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The AKI Clinic for Fragile Patients

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EDITORIAL

The AKI Clinic for Fragile Patients

The recent terrorist attack in Manchester, England, at a pop "musical" concert[1] represents a somber reminder of the London Blitz—the "lightning war"—prosecuted by Hitler against Great Britain during World War II. The dome of the church on the cover illustration, provided by Guest Editor, Charuhas Thakar, represents the hope of the Londoners who survived the protracted bombing that lasted 9 months, and our own hope that an effective resolution to the abject, lawless acts of violence by fanatical and radical terrorists comes soon.

Nephrologists are well acquainted with the physical repercussions of bombing. During the Blitz, muscle "crush" injuries from entrapment under the rubble of destroyed buildings led to oliguric kidney failure, eloquently described by Bywaters and Beall.[2] Without the extant technologies of kidney replacement that are commonplace in contemporary nephrology, those who did not experience rapid recovery of kidney function died a uremic death.

From the clinical observations of the Blitzkrieg victims, Bywaters and Beall formulated the construct of myoglobin-induced acute kidney injury (AKI), Bywaters and colleagues subsequently developed 2 animal models of rhabdomyolysis-induced AKI that still serve as touchstones for all clinician scientists. One involved injection of crystalline myoglobin[3] and the other a controlled muscular crush injury.[4] Indeed, the scientific inquiry into pigmentary nephropathy via the subsequently developed rodent model of glycerol-induced rhabdomyolysis greatly advanced the knowledge base of AKI. These advances were followed by more comprehensive analyses of rhabdomyolysis-induced AKI and have elucidated that nearly all mechanisms of AKI are at play, including ischemic, toxic, cytokine mediated, among others.

Despite advances in our understanding of AKI pathophysiology, we remain naïve in many areas, including even appropriate follow-up of AKI survivors. We are painfully reminded of exacerbation of the folly of "crash" dialysis that followed the Centers for Medicare and Medicaid Services (CMS) rescinding of immediate availability of in-center dialysis for AKI patients. A "shot across the bow" had been issued as CMS Change Request 7762 on April 26, 2012.[5] The gist of this request was that AKI inpatients bound for outpatient, in-center hemodialysis centers would be stranded, and this onerous "final rule" would become effective October 1, 2012. Afterward, nearly all US nephrologists were left scrambling to establish "AKI clinics" for their newly minted hemodialysis patients, the majority of which would require dialysis for more than 90 days and become baptized as ESRD patients. What happens to AKI patients who are dialysis dependent (AKI-D) at the time of discharge? Before 2012, the solutions to this scenario were simple. AKI-D patients would either remain in the hospital until recovery of kidney function or be discharged to dialyze in an ESRD in-center hemodialysis center. This instantaneous transition to an outpatient hemodialysis in-center unit was efficient but generally not tailored to the care of the AKI patient. Typically, the patient would have had minimal, if any, education regarding either AKI or CKD, much less ESRD. Informational overload within the relatively noisy, nonprivate setting of an in-center hemodialysis center would ensue. Patient engagement was consequently highly variable and compounded by noise, language, and cultural barriers, and possibly ineffective instructional methods in the busy, outpatient dialysis environment. Medical care for the AKI-D patient may also differ from that of the ESRD population.

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The practice of transitioning a patient to an in-center facility after dialysis-dependent AKI had never been CMS sanctioned. All nephrologists did it, and CMS ignored the practice until the expense of AKI became costly. To provide dialytic services, "AKI clinics" were rapidly implemented for AKI-D patients in response to the reversal of CMS' policy. These clinics were essentially in-center dialysis units embedded in the majority of participating hospitals. Although some centers treated AKI patients with protocols that required greater infrastructure, more intensive monitoring, and an overall greater level of care, this practice was not uniformly adopted. This stopgap measure inconvenienced patients and providers, but provided life-sustaining therapy. Now that CMS once again permits the direct transition of AKI-D patients to in-center dialysis units, that problem is resolved. However, there is still the issue of vital education of patients regarding AKI, CKD, modality choice, and nutritional advice, which may not be delivered in a timely fashion and begs the question: "How, when, and where will this occur?"

