

Direct Economic Burden of Chronic Hepatitis C Virus in a Large Managed Care Population

Davis KL¹, Mitra D¹, Medjedovic J², Beam C³, Rustgi VK⁴

¹RTI Health Solutions, RTI International, Research Triangle Park, North Carolina, United States; ²Novartis Pharma AG, Basel, Switzerland; ³Human Genome Sciences, Inc., Rockville, Maryland, United States; ⁴Georgetown University Medical Center, Washington, DC, United States

1. Background

Hepatitis C virus (HCV) is one of the most common blood-borne infections in the United States (US). Among all patients infected with HCV, approximately 20% develop cirrhosis of the liver², which leads to a substantial consumption of health care resources and associated costs. Most patients currently infected with HCV are now in their fourth or fifth decade of life, presumably having been infected during the 1960s and 1970s primarily through experimentation with injection drugs¹. Because persons in the age group most frequently diagnosed with HCV (aged 30 to 49 years) are likely to be employed and enrolled in an employer-based insurance plan, the direct medical costs of HCV in the US may fall largely on managed care payers². Despite the potential cost implications of HCV to managed care systems in the US, administrative claims data have not been extensively analyzed to characterize resource utilization and costs incurred by HCV-infected patients from the perspective of commercial insurers.

2. Objective

To estimate total all-cause resource utilization and costs among managed care enrollees with chronic HCV compared with demographically similar subjects without HCV.

3. Methods

Study Design

A retrospective database analysis was undertaken to estimate the direct economic burden of HCV.

Data Source

Data were taken from the Integrated Health Care Information Services (IHCIS) database, a commercially available source of medical and pharmacy claims from a national sample of 30 managed care health plans covering approximately 38 million lives from 1997 to 2006.

Inclusion Criteria

Inclusion criteria for the HCV group were as follows:

- At least one primary or nonprimary diagnosis of chronic HCV (International Classification of Diseases, 9th Revision, Clinical Modification [ICD-9-CM] codes 070.44, 070.54, 070.70, or 070.71)
- No evidence of hepatitis B (HBV) diagnosis
- At least 6 months of continuous health plan enrollment preceding date of first observed HCV diagnosis (index date)
- At least 12 months of continuous plan enrollment after index date

Inclusion criteria for the control group were as follows:

- No evidence of HCV or HBV diagnosis
- Matched with HCV cases (1:1) on age (± 3 years), gender, and start and stop dates of health plan enrollment

Primary Outcomes

For each patient, all-cause health care utilization and costs (inclusive of both HCV- and non-HCV-related medical services) were aggregated over the 12-month period following the index date.

Variables examined included:

- Hospitalizations
- Skilled nursing facility (SNF) admissions
- Emergency room (ER) visits
- Physician office visits
- Home health care and durable medical equipment
- Other ancillary services
- Laboratory services
- Prescription drugs
- Total health care utilization and costs

Statistical Analyses

All analyses were carried out using SAS[®] (Version 9) statistical software. Descriptive analyses entailed the tabular display of mean values, standard deviations [SDs], medians, and ranges of continuous variables of interest and frequency distributions for categorical variables of interest. Statistical differences in outcomes between cases and controls were assessed using t-tests and chi-square tests, with results reported as *p*-values.

In spite of matching between the HCV and control groups, significant differences nevertheless may have existed between HCV cases and controls. To control for these differences and derive a more accurate estimate of the incremental effect of HCV on health care costs, we estimated a linear regression model for each cost outcome while controlling for the additional covariates of geographic location, health plan type, payer type, and Charlson Comorbidity Index (CCI) that could not be included in our case-control matching algorithm. The CCI includes 17 categories of comorbidities, as defined by ICD-9-CM diagnosis codes, with associated weights corresponding to the severity of the comorbid condition of interest. The CCI was assessed over the 6-month period preceding the index date.

