ESC European Society of Cardiology

European Heart Journal (2018) **39**, 3777–3779
doi:10.1093/eurheartj/ehy519

EDITORIAL

Improving care at the population and individual level: lessons from SWEDEHEART

Elliott M. Antman*

TIMI Study Group, Brigham and Women's Hospital, Boston, MA, USA

Online publish-ahead-of-print 19 September 2018

This editorial refers to 'Relations between implementation of new treatments and improved outcomes in patients with non-ST-elevation myocardial infarction during the last 20 years: experiences from the SWEDEHEART registry 1995 to 2014'†, by K. Szummer *et al.*, on page 3766.

Clinical trials over the last several decades provide a roadmap for managing an acute coronary syndrome (ACS). Clinical practice guidelines from professional societies codified the findings of such trials into recommendations for management of the patient with an ACS event. It is of interest to evaluate the long-term impact of ACS management strategies with particular attention to the changes brought about by serial expansion of the ACS therapeutic armamentarium. Longitudinal assessments of therapies for ACS cannot be derived from clinical trials, which by definition are confined to a particular era in time. Instead, observational data must be used, and it would be desirable if the source of those data is comprehensive and stable over time. The Swedish Web-System for Enhancement and Development of Evidence-Based Care in Heart Disease Evaluated According to Recommended Therapies (SWEDEHEART) is an ideal registry to conduct such analyses. All 72 hospitals in Sweden providing care for patients with cardiac diseases participate in SWEDEHEART and data can be linked to national patient registries and compared with general population statistics in Sweden.

Using a sophisticated epidemiological approach, Szummer *et al.* previously reported improved outcomes in 105 674 patients with ST-elevation myocardial infarction (STEMI) tracked in SWEDEHEART between 1995 and 2014.[1] The 20-year interval was divided into 2-year blocks and the percentages of STEMI patients receiving key treatments [beta-blockers, reperfusion, angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (ACEI/ARBs), statins, coronary angiography, primary percutaneous corronary intervention (PCI), and in-hospital coronary artery bypass graft (CABG)] were plotted. Total mortality and cardiovascular deaths decreased over time, roughly paralleling the time course of increased use of evidence-based treatments. Standardized incidence ratios for events compared with the general population and regression analyses adjusting for demographic changes over time also showed improvements in cardiovascular outcomes in association with greater use of guideline-recommended treatments.[1]

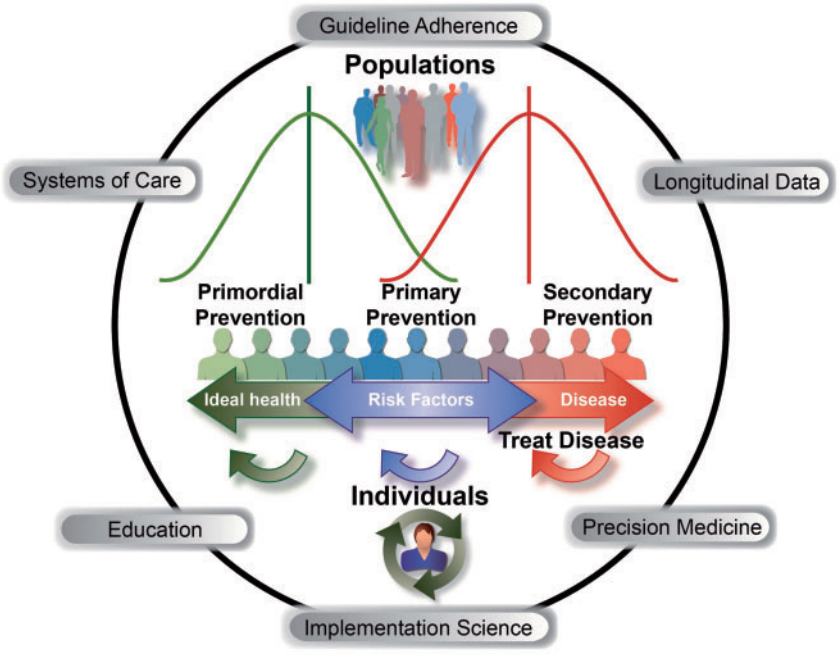
Szummer *et al.* present in the current issue of the *European Heart Journal* an analysis of 20-year outcomes in 205 693 cases of non ST-elevation MI (NSTEMI) in SWEDEHEART.[2] This required additional adjustments, accounting for the shift in biomarkers used to diagnose MI from creatine kinase (CK)-MB (89.6% in 1995–1996) to cardiac-specific troponins (99% in 2013–2014). Aspirin and beta-blockers were generally in broad use already in the mid-1990s, but ACEIs/ARBs, statins, PCI, coronary angiography, and dual antiplatelet therapy showed progressive dramatic increases in use over the 2-year blocks through 2013–2014. Tracking with the increases in use of recommended treatments were significant reductions in crude in-hospital and 1-year total and cardiovascular deaths. Standardized in-hospital and 1-year rates of death/MI also showed progressive significant declines over time. Additional analyses that support the association between greater use of guideline treatments and improvements in outcomes after NSTEMI include regression analyses adjusting for age and gender, baseline characteristics, and in-hospital angiography/PCI. Standardized incidence rate ratios compared with the general population showed that the risk of death was 5.5 times higher in NSTEMI patients in 1995–1996 and declined to 3.03 times higher in 2013–2014.

What are we to make of these impressive findings? It is gratifying to see translation of the results of clinical trials into practice. While we cannot assign causation between the significant trends in increasing use of effective treatments and progressive improvement in outcomes, there is strong biological plausibility that treatments tracked in SWEDEHEART are in the causal pathway for improvements in outcome. Enhancing flow in compromised coronary arteries, maintaining patency with stents and combination antithrombotics, and unloading a damaged left ventricle with ACEI/ARB treatments have all been shown to reduce morbidity and mortality from an ACS event. Evidence supporting the treatments tracked in SWEDEHEART was

The opinions expressed in this article are not necessarily those of the Editors of the *European Heart Journal* or of the European Society of Cardiology.

