2017 ADOLESCENT VACCINE UPDATE

MATT GRISHAM, MD
• I have no financial disclosures or conflicts of interest.
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• I think vaccines are awesome and make my life, professionally and personally, much better.
GOALS AND OBJECTIVES

• Review CDC vaccination schedule updates for healthy adolescents

• Discuss specific concerns for these vaccines

• Formulate plans for countering vaccine refusal or hesitancy

• Provide recommendations for provider- and parent-friendly educational materials pertaining to vaccines
A QUICK WALK DOWN MEMORY LANE...

• 1940s: Smallpox; Diphtheria, Tetanus, Pertussis (DTP)
A QUICK WALK DOWN MEMORY LANE...

- 1950s: Smallpox, DTP, and Polio
A QUICK WALK DOWN MEMORY LANE...

- 1960s-70s: Smallpox*, DTP, Polio, MMR
A QUICK WALK DOWN MEMORY LANE...

- 1980s: DTP, Polio, MMR, Hib
### ACIP SCHEDULE: 1983

**TABLE 1. Recommended schedule for active immunization of normal infants and children (See individual ACIP recommendations for details.)**

<table>
<thead>
<tr>
<th>Recommended age*</th>
<th>Vaccine(s)†</th>
<th>Comments</th>
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<tbody>
<tr>
<td>2 mo.</td>
<td>DTP-1, 5 OPV-1†</td>
<td>Can be given earlier in areas of high endemcity</td>
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<tr>
<td>4 mo.</td>
<td>DTP-2, OPV-2</td>
<td>6-wks-2-mo. interval desired between OPV doses to avoid interference</td>
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<td>6 mo.</td>
<td>DTP-3</td>
<td>An additional dose of OPV at this time is optional for use in areas with a high risk of polio exposure</td>
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<td>15 mo.**</td>
<td>MMR††</td>
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<tr>
<td>18 mo.**</td>
<td>DTP-4, OPV-3</td>
<td>Completion of primary series</td>
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<tr>
<td>4-6 yr.‡‡‡</td>
<td>DTP-5, OPV-4</td>
<td>Preferably at or before school entry</td>
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<tr>
<td>14-16 yr.</td>
<td>Td§§</td>
<td>Repeat every 10 years throughout life</td>
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</tbody>
</table>

*These recommended ages should not be construed as absolute, i.e. 2 mos. can be 6-10 weeks, etc.
†For all products used, consult manufacturer’s package enclosure for instructions for storage, handling, and administration. Immunobiologics prepared by different manufacturers may vary, and those of the same manufacturer may change from time to time. The package insert should be followed for a specific product.
§DTP—Diphtheria and tetanus toxoids and pertussis vaccine.
§OPV—Oral, attenuated poliovirus vaccine contains poliovirus types 1, 2, and 3.
**Simultaneous administration of MMR, DTP, and OPV is appropriate for patients whose compliance with medical care recommendations cannot be assured.
††MMR—Live measles, mumps, and rubella viruses in a combined vaccine (see text for discussion of single vaccines versus combination).
‡‡Up to the seventh birthday.
§§Td—Adult tetanus toxoid and diphtheria toxoid in combination, which contains the same dose of tetanus toxoid as DTP or DT and a reduced dose of diphtheria toxoid.

1983 childhood immunization schedule
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

(For those who fall behind or start late, see the catch-up schedule [Figure 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded in gray.

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<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
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<th>6 mos</th>
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<th>18 mos</th>
<th>15-23 mos</th>
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<th>13-15 yrs</th>
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<tbody>
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<td>Hepatitis B (HepB)</td>
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<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP: &lt;7 yrs)</td>
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NOTE: The above recommendations must be read along with the footnotes of this schedule.
Figure 1. Recommended Immunization Schedule for Children and Adolescents Aged 18 Years or Younger—United States, 2017.

(For those who fall behind or start late, see the Catch-up Schedule [Figure 2]).