4. Results

Patient Characteristics (Table 1)

- A total of 20,662 patients met the study inclusion criteria
- The mean age was 49 years, and 61% were male
- The mean CCI was 0.95 in HCV patients and was 0.24 in controls

Table 1. Patient Characteristics

	Patient Cohort			
	Chronic HCV (N = 20,662)		Control (N = 20,662)	
	N	%	N	%
Gender				
Female	8,121	39.30	8,121	39.30
Male	12,541	60.70	12,541	60.70
Age				
Mean (SD)	48.94 (10.03)		48.94 (10.03)	
Median	50		50	
Range (min, max)	(1, 79)		(1, 79)	
Age category				
<18	191	0.92	190	0.92
18-24	339	1.64	341	1.65
25-34	878	4.25	875	4.23
35-44	3,934	19.04	3,929	19.02
45-54	10,350	50.09	10,357	50.13
55-64	4,021	19.46	4,021	19.46
65+	949	4.59	949	4.59
Geographic region				
Northeast	11,424	55.29	17,249	83.48
South	5,234	25.33	1,441	6.97
Midwest	1,970	9.53	603	2.92
West	2,020	9.78	1,363	6.60
Unknown	14	0.07	6	0.03
Health plan type ^a				
HMO	7,823	37.86	10,868	52.60
POS	3,768	18.24	1,833	8.87
PPO	8,448	40.89	7,486	36.23
IND	468	2.27	436	2.11
Other	155	0.75	39	0.19
Charlson Comorbidity Index				
Mean (SD)	0.95 (1.66)		0.24 (0.79)	
Median	0		0	
Range (min, max)	(0, 16)		(0, 12)	

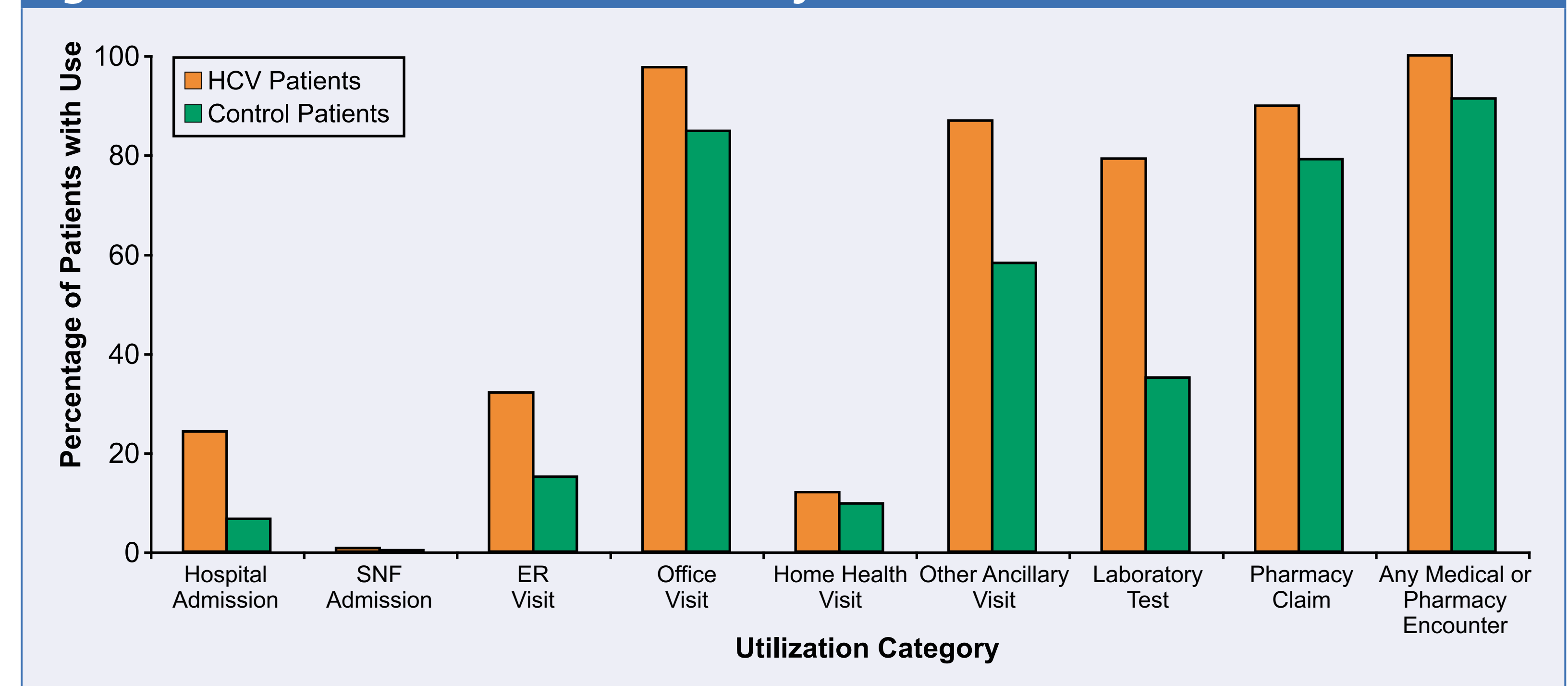
^aHMO = health maintenance organization; POS = point of service; PPO = preferred provider organization; IND = independent/self.

