northern California During the COVID-19 Pandemic. *Stroke.* 2020;51(10):2918-2924.
135. An J, Wei R, Zhou H, et al. Angiotensin-Converting Enzyme Inhibitors or Angiotensin Receptor Blockers Use and COVID-19 Infection Among 824 650 Patients With Hypertension From a US Integrated Healthcare System. *J Am Heart Assoc.* 2021;10(3):e019669.
136. Nogueira RG, Qureshi MM, Abdalkader M, et al. Global Impact of COVID-19 on Stroke Care and Intravenous Thrombolysis. *Neurology.* 2021;96(23):e2824-e2838.
137. Padrick MM, Sangha N, Paletz L, et al. COVID-19 Impact on Acute Ischemic Stroke Treatment at 9 Comprehensive Stroke Centers across Los Angeles. *Cerebrovasc Dis.* 2021;50(6):707-714.
138. Solomon MD, McNulty EJ, Rana JS, et al. The Covid-19 Pandemic and the Incidence of Acute Myocardial Infarction. *N Engl J Med.* 2020;383(7):691-693.
139. Solomon MD, Nguyen-Huynh M, Leong TK, et al. Changes in Patterns of Hospital Visits for Acute Myocardial Infarction or Ischemic Stroke During COVID-19 Surges. *JAMA.* 2021;326(1):82-84.
140. An J, Zhou H, Luong TQ, et al. Risk of hospitalization and mortality associated with uncontrolled blood pressure in patients with hypertension and COVID-19. *Int J Cardiol Cardiovasc Risk Prev.* 2021;11:200117.
141. Nogueira RG, Abdalkader M, Qureshi MM, et al. Global impact of COVID-19 on stroke care. *Int J Stroke.* 2021;16(5):573-584.
142. Khan NA, Stergiou GS, Omboni S, et al. Virtual management of hypertension: lessons from the COVID-19 pandemic-International Society of Hypertension position paper endorsed by World Hypertension League and European Society of Hypertension. *J Hypertens.* 2022;40(8):1435-1448.
143. Mefford MT, An J, Gupta N, et al. Rates of Acute Myocardial Infarction During the COVID-19 Pandemic. *Perm J.* 2021;25.
144. Bromfield SG, Ngameni CA, Colantonio LD, et al. Blood Pressure, Antihypertensive Polypharmacy, Frailty, and Risk for Serious Fall Injuries Among Older Treated Adults With Hypertension. *Hypertension.* 2017;70(2):259-266.
145. Leonard CE, Brensinger CM, Aquilante CL, et al. Comparative Safety of Sulfonylureas and the Risk of Sudden Cardiac Arrest and Ventricular Arrhythmia. *Diabetes Care.* 2018;41(4):713-722.
146. Cullen MW, Kim S, Piccini JP, et al. Risks and Benefits of Anticoagulation in Atrial Fibrillation: Insights From the Outcomes Registry for Better Informed Treatment of Atrial Fibrillation (ORBIT-AF) Registry. *Circ Cardiovasc Qual Outcomes.* 2013;6(4):461-469.
147. Strong SH, Halperin JL. Confronting atrial fibrillation in the elderly: stroke risk stratification and emerging antithrombotic therapies. *Geriatrics.* 2007;62(3):22-27.
148. An J, Niu F, Lang DT, et al. Stroke and Bleeding Risk Associated With Antithrombotic Therapy for Patients With Nonvalvular Atrial Fibrillation in Clinical Practice. *J Am Heart Assoc.* 2015;4(7):e001921.
149. Quinn GR, Singer DE, Chang Y, et al. How Well Do Stroke Risk Scores Predict Hemorrhage in Patients With Atrial Fibrillation? *Am J Cardiol.* 2016;118(5):697-699.
150. Li G, Thabane L, Delate T, et al. Can We Predict Individual Combined Benefit and Harm of Therapy? Warfarin Therapy for Atrial Fibrillation as a Test Case. *PLoS ONE.* 2016;11(8):e0160713.
151. Shen AY, Chen W, Yao JF, et al. Effect of race/ethnicity on the efficacy of warfarin: potential implications for prevention of stroke in patients with atrial fibrillation. *CNS Drugs.* 2008;22(10):815-825.
152. Go AS, Singer DE, Toh S, et al. Outcomes of Dabigatran and Warfarin for Atrial Fibrillation in Contemporary Practice: A Retrospective Cohort Study. *Ann Intern Med.* 2017;167(12):845-854.
153. Freeman JV, Reynolds K, Fang M, et al. Digoxin and Risk of Death in Adults with Atrial Fibrillation: The ATRIA-CVRN Study. *Circ Arrhythm Electrophysiol.* 2015;8(1):49-58.

154. Lee KK, Shilane D, Hlatky MA, et al. Effectiveness and Safety of Spironolactone for Systolic Heart Failure. *Am J Cardiol.* 2013;112(9):1427-1432.
155. Sim JJ, Zhou H, Bhandari S, et al. Low Systolic Blood Pressure From Treatment and Association With Serious Falls/Syncope. *Am J Prev Med.* 2018;55(4):488-496.
156. Li DK, Yang C, Andrade S, et al. Maternal exposure to angiotensin converting enzyme inhibitors in the first trimester and risk of malformations in offspring: a retrospective cohort study. *BMJ.* 2011;343:d5931.
157. Lloyd-Jones DM, Allen NB, Anderson CAM, et al. Life's Essential 8: Updating and Enhancing the American Heart Association's Construct of Cardiovascular Health: A Presidential Advisory From the American Heart Association. *Circulation.* 2022;146(5):e18-e43.
158. Ghai NR, Jacobsen SJ, Ahmed AT, et al. A comparison of lifestyle and behavioral cardiovascular disease risk factors between Asian Indian and White non-Hispanic men. *Ethn Dis.* 2012;22(2):168-174.
159. Young DR, Coleman KJ, Ngor E, et al. Associations between physical activity and cardiometabolic risk factors assessed in a southern California health care system, 2010-2012. *Prev Chronic Dis.* 2014;11:E219.
