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:** ≥ 1 hospitalization with an HBV ICD-9 code

**HCV infection:** ≥ 1 hospitalization with an HCV ICD-9 code

**Coinfection:** ≥ 1 hospitalization with an HBV ICD-9 code and ≥ 1 hospitalization with an HCV ICD-9 code
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

<table>
<thead>
<tr>
<th></th>
<th>HBV</th>
<th>HCV</th>
<th>Coinfected</th>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Diagnosis*</td>
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<tr>
<td>Cirrhosis</td>
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<td>71333</td>
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<td>ESLD</td>
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<td>Age at Hepatitis-Related Death</td>
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<td>Median</td>
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<td>21992</td>
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</tbody>
</table>

*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

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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