



# Impact of Physician Specialty Mix on the Outcomes of Patients Dually Diagnosed With Diabetes and Compensated Cirrhosis

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Liver cirrhosis, an irreversible chronic condition, was the 11th leading cause of death in the U.S. in 2012 (1). Up to 70% of patients with compensated cirrhosis have coexisting diabetes (2). Previous studies found that patients dually diagnosed with diabetes and compensated cirrhosis are often managed by primary care physicians (PCP), although the percentage who also visit specialists such as gastroenterologists (GI) and endocrinologists (ENDO) is increasing (3). Whether the mix of physician specialties visited is associated with major health events among these dually diagnosed patients is unknown. Therefore, this study investigates whether physician mix affects outcomes of patients dually diagnosed with compensated cirrhosis and diabetes. The study was reviewed and approved by the University of North Carolina at Chapel Hill Institutional Review Board.

This retrospective study analyzed MarketScan Commercial Claims and Encounters and Medicare Supplemental databases (2000–2013). A total of 18,359 adults (aged  $\geq 18$  years) with ICD-9 codes indicating both diabetes and compensated cirrhosis were classified into one of four physician mix categories: 1) PCP with no GI/ENDO, 2) GI/ENDO with no PCP, 3) PCP and GI/ENDO, and 4) neither PCP nor GI/ENDO.

The primary outcome was a composite of all-cause hospitalization or any incident decompensation event (ascites, spontaneous bacterial peritonitis, variceal bleeding, hepatic encephalopathy, hepatocellular carcinoma, acute renal failure). Secondary analysis examined hospitalizations and decompensation events separately. To control for the fact that patients select physicians based on unobserved severity of illness, three instrumental variables (physician density of PCPs, GI/ENDO, and other physicians per 100,000 residents) were used in two-stage residual inclusion (2SRI). Covariates included patient demographics (age, sex, geographic region), area-level median income, Elixhauser comorbidity index (4), severity of diabetes, and medications reflecting prognosis. Detailed ICD-9-Clinical Modification codes, Current Procedural Terminology codes, and linkage of physician density were described elsewhere (3).

Using the PCP-only category as the reference group, logistic regression without 2SRI indicated that patients who visited GI/ENDO with or without PCP had increased risk of developing any decompensation event. Logistic regression using 2SRI showed that patients who visited both PCP and GI/ENDO had 0.03 times lower odds of experiencing any decompensation event and/or hospitalization

( $P < 0.05$ ) and 0.05 times lower odds of developing any decompensation event ( $P < 0.05$ ) (Fig. 1). This may be because the specialists are able to manage some decompensation events (ascites, hepatocellular carcinoma, acute renal failure) and prevent these patients from further hospitalization. When we analyzed hospitalizations and decompensation events separately, the pattern was similar.

Our primary and secondary results indicated that patients with complex chronic conditions may benefit from care by both generalist and specialist physicians. The findings may help develop treatment protocols that specify what services PCPs and specialists (GI/ENDO) might provide. As health care reform emphasizes patient-centered medical homes (5) and coordination of care, this study provides partial evidence regarding the importance of receiving care from PCPs and specialists.

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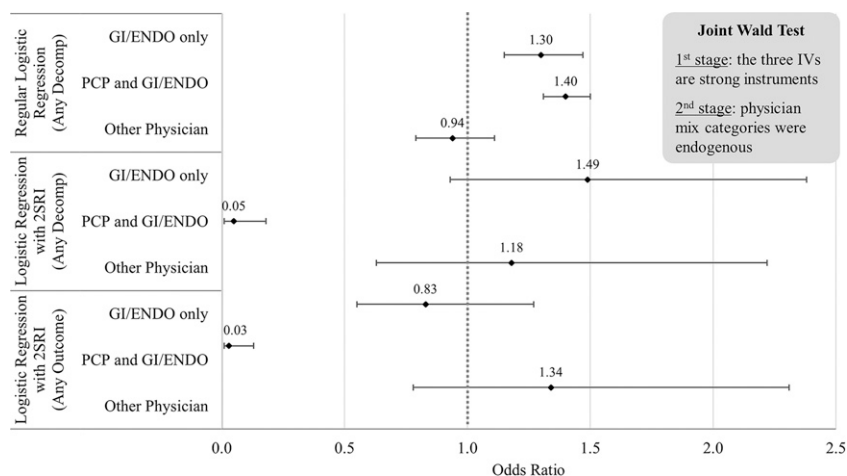
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**Figure 1**—Odds ratios for decompensation event/hospitalization by physician mix using logistic regression with and without 2SRI (PCP only as reference). Other controlled variables include dual diagnosis, sex, age-group, region, number of comorbidities, median income, diabetes medication usage, and other controlled medication. Decomp, decompensation event; IVs, instrumental variables.

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