Determining indications for adult vaccination: Patient self-assessment, medical record, or both?

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Abstract

Context: Eight or more vaccines may be indicated for adults in the United States. Determining if any vaccines are needed requires integrating information on the patient’s demographic and behavioral risk factors and health status, the health status of the patient’s close contacts, and the patient’s immunization history. This process can be time consuming for providers and their staff. We used patient self-assessment as a method of determining which vaccines are indicated for a patient and whether indicated vaccines had been received.

Design, setting, and participants: Cross-sectional convenience sample of 300 adults in three family practice settings. Participants completed a self-assessment tool to determine if influenza, pneumococcal, measles, mumps, and rubella (MMR), tetanus, hepatitis A and hepatitis B vaccines were indicated and previously received. A chart audit was then performed to obtain similar information.

Main outcome measures: Agreement (kappa statistic: ≤0.00: poor agreement; 0.00–0.20: slight; 0.21–0.40: fair; 0.41–0.60: moderate; 0.61–0.80: substantial; 0.81–1.00: almost perfect) between the self-assessment tool and the audit for (1) indicated vaccines and (2) previous receipt of indicated vaccines indicated according to both the assessment form and the audit.

Results: Agreement between the self-assessment tool and chart review was substantial or better only for pneumococcal and MMR vaccines (kappa = 0.65 and 0.85, respectively). For influenza vaccine, agreement improved (from kappa = 0.56 to kappa = 0.74) when indications attributable to health conditions of family members were excluded. Agreement regarding receipt of vaccines was highest for influenza vaccine (kappa = 0.70). Only 57% of patients correctly recalled tetanus vaccination that were documented in the medical record (kappa = −0.04). Kappa statistics were unreliable for hepatitis A and B vaccines because so few vaccinations had been received.

Conclusions: Discrepancies in agreement regarding indications for vaccines appeared to result from absence of information in the medical record regarding high risk behaviors and family contacts. Lack of agreement regarding vaccines that had been previously been received appeared due to both poor recall and lack of documentation. Combining medical record audit with self-assessment may be the most complete assessment of vaccination status of adults, but requires reconciling disagreements. Electronic medical records and registries that contain information about risk factors and previously administered vaccines may be necessary to overcome some these problems.

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Keywords: Vaccination; Immunization; Influenza vaccine; Pneumococcal vaccine; Measles, mumps, rubella vaccine; Tetanus-diptheria vaccine; Hepatitis A vaccine; Hepatitis B vaccine; Self-assessment; Chart review; Vaccine indications

1. Introduction

Most American adults should be evaluated for eight different vaccines [1]. To determine which of these vaccines should be administered, it is necessary to know whether or not the vaccine is indicated and if it has already been received. Determining if a vaccine is indicated for a specific patient can be...
complex and time consuming since it requires knowledge about the patient’s demographics (age, sex, race, ethnicity, fertility status, residence), health conditions, occupation, avocations, travel plans, behaviors (e.g. sexual preferences, number of sexual partners, and street-drug use), as well as the age and health condition of family members [2]. The provider must also determine if the patient has already received the correct number of doses at the appropriate intervals.

Interventions to increase immunization coverage in adults usually include only indications based on one or two easily assessed factors such as the patient’s age [3] or a specific disease (e.g. diabetes) [3,4], and rarely include comprehensive assessment of health-based or behavioral and occupational risk factors [2]. Adult immunization interventions most often concentrate on influenza and pneumococcal vaccine, rarely including vaccines such as hepatitis B, which is primarily indicated for behavioral and occupational exposures. The difficulty of assessing adults under age 65 is reflected in a recent review of evaluations of interventions to increase vaccination in this age group [5–11]. Most involved only one or two adult vaccines, and no study included more than three of the eight recommended vaccines. To our knowledge there are no reports of attempts to increase the coverage for all indicated vaccines. To facilitate such an intervention, we developed and validated a patient-administered self-assessment tool that assists providers in determining whether any of these vaccines are indicated.

2. Methods

This study was approved by the institutional review boards of the Centers for Disease Control and Prevention and Louisiana State University Health Science Center. The study sites which did not have their own institutional review boards, obtained federal wide assurance numbers and completed an authorization agreement saying that they would rely on the Centers for Disease Control’s institutional review board for review of the protocol.