Acknowledgements: This study was funded by Novartis Pharma AG and Human Genome Sciences, Inc.

Resource Utilization Rates (Figure 1)

- 24% of HCV patients had at least one hospital admission during follow-up, compared with less than 7% of controls (*p* < 0.0001)
- The percentage of patients in the HCV group with an ER visit was more than double that in the control group (32% vs. 15%; *p* < 0.0001)
- 79% of HCV cases had at least one laboratory test during follow-up, compared with only 35% of controls (*p* < 0.0001)

Figure 1. Rate of Medical and Pharmacy Utilization



Health Care Utilization and Costs (Table 2)

- Compared with matched controls, HCV cases had higher mean utilization and associated costs during the 12-month period after the index date for all categories of health care services, including:
 - Hospitalizations (7.7 vs. 4.7 days; \$5,765 vs. \$1,057; *p* < 0.0001)
 - Office visits (12.5 vs. 7.2 visits; \$2,112 vs. \$1,095; *p* < 0.0001)
 - Other ancillary claims (6.7 vs. 2.6 claims; \$4,799 vs. \$1,463; *p* < 0.0001)
 - Prescription drugs (25.5 vs. 13.3 prescriptions; \$6,178 vs. \$1,176; *p* < 0.0001)
- Total health care costs, inclusive of all care settings, were \$20,830 per HCV patient, compared with \$5,108 per control patient (*p* < 0.0001)

Table 2. Descriptive Summary of Overall Health Care Utilization and Costs During the 12-Month Period Following HCV Diagnosis

