



Aging Will Affect Medicare's Hepatitis C Mortality and Cost

Forecasts for the wave of newly eligible Medicare patients

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Executive Summary

The unusual demographic characteristics of the Hepatitis C Virus (HCV) epidemic mean millions of HCV-infected individuals will soon become Medicare eligible. HCV is considered a “baby boomer” epidemic¹; prevalence is strongly associated with birth year, with the peak prevalence among people born in the early 1950s. This paper examines the mortality and cost dynamics affecting Medicare as the majority of HCV-infected people age into Medicare. We believe this is the first such projection published.

Baby-boomers (born between 1945 and 1965) make up the majority of HCV-infected people in the US. While some baby-boomers are uninsured or covered by Medicaid, most have employer-sponsored insurance or other commercial insurance. The nature of HCV infection means that if patients are not treated prior to Medicare eligibility, the disease will progress in some patients and future Medicare expenditures may rise. In addition, curative treatment at earlier disease stages for commercially-insured patients will likely reduce mortality rates, which means more individuals may enter Medicare in the future. This paper quantifies the Medicare portion of this dynamic.

Hepatitis C is curable, but the cost of recently released therapies to treat and cure HCV has raised concerns among payers including governments. At the same time, the future cost of treating medical complications due to HCV infection poses a burden not yet fully understood. Given the uncertainty in the number of infected people who will receive curative treatment before they reach Medicare, we define several scenarios of treatment by commercial insurers and compare the mortality and medical costs. Our goal is to illustrate the dynamics of the HCV-infected population aging into Medicare rather than to develop definitive projections.

We find that under our most aggressive HCV treatment scenario, Medicare will see the following impacts over 2016-2025 as compared to our scenario of no curative treatment of HCV:

- Survivorship: 53,000 more people would be alive at the end of 10 years.
- Medical costs for individual patients: 10-year Medicare cost per HCV patient would be approximately \$40,000 lower without including curative treatment cost

The balance of more survivors and lower medical costs per HCV patient would reduce Medicare costs (before accounting for the curative treatment costs) by approximately \$3.9 billion dollars over ten years (2016-2025).

Most people enrolling in Medicare will have this coverage for the remainder of their lives. As with other life-threatening diseases, reducing the disease-associated mortality rates means the affected members will live longer and incur Medicare expenses for a longer time.

Figure 1 shows the additional number of HCV patients who, assuming treatment while commercially-insured, will be covered by Medicare in the next ten years. We illustrate three scenarios of commercial HCV treatment:

1. Baseline: No curative treatment of HCV
2. Scenario 1: Treatment of HCV-infected patients diagnosed with cirrhosis, which is typically a longer-term consequence of chronic HCV infection
3. Scenario 2: Broad treatment for all cirrhotic and non-cirrhotic patients diagnosed with HCV

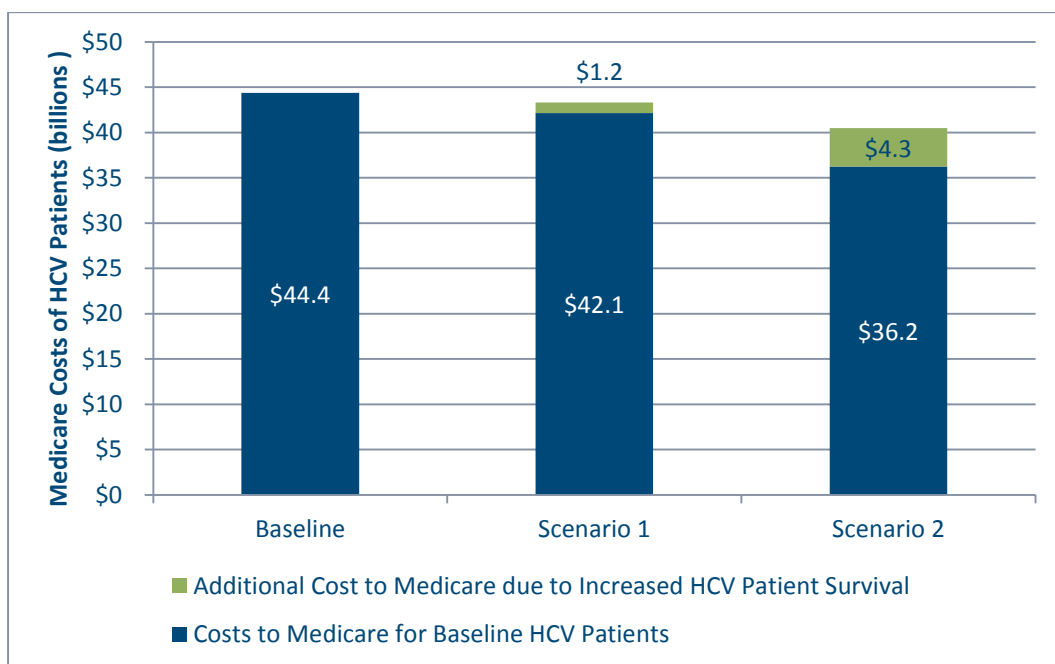
Scenarios 1 and 2 assume curative treatment by commercial insurers of about 154,000 and 672,000 HCV patients, respectively, over the period 2015-2024.