2.1. Self-assessment tool

The self-assessment-physician reminder tool (available at http://www.cdc.gov/nip/recs/adult-schedule.htm#avacs (Appendix 1) was adapted from Do I Need Any Vaccinations Today (Immunization Action Coalition, Minneapolis, MN, available at http://www.immunize.org/catg.d/4036need.htm ). The self-assessment-physician reminder tool was developed by reviewing published summaries of ACIP recommendations for 8 vaccines (influenza; pneumococcal polysaccharide; measles, mumps, and rubella (MMR); meningococcal; tetanus–diphtheria, varicella; hepatitis A; hepatitis B. Literacy experts assisted investigators in developing simple screening questions were written at a 4th grade reading level in English and Spanish. All ACIP-identified demographic, health conditions, age and health condition of household members, occupational exposures, recreational activities and travel plans, sexual preferences, and other behaviors that identify people for which vaccination is indicated [1,12] were included, with the exception of disease indications for which no lay terms were available. A ‘yes’ response to any item in a list for a vaccine means that vaccine is indicated. This listing strategy avoids the need to reveal specific sensitive information. For example, a final question asks the respondent if he or she has already received the correct number of doses of the vaccine in the proper time period. Thus, all medical personnel can use this form without compromising privacy.

We pilot tested the form among 50 volunteers at clinical sites (other than those where the study was conducted). Patients completing the form were interviewed and asked about any questions they did not understand. The patients’ physicians then reviewed the patients responses for accuracy and determined if any vaccine indications had been omitted.

2.2. Setting and data collection

The self-assessment tool was evaluated in three different family practice clinics (a two-provider private clinic in Georgia, a six-provider Federally Qualified Health Center look-alike [an organization that meets all of the federally funded Community Health Center program expectations, but do not receive federal operating grants under the Section 330 Public Health Service Act] in New Mexico, and a family practice clinic in a university hospital in Louisiana) from 24 June 2001 to 31 January 2003 as part of a larger study to determine its impact on immunization coverage. Varicella and meningococcal vaccines were excluded at the request of the participating physicians. In each facility, a convenience sample of 100 patients aged 18 and older was selected. While subjects were waiting to see their provider, they were asked if they were willing to participate in a study about their need for vaccinations. Those who consented were encouraged to answer all questions.

2.3. Determining which vaccines were indicated

A vaccine was considered indicated according to the self-assessment tool if the respondent indicated that he or she was in a target group for vaccination. Since all adults should receive tetanus–diphtheria vaccine every 10 years, this vaccine was considered indicated for all patients. Vaccines were considered indicated according to the chart audit if any characteristic listed by the ACIP as a criterion for recommending the vaccine was found on the patient’s problem list or identified during a 10 min audit. The process began with search for and abstraction of the problem list and vaccination record, if present. This information was supplemented with a review of physician and nursing notes for additional diagnoses and vaccinations.
2.4. Determining if indicated vaccines had been received

On the self-assessment tool, information regarding if and when a vaccine was received was determined by the answer to the final question in the section. In this question, respondents were asked if they had received the vaccine in a specific time frame and number of doses. Influenza was considered received if it was administered between the most recent 1 September and 31 March. A single lifetime dose of pneumococcal vaccine was adequate unless the original dose had been given before age 65; 5 years had elapsed, and the patient was now over 65. A tetanus diphtheria vaccine had to be received at least once in the previous 10 years. One post-childhood dose of MMR (people born since 1956), two doses of hepatitis A, and three doses of hepatitis B vaccine were necessary for those vaccines to be considered received. In the audit, previous receipt of vaccines was assessed by confirming actual dates of vaccination or a statement in the medical record that the correct number of doses had been received elsewhere within the appropriate time frame, as specified above. The audit was performed by a clinic staff familiar with the medical records (Georgia), a research nurse (in Louisiana), and CDC investigators (in New Mexico). Chart abstractors were blinded to the patient’s responses on the self-assessment form.

2.5. Analysis

Data from the medical record was entered into Adult Clinical Assessment (ACASA) software (Centers for Disease Control and Prevention, Atlanta, GA) a software program to facilitate chart abstractions for assessment of adult vaccination status. EpiInfo 2002 (Centers for Disease Control and Prevention, Atlanta, GA) was used to calculate the mean and 95% confidence intervals of the proportion of patients for whom vaccine was indicated and for whom was received, and statistical significance of the differences in proportions calculated using the chi squared test, and Excel used to calculate kappa statistic. We determined the number of vaccinations that were indicated for each patient according to the self-assessment and chart abstraction and calculated agreement using the kappa statistic, with agreement defined as follows [13]:

- Sensitivity: probability that vaccination was indicated according self-assessment given that it was indicated according chart audit.
- Specificity: probability that vaccination was not indicated according self-assessment given that it was not indicated according chart audit.
- Positive predictive value: probability that vaccination was indicated according chart audit given that it was indicated according self-assessment.
- Negative predictive value: probability that vaccination was not indicated according chart audit given that it was not indicated according self-assessment.

