

# Patient costs, characteristics and outcomes associated with hospitalizations related to hepatitis B and hepatitis C – California, 2002 – 2011

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## Background

Hepatitis B virus (HBV) and Hepatitis C virus are the most prevalent blood borne infections in the United States. California is estimated to have 35,000 HBV-infected persons and 750,000 HCV-infected persons. These infections can lead to death or complications including:

- Cirrhosis
- Hepatic decompensation
- End stage liver disease (ESLD)
- Liver cancer
- Liver failure requiring liver transplant

## Goals

We described the proportion of hepatitis-related hospitalizations attributable to patients with a history of HBV infection. Among patients with a history of HBV or HCV infection we described the following:

- Demographics
- HBV and HCV complications
- Charges and length of hospitalization
- Change in hospitalizations for severe complications from 2002 to 2011

## Methods

### Study population

We collected California Office of Statewide Health Planning and Development patient discharge data for all non-federal licensed acute care hospitals and rehabilitation facilities in California. We selected all hospitalizations with discharge dates during 2002–2011 and International Classification of Disease 9 (ICD-9) diagnosis and procedure codes for any of the following hepatitis-related conditions:

- Chronic liver disease
  - HBV, HCV, or unspecified viral hepatitis infection
  - Chronic liver disease sequelae
  - Alcoholic liver disease
  - Chronic hepatitis
- Cirrhosis
- Hepatic decompensation
  - Hepatic encephalopathy, including coma
  - Esophageal varices
  - Peritonitis
  - Ascites
- Liver cancer
- Liver transplant
- Liver transplant complications
- Other hepatitis symptoms
  - Jaundice, non-neonatal
  - Acute viral hepatitis other than HBV and HCV

Hospitalizations were aggregated at the patient level using a matching algorithm considering social security number, birth date, sex, race, zip code, and primary language.

### Definitions

**Hepatitis-related hospitalizations:** hospitalization with an ICD-9 code for any hepatitis-related condition excluding ICD-9 codes for HBV or HCV infection without coma unless this was the primary diagnosis

**HBV infection:**  $\geq 1$  hospitalization with an HBV ICD-9 code

**HCV infection:**  $\geq 1$  hospitalization with an HCV ICD-9 code

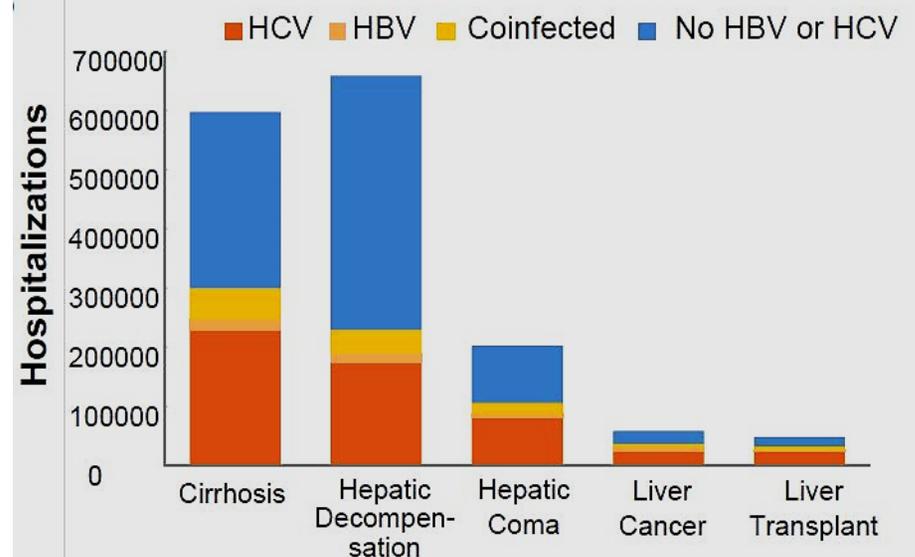
**Coinfection:**  $\geq 1$  hospitalization with an HBV ICD-9 code and  $\geq 1$  hospitalization with an HCV ICD-9 code

**Table 1:** Demographics of Patients with Hepatitis-Related Hospitalizations by Infection Status, California, 2002–2011

	HBV N = 14641		HCV N = 97152		Coinfected N = 14322	
	n	%	n	%	n	%
<b>Sex</b>						
Male	9791	67	64846	67	9995	70
Female	4848	33	32279	33	4323	30
Other/Unknown	2	0	27	0	4	0
<b>Race/Ethnicity</b>						
White	4161	28	47900	49	6953	49
Black	1126	8	10135	10	1831	13
ANAI	48	0	513	1	54	0
API	6232	43	4710	5	1624	11
Hispanic	2279	16	30102	31	3436	24
Other	387	3	1598	2	154	1
Unknown	406	3	2194	2	270	2
<b>Birth Cohort</b>						
Pre 1945	5281	36	21520	22	2945	21
1945–1965	7165	49	67927	70	10286	72
Post 1965	2195	15	7704	8	1091	8
Unknown	0	0	1	0	0	0

Abbreviations: ANAI = Alaskan Native/American Indian, API = Asian/Pacific Islander

**Figure 1:** Hepatitis-Related Hospitalizations by Infection Status, California, 2002–2011



**ESLD:**  $\geq 1$  hospitalization with a cirrhosis ICD-9 code and  $\geq 1$  hospitalization with a hepatic decompensation ICD-9 code

