ejection fraction (HFPEF) is not well understood. Dr. Takei and colleagues describe that among a group of patients with HFPEF, those with a greater left ventricular (LV) end-diastolic dimension had a greater risk of adverse outcomes (HF rehospitalization, all-cause mortality) than those with diastolic diameter below the normal reference value, despite normal LVEF. These results are interesting and highlight the importance of LV cavity dimension in prognosis. These findings also imply that some of those with greater risk actually have normal LV dimensions, another area of subclinical disease for investigation.

Previously, the Framingham Heart Study has similarly shown the importance of LV cavity size in asymptomatic individuals free of HF, whereby greater LV cavity dimension was associated with higher risk for incident HF (2). Notably, nearly all participants had normal LVEF. Thus, we examined the relations of LV end-diastolic dimension (LVEDD) in our study. In multivariable models not including LVEF, LVEDD was associated with both outcomes of interest, HF/all-cause mortality and HF alone. Inclusion of LVEDD in models including the LVEF group only modestly attenuated the association of LVEF with the outcomes. Our collective results, including those of Dr. Takei and colleagues, suggest that both LVEF and LVEDD are important contributors to risk of HF and mortality. Additionally, beyond linear LV dimensions, LV volumes and integrative measures of LV geometry have been associated with cardiovascular disease in population studies (3,4). The ultimate relative contributions of these measures in prognosis of the asymptomatic adult with borderline LV systolic function remain to be determined.

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EMS, HEMS, ECMO Center, ICU Team: Are You Ready for Hypothermic Patients?

Extracorporeal Membrane Oxygenation in Severe Accidental Hypothermia

It was with great interest that we read the article by Aubin et al. (1) published in *JACC: Heart Failure*. Transport destination for patients (core body temperature <28°C) with unstable circulation or who are in cardiac arrest is a hospital with extracorporeal rewarming (extracorporeal membrane oxygenation [ECMO], cardiopulmonary bypass) capacity (2,3). In southern Poland, we have arranged the severe hypothermia treatment system based on 3 pillars: education, coordination, and equipment (4). The E-learning platform is free and adjusted to different levels of the rescue system: basic life support (fireguards, police, mountain rescuers), advanced life support (ambulance and helicopter emergency medical service [HEMS] staff), and hospital emergency department staff. To date, 25,000 people have successfully completed that learning activity.

Early qualification for extracorporeal rewarming of hypothermic patients with cardiac arrest/hemodynamic instability is necessary to prepare operating room and staff or to haul the equipment. Coordination of transport, treatment, and approval of extracorporeal life support therapy are the tasks of the ECMO coordinator. Dispatch rescue centers have continuous contact with the ECMO coordinator, which allows early notification about victims having suspected or confirmed severe hypothermia. Notepads used in ambulances to enter data in medical records are scanned online for predefined key words describing the cooled patient. Mountain rescuers also inform the ECMO coordinator at the start of their search and rescue missions. Cardiac arrest in severe hypothermia usually requires prolonged chest compression during transport. We use an interactive map of available mechanical chest compression devices, which allows delivery of devices to the rescue team from the nearest location.

All cardiac surgery centers are equipped with ECMO and can admit deeply hypothermic patients with cardiac arrest or hemodynamic instability. We hope to

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develop a mobile ECMO treatment protocol to be used during transport to the extracorporeal life support center. In our experience, it is a safe and effective method. It is easier and safer to transport a device (with staff) to a remote hospital than to transport a patient requiring continuous chest compressions for 100 or 200 km. Implementation of extracorporeal therapy at the hospital nearest the incident site or even at the site of the incident presents an interesting new mode of treatment. Since November 2013, we have achieved 58% survival among 31 hypothermic patients (cardiac arrest or cardiogenic shock in severe hypothermia). In the cardiac arrest subgroup consisting of 17 patients (duration until implementation of extracorporeal rewarming: 107 to 345 minutes), survival is 47%. All patients were discharged from the hospital with Glasgow Coma Scale 15 and Cerebral Performance Category 1.

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REPLY: EMS, HEMS, ECMO Center, ICU Team: Are You Ready for Hypothermic Patients?

Extracorporeal Membrane Oxygenation in Severe Accidental Hypothermia

We thank Dr. Darocha and colleagues for the comment on our paper (1) in which we reported the implementation of a suprainstitutional network for rapid response remote extracorporeal life support (ECLS) for refractory circulatory failure. With great enthusiasm, we read about their efforts to implement an ECLS network for patients with unstable hemodynamics or cardiac arrest due to accidental severe hypothermia in southern Poland (2) and congratulate them on the reported early results, with very encouraging survival and outcome rates.

It is our conviction that a close suprainstitutional collaboration between specialized centers and primary care institutions may help to improve survival and outcome of hemodynamically highly compromised patients in emergency situations by providing on-site ECLS support and subsequent customized and interdisciplinary therapy. However, due to the immense resource burden and the derived socioeconomic implications, adequate patient selection criteria based on survival-based predictors seem indispensable. Therefore, and as also emphasized by Darocha et al. (2), education of emergency department and intensive care unit staff of participating institutions, who are the ones in first contact with the patient in need and are responsible for the decision to treat, as well as efficient logistic coordination, are mandatory for the success of such programs.

In *ultima ratio* emergency situations, the outcome of mobile ECLS support is usually conditioned by the time-to-initiation of circulatory support because prolonged hypoperfusion may lead to irreversible end-organ damage, limiting survival (3). Hence, caution is advised when operating in a setting that may constitute a logistical challenge, either due to an oversized catchment area or to a difficult access region, such as the one described by Darocha et al. (2). Nonetheless, severely hypothermic patients represent a special patient cohort (4), as hypothermia increases tolerance to prolonged hypoxemia, expanding the time frame and operational distance in which mobile advanced mechanical circulatory support may still be beneficial for the patient at risk. Furthermore, hypothermic cardiac shock may require additional left ventricular and/or pulmonary artery venting due to pulmonary congestion or concomitant hypoxic acute respiratory distress syndrome (5), demanding special expertise beyond percutaneous transfemoral cannulation, which usually is only available in specialized centers. Therefore, in the setting described by Darocha et al. (2), a specialized center-based ECLS network may be of particular benefit for patients experiencing accidental severe hypothermia despite challenging logistics.

In this regard, now that mobile ECLS is becoming an increasingly applied treatment option for patients