

Real-World Treatment Patterns, Patient Characteristics, Healthcare Resource Utilization and Costs among Intermediate Hepatocellular Carcinoma patients in Canada: A Retrospective Cohort Study Using Provincial Administrative Data

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Introduction

- Intermediate hepatocellular carcinoma (iHCC) is a complex stage of liver cancer comprising of a heterogeneous patient population requiring individualized treatment strategies of locoregional and/or systemic therapies (1-3).
- Limited data exist on the economic burden of HCC (all types) in Canada, ranging from mean cost per patient year (PPY) of \$51,649 (2021 CAD) to mean 5-year net cost of \$77,509 (2010 USD) (4,5).
- This study aims to evaluate the treatment patterns, healthcare resource utilization (HCRU) and costs among iHCC patients in the Canadian province of Ontario.

Methods

A retrospective cohort study used linked administrative databases from the Institute for Clinical Evaluative Sciences (ICES) in Ontario, Canada. Patients diagnosed with iHCC between April 1, 2010, and March 31, 2021, were followed until death, last available follow-up date, or March 31, 2022 (whichever occurred first).

Inclusion and Exclusion Criteria

Patients were identified using ICD-10 (C22.0, C22.4, C22.8, C22.9) and ICD-O-3 (C22.0) codes and classified as intermediate based on collaborative stage I-III, received any embolization, stereotactic body radiotherapy (SBRT), or liver transplant after diagnosis. Patients were excluded if they were diagnosed at stage IV or other cancers, received systemic therapy as first-line (1L) treatment, or had insufficient Ontario Health Insurance Plan (OHIP) coverage.

Subgroup Definitions

The cohort was stratified into three subgroups:

- Locoregional Therapy (LRT) Only: Patients who received LRT(s) and no other treatment type.
- LRT and Systemic: Patients who received a 1L LRT followed by systemic therapy.
- Untreated: Patients who received only liver transplant or ablation, and no receipt of LRT or systemic therapy.

Healthcare Resource Utilization and Costs

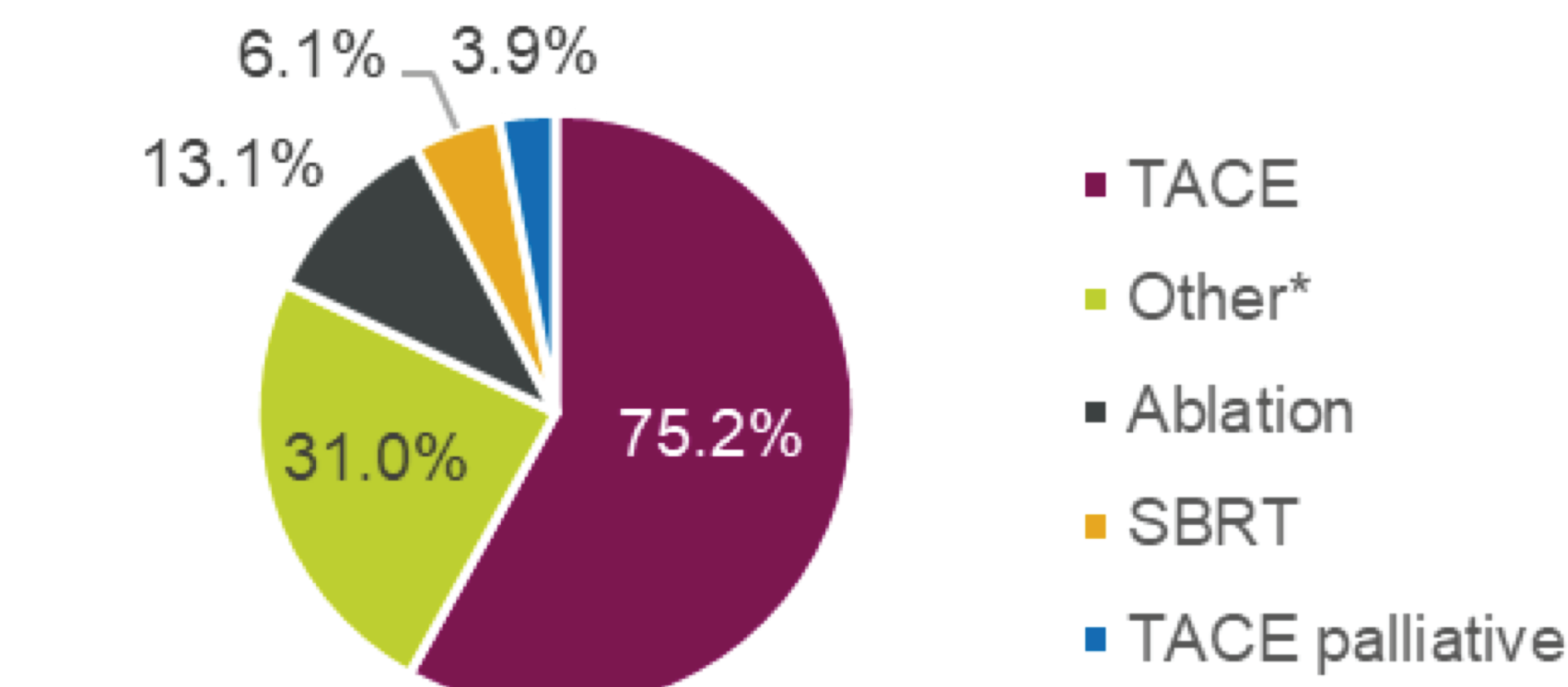
HCRU and costs (2021 CAD) were analyzed using the GETCOST macro from ICES. Costs were reported as mean cost per person from diagnosis and as per person-year (PPY).