Figure 1: HCV Patients Entering Medicare in the Next Decade, Who are Previously Commercially Insured

Year	Baseline	Scenario 1: Treatment of Cirrhotic Patients		Scenario 2: Broad HCV Treatment	
	Medicare HCV Lives	Medicare HCV Lives	Additional Medicare HCV Lives	Medicare HCV Lives	Additional Medicare HCV Lives
2016	39,600	39,600	0%	40,000	1%
2017	81,000	81,500	1%	83,000	2%
2018	119,300	120,500	1%	124,000	4%
2019	151,400	153,600	1%	160,000	6%
2020	180,000	183,700	2%	194,100	8%
2021	201,900	207,200	3%	222,500	10%
2022	218,300	225,600	3%	246,600	13%
2023	227,800	237,100	4%	264,100	16%
2024	232,900	244,200	5%	277,400	19%
2025	234,700	248,100	6%	287,700	23%

Figure 2 shows the projected medical costs of commercially-insured HCV patients as they gain Medicare coverage in the next ten years.

Figure 2: Projected Medical Cost of Commercially-Insured HCV Patients Surviving to Medicare in 2016-2025 (2015 dollars, in billions)



Assuming broad treatment of cirrhotic and non-cirrhotic HCV, total medical costs to Medicare for newly Medicare-eligible HCV patients in the period 2016-2025 are predicted to be \$40.5 billion by 2025, compared to about \$44.4 billion without treatment. This difference of approximately \$3.9 billion accounts for both lower medical costs per patient and that patients survive longer with treatment, and therefore incur more costs

under Medicare. If this offset had not been considered, cumulative savings would be \$8.1 billion (additional \$4.3 billion in medical costs). Broad HCV treatment of people who now have commercial coverage cannot only stop the progression of the disease but also reduce mortality and decrease future medical costs to Medicare.

Our analysis does not consider the price of curative HCV drug treatments. We note treatment prices have fluctuated dramatically over recent years, with episode costs ranging from about \$84,000 to under \$50,000, and net prices seem likely to decline as more curative drugs enter the market.² Our analysis also excludes the impact of the 2013 revised HCV screening guidelines.³ These guidelines are expected to increase HCV testing and diagnosis, which would result in higher savings in both scenarios. Because we focus on how commercial curative treatment decisions may affect Medicare, we do not model how treatment by Medicare may impact cost or mortality. We note that plans participating in Part D, Medicare's prescription drug program, must include the new antiviral therapies in their formulary, per CMS. The impact of Part D coverage of the new HCV drugs is an important issue that deserves further investigation.

This report was commissioned by Abbvie, a drug manufacturer. Two co-authors, Gabriela Dieguez and Bruce Pyenson, are Members of the American Academy of Actuaries and meet its qualifications to perform this work. The report reflects the authors' findings and opinions. Because extracts of this report taken in isolation can be misleading, we ask that this report be distributed only in its entirety. As with any healthcare forecast, our work cannot capture all factors and we chose simple scenarios for ease of illustration. Our goal is to illustrate the dynamics of the HCV-infected population aging into Medicare, rather than to develop definitive projections.