**Hepatitis-related death:** death during a hepatitis-related

### Analysis

Among all patients with hepatitis-related hospitalizations:

- Proportion of hospitalizations attributed to HBV-infected or HCV-infected patients

Among HBV-infected or HCV-infected patients with hepatitis-related hospitalizations:

- Descriptive statistics
- Diagnoses
- Cost and length of hospitalizations

Among HCV-infected or co-infected patients with hepatitis-related hospitalizations

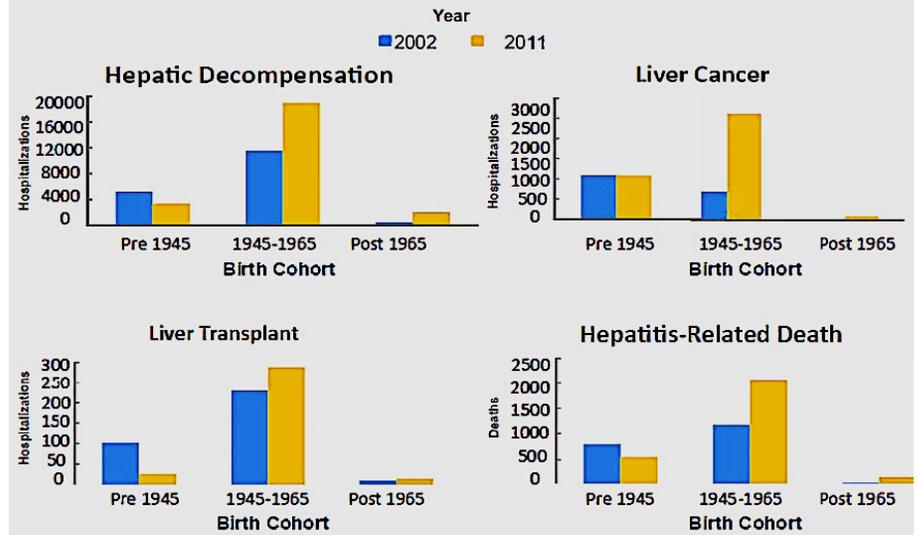
- Difference in number of hospitalizations for severe complications between 2002 and 2011
- By birth cohort

**Table 2: Costs and Complications of Patients with Hepatitis-Related Hospitalizations by Infection Status, California, 2002-2011**

	HBV N = 14641		HCV N = 97152		Coinfected N = 14322	
	n	%	n	%	n	%
Diagnosis*						
Cirrhosis	4882	33	50062	52	7723	54
ESLD	2898	20	32481	33	5554	39
Hepatic Coma	3351	23	11208	12	2013	14
Liver Cancer Transplant	570	4	2899	3	570	4
Hepatitis-Related Death	3135	21	21992	23	3653	26
Age at Hepatitis-Related Death						
Median		59		56		55
Inpatient Costs						
Hospitalizations Days		32632		310829		71632
Hospitalized Charges (in \$ Billions)		2.471		20.020		4.315

\*Diagnoses are not mutually exclusive

**Figure 2: Hepatitis-Related Hospitalizations Among HCV-Infected and Coinfected Patients by Birth Cohort, California, 2002-2011**



## Results

HBV-infected and HCV-infected patients accounted for most cirrhosis,

hepatic coma, liver cancer, and liver transplant hospitalizations (Figure 1, 50%, 52%, 62%, and 67% respectively).

126,115 HBV-infected and HCV-infected patients had at least one hepatitis-related hospitalization; 12% were HBV-infected, 77% were HCV-infected, and 11% were co-infected (Table 1).

- 61% were male and 63% were in the 1945-1965 birth cohort
- 43% of HBV-infected patients were API
- 49% of HCV-infected patients were White

HBV-infected and HCV-infected patients had 415,093 hepatitis hospitalizations resulting in charges of \$26.8 billion (Table 2).

- 23% of HBV-infected patients had liver cancer
- 52% of HCV-infected patients and 54% of co-infected patients had ESLD
- Hepatitis-related death was a common outcome of HBV-infected and HCV-infected patients
  - 21% among HBV-infected patients
  - 23% among HCV-infected patients
  - 26% among co-infected patients

Hospitalizations for severe complications among HCV-infected or co-infected patients increased from 2002 to 2011 (Figure 2).

- Increase driven by 1945-1965 birth cohort

## Limitations

Causal relationship between HBV or HCV infection and hepatitis-related hospitalization was unclear.

- Patients with HBV or HCV infection ICD-9 codes were considered infected during all hepatitis-related hospitalizations
- Cannot determine whether HBV or HCV infection

contributed to or caused hepatitis-related condition  
Diagnoses and charges may not be accurate.

- ICD-9 codes are not validated
- Charges may not reflect costs incurred

Accuracy of aggregating hospitalizations by person was limited.

- Missing names and social security number information

## Conclusions

HBV and HCV infections were major burdens on California's healthcare system during 2002-2011.

- Over 125,000 HBV-infected and HCV-infected patients
- Over 400,000 hepatitis-related hospitalizations
- Over \$26 billion in charges
- Most cirrhosis, hepatic coma, liver cancer, and liver transplant hospitalizations attributed to HBV-infected and HCV-infected patients

This burden is expected to grow.

- Persons with chronic HCV infection in the 1945-1965 birth cohort will develop more complications as they age.

To reduce hepatitis-related hospitalizations, need earlier identification and treatment of HBV-infected and HCV-infected persons, especially among the 1945-1965 birth cohort.

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