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Achieving Health Equity in Hypertension Management Through Addressing the Social Determinants of Health

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Abstract

Purpose of Review The goals of this paper were to examine recent literature on the social determinants of health as they relate to hypertension and cardiovascular disease, and discuss relevance to the practice of emergency medicine.

Recent Findings Social determinants of health, defined by the World Health Organization as "the conditions in which people are born, grow, live, work, and age" (https://www.who.int/social_determinants/thecommission/en/) play a complex role in the development of hypertension and cardiovascular disease and the persistence of racial disparities in related health outcomes. Deciphering the independent association between minority status and social determinants in the United States is challenging. As a result, much of the recent interventional work has targeted populations by race or ethnicity in order to address these disparities.

Summary There is opportunity to expand the work on social determinants of health and hypertension. This includes exploring innovative approaches to identifying at-need individuals and breaking down traditional siloes to develop multidimensional interventions. New funding and payment mechanisms will allow for providers and health systems to identify and target modifiable social determinants of health at the level of the individual patient to improve outcomes.

Keywords Disparities · Social determinants of health · Race · Ethnicity · Population health · Innovative care models

Introduction

Nearly one-half of adults in the United States (US) have hypertension according to the newest diagnostic criteria [1], and it accounts for over 42 million primary care office visits [2]. Moreover, an estimated $48.6 billion per year in direct medical costs and lost productivity is attributable to hypertension [3]. While awareness and treatment rates are similar across races and ethnicities, hypertension is most prevalent (42–59%) [1, 4] among non-Hispanic blacks yet control is highest among non-Hispanic whites (50.8%) [4]. Such disparity suggests the importance of factors beyond diagnosis and treatment with anti-hypertensive medications in successful management at both the individual patient and population levels.

Health expenditures are responsible for 17.9% of the gross domestic product in the US despite major health policy reforms [5]. Even so, health outcomes fail to keep up with other comparably developed nations. The US ranks 26th among countries participating in the Organisation for Economic Cooperation and Development (OECD) for life expectancy, despite outpacing all other member countries in spending [6]. A mounting body of literature strongly suggests that this gap between the availability of adequate medical treatment and the realization of improvement in health outcomes and reduced costs can be attributed in large part to causes that fall outside the scope of traditional medical care [7].

The influence of socioeconomic status, living and working circumstances, and environmental conditions—collectively known as the social determinants of health (SDH)—on the development of disease is not a novel concept. The connection between poverty and sickness has been acknowledged and documented for centuries [8]. It is the ability to quantify the contribution of these factors on the progression of a particular disease state or to overall health status that is relatively new to our

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understanding. One model, County Health Rankings, estimates that social and economic factors, namely education, employment, income, social support, and community safety, contribute twice as much as clinical care to individual health status [9]. Perhaps more important is the recognition among health systems and professionals that improved outcomes will not be achieved with the conventional, siloed approach that includes formal diagnosis and treatment under the purview of the medical system, while firmly situating social and economic factors in the sphere of public health or social service institutions.

Emergency departments (EDs), in particular, are well-positioned to observe the intersection of chronic disease and the socioeconomic factors that cause and exacerbate it. The following are all examples of socioeconomic influences on outcomes seen in the ED: newly diagnosed hypertension in an individual with access to very little unprocessed, low-sodium food; poorly controlled chronic hypertension in a patient with low educational attainment who does not comprehend their medication regimen; and a hemorrhagic stroke in a patient with long-standing hypertension who lost insurance coverage through an employer and no longer has access to treatment.

Defining the Social Determinants of Health

The World Health Organization (WHO) offers a broad, multidimensional definition of SDH, describing them as "the conditions in which people are born, grow, live, work, and age" [10]. While the SDH have no consensus operational definitions, income level, educational attainment, employment status, and neighborhood socioeconomic factors are associated with cardiovascular outcomes in high-income nations [11••]. They appear to play a dual role in the development of cardiovascular disease both independently and through higher rates of biological (hypertension, dyslipidemia, diabetes) and behavioral (smoking, physical inactivity, poor diet) risk factors. The role of hypertension as a mediator of this relationship is particularly complex given that it is a diagnosis itself and may have root cause in the SDH as well. The following section discusses the role of SDH on cardiovascular outcomes, with particular focus on the function of hypertension as a mediating factor.

Income

Income exerts influence at the individual and local geographic levels. In an analysis of Finnish and American cohorts, Kucharska-Newton et al. observed a higher risk of sudden cardiac death among low-income individuals compared with their wealthier counterparts [12]. There was also a higher prevalence of hypertension among the low-income group. A separate study found that lower neighborhood-level income was associated with increased mortality post-myocardial infarction, even after controlling for cardiovascular risk factors including a clinical diagnosis of hypertension [13]. These authors suggest that neighborhood income may serve as a "contextual effect" or as a proxy for other unmeasured socioeconomic variables. Cardiovascular risk has also been noted to be greater among individuals with income volatility (defined as $\geq 25\%$ income decrease between evaluation periods), suggesting that the interaction may be more dynamic than static [14].

