



Published in final edited form as:

Stroke. 2020 November ; 51(11): 3425–3432. doi:10.1161/STROKEAHA.120.030427.

Interventions Targeting Racial/Ethnic Disparities in Stroke Prevention and Treatment

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Abstract

Systemic racism is a public health crisis. Systemic racism and racial/ethnic injustice produce racial/ethnic disparities in health care and health. Substantial racial/ethnic disparities in stroke care and health exist and result predominantly from unequal treatment. This special report aims to summarize selected interventions to reduce racial/ethnic disparities in stroke prevention and treatment. It reviews the social determinants of health and the determinants of racial/ethnic disparities in care. It provides a focused summary of selected interventions aimed at reducing stroke risk factors, increasing awareness of stroke symptoms, and improving access to care for stroke because these interventions hold the promise of reducing racial/ethnic disparities in stroke death rates. It also discusses knowledge gaps and future directions.

Introduction

“Of all the forms of inequality, injustice in health is the most shocking and inhuman.”

Martin Luther King, Jr, Associated Press, March 26, 1966

Systemic racism is a public health crisis. Systemic racism and racial/ethnic injustice lead to racial/ethnic disparities in health care and health. This public health crisis demands

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Disclosures: Dr. Levine and Dr. Nguyen-Huynh disclose grant funding from the National Institutes of Health. Other authors declare that disclosures are none.

interventions to eliminate racial/ethnic disparities in health care so that all individuals have equal opportunities to experience excellent health. Stroke is a model disease that reflects how the United States should eliminate racial/ethnic disparities in health care and health. Stroke is a leading cause of death and disability in adults. Effective treatments can prevent and treat stroke. Substantial racial/ethnic disparities in stroke exist. Stroke mortality rates are higher in Black Americans, American Indians, Alaska Natives, Native Hawaiians, and Other Pacific Islanders, compared with White Americans.¹⁻³ From 2000 to 2010, Mexican Americans lost their survival advantage after stroke compared with non-Hispanic White Americans.⁴

Racial/ethnic disparities in stroke care are well documented and result mainly from unequal treatment.^{5, 6} Gaps in the translation of evidence-based treatments to prevent or treat stroke into real-world clinical settings prevent minority patients from getting them. The goal in the care of patients who have (or are at risk for) stroke should be achievement of equity in care, because it is just and racial/ethnic equity saves more lives than medical advances. For example, evidence suggests that 700,000 more United States deaths would have been averted with equalizing mortality rates between White individuals and Black individuals than would have been saved by medical advances between 1991 and 2000.⁷

This special report aims to summarize selected interventions to reduce racial/ethnic disparities in stroke prevention and treatment. It reviews the social determinants of health and the determinants of racial/ethnic disparities in care. It provides a focused summary of selected interventions aimed at reducing stroke risk factors, increasing awareness of stroke symptoms, and improving access to care for stroke because they hold the promise of reducing racial/ethnic disparities in stroke death rates.¹ It also discusses the gaps and next steps.

This report summarizes presentations on this topic from the “Health Equity and Actionable Disparities in Stroke: Understanding and Problem-solving (HEADS-UP)” symposium held in Los Angeles, California on February 18, 2020. This symposium is a multidisciplinary scientific forum focused on racial/ethnic disparities in cerebrovascular disease, with the overarching goal of reducing disparities in stroke and accelerating the translation of research findings to improve outcomes for racial/ethnic minorities who reside in the United States. It is a collaborative initiative with the National Institute of Neurological Disorders and Stroke and the American Stroke Association. It provides opportunities for researchers from diverse scientific and professional disciplines to discuss cutting-edge research about racial/ethnic disparities in stroke.

Social Determinants of Cardiovascular Disease

The risk and outcomes of cardiovascular disease (CVD), including stroke, are not distributed randomly throughout society. Instead, CVD risk and outcomes disproportionately affect some groups more than others, including certain racial/ethnic minorities. For example, from young adulthood to middle age, Black individuals, especially women, are at markedly higher risk of hypertension, independent of geography.⁸ These racial differences in hypertension incidence contribute to racial differences in CVD mortality, including stroke mortality.