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<td>Diphtheria, tetanus, &amp; acellular pertussis² (DTaP; &lt;7 yrs)</td>
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<td>Haemophilus influenza type b³ (Hib)</td>
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<td>Inactivated poliovirus² (IPV; &lt;18 yrs)</td>
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<td>Influenza⁴ (IV)</td>
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<td>Annual vaccination (IV) 1 or 2 doses</td>
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<td>Measles, mumps, rubella⁴ (MMR)</td>
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<td>Hepatitis A⁶ (HepA)</td>
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<td>Meningococcal⁷ (Hib-MenCV ≥6 weeks; MenACWY-D ≥9 mos; MenACWY-CRM ≤2 mos)</td>
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<td>Tetanus, diphtheria, &amp; acellular pertussis² (TdAP; ≥7 yrs)</td>
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<td>Human papillomavirus⁸ (HPV)</td>
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</table>

NOTE: The above recommendations must be read along with the footnotes of this schedule.
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(For those who fall behind or start late, see the catch-up schedule [Figure 2]).

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<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
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<tbody>
<tr>
<td>Hepatitis B (HepB)</td>
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<tr>
<td>Rotavirus (RV) RV1 (2-dose series); RVS (3-dose series)</td>
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<td>Diphtheria, tetanus, &amp; acellular pertussis (DTap; &lt;7 yrs)</td>
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<td>Inactivated poliovirus (IPV; &lt;18 yrs)</td>
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<td>Influenza (IV)</td>
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<td>Measles, mumps, rubella (MMR)</td>
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<td>Varicella (VAR)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<td>Hepatitis A (HepA)</td>
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<tr>
<td>Meningococcal (^{11}) (Hib-MenCV \geq 6 weeks; MenACWY-D \geq 9 mos; MenACWYCRM \geq 2 mos)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap; \geq 7 yrs)</td>
<td>Tdap</td>
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<tr>
<td>Human papillomavirus (HPV)</td>
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<td>Pneumococcal polysaccharide (PPSV23)</td>
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</tbody>
</table>

NOTE: The above recommendations must be read along with the footnotes of this schedule.
11 yr old male presents to your office for his first well child visit in approximately 4 years. The primary reason for the visit is due to a letter from his school stating he would need vaccines prior to entrance to middle school.

Past Medical History significant for egg allergy.
11 yr old male presents to your office for his first well child visit in approximately 4 years. The primary reason for the visit is due to a letter from his school stating he would need vaccines prior to entrance to middle school.

Past Medical History significant for egg allergy.

1st step: What is recommended for this age?
RECOMMENDED VACCINES FOR AGE

• Influenza (seasonal)
• Tetanus, diphtheria, and acellular pertussis (Tdap)
• Meningococcal-ACWY (MCV-4)
• Human Papillomavirus (HPV-9)
RECOMMENDED VACCINES FOR AGE

- Influenza (seasonal)
- Tetanus, diphtheria, and acellular pertussis (Tdap)
- Meningococcal-ACWY (MCV-4)
- Human Papillomavirus (HPV-9)

2nd Step: What is required by his school?
# What's Required for School?

- [www.immunize.org/laws](http://www.immunize.org/laws)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>South Carolina</th>
<th>North Carolina</th>
<th>Georgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
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<td>Not required</td>
<td>Not required</td>
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<tr>
<td>Tdap</td>
<td>7th grade</td>
<td>7th grade/age 12</td>
<td>7th grade</td>
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<tr>
<td>MCV-4</td>
<td>Not required</td>
<td>7th grade</td>
<td>7th grade</td>
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<tr>
<td>HPV</td>
<td>Not required</td>
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WHAT’S REQUIRED FOR SCHOOL?

- [www.immunize.org/laws](http://www.immunize.org/laws)

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<td>Not required</td>
<td>Not required</td>
<td>Not required</td>
</tr>
</tbody>
</table>
THE CASE CONTINUES...

• When you review any issues over the last year...
  
  • He received a Td vaccine in the ER about 1 month ago after stepping on a rusty nail.
  
  • Can he still get the Tdap today?
THE CASE CONTINUES...

• When you review any issues over the last year...
  
  • He received a Td vaccine in the ER about 1 month ago after stepping on a rusty nail.
  
