Healthcare utilization and cost of metabolic dysfunction-associated steatotic liver disease (MASLD) in Ontario, Canada: An observational study

Poster Code: EE342

Keyur Patel MD PhD[1], Diego Moreno Baca BSc[2], Natalia Konstantelos PhD[3], Ginnie Ng PhD[3], Urja Lathia MSc[2]

Introduction

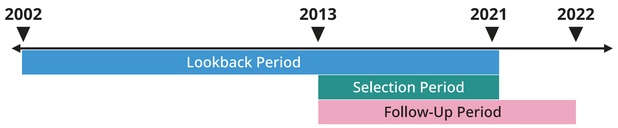
- MASLD encompasses a variety of liver diseases, including metabolic dysfunction-associated steatohepatitis (MASH), which may progress to cirrhosis, liver failure, transplant and cancer.
- While MASLD is associated with a substantial economic burden[1-3], its global prevalence has also increased nearly 50% over the past 30 years[4].
- In Canada, a model estimated the prevalence of MASLD to increase by 20% between 2019 and 2030[5].
- **Aim:** Describe the healthcare resource utilization (HCRU) and direct healthcare costs of persons with MASLD (PwMASLD) in Ontario, Canada, and further describe specific subgroups of patients diagnosed with MASLD only, MASH, and cirrhosis.

Methods

Study Design

- This retrospective observational study identified PwMASLD in Ontario using administrative health records at ICES.
- As summarized in **Figure 1**, study periods included:
  - **Selection period:** PwMASLD hospitalized or seen in an emergency department between January 1, 2013 and December 31, 2021 were identified.
    - **Index date:** The first time when PwMASLD met the inclusion/exclusion criteria during the selection period.
  - **Look-back periods:** Several periods prior to index were used to identify baseline demographic and clinical characteristics, comorbidities, and subgroups.
  - **Follow-up period:** PwMASLD were followed for 1 to 10 years after index (until December 31, 2022) to evaluate study outcomes.

Figure 1. Study overview



Study Population

- Eligibility criteria:
  - Have a valid OHIP health card number and have had at least one claim at least 12 months before the index date,
  - Have a diagnosis of MASH or MASLD (i.e., ICD-10-CA codes K75.8 or K76.0),
  - Have complete key demographic information used for matching,
  - No diagnosis of other liver diseases within the year prior to index,
  - No diagnosis of alcohol/drug use disorders within the year prior to index

Matched Controls

- PwMASLD were matched with general population controls (individuals without MASLD during the entire study period) based on age, sex, geography, and income quintile.

Analysis

- Descriptive statistics of cohort characteristics were reported. All-cause HCRU and healthcare costs after index were described per person-year (PPY).
  - Costs were calculated using the ICES costing methodology and standardized to 2022 Canadian dollars (CAD)[6].
- PwMASLD were categorized into mutually exclusive subgroups: (1) **MASLD-only**: MASLD only, without cirrhosis or MASH; (2) **MASH**: MASH without cirrhosis; (3) **Cirrhosis**: MASH or MASLD with cirrhosis.
- Results were also categorized by presence of health outcomes*:
  - **Liver events:** Compensated cirrhosis; decompensated cirrhosis; liver transplantation; liver cancer outcomes; chronic or unspecified liver failure; acute or subacute liver failure; portal vein thrombosis; and hepatic fibrosis, sclerosis, or fibrosis with sclerosis.
  - **Cardiovascular (CV) events:** Coronary revascularization; heart failure; myocardial infarction; and cerebrovascular accidents and stroke.

[1] University Health Network, Ontario, Canada; [2] Novo Nordisk Canada Inc., Ontario, Canada; [3] IQVIA Solutions Canada Inc., Ontario Canada

*Health outcomes were captured in the 2 years pre-index, at index and during the follow-up period.

Abbreviations: CV (Cardiovascular), FIB-4 (Fibrosis-4), HCRU (Healthcare Resource Utilization), ICD-10-CA (International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada), MASH (Metabolic Dysfunction-Associated Steatohepatitis), MASLD (Metabolic Dysfunction-Associated Steatotic Liver Disease), PPY (Per Person-Year), PwMASLD (Persons with MASLD), SLD (Steatotic Liver Disease).

This study made use of de-identified data from the ICES Data Repository, which is managed by the Institute for Clinical Evaluative Sciences with support from its funders and partners: Canada's Strategy for Patient-Oriented Research (SPOR), the Ontario SPOR Support Unit, the Canadian Institutes of Health Research and the Government of Ontario. The opinions, results and conclusions reported are those of the authors. No endorsement by ICES or any of its funders or partners is intended or should be inferred.

This study was sponsored by Novo Nordisk Canada Inc.

Presented at ISPOR 2025; May 13 to 16, 2025; Quebec, Canada.