Background

Hepatitis C virus (HCV) is the most common bloodborne infection in the US.⁴ Though some patients acquired the disease during blood transfusions in the 1970s, 1980s and early 1990s, screening of the blood supply since this time largely eliminated this method of infection.^{5,6} Once acquired, HCV can take years or decades before symptoms develop, leading to a large number of patients being left unaware of their infection.⁷ The primary consequence of the disease begins with liver inflammation, which eventually leads to cirrhosis or hepatocellular carcinoma for 20-30% of chronically infected patients.⁸ Advanced stages of HCV increase the risk of hepatocellular carcinoma, liver transplantation, and liver-related death.^{8,9}

The majority of HCV patients are under the age of 65, and a large portion are covered by commercial insurance, including employer-sponsored insurance. Roughly three million Americans are currently infected with HCV, with a prevalence rate of approximately 1%.¹⁰ Prevalence by age peaks among baby-boomers (born between 1945 and 1965), who make up over 75% of the infected population and are five times more likely to have HCV than non-baby-boomers.¹ The U.S. Preventive Services Task Force (USPSTF) follows the Centers for Disease Control's recommendation for screening baby-boomers in addition to high-risk individuals.⁵

The new generation of drugs to treat chronic HCV offers high rates of sustained virologic response (SVR) with low side effects.¹¹ However, the cost of these therapies raised concerns among commercial payers, who decide which patients are eligible for therapy.¹² Treatment of HCV by commercial payers would avoid disease progression and death in some patients^{11,13,14}, potentially saving Medicare billions of dollars in medical costs.

We model the impact to Medicare under several treatment scenarios on the part of commercial payers. Our goal was to measure the savings to Medicare produced by avoiding disease progression and reduced mortality. The three scenarios of commercial HCV treatment presented in this report are:

- No treatment,
- Treatment of HCV-infected patients with cirrhosis, and
- Broad treatment of all patients with a diagnosis of cirrhotic and non-cirrhotic HCV.

Results

A growing number of commercially-insured HCV patients will enroll in Medicare in the next decade, with annual medical costs ranging from about \$14,800 for those undiagnosed to more than \$42,950 for patients with a history of liver transplant, as shown in Figure 3. Left untreated, these patients are likely to progress to more severe disease stages, resulting in over 32,000 patients with end-stage liver disease (ESLD) and almost 14,000 liver transplants.

Figure 3: Baseline Scenario

HCV Patients Entering Medicare 2016-2025 Who are Previously Commercially-Insured and Annual Medical Cost per Patient (2015 dollars), by Disease Stage Forecast

HCV Stage	Undiagnosed HCV	Non-Cirrhotic HCV	Cirrhotic HCV	End-Stage Liver Disease	Liver Transplant	Total HCV
Year	HCV Patients					
2016	9,400	22,100	3,400	3,400	1,300	39,600
2017	17,200	46,100	7,400	7,400	2,800	81,000
2018	22,000	69,700	11,500	11,800	4,400	119,300
2019	24,300	89,700	15,300	16,100	6,000	151,400
2020	24,400	108,400	19,400	20,300	7,600	180,000
2021	23,300	122,600	22,500	24,300	9,300	201,900
2022	21,800	132,900	25,200	27,600	10,900	218,300
2023	19,100	140,100	27,000	29,600	12,000	227,800
2024	16,900	143,500	28,100	31,400	13,000	232,900
2025	14,800	145,000	28,700	32,300	13,800	234,700
Per Year (all Years)	Annual Medical Costs per HCV Patient					
	\$14,350	\$23,950	\$24,300	\$44,150	\$42,950	\$24,050

Broad treatment of cirrhotic and non-cirrhotic HCV can substantially improve survival and reduce the progression of the disease, resulting in lower medical costs per HCV patient over time. This treatment dynamic is illustrated in Figure 4.

Figure 4: Scenario Comparison

HCV Patients Entering Medicare 2016-2025 Who are Previously Commercially-Insured and Annual Medical Cost per Patient (2015 dollars), by Scenario Forecast