160. Coleman KJ, Ngor E, Reynolds K, et al. Initial validation of an exercise "vital sign" in electronic medical records. *Med Sci Sports Exerc.* 2012;44(11):2071-2076.
161. Pandey A, Allen NB, Ayers C, et al. Fitness in Young Adulthood and Long-Term Cardiac Structure and Function: The CARDIA Study. *JACC Heart Fail.* 2017;5(5):347-355.
162. White DK, Gabriel KP, Kim Y, et al. Do Short Spurts of Physical Activity Benefit Cardiovascular Health? The CARDIA Study. *Med Sci Sports Exerc.* 2015;47(11):2353-2358.
163. Boone-Heinonen J, Jacobs DR, Jr., Sidney S, et al. A walk (or cycle) to the park: active transit to neighborhood amenities, the CARDIA study. *Am J Prev Med.* 2009;37(4):285-292.
164. Gordon-Larsen P, Boone-Heinonen J, Sidney S, et al. Active commuting and cardiovascular disease risk: the CARDIA study. *Arch Intern Med.* 2009;169(13):1216-1223.
165. Nagata JM, Vittinghoff E, Gabriel KP, et al. Physical activity from young adulthood to middle age and premature cardiovascular disease events: a 30-year population-based cohort study. *Int J Behav Nutr Phys Act.* 2022;19(1):123.
166. Nagata JM, Vittinghoff E, Pettee Gabriel K, et al. Physical Activity and Hypertension From Young Adulthood to Middle Age. *Am J Prev Med.* 2021;60(6):757-765.
167. Sidell MA, Ghai NR, Reynolds K, et al. Statins as a free pass: Body mass index and other cardiovascular risk factors among lipid-lowering medication users and nonusers in the California Men's Health Study. *Prev Med.* 2019;129:105822.
168. Heisler M, Hofer TP, Schmittiel JA, et al. Improving Blood Pressure Control through a Clinical Pharmacist Outreach Program in Diabetes Patients in Two-High Performing Health Systems: The Adherence and Intensification of Medications (AIM) Cluster Randomized Controlled Pragmatic Trial. *Circulation.* 2012;125(23):2863-2872.
169. Selby JV, Schmittiel JA, Lee J, et al. Meaningful variation in performance: what does variation in quality tell us about improving quality? *Med Care.* 2010;48(2):133-139.
170. Schmittiel JA, Traylor A, Uratsu CS, et al. The association of patient-physician gender concordance with cardiovascular disease risk factor control and treatment in diabetes. *J Womens Health (Larchmt).* 2009;18(12):2065-2070.
171. Adams AS, Uratsu C, Dyer W, et al. Health System Factors and Antihypertensive Adherence in a Racially and Ethnically Diverse Cohort of New Users. *JAMA Intern Med.* 2013;173(1):54-61.
172. Klamerus ML, Kerr EA, Bosworth HB, et al. Characteristics of Diabetic Patients associated with Achieving and Maintaining Blood Pressure Targets in the Adherence and Intensification of Medications Program. *Chronic Illn.* 2014;10(1):60-73.
173. Schmittiel JA, Uratsu CS, Karter AJ, et al. Why don't diabetes patients achieve recommended risk factor targets? Poor adherence versus lack of treatment intensification. *J Gen Intern Med.* 2008;23(5):588-594.
174. Huang ES, Liu JY, Moffet HH, et al. Glycemic control, complications, and death in older diabetic patients: the diabetes and aging study. *Diabetes Care.* 2011;34(6):1329-1336.
175. Grant DSL, Scott RD, Harrison TN, et al. Trends in Lipid Screening Among Adults in an Integrated Health Care Delivery System, 2009-2015. *J Manag Care Spec Pharm.* 2018;24(11):1090-1101.
176. Ogunmoroti O, Oni E, Michos ED, et al. Life's Simple 7 and Incident Heart Failure: The Multi-Ethnic Study of Atherosclerosis. *J Am Heart Assoc.* 2017;6(6):06.
177. Ip EJ, Shah BM, Yu J, et al. Enhancing diabetes care by adding a pharmacist to the primary care team. *Am J Health Syst Pharm.* 2013;70(10):877-886.
178. Low KJ, Pelter MA, Deamer RL, Burchette RJ. Identification and Evaluation of Risk Factors in Patients With Continuously Uncontrolled Hypertension. *J Clin Hypertens (Greenwich).* 2015;17(4):281-289.
179. Ross R, Blair SN, Arena R, et al. Importance of Assessing Cardiorespiratory Fitness in Clinical Practice: A Case for Fitness as a Clinical Vital Sign: A Scientific Statement From the American Heart Association. *Circulation.* 2016;134(24):e653-e699.

180. Piper MA, Evans CV, Burda BU, et al. Diagnostic and Predictive Accuracy of Blood Pressure Screening Methods With Consideration of Rescreening Intervals: An Updated Systematic Review for the U.S. Preventive Services Task Force. *Ann Intern Med.* 2015;162(3):192-204.
181. Handler J, Mohan Y, Kanter MH, et al. Screening for High Blood Pressure in Adults During Ambulatory Nonprimary Care Visits: Opportunities to Improve Hypertension Recognition. *J Clin Hypertens (Greenwich).* 2015;17(6):431-439.
182. Noorian AR, Sanossian N, Shkirkova K, et al. Los Angeles Motor Scale to Identify Large Vessel Occlusion: Pre-hospital Validation and Comparison With Other Screens. *Stroke.* 2018;49(3):565-572.
183. Mark DG, Huang J, Chettipally U, et al. Performance of Coronary Risk Scores Among Patients With Chest Pain in the Emergency Department. *J Am Coll Cardiol.* 2018;71(6):606-616.
184. Sharp AL, Baecker AS, Shen E, et al. Effect of a HEART Care Pathway on Chest Pain Management Within an Integrated Health System. *Ann Emerg Med.* 2019;74(2):171-180.
185. Lozano P, Henrikson NB, Dunn J, et al. Lipid Screening in Childhood and Adolescence for Detection of Familial Hypercholesterolemia: Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2016;316(6):645-655.
