National Health Care Visit Patterns of Adolescents

Implications for Delivery of New Adolescent Vaccines

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Objective: To prepare for new adolescent vaccinations by examining current use of adolescent outpatient health care visits throughout the United States.

Design: Cross-sectional analysis of visits.

Setting: Outpatient hospital- and office-based practices in the United States included in the 1994-2003 National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey.

Participants: Adolescents ages 11 to 21 years (n=63,529) with outpatient visits.

Main Outcome Measures: Type of physician seen for overall and preventive visits, visit trends over time, demographics of adolescents seen by pediatricians vs family physicians, and visit type during which a vaccine was provided.

Results: Late-adolescence females (18-21 years old) had the most overall visits, 36% of which were to obstetrician-gynecologists. Pediatricians were seen at most outpatient visits for adolescents 14 years or younger, with fewer visits for those older than 14 years. Family practitioners were seen at one quarter of all outpatient visits. Only 9% of all adolescent visits were for preventive care. Early adolescents (11-14 years old) had 3 times more preventive visits than late adolescents (P<.001). Pediatricians were more likely to see adolescents who were younger, male, black, and urban and were more likely to be seen for preventive visits compared with family physicians (P<.001 for all). Altogether, 80%, 70%, and 64% of visits that included measles-mumps-rubella, hepatitis B, and diphtheria-tetanus vaccinations, respectively, were for preventive care.

Conclusions: On the basis of current utilization patterns, adolescent vaccinations should be delivered during early or middle adolescence. If vaccines are to be provided to older adolescent females, involvement of obstetrician-gynecologists in vaccine delivery is critical.

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IMMUNIZATIONS HAVE BEEN CALLED one of the greatest public health successes of the past century.1 In the past decade alone, rates of varicella infection have decreased by 81%,2 and invasive Streptococcus pneumoniae has declined markedly among children and adults.3,4,5

Although immunizations have been a long-standing focus of the preventive care of young children, they have not been a major component of adolescent preventive care, largely because there were few vaccines to offer adolescents. Recently, strategies for enhancing adolescent preventive services have been promulgated, including the Guidelines for Adolescent Preventive Services and Bright Futures, which recommend screening adolescents for a multitude of behaviors and risk factors annually.7,8,9 Although immunizations comprise only a small component of these guidelines, newly licensed adolescent vaccines, including meningococcal conjugate,10 pertussis booster,11,12,13 and human papillomavirus vaccines, as well as future vaccines for herpes simplex virus and ultimately human immunodeficiency virus, heighten the need to rethink adolescent vaccination delivery in the context of comprehensive preventive care. The epidemiologic features and pathogenesis of these diseases are the primary drivers for adolescent vaccination; all vaccines should be delivered either when immunity from prior immunization wanes or before adolescents are most at risk of acquiring one of these infections. However, given that utilization plays a definitive role in the practicality of vaccination delivery, it is important to understand health care utilization patterns for teens.

Many adolescents seek care at a variety of locations, whereas others lack comprehensive care.14,15 Prior studies have examined those adolescents who receive no...
health care. Results vary across data sets, but studies tend to show that black adolescents receive less primary care than white adolescents and that one sixth to one third of all adolescents do not see a physician within a year. The content of visits is variable, and visits among adolescents can be erratic, affecting the continuity and quality of adolescent preventive care. The advent of new vaccines for adolescents demands greater understanding of current patterns of care to target new vaccine implementation strategies and to evaluate their success.

Prior studies have not examined the role these patterns of health care might play in the implementation of new adolescent vaccines. Our study assessed current adolescent utilization nationally to help identify the following: (1) types of health care professionals who currently serve adolescents and will likely deliver vaccinations, (2) demographic differences between adolescents seen by pediatricians and those seen by family physicians, and (3) types of visits (eg, preventive or other) during which vaccines are currently administered. Understanding current patterns of adolescent visits and vaccinations can direct educational strategies of public health organizations and professional societies and can help immunization policymakers in targeting certain age groups and practice-level interventions to optimize the receipt of needed adolescent vaccines.