Results

Demographic and clinical characteristics

- A total of 18,202 PwMASLD and 72,770 general population controls were included. Baseline characteristics are summarized in **Table 1**.
  - Burden of disease was higher among PwMASLD compared to controls. Further, increasing burden was observed with disease progression from MASLD to MASH to cirrhosis.
  - The mean follow-up time of PwMASLD and controls was 4.5±2.5 years and 4.7±2.5, respectively.

Table 1. Demographic and clinical characteristics

			PwMASLD Subgroups		
Demographic Characteristics	**PwMASLD**	**Gen Pop Controls**	**MASLD-Only**	**MASH**	**Cirrhosis**
Number of persons	N=18,202	N=72,770	N=12,729	N=2,675	N=2,798
Age (years), mean (SD)	53.4 (17.2)	53.4 (17.2)	50.4 (17.3)	55.2 (16.6)	65.3 (10.4)
Sex, n (%)					
Female	10,159 (55.8%)	40,627 (55.8%)	6,932 (54.5%)	1,644 (61.5%)	1,583 (56.6%)
Male	8,043 (44.2%)	32,143 (44.2%)	5,797 (45.5%)	1,031 (38.5%)	1,215 (43.4%)
Rural Residence, n (%)					
Rural	2,189 (12.0%)	9,183 (12.6%)	1,506 (11.8%)	285 (10.7%)	398 (14.2%)
Urban	16,013 (88.0%)	63,587 (87.4%)	11,223 (88.2%)	2,390 (89.3%)	2,400 (85.8%)
Clinical Characteristics					
Duration of follow-up (years), mean (SD)	4.5 (2.5)	4.7 (2.5)	4.6 (2.5)	4.6 (2.4)	3.9 (2.3)
Comorbidities, n (%)					
Asthma	4,232 (23.3%)	10,119 (13.9%)	2,971 (23.3%)	656 (24.5%)	605 (21.6%)
Cardiovascular disease	2,215 (12.2%)	3,963 (5.4%)	1,252 (9.8%)	363 (13.6%)	600 (21.4%)
Chronic obstructive pulmonary disease	2,989 (16.4%)	7,269 (10.0%)	1,789 (14.1%)	495 (18.5%)	705 (25.2%)
Chronic kidney disease	1,928 (10.6%)	1,838 (2.5%)	960 (7.5%)	354 (13.2%)	614 (21.9%)
Diabetes (Type II)	7,282 (40.0%)	10,553 (14.5%)	3,827 (30.1%)	1,305 (48.8%)	2,150 (76.8%)
Dyslipidemia	4,306 (23.7%)	12,127 (16.7%)	3,038 (23.9%)	702 (26.2%)	566 (20.2%)
Hypertension	9,467 (52.0%)	23,596 (32.4%)	5,747 (45.1%)	1,607 (60.1%)	2,113 (75.5%)
Metabolic syndrome	484 (2.7%)	948 (1.3%)	277 (2.2%)	85 (3.2%)	122 (4.4%)
Obesity	4,182 (23.0%)	3,861 (5.3%)	2,673 (21.0%)	945 (35.3%)	564 (20.2%)

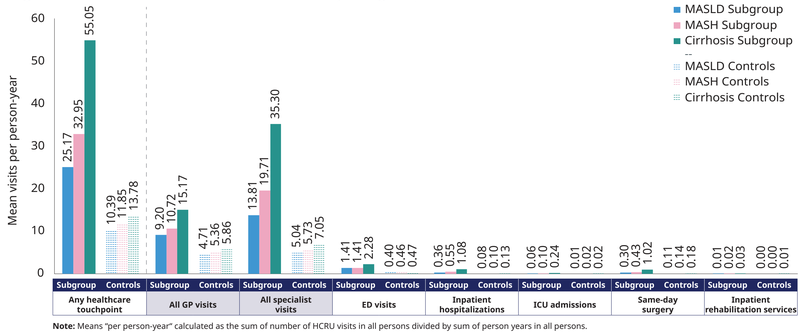
Healthcare resource utilization (HCRU)

- PwMASLD had at least twice the HCRU PPY across resource categories throughout the follow-up period compared to controls (**Figure 2**).
  - The resource category most often used by PwMASLD were physician (general practitioner, specialist) visits.
    - Compared to controls, PwMASLD had ~2-5 times as many GP and specialist visits PPY.
  - PwMASLD had ~3 times as many ED visits and 4 times as many inpatient hospitalizations compared to controls.

