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## Introduction & Aim

- Thyroid Hormone plays an essential role in lipid metabolism and regulates hepatic cell functionality
- Previous studies have demonstrated a dual promoting and inhibitory effect of thyroid hormone on various cancers
- **Aim:** Use a propensity matched analysis to examine inpatient outcomes in cases of hepatocellular carcinoma (HCC) with hypothyroidism (HT)

## Methods

### Data & Cohort

- 2001-2014 National Inpatient Sample (NIS)
- Diagnosis of malignant hepatocellular carcinoma with and without hypothyroidism [ICD-9 codes]

### Baseline Characteristics Observed / Covariates

- Patient Demographics: Age, Race, Sex, Income, Payer
- Hospital Characteristics: Teaching Status, Size, Region
- Clinical Features: Charlson comorbidities,, Admission Status, etiology of liver disease
- Assessed with Rao-Scott Chi-Squared and Mann-Whitney tests

### Outcomes Assessment

- Primary Outcomes: Length of stay (LOS), Total In-hospital charges, routine vs non-routine disposition, mortality
- Secondary Outcomes: decompensation complications and procedures performed
- Multivariable Poisson and logistic regression
- Controlled for baseline characteristic differences

## Results

Table 1: Baseline Characteristics Of the Study Cohort Pre and Post Propensity Score Matching

Variable	Raw Cohort		Pvalue	SMeanDiff	Propensity Matched Cohort <sup>2</sup>	
	No Hypothyroidism N = 495,560	Hypothyroidism N = 36,376			No Hypothyroidism N = 31,408	Hypothyroidism N = 31,461
Age	62 (54 - 72)	69 (60 - 78)	<0.001 *	0.48	69 (60 - 77)	69 (60 - 78)
Sex						
Female	25.3%	53.0%	<0.001 *	0.63	52.9%	53.3%
Male	74.6%	47.0%		-0.63	47.1%	46.7%
Race						
White	48.3%	58.5%	<0.001 *	0.22	65.5%	65.9%
Hispanic	14.2%	15.2%		0.01	17.2%	16.6%
Black	12.9%	6.7%		-0.21	7.5%	7.5%
Asian/Pac Islander	8.7%	5.1%		-0.14	5.6%	5.7%
Charlson Comorb Index	6 (3 - 8)	6 (3 - 8)	<0.001 *	0.06	6 (3 - 8)	6 (3 - 8)
Etiology of Liver Disease						
Hepatitis B	5.5%	2.4%	<0.001 *	-0.14	2.4%	2.5%
Hepatitis C	26.3%	22.0%	<0.001 *	-0.10	23.0%	22.4%
Alcohol Related Liver Disease	18.0%	11.0%	<0.001 *	-0.19	11.5%	11.2%
Nonalcoholic Fatty Liver Disease	34.0%	37.8%	<0.001 *	0.08	39.3%	38.6%
Admission Type						
Non-Elective	75.6%	77.6%	0.004 *	0.06	78.8%	78.1%
Elective	24.2%	22.2%		-0.06	21.2%	21.9%
Hospital Teaching Status						
Urban Teaching	66.9%	63.6%	<0.001 *	-0.07	63.1%	63.9%
Urban Nonteaching	26.9%	29.4%		0.06	31.4%	30.6%
Rural	5.8%	6.4%		0.02	5.5%	5.5%
Hospital Region						
South	34.0%	33.5%	<0.001 *	-0.02	34.8%	34.6%
West	25.6%	27.5%		0.04	28.4%	28.8%
Northeast	23.4%	19.7%		-0.10	21.7%	21.4%
Midwest	16.9%	19.3%		0.09	15.1%	15.2%
Primary Payer						
Medicare	45.6%	65.4%	<0.001 *	0.41	66.1%	66.4%
Private Insurance	28.3%	20.9%		-0.18	20.2%	20.2%
Medicaid	17.7%	8.9%		-0.23	9.4%	9.2%
Self-Pay	4.0%	2.0%		-0.10	1.8%	1.9%