We also calculated the sensitivity, specificity, positive predictive value, and negative predictive value of self-assessment for receipt of indicated vaccines.

- Sensitivity: probability that vaccination was received according self-assessment given that it was received according chart audit.
- Specificity: probability that vaccination was not received according self-assessment given that it was not received according chart audit.
- Positive predictive value: probability that vaccination was received according chart audit given that it was received according self-assessment.
- Negative predictive value: probability that vaccination was not received according chart audit given that it was not received according self-assessment.

3. Results

The mean age of the 300 patients was 48.2 (range 18–94) years. Most (70.2%) were female. According to information on the self-assessment form 41.5% were white, 36.5% were black or African American, and 4% were American Indian or Alaska Native. The remainder (16%) did not specify their race or indicated it as other. Ethnicity was reported as Hispanic by 17.7% of the patients. One site did not provide race/ethnicity data.

3.1. Vaccines indicated

Excluding tetanus vaccine (assumed to be indicated for all patients), 586 of 1500 possible vaccinations were indicated by either self-assessment or audit. Of these 392 (78.1%) were found on both audit and medical record abstraction, 148 (16.7%) were found on self-assessment but not audit, and 46 (5.2%) on audit but not self-assessment. Compared to chart audit, significantly more indications were reported on self-assessment for influenza, hepatitis A, and hepatitis B vaccines (Table 1). Agreement regarding individual vaccine indications was almost perfect only for MMR (kappa = 0.85) and substantial for pneumococcal (kappa = 0.65), and moderate (kappa = 0.56) for influenza. For influenza vaccine, when we eliminated patients whose only indication was the health con-
dation of a close contact (information not likely to be found in medical records), the proportion of patients for whom vaccination was indicated fell (from 74% to 56%) and agreement improved (kappa = 0.75). Agreement was only fair for hepatitis A (kappa = 0.31) and hepatitis B vaccines (kappa = 0.25) (Table 1), and medical record audit confirmed only 25% of the indications for hepatitis A vaccine and 20% of the indications for hepatitis B vaccine (positive predictive value, Table 2).

The majority of indications for influenza, pneumococcal, and MMR vaccinations found on chart audit were reported on self-assessment (Table 2; sensitivities ≥80% for each vaccine). However, chart audit detected only 25% of the indications for hepatitis A and 20% of the indications for hepatitis B vaccines reported on self-assessment.

3.2. Vaccines received

Since there were large discrepancies between indications for most vaccines, we limited further analysis to the 692 vaccinations (300 Td boosters and 392 other vaccines, 2.3 per patient) indicated according to both chart audit and self-assessment. Of these 134 (19.4%) had been received according to both chart audit and self-assessment, 187 (27.0%) according to audit only, and 335 (48.4%) according to self-assessment only. Table 3 presents agreement between self-assessment and vaccine receipt. Agreement was substantial only for hepatitis B vaccines reported on self-assessment (kappa = 0.73 [based on only nine observations]), influenza (kappa = 0.70), moderate for pneumococcal vaccine (kappa = 0.55), and slight or poor for tetanus diphtheria MMR (kappa = 0.04) and Td vaccines (kappa = −0.04) (Table 3). (None of the indicated hepatitis A vaccines had been received, so agreement could not be calculated.) Lack of agreement was attributable to the larger proportion of indicated vaccines reported as received according to self-assessment. The proportion of patients who had received specific vaccinations was greater according to self-assessment for each vaccine, and the differences were statistically significant for influenza, MMR, and tetanus (each difference P < 0.001). Influenza vaccines that were received according to chart audit were almost always reported on self-assessment (sensitivity: 98%) (Table 4). Medical record documented pneumococcal and MMR vaccinations were reported less often (sensitivity 80% and 73%, respectively) and hepatitis B and tetanus vaccinations least often (sensitivity 67% and 57%, respectively). Because vaccinations reported on self-assessment were often not found on audit, specificity varied from 38% for tetanus vaccination to 100% for hepatitis A and B. Since the receipt of vaccines was found more commonly on self-assessment than chart review, the positive predictive value of self-assessment was low (13–69%) for all vaccines except hepatitis B (Table 4).

