Heart Failure Epidemic

It’s Complicated…

“In examining disease, we gain wisdom about anatomy and physiology and biology. In examining the person with disease, we gain wisdom about life.”

—Oliver W. Sacks, The Man Who Mistook His Wife for a Hat

Twenty years ago, the onset of a new epidemic of heart failure (HF) was heralded. Although an in-depth review of 2 decades of work on the HF epidemic cannot be conducted herein, several points are important to contextualize this editorial. HF is a syndrome classified according to the left ventricular ejection fraction (EF) into reduced or preserved EF. As a chronic condition with frequent exacerbations, HF is the most frequent cause of hospitalizations in the United States. To investigate this epidemic, one must accurately ascertain the incidence of HF and whether each episode is truly an incident (the first one to occur) or a recurrence. Doing so requires comprehensive longitudinal data, which are seldom available, and few studies can provide that information. Available data indicated that, until the turn of the century, the incidence of HF was mostly stable while survival was improving, leading to conclude that the HF epidemic was partly an epidemic of hospitalizations as survivors became candidates for recurrent hospitalizations. Over the past decade, evidence indicates that the incidence of HF is declining, particularly for HF with reduced EF, with no change in mortality. The proportion of HF with preserved EF has been increasing. This phenotype is incompletely understood, likely heterogeneous, and lacks specific treatment, which stalls progress against the epidemic. These observations underscore the importance of surveillance to understand how HF manifests itself according to person, time, and place, and precise surveillance is a prerequisite to plan and monitor interventions and design policies. Because most of the currently available surveillance data were generated among white populations, data in diverse populations are urgently needed.

In the present issue of Circulation, Chang and colleagues report important surveillance data from the ARIC study (Atherosclerosis Risk in Communities) on the trends over a decade in 4 US communities in acute decompensated HF (ADHF) events and outcomes. Using the rigorous approach characteristic of manually curated surveillance studies, hospitalizations were sampled from International Classification of Diseases-9 codes and candidate cases were reviewed and adjudicated to generate a validated cohort of individuals with ADHF classified into definite ADHF, possible ADHF, chronic stable HF, and unlikely or unclassifiable HF. The case status was assigned by computer or physician review. The criteria for ADHF required evidence based on symptoms, signs, imaging, or treatment of an acute exacerbation, worsening or new onset of symptoms, or decompensated circulatory state. Events were further clas-

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sified according to the EF relying on echocardiographic studies using the cut point of 50%, consistent with the guidelines. Altogether the rigorous ascertainment of cases in ARIC bestows critical validity to the data. The findings indicate that the incidence of ADHF increased over time, reflecting primarily a rise in the incidence of HF with preserved EF. Observed among all race and sex groups, the rise was particularly prominent among black women, with a striking annual yearly increase of 12.8%. Only white men experienced an increase in the incidence of HF with reduced EF. Case fatality did not change. The findings are important given the relative paucity of data on the epidemiology of HF, particularly problematic in blacks, who experience a disproportionate burden of HF. Finally, the transition toward HF with preserved EF is important to further document.

These results are important to contextualize in light of previous reports on the same time period. Using the National Inpatient Sample, Ziaei et al reported that the national rates of HF hospitalizations (defined as a primary hospitalization for HF) decreased steadily between 2002 and 2013, equating to a notable decline of ≈31% over that decade. However, disparities persisted, with a markedly higher burden among blacks, calling for urgent measures to address it. As acknowledged by the authors, National Inpatient Sample data have intrinsic limitations and, in particular, the lack of unique patient identifiers, such that studies using the National Inpatient Sample cannot distinguish unique HF hospitalizations from HF readmissions. Over the same time period in Olmsted County, MN, the incidence of HF declined substantially as well, with a rate reduction of 37.5%. These data rely on robust surveillance methods and manually curated cases. Although they emanate from a single community, the magnitude of the decline in the Olmsted County study is commensurate to that reported overall in the National Inpatient Sample. Thus, both studies point to a decline over time in the overall burden of HF.

How can these findings be reconciled with the present ARIC report of an increase in the incidence of ADHF? First, with regard to race and ethnicity-specific findings, both the Ziaei data and the present ARIC report are consistent in their depiction of an alarming situation with a major disparity of the HF burden among blacks and a gap that is widening over time. These data resonate with prior reports that underscored the excess burden of HF in blacks. It is important to note that the Ziaei et al article and the present ARIC report augment previous publications by demonstrating that, far from addressing inequalities, we are in fact losing ground as racial disparities in the burden of HF are worsening over time and calling for urgent interventions.