Narrowing these gaps by addressing the social determinants of cardiovascular health is the best chance we have to reduce death and disability from CVD in the United States.⁹

The World Health Organization defines the social determinants of health broadly as “the circumstances in which people are born, grow, live, work, and age, and the systems put in place to deal with illness.”¹⁰ It created a Commission on Social Determinants of Health that developed an evidence-based conceptual framework.¹⁰ Socioeconomic position, race, ethnicity, social support, culture, language, access to care, and residential environment affect the distribution of CVD risk and outcomes and the distribution of resources to prevent and treat CVD. These social factors are inter-connected and have bi-directional relationships with each other, the health care system, and health distribution, including CVD. They also interact with individual genes, biology, and behaviors. Moreover, these social factors are influenced by larger socioeconomic and political forces that may constrain educational, financial, and residential opportunities at the group and individual levels. A separate paper in the series from the HEADS-UP symposium¹¹ further addresses the social determinants of health. Next, we discuss the determinants of racial/ethnic disparities in stroke care.

Determinants of Racial/ethnic Disparities in Stroke Care

Before we summarize selected interventions to reduce racial/ethnic disparities in stroke prevention and treatment, it is helpful to understand the determinants of racial/ethnic disparities in care. The Institute of Medicine developed a framework and defined potential sources of racial/ethnic disparities in health care at the patient-, provider-, system-, and policy-level factors.⁵ Patient-level factors include treatment preferences, minority patient mistrust, experiences of discrimination, treatment adherence, health literacy, and use of clinical services.⁵ Provider-level factors include provider prejudice, unconscious bias, lack of cultural competency, discordance in patient-provider race, and lack of underrepresented minority (URM) providers. Health systems-level factors include access to care and quality of care. Policy-level factors include health insurance, resource allocation, policies at the macro-economic, social, and health levels, cultural and societal norms/values, and structural racism. Bailey ZD et al. define structural racism as “the totality of ways in which societies foster race-ethnic discrimination, through mutually reinforcing inequitable systems (e.g., in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice) that in turn reinforce discriminatory beliefs, values, and distribution of resources, which together affect the risk of adverse health outcomes”.¹²

Interventions

The Institute of Medicine’s framework is useful for conceptualizing the factors and levels that serve as potential sources for racial/ethnic disparities in stroke care. However, some interventions operate at multiple levels, such as patient and provider or provider and system. So presenting interventions strictly by patient-, provider-, system-, or policy-level can be complicated. For this reason, we have organized the focused summary of selected interventions by their intended aims. In particular, we summarize selected interventions aimed at reducing stroke risk factors, increasing awareness of stroke symptoms, and improving access to and quality of care for stroke because these interventions have the

potential to reduce racial/ethnic disparities in stroke death rates.¹ We present selected interventions based on input from the authors and reviewers. We did not perform a systematic review and apologize for any omitted intervention study. We prioritized the inclusion of interventions tested in randomized controlled trials (RCTs). Researchers tested the interventions in RCTs except where noted. Trials are full-scale unless described as pilot trials. Outcomes are primary except where defined as secondary. Results are final unless designated as preliminary.

Interventions Aimed at Reducing Stroke Risk Factors

Many interventions aimed at reducing stroke risk factors and reducing racial/ethnic disparities have focused on improving the control of high blood pressure (BP), diabetes, and multiple vascular risk factors. We will focus on these areas because fewer interventions have focused on other vascular risk factors (e.g., smoking).