With the exception of tetanus vaccine, vaccines reported as not received according to self-assessment were rarely found to have been administered according to chart audit (negative predictive value ≥ 85%, Table 4). More than one-third of patients who reported that they had not received tetanus vaccine in the last 10 years had a documented tetanus vaccination in their medical record (negative predictive value 65%). To further characterize patients who incorrectly reported that they had not received vaccinations that were documented in their medical record, we focused on only influenza, pneumococcal, and tetanus vaccines (each of which had a sample size of at least 30 patients whose medical records documented the vaccine has been received). For documented influenza vaccinations 98% (41 of 42) patients correctly reported that they had been vaccinated in the previous year. For pneumococcal vaccine, 71% (24 of 34) correctly reported that they

Table 1
Percent of patients for whom vaccines were indicated, by source of information

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>N</th>
<th>Sens. (%)</th>
<th>Spec. (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>295</td>
<td>74% (66%–79%)</td>
<td>59% (53%–65%)</td>
<td>76% (71%–81%)</td>
<td>56% (50%–62%)</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>274</td>
<td>74% (59%–80%)</td>
<td>42% (36%–48%)</td>
<td>52% (46%–58%)</td>
<td>35% (29%–41%)</td>
</tr>
<tr>
<td>Tetanus</td>
<td>388</td>
<td>100% (1–100%)</td>
<td>100% (1–100%)</td>
<td>100% (1–100%)</td>
<td>100% (1–100%)</td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td>289</td>
<td>45% (38%–49%)</td>
<td>48% (37%–49%)</td>
<td>47% (43%–52%)</td>
<td>39% (34%–53%)</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>293</td>
<td>10% (6%–14%)</td>
<td>4% (2%–7%)</td>
<td>11% (8%–16%)</td>
<td>2% (1%–5%)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>276</td>
<td>17% (13%–22%)</td>
<td>5% (3%–8%)</td>
<td>18% (14%–23%)</td>
<td>3% (1%–5%)</td>
</tr>
</tbody>
</table>

Table 2
Sensitivity, specificity, positive and negative predictive value of self-assessment tool for detecting indicated vaccines, in comparison to chart review

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>N</th>
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<th>Spec. (%)</th>
<th>PPV (%)</th>
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</thead>
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<td>56% (50%–62%)</td>
<td>0.75 (0.66–0.86)</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>288</td>
<td>80% (74%–86%)</td>
<td>56% (49%–62%)</td>
<td>52% (46%–58%)</td>
<td>35% (29%–41%)</td>
</tr>
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<td>5% (3%–8%)</td>
<td>18% (14%–23%)</td>
<td>3% (1%–5%)</td>
</tr>
<tr>
<td>All vaccines</td>
<td>1459</td>
<td>94% (90%–98%)</td>
<td>85% (82%–88%)</td>
<td>80% (77%–84%)</td>
<td>75% (72%–78%)</td>
</tr>
</tbody>
</table>

Table 3
Vaccine indicated according to

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>N</th>
<th>Self-assessment Mean (95% CI)</th>
<th>Medical record abstraction Mean (95% CI)</th>
<th>Either self-assessment Mean (95% CI)</th>
<th>Both self-assessment Mean (95% CI)</th>
<th>Agreement*</th>
</tr>
</thead>
<tbody>
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<td>Influenza</td>
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<td>35% (29%–41%)</td>
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<td>100% (1–100%)</td>
<td>100% (1–100%)</td>
<td>1.00 (1–1.00)</td>
</tr>
<tr>
<td>Measles</td>
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<td>48% (37%–49%)</td>
<td>47% (43%–52%)</td>
<td>39% (34%–53%)</td>
<td>0.85 (0.79–0.91)</td>
</tr>
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<td>4% (2%–7%)</td>
<td>11% (8%–16%)</td>
<td>2% (1%–5%)</td>
<td>0.31 (0.06–0.56)</td>
</tr>
<tr>
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<td>276</td>
<td>17% (13%–22%)</td>
<td>5% (3%–8%)</td>
<td>18% (14%–23%)</td>
<td>3% (1%–5%)</td>
<td>0.23 (0.04–0.46)</td>
</tr>
</tbody>
</table>