186. Lozano P, Henrikson NB, Morrison CC, et al. Lipid Screening in Childhood and Adolescence for Detection of Multifactorial Dyslipidemia: Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2016;316(6):634-644.
187. Adams J, Cymbala AA, Delate T, et al. Cluster-Randomized Trial of Clinical Pharmacist Tobacco Cessation Counseling among Patients with Cardiovascular Disease. *Popul Health Manag.* 2015;18(4):300-306.
188. Booth JN, Colantonio LD, Howard G, et al. Healthy lifestyle factors and incident heart disease and mortality in candidates for primary prevention with statin therapy. *Int J Cardiol.* 2016;207:196-202.
189. Leeman-Castillo B, Beaty B, Raghunath S, et al. LUCHAR: using computer technology to battle heart disease among Latinos. *Am J Public Health.* 2010;100(2):272-275.
190. Ledikwe JH, Rolls BJ, Smiciklas-Wright H, et al. Reductions in dietary energy density are associated with weight loss in overweight and obese participants in the PREMIER trial. *Am J Clin Nutr.* 2007;85(5):1212-1221.
191. Chen L, Appel LJ, Loria C, et al. Reduction in consumption of sugar-sweetened beverages is associated with weight loss: the PREMIER trial. *Am J Clin Nutr.* 2009;89(5):1299-1306.
192. Chen L, Caballero B, Mitchell DC, et al. Reducing consumption of sugar-sweetened beverages is associated with reduced blood pressure: a prospective study among United States adults. *Circulation.* 2010;121(22):2398-2406.
193. Lien LF, Brown AJ, Ard JD, et al. Effects of PREMIER lifestyle modifications on participants with and without the metabolic syndrome. *Hypertension.* 2007;50(4):609-616.
194. Liese AD, Bortsov A, Gunther AL, et al. Association of DASH diet with cardiovascular risk factors in youth with diabetes mellitus: the SEARCH for Diabetes in Youth study. *Circulation.* 2011;123(13):1410-1417.
195. He J, Wofford MR, Reynolds K, et al. Effect of dietary protein supplementation on blood pressure: a randomized, controlled trial. *Circulation.* 2011;124(5):589-595.
196. Vesco KK, Karanja N, King JC, et al. Efficacy of a group-based dietary intervention for limiting gestational weight gain among obese women: A randomized trial. *Obesity (Silver Spring).* 2014;22(9):1989-1996.
197. Nguyen-Huynh MN, Young JD, Ovbiagele B, et al. Effect of Lifestyle Coaching or Enhanced Pharmacotherapy on Blood Pressure Control Among Black Adults With Persistent Uncontrolled Hypertension: A Cluster Randomized Clinical Trial. *JAMA Netw Open.* 2022;5(5):e2212397.
198. Valero-Elizondo J, Salami JA, Osondu CU, et al. Economic Impact of Moderate-Vigorous Physical Activity Among Those With and Without Established Cardiovascular Disease: 2012 Medical Expenditure Panel Survey. *J Am Heart Assoc.* 2016;5(9):e003614.
199. Myers J, McElrath M, Jaffe A, et al. A Randomized Trial of Exercise Training in Abdominal Aortic Aneurysm Disease. *Med Sci Sports Exerc.* 2014;46(1):2-9.
200. Almeida FA, Smith-Ray RL, Dzawaltowski DA, et al. An Interactive Computer Session to Initiate Physical Activity in Sedentary Cardiac Patients: Randomized Controlled Trial. *J Med Internet Res.* 2015;17(8):e206.
201. Klasnja P, Smith S, Seewald NJ, et al. Efficacy of Contextually Tailored Suggestions for Physical Activity: A Micro-randomized Optimization Trial of HeartSteps. *Ann Behav Med.* 2018;53(6):573-582.
202. Zhou YY, Kanter MH, Wang JJ, Garrido T. Improved quality at Kaiser Permanente through e-mail between physicians and patients. *Health Aff (Millwood).* 2010;29(7):1370-1375.
203. Tucker KL, Sheppard JP, Stevens R, et al. Self-monitoring of blood pressure in hypertension: A systematic review and individual patient data meta-analysis. *PLoS Med.* 2017;14(9):e1002389.
204. Margolis KL, Asche SE, Dehmer SP, et al. Long-term Outcomes of the Effects of Home Blood Pressure Telemonitoring and Pharmacist Management on Blood Pressure Among Adults With Uncontrolled Hypertension: Follow-up of a Cluster Randomized Clinical Trial. *JAMA Netw Open.* 2018;1(5):e181617.
205. Victor RG, Blyler CA, Li N, et al. Sustainability of Blood Pressure Reduction in Black Barbershops. *Circulation.* 2019;139(8):1036-1046.

206. Daumit GL, Dalcin AT, Dickerson FB, et al. Effect of a Comprehensive Cardiovascular Risk Reduction Intervention in Persons With Serious Mental Illness: A Randomized Clinical Trial. *JAMA Netw Open*. 2020;3(6):e207247.
207. Margolis KL, Dehmer SP, Sperl-Hillen J, et al. Cardiovascular Events and Costs With Home Blood Pressure Telemonitoring and Pharmacist Management for Uncontrolled Hypertension. *Hypertension*. 2020;76(4):1097-1103.
208. Boxer RS, Dolansky MA, Chaussee EL, et al. A Randomized Controlled Trial of Heart Failure Disease Management vs Usual Care in Skilled Nursing Facilities. *J Am Med Dir Assoc*. 2022;23(3):359-366.
209. Weerahandi H, Chaussee EL, Dodson JA, et al. Disease Management in Skilled Nursing Facilities Improves Outcomes for Patients With a Primary Diagnosis of Heart Failure. *J Am Med Dir Assoc*. 2022;23(3):367-372.
210. Nkonde-Price C, Reynolds K, Najem M, et al. Comparison of Home-Based vs Center-Based Cardiac Rehabilitation in Hospitalization, Medication Adherence, and Risk Factor Control Among Patients With Cardiovascular Disease. *JAMA Netw Open*. 2022;5(8):e2228720.