  • Can he still get the Tdap today?
  
  • ABSOLUTELY.
WHY Tdap?

• Rising incidence of pertussis
  • Of the 20,000+ cases in 2015, ~1/3 involved adolescents

• Waning immunity

• High morbidity for older patients

• Protection of susceptible infants
Tdap

• Warnings
  • Muscle soreness
  • Local reaction
  • Low-grade fever

• Precautions
  • Guillain-Barre Syndrome
  • Arthus Hypersensitivity Reaction

• Contraindications
  • Anaphylaxis
OTHER Tdap CONSIDERATIONS

• DTaP should be used for children < 7 years old.

• No current recommendation for routine booster of Tdap.

• Pregnant women should receive Tdap with EACH pregnancy between 27-36 weeks gestation.
ONE DOWN...

- Tdap
- Influenza
- MCV-4
- HPV-9
INFLUENZA

- Mortalities in healthy children annually
  - Adolescents accounted for ~25% of influenza-related pediatric deaths in 2015-16 season.
  - 60% of these children had no underlying high-risk conditions.

- Universal vaccination recommendation for age > 6 months
INFLUENZA

• Mortalities in healthy children annually
  • Adolescents accounted for ~25% of influenza-related pediatric deaths in 2015-16 season.
  • 60% of these children had no underlying high-risk conditions.

• Universal vaccination recommendation for age > 6 months
  • <50% of children ages 13-17 years are vaccinated.
INFLUENZA VACCINE

- Inactivated vs. Live-Attenuated
- Trivalent vs. Quadrivalent
- Intramuscular vs. Intradermal vs. Intranasal
INFLUENZA VACCINE

- **Inactivated vs. Live-Attenuated**
- **Trivalent vs. Quadrivalent**
- **Intramuscular vs. Intradermal vs. Intranasal**
BUT WHAT ABOUT HIS EGG ALLERGY...

**Fig 3.8. Precautions for Administering IIV to Presumed Egg-Allergic Children.**

**Approach to Children With Presumed Egg Allergy**

- **History of an allergic reaction to eggs?**
  - **NO**
    - Administer influenza vaccine per usual protocol
  - **YES**
    - **Was the allergic reaction severe?**
      - **NO**
        - Mild reaction only (eg, hives)
        - Administer influenza vaccine with preconditions
      - **YES**
        - Anaphylaxis or Severe Reaction
          - Cardiovascular changes (eg, low BP)
          - Gastrointestinal (eg, vomiting)
          - Respiratory (eg, wheezing, throat swelling)
          - Episode required epinephrine
          - Allergy consultation
            (Alternatively, RIV3 may be given if 18-49 years old)

  *Necessary steps for administering influenza vaccine to any child with presumed egg allergy
  - In-office observation for 30 minutes
  - Appropriate resuscitative equipment available*
THAT’S TWO...

- Tdap
- Influenza
- MCV-4
- HPV-9

GOT A FLU SHOT
DIDN’T GET SICK
**FIGURE 2**
FIGURE 2
MENINGOCOCCUS

- Often begins as an upper respiratory infection
- Incidence is declining
- Case/fatality ratio of 10-40%
IN THE NEWS

Rise in deadly W strain of Meningococcal disease prompts calls for national approach  
By Lily Mayers  
Updated 29 Jan 2017, 9:59pm

Meningococcal disease: Sixth Queenslander in a week diagnosed  
Updated 6 Jan 2017, 2:11am

Rapid take-up for vaccines after meningococcal disease outbreak in WA Goldfields  
ABC Goldfields | By Sam Tomlin  
Posted 15 Dec 2016, 3:20am
MCV-4 VACCINE

• Two options
  • Menactra (Sanofi Pasteur)
  • Menveo (Novartis)

• Both cover serogroups A, C, Y, and W

• Booster between age 16-18 yrs if 1st dose received prior to age 16 or if considered high risk

• The only true contraindication is prior anaphylaxis
  • Precaution if previous diagnosis of Guillain-Barre Syndrome
ONE MORE TO GO…

- ✔️ Tdap
- ✔️ Influenza
- ✔️ MCV-4
- ❔ HPV-9

If there were a vaccine against cancer, wouldn’t you get it for your kids?