* Observations in which indication could be determined according to both the self-assessment tool and medical record, even if not in agreement.
* Agreement between self-assessment and medical record.
Table 3
Receipt of vaccines indicated according to both self-assessment and chart review, by source of information regarding receipt

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Self-assessment</th>
<th>Medical record abstraction</th>
<th>Both self-assessment and medical record abstraction</th>
<th>Agreement (^a)</th>
<th>Kappa (^b) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>165</td>
<td>45% (37%–53%)</td>
<td>32% (25%–39%)</td>
<td>46% (38%–53%)</td>
<td>0.70 (0.59–0.81)</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>92</td>
<td>45% (34%–55%)</td>
<td>38% (28%–49%)</td>
<td>52% (42%–63%)</td>
<td>0.55 (0.38–0.73)</td>
</tr>
<tr>
<td>Tetanus</td>
<td>255</td>
<td>61% (55%–67%)</td>
<td>32% (27%–38%)</td>
<td>75% (69%–80%)</td>
<td>−0.04 (−0.16–0.07)</td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td>104</td>
<td>61% (51%–70%)</td>
<td>11% (5%–18%)</td>
<td>64% (53%–73%)</td>
<td>0.04 (−0.12–0.22)</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>7</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>–</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>9</td>
<td>22% (3%–60%)</td>
<td>33% (8%–70%)</td>
<td>33% (8%–70%)</td>
<td>0.73 (0.22–1.23)</td>
</tr>
</tbody>
</table>

\(^a\) Number of patients with vaccine indicated according to both self-assessment and chart review.

\(^b\) Agreement between self-assessment and chart review.

Table 4
Sensitivity, specificity, positive and negative predictive value of self-assessment tool for detecting received vaccines, in comparison to chart review (including only vaccines indicated in both self-assessment and chart review)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>N</th>
<th>Sens. (%)</th>
<th>Spec. (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>165</td>
<td>98</td>
<td>80</td>
<td>69</td>
<td>99</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>92</td>
<td>80</td>
<td>77</td>
<td>68</td>
<td>86</td>
</tr>
<tr>
<td>Measles, mumps, rubella</td>
<td>104</td>
<td>73</td>
<td>41</td>
<td>13</td>
<td>93</td>
</tr>
<tr>
<td>Tetanus – diphtheria</td>
<td>255</td>
<td>57</td>
<td>38</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>7</td>
<td>0</td>
<td>100</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>9</td>
<td>67</td>
<td>100</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>632</td>
<td>74</td>
<td>56</td>
<td>41</td>
<td>84</td>
</tr>
</tbody>
</table>

had been vaccinated, while only 56% (45 of 81) patients correctly reported that they had received tetanus vaccination in the previous 10 years. For each individual vaccine, the correctly reporting their vaccination status was independent of race, age or time since previous vaccination (Kruskal–Wallis \(P > 0.05\) for all three vaccines). Compared with men, women were more likely to correctly report their status as UTD for pneumococcal \(P = 0.04\), chi square) and tetanus–diphtheria vaccines \(P = 0.04\), chi square).

4. Discussion

While the medical record is the “gold standard” for the immunization status of children [15], we have shown that there are many limitations to relying on the medical record alone to determine the immunization needs of adults. In determining if a patient was in a target group and if the patient had received the indicated vaccine, patient- and medical record-provided information often disagreed. More indications were consistently found on self-assessment. Even when we limited analysis to vaccines indicated according to both self-assessment and chart, a larger proportion of patients reported previous vaccination on self-assessment than we found on chart review.

The additional indications for vaccines found on self-assessment probably reflects difficulty of obtaining and documenting in the medical record information needed to completely assess vaccination status. This was clearly the case for influenza vaccine, where the exclusion of self-assessment information about health conditions in family members decreased the proportion of patients for whom influenza vaccine was indicated and increased agreement. Although we cannot be certain that lack of agreement regarding pneumococcal vaccine indications can be attributed to almost all indications being medical conditions likely to be noted on a problem list.
While it is not surprising that the medical record appeared to lack information needed to determine some indications for vaccinations, lack of this information still represents a problem for providers attempting to assess which vaccines are needed. Collecting additional information during a thorough history taken at the time of the initial patient visit or during subsequent clinical encounters is a logical solution. It would facilitate assessment of vaccination status and decrease unnecessary revaccination. However, the plethora of risks which need to be assessed make it challenging for physicians to accurately determine the need for specific vaccines and there is strong evidence that physicians do not have sufficient time to comply with even existing U.S. Preventive Services Task Force recommendations [17]. Electronic medical records, registries and algorithms that generate computerized reminders have the potential to decrease the use of physician time and increase vaccine use.