Results					
Table 1: Baseline Characteristics for iHCC Patients (N=1,793)					
Baseline Characteristics		All iHCC (N=1,793)	LRT only (N=936)	LRT+Systemic (N=478)	Untreated (N=379)
Median age, years (IQR)		66 (59-74)	66 (60-73)	66 (60-73)	65 (57-74)
Male (N, %)		1,423 (79.4%)	744 (79.5%)	386 (80.8%)	293 (77.3%)
Charlson Comorbidity Index (CCI) Score	1	115 (6.4%)	64 (6.8%)	20 (4.2%)	31 (8.2%)
	2	146 (8.1%)	85 (9.1%)	49 (10.3%)	12 (3.2%)
	3+	466 (26.0%)	248 (26.5%)	132 (27.6%)	86 (22.7%)
	Missing	1,066 (59.5%)	539 (57.6%)	277 (58.0%)	250 (66.0%)
Mean Follow-up Years ± SD		2.4 ± 2.6	2.5 ± 2.6	2.4 ± 2.0	2.1 ± 3.2
Cirrhosis Decompensation (N, %)		794 (44.3%)	439 (46.9%)	205 (42.9%)	150 (39.6%)
Liver Transplant (N, %)		357 (19.9%)	220 (23.5%)	54 (11.3%)	83 (21.9%)
Embolization (N, %)		1,318 (73.5%)	936 (100%)	382 (79.9%)	0 (0.0%)
Transarterial Chemoembolization (TACE)		1,315 (73.3%)	*931-935 (~99.7%)	*380-384 (~79.9%)	0 (0.0%)
Transarterial Radioembolization (TARE)		37 (2.1%)	28 (3.0%)	9 (1.9%)	0 (0.0%)
Radiation Therapy/SBRT		300 (16.7)	102 (10.9%)	198 (41.4%)	0 (0.0%)
Systemic Therapy		478 (6.7%)	0 (0.0%)	478 (100.0%)	0 (0.0%)
IQR=interquartile range; SD=standard deviation; *range of values given to provide back calculation and midpoint used to estimate percentage					