Year	Baseline		Scenario 1: Treatment of Cirrhotic Patients		Scenario 2: Broad HCV Treatment	
	Medicare HCV Lives	Cost per HCV Patient	Medicare HCV Lives	Cost per HCV Patient	Medicare HCV Lives	Cost per HCV Patient ¹
2016	39,600	\$24,050	39,600	\$23,400	40,000	\$20,900
2017	81,000	\$24,500	81,500	\$23,700	83,000	\$21,050
2018	119,300	\$24,950	120,500	\$24,000	124,000	\$21,150
2019	151,400	\$25,400	153,600	\$24,350	160,000	\$21,250
2020	180,000	\$25,800	183,700	\$24,600	194,100	\$21,300
2021	201,900	\$26,250	207,200	\$24,850	222,500	\$21,400
2022	218,300	\$26,600	225,600	\$25,050	246,600	\$21,400
2023	227,800	\$26,850	237,100	\$25,200	264,100	\$21,400
2024	232,900	\$27,150	244,200	\$25,350	277,400	\$21,350
2025	234,700	\$27,350	248,100	\$25,450	287,700	\$21,350
2016-2025 Total Costs*		\$44.4 billion		\$43.3 billion		\$40.5 billion
Change in 2016-2025 Cost				(\$1.1) billion		(\$3.9) billion

*2016-2025 Total Costs calculated as the product of Medicare HCV Lives and Cost per HCV Patient, for all years.

¹ Excludes the cost of curative treatment.

Increased survival of HCV patients would cause more of these patients to ever gain Medicare eligibility and to survive in Medicare for more years. Figure 5 shows that the additional cost to Medicare of higher survival due to comprehensive HCV treatment can be as high as \$4.3 billion.

Figure 5: Increased Survival

Additional HCV Patients Surviving in Medicare 2016-2025 Who are Previously Treated by Commercial Insurance, and Annual Medical Cost per Patient (2015 dollars), by Scenario Forecast

Year	Scenario 1: Treatment of Cirrhotic Patients			Scenario 2: Broad HCV Treatment		
	Additional Medicare HCV Lives	Cost per HCV Treated Patient ¹	Cost of Increased Survival (in billions)	Additional Medicare HCV Lives	Cost per HCV Treated Patient ¹	Cost of Increased Survival (in billions)
2016	0	\$21,300	\$0.0	400	\$20,000	\$0.0
2017	500	\$21,300	\$0.0	2,000	\$20,000	\$0.0
2018	1,200	\$21,400	\$0.0	4,700	\$20,000	\$0.1
2019	2,200	\$21,450	\$0.1	8,600	\$20,000	\$0.2
2020	3,700	\$21,500	\$0.1	14,100	\$20,050	\$0.3
2021	5,300	\$21,500	\$0.1	20,600	\$20,050	\$0.4
2022	7,300	\$21,550	\$0.2	28,300	\$20,050	\$0.6
2023	9,300	\$21,550	\$0.2	36,300	\$20,050	\$0.7
2024	11,300	\$21,550	\$0.2	44,500	\$20,000	\$0.9
2025	13,400	\$21,550	\$0.3	53,000	\$20,000	\$1.1
2016-2025 Total			\$1.2			\$4.3
Avg Cost per Treated Patient		\$21,550			\$20,000	
Change in Avg Cost*		(\$2,500)			(\$4,050)	

*Change in Average Annual Cost per HCV Treated Patient calculated by subtracting scenario average from \$24,050 (see Figure 3).

¹ Excludes the cost of curative treatment.

In summary, broad treatment of HCV by commercial payers can substantially increase survival and slow the disease progression while reducing overall costs to Medicare. In the next decade, we project lower Medicare costs of about \$1.1 billion if only cirrhotic patients were treated and about \$3.9 billion with broader treatment as compared to the baseline scenarios and without the cost of the curative treatment. The cost reductions would be greater were it not for the offsetting effect of patients surviving longer and incurring costs while covered by Medicare. We estimate 13,400 additional HCV patients would be covered by Medicare by 2025 in scenario 1 and 53,000 in scenario 2. Without these cost offsets, savings to Medicare would be \$2.2 billion in the first treatment scenario and \$8.1 billion in the second scenario.

Methodology

To measure the potential impact of commercial treatment of HCV patient on future medical costs to Medicare, we modeled three treatment scenarios.

1. Baseline: No curative treatment of HCV
2. Scenario 1: Treatment of HCV-infected patients diagnosed with cirrhosis, which is typically a longer-term consequence of chronic HCV infection
3. Scenario 2: Comprehensive treatment for all HCV-infected patients with a cirrhotic and non-cirrhotic HCV

Curative treatment was assumed for HCV patients that meet the criteria above while commercially insured during any year in the period 2015-2024. This includes undiagnosed patients that become diagnosed prior to gaining Medicare eligibility.