Our results regarding the previous receipt of vaccines suggest that the medical chart does not accurately reflect patient-reported information [18]. It is likely that some vaccinations had been administered off site but not listed in the patient’s chart. While the clinical need to assess influenza vaccination status may be resolved by asking the patient if he/she received the vaccine during the current season, uncertainty about the accuracy of patient recall is a greater problem for other vaccines and certainly represents a problem when charts are used as a basis for assessing clinical performance. Our findings extend those of previous investigations, which were limited to influenza and pneumococcal vaccinations. These studies found patients were usually correct when they reported that they had already received influenza and pneumococcal vaccines [3,4,19], but sometimes failed to recall vaccines that had been administered according to the medical record [3,20]. Patients in our study correctly reported 98% of medical record document influenza vaccinations, 80% of pneumococcal vaccination, 73% of MMR vaccinations, and 57% of tetanus vaccinations. The latter two vaccines are of particular concern since the agreement was not significantly different from 0. The poor agreement suggests that recall and medical record must be reconciled before clinical decisions are made. Interestingly, we found that lack of recall was associated with the patient’s gender, but, unlike previous studies, not time since previous vaccination [4].

The results also suggest that caution should be used in relying on interventions as audit and feedback and physician reminders to increase immunization coverage, since these intervention rely heavily on information from medical records [21,22]. Registries [23] and electronic medical records [24], may be more efficient ways to remind patients and providers about the need for preventive health services [25], but unless a detailed history or patient self-assessment is included they may underestimate both the number of indicated vaccines and the number of vaccines that have been received. When coupled with standing orders. These tools can facilitate identification of recommended vaccines and decrease the amount of time providers must spend to determine which vaccines are indicated, but widespread implementation and dissemination remains a challenge [26].

When the medical record is absent or incomplete (e.g. in emergency departments, public health clinics, pharmacies and supermarkets) [27], forms such as the self-assessment tool may contribute to determining vaccine needs. Even when medical records are present, self-assessment can be an efficient way for physicians to detect new risk factors and convey new indications on the use of vaccines for adults. Self-assessment can be used while patients are waiting to see their providers, thereby decreasing provider time to identify indicated vaccines. Finally, since both patient risk factors and ACIP indications change over time simple methods are needed for physicians and patients to determine new vaccination requirements.

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Appendix 1

**ADULT VACCINATION SCREENING FORM**

Adults need to stay up-to-date on getting vaccines, but it can be hard to keep up with what you need. This form will help you and your doctor find out which vaccines might be important for you. Please take a minute to fill out this form.
Appendix 1 (Continued)

**FLU SHOT**

Please circle “Yes” or “No” for statement 1—

1. I have had a flu vaccine shot in the last 12 months.
   - Yes
   - No
   
   If you circled “Yes”, please go to the next page.
   If you circled “No”, please answer the statements below.

Please circle “Yes” or “No” for each statement—

2. I am 50 years old or older.
   - Yes
   - No

3. I have one or more of the following conditions:
   - Diabetes mellitus (sugar)
   - Lung disease, including asthma
   - Heart or kidney disease
   - Sickle cell disease
   - Cancer or HIV/AIDS
   - May be pregnant during the flu season (November–March)
   - Take steroids (such as prednisone)
   - Yes
   - No

4. One or more of the following apply to me:
   - I live with someone who is over 65 years old or older and has one of the conditions listed in Statement 3 above
   - I live with or care outside the home for a child less than 2 years old
   - I am a health care worker
   - I provide essential community services
   - Yes
   - No

If you circled “Yes” to one or more of statements 2–4, you may need the flu vaccine shot during the flu season (November–March).

Please go to the next page.
PNEUMOCOCCAL SHOT

Please circle “Yes” or “No” for statement 1—

1. I have had a pneumonia (pneumococcal) vaccine shot in the last 5 years.
   Yes  No

   If you circled “Yes”, please go to the next page.
   If you circled “No”, please answer the statements below.