† doi:10.1093/eurheartj/ehy554.

* Corresponding author. Brigham and Women's Hospital, TIMI Study Group, 350 Longwood Avenue, Boston, MA 02115, USA. Tel: +1 617 732 7149, Fax: +1 617 975 0990, Email: eantman@rics.bwh.harvard.edu



Take home figure Strategies to improve care at the population and individual level. At the centre is the biological continuum from ideal health, the development of risk factors, and transition to overt disease (e.g. NSTEMI). Clinical variations along the continuum are illustrated by shading of the figures. Current strategies for management of patients along the continuum consist of primordial/primary/secondary prevention and treatment of disease. We develop these strategies based on clinical trials of samples of individuals drawn from populations. Extrapolations are made from findings at the population level, where a shift in the distribution of an outcome of interest (e.g. mortality after NSTEMI) is noted when Group A (red distribution) is compared with Group B (green distribution). In the idealized example shown, a highly effective intervention is depicted that nearly completely separates the two distributions and shifts the position of the median to a more favourable one (red vs. green vertical lines). At present, we operate under the assumption that all subjects in a clinical trial have a common phenotype and apply the findings at a population level to treatment of specific individuals. Clinical practice guideline recommendations perpetuate this extrapolation, because we presently lack the data to be more specific for a given patient. Future strategies with the potential to improve care synergistically at both the population level and individual level are depicted in the text boxes along the outer ring. Those strategies likely to have the greatest impact at the population level are shown towards the top and at the individual level at the bottom. See text for further discussion.

reviewed by writing committees for clinical practice guidelines and presented to clinicians in structured recommendations. Thus, the SWEDEHEART report(s) are an endorsement not only of the findings of pivotal clinical trials but of the practice guideline system as well.

Why were the beneficial treatments adopted effectively into practice in Sweden? The answer lies in the SWEDEHEART registry itself. It is with great admiration that we read of the highly organized and dedicated system of care constituted by the hospitals in SWEDEHEART.[3] We also applaud the visionary leadership of Professors Wallentin and Stenesrand who recognized the value of registries and worked tirelessly to make them a success in Sweden.[3] Critical aspects of medical care in Sweden spurring success of the registry concept include the fact that every Swedish resident has a unique personal identification number that is used for healthcare, there are a rich set of national computerized databases that can be linked to SWEDEHEART, and there is a combination of public and private funding to support SWEDEHEART. The relatively 'closed' system lends itself to regular feedback to participating hospitals and offers academic opportunities for investigators to conduct research.

What lessons can we learn from SWEDEHEART of a more general nature for medical research and clinical practice? *Take home figure* depicts the transitions along a biological continuum from health to disease.[4] Further improvements in medical care at the population level are likely to occur if strategies to improve guideline adherence and establish robust systems of care are implemented; more longitudinal data sets like SWEDEHEART are needed to track progress and make adjustments to systems of care as needed. Additional improvements in health at the individual level will flow from more precise targeting of therapies based on molecular/biomarker signatures (precision medicine[4]), implementation of scientific approaches designed to address, in a culturally sensitive fashion, individual motivations and behaviours[5], and education of individuals about a heart-healthy lifestyle and the importance of adherence to prescribed regimens. For all of us it will be important to overcome the inertia that makes us immune to changing our patterns of behaviour—as healthcare providers who have been too slow in the past at adopting guideline recommendations[6] and patients who find it challenging to make lifestyle changes as an investment in future health.[7]

Conflict of interest: none declared.

References

1. Szummer K, Wallentin L, Lindhagen L, Alfredsson J, Erlinge D, Held C, James S, Kellerth T, Lindahl B, Ravn-Fischer A, Rydberg E, Yndigegn T, Jernberg T. Improved outcomes in patients with ST-elevation myocardial infarction during the last 20 years are related to implementation of evidence-based treatments: experiences from the SWEDEHEART registry 1995–2014. *Eur Heart J* 2017;**38**:3056–3065.
2. Szummer K, Wallentin L, Lindhegan L, Alfredsson J, Erlinge D, Held C, James S, Kellerth T, Lindahl B, Ravn-Fischer A, Rydberg E, Yndigegn T, Jernberg T. Relations between implementation of new treatments and improved outcomes in patients with non-ST-elevation myocardial infarction during the last 20 years: experiences from the SWEDEHEART registry 1995 to 2014. *Eur Heart J* 2018;**39**:3766–3776.
3. Taylor J. SWEDEHEART: Sweden's new online cardiac registry, the first of its kind. *Eur Heart J* 2009;**30**:2165–2166.
4. Antman EM, Loscalzo J. Precision medicine in cardiology. *Nat Rev Cardiol* 2016;**13**:591–602.
5. Victor RG, Lynch K, Li N, Blyler C, Muhammad E, Handler J, Brettler J, Rashid M, Hsu B, Foxx-Drew D, Moy N, Reid AE, Elashoff RM. A cluster-randomized trial of blood-pressure reduction in black barbershops. *N Engl J Med* 2018;**378**:1291–1301.
6. Antman EM, Lau J, Kupelnick B, Mosteller F, Chalmers TC. A comparison of results of meta-analyses of randomized control trials and recommendations of clinical experts. Treatments for myocardial infarction. *JAMA* 1992;**268**:240–248.
7. Kegan R, Lahey LL. *Immunity to Change: How to Overcome It and Unlock the Potential in Yourself and Your Organization*. Boston, MA: Harvard Business Review Press; 2009.