Education

Kershaw et al. conducted a study to assess the relationship between low educational attainment, multiple other risk factors (smoking, physical inactivity, poor diet, hypertension, diabetes, or hypercholesterolemia), and the incidence of coronary heart disease. They found that 43% of the risk of coronary heart disease among those of low educational attainment is not attributable to behavioral or biological risk factors. In addition, when performing path analyses to assess for mediating effects of the various risk factors on the causal pathways of others, they found that the effect of hypertension was significantly reduced (down to 5.3% from 13.3%) when included in a model with other behavioral risk factors as compared with a model in which it was a single risk factor [15•]. The latter highlights the complex interplay between hypertension and SDH, showing just how difficult it is to tease out independent effects.

Employment Status

In a large prospective cohort study, Dupre et al. found that job loss was associated with a 35% increase in risk for acute myocardial infarction within a year. Furthermore, lifetime incidence of job loss had a cumulative effect on risk for acute myocardial infarction. This risk was not attenuated after adjusting for potential confounders including smoking and hypertension [16].

Neighborhood

Using a composite score of neighborhood advantage, Diez Roux et al. estimated that living in the most disadvantaged neighborhood increased the risk of coronary heart disease by 70 to 90% in whites and 30 to 50% in blacks. This effect remained when controlling for individual income, education, and occupation as well as biological and behavioral risk factors [17]. In regard to hypertension specifically, a study of six sites examining various neighborhood characteristics revealed that the incidence of hypertension was significantly lower in areas with healthy food options. Although safety, social cohesion and walkability were also examined, they did not appear related to the development of hypertension [18].

While these prior studies have tried to look at the SDH and hypertension as separate risk factors for cardiovascular

disease, they have been unable to untangle the effects of these factors. In reality, hypertension and the SDH appear to operate both in parallel as separate risk factors for poor cardiovascular outcomes and serially, with the SDH leading to the development of hypertension (Fig. 1). Thus, these studies support the notion that the SDH are important in impacting both to the development of hypertension and confer additional risk for poor cardiovascular outcomes.

Hypertension, Race/Ethnicity, and SDH—Descriptive Studies in the United States

A discussion of the SDH and hypertension in the US would be incomplete without acknowledging racial disparities. Markers of socioeconomic status are often studied alongside or in the context of race. In the following, we highlight several examples of recent work.

An analysis of Behavioral Risk Factor Surveillance System (BRFSS) data by Gebreab et al. found that states in the southeast region of the US had higher rates of poor cardiovascular health, including self-reported hypertension. State-level differences in resource availability and median household income explained some of the variation, but a majority (51%) was attributable to minority status and low socioeconomic status at the level of the individual [19]. A full discussion of the specific mechanisms through which minority populations may experience higher rates of hypertension and lower rates of adequate control is beyond the scope of this paper. Yet, it is important to note that race likely plays a role as a social factor (in addition to its role as a proxy for certain genetic predispositions) in the initial development and the control of hypertension. In a study of race-consciousness or "an awareness of one's stigmatized status," blacks were five times more likely than whites to think about race. Blacks that were categorized as race-conscious had significantly increased diastolic blood pressure [20•]. Cummings et al. found that lower perceived social standing among blacks was associated with hypertension medication nonadherence. Lower medication adherence rates in this group was then linked to higher systolic blood pressure [21]. In national samples, blacks tend to have lower self-ratings of health status than whites, but in low-income, urban environments, these differences are attenuated. Both whites and blacks of low socioeconomic status have worse self-rated health than their wealthier counterparts [22, 23]. This emphasizes that poverty is an important determinant of health status, but also indicates that the larger social context has a role in perceptions of health among minority groups.

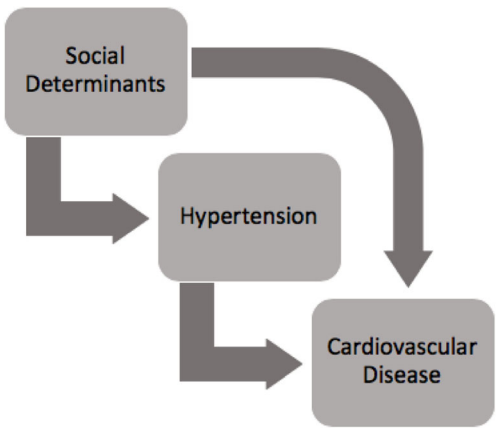

Fig. 1 Impact of the social determinants of health and hypertension on the development of cardiovascular disease

Although not intended to serve as a comprehensive review of the literature, these findings underscore the particular complexity of studying the SDH in the United States. Membership in racial or ethnic groups appears to operate as both an independent determinant of health status and a mediating factor. In other words, the social construct of race itself may be considered one of the "conditions in which people are born, grow, live, work, and age" alongside other markers of socioeconomic status. The Office of Disease Prevention and Health Promotion recognizes social norms, including racism, as a SDH [24]. However, certain racial minorities disproportionately experience disadvantageous income status, educational attainment, employment status, and neighborhood factors, further confounding the relationship. We do know that together, these conditions mediate exposures that contribute to the development of disease as well as access to preventive resources and treatments.

