
OBJECTIVES
Existing prognostic models for patients with hepatocellular carcinoma (HCC) have limitations. Analytic morphomics, a novel process to measure body composition using computational image-processing algorithms, may offer further prognostic information. The aim of this study was to develop and validate a prognostic model for HCC patients using body composition features and objective clinical information.

METHODS
Using computed tomography scans from a cohort of HCC patients at the VA Ann Arbor Healthcare System between January 2006 and December 2013, we developed a prognostic model using analytic morphomics and routine clinical data based on multivariate Cox regression and regularization methods. We assessed model performance using C-statistics and validated predicted survival probabilities. We validated model performance in an external cohort of HCC patients from Parkland Hospital, a safety-net health system in Dallas County.

RESULTS
The derivation cohort consisted of 204 HCC patients (20.1% Barcelona Clinic Liver Cancer classification (BCLC) 0/A), and the validation cohort had 225 patients (22.2% BCLC 0/A). The analytic morphomics model had good prognostic accuracy in the derivation cohort (C-statistic 0.80, 95% confidence interval (CI) 0.71-0.89) and external validation cohort (C-statistic 0.75, 95% CI 0.68-0.82). The accuracy of the analytic morphomics model was significantly higher than that of TNM and BCLC staging systems in derivation (P=0.001 for both) and validation (P=0.001 for both) cohorts. For calibration, mean absolute errors in predicted 1-year survival probabilities were 5.3% (90% quantile of 7.5%) and 7.6% (90% quantile of 12.5%) in the derivation and validation cohorts, respectively.

CONCLUSION
Body composition features, combined with readily available clinical data, can provide valuable prognostic information for patients with newly diagnosed HCC.