HPV vaccine is cancer prevention. Talk to the doctor about vaccinating your 11–12 year old sons and daughters against HPV.

www.cdc.gov/vaccines/teens
HUMAN PAPILLOMAVIRUS...
THE NUMBERS

- Transmitted with any genital-mucosal contact
- Lifetime risk of acquiring HPV >80%
- Ages 15-24 yrs account for 50% of new infections
- High-risk HPV types found in 20% of 14-19 y/o girls
- 26,000+ new cases of HPV-related cancer/year
HPV-9 VACCINE (GARDASIL-9)

• HPV-2 and HPV-4 now off the market

• These 9 HPV-types account for 90% of genital warts and almost 90% of HPV-related cancers

• Approved for boys and girls ages 9-26
HPV-9 VACCINE (GARDASIL-9)

• If age 9-14 yrs at 1\textsuperscript{st} dose and not considered high risk:
  • 2 doses, separated by 6-12 months

• If age 15+ at 1\textsuperscript{st} dose or is high risk:
  • 3 doses
    • Minimum 4 weeks between doses 1-2
    • Minimum 12 weeks between doses 2-3 (and 5 months between doses 1-3)
ARGUMENTS AGAINST HPV-9

- Waning immunity if given too early?
ARGUMENTS AGAINST HPV-9

- Waning immunity if given too early?
  - HPV-4 vaccine studies indicate 8 yrs of protection (thus far)
ARGUMENTS AGAINST HPV-9

• Waning immunity if given too early?
  • HPV-4 vaccine studies indicate 8 yrs of protection
• Doesn’t this promote sexual promiscuity?
ARGUMENTS AGAINST HPV-9

• Waning immunity if given too early?
  • HPV-4 vaccine studies indicate 8 yrs of protection

• Doesn’t this promote sexual promiscuity?
  • No increase in seeking medical attention for sexually-related diagnoses
  • Vaccinated women have more positive attitudes about practicing safe sex.
ARGUMENTS AGAINST HPV-9

• Waning immunity if given too early?
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• Doesn’t this promote sexual promiscuity?
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• It hasn’t been around long enough to determine its safety.
ARGUMENTS AGAINST HPV-9

- Waning immunity if given too early?
  - HPV-4 vaccine studies indicate 8 yrs of protection
- Doesn’t this promote sexual promiscuity?
  - No increase in seeking medical attention for sexually-related diagnoses
  - Vaccinated women have more positive attitudes about practicing safe sex.
- It hasn’t been around long enough to determine its safety.
  - 200 million doses given from 2006-2015 without any documented serious adverse events
THE WISE ASK THE ‘WHY’S’

• Why only 2 doses now?
  • Similar antibody response in 2 vs 3 in younger teens

• Why vaccinate for a sexually-transmitted infection?
  • This vaccine is about cancer prevention- plain and simple.

• Why so early in life?
  • More robust immune response
  • Gain immunity before exposure

• Why do we need to give all of these today?
  • Adolescents don’t come for regular check-ups
  • No increase in adverse events when given together
  • Similar immune response if given together vs. separate
  • Save an office visit…or 3.
FOR THE WIN…

- Tdap
- Influenza
- MCV-4
- HPV-9

YOU GET A VACCINE! YOU GET A VACCINE!!
YOU ALL GET VACCINES!!
FOR THE WIN…

☐ Tdap

☐ Influenza

☐ MCV-4

☐ HPV-9

The nurse calls you to come evaluate the patient (who is now lying on the waiting room floor)…

YOU GET A VACCINE! YOU GET A VACCINE!!

YOU ALL GET VACCINES!!
OF COURSE THIS WOULD HAPPEN...

- More common in adolescents and young adults
- Administer in a supine or seated position
- Observe in sitting/lying position x 15 minutes after administration
• Syncope more common in adolescents and young adults

• Administer in a supine or seated position

• Observe in sitting/lying position x 15 minutes after administration

This reaction is commonly reported to VAERS- but not a contraindication for subsequent doses
A 17 year old female is here with nasal congestion and cough without fever or increased work of breathing. She is non-toxic appearing, and her exam is essentially unremarkable.

