Heart Failure in Rural Communities

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KEYWORDS

• Rural health • Heart failure • Health care disparities

KEY POINTS

- Living in a rural setting has been associated with poorer health and decreased consumption of health care.
- Organizational elements, such as decreased health care providers supply, longer distance to health care centers, and low density of physicians, may contribute to adverse outcomes of chronic heart failure (CHF) in rural communities.
- Rural patients with CHF are slower to adopt healthy behaviors and have lower levels of health literacy when compared with urban patients with CHF. Interventions aimed to increase disease-related knowledge in patients with CHF may have a favorable impact on rehospitalization and quality of life.
- The challenge to improve rural CHF management involves multidisciplinary support to optimize CHF diagnosis, use of new monitoring technologies, improved therapeutic guideline adherence, and optimized outpatient self-management.

BACKGROUND

During the past century, industrialized societies underwent a major epidemiologic transition characterized by a shift of the main causes of death from infectious disease and nutritional deficiencies to more chronic, nontransmissible diseases, such as cardiovascular disease.[1] On the other hand, lower-income economies underwent an asymmetrical process characterized by progressive urbanization of large cities, rural-urban migration as a response to the perceived inequalities in wealth, and increased rural resource scarcity (**Box 1**).[2]

Today, urban communities have a higher risk-factor burden than rural communities but, nevertheless, exhibit a lower rate of adverse cardiovascular events. The Prospective Urban Rural Epidemiology (PURE) trial included 156,424 persons from 348 urban and 280 rural communities on 5 continents who were followed up for a mean of 4.1 years. Rates of all cardiovascular events as well as fatal cardiovascular events were higher in rural communities (4.83 vs 6.25 events per 1000 persons-years, $P<.001$ and 1.71 vs 3.09 events per 1000 person-years, $P<.01$, respectively). The INTERHEART risk score was higher in rural areas in high-income countries (13.43 vs 12.67, $P<.01$), but the inverse tendency was observed in middle- and low-income areas (10.11 vs 10.81, $P<.001$ and 7.57 vs 9.09, $P<.001$, respectively).[3] These disparate results (lower risk profile but higher cardiovascular mortality) suggest that health determinants other than those included in traditional risk-factor assessments are responsible in the adverse health outcomes observed in rural communities.

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Box 1
What does rural mean?

- The word *rural* is often associated with agricultural communities with low population density and variable degrees of geographic isolation. However, the operative definition of rural varies widely depending on the source and purpose.
- The US Office of Management and Budget defines a county as a metropolitan statistical area (MSA) if it contains an urban core of greater than 50,000 individuals. Any county that does not fulfill this characteristic is considered rural. Non-MSA counties can be further categorized into micropolitan (those with an urban core between 10,000 and 50,000 inhabitants) and noncore counties.
- The US Census Bureau defines urbanized areas as those with population cores of 50,000 or more inhabitants. Urban clusters have cores between 2500 and 50,000 inhabitants. All other areas are designated rural.
- The Organization for Economic Cooperation and Development defines a rural community as any local administrative unit level 2 with a population density less than 150 inhabitants per square kilometer. A predominantly rural region is a geographic area in which more than 50% of the inhabitants live in a rural community
- In India, the National Institute for Rural Development defines rural sector as any place as per the latest available census that has a population of less than 5,000, with a population density of less than 400 inhabitants per square kilometer and in which more than 25% of the male working population is engaged in agricultural pursuits.

EPIDEMIOLOGY

Traditionally, living in a rural setting has been associated with poorer health[4] and decreased consumption of health care.[5] This concern is not new; in 1966, Gibson and colleagues[6] published a first attempt to characterize chronic heart failure (CHF) epidemiology in 2 rural communities from North Carolina and Vermont and reported an increased prevalence of CHF (8.8 and 10.2 cases per 1000 habitants). The current evidence regarding the prevalence of CHF in rural versus urban communities is controversial and may exhibit considerable variation between countries. Clark and colleagues[7] performed a cross-sectional survey that included 23,845 subjects in Australia. The survey revealed a significantly higher prevalence of CHF among general practice patients in large and small rural towns (16.1%) compared with capital city and metropolitan areas (12.4%) ($P<.001$). Conversely, Yang and colleagues[8] reported a decreased prevalence in rural China using a self-reported questionnaire (1.1% vs 0.8%). The epidemiology of CHF in rural communities from other developing countries is very poorly established; for most countries, there are no published data and the available registries include hospital-based series subject to substantial selection bias.[9,10]

Even when the absolute prevalence of CHF in rural settings may seem controversial, most investigators agree that rural areas has a 1.5 higher rate of potentially preventable hospitalizations caused by chronic diseases, such as CHF; this risk has increased in the last decade despite a decline in the rate of admissions for remote rural areas.[11] This issue is also controversial, as small studies had reported a decreased rate of rehospitalization for rural patients with CHF. However, the appropriateness of this end point when assessing CHF outpatient outcomes is dubious. For instance, Wu and colleagues[12] reported a better event-free survival in rural patients with CHF using the composite end point of emergency department (ED) visits and rehospitalization; but the study was underpowered to detect a difference in death rates, and it did not account for access to health care facilities.

Several factors may influence this outcome: health care providers supply, population health literacy, distance to health care centers, increasing reliance on generalists, and so forth.[5] These factors, however, may not be consistent in all settings. Harris and colleagues[13] showed that hospitalization rates in Maine depend mainly on confounding variables, such as unemployment and poverty. Neither rurality nor physician density influenced hospitalization rates in this particular setting.

Increased prevalence and higher risk for hospitalizations contribute heavily to the increased mortality associated with heart failure in rural settings but do not fully explain the observed differences with urban patients with CHF. Several studies have tried to elucidate the causes underlying the more adverse health results in rural communities. Teng and colleagues[14] analyzed a large cohort of 17,379 Australian patients after a first CHF hospitalization. Rural patients (25.9%) were significantly younger, without significant differences in the