Universal healthcare but not universal access?

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The global burden of acute heart failure (AHF) has largely remained unchanged over the past several decades.¹ North American and European registries suggest one-year post-discharge mortality rates remain unacceptably high. Compared with stable outpatients with chronic heart failure, patients who experience an AHF exacerbation are at increased risk for one-year rehospitalization and mortality. There are many goals during hospitalization, all of which may contribute to this increased risk if not dealt with appropriately, including: 1) identifying and addressing precipitants; 2) treating comorbidities; 3) providing relief from congestion; and 4) arranging outpatient follow-up and prescribing guideline-directed medical therapy (GDMT) to facilitate a safe transition to the outpatient setting. As part of this transition process, early follow-up has been identified as an important component of avoiding early readmission and mortality.² However, early follow-up and utilization of GDMT requires several aspects of care to align, including having a provider available to arrange follow-up with, successfully scheduling the outpatient visit, having transportation to and from the provider and pharmacy, and having the resources to pay for all of these aspects of care. Theoretically, universal healthcare coverage should facilitate overcoming many of these challenges and reduce the post-discharge vulnerability in these patients.

In this issue, Andersen et al, present a Danish national cohort study evaluating one-year mortality risk among heart failure patients according to income level and educational attainment.³ The authors identified over 145,000 people above the age of 40 newly diagnosed with heart failure over a 15-year period utilizing a combination of: 1) a hospitalization for heart failure using ICD-10 codes for heart failure from the Danish National Patient Registry or 2) an outpatient diagnosis of heart failure combined with redemption of a prescription for a diuretic using the international Anatomical Therapeutical Chemical from the Register of Medicinal Product Statistics. Overall one-year mortality was 26%, which is comparable to contemporary data from the European Society of Cardiology Heart Failure Long-Term Registry.⁴ Patients with lower income levels had a greater comorbidity burden, and increased use of use of loop diuretics and spironolactone. However, the most important finding was an inverse relationship between heart failure mortality and both income and education level. They report risk differences of up to 5.8% between the lowest and highest income quartile amongst men, and a 6.6% risk difference when women with basic education were compared with those with a masters/doctoral degree, independent of the differences in comorbidity burden. Importantly, income level had a stronger association with mortality in younger than in older patients, suggesting that the difference in mortality associated with income level is caused by differences in modifiable risk factors.

Their findings are consistent with other similar analyses evaluating the association between socioeconomic status (SES) and cardiovascular disease. Low SES is associated with a greater risk for incident heart failure,⁵ and among patients with heart failure a post-hoc analysis from two clinical trials found similar results with respect to country-level socioeconomic deprivation and mortality.⁶ While these results may be subject to selection bias related to regional factors or highly selective clinical trial enrollment criteria, similar findings were seen in an analysis from a prospectively enrolled international cohort of patients with AHF. Over 18,000 patients from 44 countries were followed for one-year mortality. While there was substantial regional variation in post-discharge mortality, there were strong associations between mortality and both country income and income disparity in patients with

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heart failure with reduced ejection fraction (HFrEF), but not in heart failure with preserved ejection fraction, again suggesting that differences in mortality associated with country-level SES are caused by differences in modifiable risk factors. Similar disparities in outcomes due to socioeconomic differences have been seen in hypertension and rheumatic heart disease.\textsuperscript{7–9}

On a household level, both small and large regional cohort studies from the US suggest that economic status is related to heart failure-related quality of life and long-term survival.\textsuperscript{10,11} Importantly, a recent analysis of household income and life expectancy in Norway also suggests that death from cardiovascular disease is attributable to the decreased life expectancy seen in low income households. In total, these studies identify a recurring theme of mortality associated with socioeconomic factors and education. Many of the countries in these analyses, including Denmark in the paper by Andersen and colleagues,\textsuperscript{3} have universal healthcare coverage, which should decrease the impact of household income on health outcomes. A better understanding of the causes underlying the association between socioeconomic indicators and mortality in patients with heart failure is a prerequisite to tailoring the proposed intervention based on the modifiable risk present. There is evidence that the association between lower SES and mortality might be due to key differences in underlying latent factors including reduced health literacy, a greater burden of psychosocial risk factors, a higher prevalence of smoking/alcohol usage and obesity, and reduced access to care. In a retrospective cohort study 18\% of patients with heart failure qualified as having low health literacy. This was strongly correlated with a lower SES and associated with higher all-cause mortality rates.\textsuperscript{13} Importantly, reduced health literacy is associated with a decrease in adherence to guideline-recommended treatment and an increase in prehospital delay.\textsuperscript{13} The burden of depression is greater in patients with low SES, which might also explain the increased mortality risk. In a study from The Netherlands, 57\% of the increased risk for coronary heart disease among individuals with low SES was explained by a greater prevalence of behavioral (smoking, alcohol) and biological (obesity, diabetes) risk factors, of which smoking alone contributed more than 20\% of the risk.\textsuperscript{14} Last, mortality differences in low-income patients might be caused by differences in standard practice even in countries with universal healthcare. Patients with low income in The Netherlands were less likely to undergo interventions, including percutaneous coronary intervention, when presenting with acute myocardial infarction.\textsuperscript{15} This is even more striking in countries without a Universal Healthcare system. A recent study from the US found the low uptake of sacubitril/valsartan suggested the associated US$1685 out-of-pocket annual costs for patients on Medicare might be an important impediment for adoption of this medication.\textsuperscript{16} Programs designed to address these latent factors specifically targeting patients with low SES might include interventions targeted toward patient activation, simplified goals of heart failure care, and reducing behavioral risk factors. Further, educational interventions to emphasize the importance of treatment and long-term follow-up, and psychosocial support, may modify subsequent risk. Finally, access to care could be improved by reducing financial impediments (Figure 1).

While this analysis advances our understanding of the relationship between heart failure mortality, education and income level, there are several limitations to consider. Patients were selected from a large national registry based on ICD-10 codes. ICD-10 codes do not have the rigor of applying heart failure-specific criteria to identify index cases. For patients in the outpatient setting the authors enriched the identification process by requiring redemption of a prescription for a diuretic within 90 days. However, diuretics can be used for other disease processes exclusive of heart failure, such as hypertension. Their methods likely resulted in both over- and under-identification of patients with heart failure. They also excluded 22\% of patients due to lack of information regarding education. Finally, they were unable to adjust for important behavioral and biological risk factors, including heart failure severity.

Those limitations notwithstanding, the Andersen article\textsuperscript{3} adds to the body of literature raising significant concerns about the challenges of access to healthcare, even in a governmental-supported system providing universal access. While many of these previously discussed studies suggest that universal coverage may not be the sole answer for improving post-discharge outcomes, further research is needed to disentangle the impact of healthcare access and individual patient characteristics on outcomes. Granular prospective details are needed regarding: 1) medication prescribing at hospital discharge, especially in patients with HFrEF with multiple comorbidities; 2) the association of a prior relationship with a provider at the time of hospital discharge and the success of early follow-up; 3) successful prescription filling after hospital discharge; 4) GDMT adjustments and device utilization during outpatient follow-up; 5) development of new psychosocial and physiologic risk factors associated with increased mortality; and 6) the impact on mortality of self-care interventions tailored to the education level of the patient. If many of these risk factors prove to be modifiable, this will inform future treatment strategies.
matched to availability of local resources, with the goal of helping to improve the disappointing and unchanging post-discharge outcomes in heart failure.

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