Reconciling Short- and Long-Term Outcomes of In-Hospital Cardiac Arrest in Patients undergoing Maintenance Dialysis

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> PHYSICIAN: In case of the worst possible scenario, if you should stop breathing or your heart should stop, have you thought, before, about what you would want doctors to do?
> PATIENT: Yeah. I don't want them to go to a lotta trouble. . .
> PHYSICIAN. . .So you don't want to be resuscitated?
> PATIENT: Yeah. . .well, not if I'm gonna be like frozen if they resuscitate me, you know what I mean?
> PHYSICIAN: OK, but in the moment, we often don't know that. So, do you want us to give it like the best try we can—
> PATIENT: Oh yeah.
> PHYSICIAN: OK. So we will do all the resuscitation and then we can think later, if things don't get better down the line.
> –An excerpt from an audio-recorded conversation between a patient with ESKD and her attending hospital physician (1).

Conversations about cardiopulmonary resuscitation (CPR) between clinicians and patients are often conducted quickly and without nuance. "If your heart were to stop, would you want to receive CPR?" or some variation of this question is routinely posed to patients upon entering a hospital with acute illness. For patients with ESKD on dialysis who experience an average of two hospital admissions per year (2) and constitute 15% of American adults who experience in-hospital cardiac arrests (IHCAs) (3), the response to this perfunctory question has profound implications.

There have been very few studies that have examined IHCA in patients with ESKD, and their findings are sobering. It is estimated that CPR for IHCA is 20 times more prevalent among patients with ESKD than in the general population (4). Advances in CPR in recent decades have resulted in large gains in hospital survival after IHCA that reach 20%–30% in both the general population and those with ESKD (3–5). At the same time, patients with ESKD experience longer lengths of hospital stay associated with the index IHCA event and are more frequently admitted to a skilled nursing facility after discharge than their counterparts without ESKD (3,4). Of patients with ESKD who survive to hospital discharge after IHCA, only 14% are able to discharge home, and median survival thereafter is approximately 5 months as compared with 3 years in the general population (4). Although prior studies paint a detailed picture of long-term outcomes of IHCA, they lacked granular data on the clinical circumstances surrounding IHCA events and resuscitation efforts that may have shaped these disparate outcomes.

In this issue of the *CJASN*, Starks *et al*. (6) report the results of a large, multicenter, observational study examining resuscitation practices and outcomes of IHCA for patients with ESKD compared with other inpatients. The authors used data from the American Heart Association's Get With the Guidelines-Resuscitation (GWTG-R) program, a national hospital-based quality improvement registry, to identify 73,453 patients who received inpatient CPR from 2000 to 2012. Information in the GWTG-R is collected prospectively and adjudicated by trained local staff using standardized definitions of IHCA and CPR to enhance the accuracy of the data collected (7). This distinguishes the study from prior studies that relied on administrative billing codes to ascertain CPR events, which may incompletely capture cases (8). Furthermore, in addition to information on return of spontaneous circulation and hospital survival, GWTG-R records include detailed information about the circumstances of the IHCA, resuscitation procedures and performance quality, and patients' neurologic status at the time of discharge. Investigators used linked Centers for Medicare and Medicaid Services records to identify 8498 cohort members with ESKD on dialysis across 372 participating hospitals. Patients were then case-matched to 22,646 cohort members without ESKD in a 1:3 ratio on the basis of age, sex, race, hospital, and year of IHCA.

Patients with ESKD had a greater overall burden of comorbidity, including higher rates of congestive

heart failure (48% versus 38%), diabetes mellitus (52% versus 32%), septicemia (23% versus 16%), and metabolic or electrolyte abnormalities (20% versus 16%) as compared with matched cohort members without ESKD. Most patients in both groups had arrested during the day (64% and 64%) and on a weekday (71% and 70%), had an initial nonshockable rhythm (20% and 21%), and were in an intensive care (46% and 47%) or monitored (17% and 19%) unit at the time of arrest.

In this context, authors compared the quality of CPR provided to patients with ESKD and matched cohort members without ESKD using five American College of Cardiology/American Heart Association guideline–recommended measures; they found no differences in confirmation of endotracheal tube placement, time to chest compressions in ≤1 minute, and time to receipt of epinephrine or vasopressin in ≤5 minutes, and small differences in witnessed pulseless cardiac events (90% versus 92%) and time to first shock for ventricular arrhythmias in ≤2 minutes (54% versus 58%) between groups. Patients with ESKD more often achieved return of spontaneous circulation (69% versus 62%); however, survival to discharge among patients with ESKD was 23% and similar to that of matched cohort members without ESKD. Among patients who survived to discharge, 17% of patients with ESKD discharged with moderate neurologic impairment or better status versus 16% of matched cohort members without ESKD.

This study is the first to assess in detail the clinical context and quality of resuscitation practices in patients with ESKD after IHCA. Although the authors found several differences in resuscitation processes of care between patients with ESKD and matched cohort members without ESKD, there were more similarities than differences in the clinical context and overall quality of CPR performance between groups. It is perhaps for this reason that hospital survival and neurologic status at discharge were quite comparable between groups. These findings underscore the uniformity with which clinicians strive to provide high-quality CPR irrespective of whether patients have ESKD.

If the context, quality, and short-term outcomes of CPR are largely similar between patients with ESKD and the general population, how do we reconcile these new findings with those of prior studies indicating poorer long-term outcomes among patients with ESKD? There may be several possible explanations. First, short-term outcomes such as return of spontaneous circulation, hospital survival, and neurologic status at discharge do not fully reflect the range of acquired morbidity after IHCA, and other complications after IHCA (such as functional disability [9]) may have greater effect on long-term outcomes. Second, differences in postdischarge care and rehabilitation between patients with and without ESKD are unknown. Lastly, ESKD status may have less bearing on short-term outcomes of IHCA than how well and in what setting CPR is delivered. This seems consistent with prior studies that have demonstrated that comorbid disease burden is not strongly associated with whether patients survive IHCA to hospital discharge (10). Rather, diagnosis of ESKD may be a stronger determinant of long-term outcomes of CPR in patients and confer underlying poor health and limited life expectancy in this population that may not be averted with even the highest-quality resuscitation.

It is time to move away from making unrealistic requests of patients to make decisions about CPR on the basis of generic hypothetical scenarios and outside of the broader context of patients' ESKD, long-term prognosis, and larger life goals. Although CPR is performed with impressive uniformity and short-term results, as Starks *et al*. show, equally ardent efforts are needed to ensure high-quality conversations and decision-making about CPR.

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See related article, "In-Hospital Cardiac Arrest Resuscitation Practices and Outcomes in Maintenance Dialysis Patients," on pages 219–227.