Vaccine records reveal:

- Tdap (1 dose)
- Influenza
- MCV-4 (2 doses)
- HPV-4 (3 doses)
- Meningococcal B?
RECOMMENDED VACCINES FOR AGE

• Influenza
  • Annual immunization is recommended due to antigenic changes in the vaccine.
  • Immunity wanes within 6-12 months.

• HPV-9
  • No formal recommendation to give HPV-9 vaccine if HPV-4 series has been completed.
  • Pt would need full 3-dose series if desired.
MEN B- THE NEW KID IN TOWN

- Meningococcus Serotype B now accounts for 40% of cases.

Meningitis Outbreak Possible At Rutgers After New Case Reported

The discovery of a new Rutgers case of meningitis suggests the college is dealing with an outbreak of the deadly disease, an official said.

By Tom Davis (Patch Staff) - May 12, 2016 11:19 am ET

Princeton kicks off mass meningitis vaccinations to stop outbreak

PRINCETON, N.J. -- Princeton University will start the vaccination of nearly 6,000 students to try to stop an outbreak of type B meningitis.
MEN B VACCINATION

• Given between ages 16-18

• Two options
  • Bexsero (Novartis)
    • 2 dose schedule (0, 1 month interval)
  • Trumenba (Wyeth)
    • 2 dose schedule (0, 6 month interval)
    • 3 dose schedule (0, 1-2, 6 month interval)

• Category B recommendation (unless high risk)
THE BEST PART ABOUT GETTING VACCINATED ISN’T THE LOLLIPOP.

IT’S THE PART WHERE YOU DON’T GET SICK AND DIE.
### VACCINE HESITANCY/REFUSAL

<table>
<thead>
<tr>
<th>Reasons</th>
<th>No Provider Recommendation, % (95% CI)</th>
<th>With Provider Recommendation, % (95% CI)</th>
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<tbody>
<tr>
<td></td>
<td>Tdap</td>
<td>MenACWY</td>
</tr>
<tr>
<td>Provider did not recommend</td>
<td>33.7 (28.3–39.6)</td>
<td>49.1 (46.5–51.7)</td>
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<tr>
<td>Lack of knowledge</td>
<td>23.7 (18.5–29.9)</td>
<td>19.1 (17.1–21.3)</td>
</tr>
<tr>
<td>Not necessary</td>
<td>20.8 (16.1–26.5)</td>
<td>18.3 (16.2–20.7)</td>
</tr>
<tr>
<td>Not age appropriate</td>
<td>5.8 (3.1–10.4)</td>
<td>4.4 (3.4–5.6)</td>
</tr>
<tr>
<td>Not a school requirement</td>
<td>1.9 (0.9–3.8)</td>
<td>5.7 (4.5–7.2)</td>
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<tr>
<td>Not sexually active</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Safety concerns</td>
<td>0.8 (0.3–1.9)</td>
<td>0.5 (0.3–0.9)</td>
</tr>
</tbody>
</table>

## VACCINE HESITANCY/REFUSAL

### TABLE 1 Major Reasons Parents Report Nonreceipt of Tdap, MenACWY, or HPV Vaccines

<table>
<thead>
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</table>

TIPS FOR COMBAT

• Check your blood pressure.
• Educate. Educate. Educate.
  • Office-based
  • Web-based
• Be consistent and persistent with a strong recommendation.
• Take a presumptive approach when appropriate.