**METHODS**

**DESIGN**

We performed a cross-sectional analysis of visits to both office-based physicians and hospital outpatient departments included each year in the annual National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS). Ten years of data from 1994 to 2003 were analyzed. Combining both surveys covers most outpatient visits across the United States, not including those to pathologists, anesthesiologists, radiologists, or federally employed physicians. In addition to traditional private offices, the NAMCS and NHAMCS include hospital clinics, family planning clinics, and mental health care centers. We combined a decade of data from both sources to enhance sample size (particularly for preventive visits) and to assess secular trends. These surveys use a patient encounter as the sampling unit and are weighted to be nationally representative; detailed descriptions are reported elsewhere. For both surveys, physicians or their staff complete a 1-page questionnaire at the time of each patient visit. For the NAMCS, physicians record information on visits made during a randomly selected 1-week period. For the NHAMCS, hospital staff or physicians at each hospital outpatient department complete a form for a sample of patients during a 4-week period. Visit-specific data include patient demographics, International Classification of Diseases, Ninth Revision (ICD-9) codes, physician specialty, and vaccinations provided. Visits to emergency departments were excluded from this analysis. The study was approved by the institutional review board at the University of Rochester.

**VARIABLES**

We examined age-specific health care utilization across the entire age spectrum of adolescents (11-21 years old). For each age group and sex, we determined the type of health care professional seen for all visits and for preventive visits and the type of visit when a vaccination was given. We also examined the type of health care professional seen over time for secular trends and determined demographic differences in visits to pediatricians and family physicians. For both surveys, data are collected during a short period in each office, and preventive visits are unlikely to occur more than once per year, so it is unlikely that an individual could undergo sampling more than once. We used Health Plan Employer Data and Information Set definitions to identify preventive care visits, which included the following ICD-9 codes: V20.2, V70.0, V70.3, V70.5, V70.6, V70.8, and V70.9. Categories with fewer than 30 unweighted visits are not reported, since such data are not considered reliable. Family practice physicians and internists were combined into 1 subset for analyses of preventive visits because of small sample size when separated and because the NHAMCS combines these into 1 “general practitioner” category. Of the outpatient visits to family practice physicians or internists (from the NAMCS), only 18% were to internists (most for those >17 years) and 82% to family practice physicians. Preventive visits to subspecialists were excluded because there were substantially fewer than 30 visits for each age group and sex.

Vaccination visits included diphtheria-tetanus (Td), measles-mumps-rubella (MMR), and hepatitis B vaccination, as designated by visit-specific codes for Td (09815, 09820, 09900, 09905, 09990, 09993, 31005, and 31015), hepatitis B (92131 and 96049), and MMR (18100, 18540, and 27075). Varicella vaccine was coded (02396) at only 21 visits, so these visits were not examined.

**STATISTICAL ANALYSES**

We used chi-square tests to determine statistical differences between the samples of office-based and hospital-based visits based on stage of adolescence (early: 11-14 years; middle: 15-17 years; and late: 18-21 years) and sex and to compare, by adolescent age and sex, the type of health care professional seen for all visits, preventive care visits, and vaccination-related visits. These tests were also used to determine differences in patient demographics and visit types to pediatricians compared with family physicians. Regression analyses were used to determine characteristics of visits to pediatricians vs family physicians. Trend analyses were performed through 2002 to determine if there were significant differences in physician type for overall visits by stage of adolescence over time, as well as for the proportion of preventive visits over time. We excluded data from 2003 for trend analyses because of changes in the survey methods that make these data incomparable for trends. SUDAAN statistical software version 9.0 was used to account for the sampling design of the surveys.

**RESULTS**

**NUMBER OF OUTPATIENT VISITS**

Adolescents accounted for 9.1% of all outpatient visits in the United States from 1994 to 2003, although they comprised 13.7% of the US population in 2000. Adolescents made an average of 80 million outpatient visits per year during this time, with 70 million visits to office-based practices and almost 10 million visits to hospital-based ones. Outpatient visits for adolescents increased by 33% throughout the decade (from 69 million in 1994 to 92 million in 2003).
DEMOGRAPHIC CHARACTERISTICS

Eighty-eight percent of the sample represents visits to office-based (NAMCS) rather than hospital-based practices (NHAMCS) (Table 1). Adolescents seen in hospital-based settings were more likely to be black (24%), to be female (62%), and to have Medicaid coverage (35%) than those seen in office-based settings (10%, 16%, and 57%, respectively; \( P < .001 \) for all). The remainder of the results refer to the combined data sets.