Hypertension

High BP is a major risk factor for stroke and one of the top contributors to racial/ethnic disparities in health.^{13, 14} Black individuals tend to have an earlier age of onset, a longer duration, and a greater severity of high BP than White individuals. Black and Hispanic individuals are more likely to have worse BP control than White individuals,¹⁵ and they are also more likely to have detrimental brain effects from high BP, namely stroke,¹⁶ cognitive dysfunction,¹⁷ and greater white matter hyperintensity volume.^{18, 19} For example, the impact of high BP levels on stroke risk is 3-fold greater for Black individuals than for White individuals.¹⁶ Eliminating the Black-White disparity in BP control would avert thousands of deaths from cardiovascular disease (CVD)¹⁴ and reduce dementia risk¹⁷ in Black Americans. Among Hispanic Americans, we know that some sub-populations, such as Mexican Americans, have greater increases in BP-related mortality over time than White Americans.²⁰ However, we do not know how eliminating the Hispanic-White disparity in BP control affects CVD mortality and dementia risk in Hispanic Americans.

Hypertension – Primary Prevention

Among patients without a history of stroke or transient ischemic attack (TIA), RCTs have shown that interventions aimed at improving the control of high BP in minority populations are effective. In the Shake Rattle & Roll trial, hypertensive Black patients in an integrated health care system were randomized to 1 of 3 arms: 1) usual care; 2) enhanced monitoring of current pharmacotherapy protocol; and 3) lifestyle arm with a culturally tailored diet and lifestyle coaching intervention focusing on the Dietary Approaches to Stop Hypertension plan.²¹ Preliminary results from the trial revealed that patients in the lifestyle arm had better BP control than those in the usual care arm at the end of the study and at 12-month follow-up.²² Further research is needed to assess the most cost-effective way to implement health coaching into clinical practice. Among Black male barbershop patrons with uncontrolled hypertension, the combination of health promotion by barbers and medication management in barbershops by specialty-trained pharmacists resulted in more substantial BP reduction at six months and 12 months than health promotion by barbers alone.^{23,24} We need to understand better how to implement the barbershop intervention on a broad scale.

Interventions targeting the neighborhood also seek to reduce stroke risk factors in minority populations. For example, in a randomized social experiment, women (65% black and ~30% Hispanic) who received housing vouchers providing the opportunity to move from a neighborhood with a high level of poverty to one with a lower level of poverty demonstrated modest but likely meaningful reductions in the prevalence of extreme obesity and diabetes.²⁵ It is unclear what specific characteristics of the lower poverty neighborhoods explain its association with better health outcomes. The effects of the housing vouchers on the health of the women's children and results of additional ongoing studies of neighborhood interventions on vascular risk factors are forthcoming.

Hypertension – Secondary Prevention

Among survivors of stroke or TIA, several RCTs have tested interventions aimed at reducing BP (primary outcome) in minority populations and results have been mixed. Preliminary results show that a telehealth intervention led to a significant drop in systolic BP in Black and Hispanic stroke survivors who received care in a public health system in New York City.²⁶ Among Black and Hispanic post-stroke, home care patients, the addition of a 30-day nurse practitioner transitional care program with/without a 60-day health coach program to usual care was not associated with a significant change in systolic BP.²⁷ A culturally tailored, skills-based educational intervention with telephone follow-up did not reduce systolic BP more than standard discharge care in a diverse racial/ethnic cohort of patients with mild/moderate stroke/TIA.²⁸ A multi-component intervention consisting of clinics with advanced practice providers, self-management support, group clinics, report cards, decision support, and ongoing care coordination did not reduce systolic BP compared with usual care.²⁹

Diabetes

Black Americans, American Indians, Alaska Natives, Native Hawaiians, Other Pacific Islanders, and Asian individuals are more likely to have diabetes than White individuals with variations in subgroups of Hispanic and Asian populations.³⁰⁻³² Racial/ethnic minorities have higher rates of diabetes-related complications, including renal disease. Diabetes might also increase the risk of stroke more in Black individuals than in White individuals.³³