211. Parchman ML, Anderson ML, Dorr DA, et al. A Randomized Trial of External Practice Support to Improve Cardiovascular Risk Factors in Primary Care. *Ann Fam Med*. 2019;17(Suppl 1):S40-S49.
212. Action to Control Cardiovascular Risk in Diabetes Study Group, Gerstein HC, Miller ME, et al. Effects of intensive glucose lowering in type 2 diabetes. *N Engl J Med*. 2008;358(24):2545-2559.
213. Toh S, Hampp C, Reichman ME, et al. Risk for Hospitalized Heart Failure Among New Users of Saxagliptin, Sitagliptin, and Other Antihyperglycemic Drugs: A Retrospective Cohort Study. *Ann Intern Med*. 2016;164(11):705-714.
214. Rao AD, Kuhadiya N, Reynolds K, Fonseca VA. Is the combination of sulfonylureas and metformin associated with an increased risk of cardiovascular disease or all-cause mortality?: a meta-analysis of observational studies. *Diabetes Care*. 2008;31(8):1672-1678.
215. Lafata JE, Karter AJ, O'Connor PJ, et al. Medication Adherence Does Not Explain Black-White Differences in Cardiometabolic Risk Factor Control among Insured Patients with Diabetes. *J Gen Intern Med*. 2016;31(2):188-195.
216. Neugebauer R, Schroeder EB, Reynolds K, et al. Comparison of Mortality and Major Cardiovascular Events Among Adults With Type 2 Diabetes Using Human vs Analogue Insulins. *JAMA Netw Open*. 2020;3(1):e1918554.
217. Thompson AM, Hu T, Eshelbrenner CL, et al. Antihypertensive treatment and secondary prevention of cardiovascular disease events among persons without hypertension: a meta-analysis. *JAMA*. 2011;305(9):913-922.
218. Heisler M, Hogan MM, Hofer TP, et al. When more is not better: treatment intensification among hypertensive patients with poor medication adherence. *Circulation*. 2008;117(22):2884-2892.
219. Black HR, Davis B, Barzilay J, et al. Metabolic and clinical outcomes in nondiabetic individuals with the metabolic syndrome assigned to chlorthalidone, amlodipine, or lisinopril as initial treatment for hypertension: a report from the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *Diabetes Care*. 2008;31(2):353-360.
220. Wright JT, Jr., Harris-Haywood S, Pressel S, et al. Clinical outcomes by race in hypertensive patients with and without the metabolic syndrome: Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *Arch Intern Med*. 2008;168(2):207-217.
221. Dudl RJ, Wang MC, Wong M, Bellows J. Preventing myocardial infarction and stroke with a simplified bundle of cardioprotective medications. *Am J Manag Care*. 2009;15(10):e88-94.
222. Byrd JB, Zeng C, Tavel HM, et al. Combination therapy as initial treatment for newly diagnosed hypertension. *Am Heart J*. 2011;162(2):340-346.
223. Barzilay JI, Davis BR, Pressel SL, et al. Long-Term Effects of Incident Diabetes Mellitus on Cardiovascular Outcomes in People Treated for Hypertension: The ALLHAT Diabetes Extension Study. *Circ Cardiovasc Qual Outcomes*. 2012;5(2):153-162.
224. Magid DJ, Shetterly SM, Margolis KL, et al. Comparative effectiveness of angiotensin-converting enzyme inhibitors versus beta-blockers as second-line therapy for hypertension. *Circ Cardiovasc Qual Outcomes*. 2010;3(5):453-458.
225. Daugherty SL, Powers JD, Magid DJ, et al. The Association Between Medication Adherence and Treatment Intensification With Blood Pressure Control in Resistant Hypertension. *Hypertension*. 2012;60(2):303-309.
226. Jaffe MG, Young JD. The Kaiser Permanente Northern California Story: Improving Hypertension Control From 44% to 90% in 13 Years (2000 to 2013). *J Clin Hypertens (Greenwich)*. 2016;18(4):260-261.
227. Bress AP, Bellows BK, King JB, et al. Cost-Effectiveness of Intensive versus Standard Blood-Pressure Control. *N Engl J Med*. 2017;377(8):745-755.
228. An J, Luong T, Qian L, et al. Treatment Patterns and Blood Pressure Control With Initiation of Combination Versus Monotherapy Antihypertensive Regimens. *Hypertension*. 2021;77(1):103-113.
229. Flint AC, Conell C, Ren X, et al. Statin Adherence Is Associated With Reduced Recurrent Stroke Risk in Patients With or Without Atrial Fibrillation. *Stroke*. 2017;48(7):1788-1794.

230. McGinnis BD, Olson KL, Delate TM, Stolcpart RS. Statin adherence and mortality in patients enrolled in a secondary prevention program. *Am J Manag Care*. 2009;15(10):689-695.
231. Chi MD, Vansomphone SS, Liu IL, et al. Adherence to statins and LDL-cholesterol goal attainment. *Am J Manag Care*. 2014;20(4):e105-112.
232. Harrison TN, Scott RD, Cheetham TC, et al. Trends in Statin Use 2009-2015 in a Large Integrated Health System: Pre- and Post-2013 ACC/AHA Guideline on Treatment of Blood Cholesterol. *Cardiovasc Drugs Ther*. 2018;32(4):397-404.
233. Reynolds K, Mues KE, Harrison TN, et al. Trends in statin utilization among adults with severe peripheral artery disease including critical limb ischemia in an integrated healthcare delivery system. *Vasc Med*. 2019;1358863x19871100.
234. Shah SJ, Eckman MH, Aspberg S, et al. Effect of Variation in Published Stroke Rates on the Net Clinical Benefit of Anticoagulation for Atrial Fibrillation. *Ann Intern Med*. 2018;169(8):517-527.
235. McGrath ER, Go AS, Chang Y, et al. Use of Oral Anticoagulant Therapy in Older Adults with Atrial Fibrillation After Acute Ischemic Stroke. *J Am Geriatr Soc*. 2017;65(2):241-248.
236. Ashburner JM, Go AS, Chang Y, et al. Influence of Competing Risks on Estimating the Expected Benefit of Warfarin in Individuals with Atrial Fibrillation Not Currently Taking Anticoagulants: The Anticoagulation and Risk Factors in Atrial Fibrillation Study. *J Am Geriatr Soc*. 2017;65(1):35-41.