Second, with regard to the partitioning of HF phenotypes, ARIC reports a rise in the incidence of HF with preserved EF, which resonates with findings from Olmsted County of a shift in case mix toward HF with preserved EF. The ARIC data emanate from diverse communities and hence demonstrate the ubiquitous evolution of HF toward a clinical presentation, which is poorly understood and for which there is no specific treatment. Third, some methodological points are important to consider. Shift in coding practices have been well documented over the years for HF and augment the complexity of the case finding processes and of the interpretation of the findings in different reports. For example, another report from the National Inpatient Sample between 2001 and 2009 indicates that, although primary HF hospitalizations declined, rates of hospitalizations with a secondary diagnosis of HF were stable in that decade.

ARIC relies on ADHF for case definition validated from a pool of diagnostic codes in any position (not only primary). Acute decompensation is important to identify because it is the cardinal physiological component of the disease that causes hospitalizations, which could be prevented by optimizing the outpatient management of HF. However, most experienced clinicians would agree that the clinical diagnosis of ADHF is challenging because it relies solely on clinical findings that are increasingly difficult to ascertain as the body mass index of the US population increases. It is not uncommon clinically to be at times unsure of a patient’s volume status, particularly because other comorbid conditions share signs and symptoms with HF, such as dyspnea, orthopnea, and peripheral edema. Therefore, the quest for a pure diagnosis of ADHF, although mechanistically important, may lead to a restrictive appraisal of the global burden of HF, which is frequently interwoven with other comorbid conditions. Indeed, HF occurs primarily in the elderly and is integrated in a context of multimorbidity and geriatric conditions, such that hospitalizations among elderly persons living with HF often reflect a combination of ailments and disease processes. The ARIC data underscore the importance of examining disease in addition to the perhaps more holistic approach of examining the person with disease. Both approaches are complementary and necessary. Third, the ARIC report constitutes a powerful illustration of the crucial importance of heart disease surveillance.

Because we do not have a national system to monitor cardiovascular disease, we need surveillance studies such as ARIC to answer these truly fundamental questions: Is HF declining or increasing? Are we making progress toward the control of risk factors? Are all persons living with HF managed the same way and are their outcomes improving? Other data sources can be used to examine the burden of heart disease, including voluntary registries or claims data. These sources provide useful hypothesis-generating data but cannot measure the occurrence of new disease (incidence), which is the core metric of heart disease prevention. Without surveillance, we would not have undisputable evidence that the incidence of myocardial infarction has...
truly declined over the past 2 decades,\textsuperscript{14,15} we would be unaware that the incidence of atrial fibrillation is stable,\textsuperscript{16} and without data such as those reported by Chang et al,\textsuperscript{7} we could not quantify the magnitude of disparities in the burden of HF. These examples of surveillance data constitute the cornerstone of the evaluation of public health interventions in our collective fight against heart disease. Thus, we cannot do without. With the ever prevailing considerations of cost containment, the question of whether we can afford surveillance research, which takes time and thus is expensive, is recurrently raised. This question should be refocused on challenging researchers and public health professionals to reengineer surveillance methods to fully leverage electronic health records and, in doing so, to define a way forward for electronic epidemiology.\textsuperscript{17} The rapid growth in the implementation of electronic health record systems, fueled in part by incentives to health systems demonstrating the meaningful use of electronic health records, has considerably expanded the availability of dense longitudinal clinical datasets.\textsuperscript{18} This growth presents an unparalleled opportunity to conduct surveillance that would not be feasible with conventional methods. The increasing accessibility of digital data combined to new data science approaches is at the core of electronic epidemiology and offers the opportunity to enrich the data collection steps customary in surveillance by including, for example, patient-reported outcomes. Because electronic health record-based research constitutes a departure from historical data collection methods, new challenges must be addressed deliberately. Phenotypes must be standardized for large-scale studies and validated to capture reliable data. Voluminous, complex, and dynamic data generated from heterogeneous data sources, with a large part of information embedded in narrative form, must be transformed into platforms for data collection and extraction, which must be rigorously documented to ensure data traceability, validity, and reproducibility. These new opportunities are exciting, and our challenge is to demonstrate that methodological rigor and efficiency can coexist by managing and supporting the transition toward electronic data sources.\textsuperscript{19}

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