A systematic review summarized interventions aimed at improving diabetes control in racial/ethnic minorities, particularly Black and Latino individuals.³⁴ Evidence from RCTs has demonstrated the effectiveness of interventions targeting patients (e.g., culturally tailored education and peer support to improve self-management), providers (e.g., education and individualized feedback), and health systems (e.g., case and/or clinical management by nurse providers).³⁴ Since the systematic review's publications, two RCTs demonstrate that these interventions are effective in racial/ethnic minorities other than Black and Latino individuals. An intervention consisting of group education sessions, counseling, and behavioral coaching by nurses and community health workers reduced glycosylated hemoglobin in Korean Americans with diabetes.³⁵ A translated, culturally tailored version of the effective Diabetes Prevention Program-based lifestyle intervention lowered glycosylated hemoglobin and weight in Chinese immigrants at risk of diabetes.³⁶

Multiple Vascular Risk Factors

Some interventions have focused on reducing multiple risk factors for stroke simultaneously in stroke-free patients and stroke/TIA survivors and results have been mixed. The Stroke Health and Risk Education (SHARE) RCT tested a church-based, 1-year, multicomponent, behavioral intervention to improve dietary sodium, fruit and vegetable intake, and physical activity in stroke-free Hispanic and White Americans; the intervention increased fruit and vegetable intake, but not the other primary outcomes.³⁷ A peer-led, stroke prevention, self-management group workshop did not reduce the primary outcome (a composite of controlled BP, low-density lipoprotein cholesterol and use of antithrombotic medications) at six months but modestly improved BP control among a diverse racial/ethnic population of stroke/TIA survivors in New York City.³⁸ The Secondary Stroke Prevention by Uniting Community and Chronic care model teams Early to End Disparities (SUCCEED; [ClinicalTrials.gov Identifier: NCT01763203](https://clinicaltrials.gov/ct2/show/study/NCT01763203)) trial tested a multi-component intervention designed to improve vascular risk factor control and delivered by an advanced practice clinician-community health worker team among a diverse racial/ethnic population of stroke/TIA survivors in the Los Angeles County safety-net setting; results are pending.³⁹

Among minorities and diverse racial/ethnic populations, interventions aimed at reducing BP tend to be more effective when used for primary prevention rather than secondary prevention. Interventions effectively improve glycemic control; however, more research in Alaska Natives, Native Hawaiians, Other Pacific Islanders and Asian individuals is needed. Interventions aimed at reducing multiple vascular risk factors tend to have modest effects on one risk factor. We need more research on effective interventions aimed at reducing racial/ethnic disparities in vascular risk factors at the patient- and neighborhood-level.

Interventions Aimed at Increasing Awareness of Stroke Symptoms

Delays in hospital arrival lead to underuse of acute stroke treatments. Black patients are more likely than White patients to delay in presenting to the hospital after stroke onset.^{40, 41} Differences in timeliness of hospital presentations for stroke between other racial/ethnic minorities and White patients are unclear. However, recognition of stroke by pre-hospital providers is lower among Hispanic and Asian patients, compared with non-Hispanic White patients.⁴²

Interventions have aimed to increase awareness of stroke symptoms to reduce racial/ethnic disparities in timely hospital arrival after stroke onset. An intervention consisting of enhanced educational materials with/without interactive in-hospital sessions increased the proportion of stroke/TIA survivors arriving to the emergency department within three hours of stroke symptom onset, including within racial/ethnic minorities.⁴³ The HipHop Stroke intervention, a 3-hour multi-media stroke literacy intervention, increased stroke preparedness among economically disadvantaged minorities with sustained effects at 3-month follow-up.⁴⁴ Among Black beauty shop clients, beauticians' stroke education improved knowledge of stroke warning signs and calling 911 at six weeks and this improvement in knowledge was sustained for five months in a single-arm trial.⁴⁵ A classroom instruction intervention increased knowledge of stroke pathophysiology, stroke symptoms, and what to do for witnessed stroke among middle-school children in a

community of Mexican Americans and non-Hispanic White Americans.⁴⁶ Altogether, evidence from RCTs show that interventions can be effective at increasing awareness of stroke symptoms in Black and Hispanic populations. There has been relative few interventions designed to increase stroke knowledge targeting non-English speaking populations.⁴⁷