Interventional Studies

Presumably due to the well-documented and oft-cited health disparities among racial and ethnic groups, interventions aimed at addressing the social determinants of hypertension often define their target populations in terms of race or ethnicity. In the following, we chose not to discuss studies that used race or ethnicity to define their target populations only to intervene directly upon traditional risk factors for hypertension and poor cardiovascular outcomes (e.g., smoking, obesity) through conventional interventions such as implementing guideline-based care or encouraging lifestyle modifications within that group. Instead, we highlight work that addresses hypertension by incorporating methods that targeted upstream determinants of health that may mediate the relationship between minority status and the development or proper control of hypertension (see Fig. 2).

The Community Outreach and Cardiovascular Health (COACH) randomized controlled trial utilized teams of community health workers led by nurse practitioners to improve cardiovascular disease risk, including hypertension, among patients of an urban federally qualified health center [25•]. The patient participants were predominantly black, low-

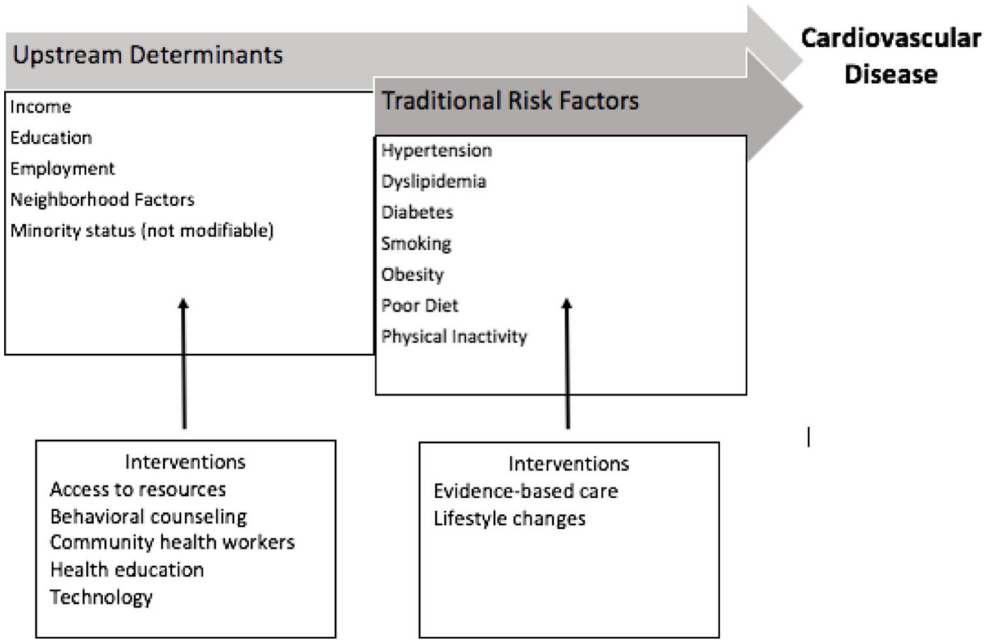

Fig. 2 Interventions targeting the upstream determinants of health

income, and publicly insured and were medically treated by nurse practitioners according to well-defined algorithms for the treatment of hypertension, hyperlipidemia, and hyperglycemia. Additionally, the intervention aimed to support lifestyle changes, namely medication adherence, healthy diet, increase in physical activity, and smoking cessation, through behavioral modifications. Community health workers discussed individual barriers to success and came up with tailored solutions. At 12 months, participants in the intervention group had a significant decrease in systolic and diastolic blood pressure as compared with the usual care group. This was true of other markers of cardiovascular disease risk as well. The intervention group also displayed significantly greater scores on self-assessments of the success of their chronic illness management.

Miller et al. conducted a randomized controlled trial based in an urban primary care office to test the efficacy of an enhanced diet intervention on control of hypertension. Participants in the intervention group were coached through specific weekly food choices with the goal of increasing potassium and decreasing salt. The comparison group was given a brochure with information on the DASH diet. Both received money for and delivery of these purchases through a partnership with a local market. This study was designed with input from the local community who had expressed difficulty with making and obtaining healthy food choices. Results after 8 weeks revealed that participants in the intervention group reported eating more fruits and vegetables and had increased excretion of potassium in the urine—indicating greater dietary consumption [26]. While participants in the intervention group did not show significant results for the primary outcome of reduced blood pressure at the end of the 8 weeks, the improvement in diet among the trial group emphasizes the positive impact on lifestyle modification that can be achieved with behavior modification, education, and community partnership.