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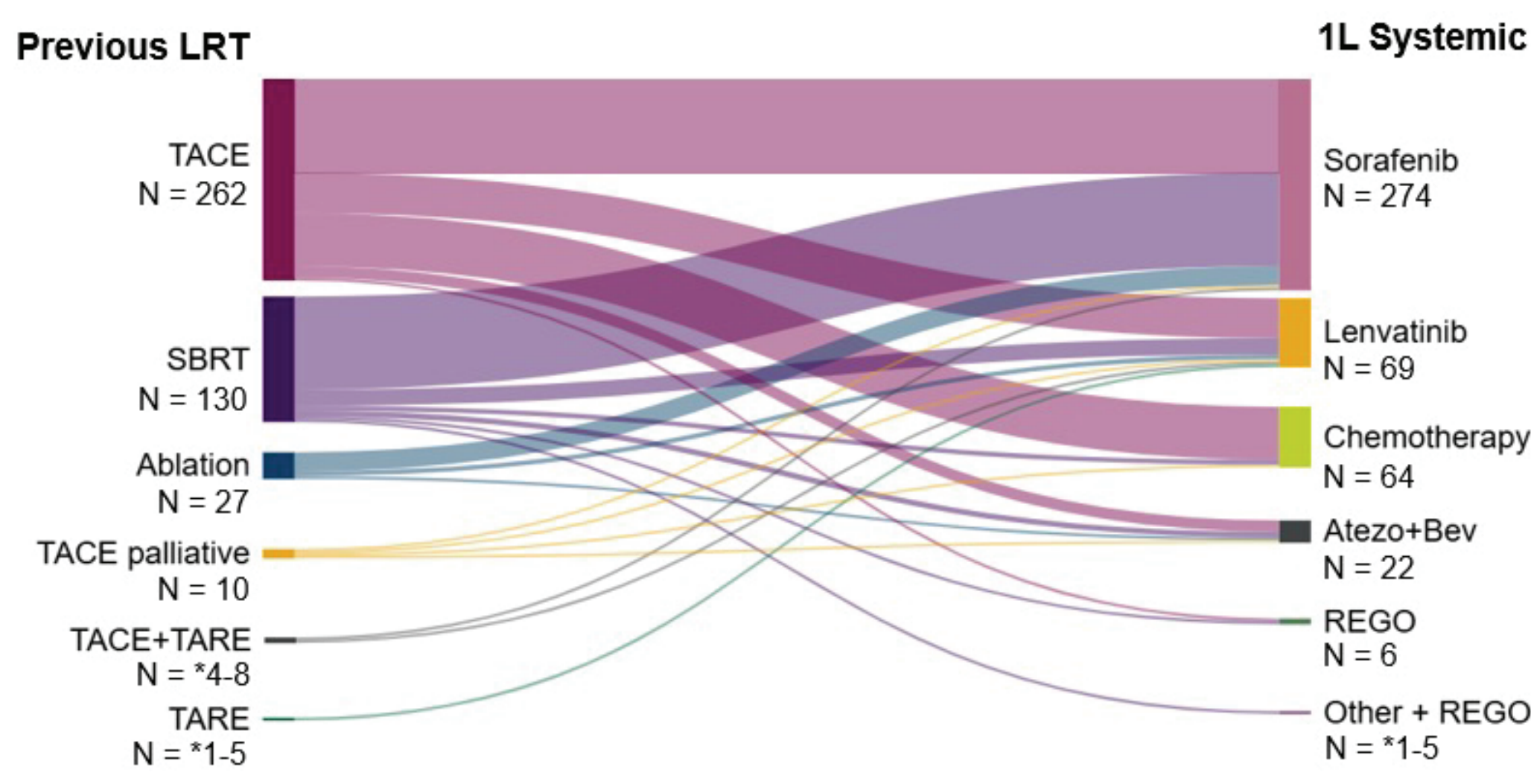
Table 1 presents the baseline characteristics (age, gender, CCI, and treatment types) for the overall iHCC cohort and the three subgroups while Figure 1 shows the distribution of the LRT treatments received by patients in the LRT-only cohort. TACE was the most common treatment, followed by other, ablation, and SBRT. In Figure 2, most of the LRT+Systemic patients received TACE (60.1%), SBRT (29.8%) or ablation (6.2%), prior to systemic treatment. Sorafenib was the most common systemic treatment following LRT (62.8%).

Figure 1: Distribution of Treatments in LRT Only Patients



(* Other = other embolization, TACE+TARE combined).

Figure 2: Treatment Sequences (N=436) for LRT+ Systemic Patients



In Table 2 for HCRU during the study period, the LRT+Systemic patients generally utilized the highest number of resources, particularly driven by medical oncologist visits while the untreated patients were offered limited treatment options and interacted less with the healthcare system overall. In data not shown, HCRU for the untreated patients found higher emergency department (ED) visits (3.0) compared to the treated patients.