Fortunately, most of those who develop an episode of AKI do not develop oliguric kidney failure and die a uremic death or require kidney replacement therapy. The minority who do develop an episode of severe AKI necessitating acute kidney replacement therapy require intense follow-up for signs of kidney recovery.[6] AKI may foster the development of CKD, particularly when severe.[7] An episode of AKI also may test the kidney fragility of patients with preexistent CKD. CKD may be unmasked by the kidney stressor of AKI. Fortunately, not every episode of AKI leads to CKD, and prediction of CKD after AKI remains a difficult enterprise. Prediction of risk of dialysis in CKD has been validated by Tangri and colleagues,[8] and the prediction of requirement for dialysis during AKI is possible by a 4- or 8-variable Kidney Failure Risk Equation.[9] However, determination of the exact downward trajectory of GFR as espoused by Cerdá and colleagues[6] requires multiple GFR measurements and evaluation points over several years. Therefore, to optimize the care of AKI patients with uncertain renal futures, periodic follow-up is obligatory.

How and where should AKI follow-up be ensured? For AKI patients who are not dialysis dependent at discharge, the old standby of "labs in one week with PCP, call with questions" is not optimal. Early nephrology follow-up (within 90 days of discharge) was associated with decreased mortality for AKI-D patients who had recovered sufficient kidney function to stop dialysis before discharge.[10] How to implement a clinical system that facilitates this careful follow-up is a challenge. Tracking AKI-D patients as they transition from the inpatient to outpatient setting, and finding time and staff in clinic to track and follow these patients, requires an innovative approach. Two groups of AKI-D patients, those who remain on dialysis at discharge and those who have recovered sufficient kidney function to stop dialysis by the time of discharge, will most likely be in separate health care systems, one in the outpatient dialysis arena and the other in ambulatory clinics. Electronic health record systems could facilitate the identification of patients, but this will require information technology expertise and staff to generate meaningful tracking tools across different health record platforms. Leadership by nephrologists is critical for success of AKI (and CKD) information technology as AKI is a global problem that has changed the climate of kidney care. The infrastructure for success should be built into standard clinical care and not by successful applications for grant funding.

Interdisciplinary (ID) CKD clinics are a logical place to coordinate follow-up,[11] particularly because recovering AKI patients are at risk for the development of CKD and CKD patients are themselves at risk for AKI. Additionally, nephrology advanced practice providers frequently care for patients in both systems—the outpatient dialysis units and the ambulatory clinics—and, thus, may augment continuity of care as patients move between systems. Many of the same renal-protective educational and therapeutic interventions are the same as those already implemented for CKD patients.[11] However, advanced practice providers may require additional education and guidance from the nephrologist in the management of resolving dialysis-dependent AKI. More frequent labs (requiring prompt interpretation for recovery of kidney function) may be ordered. It is unclear how applicable ESRD quality indicators are for AKI care. These indicators are unproven as beneficial in AKI, and should not be instituted as quality measures for this population. These patients may require a different approach to volume management, avoiding aggressive ultrafiltration to limit hypotensive episodes that may further exacerbate kidney injury.[12,13] As time progresses, and the chance of renal recovery wanes, patients will need education regarding modality, transplant, and access. At some point, patients with AKI who remain dialysis dependent may need a change in status to ESRD. Coordinating this through AKI-extended ID CKD clinics may address many of these needs. Primary care physicians should also be included in the follow-up process as they will be following these at-risk patients long-term and will be on the front lines of prevention and detection of subsequent AKI and CKD.

How do we move forward? AKI carries a tremendous burden, including the increased risk of dying. A simple program of early nephrology clinic visits may help to mitigate that risk.[10] These tools are already available in the ID CKD clinic and can help to facilitate optimal kidney recovery or a smooth transition to ESRD for those who do not recover kidney function. The key to optimizing outcomes is simple. The patient must be followed and carefully. ID CKD clinics[14]—not new AKI clinics—can be extended in scope and suitably resourced and represent one solution for our fragile AKI patients.

If blood will flow when flesh and steel are one
Drying in the color of the evening sun
Tomorrow's rain will wash the stains away
But something in our minds will always stay

Perhaps this final act was meant
To clinch a lifetime's argument
That nothing comes from violence and nothing ever could

For all those born beneath an angry star
Lest we forget how fragile we are

—*Fragile*, Gordon Sumner (1987)

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