Interventions Aimed at Improving Access to Care and Quality of Care

In the United States, Black and Hispanic individuals have worse access to care than White individuals.⁴⁸ Black and Hispanic patients are also more likely than White patients to receive care at low-quality hospitals with worse clinical outcomes.⁴⁹ For example, patients with acute myocardial infarction at the worst hospitals had 7–10 percent higher odds of death compared to patients with those conditions admitted to the best hospitals.⁴⁹ Among stroke patients, Black and Hispanic individuals are less likely to receive intravenous thrombolysis^{50, 51} and mechanical thrombectomy⁵¹ than White individuals. Even at hospitals participating in a quality-improvement program, Black stroke patients received fewer evidence-based treatments, namely intravenous thrombolysis, anti-thrombotic medications, and anticoagulants for atrial fibrillation than Hispanic and White patients.⁵² Black and Hispanic individuals, compared with White individuals, are less likely to undergo carotid artery revascularization, have higher rates of inappropriate carotid endarterectomy mostly due to higher co-morbidity, and have worse outcomes after revascularization.^{53, 54} In the outpatient setting, physician practices serving minority populations in the United States often have greater difficulties accessing specialist care.⁵⁵ Among American stroke survivors 65 and older, Black individuals and Mexican Americans have worse access to physician care and medications than White individuals.⁵⁶

Interventions designed to improve access to care and the quality of care relevant to stroke prevention and treatment have been evaluated and implemented. Among stroke/TIA patients (20–30% non-White) at 40 hospitals, a comprehensive post-acute stroke transitional care management program did not increase the primary outcome of functional status measured by the Stroke Impact Scale-16; however, it significantly increased self-reported home BP monitoring.⁵⁷ Evidence from a countywide policy intervention to improve care for a related acute cardiovascular condition, acute myocardial infarction, has findings highly relevant to stroke. A pre-post study without a control group suggests that an Emergency Medical Services-led program of coordinated and standardized Emergency Medical Services and hospital-based systems of care reduced time from 911 contact to reperfusion, improved the quality of ST-segment elevation myocardial infarction care, and reduced racial/ethnic disparities in care.⁵⁸

Relatively few interventions have targeted health care providers, particularly White providers, to recognize their own implicit racial/ethnic biases that might contribute to racial/ethnic disparities in care. Although the association between patient-provider concordance and beneficial health outcomes in minorities is unclear,⁵⁹ patients prefer and are more satisfied with race-concordant providers.⁶⁰ Nevertheless, Hispanic, Black, and American Indian providers are underrepresented. Interventions are underway to diversify the health professions and increase URM providers. A single-center survey of implicit racial bias in

medical school admissions found that medical school faculty and students have high levels of implicit White preference, particularly faculty and men; most survey respondents thought the Black-White implicit association test might help reduce implicit racial bias.⁶¹ Effective strategies and programs that enhance racial/ethnic faculty diversity in academic departments of medicine have been identified but they are underused.⁶² The HEADS UP symposium seeks to further increase URMs in the academic workforce. Early career scholars receive travel stipends to the symposium, present their disparities research, and participate in career development sessions.

Policy interventions targeting health insurance and medicine copayments have reduced racial/ethnic disparities in access to care for stroke prevention and treatment. Evidence from observational studies suggests that the Affordable Care Act and Medicaid expansion significantly increased insurance, mainly Medicaid, and decreased cost-related nonadherence to medication among American stroke survivors younger than 65.⁶³ Results from observational studies also suggest that these increases in insurance related to the Affordable Care Act reduced racial/ethnic disparities in insurance coverage.^{48, 64} Unfortunately, several states have not expanded Medicaid so minority patients in those states have not realized these benefits. In a pre-post study with a non-equivalent control, an Australian policy of copayment reductions increased medication use in Indigenous Australians, a group with higher rates of hypertension, diabetes, and hypercholesterolemia than other Australians.⁶⁵ In particular, the copayment reductions were associated with significant increases in the use of drugs that treat these conditions and prevent stroke.⁶⁵