OUTPATIENT VISITS BY AGE AND SEX

Adolescent males had fewer health care visits at older ages, with a sharp decline in visits after the age of 16 years, whereas adolescent females had a greater number of visits at older ages (Figure 1). In early adolescence, both sexes had a similar volume of visits by age (3.3 million for 11-year-old girls and 3.7 million for 11-year-old boys), whereas in late adolescence females had far more outpatient visits than males did (5 million for 21-year-old females and 1.8 million for 21-year-old males).

OUTPATIENT VISITS BY PHYSICIAN TYPE

Forty percent of outpatient visits for adolescents up to the age of 14 years were to pediatricians; however, pediatricians had a gradually decreasing role in primary care for adolescents older than 14 years. They provided a small proportion of visits for adolescents 18 years and older (4% of female visits and 7% of male visits). Family practice physicians in private offices remained fairly constant as health care providers for both sexes but performed a greater proportion of visits for older males (22% of early and 29% of late adolescent boy visits; \( P < .001 \)). Internists in private offices provided a small percentage of adolescent visits overall, and as expected, visits to these offices increased with age (4% of early and 7% of late adolescent girl visits and 3% of early and 10% of late adolescent boy visits).

Subspecialists were seen for 27% of visits overall, with the greatest proportion of visits among late adolescent males (46%). Orthopedists, dermatologists, and psychiatrists were the most commonly visited subspecialists (20%, 19%, and 12% of subspecialty visits, respectively), together accounting for approximately half of all subspecialty visits made by adolescents. After the age of 18 years, females had more visits to obstetrician-gynecologists than any other type of physician (36% of late adolescent female visits).

PREVENTIVE CARE VISITS

Preventive visits made by females declined moderately after the age of 14 years and declined further after the age of 17 years (\( P < .001 \) by age group) (Figure 2). Preventive visits made by males declined somewhat after the age of 13 years and again more substantially after the age of 17 years (\( P < .001 \) by age group). More than 3 times as many preventive visits were made by early adolescents than by late adolescents (\( P < .001 \)).

Most preventive visits for adolescents 14 years and younger (39% of visits for girls and 66% for boys) and almost half of preventive visits among middle adolescents were to pediatricians (41% of female and 46% of male visits). Pediatricians provided a much smaller share of preventive care to late adolescents (12% of female and male visits)

Table 1. Demographic Characteristics of Adolescent Visits, 1994-2003 NAMCS/NHAMCS*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Sample</th>
<th>Office-Based Visits (NAMCS)</th>
<th>Hospital-Based Visits (NHAMCS)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unweighted No. of visits</td>
<td>63 529</td>
<td>22 916</td>
<td>40 613</td>
<td></td>
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<tr>
<td>Weighted No. (%) of visits</td>
<td>797 million (100)</td>
<td>701 million (88)</td>
<td>96 million (12)</td>
<td></td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-14</td>
<td>35.8</td>
<td>36.1</td>
<td>33.5</td>
<td></td>
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<tr>
<td>15-17</td>
<td>29.7</td>
<td>29.8</td>
<td>28.7</td>
<td>.004</td>
</tr>
<tr>
<td>18-21</td>
<td>34.5</td>
<td>34.1</td>
<td>37.8</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
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<td></td>
</tr>
<tr>
<td>Female</td>
<td>57.5</td>
<td>56.8</td>
<td>62.3</td>
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</tr>
<tr>
<td>Male</td>
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<td>43.2</td>
<td>37.7</td>
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<tr>
<td>Race</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>84.0</td>
<td>85.6</td>
<td>72.5</td>
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</tr>
<tr>
<td>Black</td>
<td>12.1</td>
<td>10.4</td>
<td>24.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other</td>
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<td>4.0</td>
<td>3.1</td>
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<tr>
<td>Insurance</td>
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<td></td>
</tr>
<tr>
<td>Private</td>
<td>61.0</td>
<td>64.0</td>
<td>39.1</td>
<td></td>
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<tr>
<td>Medicaid</td>
<td>18.0</td>
<td>15.6</td>
<td>34.8</td>
<td>&lt;.001</td>
</tr>
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<td>Self-pay</td>
<td>9.1</td>
<td>9.0</td>
<td>10.2</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11.9</td>
<td>11.4</td>
<td>15.9</td>
<td></td>
</tr>
<tr>
<td>MSA</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MSA</td>
<td>83.4</td>
<td>83.0</td>
<td>86.2</td>
<td>.09</td>
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<td>Non-MSA</td>
<td>16.6</td>
<td>17.0</td>
<td>13.8</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: MSA, metropolitan statistical area; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey.
*Data are expressed as percentages of weighted visits unless otherwise indicated.
13% of male visits). Family practice physicians and interns performed the remainder of preventive visits for early adolescents (39% of female and 32% of male visits) and provided most of the preventive care visits to late adolescents (50% of female and 70% of male visits). Thirty-five percent of preventive visits made by late adolescent females (for well-adolescent care, not prenatal care) were to obstetrician-gynecologists.