Please circle “Yes” or “No” for each statement—

2. I am an American Indian or Alaska Native.
   Yes  No

3. I am 65 years old or older and have never had a pneumonia vaccine shot.
   Yes  No

4. I have one or more of the following conditions:
   - Diabetes mellitus (sugar)
   - Lung disease, not just asthma
   - Heart, kidney, or liver disease
   - Drinking problem (alcoholism)
   - Sickle cell disease
   - Cancer or HIV/AIDS
   - Do not have a spleen
   - Spinal fluid leak
   - Take steroids (such as prednisone)
   Yes  No

5. I am 65 years old or older and both the following apply to me:
   - I had a pneumonia shot when I was younger than 65
   - It has been 5 years or more since I had that vaccine shot
   Yes  No

If you circled “Yes” to one or more of statements 2–5, you may need the pneumonia (pneumococcal) vaccine shot.

Please go to the next page.
Appendix 1 (Continued)

HEPATITIS A SHOT

Please circle “Yes” or “No” for statement 1—

1. I have had hepatitis A infection or 2 hepatitis A vaccine shots.
   Yes  No

   If you circled “Yes”, please go to the next page.
   If you circled “No”, please answer the statement below.

Please circle “Yes” or “No” for statement 2—

2. One or more of the following apply to me:
   ■ I plan to visit a foreign country (except: Canada, Japan, Australia or Western Europe)
   ■ I take drugs bought on the street (use needles or snort)
   ■ I am a man who has sex with men
   ■ I have had liver disease for a long time or I have hepatitis C
   ■ I have a blood clotting disease with clotting factor infusions
      Yes  No

If you circled “Yes” to statement 2, you may need the hepatitis A vaccine shot.
Please go to the next page.
Appendix 1 (Continued)

HEPATITIS B SHOT

Please circle “Yes” or “No” for statement 1—

1. I have had hepatitis B infection or 3 hepatitis B vaccine shots.
   Yes  No
   If you circled “Yes”, please go to the next page.
   If you circled “No”, please answer the statements below.

Please circle “Yes” or “No” for each statement —

2. I am under 20 years old.
   Yes  No

3. One or more of the following apply to me:
   - I am a health care or public safety worker who could be exposed to blood or body fluids
   - I recently had or was treated for a sexually transmitted disease
   - I had more than one sex partner during the last 6 months
   - I am a man who has sex with men
   - I have sex or live with a person with hepatitis B
   - I have had liver disease for a long time or I have hepatitis C
   - I shoot drugs with needles
   - I have bad kidney disease
   - I provide direct services for people with developmental disabilities
   - I will live in Asia or Africa for more than 6 months
   - I come from Asia or the Pacific Islands
   - I have a blood clotting disease
   Yes  No

If you circled “Yes” to one or both of statements 2–3, you may need the hepatitis B vaccine shot.

Please go to the next page.
Appendix 1 (Continued)

TETANUS SHOT

Please circle “Yes” or “No” for statement 1—

1. I have had a tetanus booster shot in the last 10 years.
   Yes   No
   If you circled “Yes”, please go to the next page.
   If you circled “No”, see below.

You may need a tetanus booster shot.
Please go to the next page.
Appendix 1 (Continued)

**MEASLES-MUMPS-RUBELLA (MMR) SHOT**

**Please circle “Yes” or “No” for statement 1—**

1. I have had at least 1 Measles-Mumps-Rubella (MMR) vaccine shot.
   - [ ] Yes
   - [ ] No

   If you circled “Yes”, please go to the next page.
   If you circled “No”, please answer the statements below.

---

**Please circle “Yes” or “No” for each statement—**

2. I was born in 1957 or later.
   - [ ] Yes
   - [ ] No

3. I am a woman who was born outside of the US who could become pregnant.
   - [ ] Yes
   - [ ] No

4. One or more of the following apply to me:
   - [ ] I am a health care worker
   - [ ] I am entering college or a trade school
   - [ ] I have HIV/AIDS
   - [ ] I plan to visit foreign countries in the future
   - [ ] Yes
   - [ ] No

   If you circled “Yes” to one or more of statements 2–4, you may need the Measles-Mumps-Rubella (MMR) vaccine shot.

Please go to the next page.
Appendix 1 (Continued)

“**Chickenpox** (Varicella) Shot

Please circle “Yes” or “No” for statement 1—

1. I have had “Chickenpox” disease
   - Yes
   - No

If you circled “Yes”, please go to the next page.
If you circled “No”, please see below.

You may need the “Chickenpox” (Varicella) vaccine shot.

Please go to the next page.
References


agreement between medical charts and parent telephone interviews.