Evidence from research in the Veterans Health administration suggests that equal access to health care and general quality improvement do not necessarily eliminate racial/ethnic disparities in health outcomes.⁶⁶ Patient-centered, culturally tailored interventions that incorporate the patient, provider, and the healthcare system are more successful at reducing disparities.⁶⁶ We need more research on patient-centered, culturally tailored interventions to reduce racial/ethnic disparities in stroke care and on how physician workforce disparities influence patient care.⁶⁷

Next Steps

Hispanic populations and sub-populations, American Indians, Alaska Natives, Native Hawaiians, and Other Pacific Islanders are underrepresented in trials of interventions to reduce racial/ethnic disparities in stroke prevention and treatment. By 2060, Hispanic individuals will make up 29% of the United States population, up from 17% in 2014.⁶⁸ The two or more races population will comprise the fastest-growing American population from 2014 to 2060; by 2060, individuals with Black race alone or in combination with one or more other races will make up nearly 18% of the total population from 14% in 2014.⁶⁸ Trials of interventions to reduce stroke disparities among underrepresented racial/ethnic populations are needed. Global health projects are also essential to address racial/ethnic disparities in stroke prevention and treatment outside the United States.

We need more trials recruiting and treating minority patients in non-traditional settings (e.g., barbershops and churches) and using mobile health technology interventions delivered by

non-physicians (e.g., advanced practice providers, pharmacists, and community health workers) because we need to meet patients where they are. Among rural individuals in China and India with high cardiovascular risk (10% stroke, 75+% hypertension), a vascular risk factor management program delivered by community health workers through a smartphone-based electronic decision support system increased self-reported anti-hypertensive medication use at 1-year follow-up (a 25% absolute increase).⁶⁹ A pilot RCT demonstrated the feasibility of evaluating a mobile health technology intervention and recruiting people with uncontrolled hypertension from emergency departments;⁷⁰ a larger phase II trial is underway. Additional trials of interventions designed to improve access to care and quality of care for minority patients with or at risk for stroke are required. It is necessary to train and mentor more stroke disparities researchers in implementation science to accomplish this important research work.

Conclusions

Substantial racial/ethnic disparities in stroke health and health care persist in the United States. Interventions have aimed at reducing stroke risk factors among minorities and diverse racial/ethnic populations. Interventions to reduce BP have been more successful for primary prevention than for secondary prevention. Interventions have been effective at improving glycemic control particularly in Black, Latino, and Asian individuals. Multiple interventions have been increased awareness of stroke symptoms in minority populations, yet stroke awareness and timely stroke treatment remain sub-optimal. Interventions involving health insurance and copayment reductions have improved access to care for minority patients with or at risk for stroke. Still, the persistence of racial/ethnic disparities in stroke health care and health in the United States demands stronger, bolder action. To achieve the goal of equity in the care of patients with or at risk for stroke, we need to identify and disseminate additional cost-effective interventions to further reduce racial/ethnic disparities, improve the control of stroke risk factors, increase stroke awareness, and improve access and quality of stroke care. We also need to train and mentor a new generation of stroke disparities researchers who can perform implementation science. Achieving the goal of equity in the care of patients with or at risk for stroke warrants nothing less.

Non-standard Abbreviations and Acronyms

BP	blood pressure
CVD	cardiovascular disease
HEADS-UP	Health Equity and Actionable Disparities in Stroke: Understanding and Problem-solving symposium in Los Angeles, California, on February 18, 2020
RCTs	randomized controlled trials
SHARE trial	The Stroke Health and Risk Education trial
SUCCEED trial	Secondary Stroke Prevention by Uniting Community and Chronic care model teams Early to End Disparities trial

TIA	transient ischemic attack
URM	underrepresented minority

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