variables during the first 3 ICU days were extracted from electronic medical records. Four machine learning algorithms—logistic regression, random forest, support vector machine, and extreme gradient boost—were used to train the models for prediction of in-hospital death and major adverse kidney events (MAKEs). The latter outcome was a composite of death, renal replacement therapy, and 50% or greater reduction in estimated glomerular filtration rate from baseline to 120 days after discharge.

The developed clinical models included 15 features for prediction of mortality and 14 for prediction of MAKEs. Predictive performance was evaluated using tenfold cross-validation in the derivation cohort, followed by external validation of 2333 patients from a different center.

The 15-variable clinical model outperformed the Sequential Organ Failure Assessment score for prediction of mortality in both the derivation cohort (area under the curve [AUC], 0.79 vs. 0.71) and the validation cohort (AUC, 0.71 vs. 0.74). In the validation cohort, among patients classified as being at >50% predicted risk of mortality, 41% actually died.

The 14-variable model also improved prediction of MAKEs compared with the maximum AKI KDIGO score (AUC, 0.78 vs. 0.66 in the derivation cohort and 0.66 vs. 0.73 in the validation cohort). Among patients at 50% or higher risk, 24.5% developed a MAKE.

AKI occurs in up to 50% of patients admitted to the ICU. Although clinical models are useful in predicting AKI risk, there are few tools for prediction of AKI recovery or outcomes.

The newly developed models perform well in predicting in-hospital mortality and MAKEs in a heterogeneous population of ICU patients with AKI. "[I]f further validated, [the models] could enable risk stratification for timely interventions that promote kidney recovery," the researchers conclude. They have developed an online tool for predicting outcomes in critically ill adults with incident AKI within the first 3 days of an ICU stay, available at http://phenomics.uky.edu/taki/ [Neyra JA, et al. Prediction of mortality and major adverse kidney events in critically ill patients with acute kidney injury. *Am J Kidney Dis*, published online ahead of print July 13, 2022. doi: 10.1053/j.ajkd.2022.06.004; https://www.ajkd.org/article/S0272-6386(22)00774-0/fulltext]. ■

Acetazolamide Improves Outcomes in Decompensated Heart Failure

In patients with acute decompensated heart failure with volume overload, adding acetazolamide to loop diuretic therapy increases the odds of successful decongestion, concludes a clinical trial report in *The New England Journal of Medicine*.

The multicenter Acetazolamide in Decompensated Heart Failure with Volume Overload (ADVOR) trial enrolled 519 hospitalized patients with acute decompensated heart failure (63% men; mean age, 78 years). Eligible patients had at least one clinical sign of volume overload (e.g., edema, pleural effusion, or ascites); an N-terminal pro-B-type natriuretic peptide level >1000 pg/mL or B-type natriuretic peptide level >250 pg/mL; and at least 1 month of oral maintenance therapy with furosemide 40 mg or equivalent.

Patients were randomly assigned to acetazolamide, 500 mg intravenously (IV) once daily or placebo added to IV loop diuretics at a dose equivalent to twice the oral maintenance dose. Groups were stratified based on left ventricular ejection fraction with a cutoff of 40%. The main outcome of interest was successful decongestion, defined as no evidence of volume overload within 3 days after randomization with no indications for escalated decongestive therapy.

Acetazolamide was associated with a significant increase in successful decongestion compared with placebo (42.2% vs. 30.5%; risk ratio, 1.46). Patients assigned to acetazolamide had a nonsignificant reduction in a composite secondary outcome of all-cause mortality or heart failure rehospitalization (29.7% and 27.8%, respectively).

The acetazolamide group showed evidence of increased diuretic efficiency with higher cumulative urine output and natriuresis. Rates of worsening kidney function, hypokalemia, hypotension, or adverse events were similar between groups.

Even with high-dose loop diuretics, many patients with acute decompensated heart failure continued signs of volume overload after discharge, associated with poor clinical outcomes. Added to loop diuretics, the carbonic anhydrase inhibitor acetazolamide reduces proximal tubular sodium reabsorption and thus, might improve diuretic efficiency.

The ADVOR results show an increase in successful decongestion with acetazolamide added to standardized loop diuretic therapy for acute decompensated heart failure with volume overload. "These findings highlight the importance of targeting congestion both early and aggressively and support the use of natriuresis as an indicator of diuretic response," the researchers write [Mullens W, et al. Acetazolamide in acute decompensated heart failure with volume overload. *N Engl J Med*, published online ahead of print August 27, 2022. doi: 10.1056/NEJMoa2203094; https://www.nejm.org/doi/10.1056/NEJMoa2203094]. ■