Overall, only 9% of all adolescent visits were for preventive care (Figure 3). Preventive visits comprised a somewhat higher proportion of visits for early adolescent boys and girls (13% of visits for both) than for late adolescents (50% of female and 70% of male visits). Thirty-five percent of preventive visits made by late adolescent females (for well-adolescent care, not prenatal care) were to obstetrician-gynecologists.

In bivariate analyses (Table 2), significant differences (P<.001) were found in the physician type (pediatrician vs family physician) seen for overall visits by age group, sex, race, insurance type, metropolitan statistical area, and visit type (preventive visit vs other). In multivariate analyses (Table 3), visits to pediatricians were more likely to be made by younger and middle adolescents (odds ratio [OR], 7.9 and 4.1, respectively), black adolescents (OR, 1.7), and those from urban areas (OR, 3.4). Preventive visits were more likely made to pediatricians (OR, 1.5) than to family practice physicians. Family practice physicians were more likely to see adolescent females and individuals who paid out of pocket for health care.

OVERALL VISIT TRENDS

These analyses used 9 years of data from both surveys to examine time trends in patterns of visits by adolescent age.
and sex and by type of physician seen. Middle adolescents made fewer visits to family practices over time ($P = .004$ for girls and $P = .05$ for boys), but no significant trends were found for early or late adolescents. Middle adolescent girls also had more visits to pediatricians over time ($P = .003$) and fewer visits to obstetrician-gynecologists ($P = .05$). No significant change was found in the proportion of preventive care visits during the period examined.

**VACCINATION-RELATED VISITS**

Adolescents generally received vaccinations during preventive visits. Preventive care visits accounted for 80% of visits that included MMR, 70% that included hepatitis B, and 64% of visits that included Td vaccinations. Diagnosis codes at visits that included Td vaccination included laceration, animal bite, and puncture wounds. As expected, early adolescents received most of the vaccinations (MMR, 76%; hepatitis B, 67%; and Td, 56%), and most were received at visits to pediatricians (MMR, 61%; hepatitis B, 72%; and Td, 57%). Adolescents rarely received immunizations from obstetrician-gynecologists or subspecialists (1%-3%).

**COMMENT**

New and emerging vaccines for adolescents require a reassessment of current adolescent health care utilization, which reflects the types of physicians who should be responsible for vaccine delivery within existing care patterns. Our results show that for both overall care and preventive visits, younger adolescents primarily visit pediatricians, whereas older adolescents make more outpatient visits to family practice physicians and internists. During a 9-year period, visits to pediatricians by middle adolescents increased with time and those to family practice physicians declined. Among late-adolescent females, a larger proportion of visits were to obstetrician-gynecologists. Adolescents typically received immunizations at preventive visits and rarely during visits to obstetrician-gynecologists or subspecialists. Preventive visits make up only a small percentage of outpatient visits by adolescents and occur less frequently among older adolescents, suggesting that vaccines targeted to late adolescents may be unlikely to reach most teens if vaccination remains coupled with preventive care.

**AGE**

To best deliver vaccines to adolescents within current health care visit patterns, vaccination before late adolescence is optimal. Not only are there more preventive visits among adolescents before the age of 15 years, but those visits are to traditional immunization providers (eg, pediatricians and family practice physicians), who more often perform these services than do most subspecialists. These findings complement early evidence on human papillomavirus vaccine, which showed that vaccinating at younger rather than older adolescent ages offers a heightened immune response and that the vaccine is most effective if delivered before sexual activity occurs.

