Surveillance for Acute Hepatitis B Infection in the United States: Impact of Universal Hepatitis B Vaccination Program

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Overview

• Vaccine recommendations and uptake
  – Groups at increased risk
  – Universal vaccination
• National surveillance for acute hepatitis B virus (HBV) infection
• Continuing challenges
ACIP Recommendations for Hepatitis B Vaccination in the United States

**High Risk Groups**

<table>
<thead>
<tr>
<th>Year</th>
<th>ACIP Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>Groups at high-risk for HBV infection*</td>
</tr>
<tr>
<td>1984</td>
<td>Infants born to women with chronic HBV infection</td>
</tr>
<tr>
<td>1985</td>
<td>Heterosexual persons with multiple sex partners; international travelers to HBV-endemic areas</td>
</tr>
<tr>
<td>1990</td>
<td>Public safety workers exposed to blood; family of adoptees from HBV-endemic areas</td>
</tr>
<tr>
<td>2011</td>
<td>Adults with diabetes (provisional)</td>
</tr>
</tbody>
</table>

*Health-care providers, persons at institutions for the developmentally disabled, MSM, IDUs, clotting factor recipients, hemodialysis patients, household & sexual partners of chronic HBV, populations with high rates of HBV infection, and inmates of long-term correctional facilities.  MMWR 2002; 51(25):549-563
Hepatitis B Vaccination Coverage among Non-High-Risk Healthcare Personnel Ages 18-49 Years, 2008-2009 National Health Interview Survey (NHIS)

Hepatitis B Vaccination Coverage (≥ 1 dose) among High-risk Adults by Age Group—NHIS, 2009

Lu P.-J. Vaccine 2011; 29:7049-57
Hepatitis B Vaccination Coverage (≥ 3 dose) by Selected Years among Chronic Hemodialysis Patients

ACIP Recommendations for *Universal* Hepatitis B Vaccine in the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>ACIP Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>All US infants (starting at age 0 or 1 month)</td>
</tr>
<tr>
<td>1995</td>
<td>All unvaccinated children 11-12 years of age</td>
</tr>
<tr>
<td>1999</td>
<td>All unvaccinated children 0-18 years of age</td>
</tr>
<tr>
<td>2002</td>
<td>Preferred vaccination starting at birth</td>
</tr>
<tr>
<td>2005</td>
<td>Recommend first dose hepatitis B vaccine at “birth” (before hospital discharge; usually &lt;3 days)</td>
</tr>
</tbody>
</table>

MMWR 2002; 51(25):549-563
Increasing Vaccine-Specific Coverage Rates Among Preschool-Aged Children United States, 1967 - 2010

† DTP(3+) is not a Healthy People 2010 objective. DTaP(4) is used to assess Healthy People 2010 objectives.

Note: Children in the USIS and NHIS were 24-35 months of age. Children in the NIS were 19-35 months of age.


* Healthy People 2020 targets are 90% except for rotavirus vaccine, which is 80%
≥3-Dose Hepatitis B Vaccination Coverage among Children* United States, 2006-2010

* Determined at 19-35 months of age. MMWR. 2011;60(34):1158.
Hepatitis B Vaccination Coverage
Adolescents Ages 13-17 Years – United States, 2010

CDC. *MMWR.* 2011;60(33):1119.
Uptake of Hepatitis B Vaccine Dose 1 by Age 3 Days*: 1998-2007 Birth Cohorts – United States

*Universal “birth dose” is administered before hospital discharge

Zhao Z. *Vaccine (in press)*
National Notifiable Disease Surveillance System (NNDSS)

- Voluntary reporting weekly by states and territories
- Electronic reporting since 1990
- Confirmed case defined by the Council of State and Territorial Epidemiologists (CSTE)
  - Acute (symptomatic) hepatitis B infection
National Notifiable Diseases Surveillance System (NNDSS) Limitations

- Under reporting
- Substantial missing case information e.g., risk exposures, vaccination history
- Multiple risk exposures; presumptive source of HBV unknown
- [Systems lacking for monitoring chronic hepatitis B infection]
Incidence of Acute Hepatitis B Cases in the United States, 1980–2009

*High-risk groups* 1982
- Infants born to HBsAg+ women 1984
- All US infants 1991
- All children 0-18 years 1999
- Birth dose for all US infants 2006

*Health-care providers, MSM, IDUs, hemodialysis patients, household & sexual partners of persons with chronic HBV, inmates of long-term correctional facilities

CDC. *MMWR* 2002;51(25):550; National Notifiable Diseases Surveillance System
Characteristics of Reported Acute Hepatitis B Virus Infection Cases – United States 2009

- 3,371 confirmed acute cases
- 46.7% hospitalized
- 1.3% died
Incidence of Reported Acute Hepatitis B Cases by Age Group — United States, 1990–2009

Source: National Notifiable Diseases Surveillance System (NNDSS)
Incidence of Reported Acute Hepatitis B by Race/Ethnicity — United States, 1990–2009

Source: National Notifiable Diseases Surveillance System (NNDSS)
Assessment of Potential Risk Exposures 6 Weeks to 6 Months Prior to Onset of Acute Hepatitis B

1) Using injection drug
2) Sexual contact with suspected or confirmed hepatitis B case-patient
3) Household contact with suspected or confirmed hepatitis B case
4) Man who has sex with men
5) Multiple sex partners
Potential Risks 6 Weeks to 6 Months Prior to Onset of Acute Hepatitis B*

6) Occupational (medical, dental) exposure to blood
7) Hemodialysis
8) Blood transfusion
9) Percutaneous injury
10) Surgery
11) *New*: diagnosed diabetes

* Vaccination history lacking
Distribution of Risk Exposures among Reported Acute Hepatitis B Cases -- United States, 2009

* Includes case reports indicating the presence of at least one of the following risks 6 weeks to 6 months prior to onset of acute hepatitis B: 1) using injection drugs; 2) having sexual contact with suspected/confirmed hepatitis B case-patient 3) being a man who has sex with men; 4) having multiple sex partners concurrently; 5) having household contact with suspected/confirmed hepatitis B case-patient; 6) occupational exposure to blood; 7) being a hemodialysis patient; 8) having received a blood transfusion; 9) having sustained a percutaneous injury; and 10) having undergone surgery.