237. An J, Niu F, Zheng C, et al. Warfarin Management and Outcomes in Patients with Nonvalvular Atrial Fibrillation Within an Integrated Health Care System. *J Manag Care Spec Pharm*. 2017;23(6):700-712.
238. Velazquez EJ, Morrow DA, DeVore AD, et al. Angiotensin-Nepriylsin Inhibition in Acute Decompensated Heart Failure. *N Engl J Med*. 2019;380(6):539-548.
239. Morrow DA, Velazquez EJ, DeVore AD, et al. Clinical Outcomes in Patients With Acute Decompensated Heart Failure Randomly Assigned to Sacubitril/Valsartan or Enalapril in the PIONEER-HF Trial. *Circulation*. 2019;139(19):2285-2288.
240. Kim C, Duan L, Phan DQ, Lee MS. Frequency of Utilization of Beta Blockers in Patients With Heart Failure and Depression and Their Effect on Mortality. *Am J Cardiol*. 2019;124(5):746-750.
241. Lee MS, Duan L, Clare R, et al. Comparison of Effects of Statin Use on Mortality in Patients With Heart Failure and Preserved Versus Reduced Left Ventricular Ejection Fraction. *Am J Cardiol*. 2018;122(3):405-412.
242. Zhou H, Sim JJ, Shi J, et al. β -Blocker Use and Risk of Mortality in Heart Failure Patients Initiating Maintenance Dialysis. *Am J Kidney Dis*. 2020;77(5):704-712.
243. DeVore AD, Braunwald E, Morrow DA, et al. Initiation of Angiotensin-Nepriylsin Inhibition After Acute Decompensated Heart Failure: Secondary Analysis of the Open-label Extension of the PIONEER-HF Trial. *JAMA Cardiol*. 2020;5(2):202-207.
244. Ambrosy AP, Braunwald E, Morrow DA, et al. Angiotensin Receptor-Nepriylsin Inhibition Based on History of Heart Failure and Use of Renin-Angiotensin System Antagonists. *J Am Coll Cardiol*. 2020;76(9):1034-1048.
245. Ho PM, Magid DJ, Shetterly SM, et al. Medication nonadherence is associated with a broad range of adverse outcomes in patients with coronary artery disease. *Am Heart J*. 2008;155(4):772-779.
246. Phan DQ, Duan L, Lam B, et al. Statin Adherence and Mortality in Patients Aged 80 Years and Older After Acute Myocardial Infarction. *J Am Geriatr Soc*. 2019;67(10):2045-2049.
247. An J, Bider Z, Luong TQ, et al. Long-Term Medication Adherence Trajectories to Direct Oral Anticoagulants and Clinical Outcomes in Patients With Atrial Fibrillation. *J Am Heart Assoc*. 2021;10(21):e021601.
248. Go AS, Fan D, Sung SH, et al. Contemporary rates and correlates of statin use and adherence in nondiabetic adults with cardiovascular risk factors: The KP CHAMP study. *Am Heart J*. 2017;194:25-38.
249. Ngo-Metzger Q, Zuvekas S, Shafer P, et al. Statin Use in the U.S. for Secondary Prevention of Cardiovascular Disease Remains Suboptimal. *J Am Board Fam Med*. 2019;32(6):807-817.
250. Fung V, Graetz I, Reed M, Jaffe MG. Patient-reported adherence to statin therapy, barriers to adherence, and perceptions of cardiovascular risk. *PLoS ONE*. 2018;13(2):e0191817.
251. Magid DJ, Ho PM, Olson KL, et al. A multimodal blood pressure control intervention in 3 healthcare systems. *Am J Manag Care*. 2011;17(4):e96-103.
252. Nogueira RG, Jadhav AP, Haussen DC, et al. Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. *N Engl J Med*. 2018;378(1):11-21.
253. Towfighi A, Cheng EM, Ayala-Rivera M, et al. Randomized controlled trial of a coordinated care intervention to improve risk factor control after stroke or transient ischemic attack in the safety net: Secondary stroke prevention by Uniting Community and Chronic care model teams Early to End Disparities (SUCCEED). *BMC Neurol*. 2017;17(1):24.
254. Towfighi A, Cheng EM, Ayala-Rivera M, et al. Effect of a Coordinated Community and Chronic Care Model Team Intervention vs Usual Care on Systolic Blood Pressure in Patients With Stroke or Transient Ischemic Attack: The SUCCEED Randomized Clinical Trial. *JAMA Netw Open*. 2021;4(2):e2036227.
255. Vollmer WM, Owen-Smith AA, Tom JO, et al. Improving adherence to cardiovascular disease medications with information technology. *Am J Manag Care*. 2014;20(11 Spec No. 17):SP502-510.

256. Smith DH, O’Keeffe-Rosetti M, Owen-Smith AA, et al. Improving Adherence to Cardiovascular Therapies: An Economic Evaluation of a Randomized Pragmatic Trial. *Value Health*. 2016;19(2):176-184.
257. Harrison TN, Green KR, Liu IL, et al. Automated Outreach for Cardiovascular-Related Medication Refill Reminders. *J Clin Hypertens (Greenwich)*. 2016;18(7):641-646.
258. Derose SF, Green K, Marrett E, et al. Automated outreach to increase primary adherence to cholesterol-lowering medications. *JAMA Intern Med*. 2013;173(1):38-43.
259. Grant RW, Pandiscio JC, Pajolek H, et al. Implementation of a web-based tool for patient medication self-management: the Medication Self-titration Evaluation Programme (Med-STEP) for blood pressure control. *Inform Prim Care*. 2012;20(1):57-67.
260. Krone RJ, Rao SV, Dai D, et al. Acceptance, panic, and partial recovery the pattern of usage of drug-eluting stents after introduction in the U.S. (a report from the American College of Cardiology/National Cardiovascular Data Registry). *JACC Cardiovasc Interv*. 2010;3(9):902-910.