	Patient Cohort		Difference (Cases - Controls)	<i>p</i> -value
	Chronic HCV (N = 20,662)	Controls (N = 20,662)		
Inpatient services				
Mean no. unique admissions (SD)	0.46 (1.19)	0.09 (0.42)	0.37	<0.0001
Mean no. of inpatient days (SD)*	7.74 (15.54)	4.73 (10.34)	3.01	<0.0001
Mean total cost (SD)	\$5,764.99 (\$25,436.78)	\$1,056.63 (\$7,625.46)	\$4,708.36	<0.0001
Skilled nursing facility (SNF) stays				
Mean no. unique SNF admissions (SD)	0.01 (0.19)	0.004 (0.09)	0.006	<0.0001
Mean no. of SNF days (SD)*	8.56 (17.38)	8.30 (10.63)	0.26	<0.0001
Mean total cost (SD)	\$72.28 (\$1,757.79)	\$21.06 (\$626.49)	\$51.22	<0.0001
Emergency department (ED)				
Mean no. ED visits (SD)	0.75 (20.08)	0.23 (0.89)	0.52	<0.0001
Mean total cost (SD)	\$387.41 (\$1,291.53)	\$104.48 (\$451.28)	\$282.93	<0.0001
Office visits				
Mean No. office visits (SD)	12.54 (12.92)	7.20 (9.64)	5.34	<0.0001
Mean total cost (SD)	\$2,112.38 (\$4,808.14)	\$1,095.07 (\$2,326.88)	\$1,017.31	<0.0001
Home health care/durable medical equipment				
Mean no. home health visits (SD)	0.81 (5.76)	0.34 (3.69)	0.47	<0.0001
Mean total cost (SD)	\$773.99 (\$16,034.25)	\$109.98 (\$1,553.12)	\$664.01	<0.0001
Other ancillary services				
Mean no. other ancillary claims (SD)	6.66 (15.44)	2.62 (5.94)	4.04	<0.0001
Mean total cost (SD)	\$4,799.77 (\$18,423.92)	\$1,462.62 (\$5,081.69)	\$3,337.15	<0.0001
Laboratory services				
Mean no. laboratory tests (SD)	14.70 (26.59)	2.34 (6.40)	12.36	<0.0001
Mean total cost (SD)	\$741.51 (\$1,697.98)	\$82.80 (\$360.64)	\$658.71	<0.0001
Pharmacy				
Mean no. prescriptions obtained (SD)	25.55 (27.60)	13.30 (17.99)	12.25	<0.0001
Mean total cost (SD)	\$6,178.00 (\$11,614.48)	\$1,176.32 (\$2,492.20)	\$5,001.68	<0.0001
Total health care utilization				
Mean no. encounters (SD)	61.49 (57.41)	26.13 (29.46)	35.36	<0.0001
Mean total cost (SD)	\$20,830.33 (\$44,021.87)	\$5,108.96 (\$12,335.55)	\$15,721.37	<0.0001

* Mean number of days estimated only among patients with at least 1 unique admission.

Incremental Cost Burden (Table 3)

After controlling for additional covariates, the incremental cost impact of HCV on total health care costs compared with controls remained large and statistically significant (+\$11,651; *p* < 0.0001).

Table 3. Multivariate Regression Results

	β_1^a	<i>p</i> -value
Cost of hospital admissions	\$3,117.92	<0.0001
Cost of SNF admissions	\$25.30	0.077
Cost of ED visits	\$190.08	<0.0001
Cost of office visits	\$733.62	<0.0001
Cost of home health and durable medical equipment	\$341.75	0.0057
Cost of other ancillary visits	\$2,398.18	<0.0001
Cost of laboratory services	\$501.09	<0.0001
Cost of prescription drugs	\$4,342.56	<0.0001
Total health care costs	\$11,651.00	<0.0001

^a Regression coefficient β_1 indicates parameter estimate for dichotomous variable equal to 1 if patient belongs to HCV case group and 0 if patient belongs to control group. Variables included in each regression (not shown in table) and not controlled for in the matching algorithm were geographic region, health plan type, payer type, and CCI.

5. Limitations

- Patients were identified based on ICD-9-CM diagnosis codes that, if recorded inaccurately, may have caused some patients to be misidentified as having HCV. The validity of the results therefore depends on the accuracy of record keeping among providers submitting claims in the IHCIS database
- The study focused on direct costs incurred by commercial health plans. It did not address costs incurred by other third-party payers (e.g., Medicaid, Medicare) or the broader societal costs of HCV, including lost productivity due to workplace absence

6. Conclusions

- Total costs incurred by payers for patients with HCV are more than four times the costs attributable to similar individuals without HCV.
- Pharmacy and inpatient services are key drivers of these costs.
- Health plans should be aware of heightened costs for enrollees with HCV when considering formulary access for new treatments.

References

1. McHutchison JG, Bacon BR. Chronic hepatitis C: an age wave of disease burden. *Am J Manag Care* 2005;11:S286-95.
2. Shatin D, Schech SD, Patel K, et al. Population-based hepatitis C surveillance and treatment in a national managed care organization. *Am J Manag Care* 2004;10:250-67.
3. Charlson ME, Pompei P, Ales KL, McKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chron Dis* 1987;40:373-8.