National Notifiable Diseases Surveillance System (NNDSS)
Acute Hepatitis B Reports,* by Risk Exposure† — United States, 2009

- Injection-drug use: 239 Yes, 1854 No, 1,278 Missing
- Men who have sex with men¶: 42 Yes, 182 No, 1814 Missing
- Sexual contact: 68 Yes, 875 No, 2428 Missing
- Household contact: 18 Yes, 925 No, 2428 Missing
- Multiple sex partners: 284 Yes, 609 No, 2478 Missing

* A total of 3,371 case reports of hepatitis B were received in 2009.
† More than one risk behavior may be indicated on each case report.
§ No risk data reported.
¶ A total of 2,038 hepatitis B cases were reported among males in 2009.
Source: National Notifiable Diseases Surveillance System (NNDSS)
Acute Hepatitis B Reports,* by Risk Exposure† — United States, 2009

<table>
<thead>
<tr>
<th>Risk Exposure</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>13</td>
<td>1,537</td>
<td>1,225</td>
</tr>
<tr>
<td>Dialysis patient</td>
<td>4</td>
<td>1,227</td>
<td>2140</td>
</tr>
<tr>
<td>Transfusion recipient</td>
<td>7</td>
<td>1,393</td>
<td>1971</td>
</tr>
<tr>
<td>Surgery</td>
<td>156</td>
<td>1,251</td>
<td>1,964</td>
</tr>
<tr>
<td>Needle stick</td>
<td>62</td>
<td>1,225</td>
<td>2084</td>
</tr>
</tbody>
</table>

*A total of 3,371 case reports of hepatitis B were received in 2009.
† More than one risk exposure may be indicated on each case report.
§Risk data not reported.
Source: National Notifiable Diseases Surveillance System (NNDSS)
Outbreaks of Hepatitis B Virus Infection associated with Blood Glucose Monitoring
United States, 1990 to 2010

Hospital (2)
Nursing Home (8)
Assisted Living Facility (16)

Infection control guidance

MMWR; FDA

MMWR

MMWR

CDC unpublished data (2009-10).
Past Hepatitis B Infection
NHANES*, 1999-2010

• Nationally representative survey of non-institutionalized adults; tested for antibody to hepatitis B core antigen (anti-HBc)

• Unadjusted prevalence of anti-HBc among adults with diabetes (vs. without diabetes)
  – Overall, 60% increase ($p<0.001$)
  – Ages 18-59 years, 70% increase ($p<0.001$)
  – Ages ≥60 years, 30% increase ($p=0.032$)

*NHANES = National Health and Nutrition Examination Survey (CDC unpublished data, 2011)
Acute Hepatitis B Disease among Adults with Diabetes in 8 Surveillance Sites, 2009-2010

• Adults with diagnosed diabetes without “Other” hepatitis B risk factors†
  – Ages <60 years, 2X higher odds of hepatitis B
  – Ages ≥60 years, 1.5X higher odds of hepatitis B*

†“Other” risk factors included injecting drug use, men who have sex with men, and HIV risk associated behaviors.
*Not statistically significant (small sample size)

Reilly M. IDSA 2011
Challenges for Acute Hepatitis B Surveillance

• Define sources of HBV infection
• Assess vaccine status among cases
• Understand effects of changing patterns of disease transmission
  – Is the focus of public health effort appropriate?
Summary

• Declines in acute hepatitis B virus infection
  – >98% among children and adolescents
  – Decrease in disparities by race/ethnicity
  – Smallest declines among adults ≥40 years

• Surveillance for vaccination among acute cases needed to monitor for long-lasting protection
Acknowledgements

• Division Viral Hepatitis, NCHHSTP CDC
  – Epidemiology and Surveillance Branch - Scott Holmberg, Ruth Jiles, Monina Klevens, and the Surveillance Team
  – Vaccine Unit – Sarah Schillie, Emily Smith, Tanja Walker, Meredith Reilly
  – Prevention Branch-Geoffrey Beckett, Kathy Byrd

• States and jurisdictions reporting to National Notifiable Diseases Surveillance System, and Emerging Infections Program Sites

Thank you
Additional Slides
Acute Hepatitis B Confirmed Case Definition—United States

- A confirmed case meets the clinical case definition, is laboratory confirmed, and is not known to have chronic hepatitis B virus infection

Acute Hepatitis B Case Definition - United States

- **Clinical case definition**
  - Acute illness with discrete onset of symptoms and jaundice or serum ALT levels $>200$ IU/L

- **Laboratory criteria**
  - IgM antibody to hepatitis B core antigen (anti-HBc) positive
  - or hepatitis B surface antigen (HBsAg) positive
  - and IgM anti-HAV negative (if done)