**PHYSICIAN TYPE**

A prior analysis of the 1994 NAMCS also noted a predominance of visits to pediatricians among early ado-
lescents, but our study adds to existing knowledge by examining multiple visit types, identifying vaccination-related visits, and including visits to hospital-based outpatient settings that serve a significant proportion of low-income patients. Studies show that physicians' attitudes, recommendations, and specialty are predictors of immunization status. Our study and others have shown that family practice physicians play an important role in the care of adolescents, particularly as they approach early adulthood. Historically, some differences have been noted between pediatricians and family practice physicians in terms of perceptions and delivery of vaccinations. One study found that, compared with pediatricians, family practice physicians reported more barriers when vaccinating older adolescents. Others have found that pediatricians were more likely than family practice physicians to track under-vaccinated children and adolescents, to use acute care visits as opportunities to vaccinate, and to participate in immunization registries. At the same time, most visits by minority and urban populations are to pediatricians, and because immunization coverage among these populations has tended to be lower, pediatricians have a special role in vaccinating high-risk populations and reducing disparities in coverage. Therefore, it will be critical for professional organizations such as the American Academy of Pediatrics, American Academy of Family Physicians, and American College of Obstetricians and Gynecologists to provide intensive, specialty-specific outreach and communication with their members to maximize delivery of new vaccines to their adolescent patients, particularly those populations that remain traditionally under-immunized.

We found that a large proportion of visits among older adolescent females seen by obstetrician-gynecologists was for preventive visits and not for prenatal care, with a simultaneous decline in overall visits to obstetrician-gynecologists observed during 9 years. This finding may be reflective of the decline in adolescent pregnancies during the same interval. The role of obstetrician-gynecologists in providing primary care has evolved in recent years. As of 2003, 40 states had mandates allowing women direct access to obstetrician-gynecologist care rather than requiring a gatekeeper, and 17 had mandates that obstetrician-gynecologists can act as primary care physicians. In a 2000 survey of obstetrician-gynecologists, 47% identified themselves as primary care physicians, yet only 10% thoroughly assessed their patients for vaccine-preventable diseases. If vaccines are offered to older adolescents or catch-up vaccines are recommended for older adolescents, education of obstetrician-gynecologists in the delivery of these vaccines is important.

Some have suggested that adolescent vaccinations may be provided by specialists; however, the most common specialists treating adolescents are orthopedists, dermatologists, and psychiatrists. Since none of these groups are accustomed to providing vaccinations, a widespread program of adolescent vaccination by specialists does not appear feasible. Further studies are needed to assess how many adolescents who see specialists do not see primary care physicians.

### Table 3. Independent Associations of Adolescent Outpatient Visits to Pediatricians vs Family Practitioners, 1994-2003 NAMCS/NHAMCS *

<table>
<thead>
<tr>
<th>Demographic</th>
<th>OR (95% CI)</th>
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</thead>
<tbody>
<tr>
<td><strong>Age, y</strong></td>
<td></td>
</tr>
<tr>
<td>11-14</td>
<td>7.9 (6.8-9.3)</td>
</tr>
<tr>
<td>15-17</td>
<td>4.1 (3.5-4.8)</td>
</tr>
<tr>
<td>18-21</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.8 (0.7-0.9)</td>
</tr>
<tr>
<td>Male</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.0</td>
</tr>
<tr>
<td>Black</td>
<td>1.7 (1.4-2.1)</td>
</tr>
<tr>
<td>Other</td>
<td>0.9 (0.7-1.2)</td>
</tr>
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<td><strong>Insurance type</strong></td>
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<tr>
<td>Private</td>
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<tr>
<td>Medicaid</td>
<td>0.9 (0.8-1.1)</td>
</tr>
<tr>
<td>Self-pay</td>
<td>0.5 (0.4-0.7)</td>
</tr>
<tr>
<td>Other</td>
<td>0.8 (0.6-1.1)</td>
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<tr>
<td><strong>MSA</strong></td>
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<tr>
<td>MSA</td>
<td>3.4 (2.4-4.8)</td>
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<tr>
<td>Non-MSA</td>
<td>1.0</td>
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<tr>
<td><strong>Visit type</strong></td>
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<tr>
<td>Preventive</td>
<td>1.5 (1.2-1.8)</td>
</tr>
<tr>
<td>Other</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; MSA, metropolitan statistical area; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; OR, odds ratio. Factors significant at \( P < .001 \) are in bold.