261. Matlock DD, Groeneveld PW, Sidney S, et al. Geographic variation in cardiovascular procedure use among Medicare fee-for-service vs Medicare Advantage beneficiaries. *JAMA*. 2013;310(2):155-162.
262. Douglas PS, Brennan JM, Anstrom KJ, et al. Clinical effectiveness of coronary stents in elderly persons: results from 262,700 Medicare patients in the American College of Cardiology-National Cardiovascular Data Registry. *J Am Coll Cardiol*. 2009;53(18):1629-1641.
263. Baber U, Mehran R, Sharma SK, et al. Impact of the everolimus-eluting stent on stent thrombosis: a meta-analysis of 13 randomized trials. *J Am Coll Cardiol*. 2011;58(15):1569-1577.
264. Brott TG, Hobson RW, 2nd, Howard G, et al. Stenting versus endarterectomy for treatment of carotid-artery stenosis. *N Engl J Med*. 2010;363(1):11-23.
265. Rao SV, Ou FS, Wang TY, et al. Trends in the prevalence and outcomes of radial and femoral approaches to percutaneous coronary intervention: a report from the National Cardiovascular Data Registry. *JACC Cardiovasc Interv*. 2008;1(4):379-386.
266. Stone GW, Lindenfeld J, Abraham WT, et al. Transcatheter Mitral-Valve Repair in Patients with Heart Failure. *N Engl J Med*. 2018;379(24):2307-2318.
267. Jia B, Feng L, Liebeskind DS, et al. Mechanical thrombectomy and rescue therapy for intracranial large artery occlusion with underlying atherosclerosis. *J Neurointerv Surg*. 2018;10(8):746-750.
268. Arnold SV, Chinnakondepalli KM, Spertus JA, et al. Health Status After Transcatheter Mitral-Valve Repair in Heart Failure and Secondary Mitral Regurgitation: COAPT Trial. *J Am Coll Cardiol*. 2019;73(17):2123-2132.
269. Mack MJ, Lindenfeld J, Abraham WT, et al. 3-Year Outcomes of Transcatheter Mitral Valve Repair in Patients With Heart Failure. *J Am Coll Cardiol*. 2021;77(8):1029-1040.
270. Peterson ED, Dai D, DeLong ER, et al. Contemporary mortality risk prediction for percutaneous coronary intervention: results from 588,398 procedures in the National Cardiovascular Data Registry. *J Am Coll Cardiol*. 2010;55(18):1923-1932.
271. Tsai TT, Patel UD, Chang TI, et al. Validated Contemporary Risk Model of Acute Kidney Injury in Patients Undergoing Percutaneous Coronary Interventions: Insights From the National Cardiovascular Data Registry Cath-PCI Registry. *J Am Heart Assoc*. 2014;3(6):e001380.
272. Brilakis ES, Banerjee S, Karpaliotis D, et al. Procedural Outcomes of Chronic Total Occlusion Percutaneous Coronary Intervention: A Report From the NCDR (National Cardiovascular Data Registry). *JACC Cardiovasc Interv*. 2015;8(2):245-253.
273. Subherwal S, Peterson ED, Dai D, et al. Temporal Trends in and Factors Associated With Bleeding Complications Among Patients Undergoing Percutaneous Coronary Intervention: A Report From the National Cardiovascular Data CathPCI Registry. *J Am Coll Cardiol*. 2012;59(21):1861-1869.
274. Khush KK, Menza R, Nguyen J, et al. Donor Predictors of Allograft Utilization and Recipient Outcomes after Heart Transplantation. *Circ Heart Fail*. 2013;6(2):300-309.
275. Haddad F, Khazanie P, Deuse T, et al. Clinical and Functional Correlates of Early Microvascular Dysfunction Following Heart Transplantation. *Circ Heart Fail*. 2012;5(6):759-768.
276. Goldstein BA, Thomas L, Zaroff JG, et al. Assessment of heart transplant waitlist time and pre- and post-transplant failure: A mixed methods approach. *Epidemiology*. 2016;27(4):469-476.
277. De Vlaminck I, Valantine HA, Snyder TM, et al. Circulating cell-free DNA enables noninvasive diagnosis of heart transplant rejection. *Sci Transl Med*. 2014;6(241):241ra277.
278. Fein AS, Wang Y, Curtis JP, et al. Prevalence and predictors of off-label use of cardiac resynchronization therapy in patients enrolled in the National Cardiovascular Data Registry Implantable Cardiac-Defibrillator Registry. *J Am Coll Cardiol*. 2010;56(10):766-773.
279. Matlock DD, Peterson PN, Heidenreich PA, et al. Regional variation in the use of implantable cardioverter-defibrillators for primary prevention: results from the National Cardiovascular Data Registry. *Circ Cardiovasc Qual Outcomes*. 2011;4(1):114-121.

280. Schneider PM, Pellegrini CN, Wang Y, et al. Prevalence of Guideline-Directed Medical Therapy Among Patients Receiving Cardiac Resynchronization Therapy Defibrillator Implantation in the National Cardiovascular Data Registry During the Years 2006 to 2008. *Am J Cardiol.* 2014;113(12):2052-2056.
281. Schrage B, Lund LH, Benson L, et al. Predictors of primary prevention implantable cardioverter-defibrillator use in heart failure with reduced ejection fraction: impact of the predicted risk of sudden cardiac death and all-cause mortality. *Eur J Heart Fail.* 2022;24(7):1212-1222.
282. Shadman R, Poole JE, Dardas TF, et al. A novel method to predict the proportional risk of sudden cardiac death in heart failure: Derivation of the Seattle Proportional Risk Model. *Heart Rhythm.* 2015;12(10):2069-2077.
283. Bilchick KC, Wang Y, Cheng A, et al. Seattle Heart Failure and Proportional Risk Models Predict Benefit From Implantable Cardioverter-Defibrillators. *J Am Coll Cardiol.* 2017;69(21):2606-2618.
284. Levy WC, Li Y, Reed SD, et al. Does the Implantable Cardioverter-Defibrillator Benefit Vary With the Estimated Proportional Risk of Sudden Death in Heart Failure Patients? *JACC Clin Electrophysiol.* 2017;3(3):291-298.