Ephraim et al. describe Achieving Blood Pressure Control Together (ACT), a protocol for a randomized controlled trial still underway that aims to address personal, clinical, and community barriers to hypertension control by placing urban, African-American patients in one of three intervention arms: "(1) an educational intervention led by a community health worker alone, (2) the community health worker intervention plus a patient and family communication activation intervention, or (3) the community health worker intervention plus a problem-solving intervention" [27]. While outcomes have not yet been determined, this work is innovative in its use of community health workers to address gaps in education among the low-literacy patient population in all three treatment arms. Furthermore, the third arm of the study seeks to manage health behaviors through the self-identification of patient barriers paired with problem-solving skills.

Finally, we identified an ongoing randomized controlled trial that uses technology to facilitate patient education and self-efficacy. Specifically, the trial is testing the efficacy of a mobile health intervention to increase blood pressure control among African-American participants who are specifically recruited from urban EDs. The trial employs MI-BP, a smartphone-based application, to target multiple hypertension-related health behaviors. The application provides a tracking and goal setting function for at-home blood pressure monitoring, physical activity, and sodium intake. Participants also receive educational and motivational messaging to supplement individualized medication adherence reminders. The investigators expect that the utilization of

widely adopted mobile technology and the multidimensional focus of the intervention will lead to effective self-management and ultimately better blood pressure control [28].

Future Directions

The prevalence of hypertension in the US has remained persistently high for decades. Disparities among populations continue to exist despite efforts that appear to increase awareness and treatment rates within those populations; associated healthcare costs also remain high. In the case of hypertension, further exploration of SDH is fundamental to understanding and addressing disease development as well as the persistence of disparities among populations. At both the healthcare system and provider levels, there is a need to develop innovative methods to modify factors that affect health before a patient appears in the office or ED with symptoms.

The Johns Hopkins Center to Eliminate Cardiovascular Health Disparities is an example of an innovative community-academic partnership developed to address inequities in cardiovascular outcomes. The Center engages the community on multiple levels. Community members are part of the Community Advisory Board with responsibilities such as guiding the mission of the Center, identifying needs in the community around hypertension prevention and control, and reviewing study proposals for acceptability and feasibility [29••]. Additionally, the Center pushes the boundaries of the healthcare system's conventional role by engaging in public forums to share knowledge with the community and advocating for policy changes at the local and national levels.

There has been significant recent recognition of the importance of addressing SDH both domestically and globally. Over a decade ago, the WHO called for eliminating profound health inequities—"closing the gap in a generation"—by addressing SDH [10]. Healthy People 2020 followed suit and cited the creation of "social and physical environments that promote good health for all" as one of the four overarching goals of the decade [24], adding the SDH as a new topic area compared with Healthy People 2010. The Affordable Care Act created Medicaid waivers to empower state and local communities to address the SDH with interventions that are designed to address the unique needs of various communities [30]. The Creating High Quality Results and Outcomes Necessary to Improve Chronic (CHRONIC) Care Act creates opportunity for the payment and delivery of expanded services, not traditionally covered by health insurance, for adults with complex health needs [31].

Conclusion

While race and ethnicity are not modifiable risk factors, other factors that are often interwoven, such as education and neighborhood characteristics, are amenable to intervention. With these recent policy changes supporting innovative care models, there is great opportunity to implement studies that better address upstream determinants. New medical record technology and insurance funding mechanisms could allow for the realization of targeting individuals rather than groups with interventions tailored to modifiable factors such as education or income. ED-based screening and referral mechanisms could be established to address socioeconomic barriers to optimal management of hypertension. For example, with an address and some basic demographic data, patients may be identified as living in a food desert with limited access to healthy options and can be provided with resources to address food needs. New payment mechanisms provide for the ability to offer medical nutrition therapy in the form of medically tailored DASH diet-compliant meals. The same systems may identify another patient as having low educational attainment, thus being a candidate for educational interventions by telehealth or community health workers.

There is tremendous opportunity to expand the scope of work on SDH and hypertension and improve health equity while reducing outcome disparities. However, to achieve this, we must break down traditional silos between healthcare systems, providers, community members, public health organizations, and social welfare entities. Challenging as it may be, such multidimensional partnerships are the only way to address SDH as they relate to hypertension.

Compliance with Ethical Standards

Conflict of Interest The authors declare no conflicts of interest relevant to this manuscript.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- •• Of major importance

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