We assumed curative treatment by commercial insurers of about 154,000 and 672,000 HCV patients for scenarios 1 and 2, respectively, over the period 2015-2024. However, the mortality and cost effects reported here focus on the Medicare population and ignore the impact of additional survival and medical cost reductions to commercial insurers.

We used Monte Carlo Simulation techniques to forecast the shifts in insurance coverage of patients with HCV as well as the effects of mortality, disease diagnosis and progression, disability and cure. We produced a 10-year forecast (2016 to 2025) of HCV patients entering Medicare currently with commercial insurance, or expected to gain commercial insurance prior to becoming Medicare-eligible. We then summarized the effects of treatment scenarios on total lives, total Medicare medical costs, and the average annual medical cost per treated patient.

Assumptions

Our analysis relies on Truven's MarketScan and Medicare 5% Sample databases, years 2010-2012. Patients with HCV were identified through ICD-9 diagnosis codes and further classified into non-cirrhotic, cirrhotic, end stage liver disease, and transplant of the liver, which are consistent with the HHS commercial risk adjuster (HCC) disease stage classifications.

We adjusted prevalence rates of HCV in MarketScan and Medicare data to reflect National Health and Nutrition Examination Survey (NHANES) survey data, which indicate that a substantial portion of people with HCV is undiagnosed.

Mortality, disability, and disease progression rates by HCV disease stage were developed using historical databases. We assumed a 90% cure rate¹⁵⁻¹⁷ in our model, which encompasses both treatment and adherence. For patients who attain SVR, we assume 0% transition rates (no further disease progression) and reduced mortality rates (70% of mortality in HCV population).¹⁸ Reduced medical costs were estimated based on the HCV risk score component in CMS HCC risk adjuster, which is used in Medicare Advantage for revenue risk-adjustment. For patients who do not achieve SVR after treatment, we reduce their transition rates by 50%, since a significant number of non-responders achieve benefits from therapy.¹⁴

Data Sources

2009-2012 Truven MarketScan Commercial Claims Research Database

This is an annual medical database including private sector health data from approximately 100 payers. The dataset contains more than 35 million commercially insured lives. It represents the medical experience of

insured employers and their dependents for active employees, early retirees, COBRA continues and Medicare-eligible retirees with employer-provided Medicare Supplemental plans. The dataset consists of person-specific clinical utilization, expenditures, and enrollment across inpatient, outpatient, pharmacy, and carve-out services from a selection of large employers, health plans, and government and public organizations. The MarketScan databases link paid claims and encounter data to detailed patient information across sites and types of providers, and over time.

2010-2012 Medicare 5% Sample Data

This limited data set contains all Medicare Parts A and B paid claims generated by a statistically-balanced sample of Medicare beneficiaries. Information includes county of residence, diagnosis codes, procedure codes, and DRG codes, along with site of service information as well as beneficiary age, eligibility status and an indicator for HMO enrollment.

2014 U.S. Census Bureau, Current Population Survey

The Current Population Survey (CPS), sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics (BLS), is the primary source of labor force statistics for the U.S. population. The CPS is the source of numerous high-profile economic statistics, including the national unemployment rate, and provides data on a wide range of issues relating to employment and earnings. The CPS also collects extensive demographic data complementing and enhancing our understanding of labor market conditions in the nation overall and among many different population groups, across the states and within them.

2005-2012 Centers for Disease Control and Prevention (CDC) National Health and Nutrition Examination Survey (NHANES)

The NHANES is a series of studies designed to assess the health and nutritional status of adults and children in the U.S. The survey is unique in that it combines interviews and physical examinations. NHANES is a major program of the National Center for Health Statistics (NCHS). NCHS is part of the Centers for Disease Control and Prevention (CDC) and has the responsibility for producing vital and health statistics for the Nation.

Caveats and Limitations

Our analysis does not consider the price of curative HCV treatment. We note treatment prices have fluctuated dramatically over recent years, with episode costs ranging from about \$84,000 to under \$50,000, and prices seem likely to decline as more curative treatments enter the market. Our analysis also excludes the impact of the 2013 revised HCV screening guidelines. These guidelines are expected to increase HCV testing and diagnosis, which would result in higher savings in both scenarios.

Because we focus on how commercial curative treatment decisions may affect Medicare, we do not model the impact of how treatment by Medicare may affect cost or mortality. This important issue deserves further investigation.

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