285. Sauser-Zachrisson K, Shen E, Ajani Z, et al. Emergency Care of Patients with Acute Ischemic Stroke in the Kaiser Permanente Southern California Integrated Health System. *Perm J.* 2016;20(2):10-13.
286. Nguyen-Huynh MN, Klingman JG, Avins AL, et al. Novel Telestroke Program Improves Thrombolysis for Acute Stroke Across 21 Hospitals of an Integrated Healthcare System. *Stroke.* 2018;49(1):133-139.
287. Sauser-Zachrisson K, Shen E, Sangha N, et al. Safe and Effective Implementation of Telestroke in a US Community Hospital Setting. *Perm J.* 2016;20(4):11-15.
288. Sax DR, Mark DG, Huang J, et al. Use of Machine Learning to Develop a Risk-Stratification Tool for Emergency Department Patients With Acute Heart Failure. *Ann Emerg Med.* 2021;77(2):237-248.
289. Sax DR, Sturmer LR, Mark DG, et al. Barriers and Opportunities Regarding Implementation of a Machine Learning-Based Acute Heart Failure Risk Stratification Tool in the Emergency Department. *Diagnostics (Basel).* 2022;12(10):2463.
290. Tuzzio L, O'Meara ES, Holden E, et al. Barriers to Implementing Cardiovascular Risk Calculation in Primary Care: Alignment With the Consolidated Framework for Implementation Research. *Am J Prev Med.* 2021;60(2):250-257.
291. Bushnell C, McCullough LD, Awad IA, et al. Guidelines for the prevention of stroke in women: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke.* 2014;45(5):1545-1588.
292. James PA, Oparil S, Carter BL, et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). *JAMA.* 2014;311(5):507-520.
293. Reboussin DM, Allen NB, Griswold ME, et al. Systematic Review for the 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension.* 2018;71(6):e145.
294. Jaffe MG, Frieden TR, Campbell NRC, et al. Recommended treatment protocols to improve management of hypertension globally: A statement by Resolve to Save Lives and the World Hypertension League (WHL). *J Clin Hypertens (Greenwich).* 2018;20(5):829-836.
295. You JJ, Singer DE, Howard PA, et al. Antithrombotic Therapy for Atrial Fibrillation: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest.* 2012;141(2 Suppl):e531S-575S.
296. Jensen MD, Ryan DH, Apovian CM, et al. 2013 AHA/ACC/TOS Guideline for the Management of Overweight and Obesity in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *J Am Coll Cardiol.* 2014;63(25 Pt B):2985-3023.
297. Aortic Stenosis Writing G, Bonow RO, Brown AS, et al. ACC/AATS/AHA/ASE/EACTS/HVS/SCA/SCAI/SCCT/SCMR/STS 2017 Appropriate Use Criteria for the Treatment of Patients With Severe Aortic Stenosis: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, American Society of Echocardiography, European Association for Cardio-Thoracic Surgery, Heart Valve Society, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and Society of Thoracic Surgeons. *J Am Soc Echocardiogr.* 2018;31(2):117-147.
298. Young DR, Spengler JO, Frost N, et al. Promoting Physical Activity Through the Shared Use of School Recreational Spaces: A Policy Statement From the American Heart Association. *Am J Public Health.* 2014;104(9):1583-1588.
299. Young DR, Hivert MF, Alhassan S, et al. Sedentary Behavior and Cardiovascular Morbidity and Mortality: A Science Advisory From the American Heart Association. *Circulation.* 2016;134(13):e262-279.
300. Lobelo F, Rohm Young D, Sallis R, et al. Routine Assessment and Promotion of Physical Activity in Healthcare Settings: A Scientific Statement From the American Heart Association. *Circulation.* 2018;137(18):e495-e522.

301. Kontos MC, Gunderson MR, Zegre-Hemsey JK, et al. Prehospital Activation of Hospital Resources (PreAct) ST-Segment-Elevation Myocardial Infarction (STEMI): A Standardized Approach to Prehospital Activation and Direct to the Catheterization Laboratory for STEMI Recommendations From the American Heart Association's Mission: Lifeline Program. *J Am Heart Assoc.* 2020;9(2):e011963.
302. Parikh NI, Gonzalez JM, Anderson CAM, et al. Adverse Pregnancy Outcomes and Cardiovascular Disease Risk: Unique Opportunities for Cardiovascular Disease Prevention in Women: A Scientific Statement From the American Heart Association. *Circulation.* 2021;143(18):e902-e916.
303. Roger VL, Sidney S, Fairchild AL, et al. Recommendations for Cardiovascular Health and Disease Surveillance for 2030 and Beyond: A Policy Statement From the American Heart Association. *Circulation.* 2020;141(9):e104-e119.
304. Kaufman JD, Elkind MSV, Bhatnagar A, et al. Guidance to Reduce the Cardiovascular Burden of Ambient Air Pollutants: A Policy Statement From the American Heart Association. *Circulation.* 2020;142(23):e432-e447.
305. Mell MW, Starnes BW, Kraiss LW, et al. Western Vascular Society guidelines for transfer of patients with ruptured abdominal aortic aneurysm. *J Vasc Surg.* 2017;65(3):603-608.
306. AbuRahma AF, Avgerinos ED, Chang RW, et al. Society for Vascular Surgery clinical practice guidelines for management of extracranial cerebrovascular disease. *J Vasc Surg.* 2022;75(1S):4S-22S.
307. AbuRahma AF, Avgerinos ED, Chang RW, et al. The Society for Vascular Surgery implementation document for management of extracranial cerebrovascular disease. *J Vasc Surg.* 2022;75(1S):26S-98S.
308. Padwal R, Campbell NRC, Schutte AE, et al. Optimizing observer performance of clinic blood pressure measurement: a position statement from the Lancet Commission on Hypertension Group. *J Hypertens.* 2019;37(9):1737-1745.
309. Messé SR, Gronseth GS, Kent DM, et al. Practice advisory update summary: Patent foramen ovale and secondary stroke prevention: Report of the Guideline Subcommittee of the American Academy of Neurology. *Neurology.* 2020;94(20):876-885.