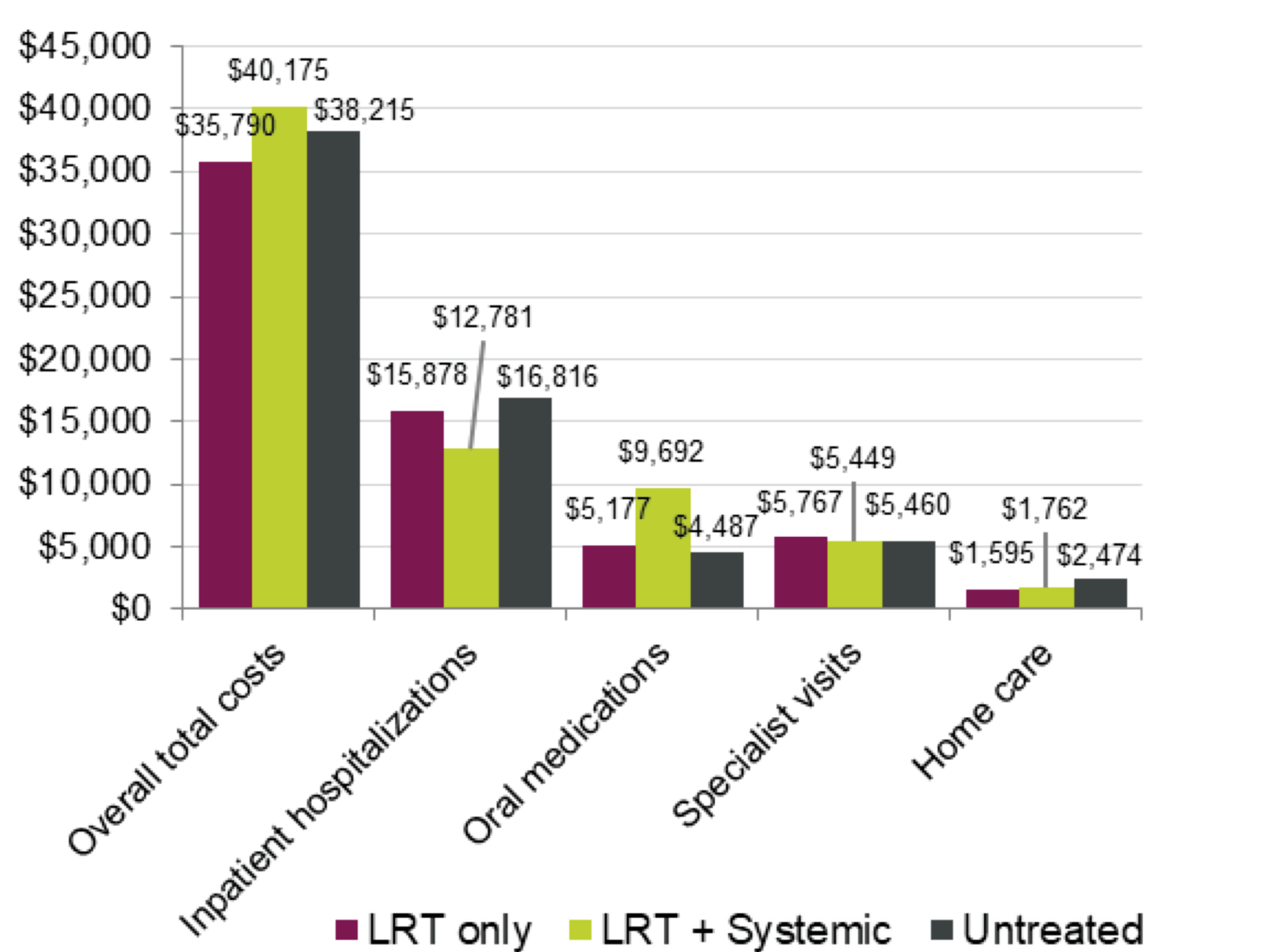
Table 2: Number of HCRU Encounters Per Patient Year				
Resource	All iHCC (N=1,793)	LRT only (N=936)	LRT+Systemic (N=478)	Untreated (N=379)
Inpatient hospitalizations	4.0	4.2	4.3	2.8
Outpatient visits	23.5	23.0	31.9	13.9
Cancer clinic visits	8.4	8.0	9.0	6.0
Oral medication prescriptions	64.6	70.2	68.7	44.3
Home care visits	57.2	63.2	53.8	49.0
General practitioner visits	40.9	42.1	45.8	31.7
Specialist visits	80.3	80.6	101.9	31.7
Radiation oncologist visits	5.8	6.1	6.9	2.5
Medical oncologist visits	15.5	9.5	27.7	5.5

COST RESULTS

In Figure 3 for costs during the study period, inpatient hospitalizations were the highest cost driver, particularly for untreated patients. Oral medication costs were nearly double for the LRT+Systemic patients. Costs associated with specialist visits were relatively the same for the three iHCC subgroups while home care costs were the highest for the untreated patients.

In data not shown, when costs were calculated for just Year 1, the mean cost PPY for the untreated patients was the highest with \$73,955, and inpatient hospitalization as the cost driver with \$37,432.

Figure 3: Mean Costs Per Patient Year for Overall Costs and Other Resources



Conclusions

- This study offers a novel, in-depth examination of the HCRU and costs associated with iHCC in Ontario, Canada, from 2010 to 2022.
- TACE was the highest utilized 1L treatment among the treated patients.
- Cost increases associated with iHCC patients receiving LRT+Systemic therapy were driven by medical oncologist visits and oral medications.
- Untreated patients were the costliest in Year 1 due to higher ED visits and complex hospitalizations, yet utilized less HCRU and incurred lower costs than treated patients over time.

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