• Completion of vaccine refusal form
Refusal to Vaccinate

Child's Name ________________________    Child's ID# ________________________

Parent’s/Guardian’s Name ________________________

My child’s doctor/nurse, ________________________, has advised me that my child (named above) should receive the following vaccines:

<table>
<thead>
<tr>
<th>Recommended</th>
<th>Declined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B vaccine</td>
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</tr>
<tr>
<td>Diphtheria, tetanus, acellular pertussis (DTaP or Tdap) vaccine</td>
<td></td>
</tr>
<tr>
<td>Diphtheria tetanus (DT or Td) vaccine</td>
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<tr>
<td>Haemophilus influenza type b (Hib) vaccine</td>
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<tr>
<td>Pneumococcal conjugate or polysaccharide vaccine</td>
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<tr>
<td>Inactivated poliovirus (IPV) vaccine</td>
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<tr>
<td>Measles-mumps-rubella (MMR) vaccine</td>
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<tr>
<td>Varicella (chickenpox) vaccine</td>
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</tr>
<tr>
<td>Influenza (flu) vaccine</td>
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</tr>
<tr>
<td>Meningococcal conjugate or polysaccharide vaccine</td>
<td></td>
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<tr>
<td>Hepatitis A vaccine</td>
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<tr>
<td>Rotavirus</td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) vaccine</td>
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</tr>
<tr>
<td>Other ______________________________________</td>
<td></td>
</tr>
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</table>

That some vaccine-preventable diseases are common in other countries and that my unvaccinated child could easily get one of these diseases while traveling or from a traveler.

If my child does not receive the vaccine(s) according to the medically accepted schedule, the consequences may include:
- Contracting the illness the vaccine is designed to prevent (the outcomes of these illnesses may include one or more of the following: certain types of cancer, pneumonia, illness requiring hospitalization, death, brain damage, paralysis, meningitis, seizures, and deafness; other severe and permanent effects from these vaccine-preventable diseases are possible as well).
- Transmitting the disease to others (including those too young to be vaccinated or those with immune problems), possibly requiring my child to stay out of child care or school and requiring someone to miss work to stay home with my child during disease outbreaks.

My child’s doctor and the American Academy of Pediatrics, the American Academy of Family Physicians, and the Centers for Disease Control and Prevention all strongly recommend that the vaccine(s) be given according to recommendations.

Nevertheless, I have decided at this time to decline or defer the vaccine(s) recommended for my child, as indicated above, by checking the appropriate box under the column titled “Declined.” I know that failure to follow the recommendations about vaccination may endanger the health or life of my child and others with whom my child might come into contact. I therefore agree to tell all health care professionals in all settings what vaccines my child has not received because he or she may need to be isolated or may require immediate medical evaluation and tests that might not be necessary if my child had been vaccinated.

I know that I may readdress this issue with my child’s doctor or nurse at any time and that I may change my mind and accept vaccination for my child any time in the future.

I acknowledge that I have read this document in its entirety and fully understand it.

I have been provided with and given the opportunity to read each Vaccine Information Statement from the Centers for Disease Control and Prevention explaining the vaccine(s) and the disease(s) it prevents for each of the vaccine(s) checked as recommended and which I have declined, as indicated above. I have had the opportunity to discuss the recommendation and my refusal with my child’s doctor or nurse, who has answered all of my questions about the recommended vaccine(s). A list of reasons for vaccinating, possible health consequences of non-vaccination, and possible side effects of each vaccine is available at www.cdc.gov/vaccines/pubs/vis/default.htm.

I understand the following:
- The purpose of and the need for the recommended vaccine(s).
- The risks and benefits of the recommended vaccine(s).

Parent/Guardian Signature: ________________________  Date: __________

Witness: ________________________  Date: __________

I have had the opportunity to re-discuss my decision not to vaccinate my child and still decline the recommended immunizations.

Parent’s Initials: ________________________  Date: __________

Parent’s Initials: ________________________  Date: __________
TIPS FOR COMBAT

• Check your blood pressure.
• Educate. Educate. Educate.
  • Office-based
  • Web-based
• Be consistent and persistent with a strong recommendation.
• Take a presumptive approach when appropriate.

• Completion of vaccine refusal form
• Last resort: dismissal from practice
## RESOURCES

### Patients/Parents
- Healthychildren.org
- ‘Vaccines on the Go: What You Should Know’ App

### Providers
- AAP.org
- CDC.gov
- ‘CDC Vaccine Schedules’ App
- ‘AAP Red Book’ App
Thank you for your dedication to providing the best possible care for the pediatric population.