By subgroups and health outcomes

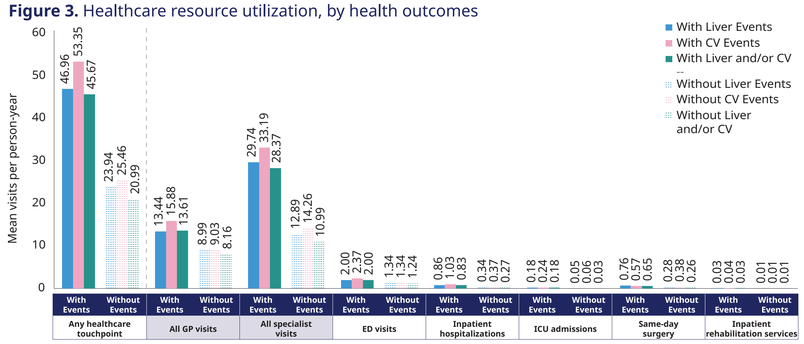
- HCRU was highest in the cirrhosis subgroup across all categories, followed by the MASH and MASLD-only subgroups. This finding was consistent across all HCRU categories (**Figure 2**).
  - Compared to controls, the cirrhosis, MASH, and MASLD subgroups had ~4, 3, 2 times as many touchpoints PPY, respectively.
- PwMASLD with a liver and/or CV event had at least twice the HCRU of those without (**Figure 3**).
  - Among all PwMASLD, HCRU was highest among those with CV events.

Figure 2. Healthcare resource utilization, by subgroup



Note: Means "per person-year" calculated as the sum of number of HCRU visits in all persons divided by sum of person years in all persons.

Figure 3. Healthcare resource utilization, by health outcomes



Note 1: Means "per person-year" calculated as the sum of number of HCRU visits in all persons divided by sum of person years in all persons. **Note 2:** Subgroups are not mutually exclusive.

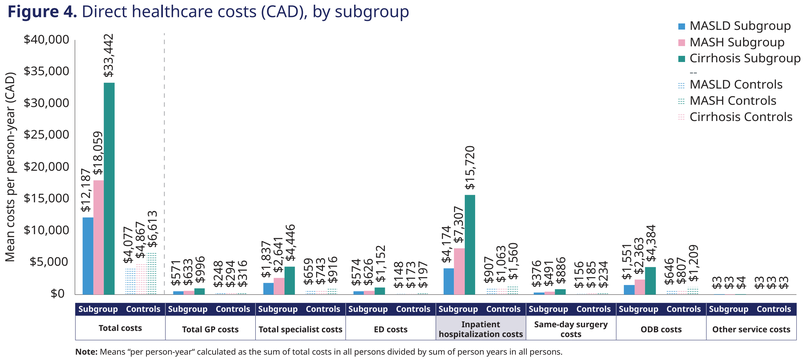
Direct healthcare costs

- Compared to controls, PwMASLD had at least 3 times the total healthcare costs during the follow-up period (**Figure 4**).
  - Inpatient hospitalization costs were the greatest cost category.
  - Compared to controls, PwMASLD incurred more than 5 times the hospitalizations costs PPY. More specifically, PwMASLD in the cirrhosis subgroup incurred ~10 times the hospitalization costs PPY compared to controls.

By subgroups and health outcomes

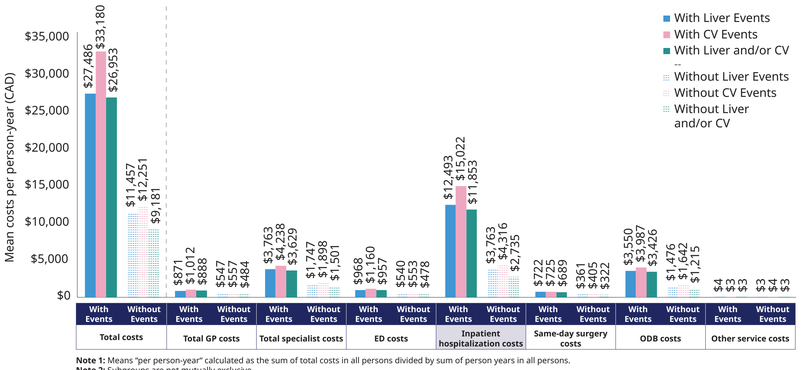
- The cirrhosis subgroup incurred the highest healthcare costs across all categories, followed by the MASH and MASLD-only subgroups (**Figure 4**).
  - Compared to controls, the cirrhosis, MASH, and MASLD subgroups incurred ~5, 4 and 3 times the mean cost PPY, respectively.
- PwMASLD with a liver and/or CV event had at least twice the costs of those without (**Figure 5**).
  - Among all PwMASLD, costs were also highest among those with CV events.

Figure 4. Direct healthcare costs (CAD), by subgroup



Note: Means "per person-year" calculated as the sum of total costs in all persons divided by sum of person years in all persons.

Figure 5. Direct healthcare costs (CAD), by health outcomes



Note 1: Means "per person-year" calculated as the sum of total costs in all persons divided by sum of person years in all persons.
Note 2: Subgroups are not mutually exclusive.

Conclusions

- This study evaluated the economic impact of MASLD in Ontario, Canada. The annual use of healthcare services and costs were higher among PwMASLD compared to controls.
  - Utilization and costs increased with disease progression from MASLD to MASH to cirrhosis.
  - PwMASLD with liver and/or cardiovascular health outcomes also had over twice the HCRU and costs compared to those without.
- Early diagnosis and appropriate intervention should be implemented to delay or prevent disease progression and alleviate the economic burden of MASLD.

References

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