1 Median (Interquartile Range) | 2. Counts weighted by NIS trends weights post propensity matching  
 SMeanDiff = Standardized Mean Difference for balance assessment  
 \* Pvalue < 0.05

Table 2: Primary Outcomes, Procedures, & Complication Rates - Estimates and Adjusted Regression Coefficients

Variable	Outcome	No Hypothyroidism	Hypothyroidism	Coefficient <sup>1,2,3</sup>	95% Conf Interval	Pvalue
Primary Outcome	Total Charges <sup>4</sup>	\$33,660 (\$17,445 -	\$34,034 (\$18,126 -	0.97	(0.92 - 1.02)	0.2
	Routine Disposition	\$63,937)	\$63,399)	1.01	(0.93 - 1.09)	0.86
	Length Of Stay <sup>4</sup>	50.9%	51.3%	0.96	(0.93 - 1.01)	0.09
	Mortality	4 (2 - 7)	4 (2 - 7)	0.76	(0.67 - 0.86)	<0.001 *
Complications	Acute Kidney Injury	20.9%	20.5%	1.00	(0.91 - 1.1)	0.96
	Portal Vein Hypertension	15.1%	14.6%	0.94	(0.82 - 1.08)	0.38
	Ascites	5.1%	4.4%	0.90	(0.73 - 1.11)	0.34
	Hepatic Encephalopathy	9.8%	9.9%	1.04	(0.89 - 1.21)	0.65
	Variceal Bleeding	2.8%	2.3%	0.88	(0.69 - 1.11)	0.28
	Jaundice	2.0%	1.6%	0.79	(0.61 - 1.04)	0.09
Procedures	Total Hepatectomy	0.3%	0.5%	1.48	(0.87 - 2.52)	0.15
	Partial Hepatectomy	4.1%	4.6%	1.09	(0.9 - 1.32)	0.36
	Liver Lobectomy	1.5%	1.6%	1.03	(0.77 - 1.39)	0.83
	Liver Transplant	2.9%	3.2%	1.10	(0.86 - 1.42)	0.44
	Liver Ablation	2.0%	2.3%	1.17	(0.91 - 1.51)	0.22

1 Coefficient derived from logistic (odds ratio), Poisson (incident rate ratio), and gamma log-link GLM regressions  
 2 "No Hypothyroidism" set as the reference group  
 3 Adjusted for age, race, sex, comorbidities, liver disease etiology, year, income, payer, admission type, hospital region, hospital type & size  
 4 Median (Interquartile Range)  
 \* Pvalue < 0.05

## Results

- 531,936 weighted HCC cases; 36,376 cases with HT were identified
- Pre-match, HCC cases with HT were older (69 vs 62, P<0.001) and were more likely to be female (53% vs 25.3%, P<0.001), and white (58.5% vs 48.3%, P<0.001)
- HT was associated with higher rates of nonalcoholic fatty liver disease (37.8% vs 34%, P<0.01) but lower rates of alcohol related liver disease and hepatitis B and C
- After matching to controls, the mortality rate of HCC with HT was significantly lower at 7.6% versus 9.9% without HT (aOR 0.76, 95% CI 0.67–0.86, P<0.001)
- There was no significant difference in LOS, total charges, or disposition.
- Prevalence rates of liver decompensation complications and frequency and types of surgical intervention were similar among the cohorts.

## Conclusion

- Inpatients hospitalized with concomitant HCC and HT have a lower overall mortality rate despite similar degrees of decompensation and interventional procedures performed than cases without HT
- Given previously studies showing thyroid hormone inhibiting hepatoma cellular proliferation, it is possible that levothyroxine used as treatment of HT has a beneficial therapeutic impact on HCC progression.
- given conflicting data in previous in vivo studies regarding thyroid hormone dysregulation and HCC aggression, future control trials are warranted to understand the clinical potential of levothyroxine in HCC patients.