310. U. S. Preventive Services Task Force, Grossman DC, Bibbins-Domingo K, et al. Behavioral Counseling to Promote a Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Cardiovascular Risk Factors: US Preventive Services Task Force Recommendation Statement. *JAMA.* 2017;318(2):167-174.
311. Patnode CD, Evans CV, Senger CA, et al. Behavioral Counseling to Promote a Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Cardiovascular Disease Risk Factors: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2017;318(2):175-193.
312. Lin JS, Evans CV, Johnson E, et al. Nontraditional Risk Factors in Cardiovascular Disease Risk Assessment: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2018;320(3):281-297.
313. O'Connor EA, Evans CV, Rushkin MC, et al. Behavioral Counseling to Promote a Healthy Diet and Physical Activity for Cardiovascular Disease Prevention in Adults With Cardiovascular Risk Factors: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2020;324(20):2076-2094.
314. Patnode CD, Redmond N, Iacocca MO, Henninger M. Behavioral Counseling Interventions to Promote a Healthy Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Cardiovascular Disease Risk Factors: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2022;328(4):375-388.
315. Guirguis-Blake JM, Evans CV, Perdue LA, et al. Aspirin Use to Prevent Cardiovascular Disease and Colorectal Cancer: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2022;327(16):1585-1597.
316. Dehmer SP, O'Keefe LR, Evans CV, et al. Aspirin Use to Prevent Cardiovascular Disease and Colorectal Cancer: Updated Modeling Study for the US Preventive Services Task Force. *JAMA.* 2022;327(16):1598-1607.
317. O'Connor EA, Evans CV, Ilev I, et al. Vitamin and Mineral Supplements for the Primary Prevention of Cardiovascular Disease and Cancer: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2022;327(23):2334-2347.
318. Guirguis-Blake JM, Webber EM, Coppola EL. Screening for Asymptomatic Carotid Artery Stenosis in the General Population: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA.* 2021;325(5):487-489.
319. Chan WW, Pearson TA, Bennett GC, et al. ACC/AHA Special Report: Clinical Practice Guideline Implementation Strategies: A Summary of Systematic Reviews by the NHLBI Implementation Science Work Group: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol.* 2017;69(8):1076-1092.
320. Commodore-Mensah Y, Loustalot F, Himmelfarb CD, et al. Proceedings From a National Heart, Lung, and Blood Institute and the Centers for Disease Control and Prevention Workshop to Control Hypertension. *Am J Hypertens.* 2022;35(3):232-243.

321. Al-Khatib SM, Benjamin EJ, Albert CM, et al. Advancing Research on the Complex Interrelations Between Atrial Fibrillation and Heart Failure: A Report From a US National Heart, Lung, and Blood Institute Virtual Workshop. *Circulation*. 2020;141(23):1915-1926.
322. Benjamin EJ, Go AS, Desvigne-Nickens P, et al. Research Priorities in Atrial Fibrillation Screening: A Report From a National Heart, Lung, and Blood Institute Virtual Workshop. *Circulation*. 2021;143(4):372-388.
323. Benjamin EJ, Al-Khatib SM, Desvigne-Nickens P, et al. Research Priorities in the Secondary Prevention of Atrial Fibrillation: A National Heart, Lung, and Blood Institute Virtual Workshop Report. *J Am Heart Assoc*. 2021;10(16):e021566.
324. Al-Khatib SM, Benjamin EJ, Buxton AE, et al. Research Needs and Priorities for Catheter Ablation of Atrial Fibrillation: A Report From a National Heart, Lung, and Blood Institute Virtual Workshop. *Circulation*. 2020;141(6):482-492.
325. Bozkurt B, Fonarow GC, Goldberg LR, et al. Cardiac Rehabilitation for Patients With Heart Failure: JACC Expert Panel. *J Am Coll Cardiol*. 2021;77(11):1454-1469.
326. Goff DC, Khan SS, Lloyd-Jones D, et al. Bending the Curve in Cardiovascular Disease Mortality: Bethesda + 40 and Beyond. *Circulation*. 2021;143(8):837-851.
327. Fremont A, Kim AY, Bailey K, et al. One In Five Fewer Heart Attacks: Impact, Savings, And Sustainability In San Diego County Collaborative. *Health Aff (Millwood)*. 2018;37(9):1457-1465.
328. Cheadle A, Rosaschi M, Burden D, et al. A Community-Wide Collaboration to Reduce Cardiovascular Disease Risk: The Hearts of Sonoma County Initiative. *Prev Chronic Dis*. 2019;16:E89.
329. Frieden TR, Jaffe MG. Saving 100 million lives by improving global treatment of hypertension and reducing cardiovascular disease risk factors. *J Clin Hypertens (Greenwich)*. 2018(Greenwich).
330. Ayanian JZ, Landon BE, Newhouse JP, Zaslavsky AM. Racial and ethnic disparities among enrollees in Medicare Advantage plans. *N Engl J Med*. 2014;371(24):2288-2297.
331. Kaiser Permanente Joins the U.S. Department of Health and Human Services, the Centers for Disease Control and Prevention, and the Centers for Medicare and Medicaid Services on the Million Hearts Initiative [press release]. September 13, 2011.
332. Kaiser Permanente Colorado Hailed as Hypertension Control Champion [press release]. September 17, 2012.
333. Kaiser Permanente Northern California Recognized as 'Million Hearts Hypertension Control Champion' [press release]. February 5, 2014.
334. Kaiser Permanente Georgia Named 2015 Million Hearts® Hypertension Control Champion [press release]. May 13, 2016.
335. Wong W, Jaffe M, Wong M, Dudl RJ. Community Implementation and Translation of Kaiser Permanente's Cardiovascular Disease Risk-Reduction Strategy. *Perm J*. 2011;15(1):36-41.
336. Gold R, Hollombe C, Bunce A, et al. Study protocol for "Study of Practices Enabling Implementation and Adaptation in the Safety Net (SPREAD-NET)": a pragmatic trial comparing implementation strategies. *Implement Sci*. 2015;10:144.