### PREVENTIVE CARE

The proportion of adolescent visits that were preventive care visits was surprisingly small. An annual preventive care visit to a health care professional is important to deliver recommended preventive services. Among younger children, underimmunization is a marker of lack of receipt of other preventive services, and focusing on immunizations has helped increase other aspects of preventive care. It is possible that a similar spillover effect could occur among adolescents. Ensuring that adolescents receive annual preventive visits should be a priority of primary care physicians, and incorporating strategies such as patient reminder or recall to increase preventive visits and vaccinations is particularly important for this age group. Tracking adolescents with an immunization registry so that vaccines received in different settings could be recorded might make secondary care physicians more likely to offer vaccines.

Physicians currently provide almost all MMR and hepatitis B vaccinations at preventive care visits. Even for Td vaccine, which is often provided at injury-related visits, two thirds of outpatient vaccinations (not including those given in emergency departments) were provided during preventive visits. Inclusion of acute care visits as potential opportunities for vaccination could improve the coverage rates for new adolescent vaccines. To increase early childhood immunization rates during the past decade, emphasis has been placed on providing vaccines to young children at illness visits to avoid missed opportunities. However, as of 1997, only 24% of pediatri-
cians and family practice physicians in the United States reported immunizing adolescents at acute care visits. Although our ultimate goal is for all adolescents to have annual preventive visits, until that goal can be reached it is important to deliver vaccinations at all possible opportunities. In addition, human papillomavirus vaccination will require multiple follow-up visits to complete the series, heightening the need to use all visits as vaccination opportunities.

STUDY LIMITATIONS

The NAMCS and NHAMCS databases are visit-based surveys. Longitudinal analyses that link individuals over time are not possible, and individuals without any health care visits are not included. For the 12% of outpatient visits obtained from the NHAMCS database, we were unable to differentiate family practice physicians from internists. Thus, we examined the data from the NAMCS database separately to better distinguish family practice physicians from internists in the care of adolescents. For preventive care, internist visits were too infrequent to provide reliable estimates, but we would not expect internists to care for many adolescents younger than 18 years, who made 63% of the adolescent visits within the NHAMCS. Finally, visit definitions for preventive visits are limited by physician documentation of diagnoses, so misclassifications are possible. However, physicians are trained in how to fill out the visit-based forms and are instructed to include all diagnoses appropriate for each visit.

CONCLUSIONS

We conclude the following:

1. As adolescents age into their late teens, visits to primary care physicians decline substantially, reducing opportunities for immunizations.
2. Pediatricians provided most of the outpatient visits for young adolescents, black adolescents, and those from urban areas but markedly fewer visits for older adolescents.
3. Family practice physicians play a large role in caring for adolescents of all ages (particularly older ones), and obstetrician-gynecologists provide the greatest number of visits for females older than 18 years.
4. Preventive visits make up a small proportion of all visits and an increasingly smaller proportion of visits for older adolescents.
5. Vaccinations are provided almost exclusively during preventive visits.

The implications are as follows:

1. Adolescents should preferably be vaccinated during early or middle adolescence, when they are most likely to visit pediatricians and family practice physicians and far more likely to have preventive visits than older teens.
2. Education and outreach to all physicians who are major providers of adolescent care are important to ensure that new vaccines are delivered routinely in all health care settings.
3. The practice of vaccinating at acute care visits should be extended to adolescents to take advantage of every opportunity to provide immunizations.
4. Physicians should incorporate strategies to bring in adolescents for annual preventive visits to deliver recommended preventive services, including new adolescent vaccinations.

By capitalizing on adolescent health care utilization patterns and incorporating strategies proven for infants to improve immunization delivery, our health care system should be able to integrate new adolescent vaccinations into efforts to improve overall adolescent preventive services.

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REFERENCES

11. Bilukha OO, Rosenstein N. Prevention and control of meningococcal disease: rec-